
THE UNIVERSITY OF
WARWICK



A Strategy for Energy in the UK

A report published by the Industry and Parliament Trust and the University of Warwick
Notes from Policy Event Meeting on A Strategy for Energy in the UK

Craig A. Fisher, Phillip A. Mawby and Stan Shire
School of Engineering, The University of Warwick



energy

Powering the world through renewable energy



INTRODUCTION

Over a quarter of UK households are struggling to afford to pay their energy bills after a year which has seen the average annual bill hit £1293. Many are already paying as much as they can afford, with almost a third of consumers saying they cannot afford more, leaving little or no capacity to absorb any further increases.

Keeping energy affordable as well as being reliable and low-carbon is a huge challenge for the energy industry in the UK. The UK will have to replace a third of power stations in the next 10 to 15 years and this has further implications for the cost of energy. Some generating technologies are currently under development such as offshore wind turbines and marine power plants. Fossil fuel-fired power stations fitted with Carbon Capture and Storage (CCS) technology to reduce their emissions should become significantly cheaper as more are built and the UK's experience with the technology grows.

The IPT's Policy Event, chaired by Lord Oxburgh KBE, was on how to encourage investment to upgrade the energy infrastructure in the UK whilst both decarbonising the economy and maintaining affordability for end-users. Attendees heard from three speakers: Rashid Al-Marri, General Manager, South Hook Gas; Kate Smith, Head of Government Relations, Shell UK; and Professor Philip Mawby, Chair of Power Electronics, Applications and Technology in Energy Research, The University of Warwick.



THE ROLE OF GAS IN A DECARBONISED ECONOMY

Over the next 10 to 15 years, the UK will have to decommission and replace a third of old coal, gas and nuclear power plants, consuming in the region of 25% of the energy budget. It is predicted that energy prices will double by 2030, raising doubt as to whether households will be able to cope with paying their bills. As such, an affordable, secure energy supply which is also low-carbon is crucial, posing a huge challenge for the energy industry in the UK. Having a secure energy supply is assisted by having a diverse energy supply; in this respect the UK is more diverse than the majority of the EU.

Importantly, it was stated that the UK has the lowest gas prices in Europe, and, as such, is a key resource for a decarbonised economy. Natural gas has 20 to 30% lower emissions than petrol, thus its application in the transport sectors would have a significant impact in achieving this decarbonisation of the economy. Moreover, in the future, Combined Cycle Gas Turbine (CCGT) and Combined Heat and Power (CHP) power plants should replace older, less efficient power stations, which, according to research by HIS CERA, would reduce greenhouse gas emissions by 58% across the EU compared to 1990 levels. It was highlighted that although the application of CCS has the potential to dramatically reduce greenhouse gas emissions from fossil fuel burning power plants, gas will still play an important role for the UK energy supply over the next 40 years. Furthermore, gas offers the benefit of being highly flexible, being capable of responding more quickly than most other power sources. This is crucial in periods of extreme high demand, as has been witnessed in cold winter periods of recent years.



EFFECTIVE ENERGY POLICY

The energy supply industry is an industry of long time scales, and there have been many confusing road maps illustrating future pathways. However, in reality, it is impossible to construct a map beyond a 10 to 15 year horizon since energy supply can be influenced by global political and environmental events. This fact has been illustrated by the recent events of the ‘Arab Spring’ and the Fukushima nuclear disaster. Conversely, it is important that we do not adopt a laissez-faire attitude; policy must be adopted to intervene in or manage the energy markets. Flexibility in the legal and regulatory framework is also crucial, allowing market dynamics and cost to determine choices.

It was the general consensus between discussion participants that, from the near term, coal usage should be phased out and replaced with gas, which requires a policy framework to ensure an effective transition. In addition, there also needs to be an incentives framework to support the development of new technologies. This should be targeted to give early stage support to new technology – CCS being an obvious example. In order to encourage investors, these incentives need to provide full chain, end-to-end support. It was also highlighted that interim targets, such as those that have been seen for bio-fuels (where the target stated that “use of biofuels in transport is only temporary”), are unwanted and will likely serve only to hinder any energy policy that is put in place. Moreover, incentives should not over-subsidise a particular technology, such as renewable electricity from photovoltaics. Another important point that was raised concerned the establishment of a robust carbon price and trading mechanism, as, currently, the carbon price in the UK is too low.

It was highlighted that the crucial issue of cost for consumers seemed to be missing from much of the discussion. Cost is an important issue for many people who want to see value for money, with lower investment and subsidy from Government. It was added that the mandatory CRC energy efficiency scheme (formerly known as the Carbon Reduction Commitment) in the UK is very large, and could be taxed to generate significant revenue. However, despite the CRC scheme, knowledge of energy efficiency within companies is often limited.



Also raised was the focus of previous policy on the electricity system, and that little effort or debate has gone on with regard to transport or heating despite the fact that 65% of imported primary energy is either oil for transport or gas for heating. As an example, households are now required to have condensing boilers fitted, yet only 20% of homes actually have these boilers fitted with the remaining 80% of boilers still to be changed to condensing ones. In reducing energy consumption, the same effect could be achieved by converting 6% of homes to be heated by heat pumps; this would incur far less disruption and could be achieved at a much lower cost than changing the entire housing stock to condensing boilers.

It was put forward that the fossil fuel industries provide a large number of jobs in the UK, and can deliver economic growth. Continuing with this subject, it was questioned as to why consideration would be given to constructing new coal plants, since they are typically twice as expensive as gas plants, and, moreover, gas is more stable in both supply and price. It was noted that coal was at the forefront of CCS, but, since then, the price of gas has gone down. With regard to CCS, most of the costs incurred are due to the capturing of the carbon dioxide. A network of pipes for CO₂ would be a relatively low cost infrastructure investment that would then both encourage and facilitate industries to implement carbon capture. It is important to note that CCS is not just of relevance to energy companies, but also in other industries where CO₂ is an unavoidable by-product of processing (for example in steel and cement manufacturing).

Despite the presence of the global energy market, a high level of materials are imported into the UK, such as glass and steel, and other energy-intensive products. This practice has a negative impact on not only the environment, but also on the UK job market. We can change what we do in terms of energy efficiency, but we cannot change global energy markets or prices. Furthermore, with regard to renewables, it was stated that the cost of renewable energy investment was not only difficult for consumers to pay, but was also making the UK less competitive than companies in the US and China, who were benefitting from lower energy costs. If intensive energy-using firms closed down in the UK, this would not only lead to job losses but also potentially more emissions as a result of importing more goods from elsewhere.



ENERGY EFFICIENCY AND THE UK POWER NETWORK

It was argued that energy efficiency can have a dramatic effect upon our energy needs. Notably, this type of saving requires technology that is readily available, or strategies with only modest levels of investment. As some have said, this is not low hanging fruit, but fruit that is already on the ground! This type of saved energy has been termed “NegaWatts”; by simple energy efficiency measures, the potential NegaWatts savings are equivalent to the output of tens of power stations.

One of the fundamental problems for the energy sector in the UK is the old conversion and distribution systems used for electrical power. However, the use of modern power electronics can revolutionise these systems and offer more efficient power conversion. This will also facilitate the roll-out of renewable capacity, in addition to linking the UK power transmission system to the continent. It was also pointed out that the UK has the benefit of a large indigenous manufacturing capability in the area, much of it producing technology that resides within wind turbines and other power facilities. Investment in this technology would cement our world-leading position in the development of high-power electronic devices, thus having a positive effect on the UK economy.

During the discussion it was asked, “why do we currently have an AC grid if DC transmission is more efficient?”. It was answered that the grid is AC due to simple voltage conversion requirements, which modern power electronics devices now offer for DC. In one example raised, the power transmission system currently experiences a 6% to 9% power loss in the cabling, though by using power electronics and DC transmission, this could be cut considerably. Furthermore, DC transmission can allow twice the amount of power to flow through the same infrastructure compared to AC transmission, and could thus offer a potential 50% saving in energy use of products in the home. It should be added that AC transmission still has its place in the UK power network, but for long distance transmission lines DC offers significant efficiency savings.



It was also suggested that due to the large amount of energy that is wasted as heat in power stations, improved efficiency could be achieved by means of a thermal network, for example by providing district heating systems. This would be a huge infrastructure project, and would therefore require backing and support from Government for the cost of such a network. However, it was argued that modern housing is so efficient that it would not require a heat network, and, in fact, excess solar thermal gain is more of a problem. In response, it was pointed out that only 150,000 houses are built each year, whilst the entire housing stock is of the order of 29 million. Lastly, it was also brought up that, at the date of the meeting, we were in the middle of “Big Energy Week”, during which householders are encouraged to switch to cheaper suppliers, and improve efficiency in the home by switching off appliances and insulate their homes. This left us with the question as to how efficient modern housing really was.

IN CONCLUSION...

In summary, discussants were in agreement that the use of gas is important for the decarbonisation of the UK economy, whilst also providing security and flexibility at an acceptable cost for consumers. The replacement of coal power plants with modern gas power plants will also have a significant impact on the level of greenhouse gas emissions. With regard to energy policy, it is important that any policy put in place is flexible, and based on market dynamics and cost. Furthermore, an incentives framework to support the development of emerging technology, such as CCS, should be put in place. Concerning energy efficiency, it is evident that large savings can be made with only modest investment; as such, these savings should be sought in the near future. The use of modern power electronics in the UK power network can also have a positive effect on not only the efficiency of the network, but also on the UK economy in general.

Craig A. Fisher, Philip A. Mawby and Stan Shire School of Engineering, The University of Warwick

For further information about the breakfast, or to register your interest in attending a future roundtable discussion please contact Otilie Marchmont OtilieMarchmont@ipt.org.uk

Industry and Parliament Trust
Suite 101, 3 Whitehall Court
London SW1A 2EL
T +44 (0)20 7839 9400
F +44 (0)20 7839 9401
w www.ipt.org.uk