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"The UK Nuclear Industry, Past, Present and Future"

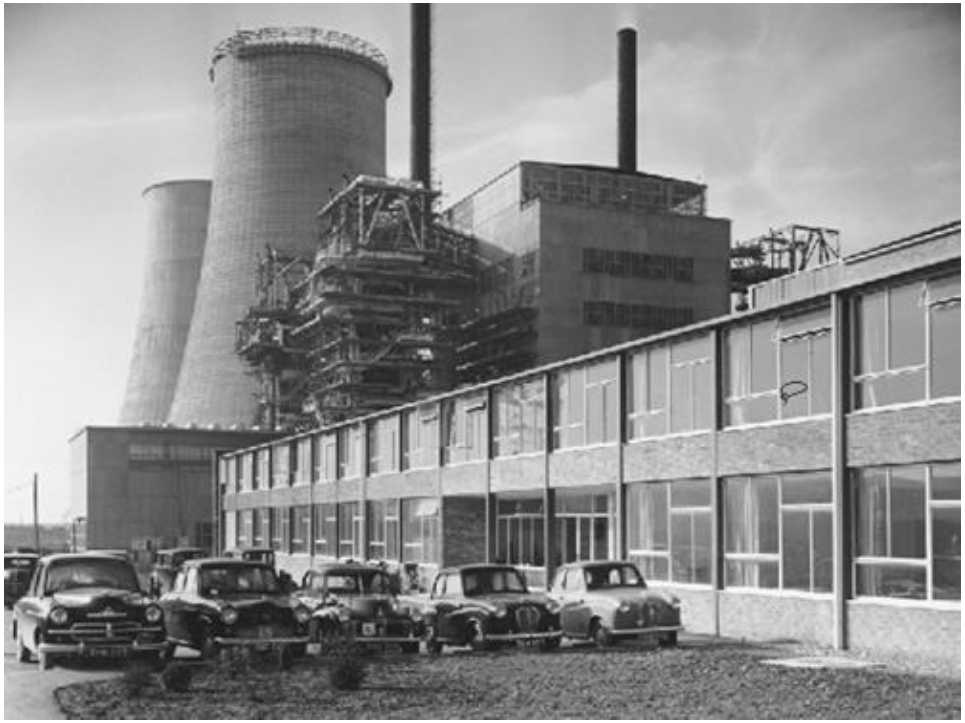
From Decommissioning the Original Fleet of Nuclear Power Stations, to Nuclear New Build

Dr Keith Franklin, National Nuclear Laboratory
First Secretary (Nuclear), British Embassy Tokyo

Sept 9th 2016

Department for International Trade

“UK Nuclear Industry – The Past”
Calder Hall, where it all started



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Tokai-1

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UK Nuclear Industry – The Future

- New Build is the future
- Operating is the future
- Decommissioning is the future

Nuclear Power in the UK – Operating Stations

Advanced Gas-Cooled Power Stations (7)		
Dungeness B	1983	2028
Hartlepool	1983	2024
Heysham 1	1983	2024
Heysham 2	1988	2030
Hinkley Point B	1976	2023
Hunterston B	1976	2023
Torness	1988	2030
Pressurised Water Reactors (1)		
Sizewell B	1995	2035

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Estimated decommissioning dates – subject to approval and life extensions

Nuclear Power in the UK – Decommissioning Stations

Magnox Power Stations (11)

Wylfa		1971	2015(44 years)
Bradwell		1962	2002 (40 years)
Chapelcross		1959	2004 (45 years)
Dungeness A		1965	2006 (41 years)
Hunterston A		1964	1989 (25 years)
Hinkley Point A		1965	2000 (35 years)
Calder Hall		1956	2003 (47 years)
Trawsfynndd		1965	1991 (26 years)
Berkeley	*Safestore*	1962	1989 (27 years)
Oldbury		1967	2012 (45 years)
Sizewell A		1966	2006 (40 years)

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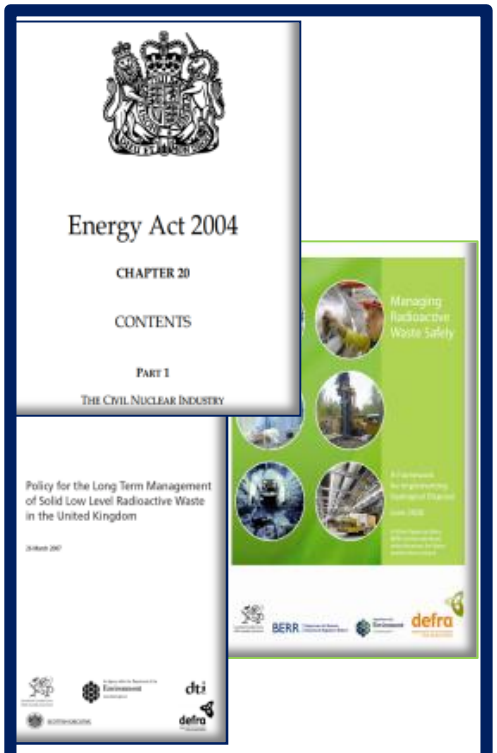
The Nuclear Decommissioning Authority (NDA)



Policy - HMG

Strategy - NDA

Implementation –
Site License SLCs

Separation of Policy / Strategy / Delivery

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The NDA

- Accountable for the on-going operation and subsequent decommissioning of 19 nuclear sites throughout the UK
- Responsible for implementing Geological Disposal for Higher Activity Waste and the provision of disposal services for Low Activity Waste
- Owns International Nuclear Services (INS), nuclear transport
- The NDA is NOT responsible for decommissioning of the 15 reactors (14 AGR's, 1PWR) owned and operated by EDF Energy plc or the New Build Reactors
- Advises government on the sufficiency of the decommissioning fund for the EDF Energy reactors and the appropriateness of estimates for new build

NDA Estate

Dounreay Site Restoration Ltd

Sellafield Ltd

Magnox

Research Sites Restoration Ltd

Springfields Fuels Ltd

LLWR Ltd

CNS
CAPENHURST NUCLEAR SERVICES

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“Decommissioning is not just about the Technology” Six Principles applied in the UK

1. Government retains overall control
2. Clear separation between policy, strategy and delivery
3. Separation of Decommissioning activities from NPP operations
4. Roles, responsibilities and accountabilities are clear and ensured
5. Conflicts of interest are avoided
6. The system allows key stakeholders to understand each other’s perspectives

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The Life of a Nuclear Power Station

N.B. Not to scale

Learned the benefits of lifetime planning

- Safety
- Economic
- Planning and communication during operation can make the life extension/decommissioning phase more efficient
- Communicating plans at an appropriate level
- Involving stakeholders in issues which are likely to be difficult

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Importance of Decommissioning Arrangements

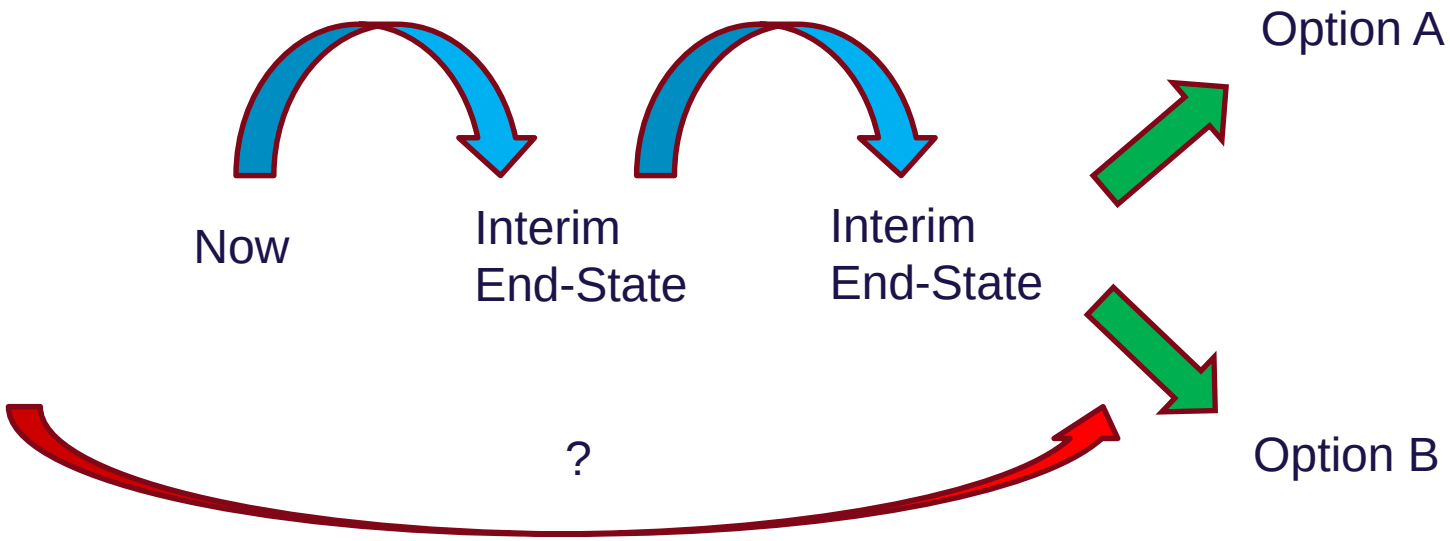
- Investing time in appropriate arrangements is vital. On complex, difficult scope, traditional contracting mechanisms can be difficult. The leadership focus can move to managing the commercial arrangements rather than assuring delivery of the mission.

- The importance of Strategy. Complex programmes of work over many decades in a constantly changing social and regulatory environment need good strategy both to ensure the endpoint can be achieved and to influence policy makers and regulators to ensure that everyone is acting to ensure a socially desirable outcome.

Interim End States

Setting interim ends state targets.

- On many decade programmes towards an end state interim states are important to provide focus. Also end states can be very debatable and change and therefore delay progress. Interim states can be easier to get agreement on.



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Most Important factor in Decommissioning? Stakeholders

Taxpayers' interest is legitimate. NDA is spending UK taxpayers' money – their interest is legitimate:

- Technically right is necessary… but not sufficient: it has to be socially right as well
- Stakeholders engage at their speed not yours: allow time
- Stakeholders want to engage with the decision makers and accountable people – not the communications department.
- Waste routes are at the heart of successful decommissioning – all the way through to an end state (e.g. geological disposal).

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UK Decommissioning Experience: Demonstrable Progress

Sometimes a ‘Skyline Change’ is necessary to demonstrate progress.

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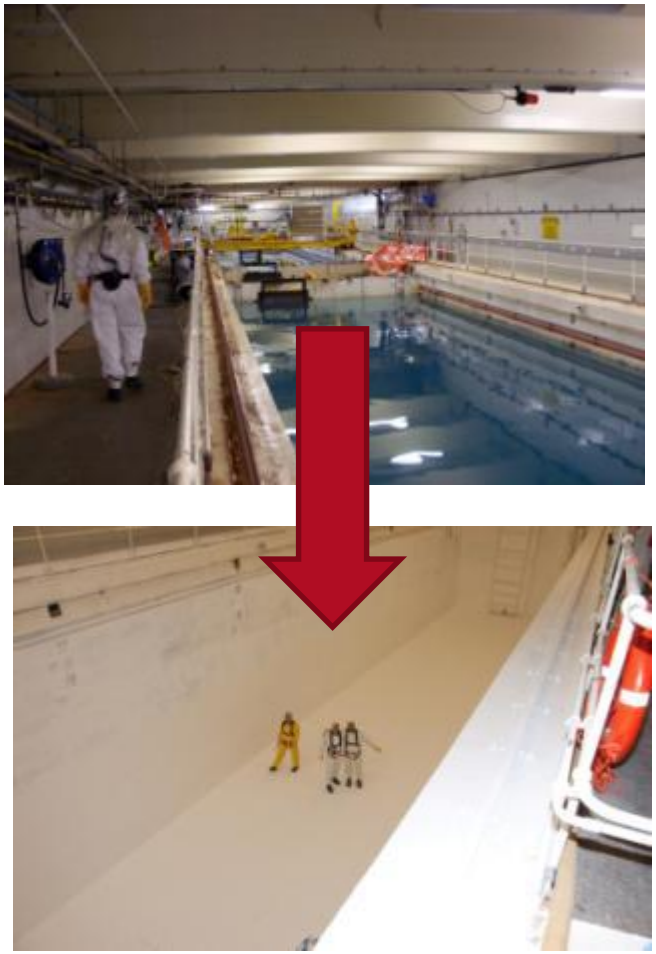
Who are the Stakeholders?

Anyone who thinks they are!

- Public (local / national / international)
- Regulators
- Government (local / national)
- Industry
- Media
- Your mum
- …….

The Reality of Decommissioning



See more on YouTube (with 日本語字幕）:

British Embassy Tokyo channel

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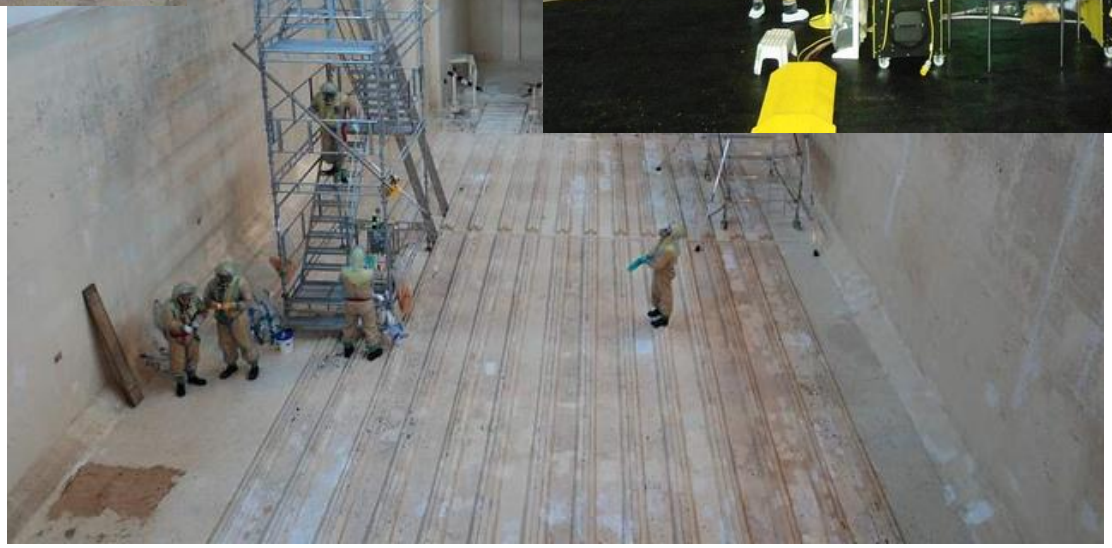
Fuel Pond Cleaning



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‘Pace and Priority’

Decommissioning takes time

- What are the problems likely to be in the future that R&D can be carried out on now?

Dialogue with the regulators

- Decommissioning is not a ‘standard’ process.
- Operator needs to demonstrate to the regulator why the chosen option is safe
- Communicating plans at an appropriate level
- When should something be tackled, and when is it important to leave it, and communicating this
- What is the “risk appetite” of your stakeholders?

- **The NDA has a ‘Value Framework’**
- Method of making decisions on decommissioning
- Documented strategy
- Carried out by contractors

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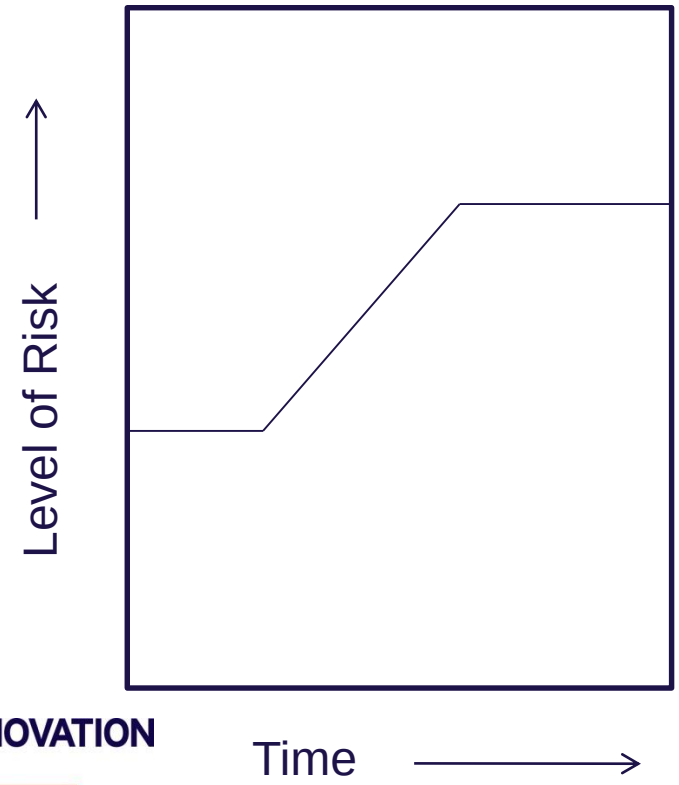
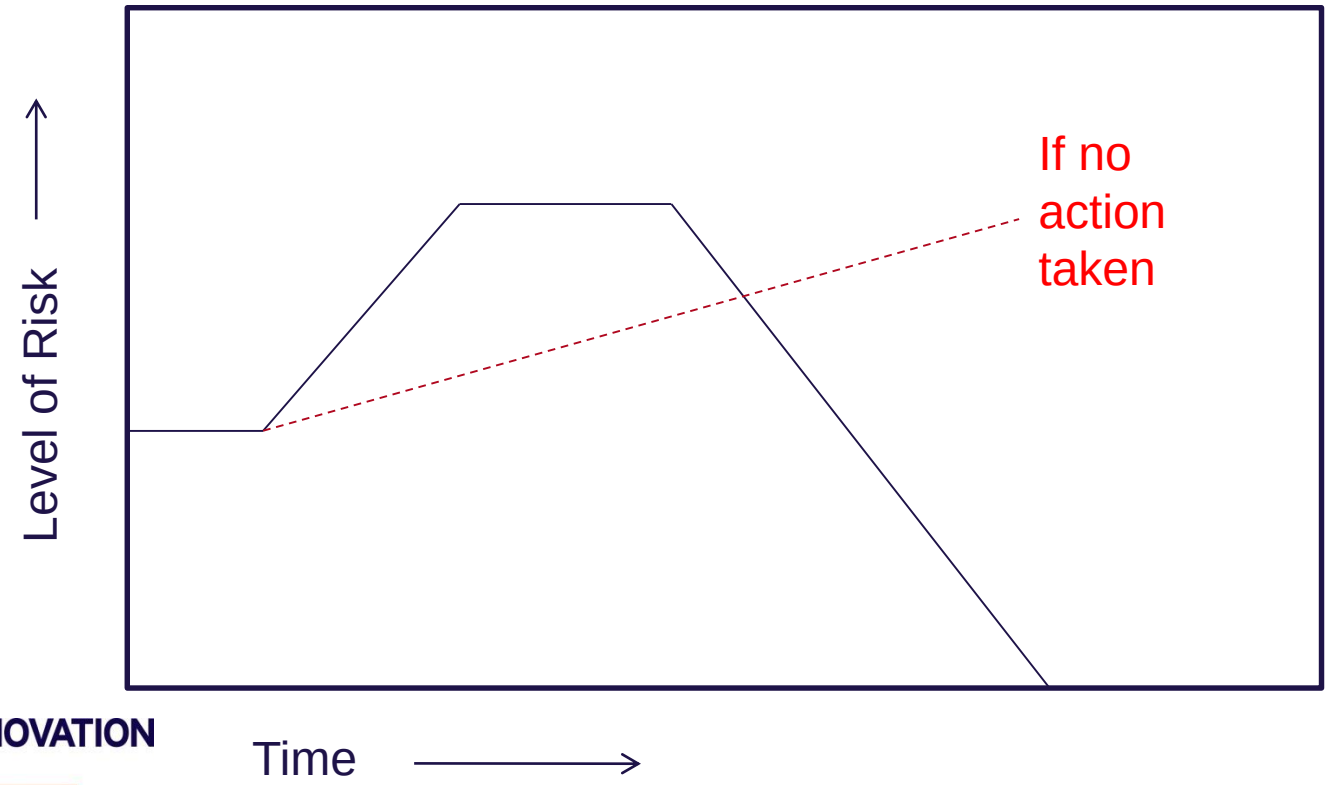
Hazard v Risk

You have hazardous situation which needs to be decommissioned - is it ok to do something which will increase the level of risk?



Hazard v Risk

Is it ok to take more risk for a short time to decrease the hazard, and prevent a worse situation in the future?



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Operations v Decommissioning

Operational Excellence	Decommissioning Excellence
1. Comprehensive set of rules developed over many years	1. A desire to get the job done – and frustration that the 'rules' are over-complicated and prevent work being done
2. A workforce that focuses on compliance and refinement of the rules rather than challenging them	2. Managers who are used to the system making decisions; unsure what to do with empowerment and how to take personal responsibility
3. A lot of "home-grown" talent that has a long history on a single site	3. Work is varied and requires innovation
4. Many years of mainly steady-state operations	4. Site infrastructure changes regularly
5. Work and the site infrastructure does not vary a great deal	5. Decommissioning actually commences with a phase of building new facilities

Reducing the Cost of Decommissioning

- Interim end states
- Visible progress
- Stakeholder management
- Fit for purpose technology
- Lifetime Planning
- Waste Management

All independent of the reactor type

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UK-Japan Collaboration on Decommissioning

Oct 2011 UK-Japan Fukushima Dai-ichi Symposium

- Cabinet Minister participation from both countries

April 2012 UK-Japan Civil Nuclear Agreement

- Establishment of Annual UK-Japan Nuclear Dialogue
  - Decommissioning working group

Dec 2012 TEPCO delegation visit the UK (featured on NHK documentary)
2013 NDA sits on TEPCO's international Expert Group
2013-16 Annual UK-Japan Decommissioning Workshops

May 2014 TEPCO-Sellafield co-operation agreement signed

Feb 2015 NDA-NDF co-operation agreement signed

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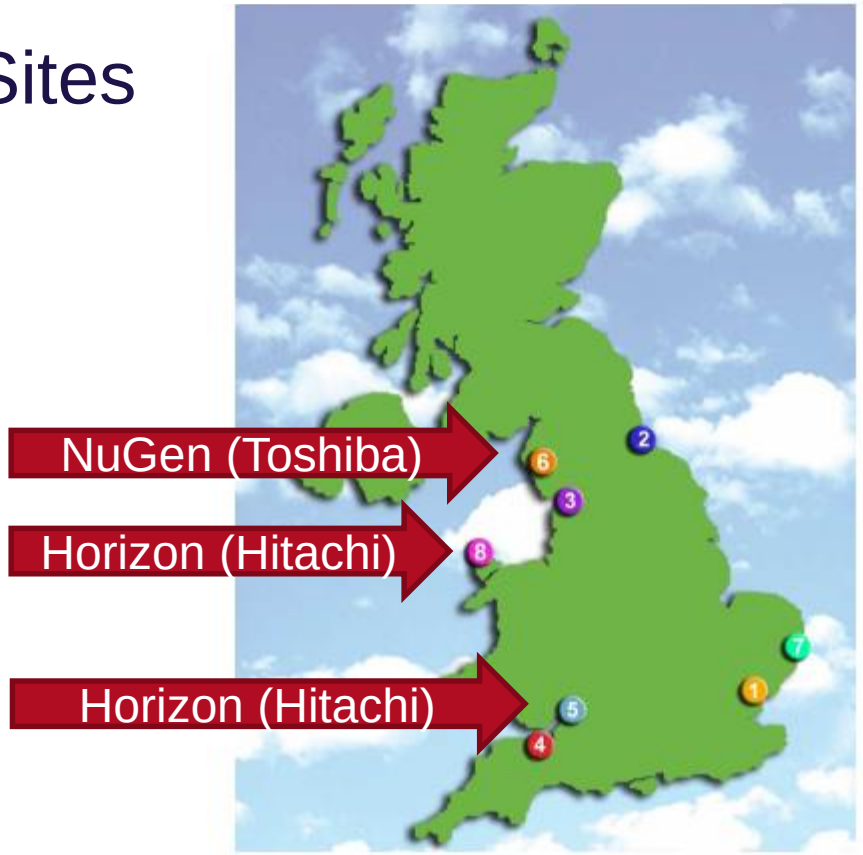
New Build is the Future

Nuclear New Build Sites in the UK



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The UK Nuclear Offering

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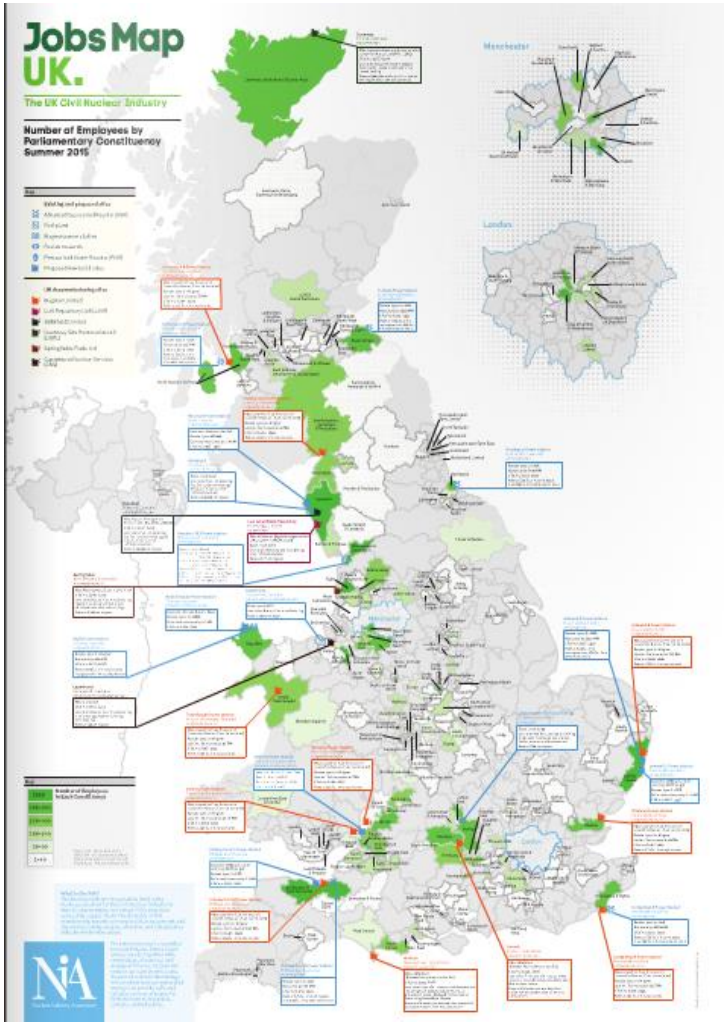
UK Supply Chain

- A diversified supply chain consisting of around 25% of small and medium sized companies
- 80% of companies in Fit for Nuclear are SMEs
- Recent history focused on waste, decommissioning, operations and military propulsion
- Many larger companies have their own network of suppliers and operate globally
- NDA budget is £3.3bn of which £2.9bn is spent in the supply chain
- Supply chain bids for work from Site Licence Companies, NDA, EDF etc as work packages.



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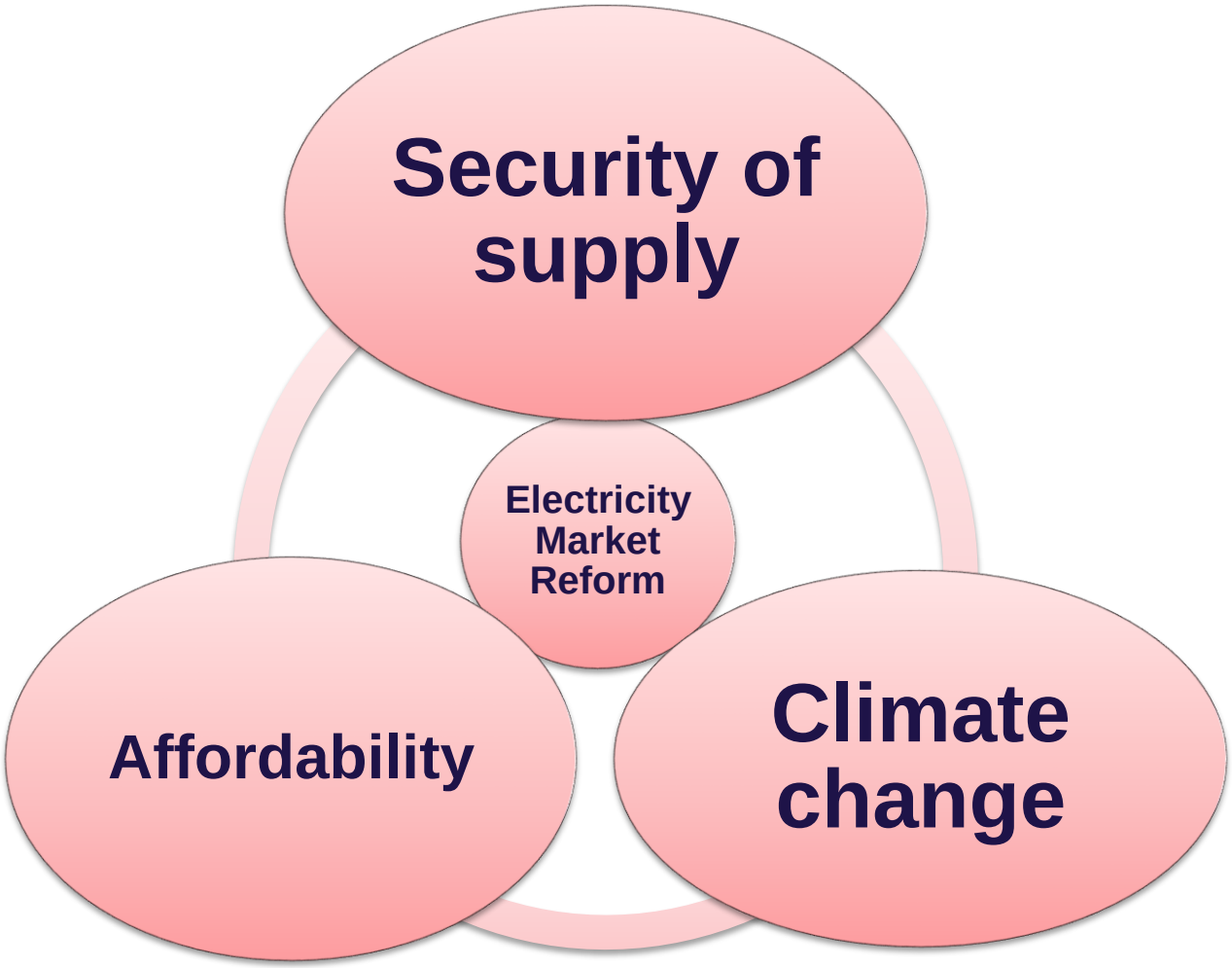
UK Energy Policy



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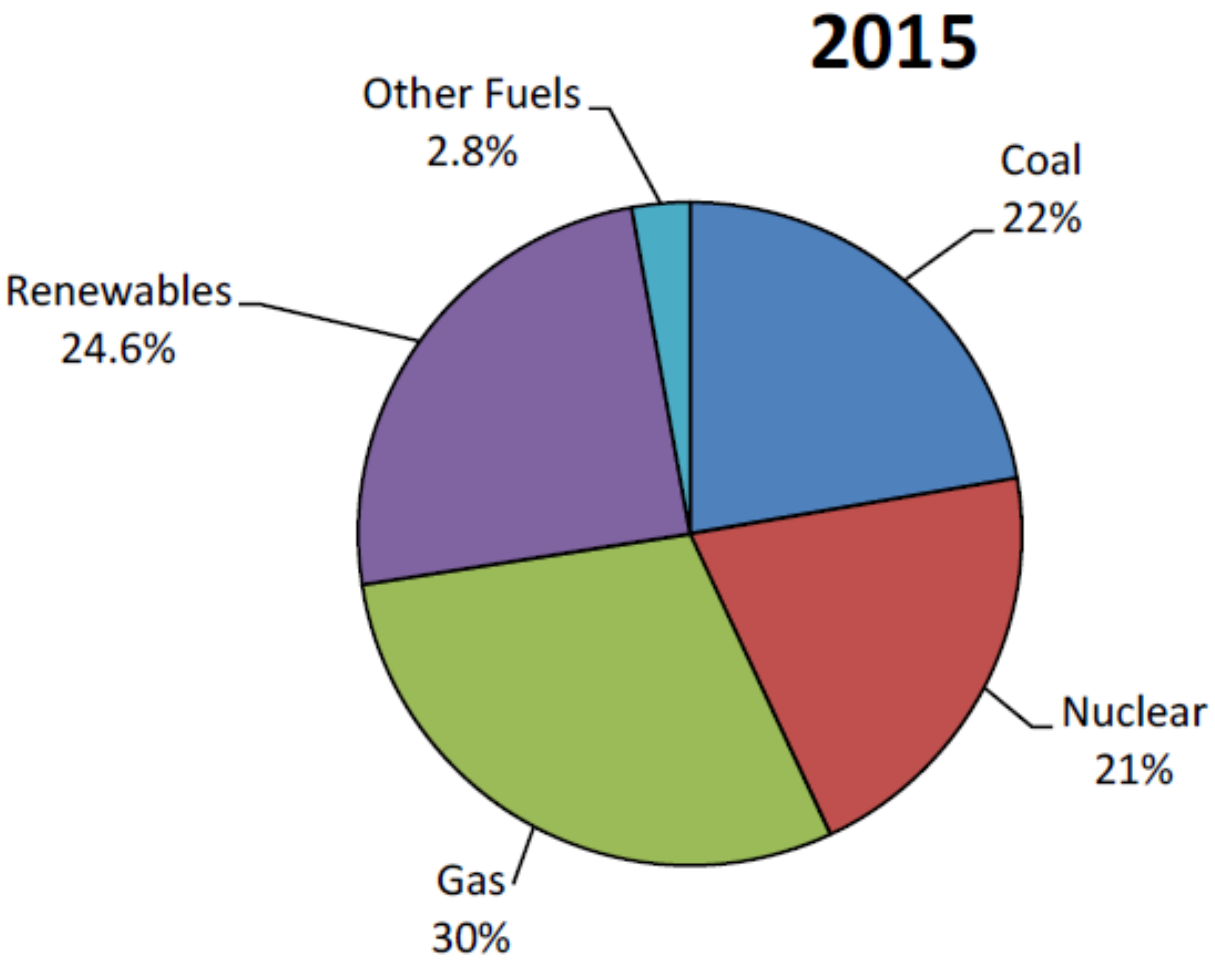
The UK Electricity Mix



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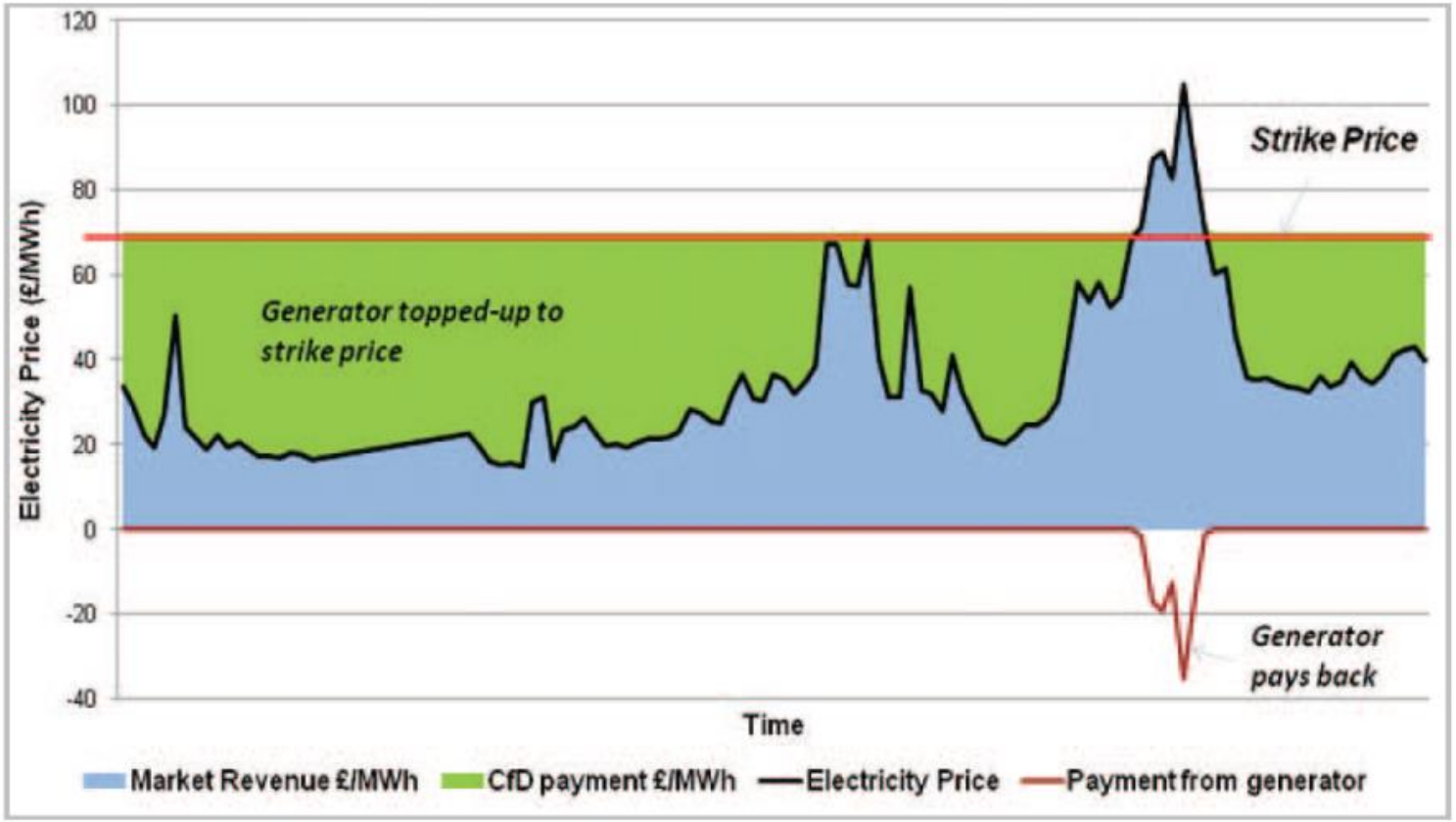
Electricity Market Reform (EMR) – Contract for Difference



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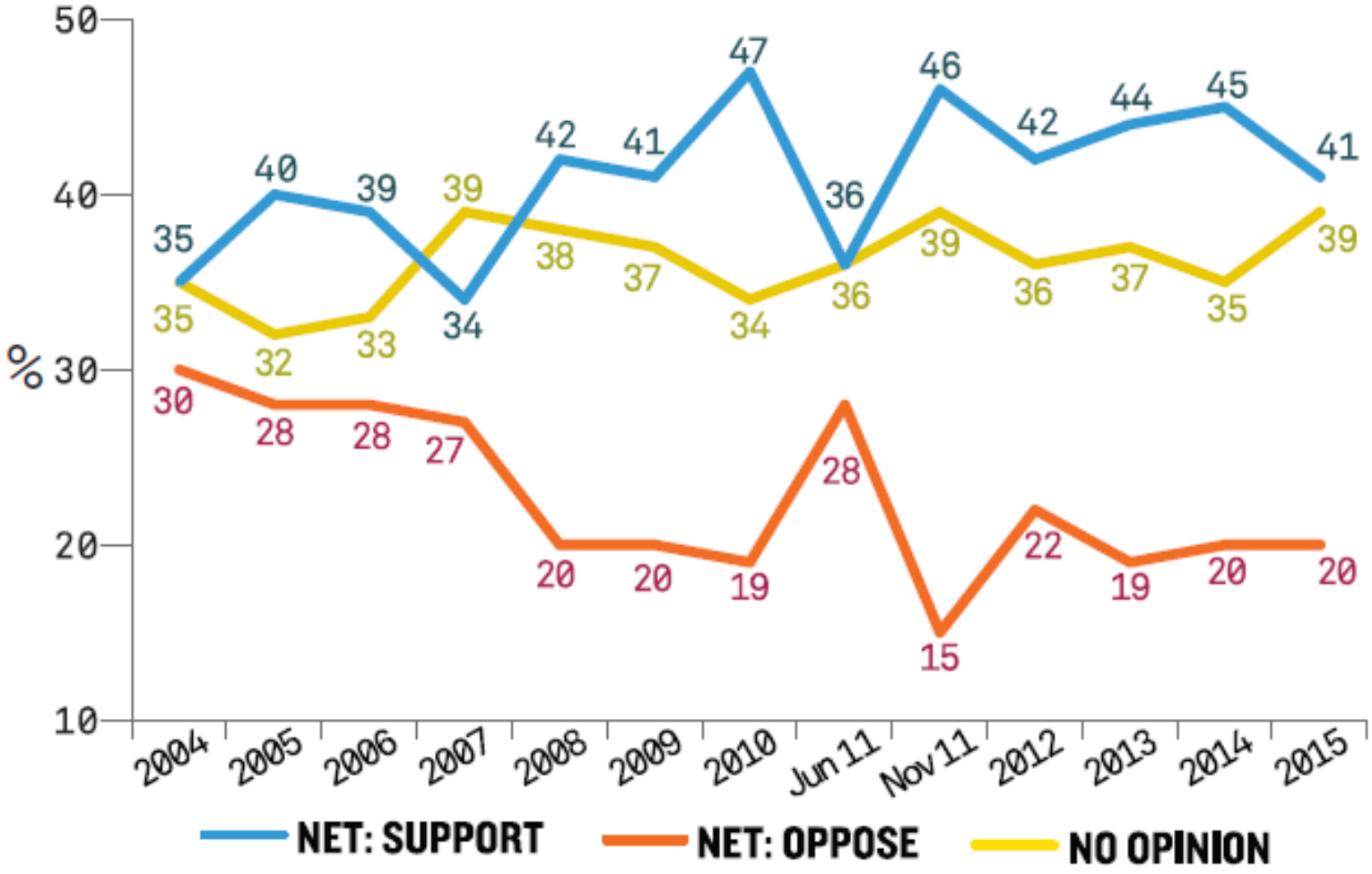
More people in the UK support new build than oppose



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Japanese 2050 Calculator:
日本版2050　パスウェイ・カリキュレーター

http://www.2050-low-carbon-navi.jp/

The 2050 Calculator

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Public Engagement

- **Site Stakeholder Groups**
  - Local groups dedicated to each side
  - Builds trust
  - Site activities can change as a result of discussions

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TEPCO-Sellafield Co-operation

- Fukushima - West Cumbria Study
- Regular video conferences, learning from the local and international stakeholder experience over many years

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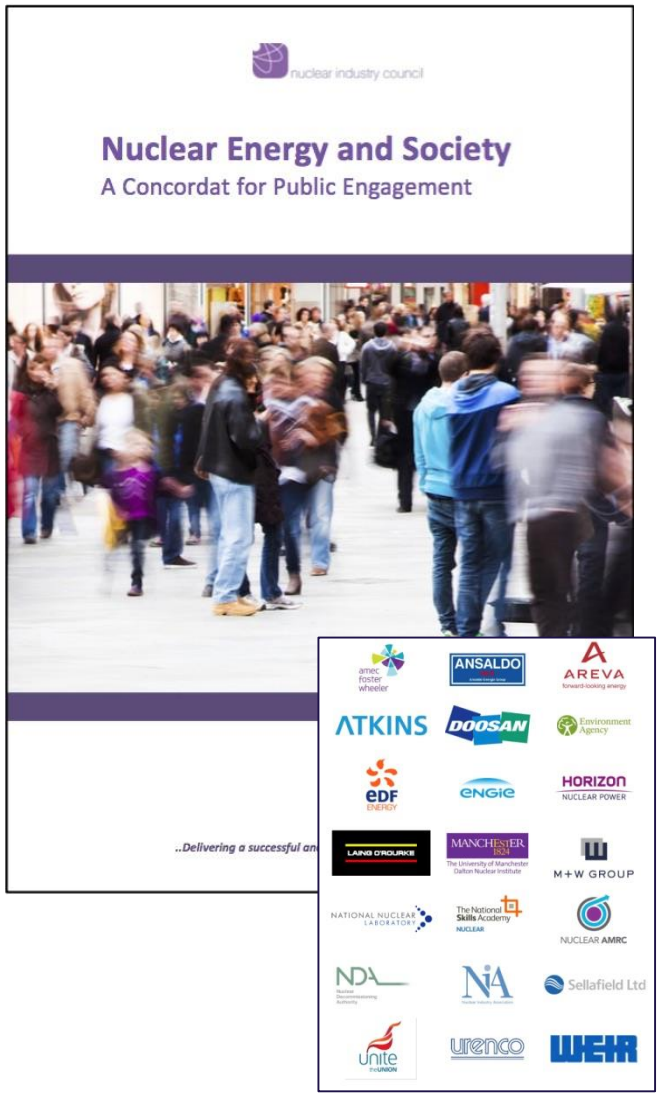
Nuclear Industry Council

- Companies working in the UK civil nuclear sector recognise the importance of public engagement.
- Our engagement with the public will be characterised by, Dialogue, Trust, Clarity, Consultation
- We recognise that our people are ambassadors for the sector and that independent experts as well as industry leaders have an important role to play in public communications.
- We recognise the importance of public attitudes to nuclear energy and regularly assess progress in fostering engagement with society.



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A collaborative approach to decommissioning

Sellafield Ltd

NDA
Nuclear Decommissioning Authority

ONR Office for Nuclear Regulation

Environment Agency

Department for Business, Energy & Industrial Strategy

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The Office for Nuclear Regulation (ONR)

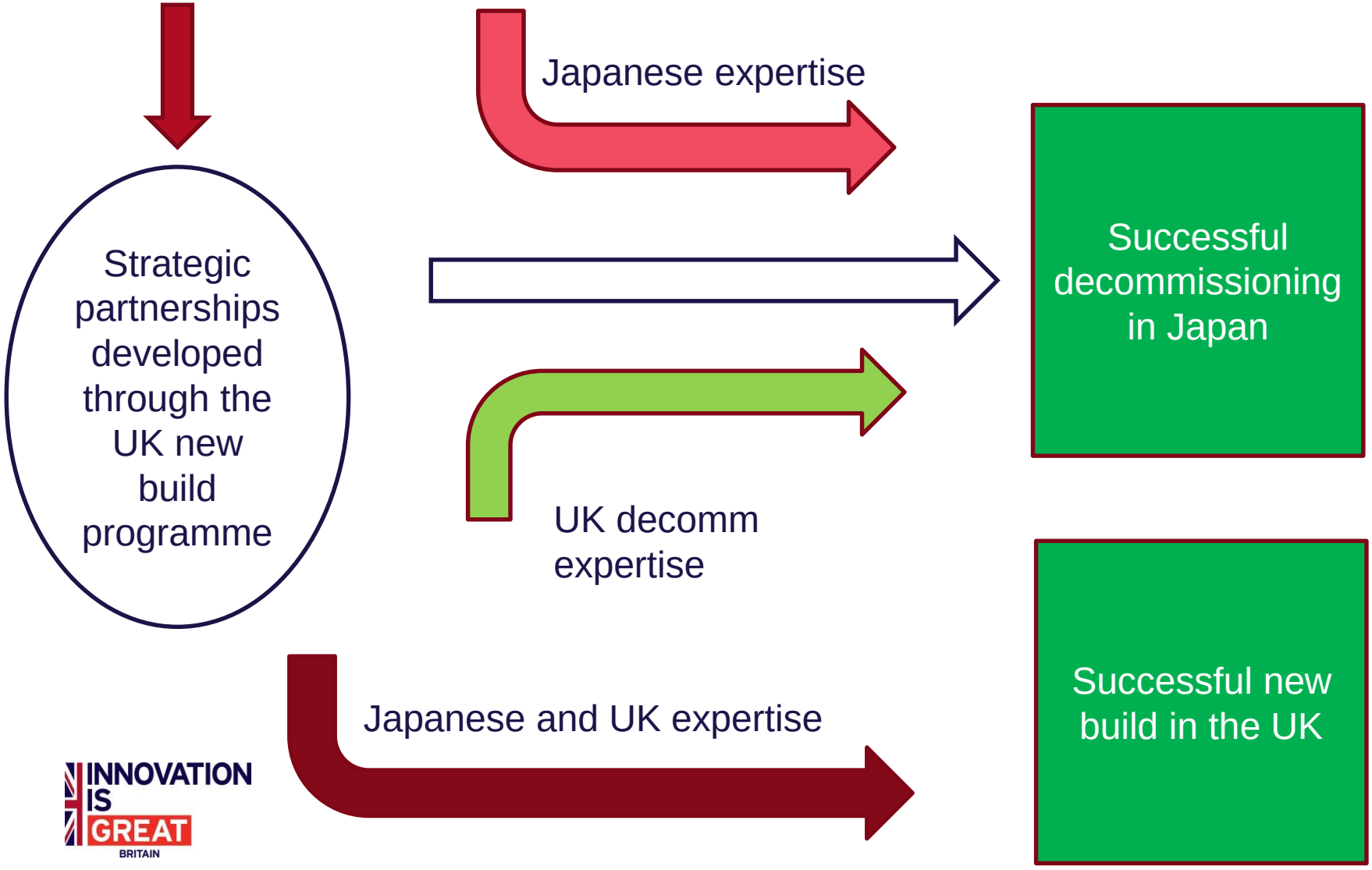
- Enshrined in primary legislation:
  - The Energy Act – Created ONR, legal vires and responsibilities
  - Nuclear Installations Act – Requires licence and allows conditions to be attached
  - Health and Safety at Work Act – Duty of employers to workers and public
- Licensee & site licence:
  - ONR powers are primarily over the licensee
  - ONR largely controls via licence conditions (36)
  - Licensee must have effective oversight & control of all its activities
- SFAIRP = Risks ALARP – key element of much of UK safety legislation

Strategic Partnerships

UK-Japan Government Nuclear Dialogue 2015

"The UK and Japan recognised that the complementary strengths of British and Japanese companies in the civil nuclear sector give them the opportunity to pursue more strategic partnerships for mutual benefit and gain."

UK-Japan Possible Strategic and Mutually Beneficial Partnerships?



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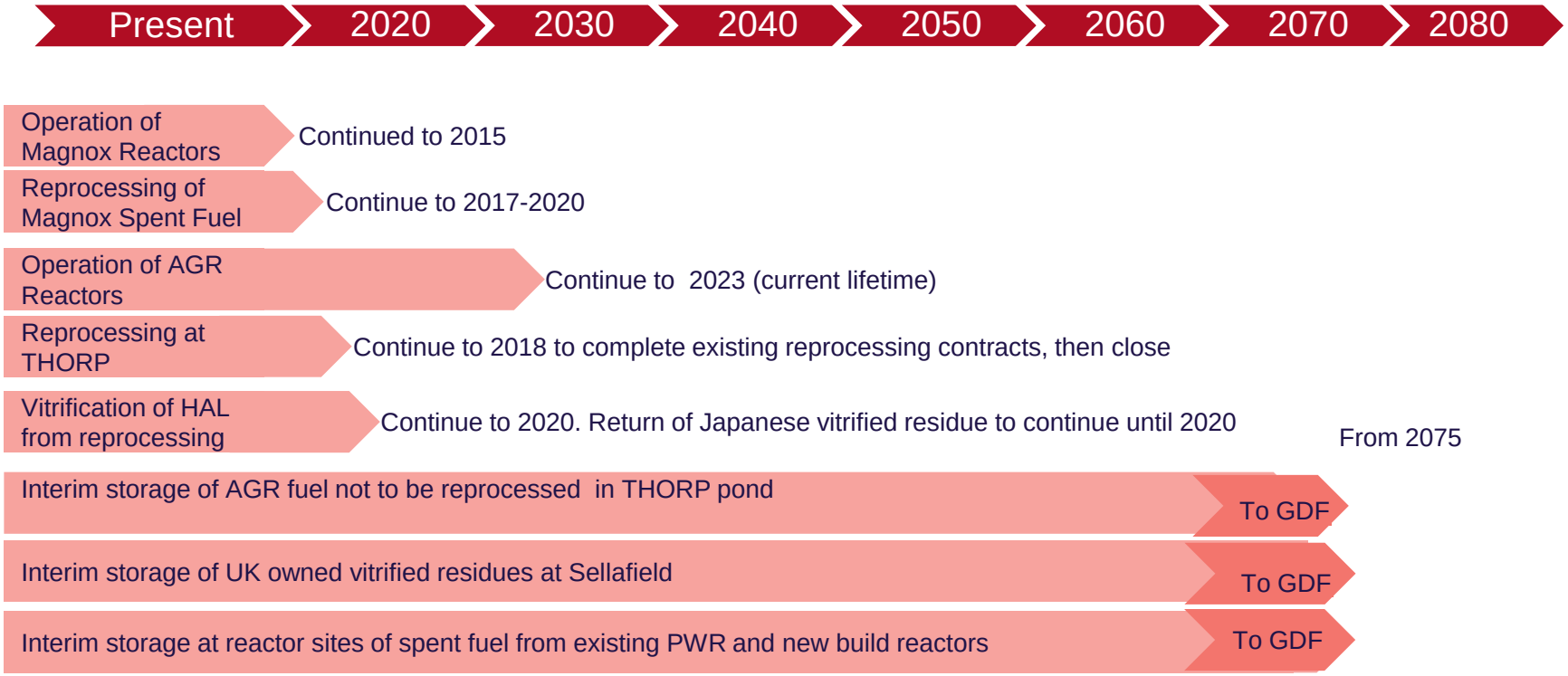
Spent Fuel Management Policy



- The decision to close THORP when the NDA's reprocessing contracts are complete was made for economic reasons. The NDA advised that completing the existing reprocessing commitments by 2018 and placing remaining AGR fuel in interim storage presented the most economic approach to managing AGR fuel.
- In the 2008 Energy White Paper on Nuclear Power, the UK Government concluded *that any nuclear power stations that might be built in the UK should proceed on the basis that spent fuel will not be reprocessed and that accordingly waste management plans and financing should proceed on this basis.* The current understanding is that new reactors will store spent fuel at reactor site for eventual disposal in a geological disposal facility (GDF).

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The UK-Japan Nuclear Dialogue

Five areas of discussion

-Nuclear Policy ✓
-Decommissioning ✓
-Public Engagement ✓
-Research and Development ✓
-Regulation ✓

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Future UK/Japan Events and Activities

- **RADIEX 2016 Science Museum Tokyo – UK Decommissioning Technologies**
  - https://www.radiex.jp/
  - UK-Japan Government to Government Nuclear Dialogue 31 Oct-1 Nov 2017
- **NDA Supply Chain Event – Manchester 3rd Nov 2016**
  - http://www.decommsupplyevent.co.uk/
- **UK-Japan Industry to Industry Forum 17-18 Jan 2017, British Embassy Tokyo**
- **Tour of UK Decommissioning Sites 27 Feb - 3 Mar 2017**

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Invitation for Japanese Organisations to visit UK Decommissioning Sites

Monday 27th Feb – Fri 3rd March 2017

Tour of UK Decommissioning Sites

Attend UK Civil Nuclear Showcase (London)

Speak to me or email:

sumie.ogiwara@fco.gov.uk

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An event to attend much sooner!
Networking session following this presentation

There will be an opportunity for further informal discussion following this presentation.

A session to share some ideas for academic and industry collaboration.

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Is it safe to go to Fukushima Prefecture?

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Summary

- The UK and Japan have a very long history of working together in the civil nuclear industry, from Tokai-1 to the NuGen and Horizon projects.
- Decommissioning, Operations and New Build are all part of the future of the industry in the UK
- UK experience of decommissioning is relevant to the situation in Japan
  - Sellafield challenges → Fukushima Dai-ichi challenges
  - The challenges of decommissioning a reactor fleet are the same no matter what reactor type.
- There is a big future for strategic partnerships between UK and Japanese organisations

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Future UK/Japan Events and Activities

- RADIEX 2016 Science Museum Tokyo – UK Decommissioning Technologies
  - https://www.radiex.jp/

- UK-Japan Government to Government Nuclear Dialogue 31 Oct-1 Nov 2016

- NDA Supply Chain Event – Manchester, Thursday 3rd November
  - http://www.decommsupplyevent.co.uk/

- **UK-Japan Industry to Industry Forum 17-18 Jan 2017, British Embassy Tokyo**
- **Tour of UK Decommissioning Sites 27 Feb - 3 Mar 2017**

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