Research Sites Restoration Ltd

New Nuclear Power in the UK

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Research Sites Restoration Ltd

- The Site Licence Company that operates Harwell and Winfrith;
- Responsible for the safe decommissioning of both sites under contract to the Nuclear Decommissioning Authority

Harwell

Winfrith

Research Sites Restoration Ltd

- The Harwell Site was established in 1946 as the UK's centre for atomic energy research
- fourteen reactors have been built at Harwell and only three remain

Nuclear Power – nothing to worry about

"A nuclear power plant is infinitely safer than eating, because 300 people choke to death on food every year."

Dixy Lee Ray, 1977

Quoted in G. Barry Golson (ed.) *The Playboy Interview* (1981).

Why is nuclear power necessary?

- From now to 2050, the World's population will grow from 6.6 billion to 9 billion
- Greenhouse gases will increase by 29 billion tonnes per year – 900 tonnes per second
- Need to reduce greenhouse gas emissions by ~60% globally by 2050; the UK Government is aiming for an 80% reduction

What is the talk about?

- Explain how electricity is produced
- Show how nuclear power has contributed
- Look at our future electricity needs and energy security, compared to other countries
- Say how nuclear power in the UK will play a part in a future balanced energy solution
- Describe the options that are being considered by suppliers, utilities and the Government…

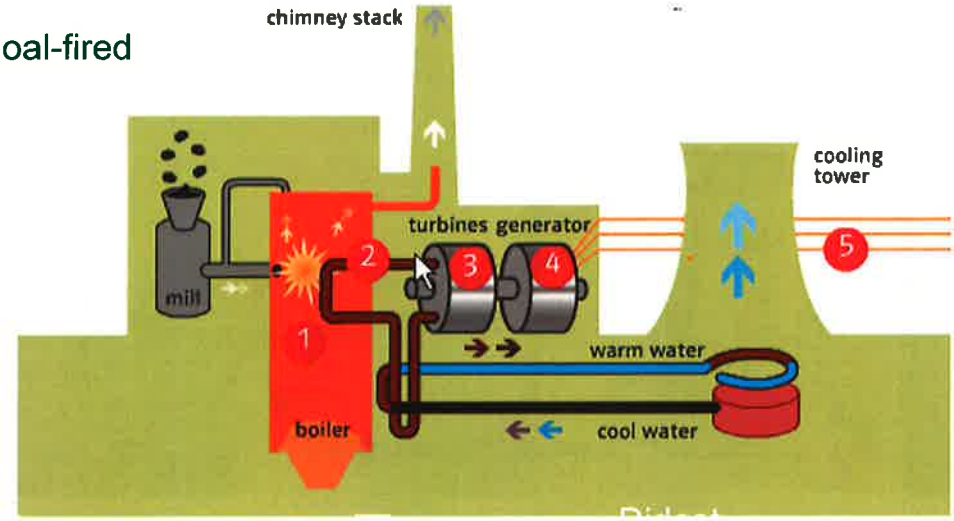
How is electricity made?

Conventional, via steam
Coal, Gas, Oil, Nuclear

"Renewables"
Wind, Wave, Solar

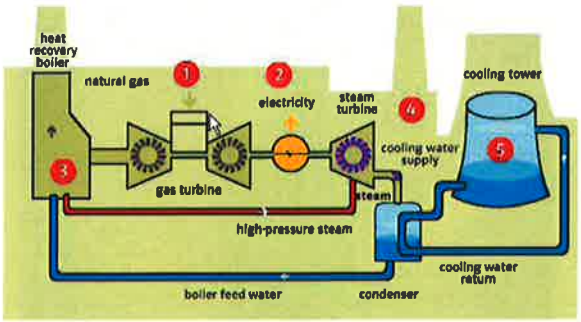
How is electricity made?

Coal-fired



How is electricity made?

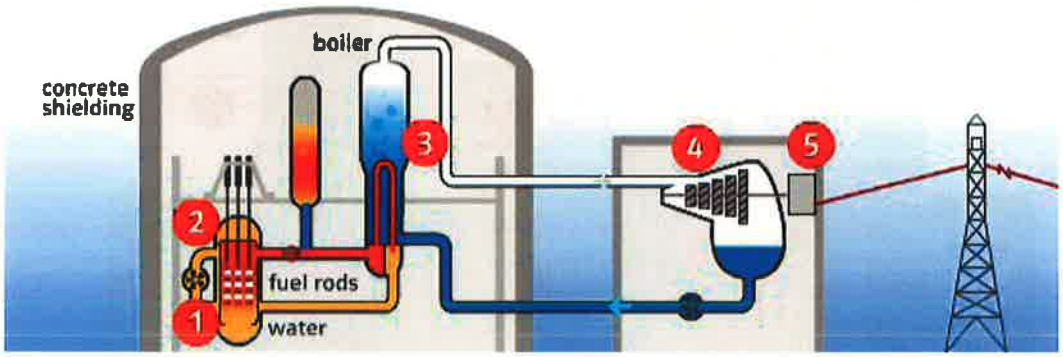
Gas-fired



Didcot Power Station – Coal and Gas

How is electricity made?

Nuclear-powered

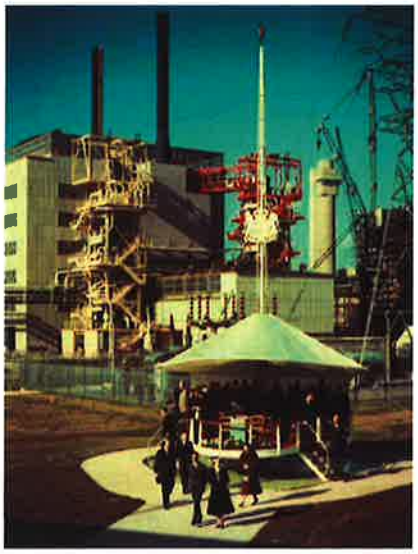


How is electricity made?

Torness AGR and Sizewell B Nuclear Power Stations

What has Nuclear Power done for us?

The UK has been generating electricity from nuclear power since 1956



The Queen opened Calder Hall, the world's first civil nuclear power station.

What has Nuclear Power done for us?

- Nuclear power has provided up to 30% of the electricity in the UK
- There are 19 reactors operating, generating up to one fifth of the electricity, but only one reactor at Sizewell, will be left by 2023

What has Nuclear Power done for us?

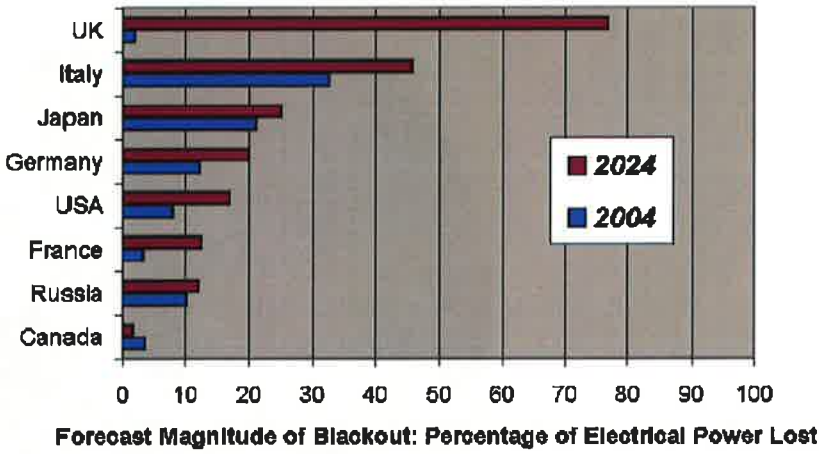
- We import about 3% of our electricity from France which comes from their nuclear power stations
- Nuclear power is a safe, clean source of energy
- Nuclear power has improved the security of electricity as it does not rely on access to supplies from volatile or unstable countries
- Electricity produced from nuclear power produces virtually no greenhouse gas emissions; each year, they prevent 40 million tonnes of CO_2 being emitted

What has Nuclear Power done for us?

- Nuclear fuel will be readily available for centuries
- Fossil fuels have been preserved for future generations
- Nuclear power stations can be built as small or large reactors, to match local needs
- Costs are competitive and declining
- Waste from nuclear operations has been managed safely

Security of Supply

- As the UK's old power stations (not just nuclear) reach the end of their life, the absence of new build affects security of supply.

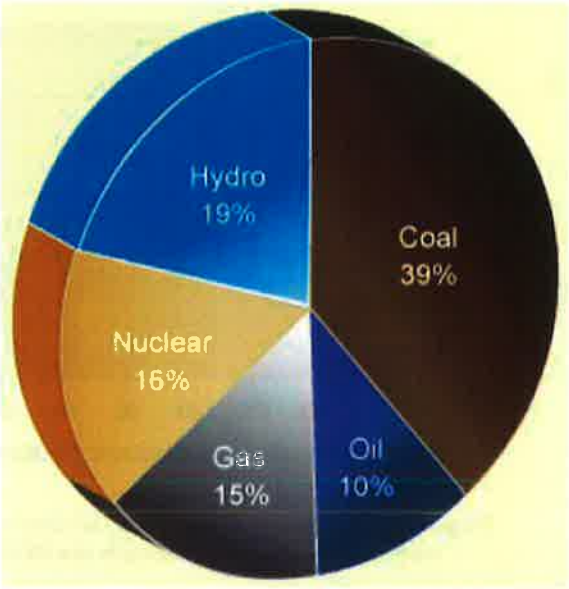


Magnitude of Blackouts of More than One Day's Duration Forecast to Occur with 2 - 5% Annual Probability in the G8 Nations – 2004 and 2024

Security of Supply

- Gas contributes about a third to electricity production
- In 2009, half of British gas supplies came from imports (up from 27% in 2007)
- By 2015, gas imports are expected to have risen to 75% as North Sea supplies run out

What happens in other countries?



World Electricity Generation

What happens in other countries?

- There are about 440 reactors operating in 30 countries
- Nuclear power generates as much electricity now as was produced by all sources, globally, in 1960
- Two thirds of the world's population live in countries where nuclear power reactors are in planning or under construction

What happens in other countries?

- More than 15 countries rely on nuclear for >25% of their electricity; in Europe and Japan it is >30%,
- France and Italy have populations of ~60M. France is the world's largest net exporter of electricity, Italy is the world's largest importer.
- The carbon intensity of electricity generation in France is 80% lower than in the UK.
- China, India, Japan, Korea all have vigorous plans for increases in nuclear power station construction

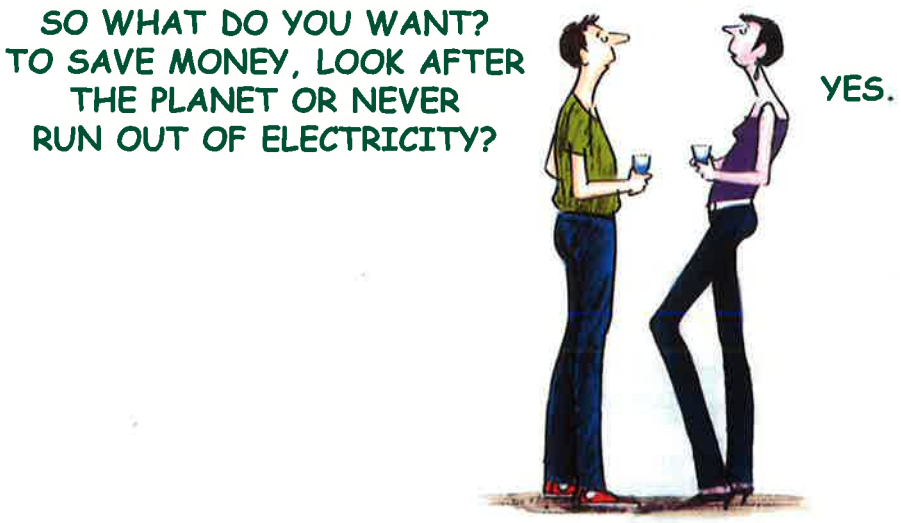
How much of our electricity comes from nuclear power?

- In 2006, nuclear plants generated 19% of UK electricity, compared to 36% from gas, 38% from coal.
- In 2007 this dropped to 15% and in 2008 to 13.5% because of problems with some old plant
- With 3% imported from France, UK nuclear electricity is normally about 22%
- Installed capacity is 83GWe, 18GWe retiring soon

How much nuclear power might there be in the future?

- Government policy has proposed the proportion should stay much the same at about 20%, and is essential to have any hope in reducing greenhouse gas emissions to 80% by 2050; this would be about 16GWe of nuclear capacity
- Government ministers and advisers have canvassed 40% nuclear as realistic and desirable; this would be about 30GWe

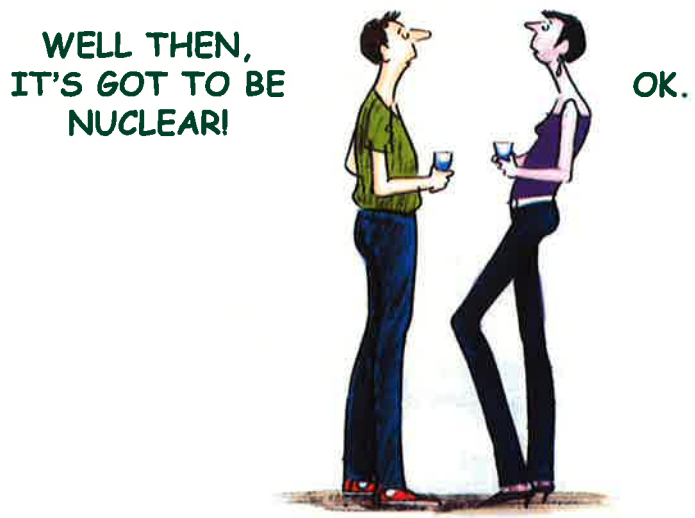
So what is the problem?



What are the concerns?

- Proliferation: IAEA safeguards all commercial reactors and breaks the link between civil and military programmes
- Operational safety: there are now >13,000 reactor-years of practical experience; WANO benchmarks operators safety performance and shares experiences
- Waste: low level waste safely stored; interim storage of all other end products from >50 years of operations; >20,000 containers of high level waste and used fuel moved safely over 20 million miles without instance of serious radioactive release
- Terrorism: nuclear plant intrinsically robust and resistant to external events

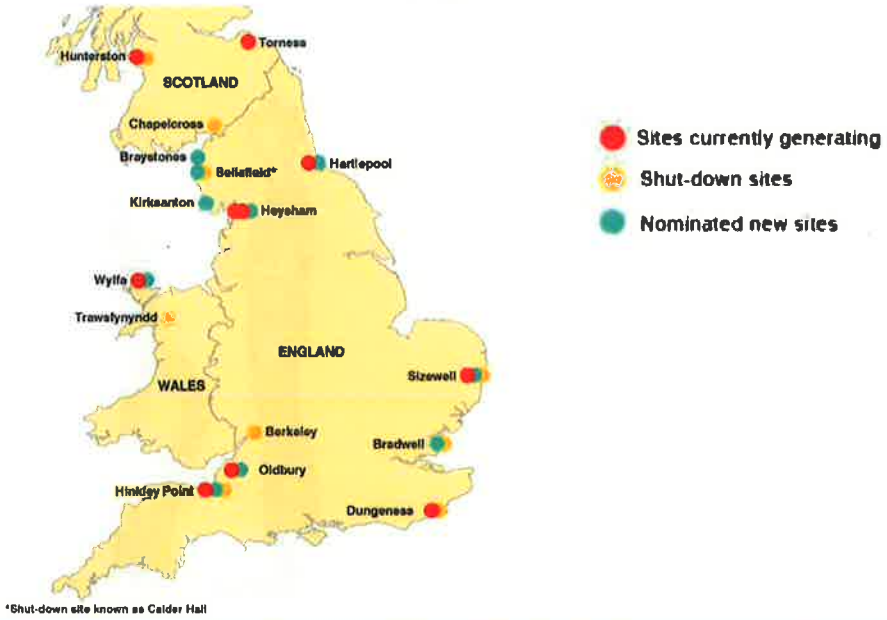
And the solution is....?



Government plans....

- Governments appear to have trouble with setting long-term energy policy but do get there in the end.
- 2003 Energy White Paper – "we don't need new nuclear power, just renewables and energy efficiency"
- 2006 Review of Energy Policy – nuclear back in, but new plants to be financed and built by private sector
- 2007 UK Planning Review – streamlining of approval for major infrastructure projects
- 2007 Vendors apply for new build Generic Design Assessments

Where would they be built in the UK?



Where would they be built in the UK?

Proponent	Site	Type	Proposed capacity MWe	Grid connection agreement MWe	Start-up
EdF / BE	Sizewell, Suffolk	EPR x 2	3300	3300	2019
EdF / BE	Hinkley Point, Somerset	EPR x 2	3300	3300	2017
Horizon (RWE + E.On)	Oldbury, Gloucestershire	EPR or AP1000*	1600-2400	1600	2020+
Horizon (RWE + E.On)	Wylfa, Wales	EPR or AP1000*	3600	3600	2020+
Iberdrola + GdF Suez + Scottish & Southern	Sellafield, Cumbria	?	3600		2020+
Total planned & proposed			16,200		

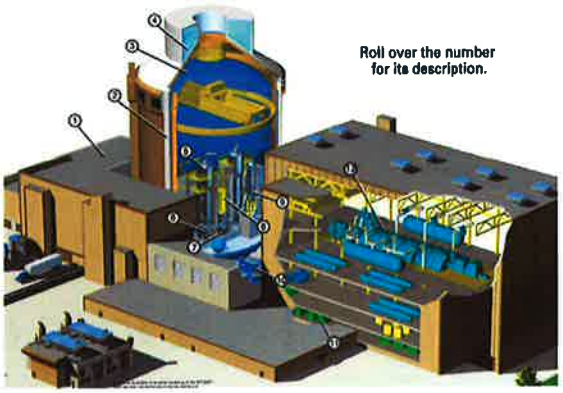
* awaiting completion of GDA before decision. Total 6000 MWe proposed for both sites.

4 EPR are "planned" - 6600 MWe, 9600 MWe "proposed" in WNA reactor table.

EdF Energy has additional grid connection agreements for Dungeness, Bradwell and Wylfa - about 1650 MWe each.

The two designs

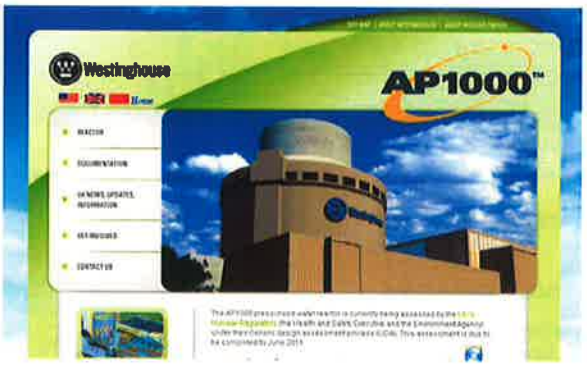
British Energy/EdF/Areva UK EPR ™



Westinghouse AP1000 ™

More information from the reactor builders

http://www.epr-reactor.co.uk/scripts/ssmod/publigen/content/templates/show.asp?P=57&L=EN



https://www.ukap1000application.com/index.aspx

Nuclear Power – an afterthought

"Nuclear power is absolutely the worst way to generate a nation's electricity needs

– apart from all other ways…."

Robert Matthews, 2009