The Oil Drum
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Energy Journal Roundup: August 2009

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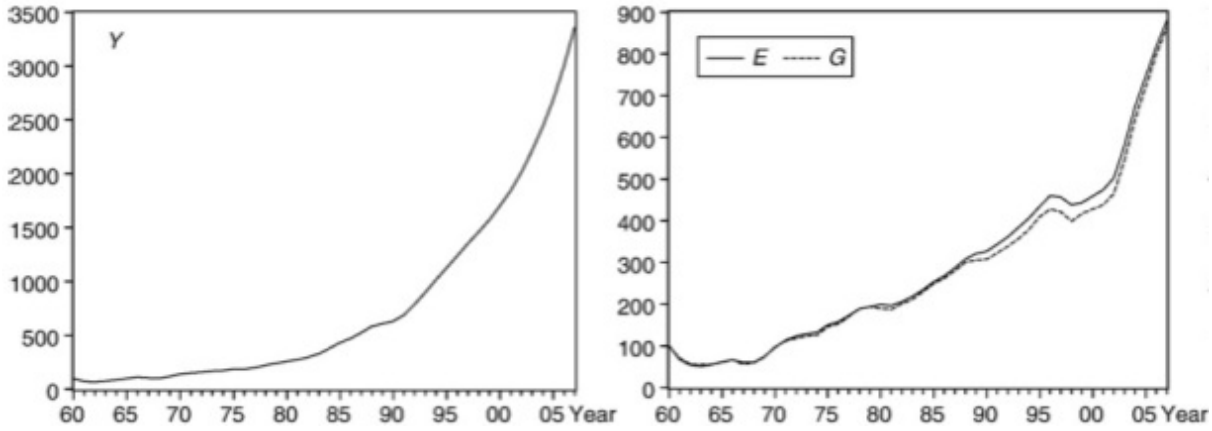
Feature Article

Xing-Ping Zhang, and Xiao-Mei Cheng, 2009, Energy consumption, carbon emissions, and economic growth in China, Ecological Economics, Volume 68, Issue 10, Pages 2706-2712.



Growth trends of income (Y), energy consumption (E) and greenhouse gas emissions (G) for China (indexed values, 1960 = 100).

The Energy Journal Roundup is a monthly post listing citations and abstracts from some of the peer-reviewed literature published in various energy journals around the world.

Xing-Ping Zhang, and Xiao-Mei Cheng, 2009, Energy consumption, carbon emissions, and economic growth in China, Ecological Economics, Volume 68, Issue 10, Pages 2706-2712.

This paper investigates the existence and direction of Granger causality between economic growth, energy consumption, and carbon emissions in China, applying a multivariate model of economic growth, energy use, carbon emissions, capital and urban population. Empirical results for China over the period 1960–2007 suggest a unidirectional Granger causality running from GDP to energy consumption, and a unidirectional Granger causality running from energy consumption to carbon emissions in the long run. Evidence shows that neither carbon emissions nor energy consumption leads economic growth. Therefore, the government of China can purse conservative

energy policy and carbon emissions reduction policy in the long run without impeding economic growth.

Jonkman, J. M., 2009, Dynamics of Offshore Floating Wind Turbines—Model Development and Verification, Wind Energy, Vol. 12, pp. 459 - 492

The vast deepwater wind resource represents a potential to use offshore floating wind turbines to power much of the world with renewable energy. Many floating wind turbine concepts have been proposed, but dynamics models, which account for the wind inflow, aerodynamics, elasticity and controls of the wind turbine, along with the incident waves, sea current, hydrodynamics, and platform and mooring dynamics of the floater, were needed to determine their technical and economic feasibility. This work presents the development of a comprehensive simulation tool for modelling the coupled dynamic response of offshore floating wind turbines and the verification of the simulation tool through model-to-model comparisons. The fully coupled time-domain aero-hydro-servo-elastic simulation tool was developed with enough sophistication to address limitations of previous studies and has features required to perform loads analyses for a variety of rotor-nacelle assembly, tower, support platform and mooring system configurations. The developed hydrodynamics module accounts for linear hydrostatic restoring; non-linear viscous drag; the added-mass and damping contributions from linear wave radiation, including free-surface memory effects; and the incident-wave excitation from linear diffraction in regular or irregular seas. The developed mooring line module is quasi-static and accounts for the elastic stretching of an array of homogenous taut or slack catenary lines with seabed interaction. The hydrodynamics module, the moorings module, and the overall simulation tool were tested by comparing to results of other models, including frequency-domain models. The favourable results of all the verification exercises provided confidence to perform more thorough analyses.

Kofowolora, O. F., Gheewala, S.H., 2009, Life cycle energy assessment of a typical office building in Thailand, Energy and Buildings, Vol. 41, pp. 1076 - 1083

A typical office building in Thailand was analyzed using the life cycle energy analysis (LCEA) method to illustrate the argument. Results indicate that although life cycle energy (LCE) distribution is concentrated at the operating phase, the embodied energy of buildings is a non-negligible fraction of the LCE balance. Energy (electricity) used for lighting and HVAC systems in the operation phase and; the manufacture of concrete and steel were the most significant elements in the buildings life cycle. Application of a combination of energy saving measures, showed that 40–50% of energy (electricity) used in a typical office building in Thailand can be saved. Preliminary analysis indicated that recycling building materials can also contribute additional energy savings (about 8.9%) to a buildings LCE profile. Therefore reducing energy consumption should be a priority for not only the operation but also other life cycle phases. It is suggested that both embodied and operating energy should be accounted for within the context of energy efficiency through the incorporation of LCEA into the existing Thai building energy code.

Antonio Roma and Davide Pirino, 2009, The extraction of natural resources: The role of thermodynamic efficiency, Ecological Economics, Volume 68, Issue 10, Pages 2594-2606.

> The modelling of production in microeconomics has been the subject of heated debate. The controversial issues include the substitutability between production inputs, the role of time and the economic consequences of irreversibility in the production process. A case in point is the use of Cobb–Douglas type production functions, which completely ignore the physical process underlying the production of a good. We examine these issues in the context of the production of a basic commodity (such as copper or aluminium). We model the extraction and the refinement of a valuable substance which is mixed with waste material, in a way which is fully consistent with the physical constraints of the process. The resulting analytical description of production unambiguously reveals that perfect substitutability between production inputs fails if a corrected thermodynamic approach is used. We analyze the equilibrium pricing of a commodity extracted in an irreversible way. We force consumers to purchase goods using energy as the means of payment and force the firm to account in terms of energy. The resulting market provides the firm with a form of reversibility of its use of energy. Under an energy numeraire, energy resources will naturally be used in a more parsimonious way.

Susan Krumdieck , 2009, New Zealand energy strategy—Introduction to the energy policy special issue, Energy Policy, Volume 37, Issue 9, Pages 3297-3300

> There is no abstract listed for this article. I included it because it is the introductory article to a special section in this volume of Energy Policy called “New Zealand and Energy Strategy.” For all those interested in New Zealand energy, here is a link to a page listing all the article titles.

C. Filippín and S. Flores Larsen, 2009, Analysis of energy consumption patterns in multi-family housing in a moderate cold climate, Energy Policy, Volume 37, Issue 9, Pages 3489-3501

> This paper analyzes the energy consumption during the period 2001–2006 of 192 flats distributed in three-storey buildings, in order to understand how current policies related to energy use could be improved for increased residential energy efficiency in Argentina. The buildings (1, 2 and 3 bedrooms) are located in La Pampa, central Argentina, in a moderate cold climate. The dimensional and energy-consumption variables are studied (area, envelope's area, FAEP=envelope's area/floor area; envelope's thermal resistance R, volumetric heat loss G and auxiliary heating Qaux). The natural gas consumption is analyzed at annual and seasonal levels. Consumption variability among buildings, storeys and flats is calculated. The quantitative analysis is coupled to a qualitative description through direct observation of the buildings. The results show: (a) a high incidence of natural gas consumption in the total annual energy consumption (natural gas+electricity), (b) seasonality of natural gas consumption, with a maximum value in the cold period July–August (variability=80%), (c) little variability

among buildings of the annual natural gas consumption (4.17%), (d) the lowest average energy consumption at the first floor, (e) high variability among flats on each storey, (f) winter consumption of a multi-family dwelling lower than a single-family dwelling of similar area and (g) little seasonal variability of the electricity consumption.

Paul Harborne and Chris Hendry, 2009, Pathways to commercial wind power in the US, Europe and Japan: The role of demonstration projects and field trials in the innovation process, Energy Policy, Volume 37, Issue 9, Pages 3580-3595

A growing, but little understood area of Government involvement in promoting renewable energy, is the use of demonstration projects and field trials (DTs) as a policy tool. This paper explores the historical role of DTs in the commercialisation of wind turbines. We review information from government, academic and industry sources, together with the newly created Cass Wind DT database, and consider the context, objectives, participants and nature of wind DTs in the EU, US and Japan.
Overall, it is difficult to identify the benefits of wind DTs for many of the key actors. Government funding of DTs does not appear to be shaped by coherent or targeted strategic objectives–indeed governments use DTs differently despite similar stated objectives. A common theme has been the involvement of many stakeholders, with local authorities, utilities and operators taking the lead rather than manufacturers. Wind DTs appear to have neither enabled participating manufacturers to become significant global suppliers–with a few exceptions driven by additional financial and legislative support from national governments-nor to have established a dominant design. The major benefit of wind DTs appears to have been 'learning by using' for utilities and wind farm operators, reducing operational costs.

Nicholas Apergis and James E. Payne, 2009, Energy consumption and economic growth: Evidence from the Commonwealth of Independent States, Energy Economics, Volume 31, Issue 5, Pages 641-647

This study examines the relationship between energy consumption and economic growth for eleven countries of the Commonwealth of Independent States over the period 1991–2005 within a multivariate panel data framework. Based on (Pedroni, 1999) and (Pedroni, 2004) heterogeneous panel cointegration test and corresponding error correction model, cointegration is present between real GDP, energy consumption, real gross fixed capital formation, and labor force with the respective coefficients positive and statistically significant. The results of the error correction model reveal the presence of unidirectional causality from energy consumption to economic growth in the short-run while bidirectional causality between energy consumption and economic growth in the long-run. Thus, the results lend support for the feedback hypothesis associated with the relationship between energy consumption and economic growth.

Chaker Aloui and Rania Jammazi, 2009, The effects of crude oil shocks on stock market shifts behaviour: A regime switching approach, Energy Economics, Volume 31, Issue 5, Pages 789-799

> In this paper we develop a two regime Markov-switching EGARCH model introduced by Henry [Henry, O., 2009. Regime switching in the relationship between equity returns and short-term interest rates. Journal of Banking and Finance 33, 405–414.] to examine the relationship between crude oil shocks and stock markets. An application to stock markets of UK, France and Japan over the sample period January 1989 to December 2007 illustrates plausible results. We detect two episodes of series behaviour one relative to low mean/high variance regime and the other to high mean/low variance regime. Furthermore, there is evidence that common recessions coincide with the low mean/high variance regime. In addition, we allow both real stock returns and probability of transitions from one regime to another to depend on the net oil price increase variable. The findings show that rises in oil price has a significant role in determining both the volatility of stock returns and the probability of transition across regimes.

Matthew R. Walsh, Steve H. Hancock, Scott J. Wilson, Shirish L. Patil, George J. Moridis, Ray Boswell, Timothy S. Collett, Carolyn A. Koh and E. Dendy Sloan, 2009, Preliminary report on the commercial viability of gas production from natural gas hydrates, Energy Economics, Volume 31, Issue 5, September 2009, Pages 815-823.

> Economic studies on simulated gas hydrate reservoirs have been compiled to estimate the price of natural gas that may lead to economically viable production from the most promising gas hydrate accumulations. As a first estimate, $CDN2005 12/Mscf is the lowest gas price that would allow economically viable production from gas hydrates in the absence of associated free gas, while an underlying gas deposit will reduce the viability price estimate to $CDN2005 7.50/Mscf. Results from a recent analysis of the simulated production of natural gas from marine hydrate deposits are also considered in this report; on an IROR basis, it is $US2008 3.50–4.00/Mscf more expensive to produce marine hydrates than conventional marine gas assuming the existence of sufficiently large marine hydrate accumulations. While these prices represent the best available estimates, the economic evaluation of a specific project is highly dependent on the producibility of the target zone, the amount of gas in place, the associated geologic and depositional environment, existing pipeline infrastructure, and local tariffs and taxes.

J. Heinimö and M. Junginger, 2009, Production and trading of biomass for energy – An overview of the global status, Biomass and Bioenergy, Volume 33, Issue 9, Pages 1310-1320.

> The markets for industrially used biomass for energy purposes are developing rapidly toward being international commodity markets. Determining international traded biomass volumes for energy purposes is difficult, for several reasons, such as challenges regarding the compilation of statistics on the topic. While for some markets (pellets and ethanol) separate overviews exist, no comprehensive statistics and summaries aggregating separate biomass streams are available. The aim of this paper is to summarise trade volumes for various biomasses used for energy and to review the challenges related to measurement of internationally traded volumes of biofuels.

> International trade of solid and liquid biofuels was estimated to be about 0.9 EJ for 2006. Indirect trade of biofuels thorough trading of industrial roundwood and material byproducts comprises the largest proportion of trading, having a share of about 0.6 EJ. The remaining amount consisted of products that are traded directly for energy purposes, with ethanol, wood pellets, and palm oil being the most important commodities. In 2004–2006, the direct trade of biofuels increased 60%, whereas indirect trade has been almost constant. When compared to current global energy use of biomass (about 50 EJ yr−1) and to the long-term theoretical trading potential between the major regions of the world (80–150 EJ yr−1), the development of international trade of biomass for energy purposes is in its initial stage, but it is expected to continue to grow rapidly.

P. Vainio, T. Tokola, T. Palander and A. Kangas, 2009, A GIS-based stand management system for estimating local energy wood supplies, Biomass and Bioenergy, Volume 33, Issue 9, Pages 1278-1288.

> A GIS-based system for decision support in wood procurement management was developed in order to identify energy wood harvesting alternatives during the integrated planning of harvesting operations. The system uses the information content of existing stand databases and an estimation method which is based on three major modules: i) modelling of energy wood volumes, ii) modelling of costs of haulage to the roadside and road transportation, and iii) economical allocation analysis of material flows. An application of this technology demonstrates how estimation of the total potential of residuals for local energy use can be integrated into wood procurement planning in Finland. Three experiments were prepared for testing this application. Based on the thinning regulations laid down by the Finnish national forest management organization Tapio, wood harvesting on permanent sample plots was simulated by two alternative procedures, one based on the empirical diameter distribution and the other on a theoretical Weibull distribution derived from the mean variables. The effects of these procedures on the extent of the residual energy wood potential were investigated. The third test compared this system with another system often used in Finland. The experimental results suggest that the theoretical distribution produces unreliable estimates in the case of untreated or young stands. Furthermore, the conventional system underestimates the potential of the residual energy wood. The implications of these results for improving the strategic planning of energy wood procurement in Finland are discussed.

Jiangfeng Wang, Yiping Dai, Lin Gao and Shaolin Ma, 2009, A new combined cooling, heating and power system driven by solar energy, Renewable Energy, Volume 34, Issue 12, Pages 2780-2788.

> A new combined cooling, heating and power (CCHP) system is proposed. This system is driven by solar energy, which is different from the current CCHP systems with gas turbine or engine as prime movers. This system combines a Rankine cycle and an ejector refrigeration cycle, which could produce cooling output, heating output and power output simultaneously. The effects of hour angle and the slope angle of the

aperture plane for the solar collectors on the system performance are examined. Parametric optimization is conducted by means of genetic algorithm (GA) to find the maximum exergy efficiency. It is shown that the optimal slope angle of the aperture plane for the solar collectors is 60° at 10 a.m. on June 12, and the CCHP system can reach its optimal performance with the slope angle of 45° for the aperture plane at midday. It is also shown that the system can reach the maximum exergy efficiency of 60.33% under the conditions of the optimal slope angle and hour angle.

Na Wang, Trishan Esram, Luis A. Martinez and Michael T. McCulley, 2009, A marketable all-electric solar house: A report of a Solar Decathlon project, Renewable Energy, Volume 34, Issue 12, Pages 2860-2871

This paper reports a design and building process of a net-zero-energy modular house, named ElementHouse, which was entered for the 2007 Solar Decathlon competition that was organized by the U.S. Department of Energy. This paper discusses the development of the ElementHouse from its initial concept to the actual construction, which integrated multi-disciplinary knowledge of architecture, mechanical engineering, and electrical engineering. By employing computer-aided simulation tools, several design approaches were developed to achieve the optimal balance among function, aesthetics, economy, and energy—a challenge in many sustainable building designs. A simplified energy model helped to form the building configuration at the preliminary design stage by showing how energy use is affected by various parameters, leading to optimization studies that provided design guidelines towards an energy-efficient building envelope and opening design. Energy modelling also estimated the annual energy use and electricity generation, as well as the costs associated with long-term operation of the house. The energy demand estimate and its daily power profile helped to design the photovoltaic (PV) system. The modular configuration of the building and its roof structure was then iteratively altered to accommodate the PV panels in such a way as to generate the most power and to facilitate interstate transportation of ElementHouse. With the progress of the design process, detailed energy simulation using EnergyPlus provided more accurate estimates of power use and generation and, coupled with daylighting simulation performed with Radiance, permitted finalizing the building envelope, opening, and electric lighting design. The building envelope embraced the passive and low energy philosophy to minimize the annual heating and cooling load and to optimize natural lighting. By illustrating the whole picture of ElementHouse design, this paper discusses a way of effectively designing and building a comfortable and affordable solar house.

Jyoti Parikh, Editor, 2009, Special Issue: Energy and its sustainable development for India, Energy, Volume 34, Issue 8, Pages 923-1042

This entry is to link readers to a special issue of The Energy Journal focused on energy and sustainable development in India. Click on the title above to link to the journal for a list of articles.

Kerstin Enflo, Astrid Kander and Lennart Schön, 2009, Electrification and energy productivity,

Ecological Economics, Volume 68, Issue 11, Pages 2808-2817

Energy productivity is crucial for sustainable development. We use cointegration analyses to investigate the effect of electricity on energy productivity in Swedish industry from 1930 to 1990. Electricity augmented energy productivity in those industrial branches that used electricity for multiple purposes. This productivity effect goes beyond "book-keeping effects," i. e. it is not only the result of electricity being produced in one sector (taking the energy transformation losses) and consumed in another (receiving the benefits).