

Summarising Assessment of Safety-Relevant Flaws in the Operation of the Nuclear Power Plant Tihange 1

The nuclear power plant Tihange 1 is one of the oldest nuclear power stations in the world. Its design was based on the safety principles and specifications applicable in the early 1970s. Accidents at nuclear plants (TMI, Chernobyl, Fukushima) in particular have led to a considerable tightening of the safety requirements for nuclear power plants. Apart from a general strengthening of the first three safety layers of the 'defence-in-depth' concept, this concerns, first and foremost, the protection of safety-relevant infrastructure against overarching external effects and hazards, including those that exceed the design limits, the introduction of measures and facilities for the management of beyond-design incidents, as well as measures and capabilities for the containment of the effects of core meltdown accidents. These safety requirements are also reflected in the WENRA Safety Reference Levels for Existing Reactors /1/.

Comparison of the current safety specifications of the Tihange 1 nuclear power plant (Chapter 2.1) with safety requirements that conform to the current state of the scientific and technical knowledge as listed in Chapter 2.2.1, and consideration of the available operating experience (Chapter 3), results in the following key findings regarding the Tihange 1 nuclear power plant:

- Safety-relevant facilities required for the management of beyond-design accidents at the site, including the fuel pool, should, according to the best available technology as described in /1/ und /7/, be single-fault-proof, segregated, diversely redundant and, insofar as possible, designed to meet maintenance requirements during operation. The Tihange 1 nuclear power plant shows deficiencies to varying degrees in this respect, particularly in the engineered safety features for heat dissipation on the primary and secondary side, and also in the supply systems for this equipment. These deficits are associated with safety layer 3, i.e. the safety layer of the defence-in-depth concept specifically laid out for the containment of beyond-design accidents. The auxiliary emergency system retrofitted in the 1980s also covers such functions for the management and containment of beyond-design accidents which according to current standards should form the basis of nuclear power plant layout. The auxiliary emergency system itself, however, does not fulfil the requirements to be met by a safety system.

It should be noted that the Tihange 1 nuclear power plant does not meet the requirements of reliable hazard and accident protection.

- The Tihange 1 nuclear plant provides only limited basic protection, compared to the comprehensive safeguards against overarching external effects (flooding, earthquake, plane crash) called for in WENRA Ref. Level E5.2. Its design does not consistently cover the state-of-the-art requirements for protection against overarching external effects. This applies in particular to protection against airplane crashes, which, given the proximity to the airport at Bierset-Liège, is a highly safety-relevant factor.

The crash of an airplane – larger than a sporting aircraft – would have a catastrophic impact on the site and its surrounding area.

- The safety status of Tihange 1 appears particularly precarious in light of the plant's safety management and failure record. The marked rise in the incidence of unplanned events at Tihange 1, in particular, points to the progressive ageing of the plant.

The inherent safety design deficiencies of Tihange 1 already raise serious doubts concerning the plant's accident safety, which are further underscored by the negative operating experience.

- The Tihange 1 nuclear power plant must be classified as belonging to a generation of nuclear facilities with an obsolete safety design. Concept-related safety impairments are manifest i.a. in the layout of safety-critical features in terms of their type and comprehensiveness, the capability to manage/contain beyond-design plant states, and the plant's resilience to beyond-design impacts due to natural and man-made causes.

A removal of the design-related safety impairments at the Tihange 1 nuclear power plant is practically inachievable.

- ***In view of the presented aspects concerning the design deficiencies of the Tihange 1 nuclear power plant, the criticisms of the safety management, as well as the negative trends regarding the operating experience, the operation of Tihange 1 constitutes a potential danger for the Tihange site and its surrounding area.***

*Author of the study: Prof. Dr. Manfred Mertins
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