

Information paper – 1

Security of energy supply

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Security of energy supply

This information paper provides an illustration of some of the potential issues with global energy supply. Disruptions in the supply of gas and oil due to geopolitics are too complicated to try and cover here. *The Quest: Energy, Security and the Remaking of the Modern World* by Daniel Yergin provides an overview of the history and politics of global energy supply.

1. ENERGY SUPPLY AND DEMAND

Global fuel supply

Under the New Policies Scenario in the International Energy Agency's World Energy Outlook 2011 the IEA estimates that the increase in global energy between 2010 and 2035 will be met by increasing the supply from fossil fuels as well as renewables and nuclear – see Table 1. For comparison, in 1973 total global energy consumption was 6,107 Mtoe, half the amount in 2010.

	2010 (Mtoe)	2035 (Mtoe)	% in 2010	% in 2035	Increase from 2010 to 2035
Oil	4,120	4,650	32%	27%	13%
Coal	3,472	4,100	28%	24%	17%
Gas	2,721	3,950	21%	23%	46%
Renewables	1,679	3,100	13%	18%	88%
Nuclear	725	1,200	6%	7%	71%
Total	12,717	17,000			34%

Table 1 Estimates of energy supply in 2010 and 2035 (source: IEA)

European energy imports

More than half (53.9%) of the European Union's (EU) gross inland energy consumption in 2009 came from imported sources.¹ The highest energy dependency rates were for crude oil (84.1%) and for natural gas (64.2%). Production of primary energy in the EU-27 totalled 812.2 Mtoe in 2009 and has continued the generally downward trend of energy production, as supplies of raw materials become exhausted and/or producers consider the exploitation of limited resources uneconomical.

Until 2003 the UK was a net exporter of energy in the EU but by 2008 was importing 25%. Denmark is now the only EU-27 country with net energy exports.²

Further information on the EU's energy supplies and costs can be found at http://ec.europa.eu/energy/index_en.htm and www.energy.eu.

The UK's dwindling energy resources

Figure 1 shows the production and consumption of energy in the UK between 1970 and 2009.³ Coal, the fuel of the industrial revolution, has been in a steady decline (the sharp drop in 1984 was during the miner's strike). North Sea oil and natural gas production ramped up in the 1970s and both peaked in 2000. Between 1983 and 2004 the UK was a net exporter of energy but by 2009 was importing more than a quarter of its energy needs. Consumption during this period has remained fairly steady with dips due to wars in the Middle East in 1973 and 1981-84, and the recession in 2008-09.

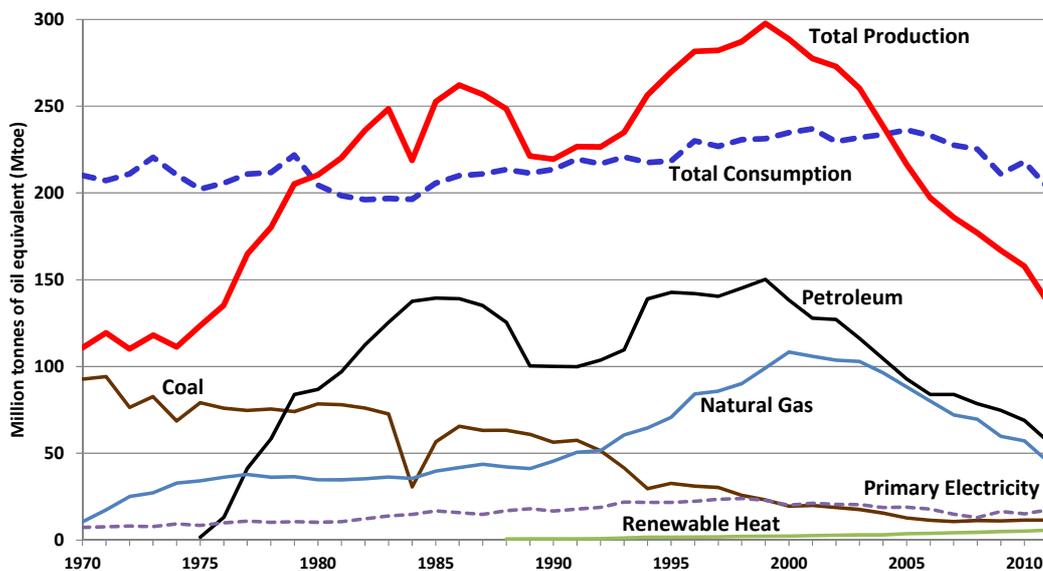


Fig 1 UK production and consumption of primary fuels 1970 to 2011

UK natural gas production in 2011 was down over a fifth on 2010. This was the largest year-on-year decrease recorded since 2000, and some three times the average post 2000 decrease. It was the result of a number of unexpected slowdowns and maintenance issues on the UK Continental Shelf. Imports of Liquefied Natural Gas (LNG) have grown substantially over the last few years. In 2011 these imports accounted for almost half of the UK's total commercial imports of gas, up from around a third in 2010.⁴

At the 2012 CIBSE Annual Lecture, OFGEM CEO Alistair Buchanan noted that the UK will have a safety margin of just 4% in available power by 2015. 'The UK's power demand is falling, but our capacity is falling faster,' he said. A quarter of the UK's current electricity generation capacity is due to be decommissioned by 2020, raising the prospect of rolling blackouts during peak demand periods. Refer to section 4 for further details of a capacity assessment in June 2013 by Ofgem.

The prospect of obtaining energy from the UK's reserves of shale gas have excited politicians in 2013. How much can be extracted economically, and whether the populace is willing to allow thousands of gas rigs to be spread throughout the countryside is yet to be tested.

2. FOSSIL FUEL SUPPLIES

Russian gas supply to Europe

Politics can affect gas supplies. Russia supplies about 34% of Europe's gas demand,⁵ and is not adverse to shutting off supplies to neighbouring countries for financial and/or political reasons:

- 2010 – Russia's state-controlled gas monopoly Gazprom started to cut supplies to Belarus over its debt after Russian President Dmitry Medvedev ordered the reduction. Around 20% of Russia's gas supply to Europe passes through Belarus.⁶
- 2009 – Vladimir Putin orders that Russia shut down the gas supply to Ukraine for 20 days in January 2009. This led to disruptions across Europe with 18 countries reporting major drops in or complete cut-offs of their gas supplies transported through Ukraine.⁷ A similar, but less severe incident occurred in 2006. Around 60% of Russia's gas supply to Europe passes through Ukraine.

European countries responded by reducing their reliance on gas from Russia and increasing gas storage capacity.

Shale gas – the energy saviour?

Fracking is the injection of a fluid at high pressure to propagate horizontal fissures in rock. It's first large scale commercial use to release natural gas deposits trapped in shale formations was in the United States in 1997. In 2000 shale gas accounted for 1% of natural gas production in the US, by 2010 it was over 20% and by 2035 it is estimated to account for almost half.

Concerns have been raised about the environmental impact of fracking, including potential pollution of groundwater and the leakage of gas (methane) during extraction.

Getting to oil is getting harder

The Deepwater Horizon Oil Rig drilled the world's deepest oil well(>10km) in 2009. In April 2010 it exploded, killing 11 people and causing the largest off shore oil spill in US history. The total cost to BP is estimated to be over US\$50 billion.⁸

Coal

China produces almost half of the world's coal. The number of people dying in China's coal mines each year is gradually reducing from nearly 7,000 in 2002 to 2,631 in 2009. It's still a dangerous occupation.⁹

3. NUCLEAR POWER

Fukushima nuclear power accident 2011

Following a major earthquake, a 15-metre tsunami disabled the power supply and cooling of three Fukushima Daiichi reactors, causing a nuclear accident on 11 March 2011. All three cores largely melted in the first three days. In the following 14 months the country's other 54 reactors, which account for one-third of electricity generation, were shut down.¹⁰ This led to the operation of factories on weekends and overnight and much less use of air conditioning to reduce the peak electricity load, and the greater use of fossil fuel plants. Japan also intends to substantially increase its renewable energy capacity.

The response in Germany was to permanently close eight reactors with the gradual phase out of the rest expected by 2022. The country also committed to a significant increase in renewable energy deployment (35% of electricity by 2020 and 50% by 2030), significant new investment in energy efficiency, infrastructure and energy storage systems and the construction of efficient fossil fuel plants. This creates opportunity for German manufacturing and employment.

The response by the UK Government was to support nuclear power and give assurances that no disaster could occur in the country.

Perhaps the most powerful lesson from Fukushima is not whether nuclear power is good or bad (a strongly emotive argument from environmental, social and financial perspectives) but that rapid and major changes can be made to a country's energy system if there is political consensus, will and necessity.

4. ELECTRICITY INFRASTRUCTURE

Indian blackouts, 2012

Half of India's population were left without electricity in two separate power outages on 30 and 31 July 2012. On the second day 20 of India's 28 states were hit by power cuts, along with the capital, New Delhi, when three of the country's five electricity grids failed at lunchtime. The blackouts raised serious concerns about India's infrastructure and the government's ability to meet the nation's increasing appetite for energy as it aspires to become an economic superpower.¹¹

Heat waves and blackouts in the United States, 2012

Violent storms in the eastern states of the United States in early July 2012 led to significant power outages to over 2 million homes and businesses. This coincided with a major heat wave with many buildings unable to run their air conditioners for a week.¹²

UK electricity generation capacity by 2015

In June 2013, Ofgem released a report highlighting the importance of government reforms to encourage more investment in electricity generation.¹³ The report noted that electricity margins could tighten in 2015/16 to between around 2 and 5% depending on demand, meaning that the probability of a supply disruption increases from 1 in 47 years in 2013, to around 1 in 12 years for 2015/16. If the projected decline in energy demand does not materialise margins could fall to 2%. The security supply risk has increased since the previous assessment in October 2012 due primarily to deterioration in the supply-side outlook, but also uncertainty over projected reductions in demand.

Notes

All websites were accessed on 15 June 2013 unless noted otherwise.

1. http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Energy_production_and_imports
2. *Energy, transport and environment indicators*, Eurostat Pocketbook 2011.
http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-DK-11-001/EN/KS-DK-11-001-EN.PDF.
3. Data taken from Tables 1.1.1 and 1.1.2 in Chapter 1: Energy of *Long Term Trends, Digest of UK Energy Statistics 2012*.
www.decc.gov.uk/assets/decc/11/stats/publications/dukes/5958-dukes-2012-long-term-trends.pdf.
4. Chapter 4, *Digest of UK Energy Statistics 2012*.
<http://www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx>
5. Russia is the largest energy supplier to Europe. In 2009 it provided 34% of natural gas, 31% of crude oil and 30% of hard coal. Refer note 1.
6. *Russia cuts Belarus gas supplies over debt*, online article on BBC website dated 21 June 2010.
www.bbc.co.uk/news/10362731.
7. http://en.wikipedia.org/wiki/Russia%E2%80%93Ukraine_gas_disputes
8. www.guardian.co.uk/business/2013/feb/05/bp-deepwater-horizon-charge-rises.
9. <http://uk.reuters.com/article/2010/02/14/china-coal-deaths-idUKTOE61D00V20100214>
10. *Japanese energy policy stands at a crossroads*, online article in The Guardian dated 3 May 2012.
<http://www.guardian.co.uk/environment/2012/may/03/japan-nuclear-power-post-fukushima>
11. http://en.wikipedia.org/wiki/2012_India_blackouts
12. 1.4 million still blacked out after broad US storm, online article on ABC News dated 3 July 2012.
http://abclocal.go.com/wpvi/story?section=news/national_world&id=8720206
13. *Electricity Capacity Assessment Report 2013*, Ofgem, 27 June 2013.
<http://www.ofgem.gov.uk/Markets/WhlMkts/monitoring-energy-security/elec-capacity-assessment/Documents1/Electricity%20Capacity%20Assessment%20Report%202013.pdf>

The inevitable legal bit

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