



Technical Meeting on Innovation, Advances and Developments in the Water Chemistry of Pressurized Water Reactors

22-26 April 2024

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The safe operation of Pressurized Water Reactors (PWR) and water-water energetic reactors (VVER) requires among others an appropriate and effective water chemistry programme. The purpose of the event is to share the latest insights on innovations, advances and, developments in the water chemistry programmes for primary, secondary and, auxiliary systems of PWR and VVER. Associated technological transformations – in areas such as simulation modelling, on-line/automated monitoring methods and techniques, digitalisation of processes – and, on-going research efforts where relevant will be also discussed.

Context

The main goals of a water chemistry programme are to contribute to the reactivity management, to minimize all forms of corrosion, to preserve the integrity of the fuel and, to reduce the build-up of radioactive material enabling. On the long-term perspective, excellence in water chemistry prevents unplanned and earlier-than-expected replacements of major plant components and, therefore, contributes to the control of operational expenses within the defined overall plant business plan. It is also an element of a Plant Life-cycle Management (PLiM) programme and a key ingredient to achieve safe and cost-effective operation of existing plants that had transitioned to Long-Term Operation (LTO).

Scope

Typical topics of interest for the event are as follows:

- Primary system water chemistry: advance on the use of enriched boron, advances on H₂ management for controlling reduction, developments in removing chemical compounds with low solubility (e.g. silica when zinc is injected), control of source terms, developments in controlling parameters and discharges in commissioning or when entering LTO or flexible operations, development in optimising chemistry for shutdowns and outages;
- Secondary system water chemistry: advances on changing pH control agents (e.g. ammonia to dimethylamine), advances on replacing reducing agent hydrazine and use of film-forming products, developments in optimising start-up chemistry incl. after steam generator replacement,

developments in chemical soft cleaning/lancing and use of dispersants, innovations in modelling such as use of digital twins;

- Auxiliary system water chemistry: innovation in biocidal dosing and developments in using biofilm growth detectors in cooling water systems, developments in Electro-Deionization (EDI), Reverse Osmose (RO) and nano-filtration in water treatment systems, advances on pH control and modelling in stator cooling systems;
- Advances in sampling, in measuring parameters (pH at high temperature, concentration of Li, B, metallic ions, corrosive impurities, etc.) and in modelling effects of corrosive impurities;
- Developments in On-Line Monitoring (OLM), digitalisation of processes and, Chemistry Information Systems, including innovative use of Artificial Intelligence and Pattern Recognition methods for water chemistry programmes.

Target Audience

Station chemists and experts from nuclear power plants, operating organisations and, technical support organisations with PWR and VVER from all around the world.

Expected Outputs

- Shared presentation materials on innovations, advances, new developments, on-going research efforts and technological transformations in the water chemistry of primary, secondary and, auxiliary systems of PWR and VVER in the participating Member States.
- Suggested technical conclusions and, generic lessons to be incorporated in the draft IAEA TECDOC publication on *“Innovation, Advances and Developments in the Water Chemistry of Pressurized Water Reactors”*.