

# Experimental Program to Address Knowledge Gaps in Phenomena Related to Severe Accident Source Terms in Small Modular Reactors

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## Objectives

Investigate phenomena relevant to severe accidents High Temperature Gas-cooled Reactor (HTGR) and Integral Pressurized Water-cooled Reactor (iPWR) type SMRs:

- Initiation of bulk natural circulation of air in an air ingress accident, affecting graphite oxidation in HTGRs
- Fission product aerosol behaviours in small waterimmersed containments with strong condensation effects

## Federal Stakeholders

- Natural Resources Canada (NRCan)
- Canadian Nuclear Safety Commission (CNSC)

## HTGR Air Ingress Experiment Previously:

- Prepared technical specifications document for experiment measuring air ingress into HTGR primary vessel
- Completed conceptual design of High Temperature Air Ingress Facility (HTAIF)

## Progress in FY:

- Detailed Engineering design initiated and in-progress
- Commenced bulk material procurement

## Future work:

- Material procurement, construction and commissioning
- First test campaign, after scheduled construction completion

## Expected outcomes:

- Experimental data on the timing of initiation of bulk natural circulation of air in a scaled (full-height) HTGR vessel. Data will be needed to benchmark model predictions of air ingress and graphite oxidation in HTGR severe accident analysis.

## iPWR Aerosol Behavior Modelling and Experiment Previously:

- Prepared test plan for measuring aerosol behavior in iPWR containment conditions
- Created preliminary MELCOR model of generic iPWR
- Detailed design of the Strong Condensation Containment Apparatus (SCCA)

## Progress in FY:

- Created MAAP-CANDU model of US DOE/EPRI iPWR aerosol experiments for benchmarking
- Construction and commissioning of experimental apparatus

#### Future Work:

- First test campaign of aerosol behavior using the SCCA

#### Expected outcomes:

- Data on fission product aerosol behaviours in iPWR containment conditions. Data will be used to evaluate high source term retention predictions in iPWR accident analysis

### Canadian Leadership in SMRs

#### Previously:

- Technical program chair for G4SR-1 conference

#### Progress in FY:

- SMR track chair at Canadian Nuclear Society conference • Participated in US DOE workshop on Licensing Base Events for Molten Salt Reactors
- Coordination meeting for IAEA Collaborative Research Project (CRP) on SMR Emergency Planning Zones (EPZs)

#### Future work:

- Technical program chair for G4SR-2 conference

### Collaborations

- IAEA CRP on technical basis for SMR EPZs
- US-Canada Action Plan