Presentation to the UK-MAB Urban Forum by Paul Mobbs on 6th December 2005 at University College London.

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Mobbs, Paul(2005). *Energy Beyond Oil*. Matador Publishing, Leicester. ISBN 1 905237 00 6. pp. x + 198.

Summary

The book consists of an introduction followed by ten chapters, plus a list of sources and further information. Many of the key findings are available on the book's own web-site: www.fraw.org.uk/ebo

The introduction sets out the author's contention that oil is almost past 'peak' production, that is, it is on its way out. Various substitute energy options are not options, because oil provides energy in very dense form. The price of oil is predicted to escalate dramatically. Large changes in lifestyle in the Western world will be needed to cope with it.

Chapter 1: What is it about oil? discusses how the modern economy is dependent on the supply of cheap oil to buoy it up. It includes mention of controversial recent theories such as the 'abiotic theory of oil formation', and is effectively an outline of the geology and chemistry of oil production and products derived from oil, e.g. polymers. The chapter ends with the contention that oil cannot last, and that, although reserves may last until 2050, from 2010 to 2015 it is likely that a growing shortage of oil production will cause prices to rise, and this will cause the current structure of the global economy to spiral into recession: 'The energy of oil revenues, like the energy of the oil, has inflated the global economy. Take that energy away and the economic system that oil supports must collapse.' The chapter ends with a box illustrating the First Law of Thermodynamics.

Chapter 2: Where does the energy go? firstly emphasises the huge amount of fossil fuel energy used by Western society (and increasingly, India and China) and the inexorable link between economic growth and oil use. Then it describes the sources of data on energy availability held by individual countries and oil companies. This is followed by comparative data about the sun's energy. Data is also provided about how energy use is broken down into separate components. Most data here are sourced from the United Nations Development Programme (UNDP), though other sources are also used within the chapter –for example BP's dataset. Many more are also used within the book, in general. The prediction is then made that 56% of 'human energy use' (237 Exa-Joules/year of oil and gas) is going to either run out or become scarce within the next 100 years, and one

third of it (147 EJ/year of oil) will become very expensive within the next 15 to 20. Though the effects of 'Peak Oil' will ultimately affect the industrialised world more significantly than the developing world in terms of lifestyle changes, the immediate impacts will be felt more severely in the developing world. Then statistics are presented on UK energy use, also flow charts. Predictions are that the 'Peak Oil' crisis or 'crash' will be made worse by current rapid economic growth and, along with it, oil use. This sets the scene for the next chapter which attempts to predict when 'Peak Oil' will occur.

Chapter 3: Peak Oil —why and when? discusses the economy of oil. It starts by describing recent post-2004 price rises which are attributable largely to uncertainty. However, the author argues that, underlying the political trends, are deeper concerns and trends. Oil consumption is rising and refinery production is not keeping pace with demand. This leads into descriptions of how oil is produced, and also, phenomena based around oil reservoirs. Central to the arguments used here is M. King Hubbert's 1950s principles (Hubbert's Plot or Hubbert's Peak). These were used to accurately predict the peak in American oil production in 1970, and the subsequent fall in production. There then follow discussions around the uncertainties in oil production, and 'Peak Oil'. Predicting oil prices is a central concern of governments. Also, the inflation rate shadows the oil price. The chapter dissects the potential role of oil speculators in driving up prices still further once 'Peak Oil' has occurred, at global level. Energy availability will, once it is limited, reduce the amount of money governments have to spend. Because goods will cost more, people's income will be worth less. Tax revenues will then decline, because of loss of indirect taxation. It is predicted that the resulting recession will then be indefinite, until the economy is recorganised around sustainable energy sources. This serious situation should, argues the author, be exercising the minds of politicians, but there has been limited discussion because of the implications: These are that we should *disengage from the oil economy*. However, conventional economics, as used in the developing world, predicts that other resources will come in to fill the gap left by oil.

Chapter 4: Climate Change, deals with the production of carbon dioxide gas by oil, and its effects on the global environment. The phenomenon of abrupt climate change is mentioned as well as feedback effects, and the possible breakdown of the North Atlantic Thermohaline Circulation (or Gulfstream). Another area dealt with is the role of industrialists funding sceptical scientists to challenge the more radical, predicted effects of climate change.

Chapter 5: Energy policy and energy use, describes the various techniques used to predict energy use and describes the politics around energy use and the tendency for lobbying groups to evolve in direct relation to energy use by countries. It is emphasised that almost inevitably, lobbying results from the centralisation of both energy distribution networks and sources of energy in large corporations. Various governmentally-sourced predictors of energy policy, demand and supply are reviewed. The 'Dash for Gas' is described, together with apparent complacency over renewable energy supplies, together with other phenomena, which the author regards as being controversial, such as 'carbon trading'. It is concluded that, in reality, the drop in energy supplies over the next twenty years will not happen, because government is likely to step in and adopt other energy

sources, irrespective of their costs. Nuclear power and new technologies based upon coal are likely to be used, but the issue of simply using less energy is not likely to be considered because it represents an entirely new paradigm: 'business as unusual' rather than 'business as usual'.

Chapter 6: Conventional and nuclear energy, looks in practical detail at the business of energy generation, and the relative efficiency of different processes. This concludes that the best efficiencies of current turbines at extracting energy range between 30% and 35%. More complex technologies such as Combined Cycle Gas Turbines (CCGTs) and Integrated Gasification Combined-Cycles (IGCC) offer efficiencies which rise to around 50%. The only way to improve efficiencies further is to find a use for the waste heat generated. Another option, that of burning waste, is also explored. Here, the outputs of Municipal Solid Waste (MSW) incinerators is given account of. Despite claims that this process constitutes a 'renewable technology' the author states that no objective analysis could view it as such: in other words, a Life Cycle Analysis of the waste streams to MSW would reveal that many of the materials supplied to the incinerators have only been produced by the heavy use of fossil fuels. Nuclear power produces greenhouse gas emissions at an order of magnitude less than gas or coal powered plants. However, the uranium used to fuel reactors is a finite resource, put at 1 million tonnes easily recoverable; 1.4 mt slightly less easily recovered; and 700,000 tonnes more awkward to extract. The Organisation for Economic Co-operation and Development (OECD) says that for nuclear to substitute for declining oil, known uranium deposits would last for around a decade, potentially slightly more using fast-breeder reactors. Nuclear waste also presents formidable storage difficulties, needing cooling and monitoring for up to 50 years, then containment for over 100,000 years due to radioactivity. The chapter ends by arguing that to cater for renewable energy, a fundamental rethink of the 'national grid' within the UK is needed, because at present such a system militates against local renewable energy production.

Chapter 7: Low carbon energy sources, presents a critique of renewable energy. The author describes biomass energy, landfill gas (dismissed, because the very waste it contains comes from excessive fossil fuel use), and hydrogen. The latter, it is noted, would consume considerable energy to produce it in the first place: it is really part of the current, problematic industrial paradigm within which energy use is considered. The author does not altogether disregard some low carbon fuels, especially biomass and biodiesel, and says that under some circumstances they will be useful substitutes 'where other energy sources would be inefficient or difficult to utilise'. However, the key difficulty with such sources of energy is that they require formidable areas of land, plus fertilisers, for their production. A central point given at the end of the chapter is that many of the problems associated with such fuels are simply being ignored 'in the rush to implement low carbon alternatives to fossil fuels'.

Chapter 8: Renewable energy, examines the prospects for these energy sources, beginning with an account of how wide the gulf is between public perceptions of wind turbines and solar panels, and the (UK) government's view that renewables include landfill gas, burning waste, car tyres and animal waste. Structural and political problems

prevent renewables from competing effectively with other energy sources. Current low energy prices as a result of deregulation, in effect, create a penalty for householders wishing to install their own energy systems. Secondly, governmental policy favours large scale supply-side renewable energy projects, carried out by large organisations, rather than small-scale, locally derived innovation. Renewable energy systems can only produce relatively small amounts of power, because they source it from the natural environment. Geothermal and solar energy systems are described, together with heat pumps, wind turbines and tidal power. It is concluded that if energy supplies become more unstable, small-scale renewables may be 'one solution by which we can gain energy security'.

Chapter 9: How much do we need to cut? draws on the findings from the previous three chapters and presents scenarios for retrofitting buildings with renewable energy devices. It is estimated that it will take around 75 years for this work to be carried out, based on an assumption that 350,000 homes could be dealt with each year, within the UK. In addition the structural characteristics of 20th century housing comes in for criticism: it is argued that since such housing has not been designed to properly equilibrate with the climate, it too, will need retrofitting in terms of actual building materials, and this would also take a similar time. Gradually, if such a programme were to be adopted, benefits would flow from increased energy efficiency, especially during summer months. The issue of 'food miles' is then explored, and it is concluded that the centralisation and industrialisation of food production will be 'endangered' due to 'Peak Oil' and later on, 'Peak Gas'. In particular, there are high energy costs now integral to agriculture which will need to be dealt with. Then the issue of the (UK) national grid is returned to. The author argues that it needs to be 'de-nationalised' in order to encourage local energy supplies —around a third of the electrical energy is lost between the power stations and delivery to homes. The future of energy supply therefore depends as much on politics as it does on any 'objective' analysis of potential shortages. Then, the possibilities of using coal are briefly reviewed. Reserves would last for less than 100 years if it were to make up 60% of the world's energy supply. However, the burning of these reserves would make climate change severe: in excess of 10°C or 12°C. The last time such a temperature rise occurred was during the Permian extinction when most animals died out. Various other scenarios for future energy use are explored, including the 'burn everything model' and the 'reduce and renewable' model. These are used to lead into discussions of personal orientations in the next chapter.

In *Chapter 10: Tune Out, Turn Off, Be Happy?* the author contends that there has been no meaningful political debate on the matter of Peak Oil. In fact, the UK's use of energy is expected to grow, year on year. Current tokenism towards small-scale renewable energy also does not auger well. One question confronting Western society is now: how can the current economic paradigm be challenged effectively? It is not a question of examining the morals of how society has got into this situation, but of trying to ensure that effective action is taken before the crisis occurs. This is made difficult because development of alternatives to the perceived crisis is being obstructed by political lobbyists. This is often explained by the 'Great Aunt Principle', i.e. that everyone has experience of an elderly relative who has survived smoking forty cigarettes a day with apparently no ill effects. This kind of argument is turned into political and economic inertia, with good effect: it 'is

stalling the debate on reducing greenhouse gas emissions, or energy reduction'. What is needed, at personal level, is a philosophy about change in relation to energy trends. Unfortunately, 'we have become de-skilled about existence in general'. Finally, the author argues that, unless time is taken to understand and plan our transition to a low-energy lifestyle, 'we are going to have [an] … abrupt revelation to the value of energy within our lives'.