

**Annual revenue of £1.9bn protected with renewed supply of discontinued critical systems**

- World class ability to support the life extension of nuclear licensed facilities
- Remanufacture of complex nuclear grade equipment to modern standards
- Complete lifecycle support



Maintaining the safety of nuclear facilities and maximising their lifetime value

## Annual revenue of £1.9bn protected with renewed supply of discontinued critical systems



### Customer

#### Operating the UK's fleet of ageing AGR nuclear power stations

EDF Energy is the UK operating arm of EDF, the French state-owned energy company. Among other activities, EDF Energy operates the UK's fleet of seven advanced gas-cooled reactor (AGR) nuclear power stations. Ultra has worked with EDF Energy for decades, supplying the company with safety solutions to support its power stations' mission critical systems.

### Challenge

#### Spares shortage risks curtailing reactor life with significant revenue loss

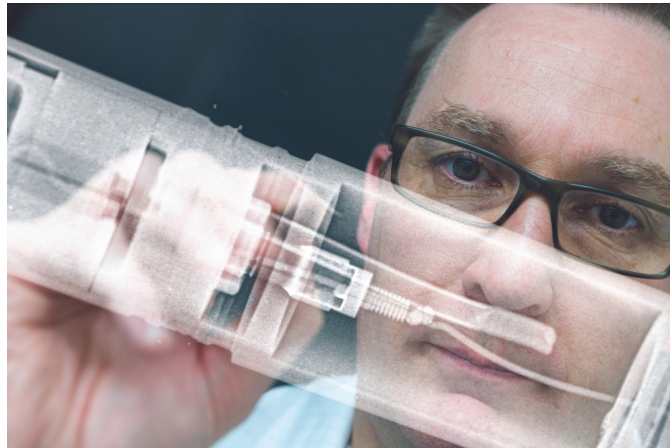
The UK's AGRs were built from 1965 to 1988. They are among the oldest of the country's reactors still generating power. Due to be decommissioned from 2008, at around that time EDF Energy reached an agreement with the UK government to buy them and extend their life. EDF Energy's key priorities for the acquisition were sustaining their safe, reliable and commercially viable operation.

Neutrons are the key to nuclear fission. The power level of a reactor is directly related to the neutron rate. The ability to measure neutrons accurately and in real time is therefore fundamental to controlling the power a reactor generates. Neutron detectors are the source of the information that is required.



Maintaining the safety of nuclear facilities and maximising their lifetime value

Four variants of neutron detector were manufactured for the AGR power stations owned by EDF Energy. Each reactor has between 12 and 16 detector units installed within the reactor. These trigger reactor shutdown in the event of an uncontrolled increase in neutron rate.



AGRs create a particularly hostile environment for neutron detectors, which must withstand the very high temperature that is a characteristic of them. While detectors can operate to design specification for decades, at some point their performance will degrade.

To avoid that happening, detectors need regular replacement. A consequence of the AGR power stations being scheduled for decommissioning in 2008, was that replacement detectors in sufficient numbers to support their operation far beyond that year did not exist.

At the point EDF Energy took ownership, only a small number of potentially useable spare detectors were available. There were no companies able to manufacture new stock. Drawings of the detectors showed the design to be obsolete in relation to modern manufacturing processes and standards. The specialists who had manufactured the originals had long since left the industry, taking their skills with them.

With very few replacements available for the obsolete neutron detectors, EDF Energy would not be able to operate its reactors to their extended end of life date. If they were shut down, EDF would lose around £750,000 in revenue per reactor per day. At the point that this was discovered, the possibility of having to shut its UK fleet of AGR power stations was one of the largest financial risks EDF faced at a global level.



## Solution

### Adapting an obsolete design to modern standards

Many of the world's nuclear power stations were built many decades ago and are reaching their planned decommissioning dates. Given the pressure on countries to secure their supply of low carbon power, there is a growing need to extend their life. The ability to sustain legacy nuclear grade equipment on which their safe operation depends is a growing requirement.

EDF Energy recognised Ultra's high level of specialist skill in delivering 'ageing and obsolescence' programmes to nuclear operators around the world. Ultra has strong capabilities in refurbishment, reverse engineering, redesign and remanufacture of precision engineered, nuclear grade components or entire systems that met now historic standards and are no longer in production. Ultra was contracted by EDF Energy to deliver a legacy neutron detector management programme soon after the company took control of the power stations in 2009.

Firstly, Ultra delivered a development programme to regenerate the specific skills required to build and test detectors. We then tested existing spares to discover how many were still useable, which produced a confirmed inventory of five years.



In parallel, we updated the specifications of the detectors to include the latest engineering best practice and enable them to be built using modern manufacturing processes. To support production quality and efficiency, we created a custom manufacturing and testing area in our Wimborne, UK, site. This facility allowed us to manufacture new units to the updated design and carry out their radiological testing all under one roof.

We also supported EDF Energy with the safety case documents required by the Office for Nuclear Regulation. As part of the successful approval process, we met with the regulator as subject matter experts to train them on the detectors, including their manufacture and operation.



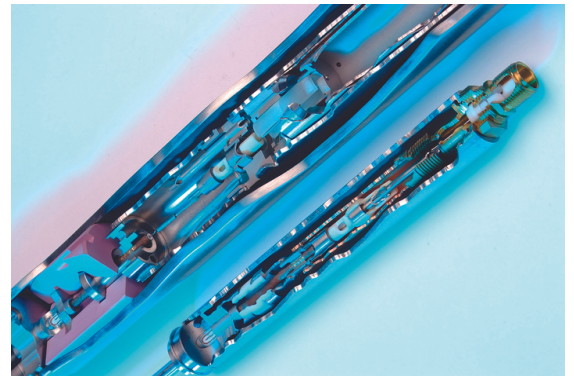
Maintaining the safety of nuclear facilities and  
maximising their lifetime value

## Benefits

### **EDF Energy annual revenue of £1.9 billion protected as power generation able to continue to the sites' end of life target**

Thanks to our ability to support customers with ageing and obsolete systems, the large financial risk EDF Energy faced – the total annual revenue of its seven UK AGR sites is £1.9 billion – was removed. The company now has a guaranteed supply of critical neutron detectors for its UK AGR power stations so will be able to continue operating them to their extended end-of-life target dates.

Additionally, thanks to lessons Ultra learned while building the new neutron detectors, the time it previously took to manufacture a unit was reduced from two years to eight months. This generated a proportional reduction in the per unit cost, which we passed on to EDF Energy.



## Future

### **A deeper partnership and multiple new programmes**

The relationship between Ultra and EDF Energy was strengthened by our work to deliver the neutron detector programme. EDF Energy now regularly engages us on long term programmes to maintain and repair complex equipment. We are also working on further projects to build replacement systems to modern standards, as well as on new solutions for their other nuclear projects.



Maintaining the safety of nuclear facilities and  
maximising their lifetime value

# ULTRA.

## About Ultra Energy

Organisations working with nuclear technologies have a responsibility to safeguard people, the environment and infrastructure. We provide solutions that give our customers complete, long-term protection and control of safety critical systems, while helping them increase the net value derived from nuclear investments over their total lifespan.

Part of Ultra Group, Ultra Energy has worked with nuclear customers for over 60 years. We're embedded in strategic national infrastructure and helping organisations develop future nuclear applications. We support continuous operation of nuclear sites with protection and control solutions that monitor and manage factors such as radiation, neutrons, temperature and pressure within safety critical systems.

## United Kingdom

Innovation House  
Lancaster Road  
Ferndown Industrial Estate  
Wimborne  
Dorset BH21 7SQ  
UK

Tel: +44 (0) 1202 850 450

## United States of America

707 Jeffrey Way  
Round Rock  
Texas 78665-2408  
USA

Tel: +1 512-434-2800

## For more information

Web: [ultra.energy.com](http://ultra.energy.com)  
Email: [info@ultra-ncs.com](mailto:info@ultra-ncs.com)

