

## The Post Carbon Landscape: Alternative Pathways to a Low Carbon Landscape

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Over the last 30 years more and more scientists and economists have come to understand that the world is a complex dynamic system rather than a linear Newtonian one.

The world of finance experienced the extreme effects of the workings of a complex dynamic system as relatively isolated events on the world stage were amplified rapidly into features which threatened the totality of the global economic system. We are currently living through the aftermath of this extreme turbulence.

The world of energy is about to enter an era of ever increasing complexity and interdependence as patterns of demand shift through such changes as a moves to the electrification of transport, as populations grow, and as rising economic prosperity spurs on demand for energy based services. What the size and shape of demand will be is highly uncertain. What the portfolio of sources will be to meet that demand is also highly uncertain with the advent of non-traditional sources of oil and gas, the growth of renewable generation, the potential rise of distributed community based generation, the in-home generation potential, and the use of cars and homes as energy sinks and storage. In addition we see the gas and electricity markets moving from a world defined by energy and metering to one defined by communications and IT (together with energy and metering). Picturing this world as a system is the essential first step in understanding what may happen.

## **Key features of this report**

- Exploration of the complex dynamic system of energy
- A review of the bandwidth of demand uncertainty based on projections of population growth, rising economic prosperity and the potential for energy efficiency improvement
- An examination of how the world of supply may evolve
- An exploration of two scenarios – pathways to a Low Carbon Landscape
- A comparison of the scenarios and the evidence for them in the world today
- The argument for complex dynamic system simulation as an essential tool for managing the energy future

## **Scope of this report**

- Achieve a quick and comprehensive understanding of how energy market demand trends and supply possibilities may impact on the world by 2050
- Gain a helicopter perspective on how the various elements of the energy system interact
- Understand the bandwidth of uncertainty facing the world in order to appreciate the breadth of outcome, and the scale of the challenge, facing all of us
- Identify the opportunities for grasping emergent market elements such as non-conventional gas, in-home and community generation etc

## Key Market Issues

- **Climate change:-** The growth of carbon dioxide emissions globally potentially threaten the viability of our existing socio-economic systems. Governments around the globe are extremely aware of the issues although differences in beliefs and responses mean that it is by no means certain what our carbon outcome will be
- **Demographics:-** The population is set to grow from just under 6 billion to just over 9 billion people. By 2050 the economic prosperity of the Chinese is likely to be the same as the citizens of the USA today which in turn will fuel the demand for energy services. Demographics put us on the path to a world of extremely high energy demand – and a very high carbon outcome.
- **Demand:-** Looking at both demographics and potential energy savings the bandwidth of future demand lies somewhere between 12 and 24 billion tonnes of oil equivalent in 2050 vs a level of 8 billion tonnes of oil equivalent today

## Key findings from this report

- The world of energy and carbon can be represented as a complex dynamic system
- Energy demand will increase either a little or a lot, from 8 billion tonnes of oil equivalent today to somewhere between 12 and 24 billion tonnes of oil equivalent by 2050
- A lack of hydrocarbon molecules is not the problem – even given peak oil. The questions are: can these be exploited in an environmentally and economically acceptable fashion? And can the growth of supply keep up with the pace of growth of demand?
- To mitigate climate change energy efficiency is not enough – the decarbonisation of supply is essential
- Significant benefits can be derived from electrifying transport, and to some extent heating, providing the source of the electricity is carbon free

## Key questions answered

- What will the demographics of the world look like in 2050 in terms of the number of people, wealth and energy based service requirements?
- What levels of energy efficiency improvement can we foresee?
- What are the implications for energy demand – in total and at sector level?
- Where will future hydrocarbons come from after peak oil?
- What will generation look like in 2050?

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