



Energy Journal Roundup: May 2009

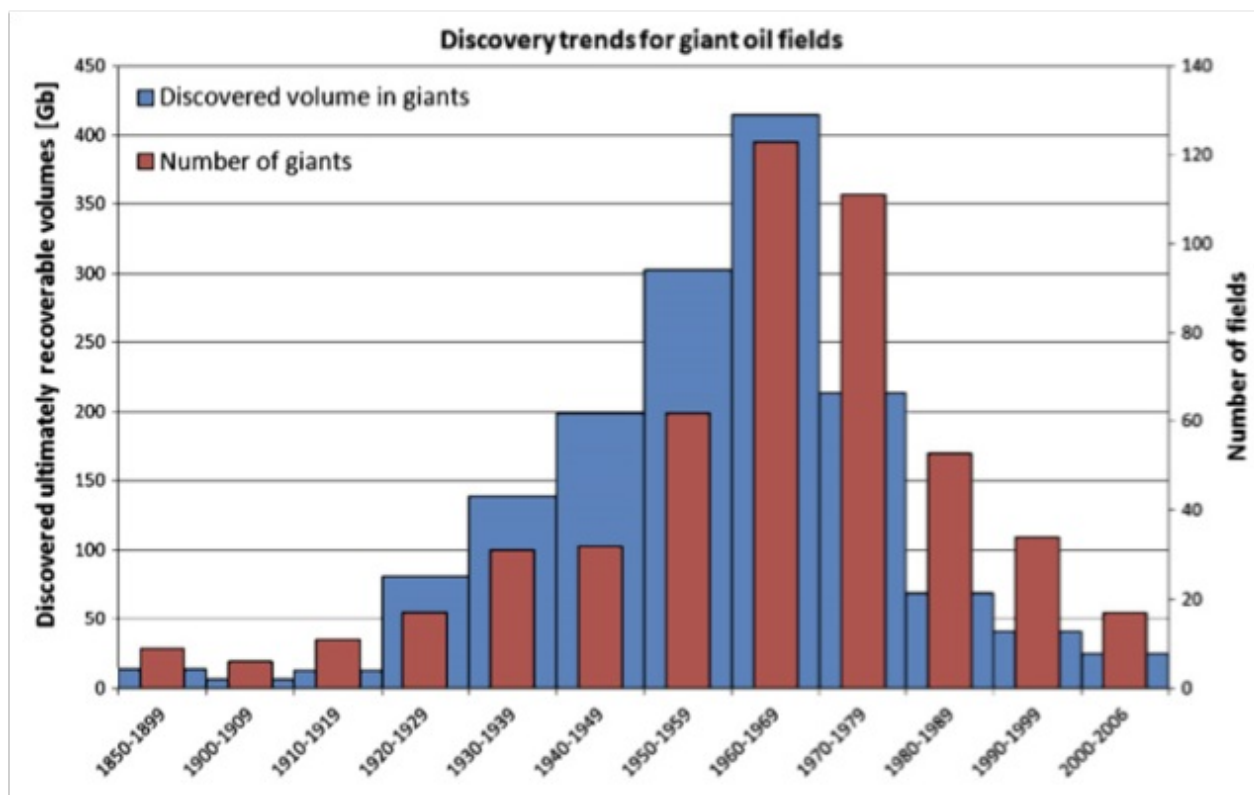
Posted by [David Murphy](#) on May 16, 2009 - 10:05am

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Feature Article

Mikael Höök, Robert Hirsch, Kjell Aleklett, 2009. [Giant oil field decline rates and their influence on world oil production](#), Energy Policy, Volume 37, Issue 6, June 2009, Pages 2262-2272



The Energy Journal Roundup is a monthly post reviewing the peer-reviewed literature published in various energy journals from around the world.

Mikael Höök, Robert Hirsch, Kjell Aleklett, 2009. [Giant oil field decline rates and their influence on world oil production](#), Energy Policy, Volume 37, Issue 6, June 2009, Pages 2262-2272

The most important contributors to the world's total oil production are the giant oil

fields. Using a comprehensive database of giant oil field production, the average decline rates of the world's giant oil fields are estimated. Separating subclasses was necessary, since there are large differences between land and offshore fields, as well as between non-OPEC and OPEC fields. The evolution of decline rates over past decades includes the impact of new technologies and production techniques and clearly shows that the average decline rate for individual giant fields is increasing with time. These factors have significant implications for the future, since the most important world oil production base – giant fields – will decline more rapidly in the future, according to our findings. Our conclusion is that the world faces an increasing oil supply challenge, as the decline in existing production is not only high now but will be increasing in the future.

Faehn, T., Bruvoll, A., 2009. [Richer and cleaner – at others' expense?](#), Resource and Energy Economics, vol. 31, pp.103-122.

In rich economies emissions of many pollutants tend to grow at a slower rate than GDP. This could be a result of shifting comparative advantages. If so, net imports of dirty products to these economies will increase and rather than reduced, emissions will be relocated to other countries. In this paper we investigate if decoupling in a rich, open economy coincides with such pollution leakages abroad. Based on historical observations and model projections, we find little evidence to support this hypothesis. Historically, decoupling coincides with falling pollution leakages. Projections over a period of decades indicate a weakening of the decoupling, but that leakages will increase.

Kusiak, A., Zheng, H., Song, Z., 2009. [Wind farm power prediction: a data-mining approach](#), Wind Energy, Vol. 12, No. 3, pp 275-293.

In this paper, models for short- and long-term prediction of wind farm power are discussed. The models are built using weather forecasting data generated at different time scales and horizons. The maximum forecast length of the short-term prediction model is 12 h, and the maximum forecast length of the long-term prediction model is 84 h. The wind farm power prediction models are built with five different data mining algorithms. The accuracy of the generated models is analysed. The model generated by a neural network outperforms all other models for both short- and long-term prediction. Two basic prediction methods are presented: the direct prediction model, whereby the power prediction is generated directly from the weather forecasting data, and the integrated prediction model, whereby the prediction of wind speed is generated with the weather data, and then the power is generated with the predicted wind speed. The direct prediction model offers better prediction performance than the integrated prediction model. The main source of the prediction error appears to be contributed by the weather forecasting data.

Bolinger, M., Harper, J., Karcher, M., 2009. [A review of wind project financing structures in the USA](#), Wind Energy, Vol. 12, No. 3, pp-295-309.

The rapid pace of wind power development in the USA over the last decade has outstripped the ability of most project developers to provide adequate equity capital and to make efficient use of project-related tax benefits. In response, the sector has created novel project financing structures that feature varying combinations of equity capital from project developers and third-party tax-oriented investors and, in some cases, commercial debt. While their origins stem from variations in the financial capacity and business objectives of wind project developers, as well as the risk tolerances and objectives of equity and debt providers, each structure is, at its core, designed to manage project risk and to allocate federal tax incentives to those entities that can use them most efficiently. This paper surveys the six principal financing structures through which most new utility-scale wind projects (excluding utility-owned projects) in the USA have been financed from 1999 to the present. These structures include simple balance sheet finance, several varieties of all-equity special allocation partnership flip structures and two leveraged structures. In addition to describing each structure's mechanics, the paper also discusses its rationale for use, the types of investors that find it appealing and why, and its relative frequency of use in the market. The paper concludes with a generalized summary of how a developer might choose one structure over another.

Donovan, G.H., Butry, D.T., 2009. [The value of shade: Estimating the effect of urban trees on summertime electricity use](#), Energy and Buildings, Vol. 41, No. 6, pp.662-668.

We estimated the effect of shade trees on the summertime electricity use of 460 single-family homes in Sacramento, California. Results show that trees on the west and south sides of a house reduce summertime electricity use, whereas trees on the north side of a house increase summertime electricity use. The current level of tree cover on the west and south sides of houses in our sample reduced summertime electricity use by 185 kWh (5.2%), whereas north-side trees increased electricity use by 55 kWh (1.5%). Results also show that a London plane tree, planted on the west side of a house, can reduce carbon emissions from summertime electricity use by an average of 31% over 100 years.

Parker, D.S., 2009. [Very low energy homes in the United States: Perspectives on performance from measured data](#), Energy and Buildings, Vol. 41, No. 5, pp.512-520.

We present measured annual performance data from a dozen recent-vintage very low energy homes in North America. Many of the designs combine greater energy efficiency with solar electric photovoltaic power in an attempt to create Zero Energy Homes (ZEH). We also provide measured data from the first home constructed to the German Passivhaus standard in the United States. Several projects either exceeded or come very close to true net zero energy when evaluated over a year. The data indicate that very low energy use buildings can very readily be achieved in North America. Annual energy use half that or less than standard housing can be achieved for an equivalent cost of \$0.10/kWh from the efficiency investment. In general, the better cost effectiveness seen from energy efficiency measures indicates that greater investment in conservation should be a prerequisite to installation of solar water heating and solar electricity in Zero Energy Homes. However, over emphasis in efficiency is also possible. This suggests that

optimization tools such as BEopt and EGUSA, which characterize both renewable resource performance and that also of specific combinations of energy efficiency measures, will best guide designers to locate the most economically favorable mix to reach an energy neutral level.

Lin Zhao, Lianyong Feng, Charles A.S. Hall, 2009. [**Is peakoilism coming?**](#), Energy Policy, Volume 37, Issue 6, June 2009, Pages 2136-2138

Peak oil research and the Association for the Study of Peak Oil and Gas (ASPO) have contributed a great deal to improve people's recognition of peak oil. Although peak oil is becoming a part of public recognition, it is still hard to say whether peak oil discussion will develop into a theory such as "peakoilism". On one hand, there are still some difficult problems in peak oil research. On the other hand, the peakoilers have the potential for scientific research and have their allies: the climate change researchers and the new energy advocates. Oil is a limited, non-renewable resource, and an oil peak is inevitable. Peak oil theory is a kind of development theory rather than a crisis theory, which promotes reasonable utilization of the limited oil resources, promotes conservation, and encourages the development of renewable energy.

Anil Hira, Luiz Guilherme de Oliveira [**No substitute for oil? How Brazil developed its ethanol industry**](#), Energy Policy, Volume 37, Issue 6, June 2009, Pages 2450-2456

The world is presently mired in an energy crisis that challenges our ability to maintain standards of living in the North and raise them in the South. With accelerating demand for fossil fuels and relatively stagnant supplies, the fundamental bases of our transportation, energy, and agricultural systems are being questioned.

Biofuels provide a more feasible technology than other renewables that could serve immediately to substitute for petroleum products in transportation. However, biofuels have been much reviled as leading to increased food prices and being environmental unfriendly. This article examines the case of Brazil. As a pioneer of biofuel use, Brazil is a key case for studying the possibilities, trade-offs, costs and benefits, of ethanol as an alternative to petroleum. Brazil has had an active program for over 30 years and is the world leader both in terms of technology and usage of ethanol. With relatively low economies of scale, a number of developing countries could successfully adopt the Brazilian system, reducing their dear dependence on petroleum. The evolution of the Brazilian ethanol system and its parameters are therefore of paramount interest to those interested in energy policy around the world.

Erika Felix, David R. Tilley [**Integrated energy, environmental and financial analysis of ethanol production from cellulosic switchgrass**](#), Energy, Volume 34, Issue 4, April 2009, Pages 410-436

Ethanol production from cellulosic sources such as switchgrass (*Panicum virgatum* L.)

requires the use of natural resources, fossil fuels, electricity, and human-derived goods and services. We used emergy accounting to integrate the ultimate amount of environmental, fossil fuel, and human-derived energy required to produce ethanol from switchgrass. Emergy is the total amount of energy of one form required directly and indirectly to make another form of energy. Forty-four percent of required emergy came from the environment either directly or embodied in purchased goods, 30% came from fossil fuels either directly or embodied in purchased goods, and 25% came from human-derived services indirectly. Ethanol production per petroleum use (emergy/emergy) was 4.0-to-1 under our Baseline Scenario, but dropped to 0.5-to-1 under a scenario that assumed higher input prices, lower conversion efficiencies and less waste recycling. At least 75% of total emergy was from non-renewable sources. Energy 'hidden' in indirect paths such as goods and services was 65% of the total. Cellulosic-ethanol is not a primary fuel source that substitutes for petroleum because its production relies heavily on non-renewable energy and purchased inputs. It is a means for converting natural resources to liquid fuel.

Daniel D. Moran, Mathis C. Wackernagel, Justin A. Kitzes, Benjamin W. Heumann, Doantam Phan, Steven H. Goldfinger. [Trading spaces: Calculating embodied Ecological Footprints in international trade using a Product Land Use Matrix \(PLUM\)](#), Ecological Economics, Volume 68, Issue 7, 15 May 2009, Pages 1938-1951

Nations import and export biophysical resources. With many ecosystems worldwide under mounting stress, countries may be increasingly interested in knowing the extent and origin of their ecological imports and dependencies. In this paper the Ecological Footprint is used as a tool to measure the biophysical (as opposed to financial) value of international trade flows. This paper attempts to answer the following question: How large of an Ecological Footprint does a given country exert inside the borders of each of its trading partners? Records in the UN COMTRADE bilateral trade database are multiplied by a matrix of per-product Footprint yield coefficients to translate from values in dollars and tonnes to units of hectares. The results show that the largest interregional flows are from Latin to North America, and from North America to Asia-Pacific. Grouping countries by GDP, high and middle income countries appear in Footprint terms to trade predominantly with other high and middle income countries and much less with low income countries.

Julianne H. Mills, Thomas A. Waite [Economic prosperity, biodiversity conservation, and the environmental Kuznets curve](#), Ecological Economics, Volume 68, Issue 7, 15 May 2009, Pages 2087-2095

Many conservationists contend that economic growth and biodiversity conservation are incompatible goals. Some economists contest this viewpoint, arguing that wealthier countries have the luxury of investing more heavily in efforts to conserve biodiversity. Under this assumption, we expect a U-shaped relationship between per capita wealth and proportion of species conserved. We test this environmental Kuznets curve (EKC) using estimates of per capita income and deforestation rates (index of biodiversity threat) for 35 tropical countries. A prior analysis [Dietz, S., Adger, W.N., 2003.

Economic growth, biodiversity loss and conservation effort. Journal of Environmental Management, 68:23–35] using conventional regression techniques failed to provide any support for the parabolic relationship predicted by the EKC hypothesis. Here, we introduce the use of quantile regression and spatial filtering to reanalyze this data, addressing issues of heteroskedasticity and spatial autocorrelation. We note that preliminary analysis using these methods provides some initial evidence for an EKC. However, a series of panel analyses with country-specific dummy variables eliminated or even reversed much of this support. A closer examination of conservation practices and environmental indicators within the countries, particularly those countries that drove our initial support, suggests that wealth is not a reliable indicator of improved conservation practice. Our findings indicate that an EKC for biodiversity is overly simplistic and further exploration is required to fully understand the mechanisms by which income affects biodiversity.

Mathew Werber, Michael Fischer, Peter V. Schwartz [**Batteries: Lower cost than gasoline?**](#), Energy Policy, Volume 37, Issue 7, July 2009, Pages 2465-2468

We compare the lifecycle costs of an electric car to a similar gasoline-powered vehicle under different scenarios of required driving range and cost of gasoline. An electric car is cost competitive for a significant portion of the scenarios: for cars of lower range and for higher gasoline prices. Electric cars with 150 km range are a technologically viable, cost competitive, high performance, high efficiency alternative that can presently suit the vast majority of consumers' needs.

Patrick Moriarty, Damon Honnery. [**What energy levels can the Earth sustain?**](#), Energy Policy, Volume 37, Issue 7, July 2009, Pages 2469-2474

Several official reports on future global primary energy production and use develop scenarios which suggest that the high energy growth rates of the 20th century will continue unabated until 2050 and even beyond. In this paper we examine whether any combination of fossil, nuclear, and renewable energy sources can deliver such levels of primary energy—around 1000 EJ in 2050. We find that too much emphasis has been placed on whether or not reserves in the case of fossil and nuclear energy, or technical potential in the case of renewable energy, can support the levels of energy use forecast. In contrast, our analysis stresses the crucial importance of the interaction of technical potentials for annual production with environmental factors, social, political, and economic concerns and limited time frames for implementation, in heavily constraining the real energy options for the future. Together, these constraints suggest that future energy consumption will be significantly lower than the present level.

Christian Wolf [**Does ownership matter? The performance and efficiency of State Oil vs. Private Oil \(1987–2006\)**](#), Energy Policy, Volume 37, Issue 7, July 2009, Pages 2642-2652

This paper investigates the existence of ownership effects in the global oil and gas

industry, i.e. whether there are systematic performance and efficiency differentials between National Oil Companies (NOCs) and privately owned International Oil Companies (IOCs). After discussing key issues of comparing 'State Oil' and 'Private Oil', I summarise important trends emerging from the dataset, which covers 1001 firm observation years over the period 1987–2006. Using panel-data regression analysis it is shown that NOCs significantly underperform the private sector in terms of output efficiency and profitability. They also produce a significantly lower annual percentage of upstream reserves, although this may not be an indication of firm efficiency. Overall, this paper suggests that a political preference for State Oil usually comes at an economic cost.

Troy Lorde, Mahalia Jackman, Chrystol Thomas [The macroeconomic effects of oil price fluctuations on a small open oil-producing country: The case of Trinidad and Tobago](#), Energy Policy, Volume 37, Issue 7, July 2009, Pages 2708-2716

Using vector autoregressive (VAR) methodology, this paper empirically investigates the macroeconomic effects of oil price fluctuations on Trinidad and Tobago. Overall, we find that the price of oil is a major determinant of economic activity of the country. Our impulse response functions suggest that following a positive oil price shock, output falls within the first two years followed by positive and growing response. We also investigate the macroeconomic impact of oil price volatility. Results suggest that an unanticipated shock to oil price volatility brings about random swings in the macroeconomy; however, only government revenue and the price level exhibit significant responses. With regard to the magnitude of the responses, shocks to oil price volatility tend to yield smaller macroeconomic impacts in comparison to shocks to oil prices. Variance decompositions suggest that the price of oil is a major component of forecast variation for most macroeconomic variables. Finally, Granger-causality tests indicate causality from oil prices to output and oil prices to government revenue.

Benjamin K. Sovacool, Kelly E. Sovacool. [Identifying future electricity–water tradeoffs in the United States](#), Energy Policy, Volume 37, Issue 7, July 2009, Pages 2763-2773

Researchers for the electricity industry, national laboratories, and state and federal agencies have begun to argue that the country could face water shortages resulting from the addition of thermoelectric power plants, but have not attempted to depict more precisely where or how severe those shortages will be. Using county-level data on rates of population growth collected from the US Census Bureau, utility estimates of future planned capacity additions in the contiguous United States reported to the US Energy Information Administration, and scientific estimates of anticipated water shortages provided from the US Geologic Survey and National Oceanic and Atmospheric Administration, this paper highlights the most likely locations of severe shortages in 22 counties brought about by thermoelectric capacity additions. Within these areas are some 20 major metropolitan regions where millions of people live. After exploring the electricity–water nexus and explaining the study's methodology, the article then focuses on four of these metropolitan areas – Houston, Texas; Atlanta, Georgia; Las Vegas, Nevada; New York, New York – to deepen an understanding of the water and electricity

challenges they may soon be facing. It concludes by identifying an assortment of technologies and policies that could respond to these electricity–water tradeoffs.

Rogério Cezar de Cerqueira Leite, Manoel Regis Lima Verde Leal, Luís Augusto Barbosa Cortez, W. Michael Griffin, Mirna Ivonne Gaya Scandiffio [Can Brazil replace 5% of the 2025 gasoline world demand with ethanol?](#), *Energy*, Volume 34, Issue 5, May 2009, Pages 655-661

Increasing use of petroleum, coupled with concern for global warming, demands the development and institution of CO₂ reducing, non-fossil fuel-based alternative energy-generating strategies. Ethanol is a potential alternative, particularly when produced in a sustainable way as is envisioned for sugarcane in Brazil. We consider the expansion of sugarcane-derived ethanol to displace 5% of projected gasoline use worldwide in 2025. With existing technology, 21 million hectares of land will be required to produce the necessary ethanol. This is less than 7% of current Brazilian agricultural land and equivalent to current soybean land use. New production lands come from pasture made available through improving pasture management in the cattle industry. With the continued introduction of new cane varieties (annual yield increases of about 1.6%) and new ethanol production technologies, namely the hydrolysis of bagasse to sugars for ethanol production and sugarcane trash collection providing renewable process energy production, this could reduce these modest land requirements by 29–38%.



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