NATIONAL NUCLEAR LABORATORY

NNL Overview

October 2015

National Nuclear Laboratory's History

1954 UKAEA formed

1957 CEGB formed

1971 BNFL formed

1991 Nuclear Electric & Scottish Nuclear formed

1996 AEA Technology, Magnox Electric and British Energy formed. BNFL R&T Division established

1998 Magnox Electric became part of BNFL

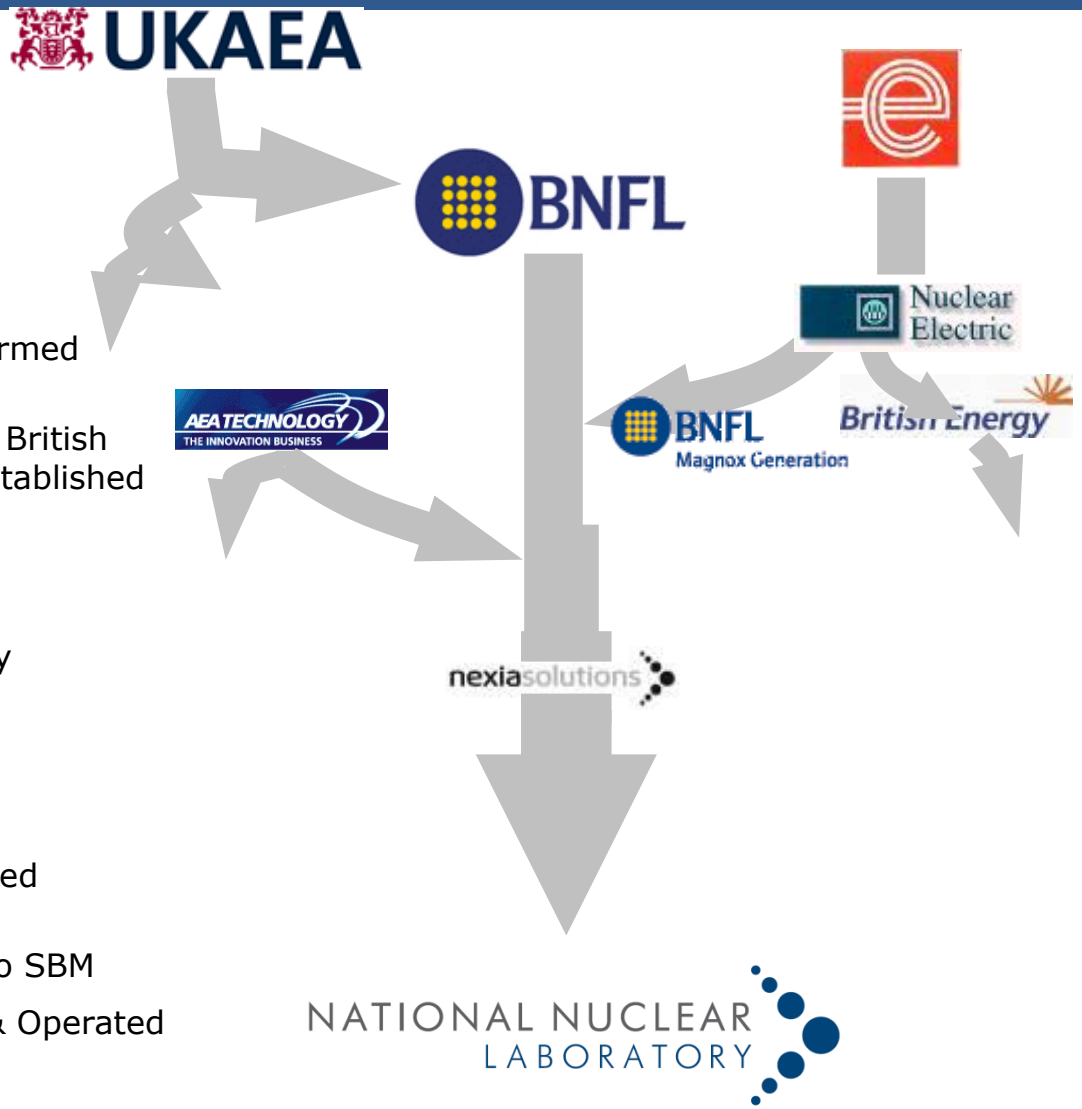
2003 AEAT Nuclear Engineering acquired by BNFL R&T, which rebranded as NSTS

2005 Rebranded as Nexia Solutions

2008 National Nuclear Laboratory established

2009 3+1+1 year M&O contract awarded to SBM

2013 NNL defined as Government Owned & Operated



NNL at a Glance

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NNL: The principal R&D organisation to underpin UK's national nuclear programmes

	Key Facts	
Status	GoGo	• Commercial business model • No direct HMG grant funding
Ownership	DECC	• Managed via ShEx
Revenue	~£100m	• Sellafield, EdF Energy & MoD
EBIT	~£10m	• Reinvested in facilities and R&D
Headcount	1000	• >60% STEM degrees/PhDs
Facilities	3 nuclear labs	• Located on nuclear licenced sites

Winner
RESEARCH & DEVELOPMENT
Sector Award
Winner 2004 - 2008, 2010 - 2011, 2014
Highly Commended 2009, 2012, 2013




NNL supports the UK's entire civil nuclear fission programme

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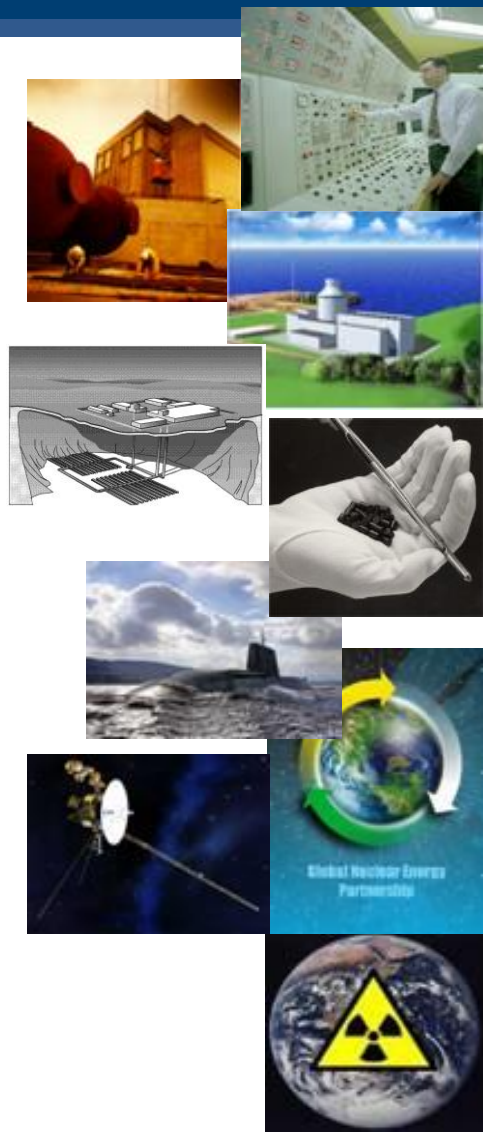
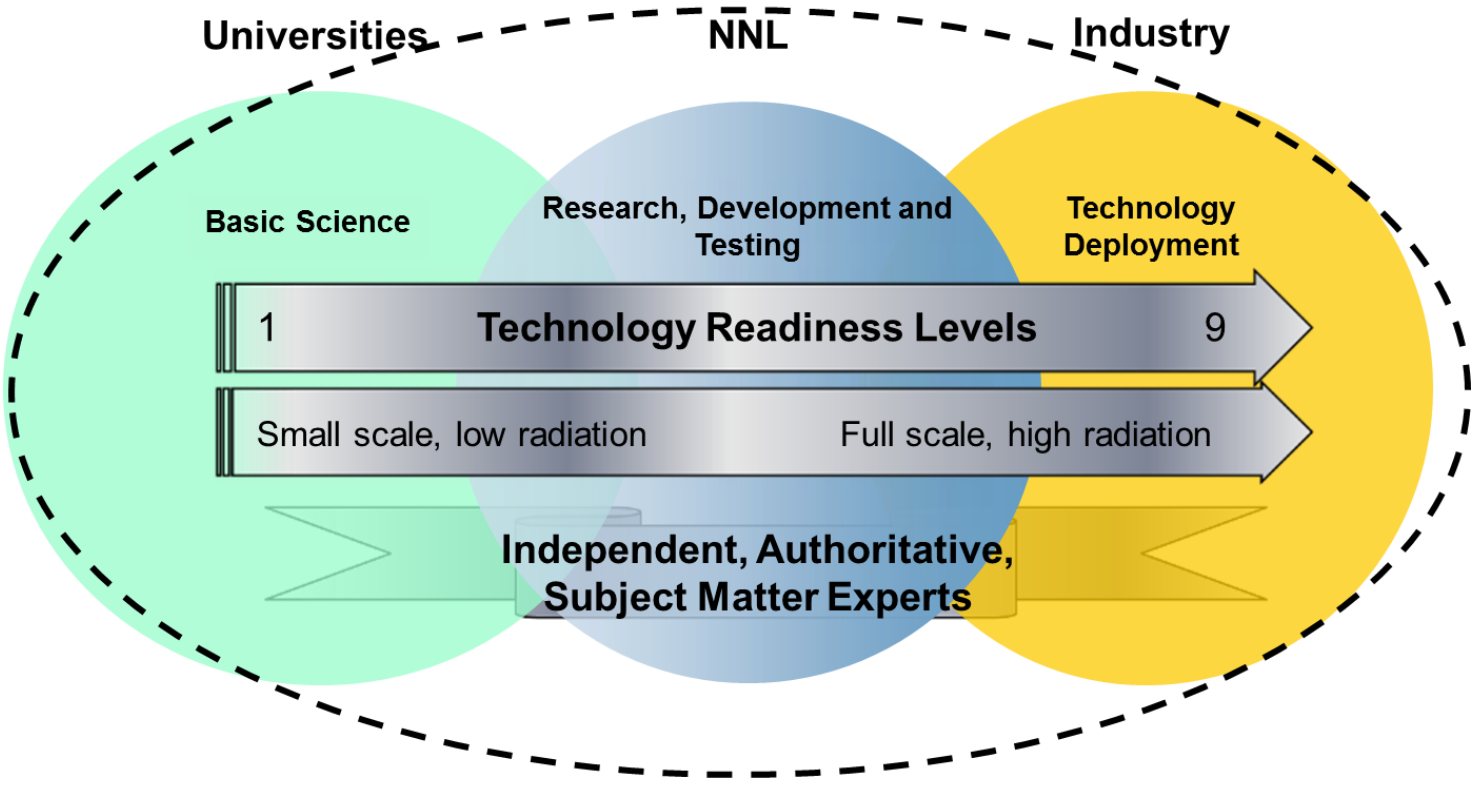
- Continued operation of existing reactors
- Legacy waste management / decommissioning
- New nuclear build
- Geological disposal
- Plutonium stockpile disposition
- Naval propulsion support programme
- Advanced reactor (Gen IV) and fuel cycle development
- Space Power systems
- Security, non-proliferation & safeguards



NNL's Living Network



NNL's leverage and uniqueness exists in bringing its network of academia, national labs, industry (SMEs, supply chain) together to address S&T challenges

DECC's Key Objectives for NNL:

1. Act as strategic technical advisor to Government and stakeholders
2. Grow a sustainable business delivering operational excellence
3. Ensure business is supported by outstanding people and facilities
4. Deliver impactful science, technology and engineering
5. Achieve industry leading standards of operational EHSS&Q

Advanced Test Fuel Research

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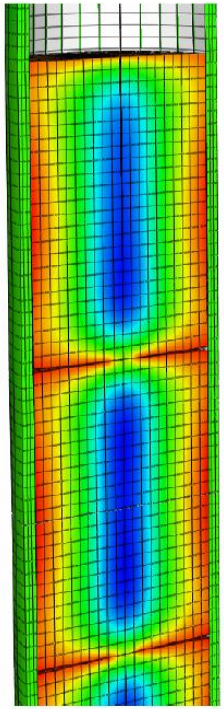
- **Test Fuel Manufacture**
  - Dry powder pellet production;
    - Pu/Th MOX fuel
    - Oxide / Carbide / Nitride Fuel
  - Gel Sphere Precipitation test rig (SiCarbide fuel)
- **Test Fuel Assembly**
  - Test rod assembly for a variety of fuel types
- **Fuel Material Properties**
  - Ceramographical Examination
  - Inspection and X – Ray
  - Autoradiograph, thermogravimetric analysis
- **Fuel performance using state-of-the-art computer code suite**



Temperature distribution

in LWR fuel rod (BISON)

Test Fuel Fabrication Laboratory

Fuel Manufacture and Performance: International Collaboration

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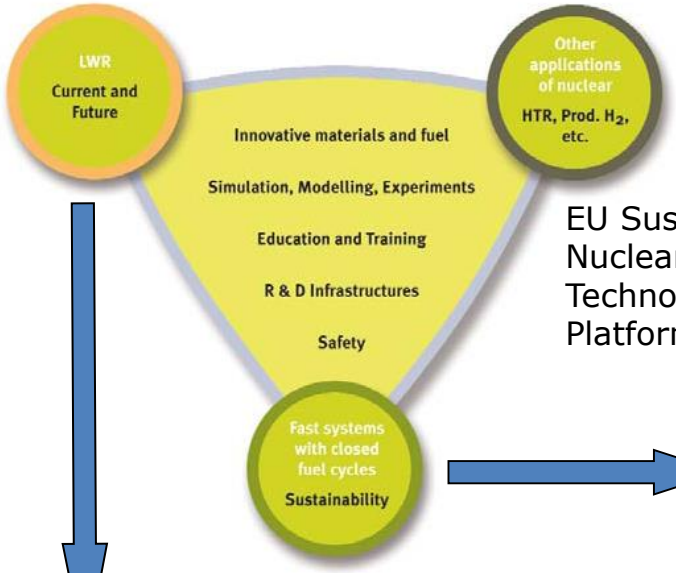
- **NNL expertise and facilities supporting UK and international initiatives**



NUGENIA
NUclear GENeration II & III Association

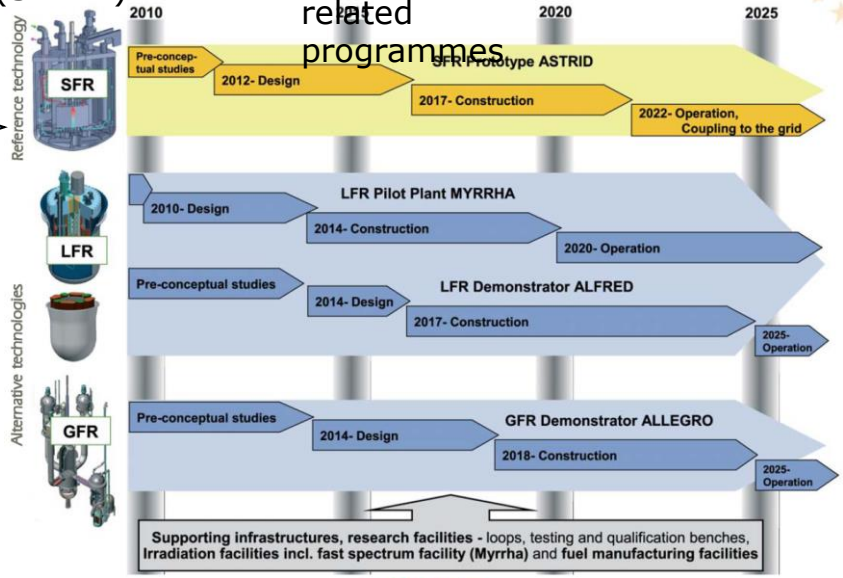
NNL is one of several EU organisations providing Technical Area leadership

EU Sustainable Nuclear Energy Technology Platform (SNETP)

GoFastR

ASGARD

NNL is participating in these two ESNII-related programmes



European Sustainable Nuclear Industrial Initiative (ESNII)

Advanced Reprocessing

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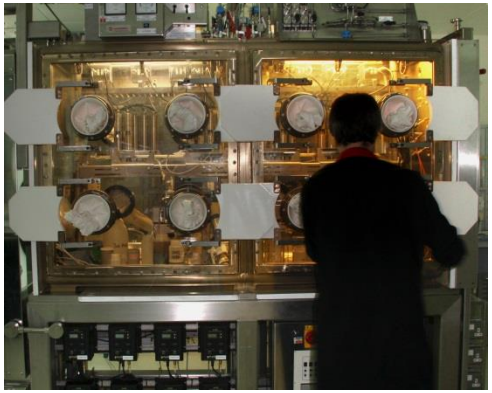
- Programmes in UK for past 20 years
- UK involvement in international programmes including EU
- Collaboration in future important



ACSEPT
innovative solutions for sustainable nuclear energy

GANEX Flowsheet, Pu Dissolution

Waste Management R&D

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Plant Lifetime Extension

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- Reactor and station plant chemistry
- Materials behaviour
- Ageing plant strategy management
- Plant inspection

Plutonium Management

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- NDA remit to ensure safe, secure and cost-effective lifecycle management of Pu stocks
- Options currently being evaluated;
  - Reuse
    - Areva MOX technology (Reference)
    - CANDU technology
    - Prism technology
  - Immobilisation
    - Full inventory
    - Scraps and Residues

Legacy Waste Management

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Range of facilities from early nuclear programme – examples at Sellafield

- Fuel storage ponds
- Waste silos
- Waste storage tanks
- Windscale Pile
- 1st Reprocessing Plant

R&D to:

- Reduce the radioactive hazard
- Accelerate the programme
- Innovative solutions
- Reduce the costs

Nuclear Fuel Cycle Analysis

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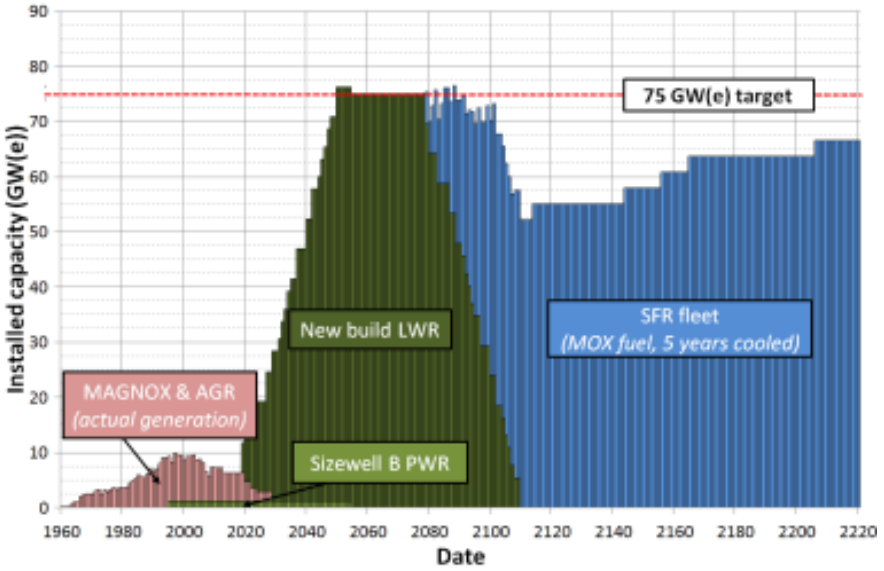
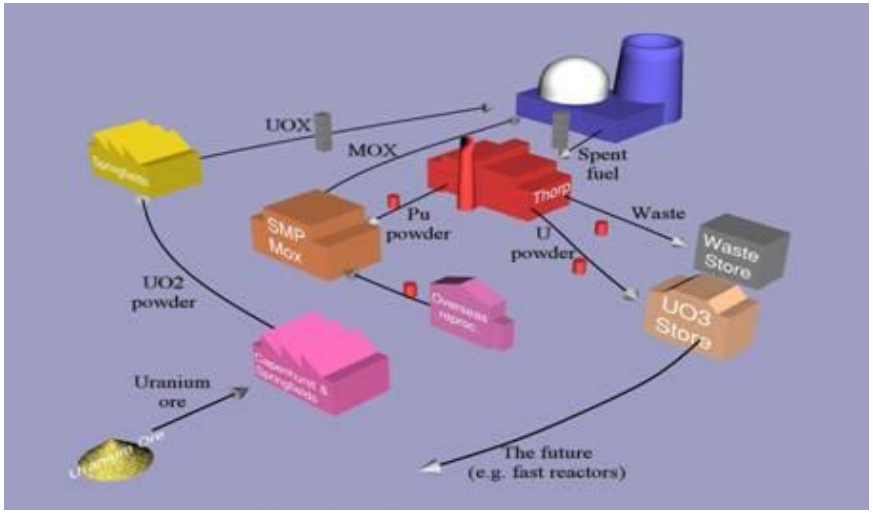
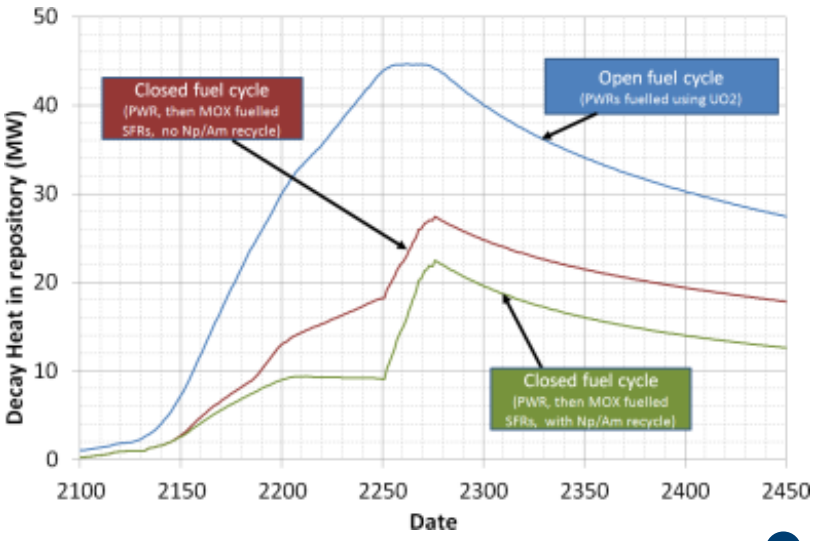
- Nuclear Scenario Roadmaps
  - Open and Closed fuel cycles
  - Various reactor and fuel systems
  - Implications and decision points explored







Nuclear R&D Facilities

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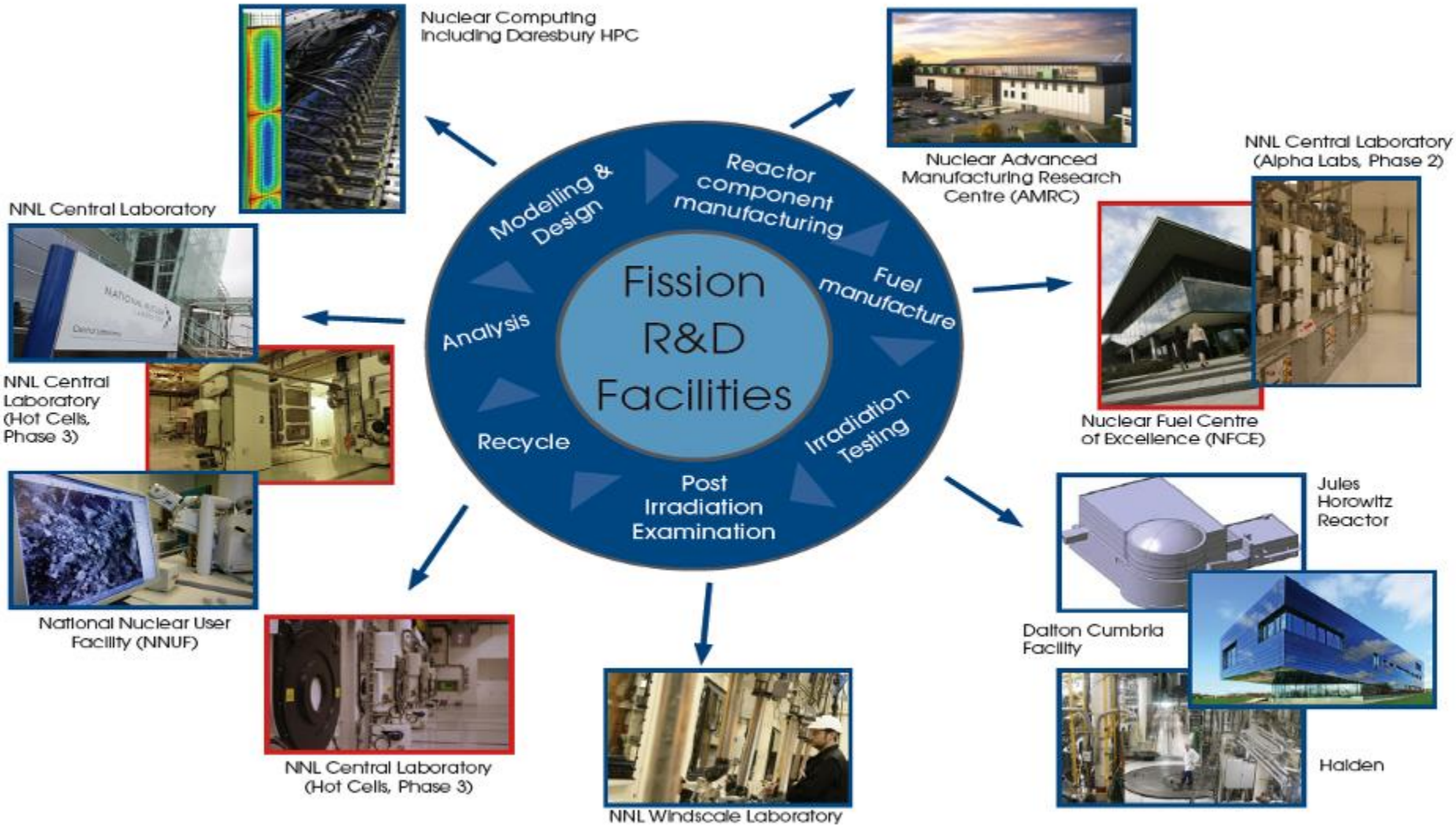


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