
Modelling in Nuclear Science & Engineering

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Net Zero

1,516 weeks until the UK is to legally meet net zero Greenhouse Gas Emissions,

All technologies need to be considered,

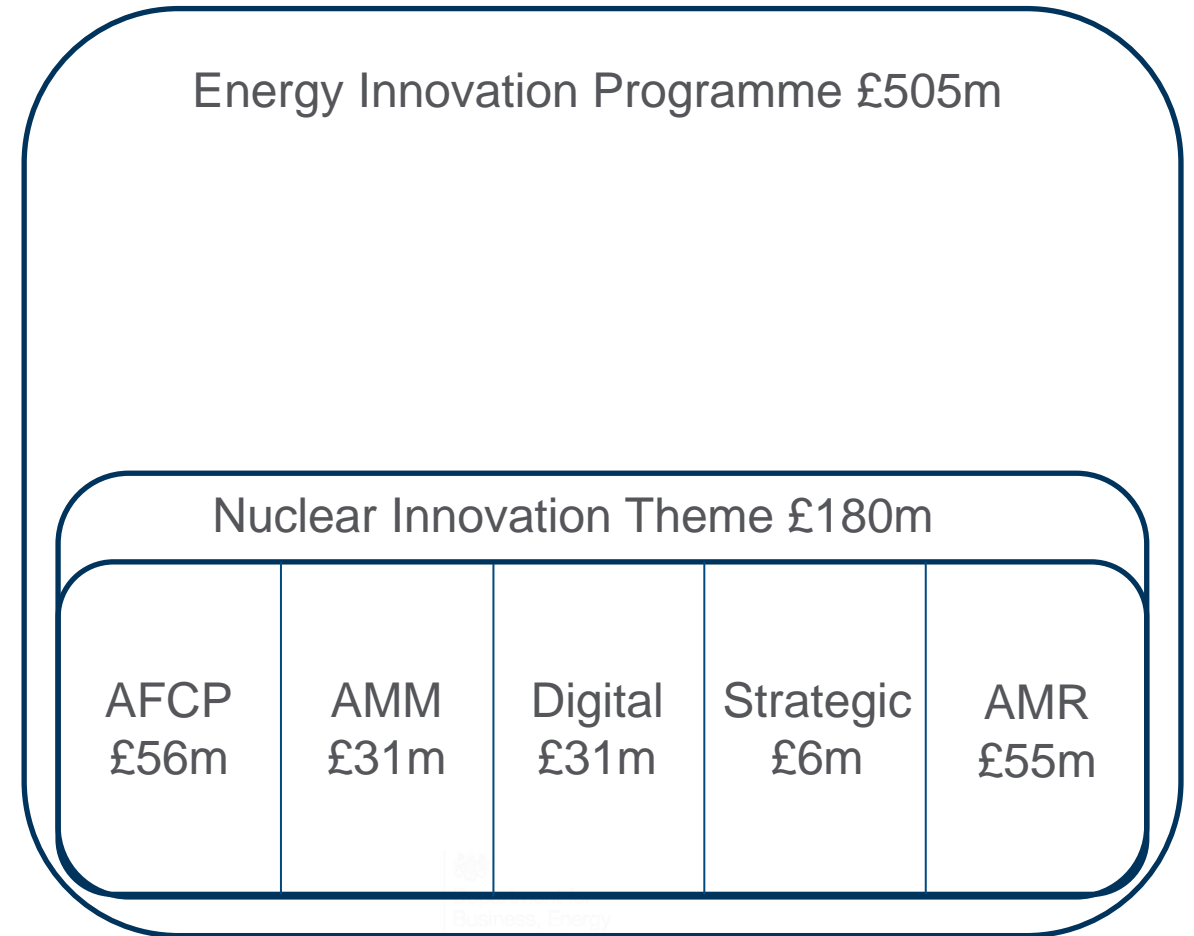
Nuclear has a key role to play across GW scale, SMR and AMR.



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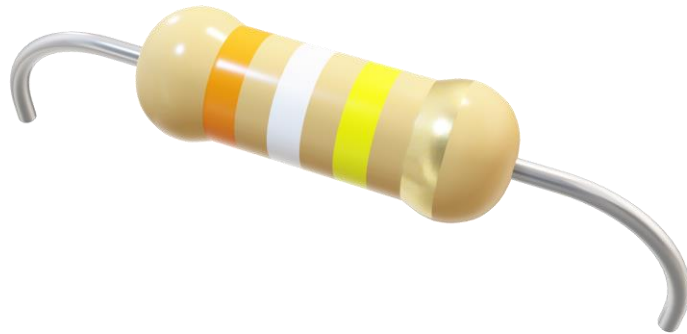
Energy Innovation Programme

- Launched in 2016,
- Energy Innovation Programme is a £505m portfolio,
- The Nuclear Innovation Theme allocated up to £180m,
- Targeted to halt decline in researcher numbers, reduce nuclear costs and increase export potential (increase capability, capacity and decrease cost),
- Modelling has played a key role (up to £31m).

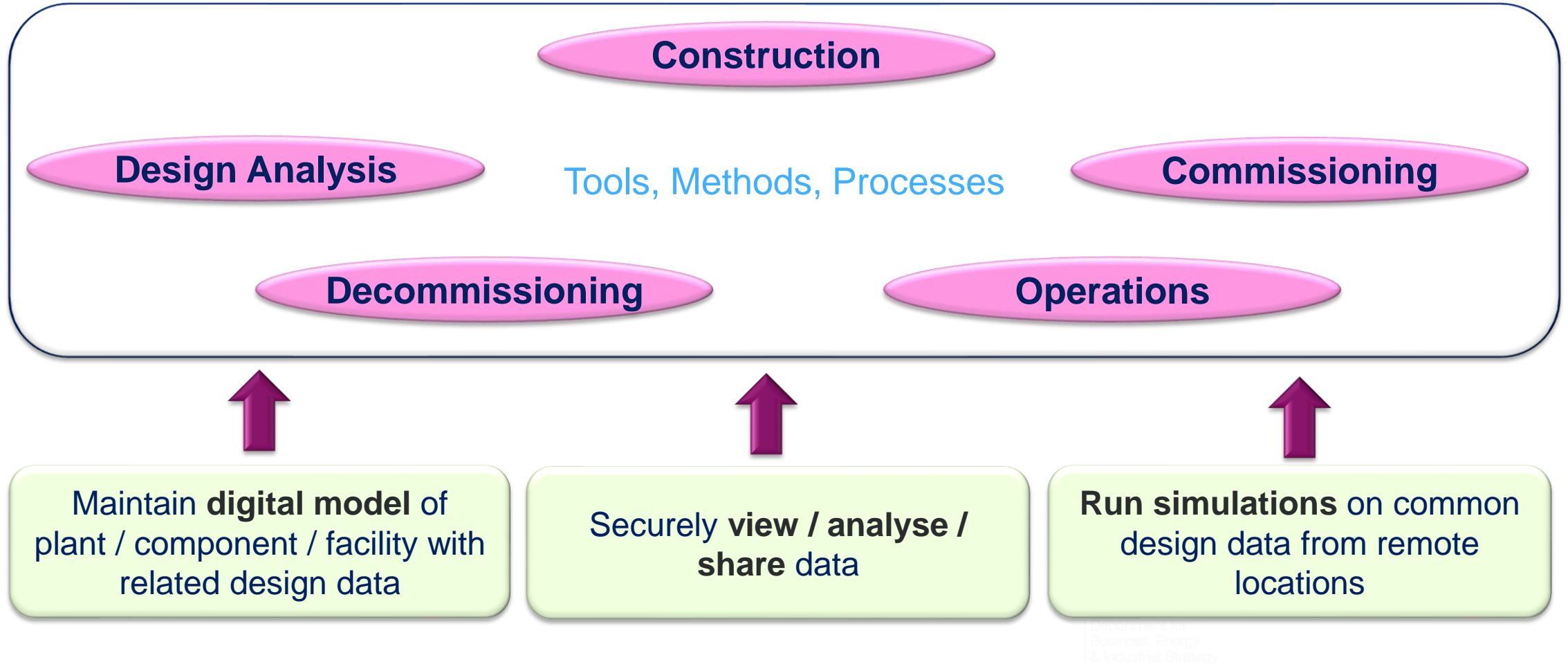


Digital Reactor Design

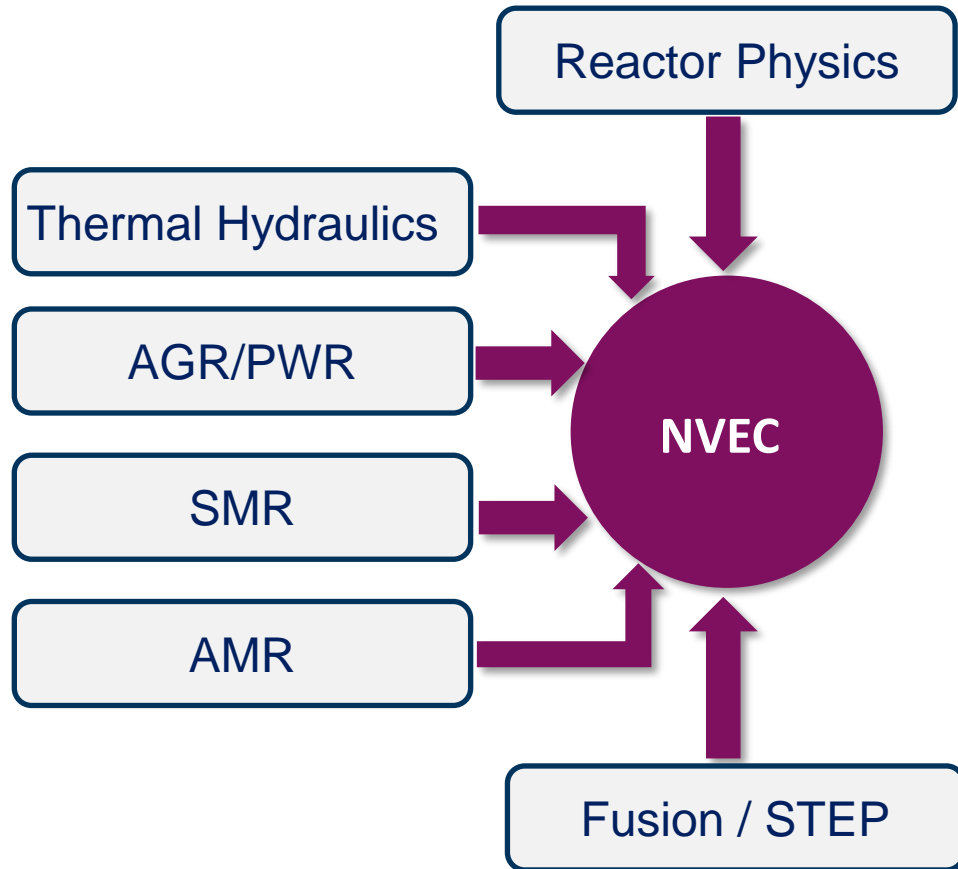
- £31m programme from 2016 – 2021,
- Encompasses thermal hydraulics, virtual engineering and safety & security,
- Latest in digital advances for nuclear plant,
- Coupling of modelling codes,
- Launch of Nuclear Virtual Engineering Capability.



NVEC Environment



NVEC as Master Programme Integrator



Core software components developed that enable:

- Change control of all data and 'single source of truth'
- Integration of generic simulation/analysis tools
- Integration of sensor data (for modelling/simulation)
- Development of flexible inter-organisational network
- Development of Digital Twins if combined with relevant data/simulation codes

Benefits: Reduced costs, shortened development times, enhanced operability, joined-up industry, enabling innovation



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How did the Nuclear Innovation Theme do?

Rediscovering our spirit of innovation...

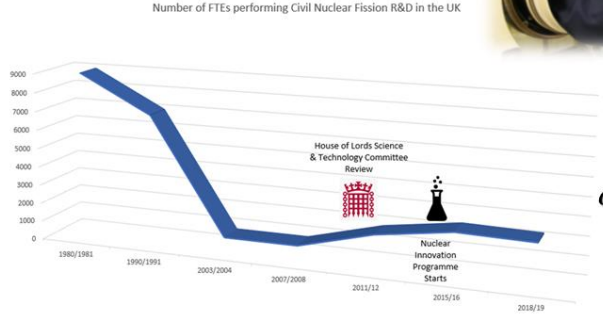
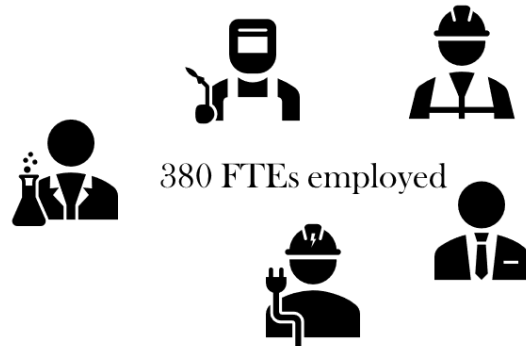


Optimising safety and efficiency...

£4.95 in value for every £1 spent*

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20 Universities and 76 organisations engaged across the UK



Halting the skills decline and growing new talent...

AMR Phase 2 Competition

- Follow on from AMR Phase 1 Design Development,
- Phase 1 included up to £300k for design development across 8 designs,
- Three designs selected for Phase 2 for up to £10m each to develop design and perform supporting R&D,
- Phase 2 involves corrosion testing, safety systems and thermal hydraulics modelling and design development.



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Low Cost Nuclear Programme

- Launched in 2019,
- Delivering a new approach to low cost nuclear electricity using standardised modular and factory build,
- Incorporating the latest digital tools and techniques for design and construction,
- Phase 1 of £36m funding (matched private and public) due for completion in 2021,
- Envisaged Phase 2 funding of around £500m awaiting approval.



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Molten Salt Advisory Group

- Formed in July 2020 by BEIS,
- Group of the UK's leading academics on the research, development and application of molten salt technologies,
- Convened by BEIS to provide technical advice, and recommendations on how to most effectively leverage UK capability to support the development and exploitation of molten salt technologies,
- To get involved feel free to contact BEIS via smr@beis.gov.uk.


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NEA Data Bank

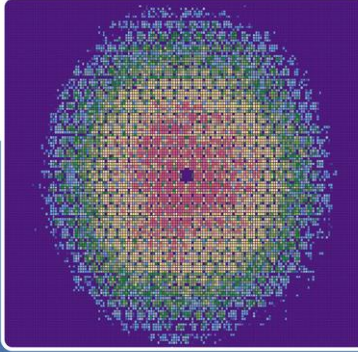
Mission

The NEA Data Bank serves as the premier international centre of reference for basic nuclear tools, such as computer codes, nuclear and thermochemical data, experimental and evaluated microscopic nuclear data, and benchmark experimental data used for the analysis and prediction of phenomena in the nuclear field. It also maintains and distributes databases developed within the NEA working parties and expert groups, as well as by NEA joint projects.

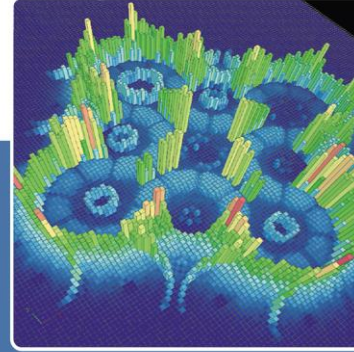
Have your say! **End-users engagement with Data Bank:**

Universities 12th of November – *invitations have been sent out!*
Industry ca. end of November – *await your invitation*

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Computer Program Services (CPS)



Nuclear Data Services (NDS)



Thermochemical Database (TDB)



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Generation IV International Forum

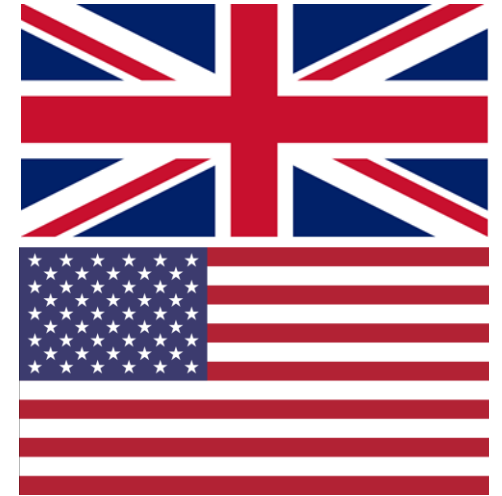
- In 2018, UK Government ratified re-entry into the Generation IV International Forum (GIF),
- Strong engagement from UK Representatives across the Working Groups,
- Co-ordinated by BEIS.



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UK-US Action Plan

- Signed in September 2018
- 1st Steering committee meeting in Nov 2019 in Washington
- Currently it enables collaborations under six working groups :
 - Radioisotopes for use in Space Technologies WG1
 - Nuclear Reactor Technologies WG2
 - Advanced Fuels WG3
 - Fuel Cycle Technologies WG4
 - **Advanced Modelling and Simulation Tools** WG5
 - Enabling technologies WG6



WG5 is currently focusing on:

- CFD Benchmarking
- Graphite/Thermal/Mechanical Failure Models
- Share Expertise in the Development of the Digital Nuclear Environment/Digital Twins

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UK-Canada Action Plan

Builds upon our many bi-lateral and multi-lateral areas of cooperation such as G7, G20 and The Clean Energy Ministerial,

Signed in London, March 2020 by BEIS and Natural Resources Canada,

ONR and CNSC signed agreements for cooperation in October 2020,

Includes work across:

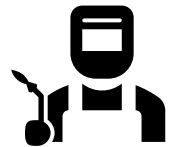
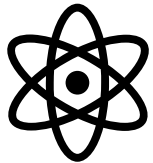
- Fuel Supply Chain,
- Waste Minimisation,
- Advanced Manufacturing,
- Regulatory Collaboration,
- SMR Financing.




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Looking to the future ...

- Initial award of £1bn for a future energy innovation programme,
- Treasury have announced a 1 year Spending Review,
- New innovation programme will focus on opening up the opportunities for innovation in achieving Net Zero efficiently and rapidly,
- Look out for calls ...



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