



# Nuclear Developments in Canada: UNENE Perspective

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# Nuclear in Canada: UNENE Perspective

## Agenda:

- Background to UNENE .... how we view things
  - Nuclear Environment in Canada
    - Nuclear Activities in Canada
      - University roles
        - Issues – key agenda items looking ahead



# UNENE Background

UNENE is a not-for-profit partnership between industry, universities and government, formed in 2002 to address industry gaps in staff development, R&D coordination, and knowledge management:

- Supply of Highly Qualified Personnel (HQP)
- Support, fund and direct nuclear research and education in universities to address industry needs
- Coordinate and facilitate information exchange to enable universities and industry to collaborate
- Create respected pool of university-based expertise for independent advice





UNENE  
University Network of  
Excellence in Nuclear  
Engineering

# UNENE MISSION



Harness the strength of the UNENE network to ***fund*** and ***advance*** nuclear knowledge, build capacity and heighten visibility of Canada's excellence as a global partner in nuclear science & technology



# Members

## INDUSTRY

Canadian Nuclear Labs (CNL) (*formerly part of AECL-CRL*)

Bruce Power

Ontario Power Generation (OPG)

Canadian Nuclear Safety Commission (CNSC)

CANDU Owners Group (COG)

Nuclear Waste Management Org. (NWMO)

Kinectrics

SNC-Lavalin-Nuclear (*formerly Candu Energy Inc / part of AECL*)

## UNIVERSITIES

McMaster University

Queen's University

Ontario Tech (University of Ontario Institute of Technology)

University of Saskatchewan

University of Toronto

University of Waterloo

University of Western Ontario

Ecole Polytechnique

University of New Brunswick

Royal Military College

University of Guelph

University of Windsor

University of Regina

University of Manitoba

Polytechnica University of Bucharest

University of Cordoba



- ***Foundational national challenge*** – net-zero by 2050
  - Government commitment – but how will we get there?
  - Split responsibilities between federal, provincial governments, industry
- Recent industrial focus: *operating fleet* and life-extension
- Moving quickly to a *forward-looking agenda*, with a focus on SMR development and deployment
  - Individual projects and initiatives so far
- *Nuclear agenda* has broadened – new attention to fuel cycle and waste strategy, decommissioning and remediation, additional nuclear services (e.g. isotopes)
- *Who is involved*: Governments; key utilities (OPG, Bruce Power, NB Power, new entrants), technology vendors, R&D, universities, local communities.....
- *The next frontier* – a particular Canadian interest in vSMRs for remote communities and industry





- Life extension of current CANDU fleet – OPG, Bruce Power
- Additions to isotope production – increased as by-product of power generation
- Progressing used fuel management – retrievable long-term disposal is reference – recycling option ?
- SMR Technology Development and Deployment
- SMR projects:
  - Grid-scale projects by OPG (Darlington first BWRX-300 announced); Saskatchewan Power (replicate BWRX-300)
  - Prototype HTGR (Ultra-Safe Nuclear plus OPG, located at Chalk River National Lab site)
  - Development: MOLTEX, Terrestrial Energy
  - Application: GE-H; X-Energy; Westinghouse: NuScale; Starcore; etc





- **Education:**
  - UNENE and colleague universities represent long history of nuclear E&T-- nuclear courses at several universities
  - Ontario Tech provides largest program including B.Eng (Nuclear) and M.Eng programs
  - UNENE works with 5 universities to deliver part-time continuing education M.Eng (nuclear) for young professionals in employment
- **Facilities and programs:**
  - UNENE universities operate Canada's main research reactor (5MW Reactor at McMaster) and world class accelerator, materials testing, microscopy facilities
  - UNENE members support 8 research chair programs that provide a foundation for additional chair programs and individual research projects
- Universities work in cooperation with research institutes, utilities, vendors to define and develop programs







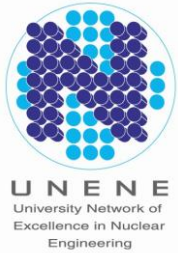
# Current research activities: UNENE Research Chair Programs

<b>RC Title</b>	<b>Location</b>	<b>Holder(s)</b>
<b>Nuclear Materials</b>	Queen's University	M. Daymond
<b>Nuclear Safety/ Advanced Thermalhydraulics</b>	McMaster University	J. Luxat/ D.Novog
<b>Control Instrumentation and Electrical Systems</b>	University of Western Ontario	J. Jiang
<b>Corrosion Studies, Material Performance in Nuclear Systems</b>	University of Toronto	R. Newman
<b>Risk and Reliability based Life Cycle Management</b>	University of Waterloo	M. Pandey
<b>Radiation Physics and Environmental Safety</b>	University of Ontario Institute of Technology	A. Waker / E.Waller
<b>Radiation induced Corrosion</b>	Western University	C. Wren (IRC)
<b>High Temperature Aqueous Solutions</b>	University of Guelph	P. Tremaine



- Evolving nuclear universities role:
  - Pursuing foundational research for SMRs
    - Individual programs funded by vendors, utilities, UNENE consortium, supply chain
  - Orienting training programs to broader scope beyond current fleet
    - UNENE starting work with industry on a needs assessment
  - Increasing collaboration across boundaries
    - Connecting engineering and science studies to social science, and community outreach
    - Looking at international collaboration in R&D and education – first IAEA Nuclear Energy Management School in Canada May 2022 – international UNENE members

# Issues – what is front of mind....



- Meeting the scale of the net-zero challenge
  - Accelerating past the R&D stage
  - Training a new cohort of nuclear professionals
    - Beyond traditional academic structure –
    - on-line learning, micro-credentials
  - How should Canadian universities connect world-wide?
- *Building a joined-up program*
  - Currently SMR, fuel cycle, new build programs are fragmented
  - How to mobilize consistent government support
- *Universities as a credible, respected voice*
  - Canada still early in the clean energy conversation





UNENE focus - driven by government and industry stakeholders' interests, and network of university research and education work.

UNENE connects these worlds, providing a line of vision across the network to help align societal goals, industry work and academic research and education.



**Thank You ! Questions ?**