

# The Outlook for Nuclear Energy in the UK

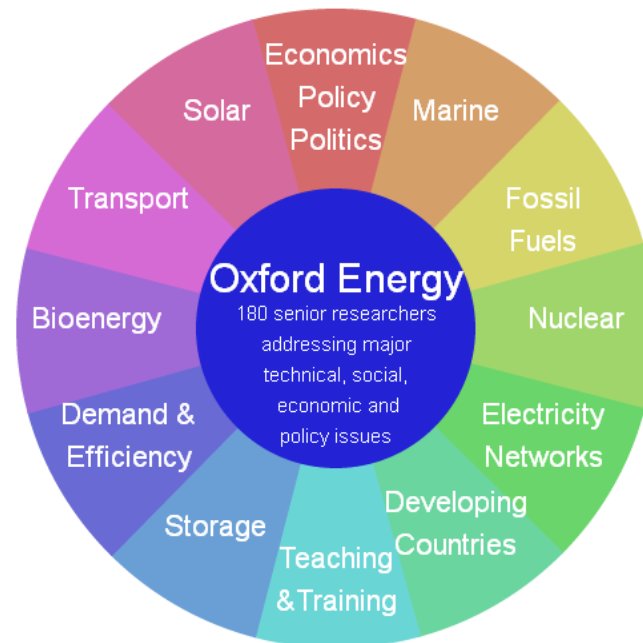
## Introduction to a Discussion Under the Chatham House Rule

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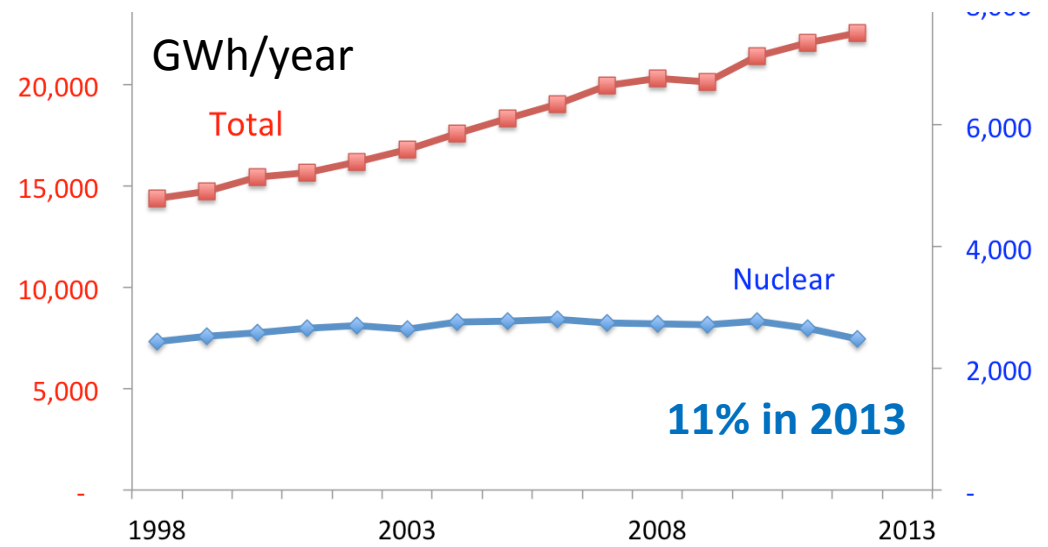
**President SESAME Council**

**[www.energy.ox.ac.uk](http://www.energy.ox.ac.uk)**

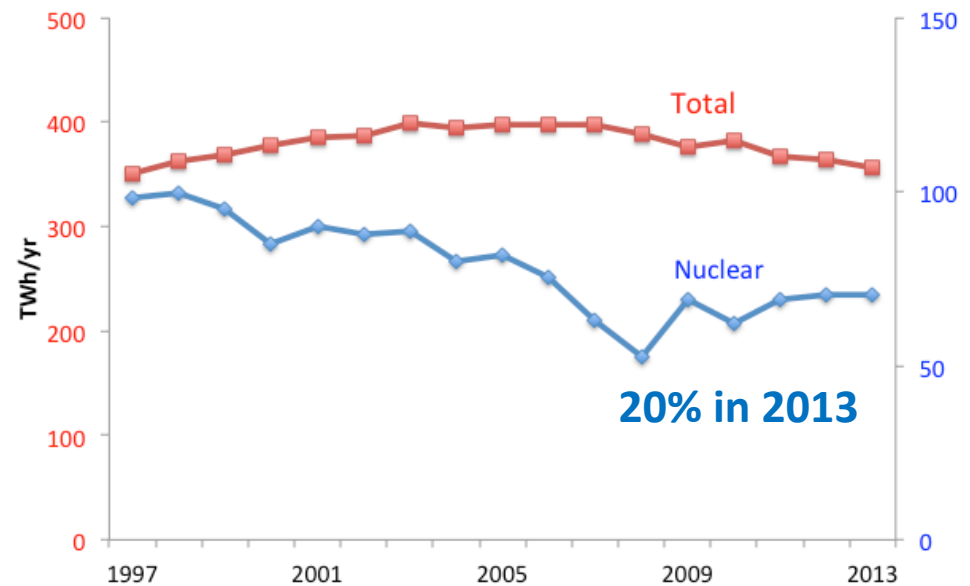


# Nuclear has stalled:

Globally:



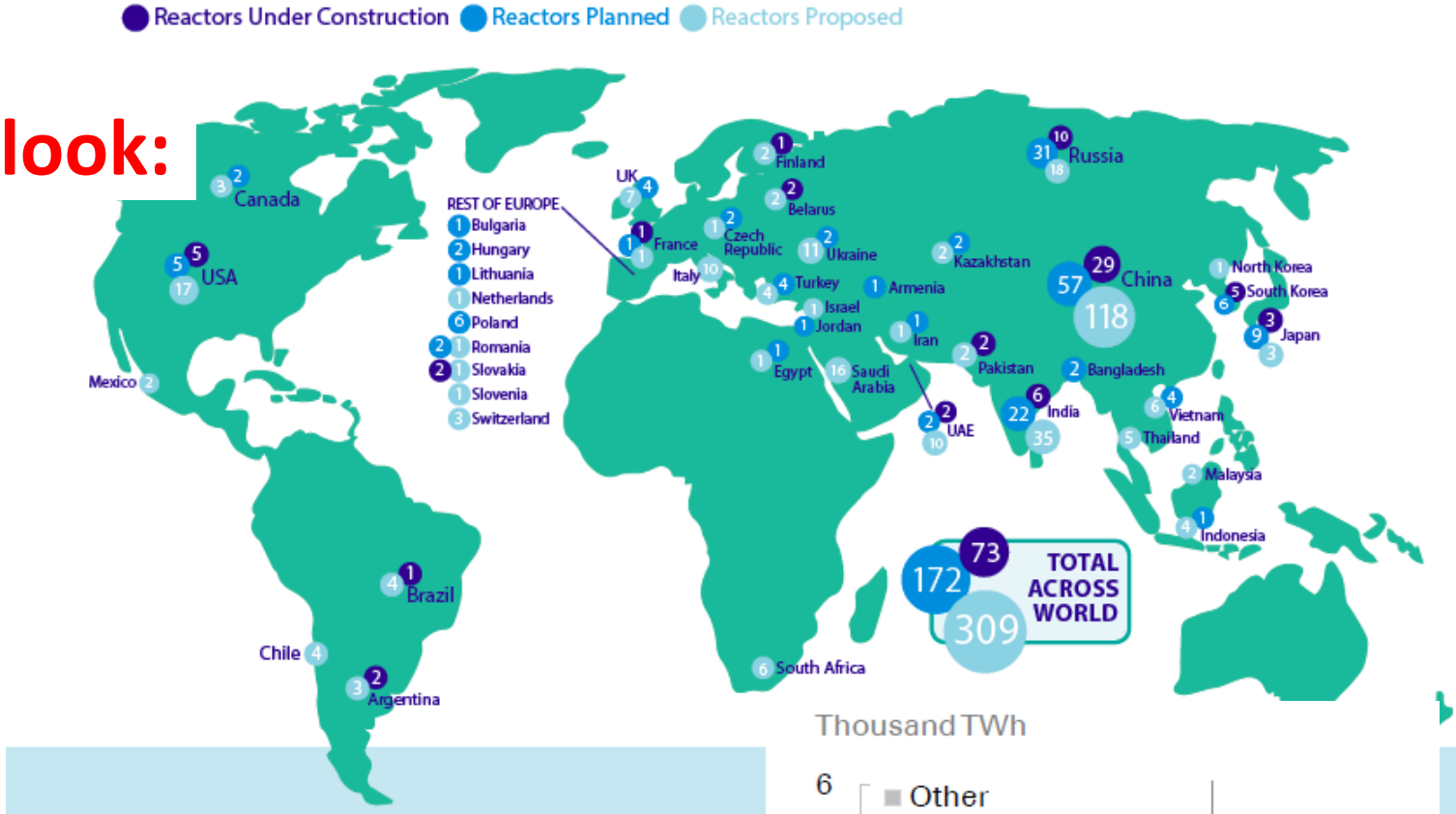
In the UK



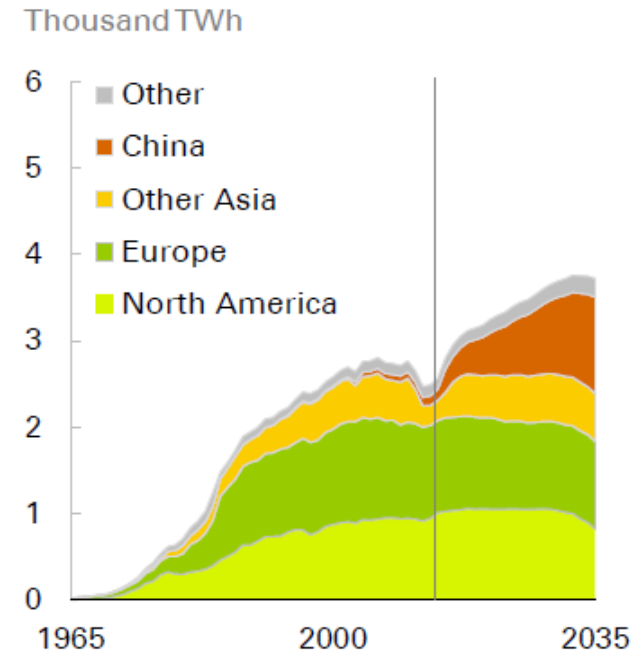
But there are plans for expansion



# Global Outlook:



## BP's Nuclear Projection (February 2015)



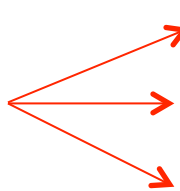
# UK – all but one reactor due to close by end 2023

Plant	Type	Present capacity (MWe net)	First power	Expected shutdown
Wylfa 1	Magnox	490	1971	Dec 2015
Dungeness B 1&2	AGR	2 x 545	1983 & 1985	2028
Hartlepool 1&2	AGR	2 x 595	1983 & 1984	2024
Heysham I-1 & I-2	AGR	2 x 580	1983 & 1984	2019
Heysham II-1 & II-2	AGR	2 x 615	1988	2023
Hinkley Point B 1&2	AGR	2 x 610, but operating at 70% (430 MWe)	1976	2023
Hunterston B 1&2	AGR	2 x 610, but operating at 70% (420 MWe)	1976 & 1977	2023
Torness 1&2	AGR	2 x 625	1988 & 1989	2023
Sizewell B	PWR	1188	1995	2035
<b>Total: 16 units</b>		<b>10,038 MWe</b>		

so any replacement is needed soon. **Government foresees**

- in context of expected doubling of electricity generation by 2050

**16 GW<sub>e</sub> new nuclear build by 2035** (all 2014 National Grid scenarios → less)

2050  no more nuclear?  
50% more (to 40 GW<sub>e</sub> = total electrical output today)?  
Maximum possible: 75 Gw<sub>e</sub>?

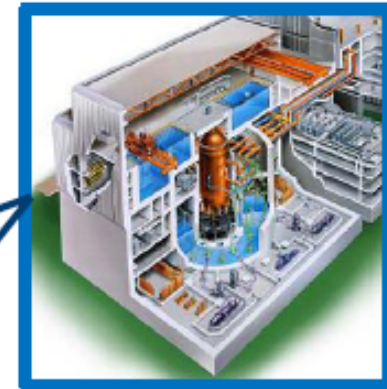
# Nuclear New Build Sites – 16 GWe



Westinghouse  
AP1000



AREVA - EPR



Hitachi - ABWR

Sizewell

# Nuclear is still the world's second largest source of low-carbon power (2013: hydro 16.4%, nuclear 10.8%, wind 2.7%, solar 0.54%) and could play a much bigger role

## Possible barriers:

- Uranium - plenty for time being (then thorium, fast breeders, perhaps fusion)
- **Public perceptions**

Two recent UK surveys (of over 2000 people) on new build

	Support	Oppose
DECC March 2014	42%	20%
YouGov November 2014	45%	20%

- **Cost + Financing are the real barriers**

# Costs

- Large reactors are the only tried option ready to build now  
Problem: very large, complex, effectively one-off, projects → track record suggests time and cost overruns
- Capital cost/kW<sub>e</sub> expected to *decrease* with size, but data *suggest an increase* (power 0 to 0.10) - time over runs,...Doubling number of units has decreased cost in most cases, but not by more than 10% (new labour force; design modifications; new regulations;...)
- For the medium term, perhaps Small Modular Reactors could bring down cost (even if cost/kW<sub>e</sub> increases in going down from - say - 1000 MW<sub>e</sub> to 100 to 200 Mw<sub>e</sub> - learning could beat lost economies of scale)
  - Design simplification
  - Multiple units one site
  - Production learning
  - Standardisation
  - Relatively rapid build
  - Finance savings

# Questions for discussion include:

- For the reactors to be procured in the near future: how to assure that the necessary finance is available, construction is completed on time and budget, and the legacy is more than blue-collar jobs?
- For the longer term: should the UK be positioning itself (if so, how?) to play a leading role as a supplier, e.g. in Small Modular Reactors\* in the near/medium term (and in the longer-term possibly in thorium, molten salt, fast-breeder... reactors in longer term)?

\**Opportunities analysed in an NNL Feasibility Study, December 2014*



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