



Rolls-Royce

2018 Nuclear Supply Chain Management Workshop

Emerging Challenges with Globalisation of a Nuclear Supply Chain

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Pioneering the power that matters



Agenda

- 01 **Introductions**
- 02 **Global Supply Chain Challenges**
- 03 **Global Supply Chain Enablers**
- 04 **Planning for the Future**
- 05 **Questions and Answers**



01

Introductions



Introductions

Rolls-Royce Civil Nuclear Executive Vice President Chris Tierney



- 30 years' experience within a number of highly-regulated Engineering and Manufacturing organisations.
- Joined Rolls-Royce in 2009 and is currently Executive Vice-President for the Civil Nuclear UK business.
- Primarily focus - UK New Build & Operational Services Market.
- Functional role - Head of Procurement and Supply Management
- Based in the UK (Derby location).



Introductions

Introduction - Session

Share Rolls-Royce experience of operating across a diverse and technically demanding range of industries with over 300 certified nuclear suppliers in a supply chain that Rolls-Royce has been active in for more than 50 years.

Consider the challenges facing global suppliers when providing nuclear equipment to countries developing their nuclear supply chain, local manufacturing resources.

Discuss emerging challenges with new manufacturing technology including Small Modular Reactors (SMR).



Our Vision

Pioneering the power that matters

We pioneer cutting-edge technologies that deliver the cleanest, safest and most competitive solutions to meet our planet's vital power needs



Who we are

We are one of the world's leading industrial technology companies, creating power and propulsion systems for use on land, at sea and in the air.





Our people, our power

Driving our business forwards is a highly skilled workforce concentrated in key hubs around the world.

Across this global organisation, we are determined to pursue greater diversity and inclusion in all its forms.

We are committed to creating an environment where everyone can be at their best.



50,000
Employees

18,245
Engineers

750
Apprentices

50
Countries



How we are structured

Rolls-Royce is tightly focused into three operating businesses.



Civil Aerospace



Defence



Power Systems





At a glance

Civil Aerospace



35
types of commercial
aircraft powered by
Rolls-Royce engines



13,000
engines in service
around the world



24,600
employees

Defence



Over 150
Customers in over
100 countries



16,000
engines in service
around the world



9,800
employees

Power Systems



>1,200
Development, service
production, and
dealership locations



>20,000
Reciprocating
engines sold per year



11,400
employees



Our future

As pioneers, we must continuously innovate to provide the best solutions in the markets we serve.

In the coming years, we believe that the three key trends will define the world's future power needs.

Electrification

Fusion of mechanical and electrical technologies



Digitilisation

Fusion of physical and digital technologies

Growing demand for cleaner, safer and more competitive power

Increasing demand for travel, trade and sustainable energy



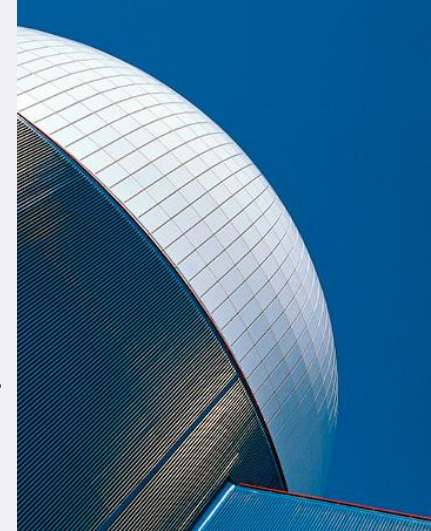


Roll-Royce Nuclear Heritage

Nuclear Heritage

Over 50 years experience in serving customers across the global nuclear industry

- Rolls-Royce has been involved in the nuclear industry for over 50 years
- Our experience is directly applicable to all phases of the new build programme that are planned in the UK and globally, and also to the operation and upgrade of existing sites.
- Our capability (Defence and Civil) is unique in the UK and matched only by a handful of companies worldwide.
- The expansion of the civil nuclear market represents an exciting opportunity which builds on our extensive nuclear capabilities.





Submarines

- Reactor design/supply
- Licensed site operation
- Fuel fabrication
- Through-life services



Systems

- Reactor protection
- Rod control
- Neutron instrumentation
- Plant monitoring
- In-core instrumentation
- Heat exchangers
- Back-up power
- Waste treatment
- Plant process computers



Services

- Engineering
- Licensing
- Security
- Remote inspections, NDT
- Supply chain management



Data

- Asset life extension
- Optimised maintenance
- Inventory efficiency
- Risk reduction
- Operating cost reduction



Electricity

UK SMR Power Station



Our Nuclear Capability



Nuclear Global Foot Print





Civil Nuclear UK Customers



HITACHI



HORIZON

NUCLEAR POWER



中广核 CGN



ROSATOM



NUCLEAR AMRC





02

Global Supply Chain Challenges



Global Challenges

Nuclear

Challenges for New Entrants to Nuclear Supply Chain -

- Highly regulated
- Different codes and requirements (ASME & RCC-M) to meet
- Uncertain market demand – investment vs returns
- Low volume, high value, high risk components & services
- Limited number of existing Supply Chain companies with relevant experience (eg UK New Build)
 - Supply Chain incumbents are very well established
 - High cost to entry



Global Challenges

Nuclear

New Supply chain entrants - Cost to Entry -

- Requirements – understanding gaps and costs
- Staff experience – limited resource pool, up-skilling
- Developing a nuclear safety culture – time and cost
- Quality systems – gaps and routes to certification
- Facility and infrastructure – cleanliness, segregation
- Systems – planning, management, document / records
- Controls – materials, manufacture, quality, export & security
- Management of supply chain sub-tiers



Global Challenges

Nuclear

Supply Chain Risks to be managed -

- In-country regulations, language and cultural differences
- Interpretation of requirements and consequences of product failure
- Experience – eg: cost estimating, planning
- Security – intellectual property, facilities, system access
- Export control – awareness, restrictions and controls
- Counterfeit, Fraudulent and Suspect Items management



03

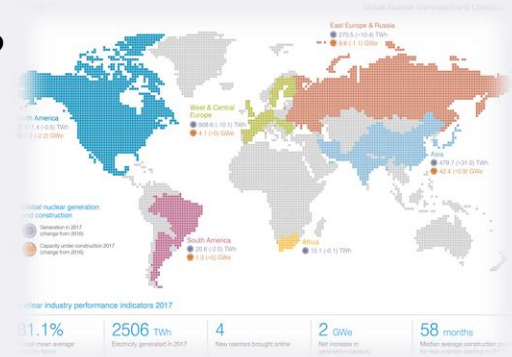
Global Supply Chain Enablers



Global Supply Chain Enablers

How to map Market Opportunities

- Civil vs Defence opportunities
- New build, plant maintenance, plant life extension and de-commissioning (full lifecycle)
- Take time to be clear where to focus -
 - Safety vs non-safety components and services?
 - NI, BNI, BOP, Services & Support?
 - Which tier of Supply Chain?
 - In-country / international?





Global Supply Chain Enablers

Global Supply Chain Enablers – How to mitigate risks -

- Coordinated approach – governments, regulators, industry
- Industry Focus Groups – sharing and influencing
- Sharing of experiences
 - Working groups, systems, internet, bulletins
 - Support from industry experts
- Common codes and standards - guidance to certification
- Applying a graded approach to quality and oversight
- Supply Chain Development programmes
- Partnership arrangements

WORLD NUCLEAR ASSOCIATION

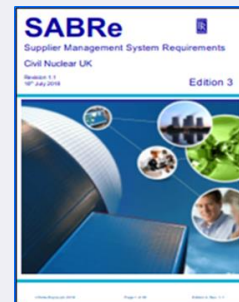


nuclear industry
SDF SAFETY DIRECTORS' FORUM



NUCLEAR AMRC

F4N
Fit For Nuclear





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Planning for the Future



New Technologies and Enablers



New Technology - Benefits

Manufacturing - 3D printing, welding, NDT, modular build.

Digital - data and knowledge

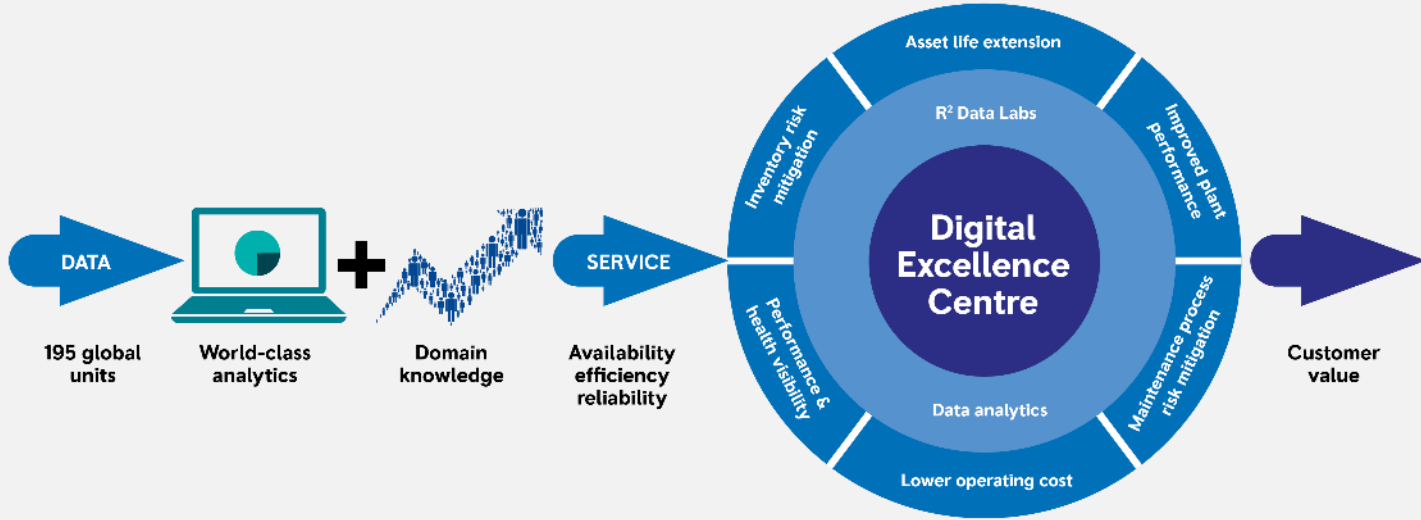


- Opportunity to improve design through innovation
- Improve and sustain quality, reduce non-conformance
- Reduce manufacture and assembly time
- Reduce risk (lead-time, cost, product quality)
- Reducing cost of build and ownership
- Extending plant / component life
- Obsolescence management risk reduction



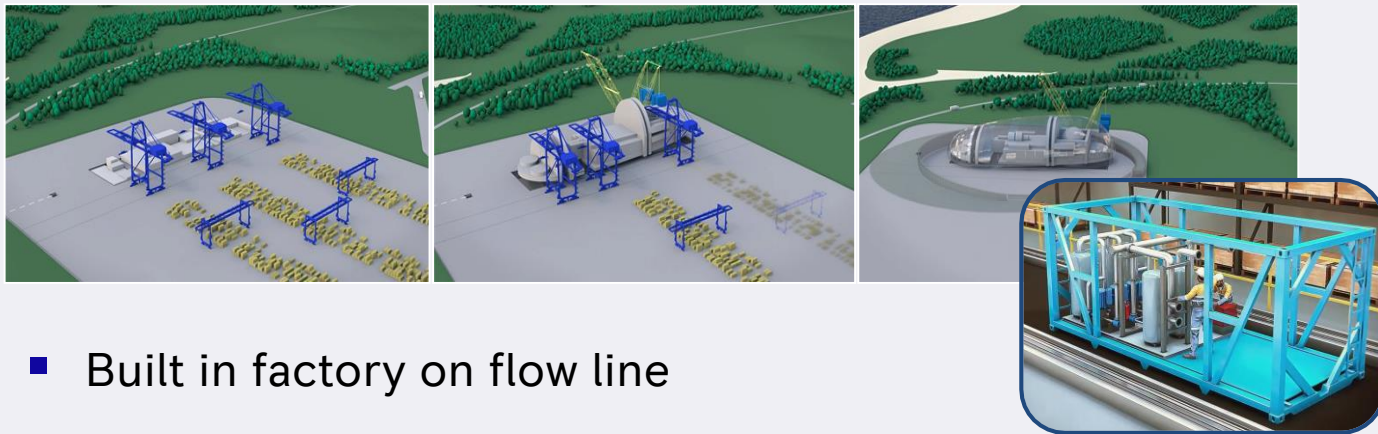


Digital Future





Small Modular Reactors



- Built in factory on flow line
- Higher volume / rate – reduces costs and risk
- Package the plant into standardised transportable modules
- Tested and commissioned at the factory
- Shipped to site and assembled with relatively low skill requirements.



New Technologies and Enablers



Enablers for the Future

- Work closely with Universities and Technology Centres
- New manufacturing techniques
- Move to digital - Data, documents, records and storage
- Standardisation & agility - codes, standards and systems
- Qualification – plans and enablers
- Shared approaches to material / obsolescence management
- CFSI awareness and sharing
- Protection - Intellectual Property, Export, Security
- Early supply chain engagement



05

Questions?

