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Note:  
This is a translation of the RSK statement entitled  
“Einschätzung des fachlichen Beitrags der gegebenenfalls erweiterten THAI-Versuchsanlage hinsichtlich der  
sicherheitstechnischen Bewertung von Forschungs- und Leistungsreaktoren sowie der Kompetenz- und  
Nachwuchsentwicklung im Bereich der nuklearen Sicherheit”  
In case of discrepancies between the English translation and the German original, the original shall prevail.

RSK statement

(534<sup>th</sup> meeting of the Reactor Safety Commission (RSK) on 22 February 2023)

**Assessment of the technical contribution of the possibly expanded THAI test facility with regard to the safety assessment of research and power reactors as well as competence building and development of future talent in the field of nuclear safety**

**STATEMENT**

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## 1 Background

The THAI (Thermal-hydraulics, Hydrogen, Aerosols, Iodine) test facility in Eschborn is a technical-scale experimental facility for investigating phenomena in the containment of nuclear power plants during accidents and severe accidents. It is owned by the Federation and operated by the company Becker Technologies GmbH on behalf of the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) within the framework of project-funded nuclear safety research. The facility has been in operation since its construction in 1998, and numerous national and international projects have been carried out since then.

The experimental programmes at the THAI test facility serve to clarify issues related to thermohydraulics and the behaviour of hydrogen, iodine and aerosols in the containment of water-cooled reactors. In the OECD/NEA report of 2021 “Nuclear Safety Research Support Facilities for Existing and Advanced Reactors: 2021 Update”, the THAI facility was again classified as an experimental facility of international importance in reactor safety research, the further operation of which is strongly recommended and should be supported by international projects.

Currently ongoing projects are the OECD/NEA project THEMIS “THAI Experiments on Mitigation measures, and source term issues to support analysis and further Improvement of Severe accident management measures” and the national project THAI-VIIa. The seventh phase of the national THAI experiments comprises tests and series of tests on eight different topics, which are funded until the end of October 2023. It is expected that the actual project duration will be extended into 2024 since the test planning has to be coordinated with the THEMIS project running in parallel.

In July 2022, it became known that the lease agreement for the land on which the federally owned THAI test facility is located was unexpectedly terminated with effect from the end of 2024. Becker Technologies GmbH initially examined options for extending the lease beyond 2024. In late autumn 2022, however, it was explained that lease extension cannot be realised.

Therefore, a decision is to be made on the option of relocating the test facility. Becker Technologies GmbH has submitted a time and cost schedule that outlines the relocation process. Due to the successive project phases (construction planning, licensing, new construction, relocation), a decision should be made in the near term at the beginning of 2023.

In parallel, possibilities for expanding the implementable experimental setups were explored in the currently ongoing national project THAI-VIIa. This work was independent of the relocation situation and had already been started before the termination of the lease agreement was foreseeable. The results of the investigation were presented at the meeting of the project committee on transients and accident sequences on 20 October 2022 and technically assessed by the committee experts.

The project committee prefers the expansion of the facility to investigate effects that would have to be considered in SMR (small modular reactor) concepts and supports the implementation, stating that such investigations were currently of great interest internationally in safety research and also correspond to the topics of the current BMUV project funding programme on safety research for nuclear facilities.

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## 2 Advisory request

In a letter dated 2 February 2023, the BMUV requested the Reactor Safety Commission (RSK) to answer the following questions against the background of having to take a decision on the further operation and expansion of the THAI test facility:

- 1) From the RSK's point of view, what technical contribution can the possibly expanded THAI test facility make in the future with regard to the safety assessments of research reactors as well as of internationally operated and planned power reactors and, in particular, new reactor concepts?
- 2) From the RSK's point of view, what contribution can the possibly expanded THAI test facility make in the future with regard to retention and building of competence as well as development of future talent in the field of nuclear safety?

The RSK was asked to deal with the advisory request at the 534<sup>th</sup> RSK meeting on 22 February 2023 and to conclude it in this meeting.

## 3 Consultations

With advisory request of 2 February 2023, the BMUV submitted

- information about the state of current projects at the THAI test facility as at 18 August 2022, as reported by the project management agency GRS,
- the presentation of Becker Technologies GmbH on the exploration of possibilities to expand the THAI test facility within the framework of the experimental programme on safety-relevant issues related to the containment of existing and new reactor concepts (THAI Phase VII), which was presented and discussed at the 7<sup>th</sup> meeting of the project committee on transients and accident sequences on 20 October 2022, and
- the corresponding excerpt from the minutes of the 7<sup>th</sup> meeting of the project committee on transients and accident sequences on 19/20 October 2022.

In preparation for the 534<sup>th</sup> RSK meeting on 22 February 2023, these documents were sent to the members of the RSK and the RSK Committee on PLANT AND SYSTEMS ENGINEERING (AST) with the request to formulate questions which, from their points of view, should be answered for the consultations. Based on the responses, a list of questions was prepared and sent to Becker Technologies GmbH as the operator of the facility and to the project management agency GRS responsible for project-funded reactor safety research within the framework of the BMUV project funding programme in preparation for their hearing at the 534<sup>th</sup> RSK meeting.

With the participation of the RSK Committee AST, the RSK heard the operator and the project management agency GRS at its 534<sup>th</sup> meeting on 22 February 2023, consulted on the presentations, formulated the consultation results, and adopted its statement.

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## 4 Consultation results

The results of the consultations of the RSK with the participation of the AST Committee are presented below:

### **Question 1:**

From the RSK's point of view, what technical contribution can the possibly expanded THAI test facility make in the future with regard to the safety assessments of research reactors as well as of internationally operated and planned power reactors and, in particular, new reactor concepts?

Summary of presented information:

Becker Technologies GmbH and the project management agency GRS present the following:

- The THAI test facility can simulate a broad spectrum of phenomena for internationally operated power reactors as well as new reactor concepts. The aim is not to investigate specific designs, but generic phenomena, for example processes at low temperatures and low pressures or hydrogen deflagration in very narrow geometries, for which no data are available yet for safety assessments and for validating the computer codes.
- The experiments would lead to a deeper understanding of phenomena relevant with regard to passive safety systems such as external containment cooling.
- The facility also allows the investigation of phenomena for research reactors, although no research projects are currently planned in this regard.

Results from the RSK's point of view:

- The RSK understands the arguments put forward and considers that the possibly expanded THAI test facility can contribute to the safety assessment of new reactor concepts. Statements on current issues can be obtained for which only few generally accessible experimental data are available so far. This can provide a basis for an independent assessment of manufacturers' statements and for the validation of computer codes.
- This also applies to the assessment of passive safety systems and issues related to accidents and severe accidents (e.g. hydrogen deflagration) of existing and planned power reactors.
- From the RSK's point of view, the possibly expanded THAI test facility can only make a minor contribution to current issues related to existing research reactors and, in particular, no contribution to the assessment of the new reactor core of FRM-II to be carried out.

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## **Question 2:**

From the RSK's point of view, what contribution can the possibly expanded THAI test facility make in the future with regard the retention and building of competence as well as development of future talent in the field of nuclear safety?

Summary of presented information:

Becker Technologies GmbH and the project management agency GRS present the use of the THAI test facility, among others, for the training of young scientists as well as for national and international research projects, which shows that many national and international institutions have been involved in research projects at the THAI facility in the past.

Results from the RSK's point of view:

- The possibly expanded THAI test facility can promote and support retention of competence and the recruitment of young talent, especially since a large, internationally unique and modern facility with excellent instrumentation for research projects and traineeship will be available with it.
- Shutting down the THAI test facility would internationally be perceived as a signal that Germany is withdrawing from safety research, particularly in view of the fact that experiments at the PKL test facility in Germany will be stopped by the end of 2023. This would weaken the involvement of German institutions in international bodies and make it more difficult to get access to international research projects on reactor safety and to obtain data from abroad. Therefore, shutting down the THAI facility would also make this facet of maintaining competence more difficult.