



Long-Term Operation of Koeberg Nuclear Power Station



What is long-term operation (LTO)?

Long-term operation (LTO) of a nuclear power plant is the term used for the process of conducting safety assessments and obtaining regulatory approval for the power plant to safely operate beyond its original licence term.

Koeberg Nuclear Power Station's two units were originally designed for 40

years of operation, using very conservative assumptions. The units will reach 40 years of safe operation in July 2024 (Unit 1) and November 2025 (Unit 2). The knowledge and experience on how this type of nuclear power plant is operated, inspected, and maintained, has improved over the years. Many nuclear power plants now operate safely

and cost effectively beyond their original 40-year design life. In line with this practice, Eskom has applied to the National Nuclear Regulator (NNR) to continue operating each unit for an additional 20 years. If approved, the two units will continue to operate safely until July 2044 (Unit 1) and November 2045 (Unit 2) respectively.

Is the long-term operation of nuclear power plants a common practice?

Extending the operating life of nuclear power plants beyond the original operating licence term of 40 years is a common practice worldwide.

Throughout the world, there are 133 nuclear reactors that have been in operation for 40 years or more, with the oldest operating reactor having been in operation for 53

years (Unit 1 at Nine Mile Point power station in New York). As of January 2022, the United States Nuclear Regulatory Commission (USNRC) renewed the operating licences of 94 nuclear reactor units. It has since issued subsequent licence renewals (to extend the operating life from 60 years to 80 years) to six nuclear reactor

units, and a further nine are under review.

In France, 21 of its 56 nuclear reactor units in operation are 40 years or older, with Bugey-2 (its oldest unit in operation) having been connected to the power grid in 1978.

How is the IAEA involved in the application for LTO?

The International Atomic Energy Agency (IAEA) was invited to conduct a safety review of Koeberg's readiness for LTO, using international standards, and make recommendations for safe LTO. Eskom is committed to implementing the IAEA recommendations for safe LTO and has made significant progress in this regard. This

initiative afforded Koeberg the opportunity to adopt a systematic and proven approach to preparing for safe LTO.

The application for LTO is supported by a safety case submitted to the NNR for approval. The safety case provides documented evidence and arguments that demonstrate that there

is no undue risk to safety, health, or the environment if Koeberg continue operating for 20 years beyond the initial licensed period of 40 years. The safety case draws on safety assessments including the review done by the IAEA. A redacted safety case has been made available to the public and is available on the Eskom website.

Why is the focus on the ageing management of Koeberg plant equipment?

The international standards require ageing management to be assessed as part of the LTO licensing application process. The regulatory guide on Ageing Management and Long-Term Operations of Nuclear Power Plants prescribes the activities needed to ensure effective ageing management programmes.

Effective ageing management practices and

processes can prevent the adverse effects of ageing (such as corrosion) from affecting the reliability of plant equipment during long-term operation. A team of international experts (under the auspices of the IAEA) conducted an ageing management assessment. It was aimed at determining the status of the existing Koeberg ageing management practices and processes utilising international, national, and

regulatory safety requirements. Koeberg has completed the ageing management evaluation, and the outcome has confirmed that LTO can be safely supported. Improvements in ageing management programmes, testing, and monitoring of safety equipment will continue prior to LTO and throughout the full period of LTO to ensure safe, reliable operation.










What type of maintenance and inspections need to be conducted at Koeberg in support of LTO?

Koeberg routinely conducts maintenance and inspections of its safety systems in accordance with national and international standards and guidelines, which are subject to regulatory

review and oversight. Engineering assessments identified additional activities that need to be done prior to LTO and during LTO. The activities are intended to ensure the continued safety

and reliability of Koeberg for the full LTO period. Some of the major activities are shown below. The steam generators are the last major pieces of equipment being replaced for LTO.

Some major activities that have been completed or planned for completion prior to LTO

-  Steam generator replacements
-  Installation of super-high-density fuel storage racks
-  Replacement of the refuelling water storage tanks
-  Replacement of the reactor vessel heads
-  Concrete repairs of the reactor buildings
-  Upgrade of obsolete analogue monitoring and control systems
-  Implementation of additional ageing management programmes
-  Inspection and testing of equipment important to safety (e.g., containment building integrated leak rate test)
-  Updated assessment of all aspects of the Koeberg site characteristics (seismic, tsunamis, tornados, etc)



Loading of spent fuel casks.



The storage facility housing the replacement steam generators.



Reactor Cavity and Spent Fuel Pool Cooling System tank.



Arrival of the Reactor Pressure Vessel Head and Control Rod Drive Mechanisms at Koeberg.



The arrival of one of the six replacement steam generators.

What is the impact of LTO on nuclear safety?

As part of the LTO application, a safety case is compiled and submitted to the NNR that demonstrates that there is no undue risk to safety, health or the environment because of LTO.

Koeberg has been operating safely for nearly 40 years. This is achieved through robust plant design,

the application of rigorous safety programmes (for example, maintenance and inspection programmes), consistent compliance with processes (for example, quality assurance), as well as sharing and learning from experiences with international organisations such as WANO and the IAEA. The NNR also performs a

crucial role in ensuring the continued safe operation of Koeberg by providing strict and systematic regulatory oversight.

The safety case considered multiple aspects and has confirmed that there is no undue risk to safety, health or the environment.

What is the plan for radioactive waste disposal and how is this affected by LTO?

Low and intermediate level radioactive waste is packaged in concrete or steel waste containers that comply with stringent acceptance criteria approved by the NNR. The acceptance criteria specify the radiological, mechanical, physical, chemical, and biological characteristics of the waste package to ensure that the waste is properly contained and can be stored safely. The waste is currently disposed of at the Vaalputs Radioactive Waste Disposal Facility, in the Northern Cape. This practice will continue for the duration of Koeberg's LTO.

Currently, spent nuclear fuel is safely stored in the spent fuel pools and dry storage

casks at Koeberg. A national radioactive waste management strategy has been developed to address the long-term storage and final disposal of radioactive waste including spent fuel. Spent fuel will continue to be stored in the spent fuel pools for at least 10 years at which time the energy levels have reduced significantly before it is transferred to dry storage casks on the Koeberg site. The spent fuel pools and dry storage casks provide a safe and reliable means of long-term storage for used nuclear fuel. This approach is widely utilised and aligned with current international practices.

Koeberg is making provision for the temporary

interim storage facility (TISF), subject to NNR approval, to house additional fuel storage casks used for the dry storage of spent fuel. To minimise waste storage at Koeberg, a centralised interim storage facility (CISF) is in the planning phase and will provide the next phase of storage for spent fuel. Until the CISF has been established by the National Radioactive Waste Disposal Institute, Eskom will ensure that spent fuel is safely stored on the Koeberg site.

More information can be obtained in the public information document available on the Eskom website.

Some aspects considered in the safety case

- How does plant design compare to modern codes and standards
- Current condition of the plant equipment
- Compliance with regulatory safety criteria
- The effectiveness of ageing management programmes
- Action plans for safety improvements
- Overall assessment of nuclear safety