



SMR

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Rolls-Royce SMR

Clean, affordable, energy for all

Croatian Nuclear Conference

June 2024



SMR

Rolls-Royce SMR Ltd is a technology vendor offering a complete SMR power plant on a turnkey basis.

Our development programme is fully funded with €580m 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

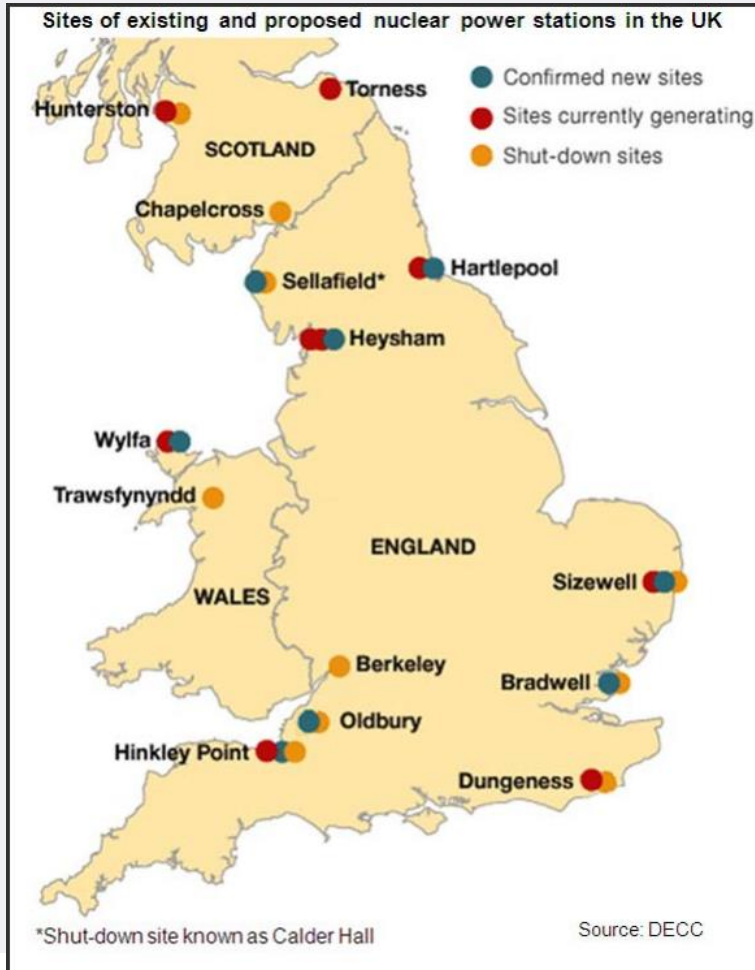
UK Government Grant Funding



UK Research and Innovation

Rolls-Royce SMR has received UK Government funding of £210m as part of Phase 2 of the Low Cost Nuclear Challenge Project, administered by UKRI,

SMR UK's Nuclear Ambition

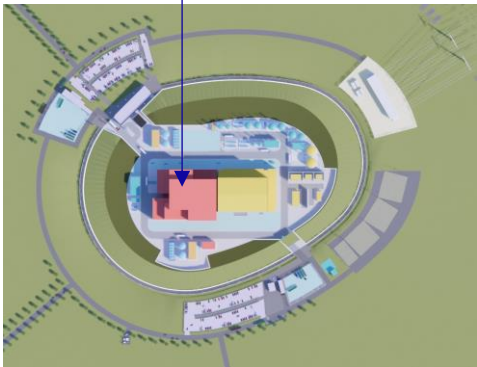
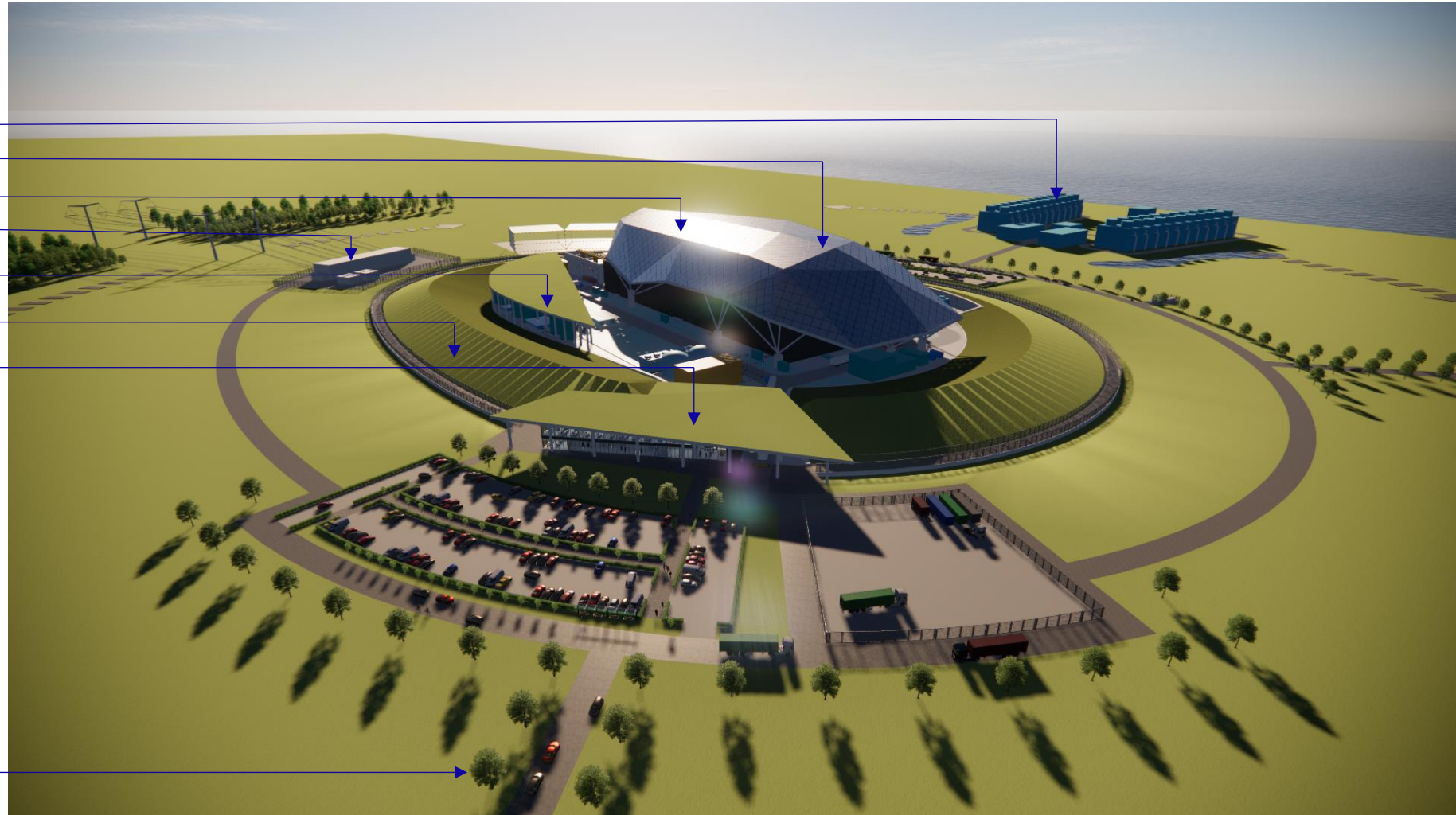


- UK currently generates 6GW from Nuclear Power.
- UK Nuclear roadmap to 2050 sets out the ambition for 24GW
- Hinkley Point C (3.2GW) and Sizewell C (3.2GW) are currently in construction.
- Great British Nuclear (GBN) are currently out to tender for SMRs.



SMR The Rolls-Royce SMR

- CWI Cooling Towers
- Reactor Island
- Turbine Island
- Grid Connection
- Green Roof
- Berm
- Main Entrance



Main Entrance Access Route

Plant area: ~147,800m² (36.5Acres) including the berm: Primary plant ~100,000m² (24.7 Acres) within the berm



SMR

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 power plant including civil construction
- Enables delivery, by Rolls-Royce SMR under single EMA contract

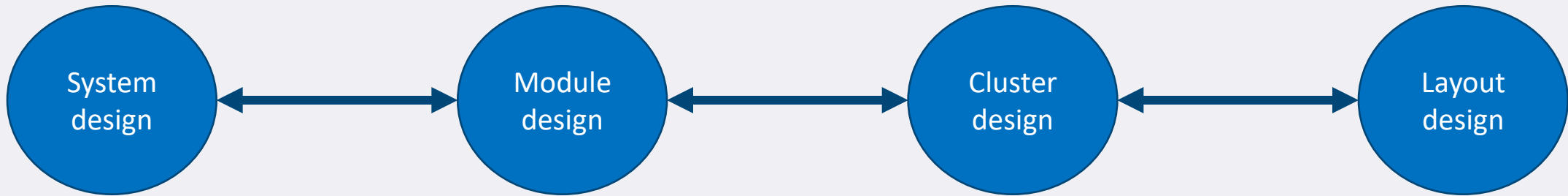
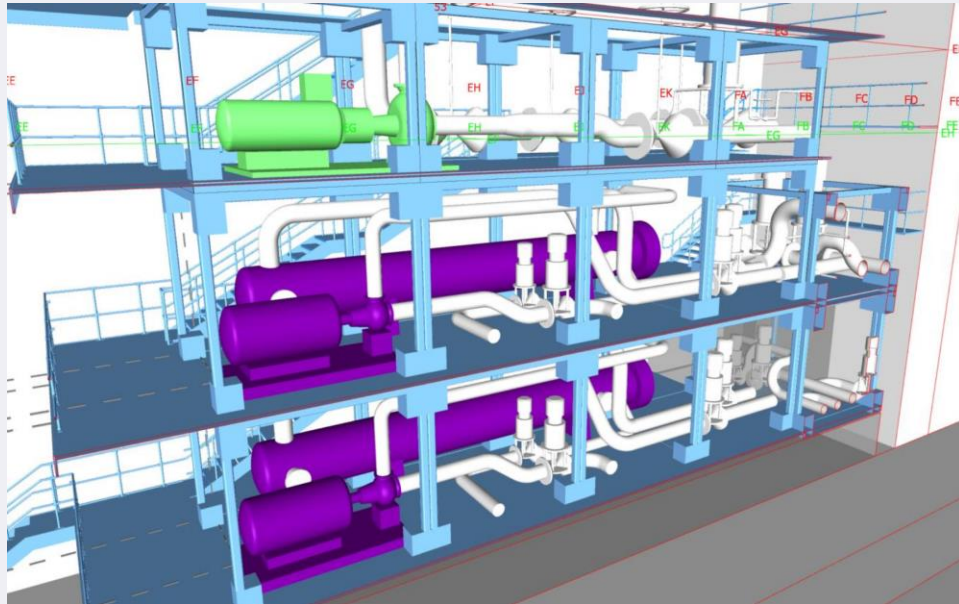


SMR Site Layout – Cross Section





SMR Engineering with Modularisation





SMR Manufacturing with Modularisation

Easier to manufacture each module in a clean environment.

Each module can go through Verification and Validation.

Modules can then be safely and securely transported to the site factory.





SMR Assembly with Modularisation



Smaller size allows for the site factory to be constructed.

This enables build certainty as construction and assembly is not weather dependent.

Greater build certainty decreases overall costs.



SMR Estimated Timeline

Complete Engineering Design and Pre-Licensing

First Site Construction and Commissioning (6 years)

Rolling 4 year construction and commissioning cycle

- Site Licensing
- Build the Module Assembly Factory and Module Distribution Centre.
- Groundwork on site and Site Factory construction.
- Assembly of power plant inside site factory.
- Commissioning and operating.



SMR

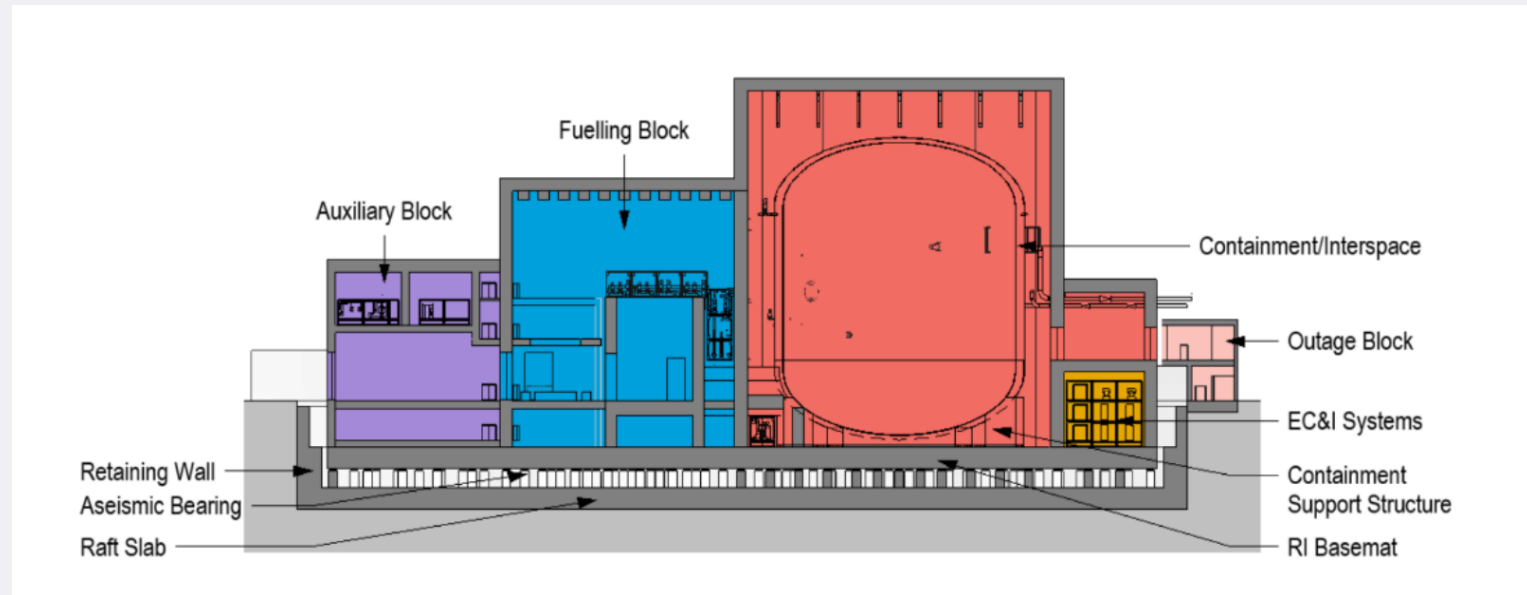
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Technical Design Overview

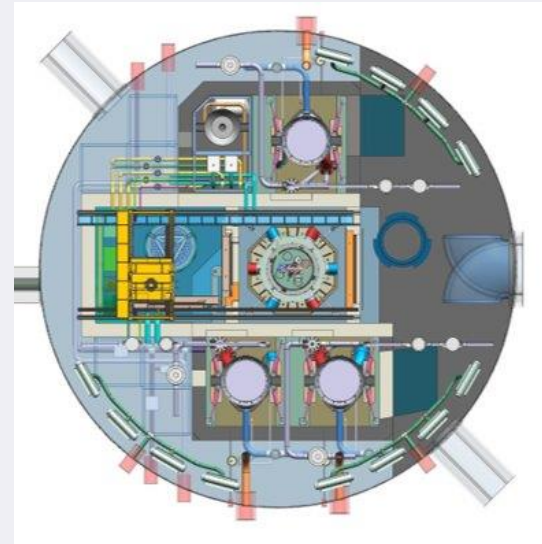
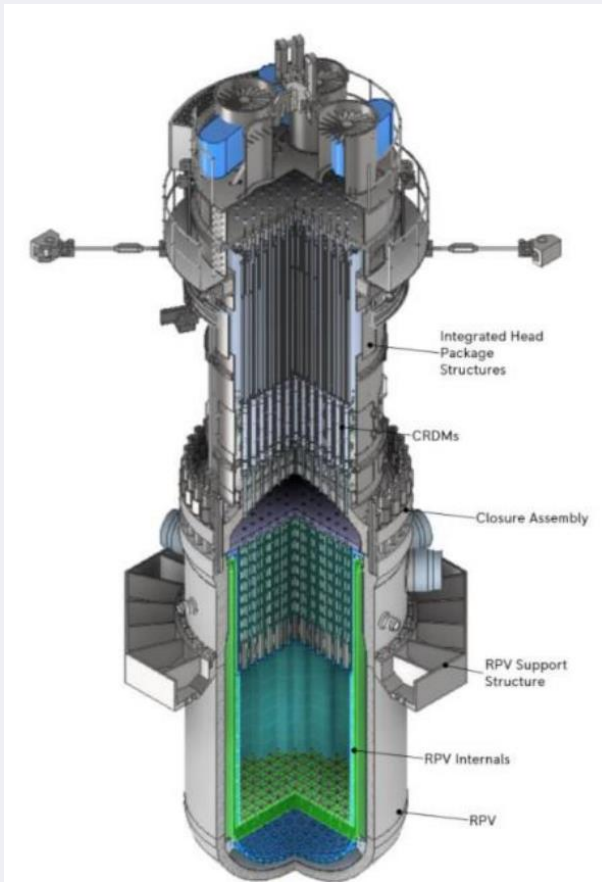


SMR The Rolls-Royce SMR Nuclear Power Plant

- 470MWe (1358MWth) output
- 18 to 24 month fuel cycle
- <18 days outage for refuelling.
- Entire Reactor Island sits on Seismic Isolation Bearings.



SMR Reactor Design



- 121 Fuel Assemblies using 4.95% enriched fuel.
- Rankine thermodynamic cycle.
- Boron free design to reduce tritium production.
- Material selection to reduce Source Term effects.
- Active and Passive cooling measures.
- Load following in line with EU requirements.



SMR Safety Features

- Active cooling via SG loop.
- Passive heat decay cooling via external water sink for 72 hour walkaway protection.
- Emergency cooling via SCRAM or Emergency Boron Injection.
- Pressure relief valves on steam lines.

- First UK reactor to have PSA informed design.



SMR

Nuclear Technology

Design based on 60+ years of nuclear design & manufacturing experience



NUCLEAR PLANT

- **Traditional Pressurised Water Reactor technology** used in more than 60% of the world's current operating reactors
- **Up to 470 MWe and 1358 MWt output** enough to power ~1.5 million homes
- **60+ years design life**
- **Up to 95% availability factor**
- **Compact 3-loop plant design**
- **Load following** meets EUR requirements



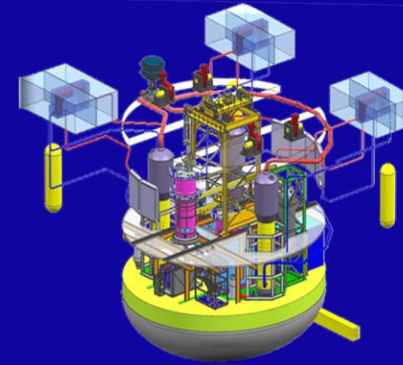
FUEL

- **Industry standard Uranium Dioxide fuel**
- **Standard enrichment <4.95% enriched**
- **Existing fuel supply chain**
- **18-24 month re-fuelling cycle**
- **Adaptable to utilise MOX fuel**



WASTE MANAGEMENT

- **Designed to minimise or eliminate all forms of waste**
- **Designed to utilise existing waste management facilities**
- **Boron free design significantly reduces tritium waste**
- **The fuel pond is sized to house used fuel for 6-10 years.**
- **Total volume of spent fuel for 60-year operation: 2.5 London buses**



SAFETY

- **Multiple active and passive safety systems** with internal redundancy
- **72-hour walkaway safety** with no human interaction required.
- **Best in class core damage frequency <10⁻⁷ /yr**

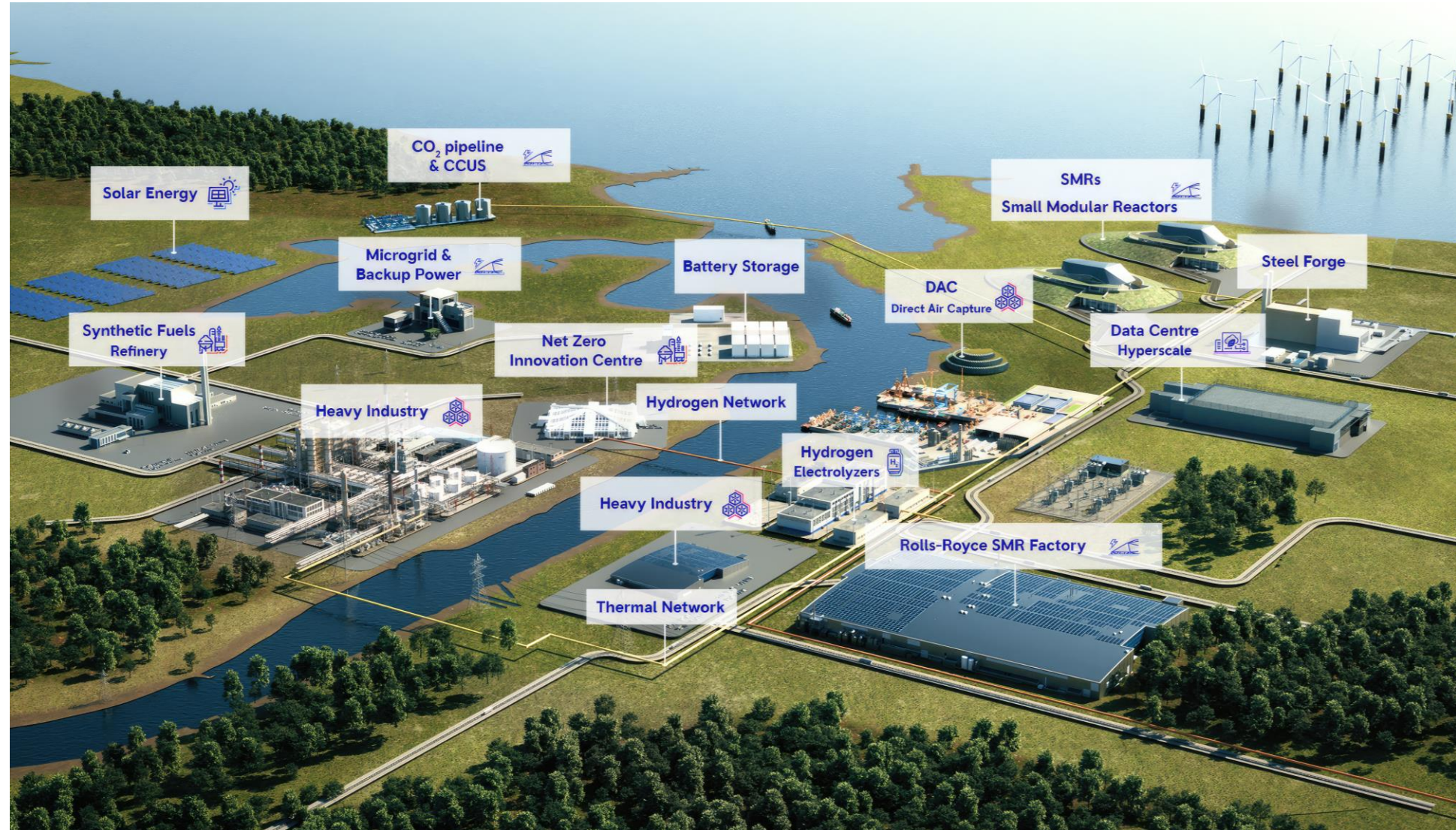


SMR

Decarbonising the global economy

The Rolls-Royce SMR has been designed to supply both baseload electricity and heat to industrial users requiring 'always-on', low-carbon power.

The versatile baseload electricity and heat to PWR design supports a range of applications by providing an economic, low-carbon, power source that ensures continuity of operations to a net zero future and far beyond.



The Rolls-Royce SMR design allows for flexible siting options, enabling access to the widest possible range of locations and potential end users



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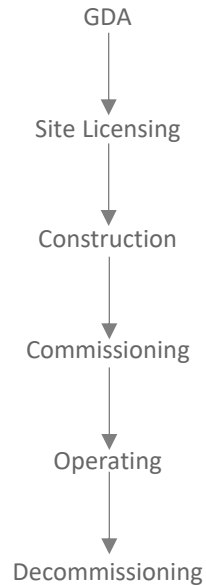
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Generic Design Assessment (GDA)



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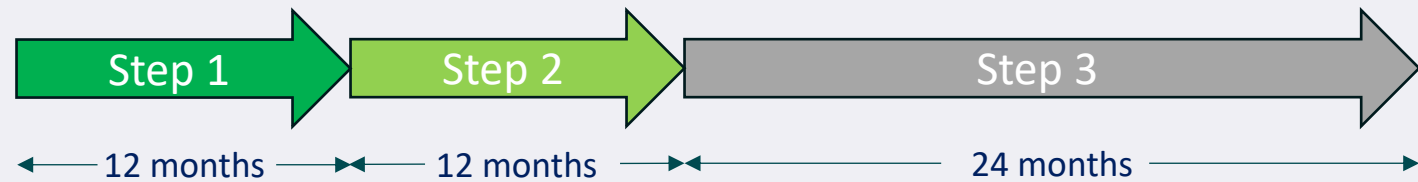
Regulatory Progress



Rolls-Royce SMR GDA

- First SMR design to go through the GDA process with the Office for Nuclear Regulation, Environment Agency, and Natural Resources Wales.

Typical GDA Timeline



- GDA is made up of three distinct steps:
 - Step 1 – Initiation (Regulator statements available online)
 - Step 2 – Fundamental Assessment
 - Step 3 – Detailed Assessment
- Rolls-Royce SMR Limited are currently finishing Step 2 at the end of July 2024.



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Any Questions?

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