

Contribution ID: 85

Canadian Association of Physicists

Association canadienne des physiciens et physiciens

Type: Invited Speaker / Conférencier(ère) invité(e)

Advanced Fission Reactors in Canada

Wednesday 11 June 2025 14:45 (30 minutes)

A number of reactor designs are under consideration in Canada for pre-licensing/licensing by the Canadian Nuclear Safety Commission. Although these reactors build on concepts that were adopted during the early era of nuclear power, they are advanced by introducing features to overcome the cost overruns and delays typically associated with nuclear power plant constructions. Inherent and passive aspects are also introduced to enhance safety and reliability. To reduce financial risk and to accommodate districts with modest power needs, small reactor modules, with power of 300 MW(e) or less, are favoured. Microreactors (of about 10 MW(e) or equivalent) are designed to be self-regulating so that they can be used in remote and isolated communities and in industrial outlets without refuelling for a decade or more. There is still however interest in reactors with power in the GW(e) range to take advantage of the economy of scale. Reactors that can burn spent nuclear fuel and/or breed fissile materials are also reemerging to reduce nuclear waste and sustain the nuclear fuel cycle, while high-temperature reactors are contemplated to raise thermal efficiency and meet industrial process heat demands. Whatever the size or type, modularity is advocated as an approach to reduce construction costs and duration.

This presentation reviews the reactor designs under consideration in Canada; in terms of the novel features that help meet the goals set by the Generation IV Forum. These goals focus on supporting enhanced sustainability, improved economics, excelled safety and reliability, ensured proliferation resistance, and increased physical protection. The various concepts of modularity will also be explored, showing that modularity in reactors is best achieved by design intensification/integration to provide compact modules or in the design of auxiliary systems outside the nuclear island, and via modular fabrication and construction.

Keyword-1

Nuclear Reactors

Keyword-2

Fission

Keyword-3

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Session Classification: (DNP) W2-6 Multiple Facets of Nuclear Science : Isotopes in Environment | Les multiples facettes de la science nucléaire : Isotopes dans l'environnement (DPN) **Track Classification:** Symposia Day (Wed June 11) / Journée de symposiums (Mercredi 11 juin): Symposia Day (DNP - DPN) - Multiple Facets of Nuclear Science