

Position paper

WENRA considerations with respect to new fuels development challenges

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Background and Approach

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The latest development in EU Taxonomy requires NPP to use accident-tolerant fuels (ATFs) after 2025. The technology must be certified and approved by the national safety regulator. This led to discussions on what ATF exactly means since the taxonomy does not provide a definition.

In its autumn meeting 2022 WENRA requested RHWG to draft a paper highlighting considerations with respect to new fuels development challenges. This should include aspects of currently approved fuels, licensing process, necessary time for safety assessment, etc.

The purpose of this document is neither to define the requirements of ATF, nor to discuss whether any existing fuel is considered ATF. The objective of the document is to summarize experience on the licensing of new fuels in WENRA countries.

RHWG members provided an overview of their national practical experience and feedback for licensing of new fuel. A summary of the feedback can be found in the text below.

The national approaches in WENRA countries are quite different. While some countries approve specific fuel types¹, others do not certify or approve fuel as individual components. In the latter case, a review of the safety case is carried out by the regulatory authority, or the compliance of new fuel types requires verification which is reviewed by the regulatory authority.

¹ In the following „fuel“ includes fuel elements (subassemblies) as well as fuel types (as UOX or MOX).

01 Timescales

Time needed before a new fuel can be used depends on various factors including

1. how far the fuel design moves away from an existing body of operating experience, experimental and other data,
2. the time necessary in the design development programme to generate new data required (for example, through pilot loadings) and preparation of new analytical tools, if necessary,
3. compatibility with the resident fuel,
4. the readiness of the feasibility study as a first step and then consequently the quality and completeness of the safety case that is eventually submitted.
5. Human resources allocation to the project itself.

The regulatory approval process itself takes between 4 weeks and 1.5 years. For slightly modified fuel, a time frame of between a few months and 3 years can be expected before the fuel can be used. A time frame of 7 to 15 years can be expected for new fuel types, including development and testing (for example in the case of use of different cladding or pellet material or different fuel assembly geometry).

Other aspects

- Some countries are considering compatibility of new fuels with the waste management or storage requirements once the fuel is spent, which could make the licensing process more extensive.
- Where experience with a particular fuel type can already be used from NPPs outside a country, the process could be expedited through close cooperation with foreign countries.
- Monitoring of testing and manufacturing is in some cases undertaken by the regulatory authority and might allow early insights to support the process.
- The availability of specific guidance documents in some countries could also assist the process.

02 Conclusion

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Generally, the nuclear fuels which are currently in operation at NPPs in WENRA countries are more advanced compared to the original design fuels. In many countries, there is continuous extensive development in the field of fuel endurance under accident conditions as well as the fuel reliability under normal conditions.

Licensing procedures in WENRA countries vary. Despite the different approaches, the development, testing and approval of a new fuel cannot be achieved quickly because the requirements for quality, verification and performance of the fuel must be high. The expediency at which modified fuel could be licensed for operation depends on how great the differences are and whether there is already experience available. It is not possible to make a clear assessment as this depends on many factors.