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South Ukrainian nuclear power plants – not ready for a safe operation in over–design period

On October 14, 2013 the State Nuclear Regulatory Inspectorate of Ukraine (SNRIU) published a draft decision on the possibility of a lifetime extension for unit 1 of the South Ukrainian nuclear power plant (SUNPP-1) up to December 2, 2023, beyond its technically designed lifetime.

SUNPP-1's license is going to expire on December 2nd 2013. The unit has been stopped already in March 2013 for necessary maintenance and safety upgrade works. SNRIU conditioned the possibility of the unit's re-start and lifetime extension to a list of measures that need to be implemented, including the list of measures from the Complex (Consolidated) Safety Upgrade Program for Ukrainian NPPs.

In October 2013, NECU commissioned an analysis from a technical expert on nuclear power plants with the task to assess whether the technical state of SUNPP-1 is proved to be sufficient to allow for safe operations for an extra 10 years and whether the necessary safety upgrades have been fully implemented. For this, Energoatom's report "South-Ukrainian NPP, Unit 1. Report on the periodic safety review "Comprehensive Safety Analysis" as well as other relevant documents available to the public were analysed.

The report comes with the following conclusions:

- The report, disclosed for public scrutiny, contains only summary information and analysis on the findings of 14 safety factors, i.e. factual information in this document is mostly missing. **Reports on the results of the evaluation for each safety factor were not made public.**
- Ukraine's national energy company Energoatom in its report has analysed the unit's safety deviations from the requirements of technical standards as of January 1, 2012. **However, the state of the unit does not meet the requirements of newly released regulations and currently applied technical and regulatory standards**

In February 2009, an International Atomic Energy Agency (IAEA) mission assessed the design safety of SUNPP unit-1. According to the mission's results, a list of safety measures was prepared and their implementation scheduled. These measures were included into the Complex (Consolidated) Safety Upgrade Program for Ukrainian NPPs (KsPPB).

As of 14.10.2013, the implementation of 54 measures under KsPPB has not been completed.

Out of the measures that were named by SNRIU as obligatory for considering the unit's lifetime extension, 38 measures have not been completed (as of October 10th) and for 13 of them, neither the status of implementation nor the expected implementation timing has been specified in the report. However, the majority of them are crucial for ensuring safety in case of emergency situations. Guidelines for severe accidents have not been developed. No measures have been taken to increase the reliability of power supply and for removing long-term residual heat from the active zone, as well as from cooling ponds for spent nuclear fuel.

One of the major concerns is the fact that the number of allowed cycles of a "planned cooldown to the cold state" at SUNNP-1 has been already exceeded (91 vs 90 allowed). During the planned 'cooldowns', the reactor material experiences maximum stress and "ageing" occurs. In emergency cases, an emergency cooldown takes place which accelerates ageing processes and decreases the operational life of the reactor. When the limit for 'cool downs' is reached (i.e. many planned or emergency cooldowns have occurred) the reactor vessel and first loop piping (the reactor core) can have brittle so much that cracks in the core reactor could appear. The reactor core is one of few equipment which cannot be replaced.

The number of factual cycles of "hydrostatic pressure tests" for establishing potential cracks in the reactor pressure vessel, pipes and welds has also exceeded expected figures and now 98 out of 100 allowed cycles have already taken place. To justify the

possibility for the unit's continued operation under such circumstances, a number of assessments have been performed at the reactor by the Nuclear Research Institute Rez (Czech Republic) and an institute called "Resource-Audit" (Ukraine). However, according to the national nuclear safety regulation, every deviation from the project should be identified, documented, verified and approved by the organisation who designed the reactor, in this case "Hydropress" and the manufacturer of the reactor core. The main constructor for the VVER-1000 units was not involved in the development and implementation of the lifetime extension programme, although this is required by the national nuclear safety regulations.

A number of deviations from international standards has been identified. A reassessment of the content of the ageing management programme to comply with "NS-G-2.12 Ageing Management for Nuclear Power Plants" was not performed at SUNPP-1.

A decommissioning project for SUNNP-1 and even a feasibility study for it has not yet been prepared despite the requirement of the state law "On regulation of nuclear safety issues".

Recommendations

Our recommendations are in line with the recommendations of the expert analysis:

1. The decision on the possibility of lifetime extension of SUNPP-1 should be postponed until the completion of all measures from the Complex (Consolidated) Safety Upgrade Programme, specified in the tables 1 and 3 and until the issue with the amount of allowed cycles of "planned cooldowns" and "hydrostatic pressure test" is properly addressed.
2. The feasibility study and the decommissioning project for SUNPP-1 should be prepared as soon as possible and

be in compliance with the national safety regulations requirements. The fact that there is currently no spent nuclear fuel and radioactive waste deposit, and that timing for their design and construction is rather long, should be taken into account.

If SNRIU will grant a lifetime extension to SUNNP-1 despite the inconsistencies and violations described above the following problems will occur:

- As the case of the lifetime extensions of the Rivne 1 and 2 nuclear reactors has shown, the SNRIU will lose its leverage on the nuclear operator to ensure that all measures from the Complex (Consolidated) Safety Upgrade Programme are fully and promptly implemented;
- The SNRIU will lose its power and independence to properly implement nuclear safety regulations and to endorse its own decisions and consequently to guarantee nuclear safety for Ukraine and its neighbours.

The EU should require Ukrainian counterparts through the policy dialogue and financial leverages to adhere fully to all nuclear safety regulations, to ensure that lifetime extensions for nuclear reactors are not considered before all safety assessments are properly done and safety upgrades fully implemented, to ensure decommissioning plans start being prepared;

The EU should also ensure the right of EU citizens to be informed and consulted on lifetime extensions of nuclear reactors in Ukraine. Currently, Ukraine does not implement transboundary environmental impact assessments (EIA) prior to decisions on nuclear plant lifetime extensions, in breach with the Espoo Convention, as the Espoo Implementation Committee from March 25, 2013 concluded².

2 <http://www.ecoclubrivne.org/files/Espoo13.pdf>