

## The Future of Nuclear Power in the UK

Sixty leading experts from industry, academia and politics met in London in March 2015 on the invitation of the Director of Energy Research at the University of Oxford, Professor Sir Chris Llewellyn Smith, to debate the future of nuclear power in the UK. In the light of cross-party consensus on the need for nuclear, the discussion focussed on how a nuclear programme could be delivered successfully and at acceptable cost.

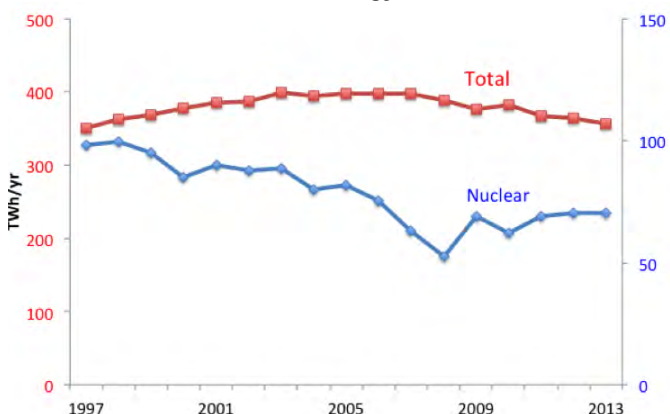
Professor Llewellyn Smith opened the meeting by giving a brief overview of the current situation.<sup>1</sup> The meeting was conducted under the Chatham House Rule and this summary therefore reflects the views of participants without revealing their identity or affiliation.

In the mid-1990s nuclear provided 18 % of the world's electricity, but subsequently nuclear output rose very slowly, before falling slightly post Fukushima. Meanwhile total electricity supply rose steadily, and by 2013 nuclear's contribution had fallen to 11% of the total. In the UK, nuclear's contribution peaked at 28% in the late 1990s, but output then fell and in 2013 it contributed about 20%. However, plans for new build suggest that this trend will



EPR under construction in Taishan, China, October 2011  
(Amafrance-cn.org, CTNPJVC-EDF)

<sup>1</sup> Slides available on [www.energy.ox.ac.uk/FutureNuclear](http://www.energy.ox.ac.uk/FutureNuclear)



Nuclear's contribution to total UK electricity consumption peaked at 28% in the late 1990s. By 2013 its share was 20%.

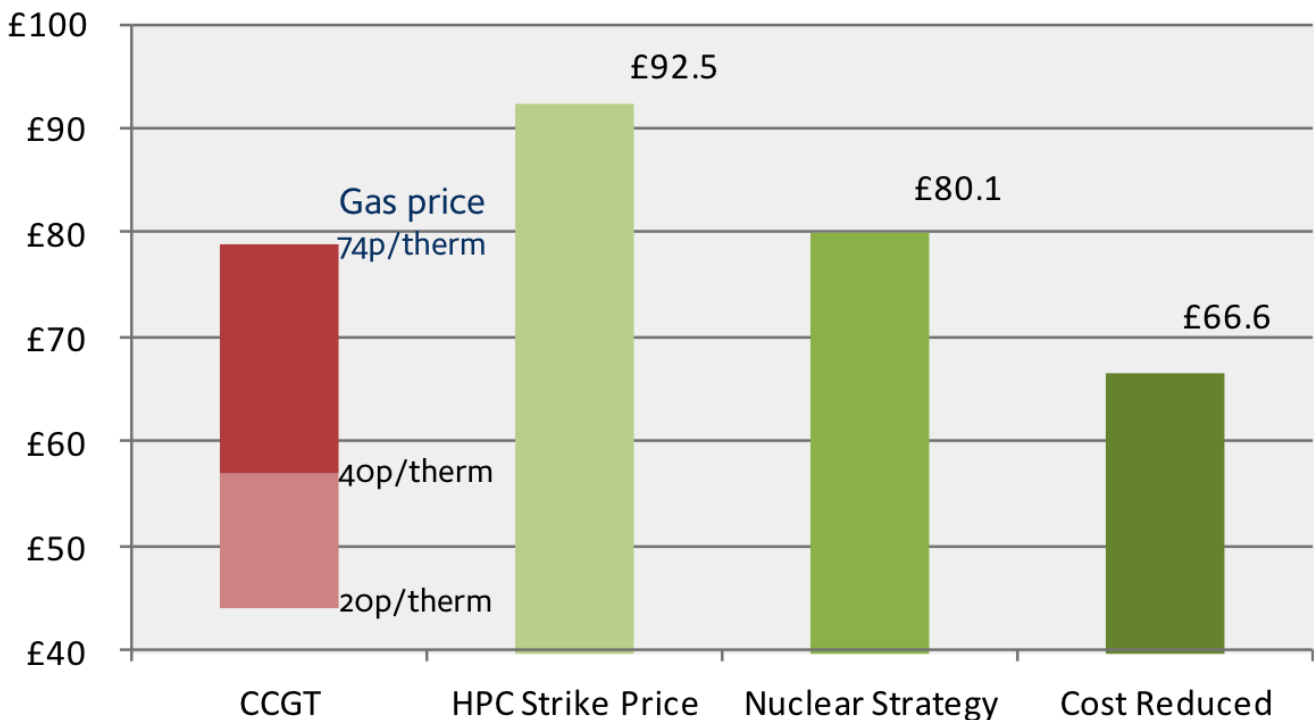
be reversed. 73 reactors are under construction, with a further 172 planned and over 300 proposals awaiting decisions (currently there are 435 operable civil power reactors, including many due to be retired in the coming two decades). The British Government foresees 16 GW<sub>e</sub> new nuclear build by 2035, in the context of expected doubling of electricity generation by 2050.

*"We have built one of everything."*

Historically the UK has played a leading role in the deployment of nuclear power and still holds considerable experience on a wide range of reactor types. 'We have built one of everything' and the UK should be ambitious to ensure its



## Price £/MWh



Electricity prices from current nuclear strategy are uncompetitive even with a high price of gas - a different strategy could be much more competitive (Data: DECC Gas Prices & LLEC 2013; figure Tony Roulstone, Cambridge)

legacy in the next round of nuclear build is more than 'blue collar jobs'. It was said that there is a 'great opportunity' for global export markets in which the UK still has technical and academic leadership. Failing that, the UK may 'sleepwalk into becoming only a buyer'.

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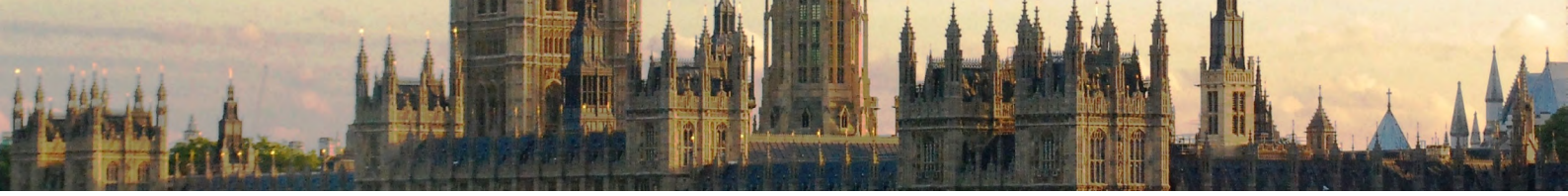
## COST REDUCTION NEEDS STRONG NUCLEAR STRATEGY

There was consensus on the need to bring the cost of nuclear power down. The strike price of £92.50 per MWh, agreed between the Government and EDF, was widely considered to be very high. The highest predictions for gas at 74p/therm, which informed the policy, looks rather expensive now. Even at this level electricity prices from gas are around £79 per MWh (see Figure above). The cost of nuclear must therefore be brought down if it is to play a major long term role. The target for competing with gas should be closer to £57 per MWh (corresponding to 40p/therm).

The meeting heard that a 'strategy is required' in delivering this aim. 'With cost being the number 1 issue for nuclear expansion in the UK, the current hands-off policy of 'letting the market decide' should be reconsidered'.

'The UK is very well suited to first of a kind models'. However, 'just not enough of each kind are being built for learning to take place' and this was seen as the central challenge to reduce costs. A competitive nuclear programme 'is possible', and experience in Korea suggest that the cost could be reduced to £80 per MWh and ultimately £67.

The high up-front cost makes financing large nuclear projects very challenging. Hinkley point



C 'is expected to cost £25bn'. The meeting heard that fixed price contracts help with financing, but it was stated that they 'always get renegotiated - not within 35, but as little as 10 or 15 years' as a 'recognition by both parties of the fact that prices move'.

### IS BIG NO LONGER BEAUTIFUL?

*“Fixed price contracts always get renegotiated - not within 35, but as little as 10 or 15 years.”*

Participants debated the sheer scale of nuclear build projects: 3 million tons of concrete, enough steel to run a railway 'to Rome and back', and 4.7 million man hours of design work alone. No single company can do this on their own and even major players in the field are 'looking for partners'. The scale of large nuclear projects makes financing very challenging, and their the complexity tends to lead to time and cost overruns.

The industry is keen to build small modular reactors (SMR), which could use technology and skills already employed in nuclear submarines and lead to cost reductions from building larger numbers, as well as generating exports. However, opinion over their future role was divided within the meeting and 'neither DECC nor Parliament can make up their mind about SMRs'.

### SKILLS

Although it is 'always difficult to drive bright young minds to join the nuclear industry', the outlook for careers in nuclear was seen as positive. Over its operating life a nuclear power plant is said to support 900 jobs. Some industries are presently recruiting at a rate of eight per month. Industry works with universities to ensure there is a pipeline of skills.

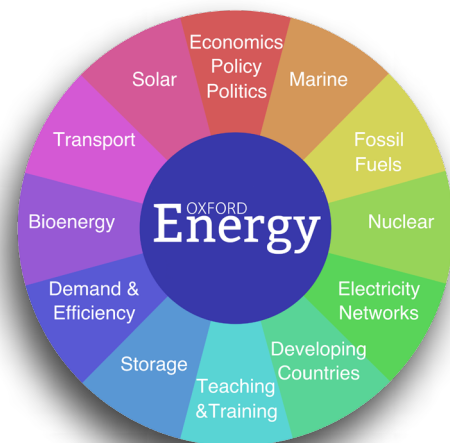
### SAFETY

There was widespread praise for the UK safety record on nuclear, although the view was expressed that 'safety must address real - not theoretical risk'. Design should not have to meet 'threats that don't exist in the UK', with reference to standards introduced after the Fukushima Tsunami.

### INVESTMENT IN THE UK

Participants listed three main reasons why the UK would be an attractive location for nuclear build. 1) The meeting was in broad agreement that the UK is 'blessed with a good regulator'. 2) The 'excellent safety record of the industry' has resulted in some of the highest levels of public support by international comparison, especially near existing nuclear reactors. 3) Unlike many proposed nuclear builds, UK political and financial stability gives some degree of reassurance to investors, without the need for IMF checks on the currency's ability to cope.

In summary, the meeting concluded that costs of nuclear must be reduced with the help of a strategic nuclear programme, which would allow the UK to take advantage of and capitalise on its global position.



The meeting was kindly hosted by Blackrock, Inc. Professor Llewellyn Smith's introductory slides are available for download at [energy.ox.ac.uk/FutureNuclear/](http://energy.ox.ac.uk/FutureNuclear/)