

Rolls-Royce SMR

Clean, Affordable, Energy For All

The role of SMRs in a global energy transition policy
Perspective of the UK Industry on SMRs

- Brussels Nuclear Law Association
- (in cooperation with the International Nuclear Law Association)

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General Counsel
September 2023



SMR



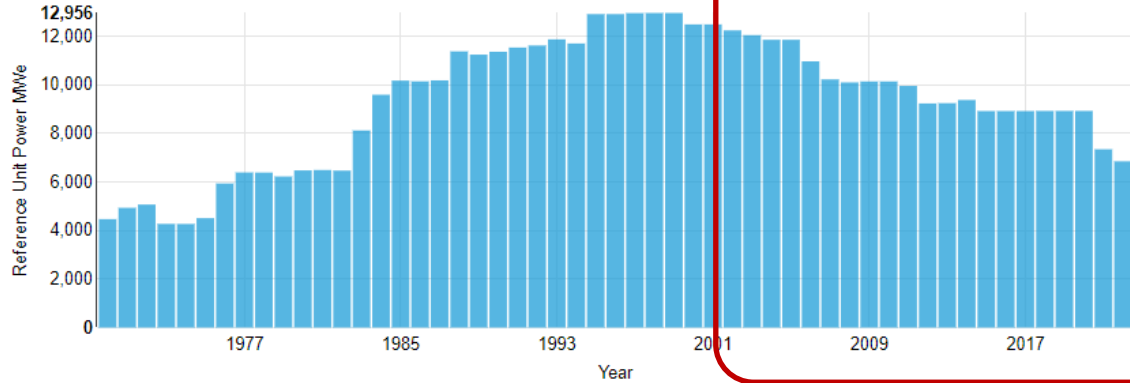
- Current position of Nuclear in the UK
- UK Government Policy – Powering up Britain
- GBN
- Legislation
- Rolls-Royce SMR – an integrated SMR power station solution, turning nuclear into a product, not a one-off project



Nuclear in the UK

The UK generates about 15-20% of its electricity from nuclear, but almost half of current capacity is to be retired by 2025.

Operable nuclear power capacity



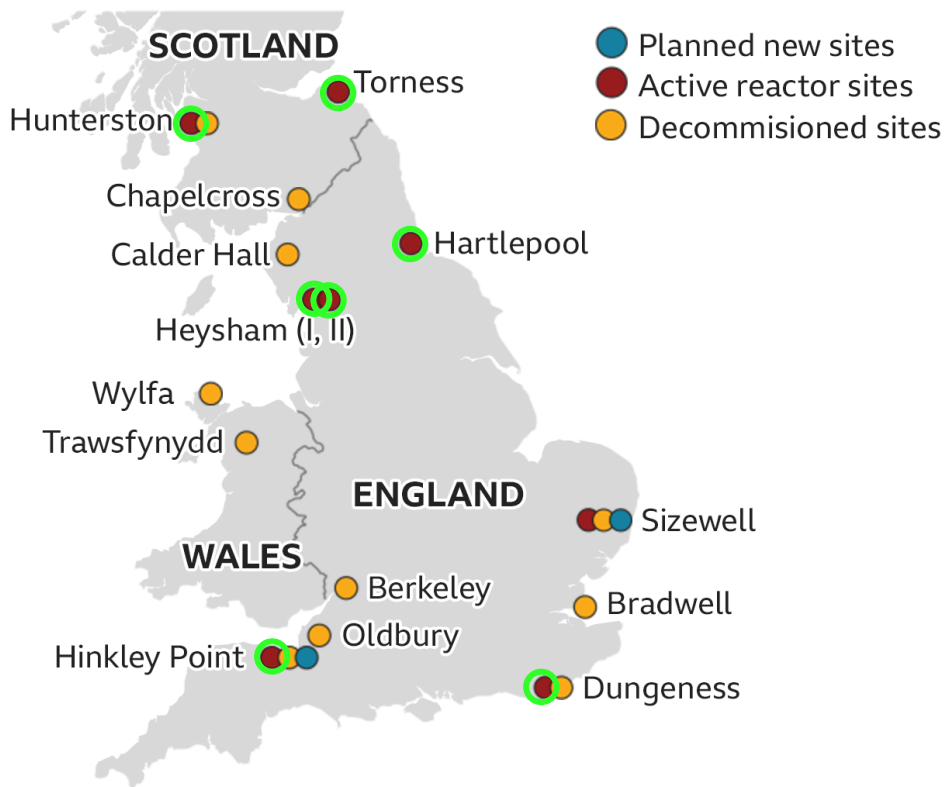
UK Nuclear Landscape

There are only 5 reactors currently operational in the UK with one in build – Hinkley Point C

By 2028 there will only be a single reactor remaining – Sizewell B

Nuclear power stations in the UK

Active, decommissioned and planned nuclear reactor sites



Source: Office for Nuclear Regulation, March 2022





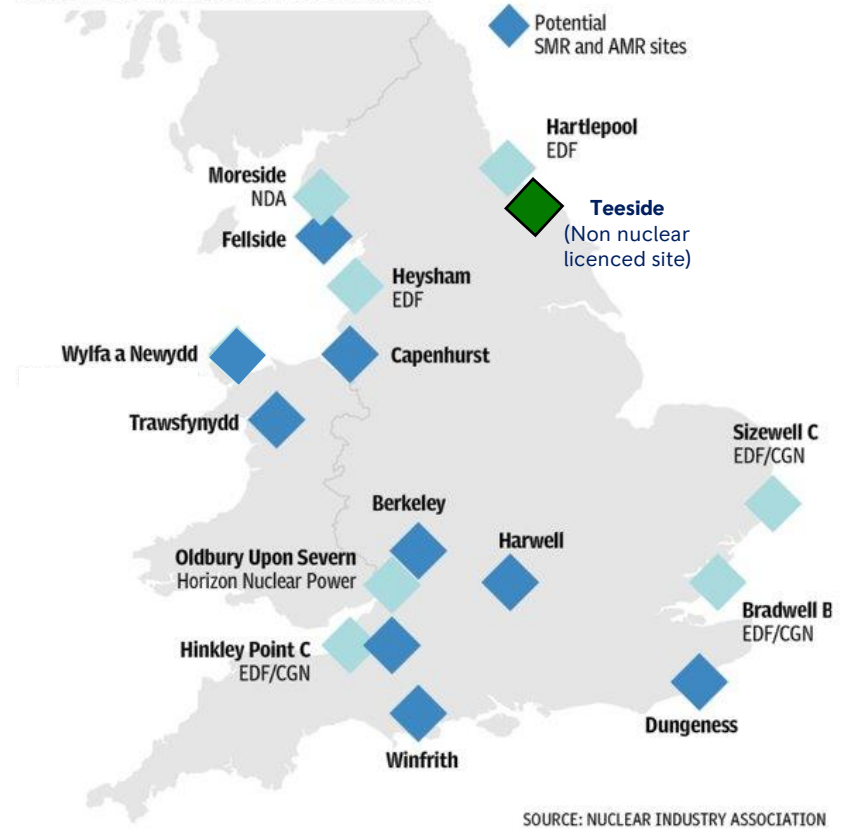
SMR

UK Potential Site Locations

Siting process to form part of GBN process

The UK has several nuclear plants in the works

Current and potential sites for new nuclear plants



-  Potential SRM & AMR Sites
-  Large nuclear sites
-  New sites



SMR UK Government Policy – Powering up Britain (March 2023)

“Nuclear is the critical baseload of the future energy system and we are setting out an ambitious programme for increasing generation to match global competition. The Government is committed to a programme of new nuclear projects beyond Sizewell C, giving industry and investors the confidence, they need to deliver projects at speed.”

“Nuclear energy has been used reliably and safely in the UK for over 60 years and we have extensive experience of the full nuclear life cycle, from front-end design through to decommissioning. One of the world’s most advanced nuclear technologies is being developed here in the UK, with up to £210 million awarded to Rolls-Royce SMR Ltd in November 2021 to develop further their design for one of the world’s first Small Modular Reactors (SMRs). We are matching the global competition and scaling-up our nuclear programme by having launched GBN, responsible for driving delivery of new nuclear projects, backed with the funding it needs.”

Secretary of State for Energy Security and Net Zero, Claire Coutinho –Appointed 31 August 2023
Minister for Nuclear and Networks, Andrew Bowie



About GBN

Great British Nuclear (GBN) will deliver the government's long-term nuclear programme and support the government's ambition to deliver up to 24GW of nuclear power in the UK by 2050. This could mean nearly a quarter of the UK's total power demands being met by low-carbon, secure nuclear energy, supporting the UK's energy security, and contributing to our net zero targets.

Inaugural Chairman is [Simon Bowen](#) and Chief Executive is [Gwen Parry Jones OBE](#). Both currently serve as interim office holders.

GBN's Work

GBN's first priority is to administer a competitive process to select the best small modular reactor (SMR) technologies from around the world.

This SMR technology selection process will underpin government's commitment to two nuclear Project Final Investment Decisions during the next Parliament, with at least one of these being into an SMR project.

GBN has launched the next phase of the SMR technology selection process and invites SMR vendors to register their interest. This is an important next step in identifying those companies best able to reach a project Final Investment Decision (FID) by the end of 2029, which could result in billions of pounds of public and private investment in SMR projects.



How GBN's technology selection process for Small Modular Reactors (SMRs) will work.

This is on the Gov website accessible here:

[Small Modular Reactors: competitive technology selection process - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/news/small-modular-reactors-competitive-technology-selection-process)

'There is a process currently underway to identify the best, most appropriate, SMR technologies:

1. Market intelligence gathering, which concluded in June 2023.
2. Technology initial down selection, launched in July, concluding in Autumn 2023 with the next phase to launch as quickly as possible after that.
3. Successful technologies will be supported to be ready to enable a Final Investment Decision (FID) by 2029. This will entail funding to support technology development and site-specific design; a close partnership with GBN, which will be ready and able to provide developer capability; and support in accessing sites.'



Climate Change Act 2008

In June 2019, the Climate Change Act 2008 (2050 Target Amendment) Order 2019 (SI 2019/1056) revised the UK's carbon reduction target upward, from 80% to 100% which is termed a net zero reduction in GHG levels by 2050.

Nuclear Energy (Financing) Act 2022

The NEFA 2022 provides the statutory framework for the Regulated Asset Based (RAB) funding model which is intended to attract private finance to nuclear new-build at a cost that represents value for money to consumers





SMR **Rolls-Royce SMR Ltd is a technology vendor offering a complete SMR power plant scope.**

Our development programme is funded with £495m through commercial equity and UK Government grant funding

Rolls-Royce SMR Ltd Shareholders



Rolls-Royce Group

60 years designing, manufacturing, supporting and operating nuclear technology



Constellation Energy (previously Exelon Generation Ltd)

Operates the largest U.S. fleet of zero-carbon nuclear plants with over 18.7GW from 21 reactors at 12 facilities



BNF Resources UK Ltd

Extensive investments in the energy space and represented and advised by BNF Capital Limited, an FCA regulated UK-based investment advisory



Qatar Investment Authority

Invests in the energy transition and funds technologies that enable low carbon electricity generation

UK Government Grant Funding



Department for
Business, Energy
& Industrial Strategy



UK Research
and Innovation

UK Department of Business Energy and Industrial Strategy

Rolls-Royce SMR Ltd received the Low-cost nuclear (LCN) grant award by UK Research and Investment (UKRI)



SMR

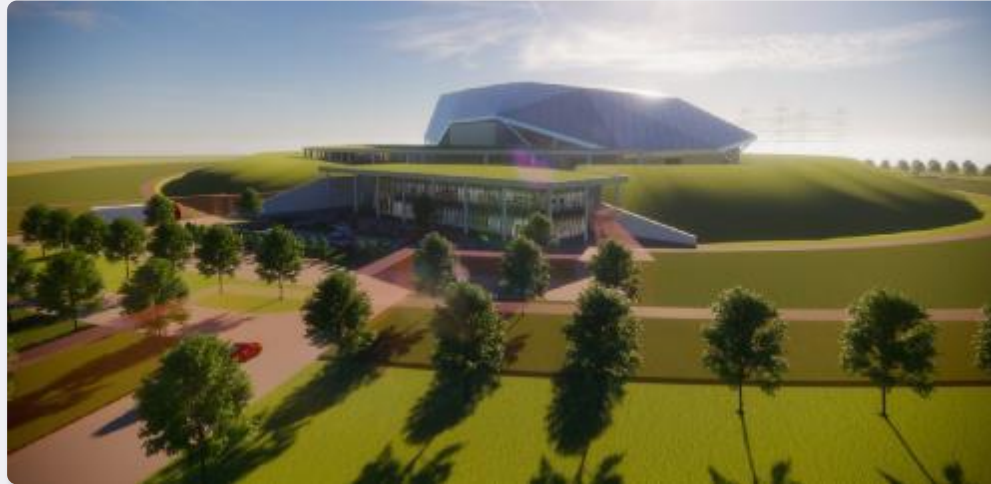
Rolls-Royce SMR is a new way of building nuclear to meet the needs of **Net Zero**

~470 MWe net output

60-Year life @ circa 95% availability

Proven PWR technology & standard fuel

Power station delivery



4 Year on-site construction (fleet unit)

Enhanced safety and security

1st Unit on grid early 2030s

Adaptable, multi-use power & heat output

Low cost



Deliverable



Investable



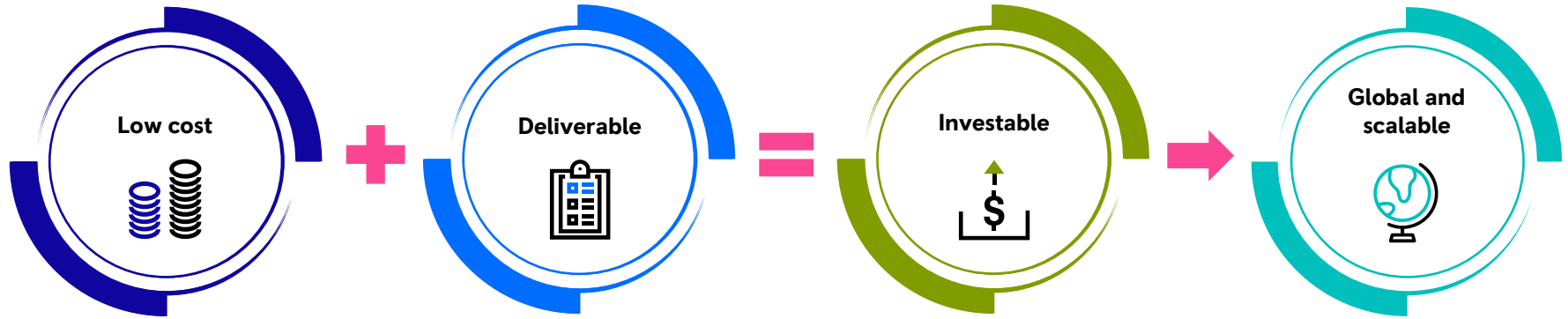
Global & scalable



* 2022 economics, fleet unit; costs based on UK labour rates ** 2022 economics, range dependent on financing mechanism and FOAK vs. NOAK



RR SMR will deliver an investable and scalable SMR with lower capital cost and increased schedule certainty



- 1**
- Optimised whole power plant solution
 - Proven PWR technology
 - Simplified and standardised equipment
 - Predictable and repeatable
 - In-built knowledge transfer across units
 - Radical reduction in construction-based activities

- 2**
- Standardised power station
 - Commoditised factory-built product
 - Controlled build conditions
 - Minimise construction risk
 - Maximise learning, productivity and innovation across fleet
 - Single entity delivery model

- 3**
- Lower capital cost and reduced cost and schedule risk improves investability
 - Significantly reduced construction risk
 - Lower completion risk given standardised manufactured nature of product

- 4**
- Highly scalable through innovative production methodology
 - Road transportable
 - Flexible siting with cooling towers allows placement in wider geographies



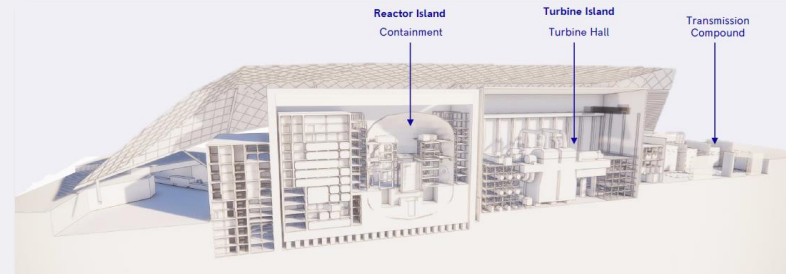
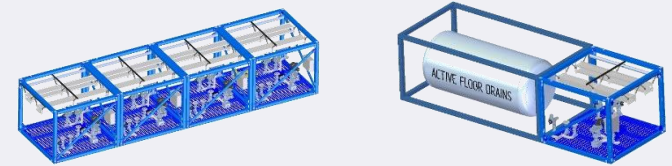
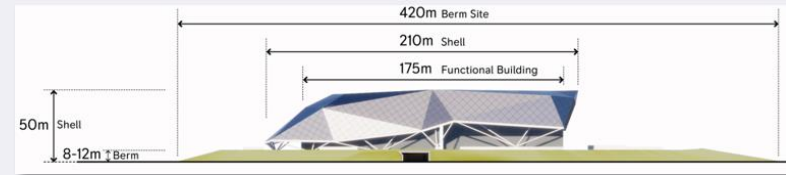
Not all SMRs are the same

To deliver cost reduction, schedule reduction, and certainty we must not reproduce a “small” large plant

- **Small**
 - Maximise power for physical constraints around manufacturability and transportability
 - Not about designing around an arbitrary power level

- **Modular**
 - Standardisation, factory repeatability in a production line approach.
 - Avoidance of large modules that must be disassembled for transportation - defeats the benefits of modularisation
 - Modules tested in factories to reduce site activity

- **Reactor**
 - Rolls-Royce SMR provides the power plant, not just the reactor
 - Reactor is ~20-25% of the power plant by capital
 - Modularisation of the full power plant including civil construction
 - Enables delivery, by Rolls-Royce SMR under single Engineer, Manufacture, Assemble contract



✗ EPC (mega project)

Conventional EPC (e.g. Large nuclear)

- Mega project
GBP10bn+
- Reactor only, *not* whole plant
- Government driven
- Commercially complex

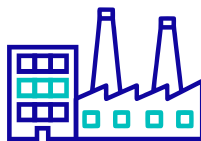


Designed for LCOE
and simplicity of
deployment



Reducing Project Risk

Factory product



Standardization



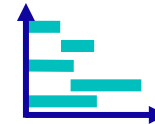
EMA (factory product)

Engineering
Manufacturing
Assembly

- Much lower risk
- Reduced capital
- Shorter time to build

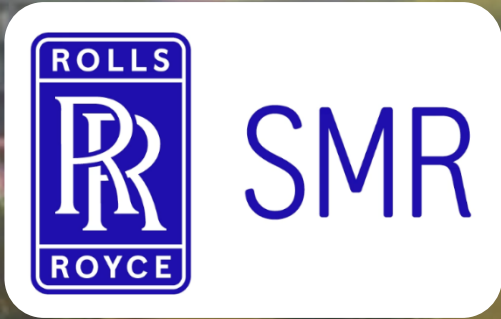
= Reduced financing cost

Schedule certainty



Commercial simplification





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