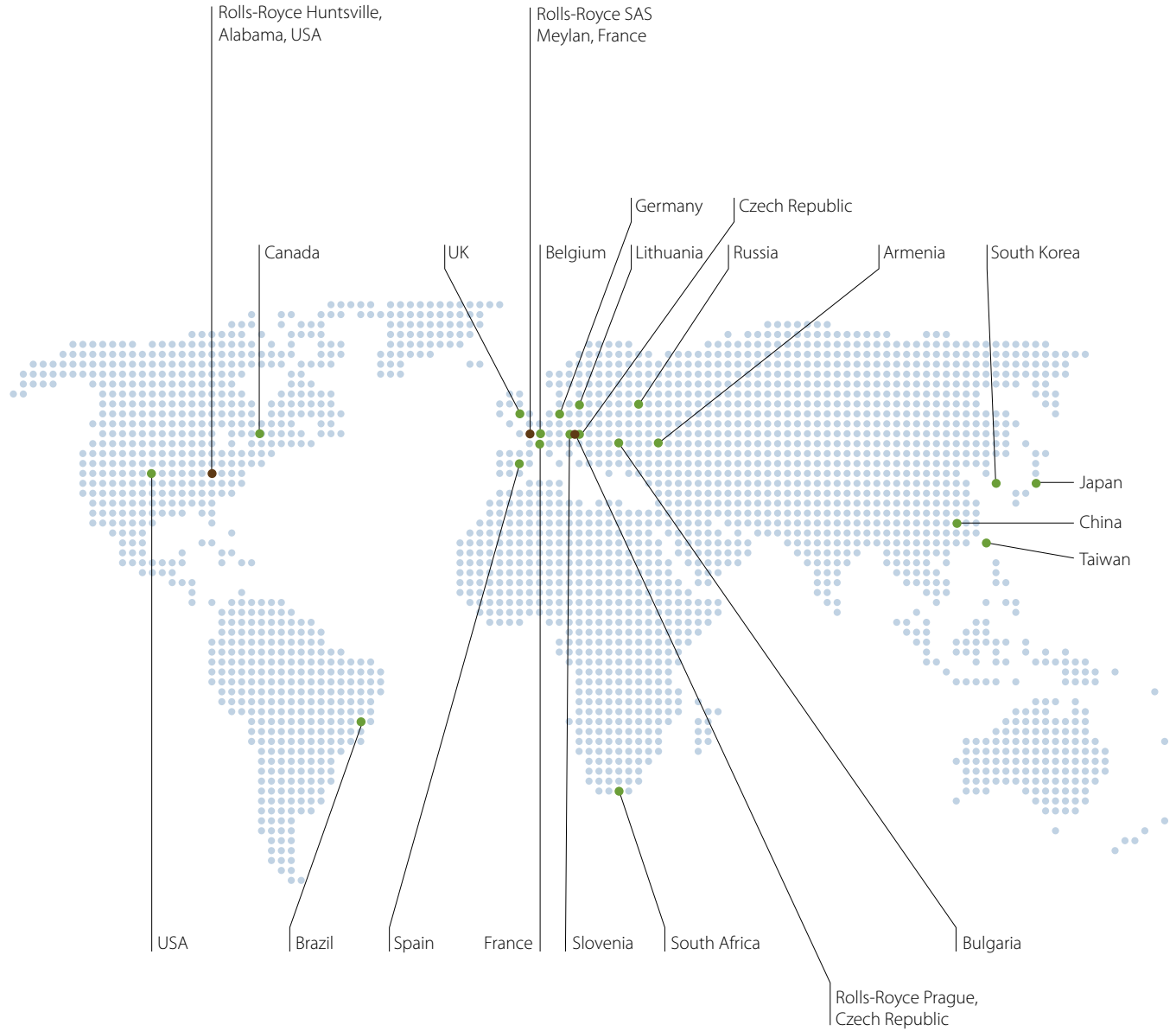


Instrumentation & Control

Systems and services for nuclear power plants



- International Headquarters
- Equipped Nuclear Power Plants



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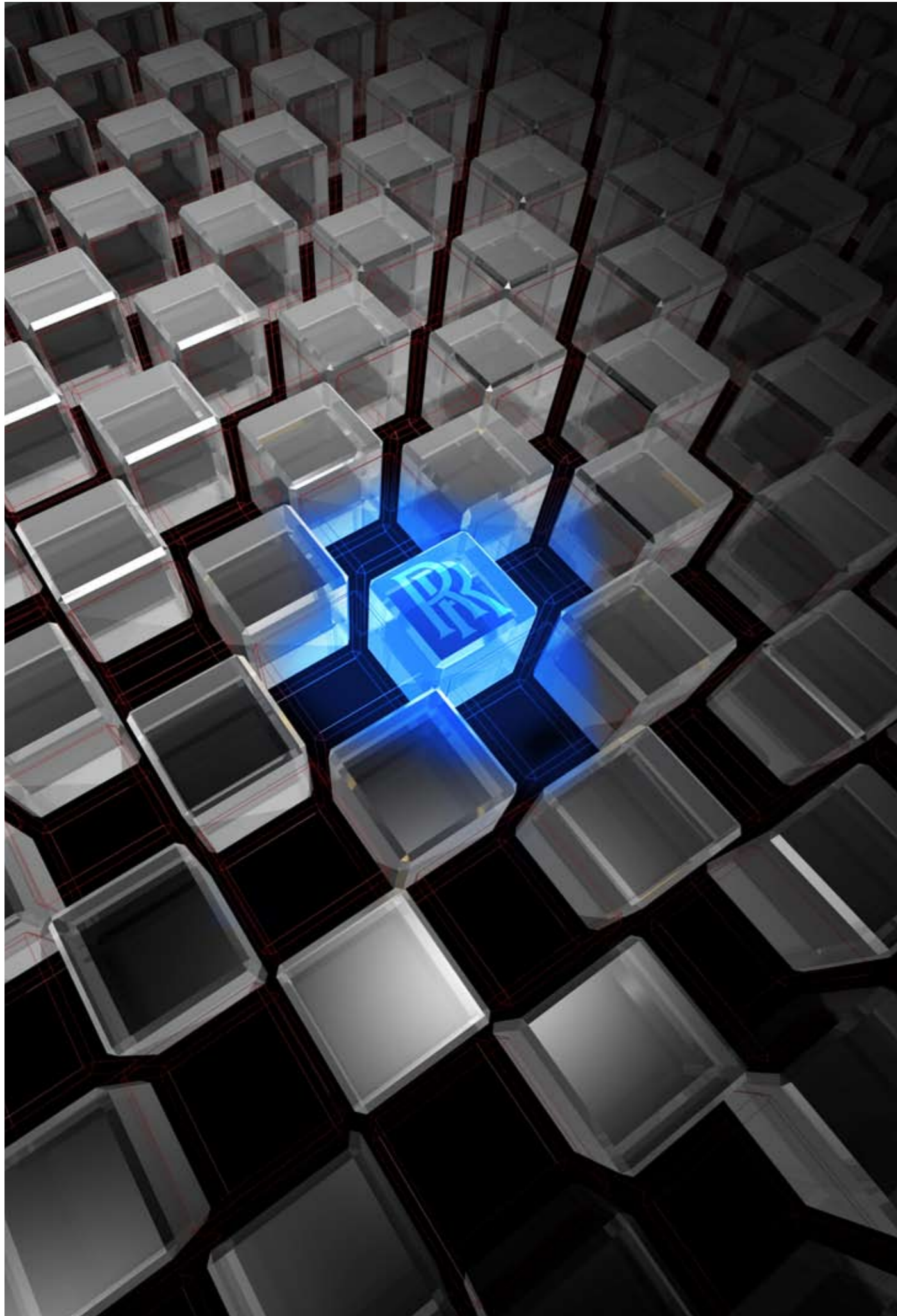
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The I&C leader you can trust

We focus our energy to help you optimise your generation assets

The I&C leader you can trust

Rolls-Royce is one of the most famous names in engineering. The Group is a global power systems and services business, manufacturing in 20 countries and with customer support facilities in 50 countries.

We have been part of the UK nuclear industry for the past 50 years, and have provided instrumentation and control (I&C) systems together with life-cycle support services for more than 40 years. Our experience spans the design and supply of equipment for both civil and military reactors.

Our engineers, technical experts and information technology professionals are based around the world at our centres in the United States, France, United Kingdom and Czech Republic. Our primary goal is to deliver equipment and services that will improve the reliability, availability and safety of high value assets, while at the same time reducing operating costs for our customers.

In 2009 the nuclear I&C business of Data Systems and Solutions was integrated into Rolls-Royce, further extending the company's domain knowledge and leadership in nuclear I&C Systems and Services.

Over 40 years I&C experience

Our extensive nuclear experience includes the design and build of instrumentation, control and monitoring systems for both water and gas cooled reactors, including PWR, BWR, RBMK, VVER, PHWR, CANDU, Magnox, AGR, research and naval reactors.

We have installed our products and provided services to:

- Every nuclear power plant in France and the UK
- More than 80 nuclear power plants in the USA
- More than 80 nuclear power plants in Western and Eastern Europe
- Plants in China and South Africa
- All UK Royal Navy submarine reactors

We have also undertaken upgrades across a number of operating reactors and developed formal obsolescence strategies using a combination of analogue and digital expertise. Our advancements in technology enable Rolls-Royce to help customers manage the introduction of new systems and ensure that they meet local licencing requirements.



Our solutions have more than 3000 reactor-years of successful operating experience and deliver safety with optimum reliability to over 180 reactors.

Leading-edge products and services

Real-time systems technology

Rolls-Royce provides a complete nuclear I&C service from system specification and design, to the provision of through-life support and systems upgrades.

Reactor Protection Systems

To monitor plant safety parameters

Safety systems

- Spinline™
- Reactor Protection Systems (RPS) and Engineered Safety Feature Actuation Systems (ESFAS)
- Nuclear Instrumentation Systems (NIS)
- Diesel load sequencing systems

Control and monitoring systems

To monitor operating parameters and reduce unplanned events

- Rod control systems
- Rod Position Indication Systems (RPIS)
- Boron meters
- Reactivity meters
- Digital radiation monitoring systems
- In-core instrumentation systems
- Plant process computers (BWR & PWR)
- Safety Parameter Display Systems (SPDS)
- Annunciator Management Systems

Instrumentation and hardware

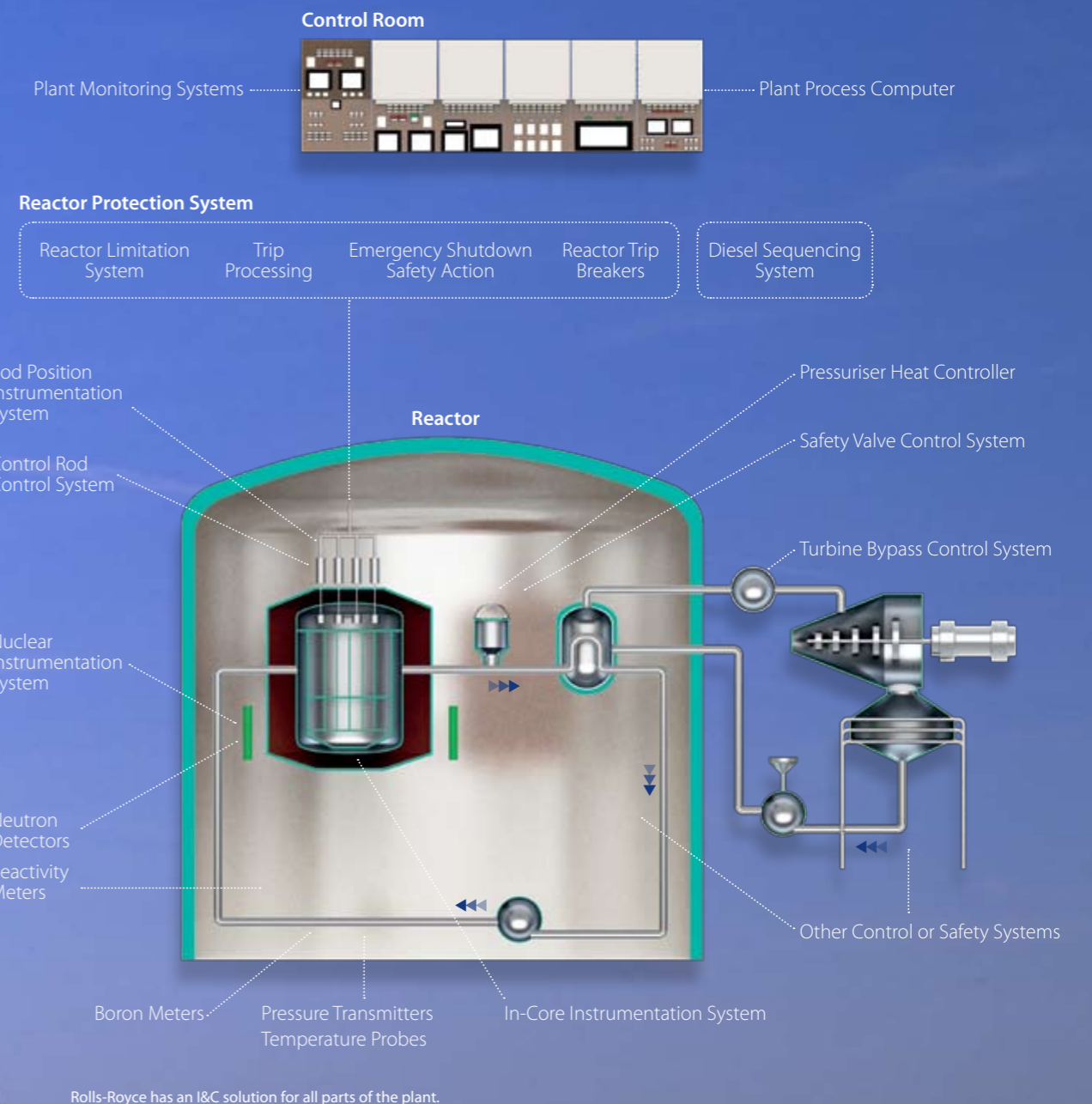
Designed for long life - robust and reliable

- Neutron detectors
- Pressure transmitters
- Temperature probes
- Pressurised heater control
- Reactor trip breakers

Support services

To optimise plant operation and performance

- Maintenance and support contracts
- Obsolescence management
- On-site maintenance
- Technical support
- Training
- Service and spares provision
- Installation and commissioning
- Life-cycle cost modelling





We equip reactors of all types...

...and at all stages of the reactor life-cycle

For over 40 years Rolls-Royce has been involved in building and upgrading nuclear reactors of all types and sizes, from PWR and BWR to VVER, PHWR and naval reactors. We have extensive experience in supporting nuclear plants at each stage of their life-cycle and can support customers during build phase and operation:

- Definition, licencing and specification
- Design and validation
- Construction
- Installation and commissioning
- Maintenance
- Through-life upgrades

Our engineers installed the world's first digital protection system at the EDF Paluel nuclear power plant in France over 20 years ago. Today there are over 25 Rolls-Royce digital reactor safety protection systems in-service around the world.



Neutron detectors from Rolls-Royce are suitable for integration with many I&C systems and are used extensively in our own digital nuclear instrumentation systems. Over 1,000 of our detectors are in operation today measuring neutron flux in PWR, VVER, and a number of research reactors.

All our digital safety solutions installed in French nuclear power plants are operated by EDF with the approval of the French Nuclear Safety Authorities. Strict and rigorous analysis is conducted by the Institut de Radioprotection et de Sûreté Nucléaire (IRSN), the technical advisor.

As an integrated business we control every aspect of our design and manufacturing process – from system specification – to on-site commissioning and testing, which means there is only one point of contact for ease of communication.

Core Competencies

The exceptional performance of our products is the direct result of our attention to quality and our core competencies in:

- Safety system architecture design and implementation
- Analog and digital electronics design and manufacture
- High dependability safety application design, implementation, validation and verification
- Neutron physics
- Electromagnetic compatibility



Customer support

We understand your regulatory and commercial pressures. Our specialist I&C services keep plants operating safely and reliably, and minimise downtime.

Keeping nuclear plants operating safely and maximising output is a cornerstone activity of Rolls-Royce. For over 40 years we have provided solutions to some of the most complex plant engineering problems. We understand how important it is to have reliable support available whenever required and an ability to effectively manage ageing equipment. We not only supply spare parts, we also anticipate component and system obsolescence, updating over 200 components annually, and maintain vital knowledge and tools to ensure continued safe plant operation.

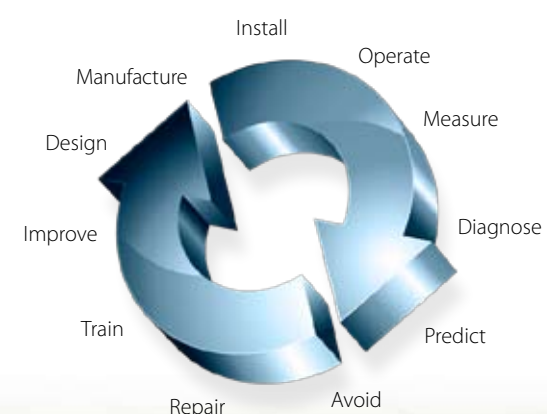
Long-term I&C support

The I&C system is vital for the safe operation of all reactors. Downtime can result in the shutdown of the plant. Therefore our long-term I&C support programmes are designed to protect your investment, maintain reliable operation at a predictable cost and ensure continued compliance. Over the last 40 years in France we have provided all 58 operating nuclear power plants (NPPs) with reactor control and reactor protection systems. We have a long-term support agreement in place with operator EDF for through-life support.

Customer benefits of long-term support programmes:

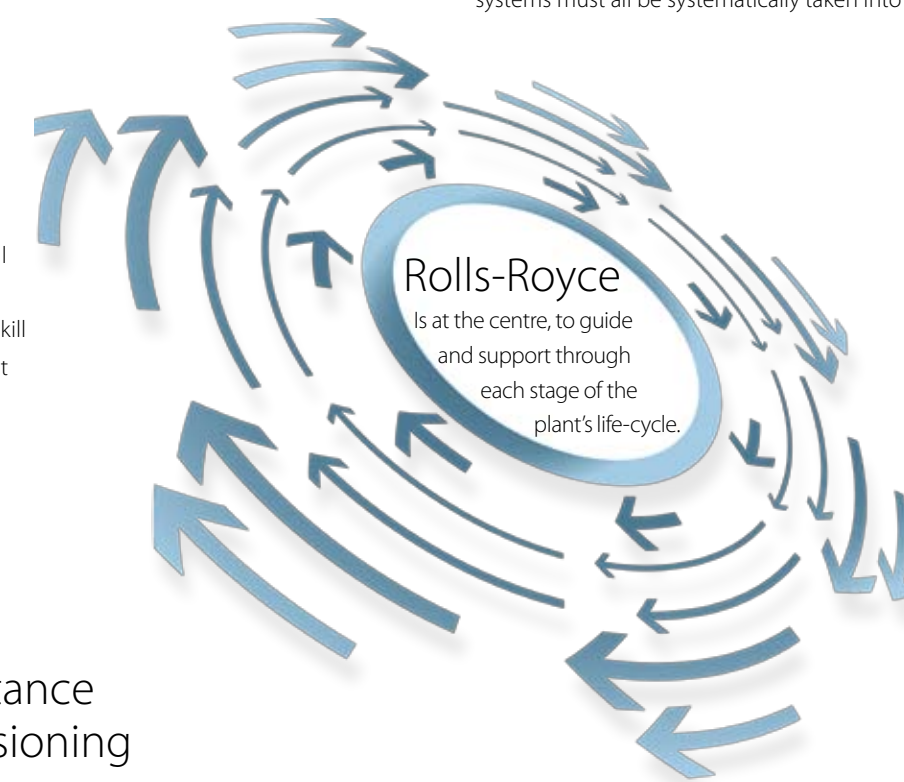
- Predictable maintenance costs
- Extended equipment lifetime
- Obsolescence management
- Regular component upgrades

As we build and maintain a detailed working knowledge of each I&C system, we use the data to effectively manage the system, measure performance, diagnose in service issues, predict component life to avoid component failures. We also use the knowledge to help us continually improve and develop our products.



Training

Only real equipment is used to train operators in our own training centre. This ensures we emulate real working scenarios and deliver the experiences that provide the high skill levels required for future competent operation.



On-site assistance and commissioning

Every part of the system installation through to the cabling is supervised by our experienced field engineers. They also conduct the on-site testing and commissioning to ensure each system is safely performing to its design intent. Any issues can be resolved quickly and easily.

Responding to your needs

Our technical engineers are experienced in assisting and specifying the system requirements. Constraints such as interfaces, the EMC environment, existing cabling, lighting protection and power distribution systems must all be systematically taken into account.

System design phase

We are involved from the beginning and maintain close contact with the NPP operator and the design engineering teams. Only by fully understanding the requirement and maintaining close dialogue with all parties can we deliver the system solution that meets the design specification.