

Africa’s Only Nuclear Reactors Extend License Despite Public Outcry, Multiple Unexpected Shutdowns

By Lydia Petersen, Project 90 by 2030, and Koeberg Alert Alliance

Koeberg Nuclear Power Station, located near Cape Town, South Africa is the only operational nuclear power plant on the African continent. The station’s two reactors were built by French nuclear giant Framatome in the 1970s, and both are 970 megawatt pressurized water reactors. Unit 1 was synchronized to the grid in 1984 and unit 2 a year later. Koeberg contributes approximately 4.8% of South Africa’s electricity generation to the national grid, providing both reactors are online simultaneously.

As the country continues to grapple with an energy crisis and rolling black-outs, Eskom, the state-owned utility, has embarked on a project to extend the operational lifespan of Koeberg by an additional 20 years. This decision to relicense unit 1 was granted by South Africa’s nuclear-overseeing agency, the National Nuclear Regulator (NNR), on July 15, 2024. The license extension has sparked significant debate, particularly regarding safety concerns found by the International Atomic Energy Agency and the handling and storage of radioactive waste produced by the reactors. Public fears were affirmed less than two months later, on September 11, when Koeberg shut down unexpectedly for 10 days after failing a routine test. Eskom was forced to announce the shutdown to the public after Koeberg Alert Alliance notified the press. [As Nukewatch *Quarterly* goes to print, the unit is out of operation, now for a second time, with no announcement or explanation by the owners.]

The 20-year Extension

When originally commissioned, Koeberg was designed to operate for 40 years. However, as electricity demand increased, and Eskom faced challenges with its aging coal-fired fleet, the decision was made to extend the life of the reactor. The extension and refurbishment program were budgeted for 20 billion South African Rands, or roughly \$1.1 billion, including replacement of the reactor vessel head and steam generators, among other upgrades. These renovations were deemed necessary to ensure that the facility meets modern safety and performance standards.

Since the announcement of the proposed extension there has been public outcry about potential safety and environmental risks. Furthermore, many are concerned with potential accidents, considering that Koeberg is built near a fault line, and Cape Town experienced a few earthquakes in recent years. The

public’s fears have been further compounded by the lack of transparency as Civil Society organizations, including Project 90 by 2030, had to intervene with legal processes to have access to vital documents regarding the extension and safe operation of the reactors. Many also reject the significant long-term environmental harm of continued radioactive waste generation. Thanks to a campaign by Koeberg Alert Alliance and Project 90 by 2030, letters appealing the license renewal have flooded the office of the Minister of Electricity and Energy.

Radioactive Waste Management

A critical aspect of nuclear power generation is the amount of nuclear waste it produces. As Koeberg’s original lifespan has come to an end, storage space in the irradiated waste fuel pools has reached capacity. This forced Eskom to re-rack the fuel rods to accommodate more highly radioactive waste material. After the waste fuel assemblies have been in the cooling pools for five to eight years, they are moved to dry casks in a specially demarcated area at the facility.

The low and intermediate levels of nuclear waste, including personal protective clothing and items used in radioactive areas, are transported to the Vaalputs Waste Disposal Unit in the Northern Cape Province some 600 kilometers (375 miles) away. It is widely speculated that this site was chosen by the Apartheid Regime due to its sparse population, particularly with marginalized communities, making it easy for the government to impose decisions without significant opposition. Apartheid policies prioritized keeping potentially hazardous or undesirable activities away from urban centers predominantly inhabited by the white population. In this way, the government adhered to its practice of environmental racism, where marginalized communities bore the brunt of environmental and health risks.

This facility is managed by the National Radioactive Waste Disposal Institute. Vaalputs is located in the Namakwaland region, known for its dry, desert-like conditions. The communities surrounding the disposal site have grave concerns about the possible leakage of radioactive waste materials into the groundwater and their drinking water. The nuclear waste is stored in drums and cement casks, buried in 8- to 10-meter (26- to 33-foot) trenches, just above groundwater level.

As Koeberg unit 1 embarks on its 20-year life extension the critical issues of safety concerns at the sta-



Koeberg Alert Alliance and Project 90 by 2030 gather outside a public hearing for the licence renewal of South Africa’s Koeberg unit 1 reactor.

tion and the continued generation of nuclear waste remain a bone of contention. Civil society believes that the National Nuclear Regulator acted with undue haste to extend the license. Energy experts have harshly critiqued the extension decision, mirroring the opinion of the general public.

“The NNR decision increases the public’s perception that the NNR is solely looking out after its own interests,” said Karel Beukes, a resident living near the Vaalputs Waste Disposal Unit who appealed the license decision. “The public in the ... area are sick and tired of the clandestine manner in which Eskom and the NNR operate, and we demand transparency when it comes to decisions that affect us.” The call for transparency has exponentially increased during the last two years, with many observing that the license extension puts profit above people again. While Eskom and the South African government maintain that the necessary safety measures are in place, public concern persists. Civil Society is adamant that safety protocols have not all been observed and implemented during the refurbishment period, and that critical safety features were omitted. This is a glaring omission as Eskom claims to follow global safety standards. These and many additional concerns will be raised again as the license extension process gets underway for unit 2 next year, with a license decision expected by November 2025.

— Koeberg Alert Alliance, July 22; International Atomic Energy Agency, Mar. 31, 2022

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Fukushima: Spreading Radioactive Wastewater, Sludge, Soil

By John LaForge

Melted fuel still vexing test extraction methods

Thirteen years on from the catastrophic triple explosions and reactor meltdowns at Fukushima-Daiichi in northeast Japan, emergency responders are still trying to observe and examine the melted fuel under the reactors (sometimes called “corium”). Contractors from Tokyo Electric Power Co. (Tepco) have repeatedly failed in attempts to robotically collect a mere three grams (0.1 ounce) of the corium from reactor 2, a project that started three years ago.

The company Amentum, working for Mitsubishi Heavy Industries, has built robotic machinery to try to retrieve a smidgen of corium. Its goal is to find out the state of the meltdown because, as National Public Radio reported, “the exact nature of the debris is currently unknown.”

Amentum is trying to build an extraction tool that can function in a radiation zone so fierce that it wrecks most machinery. A 2015 attempt to look inside reactor 1 with a device built by Hitachi-GE Nuclear failed after three hours. Amentum’s first attempt in reactor 2 was stalled August 22 after the long pipe insertion system was found to have been mis-assembled. Then Sept. 18, video feed problems halted the second try. The Associated Press reported that the probe is “maneuvered remotely by operators

at another building because of the fatally high radiation emitted by the melted debris.”

Teams of workers have to do 15-minute rotating shifts — to limit their exposure to the wreckage’s radioactivity level — preparing the probe for another attempt. Industry slang for team members is “sponge.” Recovering a mere three grams is scheduled to take two weeks, because the slow-moving robotic plucker tends to get stuck in the tangled debris and takes a tortured path past meltdown-produced obstacles.

The mission of the tiny retrieval is to determine whether it’s possible to eventually retrieve and containerize all 880 metric tonnes — 300 tonnes per reactor — of the fatally radioactive wreckage, to keep it out of the environment for eons. Some critics have said decommissioning the whole site could take 100 years.

The idea of covering the site’s six-reactor radioactive blight with a roof — like the shed that was installed over the Chernobyl reactor site — is unpopular because of the risk of another major earthquake and tsunami.

Meltdown-spewed plutonium on the wind

Nuclear reactors at Fukushima (and everywhere), smash apart uranium atoms creating a lot of heat —

to boil water. This atom smashing inside reactors produces radioactive poisons like cesium, iodine, strontium, and dozens of other elements — including plutonium. In addition to this reactor-borne plutonium at Fukushima, about 6% of the fuel in reactor No. 3 was made from plutonium itself.

Some of this plutonium from inside the three destroyed reactors was released to the environment by the meltdowns and explosions of March 2011. On Nov. 15, 2020, the journal *Science of the Total Environment* published the report, “Particulate plutonium released from the Fukushima-Daiichi meltdowns,” noting that plutonium-239 was dispersed widely by the disaster.

Plutonium, the most toxic substance known to science, was spread “up to 230 km away” (142 miles) from the reactor site, the researchers found.

Long-distance dispersion of plutonium was partly the result of micro-particles being blown by the wind. Five isotopes of plutonium were released including Pu-238, -239, -240, -241, and -242. Some plutonium persists environmentally and contaminates the food chain for 240,000 years.

In 2023, the journal *Chemosphere* reported on a study’s findings of large amounts of highly radio-