

5th MDEP Conference on new reactor design activities

International Co-operation: Past, Present and Future

24-25 April 2023 | Antalya, Türkiye



SUMMARY OF KEY MDEP ACTIVITIES FEEDBACK FROM MEMBERS AND FUTURE PROSPECTS

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 - TESH RPV&PC
 - TESH SA
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VVERWG GOALS



Leverage national regulatory resources by sharing information and experience on the regulatory safety design reviews of new VVERs

- Exchange experience on licensing process and design safety reviews, lessons learned, and design-related construction, commissioning and initial 2 year phase of operation experience
- Understand the differences in regulatory safety review approaches in each country to support potential use of other regulators while design safety evaluations

Provide input to MDEP working groups on potential topics of Regulators significant interest regarding the safety

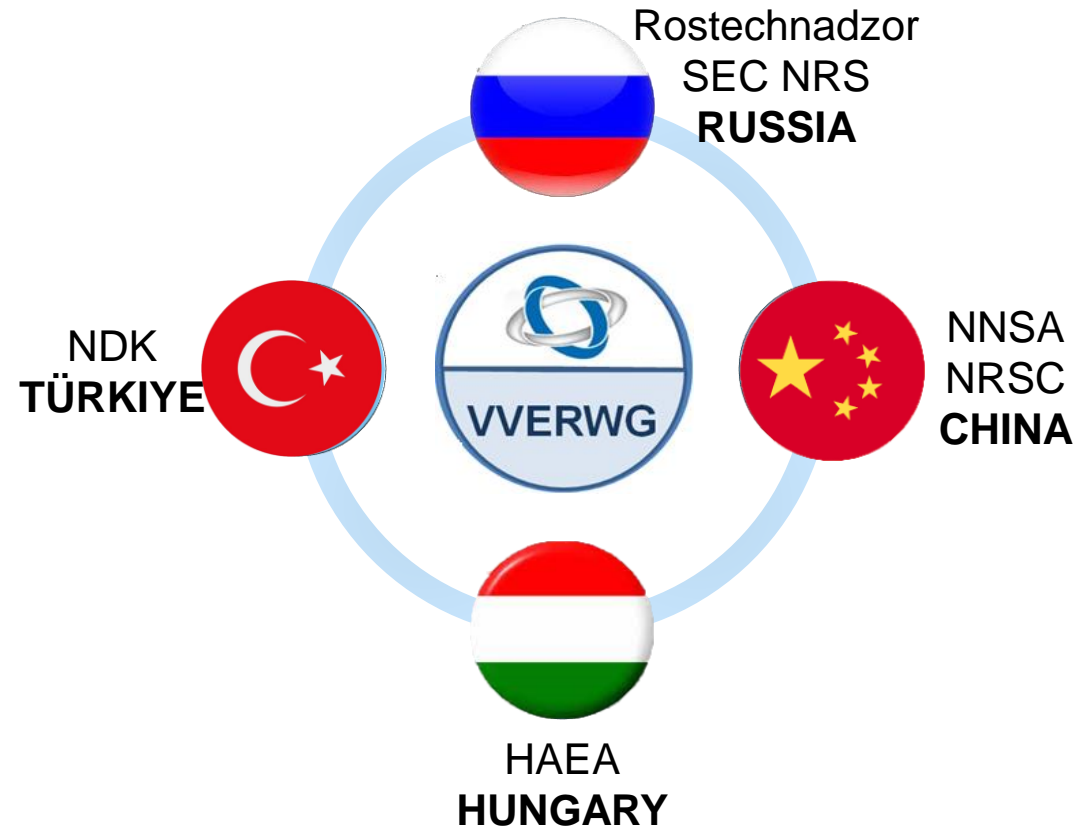
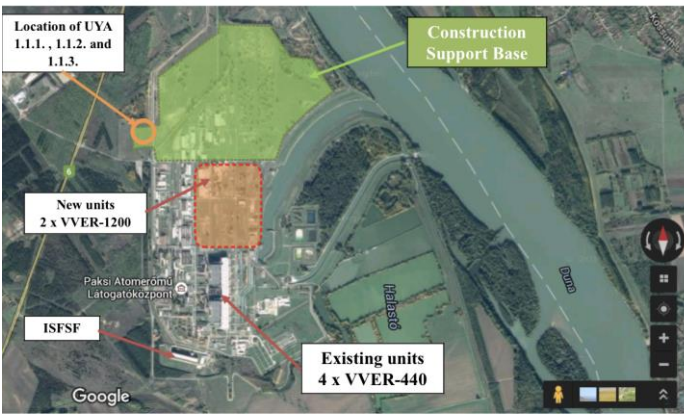
- Promote safety of new VVER designs through cooperation of Regulators and harmonization of regulatory practices
- Document common positions of MDEP members on design safety review aspects
- Communicate MDEP members' common positions to vendor and operators regarding the safety
- Use experience gained in learning about similarities and differences in regulatory requirements to identify potential paths forward to a safety benefit

VVERWG ACTIONS



- Regular meetings of main VVERWG and technical experts sub-groups
- Experience and information exchange on regulatory activities and approaches related to new VVER designs in each country
- Technical visits to new VVERs being under construction or commissioning
- Development of comparison table of differences in new VVER designs
- Joint assessment of safety related issues
- Interactions & meetings with design organizations to provide necessary information & data on design solutions significant to safety
- Elaboration of technical reports and Common Positions of VVERWG members

VVERWG MEMBERS



TECHNICAL EXPERT SUBGROUP ON REACTOR PRESSURE VESSEL & PRIMARY CIRCUIT

In 2019-22 - First Common Position of TESSG on RPV & PC on Topics:

- Application of Leak Before Break concept
- Radiation embrittlement of Reactor Pressure Vessel regarding use of new base materials including influence of Ni and Mn
- Pre- and in-service inspection of primary components (including hydrostatic pressure test)
- Design basis of primary components (loadings and their combinations)
- Protection against overpressure of primary circuit

TECHNICAL EXPERT SUBGROUP ON REACTOR PRESSURE VESSEL & PRIMARY CIRCUIT

Ongoing activities

Second Technical Report of TESG on RPV & PC on Topics:

- Evaluation of surveillance programme for justification of RPV integrity
- Qualification of a first of a kind (FOAK) component
- Qualification of non-destructive testing (NDT) and welding personnel and special processes



TECHNICAL EXPERT SUBGROUP ON SEVERE ACCIDENTS

In 2019-22 TEG SA developed:

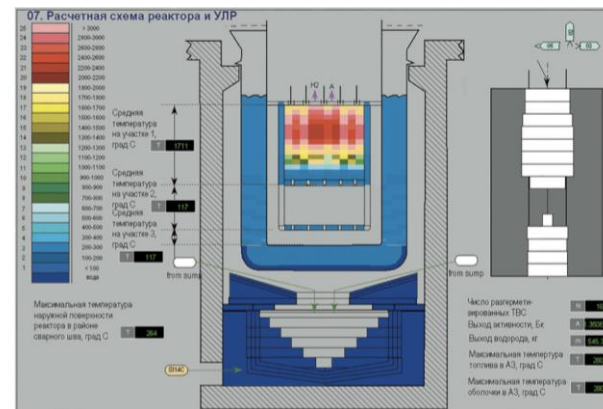
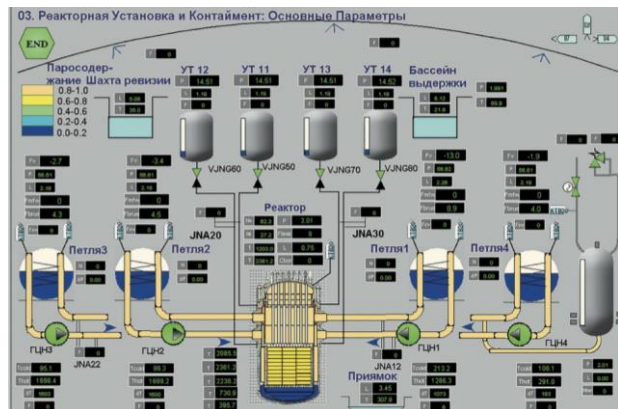
- TR-VVERWG-04: Core Catcher - description of the core catcher design, main functions and operational characteristics of the core catcher, auxiliary systems, regulatory requirements
- TR-VVERWG-05: Hydrogen Passive Autocatalytic recombiners (PAR) – analysis of national regulations related to PARs performance, safety classification of PARs, location of PARs inside the containment, CFD modeling to support PARs justification



TECHNICAL EXPERT SUBGROUP ON ACCIDENTS AND TRANSIENTS

In 2019-22 TEGS AT developed:

- TR-VVERWG-03: Regulatory approaches related to accidents and transients analyses – comparative analysis of national requirements for accident and transient analyses, computer codes used for modelling of accidents and transients; issues concerning safety demonstration of passive systems; approaches for regulatory review of safety analyses
- Report on Uncertainty analysis (approved on 20th VVER WG meeting, expected for publication in 2023) – national regulatory requirements and guidelines for Uncertainty Evaluations of Deterministic Safety Analysis; sources of uncertainty to be analyzed; methodologies to assess the uncertainties



ONGOING ACTIVITIES OF TESG SA & TESG AT

In 2022 both subgroups decided to combine their efforts. First joint meeting will be held on April 26th.

Ongoing activities:

- Regulatory review experience - report on review findings is planned to be presented to VVER WG in late 2023
- Long-term Heat Removal from the Containment –Technical Report

Development of new program plan based on the first joint meeting decisions

TECHNICAL EXPERT SUBGROUP FUKUSHIMA

- TESG FUKU is working on the “Fukushima Common Position” contains a description of the general approach to the safety assessment of nuclear power plant projects with VVER, taking into account the lessons of the accident at the Fukushima nuclear power plant.
- Group agreed on to starting activities with discussions about “How do national regulations interpret & approach to the important issues/definitions/terminologies of Vienna Declaration” and these are;
 - Implementation of DiD in general
 - Application of Design Extension Conditions
 - Practical Elimination & its demonstration
 - Early releases & long term off site contamination

WORKSHOP WITH THE INDUSTRY

Construction of New VVERs in VVERWG Member-Countries

- May 2018, Moscow, Russia:
 - Design and vendor organization on new VVER designs taking into account differences
 - VVERWG member-countries' industry organizations on national licensing experiences and challenges and enhancement of interaction between industry and VVERWG

- October 27-29, 2021 (teleconference):
 - Usage of PSA in the NPP design
 - Supply chain
 - Validation/verification of 'Fist-Of-A-Kind' equipment

- Next workshop: 2024
 - VVER-1200 Design differences issues
 - FOAK tests



VVERWG TECHNICAL VISITS



- May 2015 – Leningrad NPP-II (Russian Federation)
- May 2016 – Novovoronezh NPP-II (Russian Federation)



VVERWG TECHNICAL VISITS



- November 2016 – Tianwan NPP (China)
- November 2017 – Tianwan NPP (China)



VVERWG TECHNICAL VISITS



- May 2019 – Hanhikivi (Finland)
- October 2019 – Tianwan NPP (China)



BENEFITS FROM MDEP PRODUCTS FOR THE HUNGARIAN REGULATORY AUTHORITY

- Learned from other members' experiences during licensing period at:
 - Application of Leak before Break (LBB) conception
 - FOAK components
 - New Approaches at pre- and in-service inspections
 - Construction licensing.
- Getting acquaintance with new NP regulations
- Getting more familiar with the VVER 1200 technology, for example the core catcher
- Comparison of different national legislations
- Visits to different construction sites

BENEFITS FROM MDEP PRODUCTS FOR THE RUSSIAN REGULATORY AUTHORITY

MDEP Products used by Rostechnadzor and SEC NRS for updating national regulations and guides and in the review of safety analysis:

- CP on Fukushima-related issues ⇒ NP-006-16 Requirements for the content of VVER SAR
- CP on RPV and primary components ⇒ NP-104-18 Welding and surfacing of equipment and pipelines, NP-105-18 Control of Metal of Equipment and Pipelines, PNAE-7-002 Strength Calculation of equipment and pipelines, GOST R 58328-2018 Leak before break
- CP Addressing ex-vessel corium stabilization in core catcher ⇒ review of safety analysis of core catcher in VVER-1200
- TR on Uncertainty analysis ⇒ RB-166-20 Recommendations for uncertainty analysis
- Increased transparency and information sharing through joint workshops with industry stakeholders

BENEFITS FROM MDEP PRODUCTS FOR THE CHINESE REGULATORY AUTHORITY

- The VVERWG regularly updates the design comparison table, which helps NNSA understand the design improvements of VVER units in other member countries, and also lays a foundation for understanding the regulatory practices of other member countries.
- The common position and technical documents issued by VVERWG help NNSA understand the regulatory requirements and positions of other member countries. NSNA uses them as reference documents in its technical review of specific issues, which provides technical support for NNSA to establish regulatory positions.
- VVERWG is committed to strengthening the connection between regulators and the industry, and has held the second joint workshop. The technical exchange with industry, especially the Russian designer, has promoted to form a consensus among regulatory bodies, as well as providing convenient conditions for licensing and regulation in members.
- VVER AT TESHG regularly discusses the review findings of each member, with most common findings. By exchanging regulatory requirements and actions from members, it helps NNSA to enrich its perspective on this issue and reasonably determine regulatory actions.

BENEFITS FROM MDEP PRODUCTS FOR THE TURKISH REGULATORY AUTHORITY

- The comparison table which is a living document helps NDK to understand the design changes from the reference plant and the Akkuyu Design.
- The workshops gives the opportunity to learn the aspects and technical details of the VVER design and opportunity to contact with the industry.
- Information Exchange with the VVER licensing regulatory bodies is a strong tool for providing inputs to the new regulations of NDK.
- Subgroup reports and activities help NDK specialists to understand details of VVER design.

GENERAL FEEDBACK ON THE MDEP ACTIVITIES

- Focused on safety issues on particular reactor technology
- Collective review of safety by newcomers and experienced regulators
- Improved stakeholder engagement
- Support of efficiency and consistency in licensing procedures
- Enhanced safety standards and agreed evaluation criteria



Thank you