SMR/AMR Market Landscape
What's happening in the UK?

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TÜV SÜD

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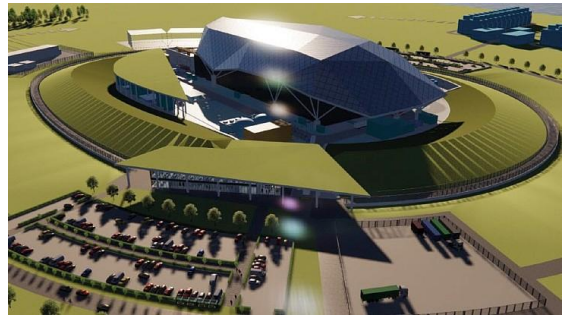


UK Nuclear Ambitions

UK Nuclear Ambitions: Targets and Commitments

The UK has an ambition to have zero CO_2 emissions by 2050. This will require:

- Decarbonisation of industries
- Electrification of the grid i.e. renewable energy sources

This led to the target of the UK having ‘up to 24 GW of nuclear capacity by 2050’.

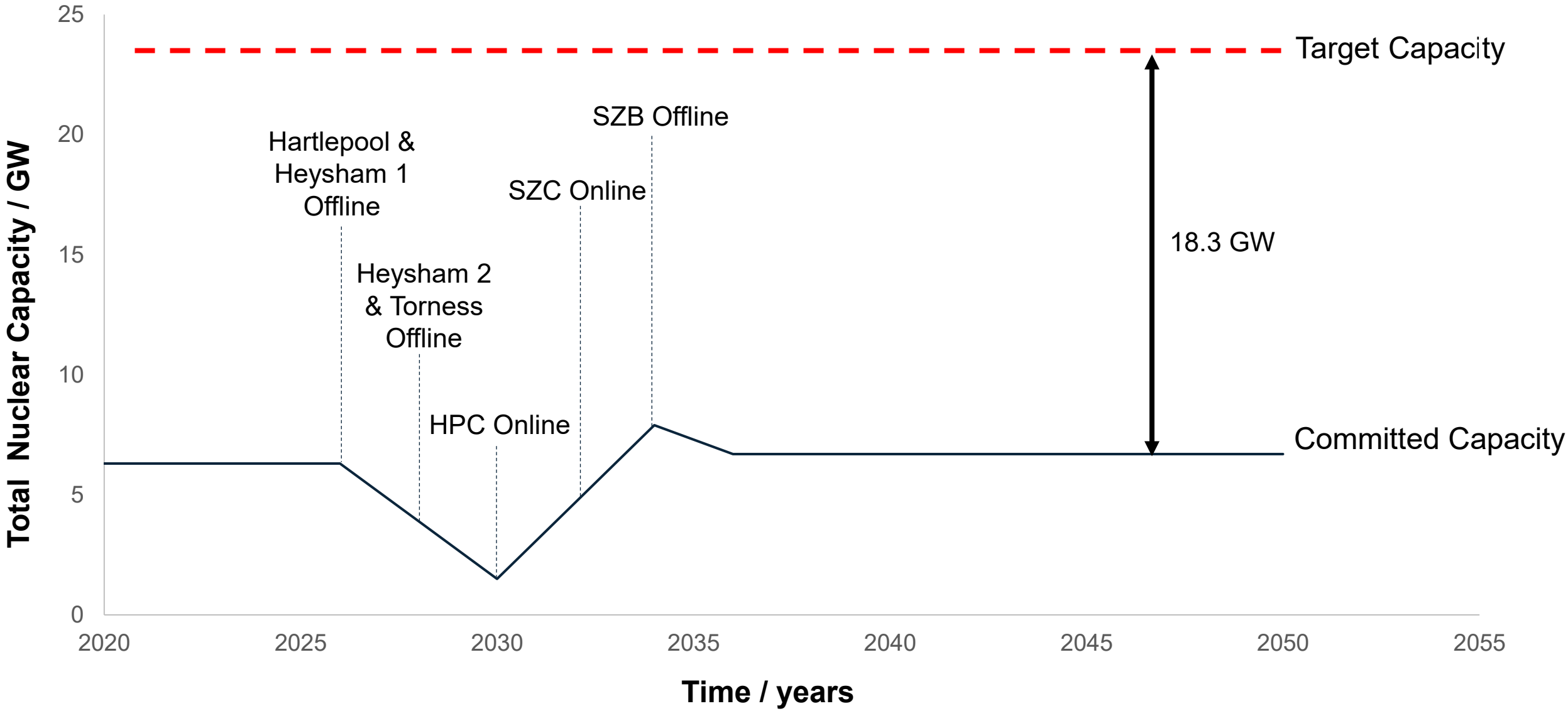
In addition to supporting net zero ambitions, it also enables greater sovereignty of the UK’s energy production and provides more assurance of energy security.

The Pathway to 2050 – our commitments in summary

1. We are committing to explore a further large-scale reactor project beyond SZC.
2. We are committing to deploy SMRs in the UK, unlocking the benefits of modularisation and replication.
3. We remain committed to deploying up to 24GW by 2050 and to achieve this aim will aim to secure investment decisions to deliver 3-7GW every five years from 2030 to 2044.
4. We will develop a strong government support offer for private sector AMR vendors, following the Alternative Routes to Market consultation.

Link: [Civil Nuclear: Roadmap to 2050]

Current UK Nuclear Capacity: Operational & FID



How is the UK supporting nuclear new builds?

1. Regulatory reform and international harmonisation
    - Fingleton review / Nuclear Regulatory Taskforce

2. Planning reform and Siting Flexibility
    - National Policy Statement EN-7

3. Enabling Technology Deployment
    - Advanced Nuclear Framework (AMRs / SMRs)
    - SMR Competition

4. Direct Government Sponsorship
    - Establishing GBE-N as a publicly owned body to support nuclear project delivery and development.

Great British
ENERGY | NUCLEAR

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Great British ENERGY | NUCLEAR

UK SMR Landscape

GBE-N
SMR Competition

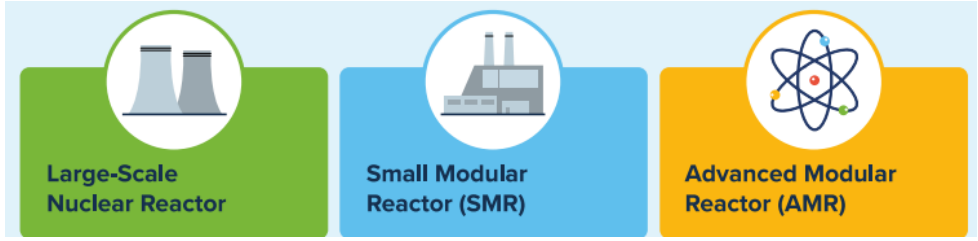
Great British Energy - Nuclear (GBE-N)

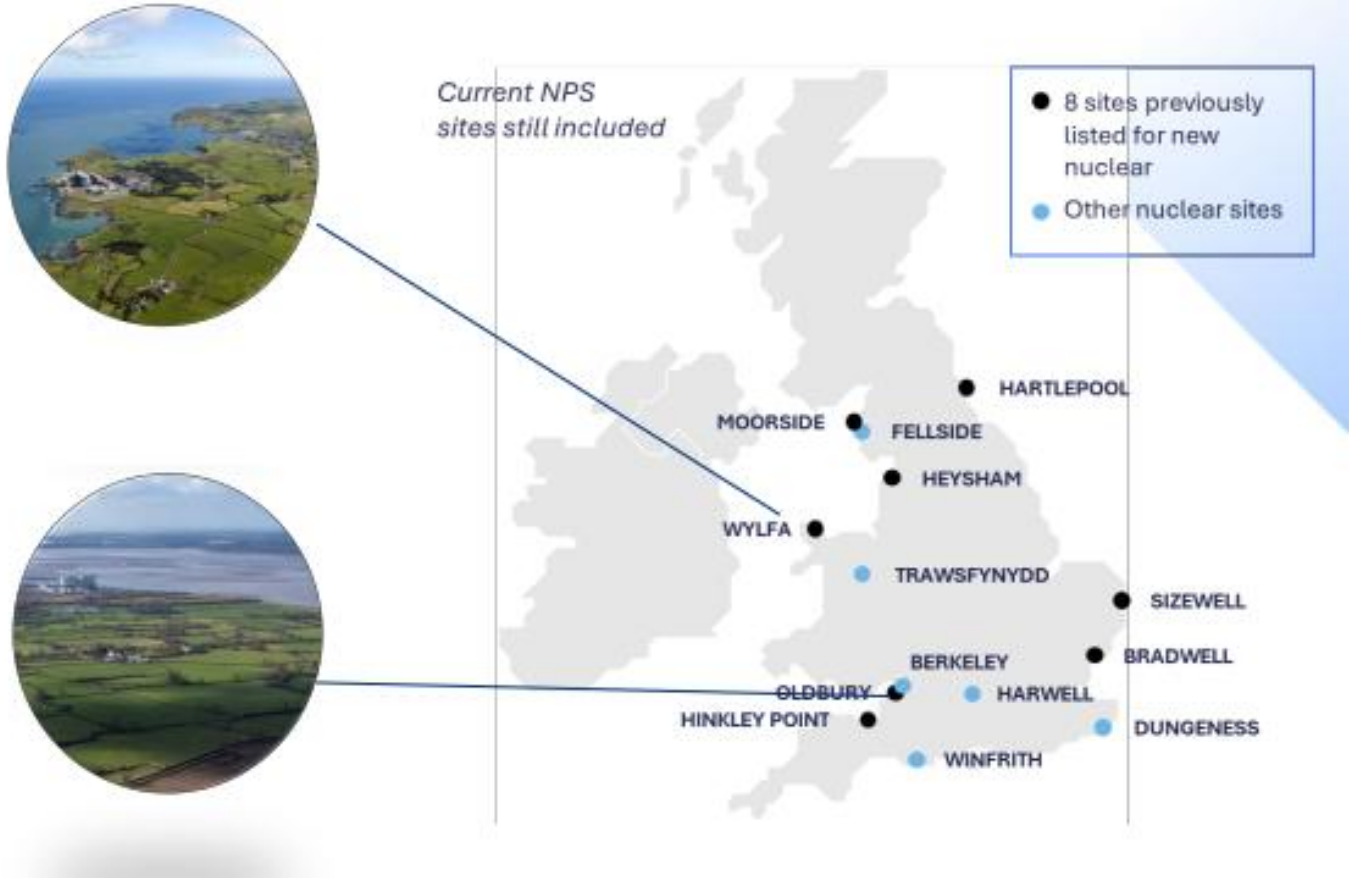
GBE-N is an arm's length body of DESNZ to deliver government's nuclear programme. Initial focus on SMR's but will support the deployment of gigawatt reactors and AMRs.

The current aims of GBE-N are:

1. Advise
2. Enable
3. Deliver

GBE-N will support the different types of nuclear technologies through different mechanisms.





GBE-N: SMR Competition

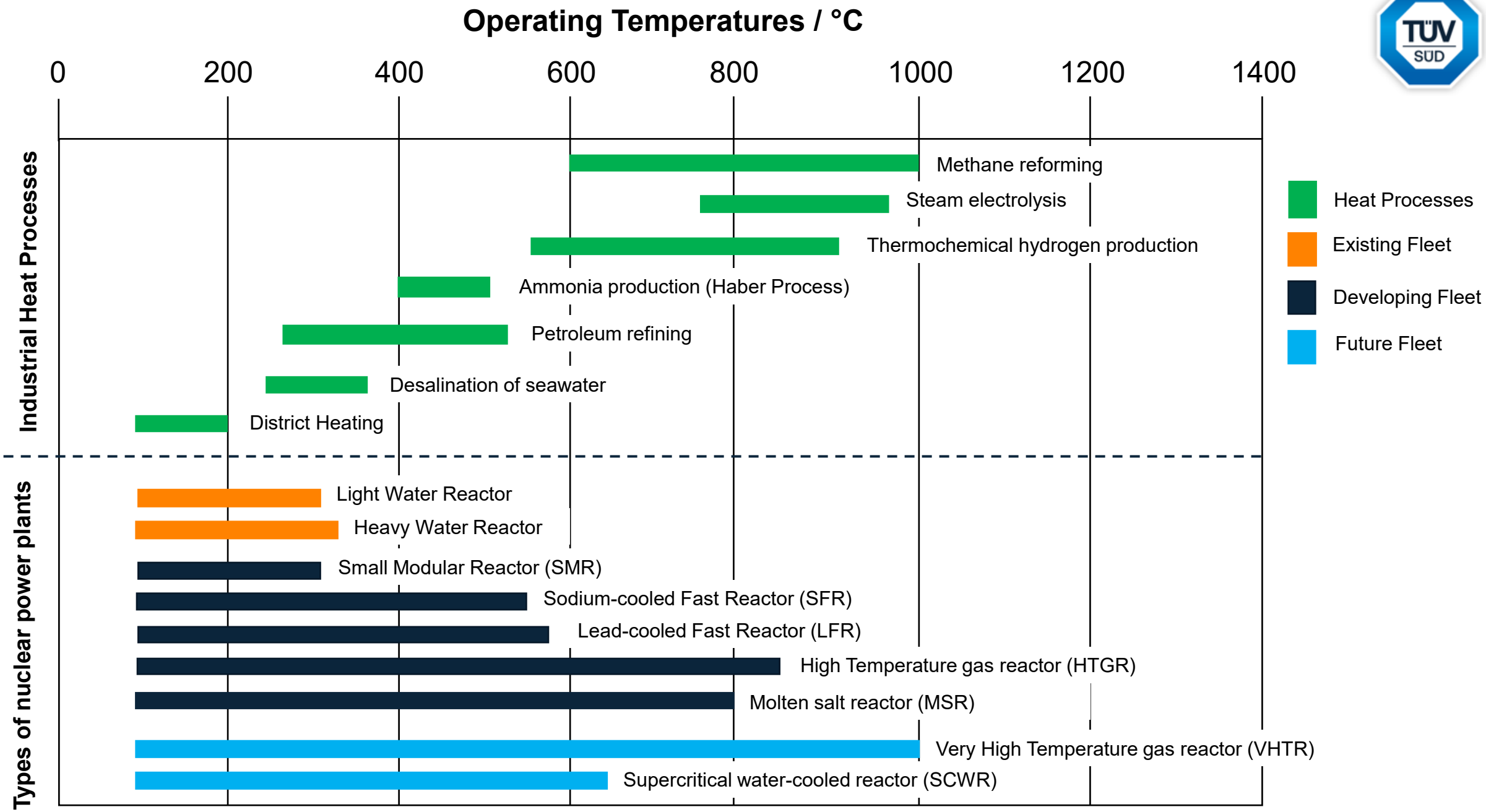
The Great British Nuclear (GBN) SMR competition is a UK government-led programme to select and support the deployment of SMRs as part of the UK's net zero policy. This competition was launched in 2023 which led to six SMRs being selected to apply.

After 2 years, Rolls-Royce SMR was selected as the preferred technology partner and Wylfa was announced as the chosen site to develop three RR SMRs. The projected timeline is for the first reactor (470 MWe) to be online mid-2030s.

UK AMR Landscape

Context

Advanced Nuclear Framework (ANF)


Operating Temperatures / °C
0
200
400
600
800
1000
1200
1400
Industrial Heat Processes
Methane reforming
Steam electrolysis
Thermochemical hydrogen production
Ammonia production (Haber Process)
Petroleum refining
Desalination of seawater
District Heating
Types of nuclear power plants
Light Water Reactor
Heavy Water Reactor
Small Modular Reactor (SMR)
Sodium-cooled Fast Reactor (SFR)
Lead-cooled Fast Reactor (LFR)
High Temperature gas reactor (HTGR)
Molten salt reactor (MSR)
Very High Temperature gas reactor (VHTR)
Supercritical water-cooled reactor (SCWR)
Heat Processes
Existing Fleet
Developing Fleet
Future Fleet

The Changing Landscape of Nuclear Energy

The Current Vertically Integrated Model

Owner — EDF ENERGY

Developer — EDF ENERGY

Operator — EDF ENERGY

Power Off-take — EDF ENERGY

To Grid — EDF ENERGY

Future Projects

Technology Vendor(s)

HITACHI

energy

ROLLS ROYCE SMR

HOLTEC INTERNATIONAL

Westinghouse

TerraPower

+ Many more

Investor(s)

Owner(s) ?

Developer ?

Operator ?

Power/Heat Off-take

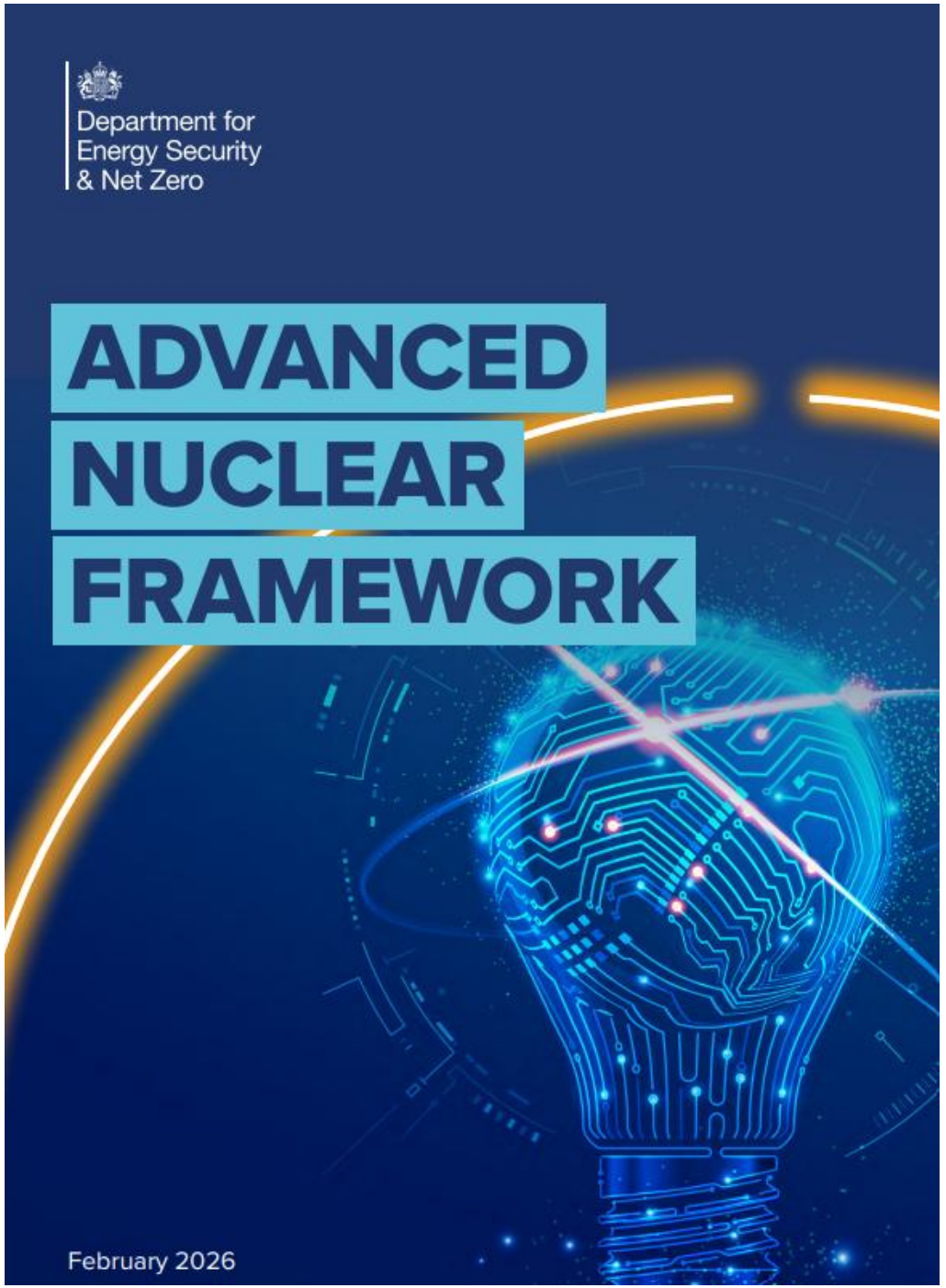
Off-Grid Fuel
Hydrogen, NH_3

To Grid

Off-Grid
Electricity

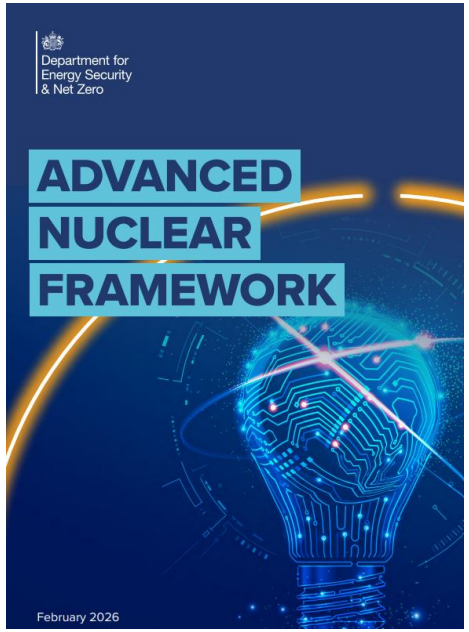
Advanced Nuclear Framework (ANF)

Department for Energy Security & Net Zero



Advanced Nuclear Framework:
Purpose

- Designed to **unlock privately led** advanced nuclear projects in the UK and support **credible** projects.
- Aims to give more **incentives** for private nuclear projects to be built in the UK.
- Provides a **route to market** from proposal to deployment.



Department for Energy Security & Net Zero

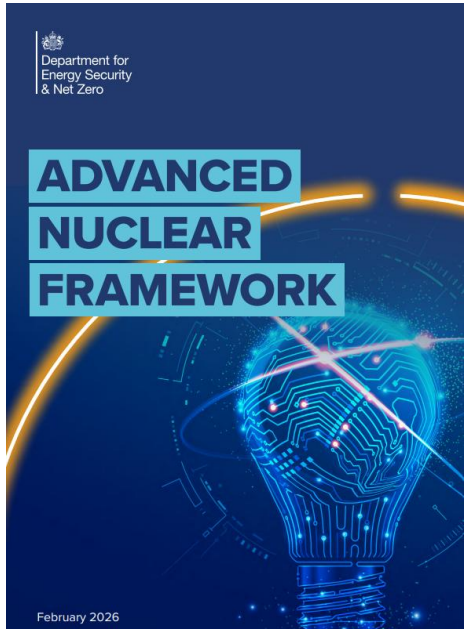
Link: Introduction to the Advanced Nuclear Framework

Advanced Nuclear Framework:
What is it?

It is a structured **due diligence** and **engagement** process where successful applicants get a place on the **UK Advanced Nuclear Pipeline**.

The assessment considers whether a project is **mature** enough in areas required to deploy in the UK.

It is an **open** and **ongoing** process. There is no limited to how many times a technology vendor could apply.



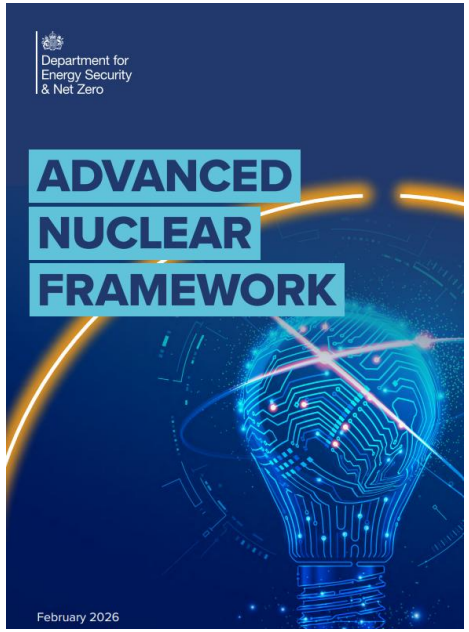
Department for Energy Security & Net Zero

Link: [Introduction to the Advanced Nuclear Framework]

Advanced Nuclear Framework:
Eligibility

An applicant must be:

1. An advanced nuclear technology for civil energy purposes.
2. Provide energy as heat and/or electricity
3. Projects must be fuelled by uranium-235 enriched less than 20%.



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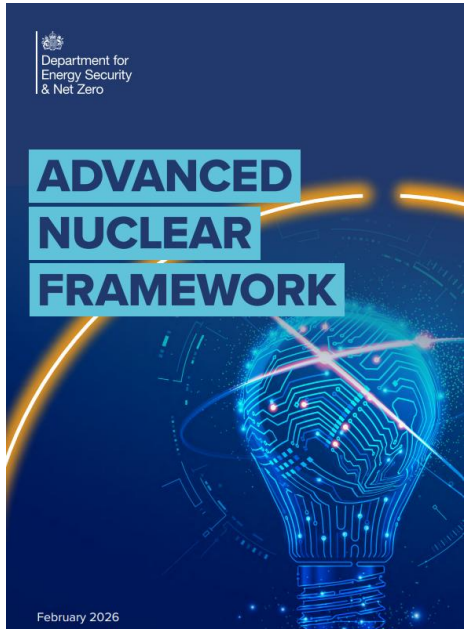
Advanced Nuclear Framework:
Why join the pipeline?

If you successfully get through the assessment process, then you directly receive:

- A statement of limited endorsement from DESNZ.
- Listed on the DESNZ public pipeline, with key project information.
- Initial engagement on future mechanisms for revenue support.
- Coordinated engagement with the Advanced Nuclear Business Engagement Unit regarding other enabling elements of the Framework.
- Once on the pipeline, the UK govt expect the project to begin construction within 10 years.

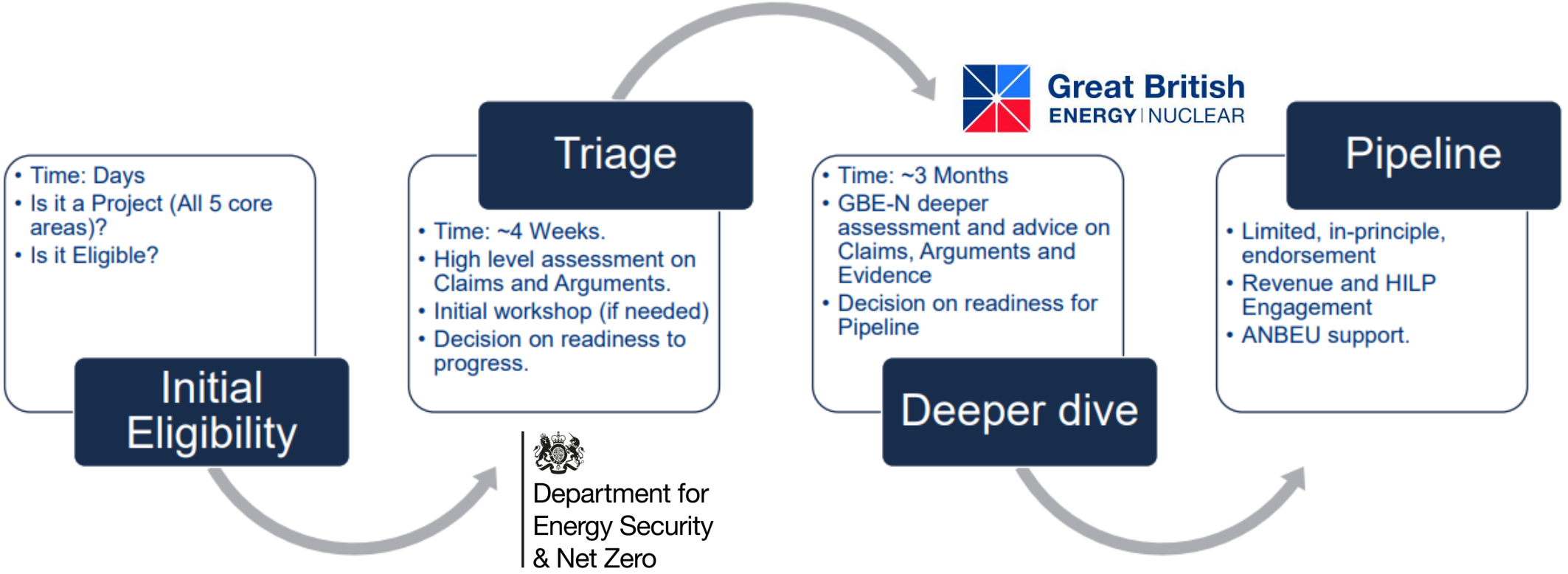


Department for Energy Security & Net Zero

Link: [Introduction to the Advanced Nuclear Framework]

Advanced Nuclear Framework:

How does ANF work?



Link: [Introduction to the Advanced Nuclear Framework]

Advanced Nuclear Framework:

What does a successful project look like?

Link: [Introduction to the Advanced Nuclear Framework]

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Advanced Nuclear Framework:

What does a successful project look like?

Technology & Supply Chain

Reactor

- Design
- Operation or design status
- Regulatory status
- Provider engagement
- Fit

Fuel

- Fuel spec
- Availability
- Compliance with UK civil fuel use.
- Waste management.

Supply Chain

- Component status
- Availability and market
- Uk supply chain resilience.

Link: [Introduction to the Advanced Nuclear Framework]

Advanced Nuclear Framework:

What does a successful project look like?

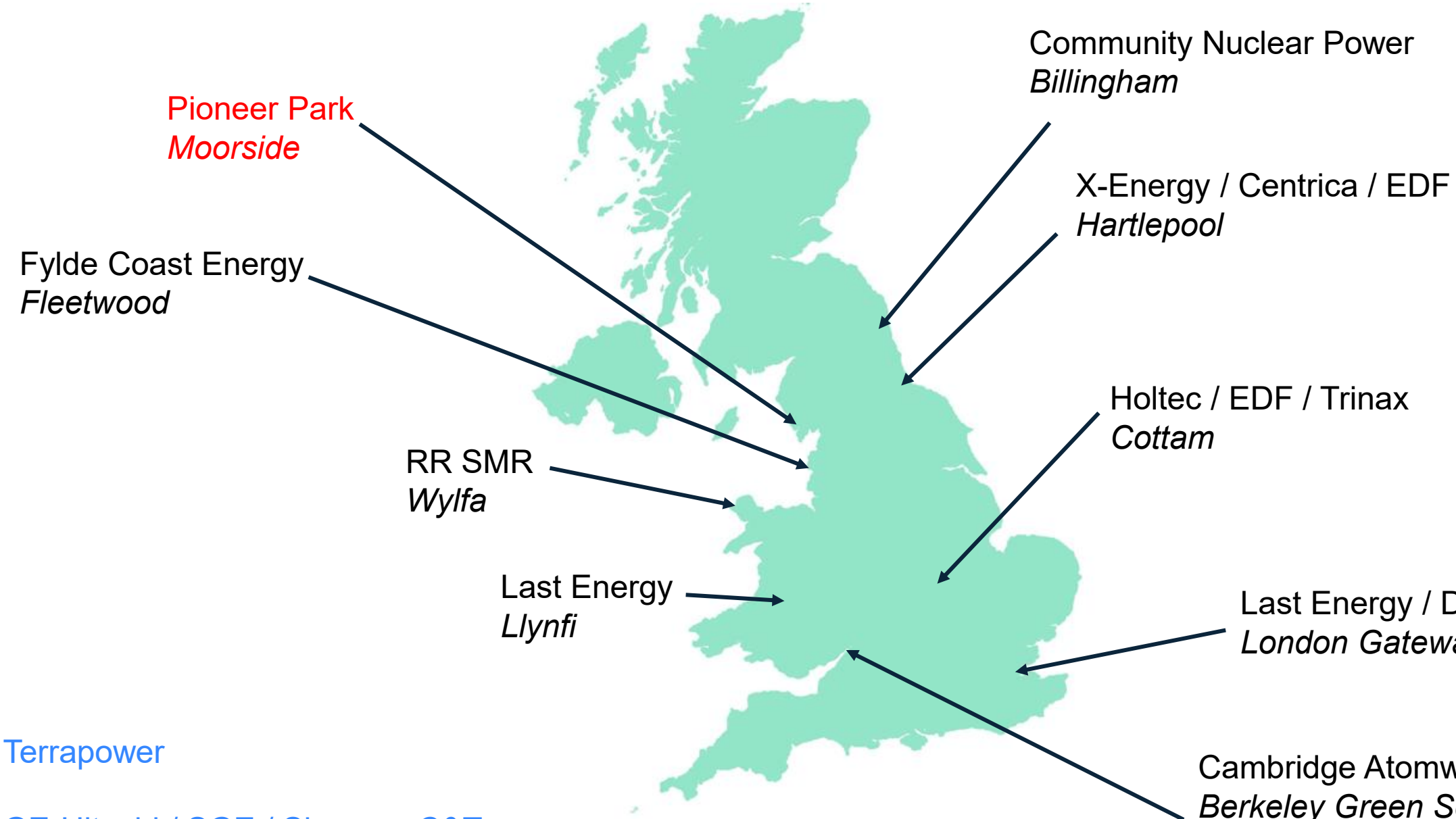
	Triage (>1 including a 3)		Deep Dive (15 points)
3	More than satisfactory: **Good, or better, claims and arguments** that the project has plans and agreements in place that satisfactorily **address the criterion in a Core Area** with only **minor omissions** at most. Substantial evidence provided upon which Phase 2 assessment can be carried out.	5	Excellent: **Clear evidence** that the project has satisfactorily addressed **all** the criterion in a Core Area and has binding agreements and credible plans in place to deliver them.
		4	Good: The project has plans and agreements in place that satisfactorily address the criterion in a Core Area with a **good evidence base**, with only **minor omissions** or lack of clarity.
2	Satisfactory: **Reasonable claims and arguments** that the project has considered or has credible plans to satisfactorily address the criterion set out in a Core Area but **some omissions** are evident and **further clarification is needed**. Moderate evidence provided upon which Phase 2 assessment can be carried out.	3	Satisfactory: Reasonable evidence that the project has considered or has credible plans to satisfactorily address the criterion in a Core Area but **some omissions** are evident and **further clarification is needed**.
1	Not satisfactory: **No content and/or weak claims and argument** that the project has considered or has credible plans for the criterion set out in a Core Area. Major omissions are evident. No or limited evidence provided upon which GBE-N can carry out a Phase 2 assessment.	2	Partially unsatisfactory: There is little evidence that the project has considered or has credible plans for satisfactorily addressing the criterion in a Core Area and **some omissions** are evident. **Much more clarification is needed.**
		1	Not satisfactory: **No, or insufficient, evidence** that the project has considered or has credible plans for the criterion set out. **Major omissions are evident**.

13

Link: Introduction to the Advanced Nuclear Framework

UK ANT Projects

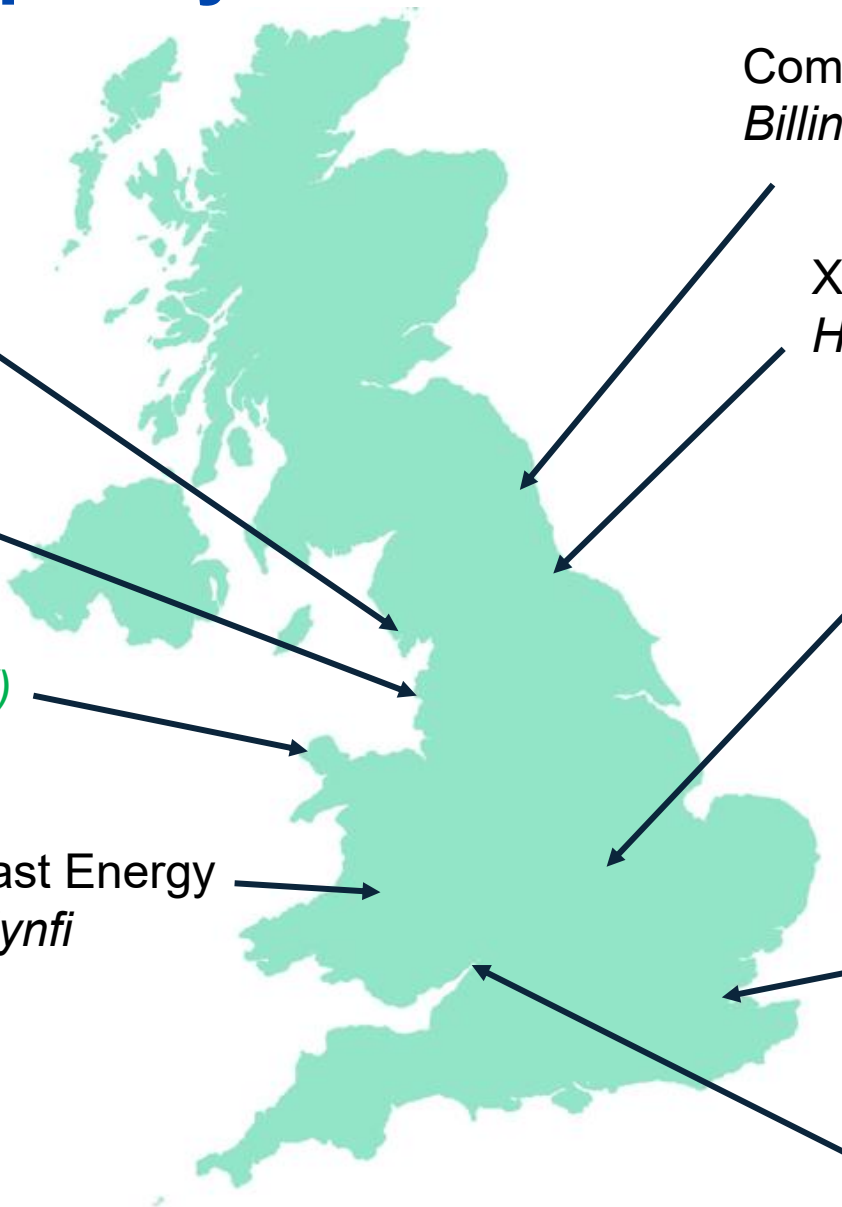
New Build: ANT



Terrapower

GE-Hitachi / SGE / Siemens C&T

New Build: ANT Capacity



Pioneer Park
Moorside

Fylde Coast Energy
Fleetwood

RR SMR
Wylfa (1.5 GW)

Last Energy
Llynfi

Community Nuclear Power
Billingham (~1 GW)

X-Energy / Centrica / EDF
Hartlepool (up to 6 GW)

Holtec / EDF / Trinax
Cottam (up to 1.3 GW)

Last Energy / DP World
London Gateway

Cambridge Atomworks / CVB
Berkeley Green Science and Technology Park

Total Additional Capacity:
14 GW

Terrapower

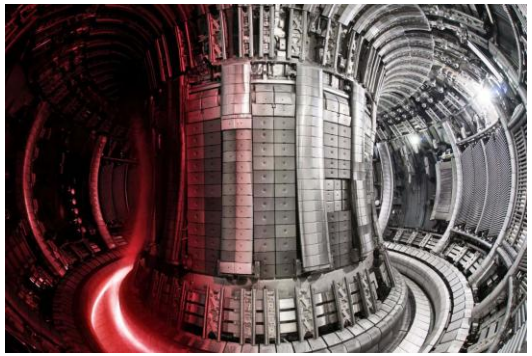
GE-Hitachi / SGE / Siemens C&T *(4.2 GW across 3 sites)*

UK Capability Gaps & Challenges

UK Capability Gaps & Challenges

The UK is simultaneously:

- Building Hinkley Point C
- Progressing Sizewell C
- Developing the first SMR fleet (RR SMR)
- Developing new ANT technologies
- Supporting fusion programmes
- Extending operation of existing reactors
- Expanding decommissioning activities



The UK has capability to pursue these programmes, but capacity will be a challenge. Some gaps in have been identified below:

- Technical Skill Shortages
  - Nuclear Engineers
- Advanced Manufacturing Capacity
  - Nuclear-grade fabrication
  - Modular factory production
- Fuel Cycle & Waste Expertise
  - Advanced fuel development
  - AMR fuel qualification

Link: [UK R&D and supply chain capability for Advanced Modular Reactors - GOV.UK]

UK Capability Gaps & Challenges

No single company can deliver the entire SMR/AMR eco-system alone. Large programmes are expected to depend on broad international supply chains while **building UK capability**. Therefore, the UK must balance:

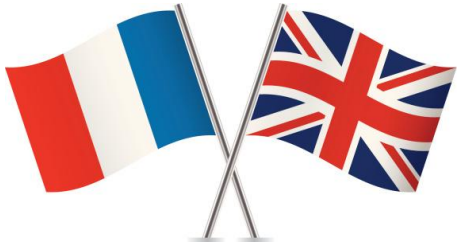
- Using international expertise
- Developing domestic capability

The HM Government's SMR programme is intended not only to deliver power generation but also to strengthen UK industrial capability. This creates pressure for suppliers to demonstrate:

- UK investment
- UK jobs
- UK content

How can an international partner/supplier support the UK nuclear landscape:

- Direct supply into UK programmes
- Joint ventures with UK Tier 1s
- Technology partnerships with SMR developers
- Local UK manufacturing investment
- UK/French R&D collaboration



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Q & A