Nuclear Life Extension: Bridging the Energy Gap

Whilst the construction of new nuclear power stations in the UK is looking increasingly likely, it will be 2018 at the very earliest before they start to generate electricity. Meanwhile, many of the UK's existing nuclear power stations are reaching the end of their design life, potentially leaving an energy gap of over 10% of the nation's electricity demand. One solution to this problem is to extend the lives of the existing nuclear power stations, particularly British Energy's ageing fleet of 7 Advanced Gas Cooled Reactor (AGR) stations, one of which is already operating within a justified life extension [see Fig 1].

This presents an interesting challenge for British Energy. Ageing plant generally needs more care and attention to ensure it operates safely and reliably. Unforeseen issues may be identified through rigorous surveillance. Refurbishment or replacement of certain systems and components, some of which may be obsolete, may be required to overcome age related problems. Compounding these challenges, continued safe operation must be assessed against current standards, which have evolved significantly over the stations' operating lives.

Not surprisingly, the As Low As Reasonable Practicable (ALARP) principle plays a pivotal role in the justification of life extension, because the stations were not originally designed with current standards in mind. The aim, therefore, is to target the more significant risks where improvements will deliver the most benefit, so that overall risk is reduced so far as is reasonably practicable.

To deliver this aim British Energy manages a range of diverse projects with the common goal of demonstrating continued safe operation of the AGRs. Box 1 illustrates Risktec's involvement.

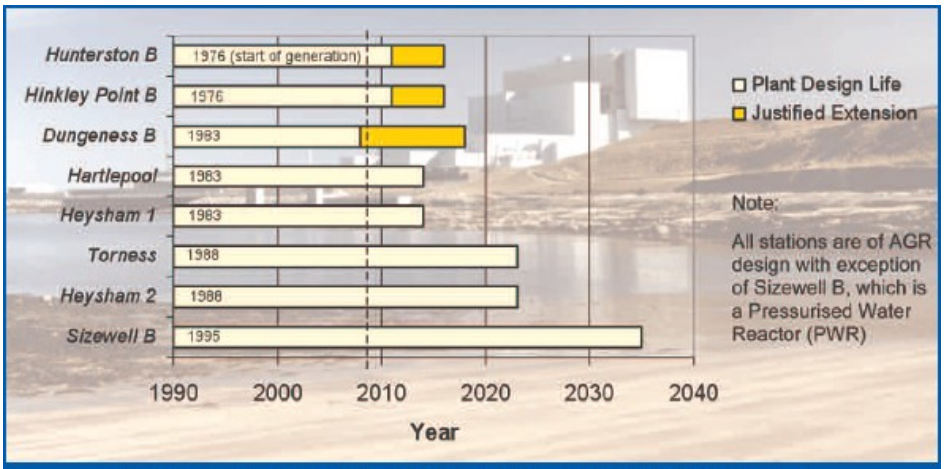

Figure 1 – Remaining Life of British Energy Nuclear Power Stations

Box 1 – Life Extension in Practice

Periodic Safety Review
To satisfy the requirements of their nuclear site licence, a licensee must conduct a systematic review of its safety cases at pre-determined intervals. For each station, this entails a review of operating experience, plant modifications and changes to design standards to establish their impact on the safety case.

Hartlepool BCU Recovery Project
During the October 2007 statutory outage of Reactor 1 at Hartlepool, corrosion was detected within the pre-stressing wires of one of the Boiler Closure Units (BCUs). As a precautionary measure, Reactor 2 was also shut down. Following a detailed review, a programme of remedial work is being implemented to enable the safe return to service of both reactors. This includes enhancements to instrumentation to monitor the BCUs during operation.

Hunterston B Vessel Entry Project
Manned entries into the reactors at Hunterston B and Hinkley Point B have been performed during statutory outages throughout their life by operators wearing specialist air-cooled suits. With the likely increase in the requirement for inspections and repairs as the stations near the end of their life, British Energy is looking at ways of improving or replacing the existing entry suits and associated equipment to reduce task time and radiological dose.

Graphite Core Inspection Equipment
The graphite cores of the AGRs are subject to ageing mechanisms that could potentially degrade their performance. To counter this risk, British Energy has developed graphite core inspection equipment to determine the condition of the cores during periodic reactor shutdown [see inset].

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