

OECD/NEA Workshop<sup>1</sup> on  
**Innovations in Water-cooled Reactor Technologies**

Tentative dates: 11-12 February 2015,  
OECD/NEA Headquarters, Issy-les-Moulineaux

### OBJECTIVES AND SCOPE

The OECD/NEA is planning to publish in 2015 a short report describing evolutions in design of water-cooled reactors (addressing both light water and heavy water-cooled reactor technologies) focussing in particular on innovations that have brought improvements in safety and performance. To gather input from utilities, vendors, as well as technical safety organisations and regulators, a two-day workshop is being organised at the NEA on 11-12 February 2015 (tentative dates).

New technologies and solutions have been developed over more than thirty years to improve the safety, performance and economics of nuclear power plants. Particular efforts were made in designing systems to prevent or mitigate nuclear accidents and, greatly limit or even avoid any off-site release of radioactivity. Reactor designs developed in the 1980s and later are often referred to as Generation III (Gen III) reactors. They offer enhanced safety compared to earlier Generation II (Gen II) designs, as well as improved performance and economics.

Examples of Gen III safety design features include solutions for corium localisation, advanced containment structures, improved emergency core-cooling systems, filtered venting systems, hydrogen risk management solutions, etc. Some of these solutions have also been back-fitted or partially adapted to existing reactors, based on recommendations from regulators or modernisation efforts by the utilities operating these reactors, to bring their level of safety to levels approaching those of the more modern designs. Other innovations found in the latest water-cooled reactor designs include the use of passive safety systems, and often associated with those, a simplification in the design of the reactor.

Gen III reactors also feature better economics, for example increased design lifetime up to 60 years, ability to use 100% MOX fuel and operate with higher flexibility, higher thermal efficiencies and reduced staff requirements. Modularity is often quoted as a feature of some Gen III designs as a way of reducing the construction times and simplifying the decommissioning of the plant.

The scope of the Workshop includes, *inter alia*:

- Evolution of regulatory and design requirements for commercial water-cooled reactors;
- Innovations in water-cooled reactor technologies that allowed significant improvement in the level of safety, with a discussion on advantages and challenges of active vs. passive safety systems;
- Advantages that Gen III reactors have over previous designs in terms of economics, fuel utilisation, thermal efficiency, etc;
- Operational issues of nuclear power plants in future low carbon energy systems with high shares of variable renewables, and issues posed by climate change (e.g. water scarcity, increased air and water temperatures, extreme weather events).
- Standardisation, modularisation and constructability issues and challenges;
- A discussion of key differences between Gen II and Gen III designs, and possibilities of back-fitting Generation II reactors with new technologies, as part of a Long Term Operation strategy.

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<sup>1</sup> The workshop will gather about 30-40 experts, by invitation only. Contact details: Dr. Henri Paillère, [henri.paillere@oecd.org](mailto:henri.paillere@oecd.org), +33 1 45 24 10 67

## DRAFT AGENDA

### Day I (11 February 2015): Requirements and regulation

- Introduction to the workshop. Objectives.

#### Session I-1: Utility safety and performance requirements

- Discussion on EPRI Utility Requirement documents, European Utility requirements (EUR) and their evolution in time.

#### Session I-2: Regulatory aspects

- Evolution of regulatory requirements (historical perspective, feedback from nuclear accidents)

#### Session I-3: Round table discussion

- Role of innovation and design in coping with severe accident initiators
- Nuclear power operation and safety challenges in future energy systems (load following, flexibility, smart grids, climate change)
- Incorporating advanced solutions in existing Gen II reactors (safety upgrades and long-term operation)

### Day II (12 February 2015): Vendor and utility perspectives

#### Session II-1 Utilities

- Nuclear operators from Europe, North America, Russia and Asia will be invited to discuss their views on innovations in advanced reactor designs, as well as modernisation of existing nuclear power plants.

#### Session II-2 Vendor perspectives

- Vendors will be invited to discuss innovations in reactor and fuel designs to address improved safety and economics. The discussion will essentially address Gen III designs but also specific innovative features of Small Modular Reactors based on light water reactor technology.

#### Session II-3 Research organisation perspectives

- In this session, research organisations including Technical Safety Organisations supporting regulators will discuss long-term developments that could lead to innovations for future advanced water-cooled reactors and their fuel cycle (e.g. accident-tolerant fuels).

#### Session II-4 Round table discussion and conclusion of the workshop

- Future evolution of water reactor technologies in the 21<sup>st</sup> century; Gen III vs. Gen IV reactors
- Innovations that might be game-changers for the nuclear power sector vs. other generation technologies, R&D needs.