

# Compact Nuclear Energy: Capturing the Manufacturing and Supply Chain Opportunity

## Joint CDT Fission-Fusion Event on Compact Nuclear

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# Overview

- **Recent Experiences**

- Commencement of large reactor new build
- Success and failure

- **The scale of the challenge to UK supply chain**

- Capability and Capacity

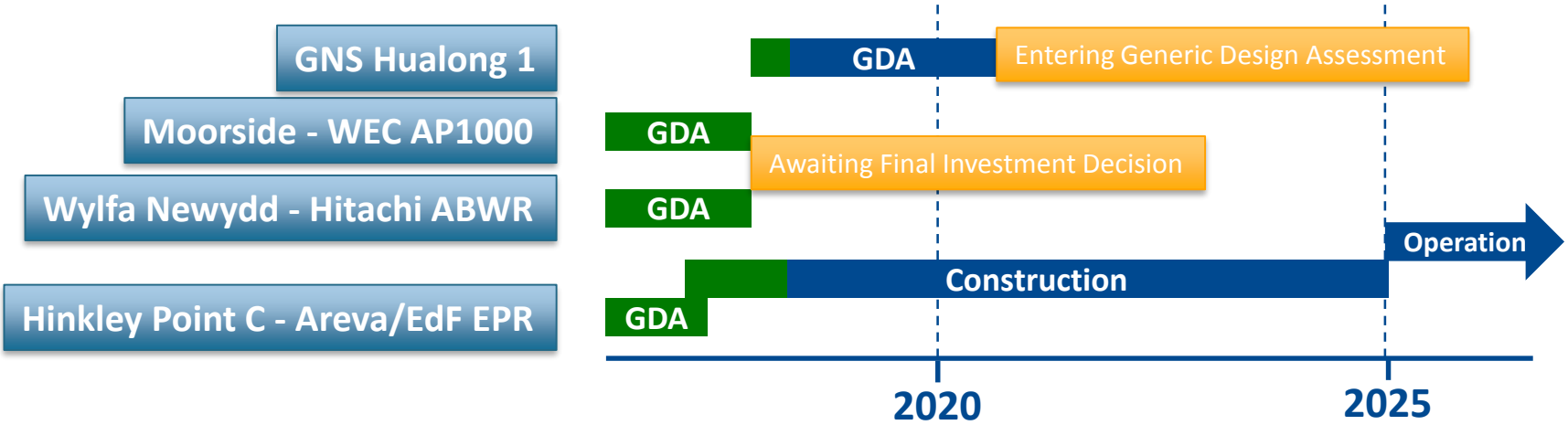
- **Small Modular Renaissance**

- Meeting the challenge of SMR



# Recent Experiences - Timeline

- The UK is attracting multiple international reactor vendors to build new large nuclear plants
  - Financing is the key challenge – to date only EPR at Hinkley Point C is financed

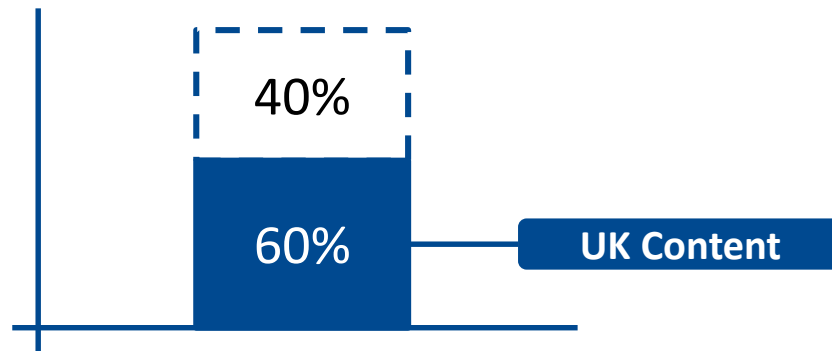


# Large Reactors – UK Content

- There is a significant amount of UK content
- Around 50% of the UK content relates to Civil Engineering, Earthworks and Construction – things that have to be done on site in the UK
- UK must strive towards increasing share of higher technology / IP items



Hinkley Point C - Areva/EdF EPR



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# UK Supply Chain - Capability

Reactor Pressure Vessel					
RPV Internals					
Reactor Integrated Head Package					
Steam Generator					
Pressuriser					
Control Rods Drive Mechanism (CRDM)					
Reactor Containment Liner/Vessel					
Primary Circuit Auxiliaries					
Tanks, Vessels, Heat Exchangers*					
Reactor Coolant Loop Pumps					
Pumps & Valves					
Mechanical Equipment Modules					
Reactor Polar Crane					
Cranes (Excluding Polar)					
Primary Loop Pipework					
Safety Related Pipework					
Non-Safety Related Pipework					
Safety Related EC&I					
Non-safety Related EC&I					
HVAC					
Nuclear Island Installation					
Turbine/Generators					
Emergency Diesels					
Transmission & Distribution					
Radwaste Plant					
Water Treatment Package					
General Site Electricians					
Security Equipment					
Forgings ( Excluding Ultra-large)					
Mechanical Installation					
Electrical Installation					
	Major Companies	Support Companies	Skills	Experience	Facilities

\*May be less capacity for safety related tanks etc

- The UK has the capability to manufacture most of the components, systems and sub-systems for large reactors
- Several of the components that are constrained (red) become orange or green when size is reduced for SMR

KEY			
Major Companies	→ 5 Companies	3 ↔ 5 Companies	← 2 Companies
Support Companies	→ 5 Companies	3 ↔ 5 Companies	← 2 Companies
Skills	Sufficient available skills capacity	Capacity available with some investment	Skills shortages, need special attention
Experience	Current experience of nuclear markets	Some experience of nuclear or related markets	Lack of experience, needs special attention
Facilities	Sufficient current capacity	Capacity available with some investment	Shortage of capacity without significant new investment

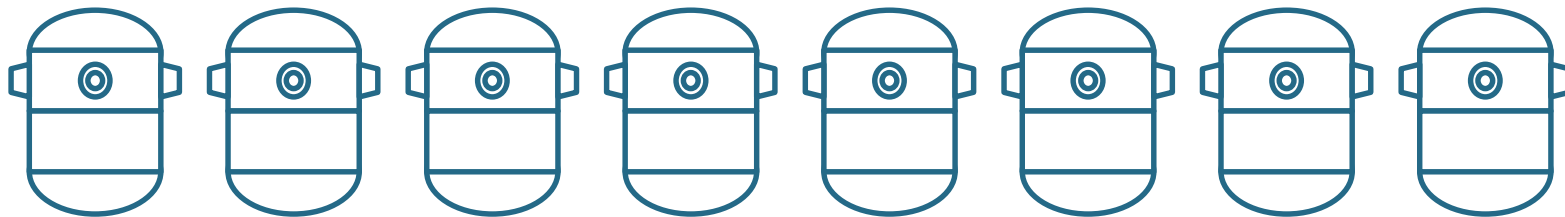
Taken from 'Capability of the UK Nuclear New Build Supply Chain', (NIA, 2012)



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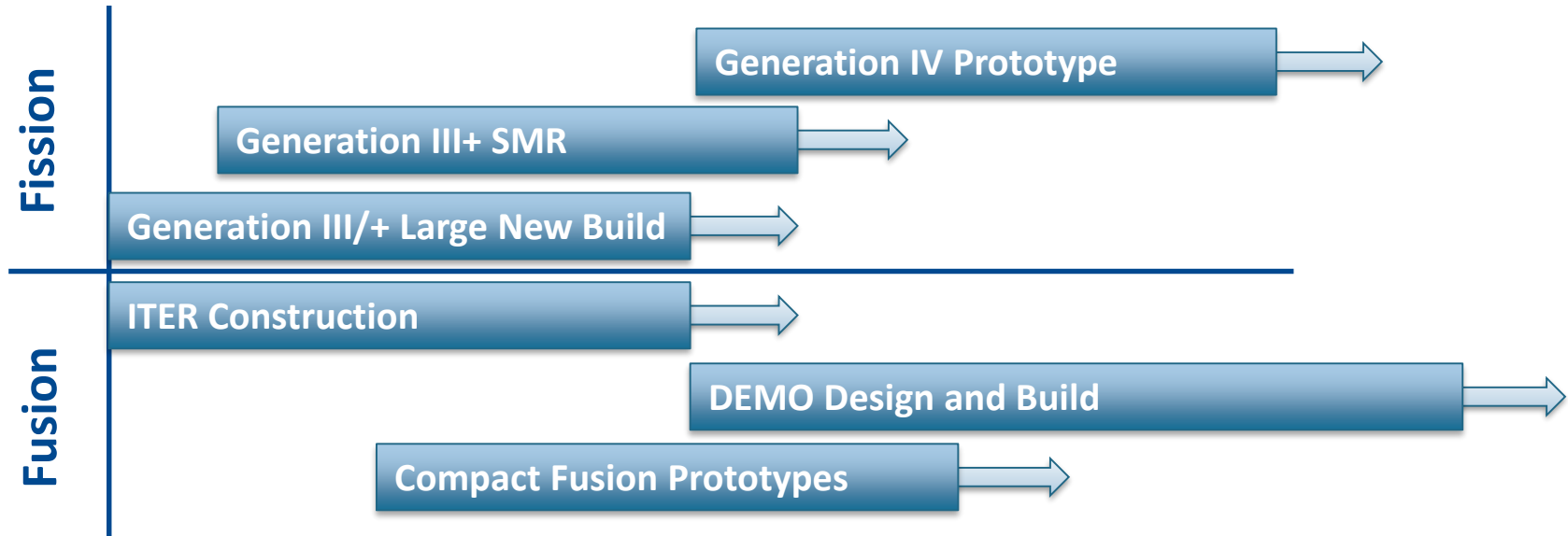
# UK Supply Chain - Capacity

- However, the most significant challenge is not capability...  
... but capacity



- The UK nuclear supply chain is focussed on engineering services, decommissioning and defence applications

# Forward timeline



# SMR – Future Fission



Large Reactors	Category	SMR
1200 - 1700 Mwe	Plant Power Output	Less challenging to grid infrastructure
£4 Bn - £8 Bn	Capital Cost	Able to access project financing
8 – 12 Years	Construction Duration	Designed for build certainty
60 Years	Intended Lifetime	Similar operational lifespan
Under Construction	Current Maturity	Designs require regulatory approval
~ 16 GWe planned	UK Energy Policy	Government support always key to nuclear

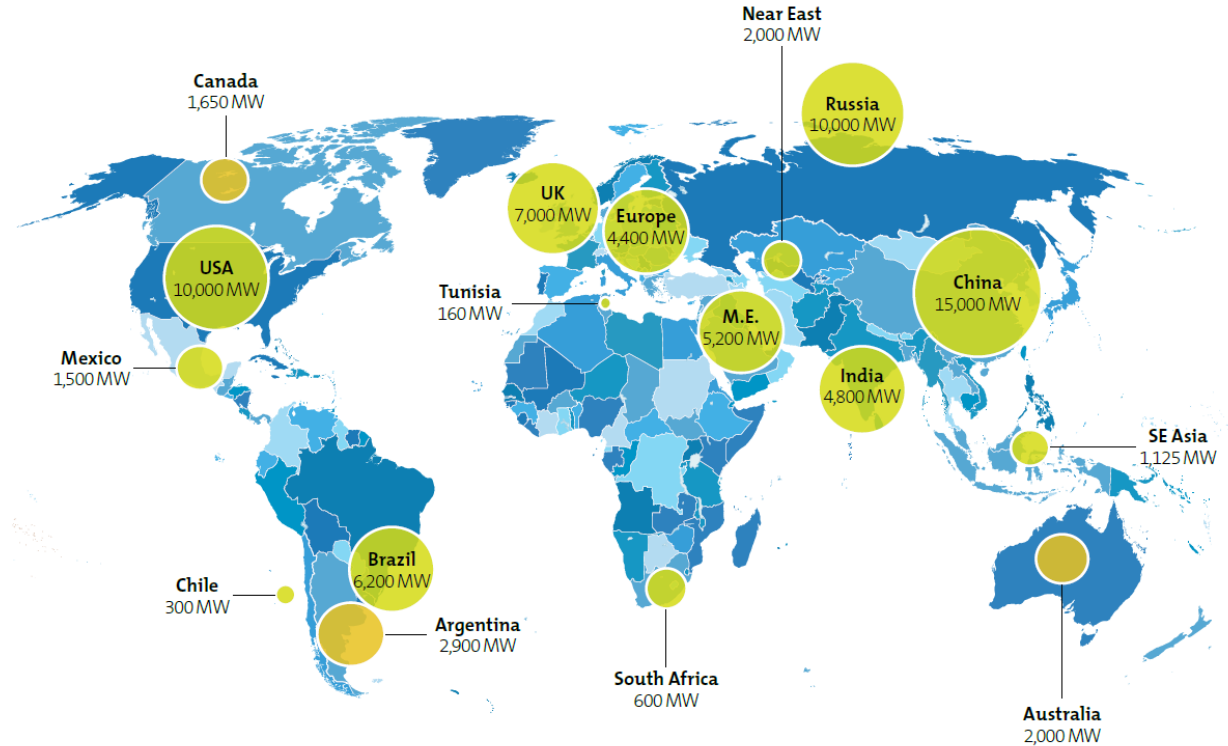


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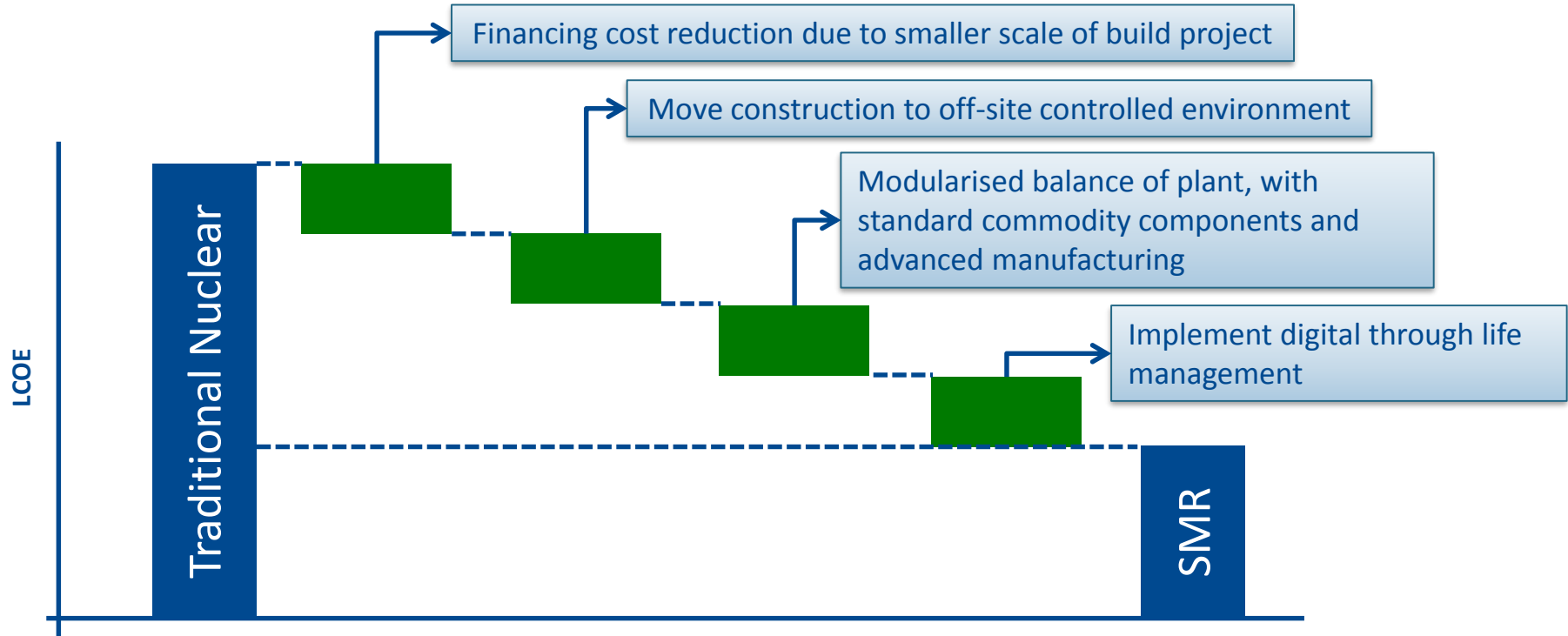


# SMR – A Substantial Reward

- UK SMR market estimated at around 7 GWe by 2035
- Global SMR market estimated to be around 65-80 GWe by 2035



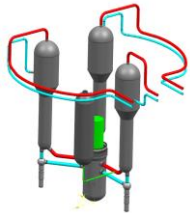
# SMR – Why SMR?



# SMR – The Challenge



x2 SMR per year



x2 reactor plant sets



- 2 x RPV
- 6 x Steam Generator
- 2 x Pressuriser
- 9 x RCP



x1,000 MEP modules



- 2 sets of '500' (?) plant modules?



x4,000 Civils ' building block modules'



- 2 sets of '2000' modular building blocks?



# SMR – A step-change in manufacture

12

[Link to Video](#)



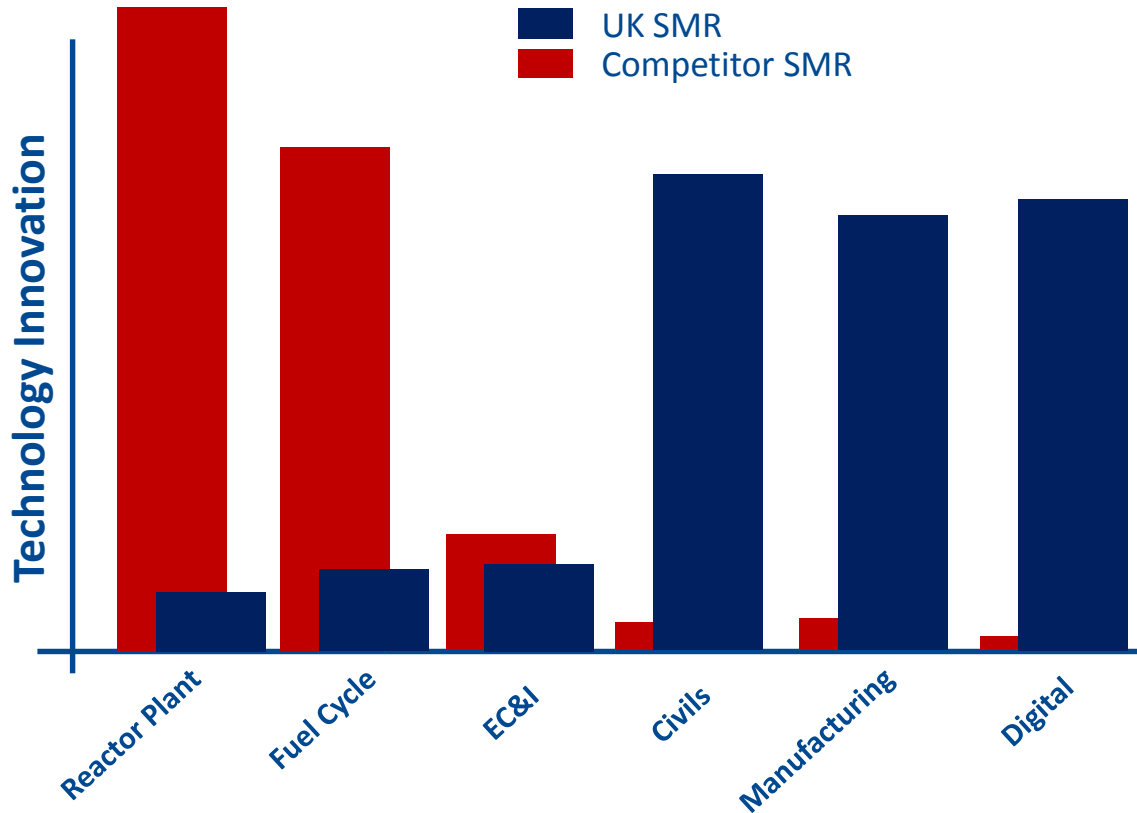
# UK SMR

13

- **Safe, reliable and affordable low carbon energy; on grid by 2030**
- **£100 Bn boost to the UK economy through life**
- **Access to a £400 Bn export market**
- **Revitalisation and sustainment of the UK nuclear supply chain to 2050**
- **Creation of 40,000 skilled and sustainable jobs**



# UK SMR – Research & Technology



- UK SMR targets build certainty, affordability and through-life product quality
- This will be achieved through innovative approaches to civil engineering / construction, manufacturing and digital technology adoption

