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SUJB – NUWARD, tri-literal perspective

ASN, STUK and SUJB joint early review of the NUWARD™ reactor

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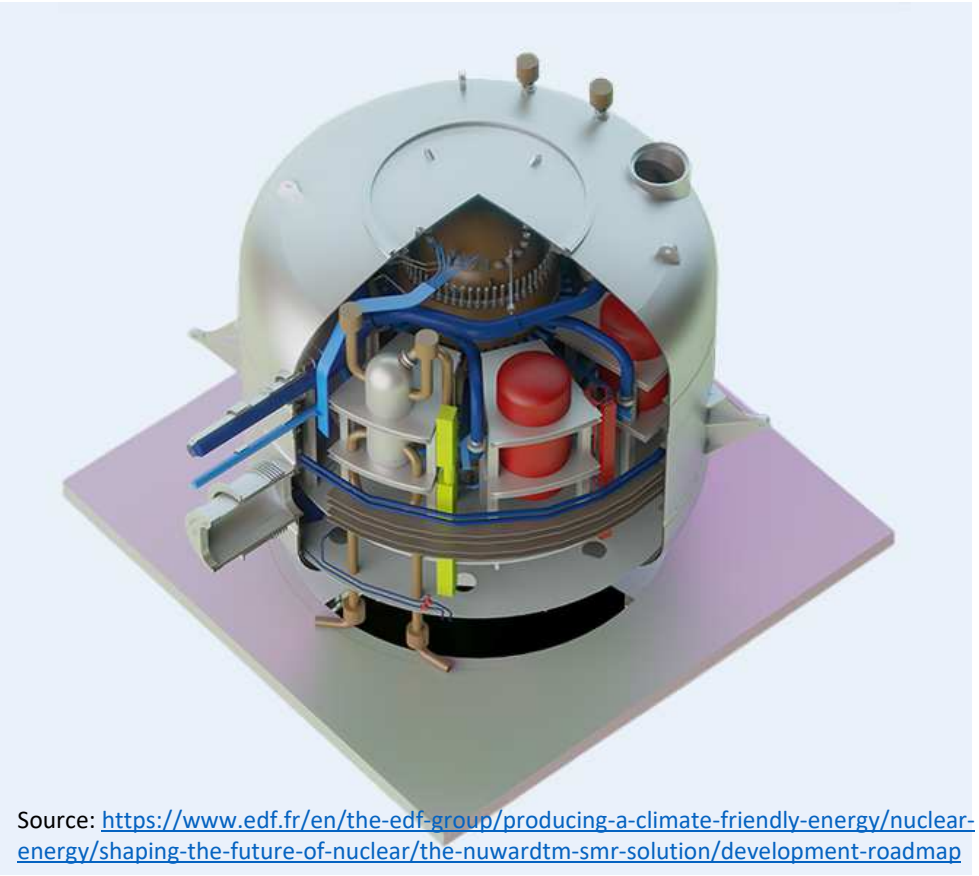

Source: https://www.edf.fr/en/the-edf-group/producing-a-climate-friendly-energy/nuclear-energy/shaping-the-future-of-nuclear/the-nuwardtm-smr-solution/development-roadmap

The Working Group introduction

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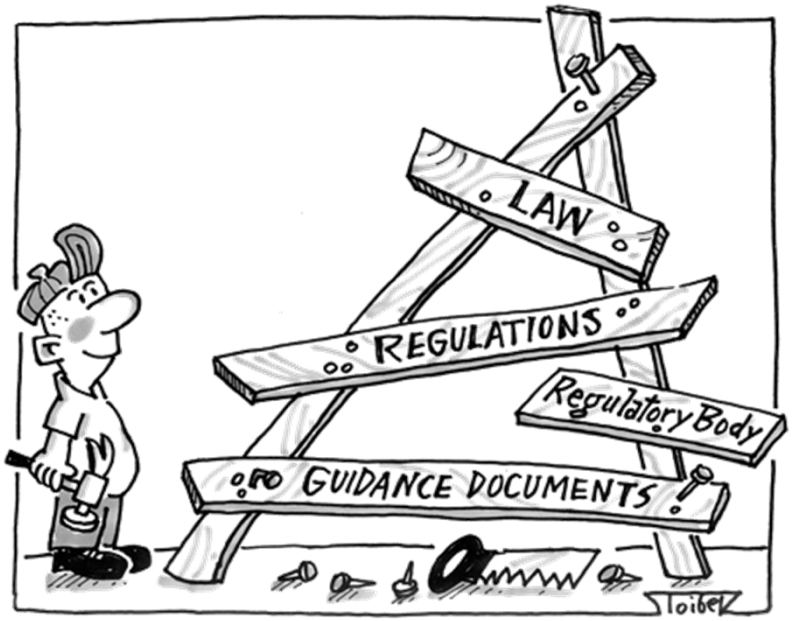
- Nuclear Safety Authority (ASN) + Institute for Radiation Protection and Nuclear Safety (IRSN), France
- Radiation and Nuclear Safety Authority (STUK), Finland
- State Office for Nuclear Safety (SUJB) + National Institute for Radiation Protection (SURO), the Czech Republic
- Electricité de France S.A. (EDF), NUWARD™ developer



Joint Early Review introduction and goals

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Through technical discussions, the regulatory bodies involved in this WG shall identify and provide a preliminary review of technical and regulatory challenges raised by this specific NUWARD™ light water SMR design.

In particular, this JER process shall enable participating regulators:

- to acquaint with a SMR design and identify the potential challenges that it raises prior to the beginning of a licensing process;
- to share their expectations, knowledge and practices about the identified topics;
- to increase knowledge transfer about regulatory practices and expectations;
- to provide EDF with an early feedback about its design and possible associated regulatory challenges.

Topics selection process

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The topics have been selected considering that they present high stakes for the safety or for the NUWARD™ reactor design. Indeed, they fulfil at least one of the following conditions:

- it is a topic which brings answers on the expected level of safety and the approach to meet this level;
- it is a SMR safety specific topic on which there is no or very few safety standards recommendations or guidance or significant information and experience feedback;
- it is a structuring subject for the NUWARD™ reactor design in a way that a late change on this topic would have an important impact on the design or the safety demonstration;
- it is an important feature of the safety demonstration which requires a lot of time to be developed and assessed, due to its complexity. Starting the review of this topic as early as possible could help reducing the timeframe of the licensing process.
- Also, before engaging in technical discussions on a topic, it is expected that the basic design phase, regarding this topic, is complete and that the related documentation is available.

Topic selected

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The WG (ASN, STUK, SUJB + SURO) was established to review the NUWARD™ reactor preliminary design and safety approach regarding the following technical topics:

- definition of safety objectives;
- identification of “Design Basis Conditions” (DBC);
- use of cooling passive systems in the safety analysis of DBC and Design Extension Conditions without severe fuel damage (DEC-A);
- development plan of scientific computing tools;
- twin modules integration,
- PSA methodology (this topic was added after the beginning of the project as another important general topic which can bring substantial lesson learned to all participants when discussed in early stage of design preparation).

Methodology

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- The WG is driven by its members (chair was selected – EDF expert)
- Each member is expected to share its regulatory requirements and any useful information and experiences to help address the selected topics.
- During the meeting, EDF provides a presentation of the topic and answers the questions (provided before the meeting) of the WG members. EDF proposes a draft of the meeting's minute to the WG members for comments and remarks.
- If necessary, additional meetings could be set up or questionnaires could be addressed to EDF. The need for an additional meeting or out of meeting questions can be expressed by any WG member.
- The chair sets up a WG meeting where each member shares the conclusions of its review. During this meeting, a preliminary draft of a consensus-based synthesis highlighting the main convergence and divergence points identified at this stage for the selected topic is drawn up. In particular, for a better understanding of every stakeholder, the WG will develop the reasons leading to these divergence points with the NUWARD™ reactor or among the WG members.
- At the end of the working program, based on all the synthesis already endorsed by the WG and sent to EDF, a closure report summarizing the work done will be written in order to be published.

Benefits

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- From the regulatory point of view, a fundamental benefit of the JER is the possibility of comparing regulatory approaches in the individual countries participating in the project.
- Although the basis of requirements implemented in the legislation of the 3 regulators participating in the JER is similar (IAEA fundamental documents and WENRA reference levels), the specific implementation is different, the level of detail of the requirements usually differs and sometimes the national requirements are also more strict than the international standard (based on national experience, good practice...).
- The project enabled a detailed comparison and learning in a certain range of evaluated areas. It should be emphasized that the lesson learned in JER do not imply any commitment to further harmonization of requirements, although of course the lessons learned can be a valuable inspiration for the preparation of more detailed documents (safety guide level) or even a source of inspiration for a possible revision of legal requirements.

SUJB´s lesson learned

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- None of the Czech, French and Finnish regulatory frameworks and practices generally forbid to share systems between units. The Czech legal framework doesn´t include any requirement on sharing of safety systems and safety features at all. It would be beneficial to include some general requirements at the decree level. The requirements can be based on 33 of IAEA SSR-2/1 (“no sharing”) or 33A of IAEA TECDOC 1936 (“sharing is possible if safety system or safety features shall be functionally capable of fulfilling the safety requirements of each of the modules simultaneously”).
- The decision if it is necessary to have an Emergency Planning Zone is currently based on probabilistic value. It is not incorrect per se, but addition of another criterion based on e.g. the radioactive mass inventory or the source term can be beneficial.
- The requirements on containment system are currently set just for the nuclear reactors with the minimum thermal power of 100MW. The requirement could be refined taking into account also the radioactive mass inventory or the source term and the expected use of the nuclear reactor.
- Refining of the requirements on the independent shutdown system – take into account also systems with high negative reactivity coefficients, refine classification requirements etc.

…and a lot of ideas how to refine the current requirements in the at the safety guides level.

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Thank you for your attention!