



# CNS UPDATE

## MESSAGE FROM THE PRESIDENT



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This is Issue 3 of the CNS UPDATES NEWSLETTER. It summarizes the CNS Covid Recovery Task Force initiatives and updates, and reports some very exciting and positive developments on SMRs regarding regulatory approval of NuScale Power by USNRC and Government of Canada funding of Terrestrial Energy's IMSR® along with agreement for its joint review by CNSC and USNRC.

We just had a very successful Symposium on AI, ML and Innovating Technologies and look forward to the upcoming G4SR Virtual Summit and Webinars, as well as courses on CANDU Technology, Nuclear Chemistry and the Nuclear for Everyone webinars series.

On account of the resignation of Dr. Derek Lister, 2nd VP, for family reasons, CNS is currently conducting an election to fill this vacant Executive position. We have appointed a CNS website reform task force under the leadership of Arthur Situm to provide recommendations to modernize and make the CNS website more user friendly, appealing and intuitive.

Upon receiving the invitation from the International Association of Structural Mechanics in Reactor Technology (IASMiRT), CNS and CNSC are jointly making a Canadian proposal to hold the SMiRT 28 conference in 2025 in Canada.

CNS needs your continued support to fulfill its vision and mandate. I urge you to join CNS and renew your membership by visiting [www.cns-snc.ca](http://www.cns-snc.ca), which also contains more information about CNS activities, available vacancies and opportunities.

### Annual CNS Conference 2021 Will Be Online

The Conference Organizing Committee has now decided that the CNS Annual Conference in 2021 will be fully online, in the timeframe 2021 June 6-9.

Stay tuned!

### CNS POST-COVID-19

The following summarizes the various initiatives of the Task Force.

- Obtained Licence for Cisco WebEx software for CNS
- Various CNS Divisions planned and are organizing CNS virtual events:
  - Virtual Symposium on AI, ML, Big Data Analysis and Innovative Technologies in Nuclear
  - G4SR Virtual Summit and associated webinars
- CNS courses
  - CANDU Nuclear Technology
  - CANDU Chemistry
  - Nuclear-for-Everyone webinar series
- A Task Force has been formed under the Education Committee is to:
  - recommend enhancements of CNS existing courses and plan new ones, in collaboration with UNENE and other organizations
  - review and recommend fair honoraria for CNS course instructors
- A committee has been struck on reformation of the CNS website to modernize it, make it more user friendly, intuitive, searchable and appealing. This committee is chaired by Arthur Situm. Arthur has conducted a survey of the membership to obtain feedback and has reported the progress of his committee to the CNS Executive.

### PROPOSAL FOR SMIRT 28 CONFERENCE IN CANADA IN 2025

On the invitation of the International Association of Structural Mechanics in Nuclear Technology (IASMiRT), we are very excited to make a joint CNS- CNSC proposal to bring the SMiRT 28 conference to Canada in 2025. The successful SMiRT 19 conference was held in Toronto in 2007. For the preparation of the proposal, which is due in spring 2021, a Team Canada consisting of people experienced in international conference organization has been assembled.

## NuScale SMR Receives USNRC Approval

(Credit: Article from Engineering New Record, 2020-08-30)

- The U.S. Nuclear Regulatory Commission has approved the first small modular reactor (SMR) design, a milestone that nuclear energy advocates say could revive the nation's languishing nuclear sector.
- The NRC announced Aug. 28 it had issued the final safety evaluation report for an SMR design developed by NuScale Power, based in Portland, Ore. The report marks the final phase of the technical review of the safety aspects of NuScale's design. The design approval does not grant permission to build and operate a nuclear reactor, however. That will require a separate application for a combined license (COL) to build and operate a nuclear power plant. But it is an important step that will allow a utility to reference NuScale's design when applying for a COL.
- Marc Nichol, senior director of new reactors at the Nuclear Energy Institute, called the approval of NuScale's design a "monumental milestone" for the nuclear industry. "NuScale's design approval, the first of its kind, brings the country closer to meeting its clean energy goals and making electricity more accessible for all."
- NuScale applied for certification of its SMR design for use in the United States in late December 2016. The design uses natural passive processes including convection and gravity in its operating systems and safety features. The SMR's 12 modules in the reference design, each of which produces 50 MW, are submerged in a pool built below ground level.
- The NRC says it concluded, based on its technical review, that the designs' passive features would ensure that a nuclear powerplant would shut down safely and remain safe under emergency conditions.
- NuScale spent more than \$500 million, with the backing of Fluor Corp.—a majority owner—and more than two million labor hours to develop the information needed to prepare the design application. NuScale's has received more than \$266 million of cost-sharing assistance from Congress since 2013 to accelerate the firm's design and certification.

### Another Step Toward Demonstration Project

NuScale already has a demonstration project in the works. In 2015, the Dept. of Energy awarded NuScale \$16.6 million in cost-sharing funding for the preparation of a combined license application to build a 12-module, 720 MW powerplant within the Idaho National Laboratory site in Idaho Falls, Idaho for the Utah Associated Municipal Power Systems, a consortium of public power entities. The NRC's approval of Ncale's design is another step in the project's advancement.

The first module is expected to be operational in Idaho by mid-2029, with the remaining 11 modules to come online a year later.

# GOVERNMENT OF CANADA INVESTS IN INNOVATIVE SMALL MODULAR REACTOR TECHNOLOGY

**From: Innovation, Science and Economic Development Canada**

## **News Release**

As a global leader in nuclear energy and nuclear safety, Canada is poised to be a leader in the safe and responsible development of small modular reactor (SMR) technology.

Strategic Innovation Fund investment will help develop cleaner, safer small nuclear reactor technology - October 15, 2020 – Oakville, Ontario

As a global leader in nuclear energy and nuclear safety, Canada is poised to be a leader in the safe and responsible development of small modular reactor (SMR) technology. SMRs are expected to play a key role in Canada's efforts to achieve net-zero greenhouse gas emissions by 2050 and in providing economic benefits as we emerge from the COVID-19 pandemic.

The Honourable Navdeep Bains, Minister of Innovation, Science and Industry, today announced a \$20 million investment that will enable an innovative Ontario technology company to take a critical step toward commercializing its cutting-edge SMR technology, creating significant environmental and economic benefits for Canada.

The investment will help Oakville's Terrestrial Energy complete a key pre-licensing milestone through the Canadian Nuclear Safety Commission to assess the acceptability of the Generation IV technology that the company is developing as part of its \$68.9 million Integral Molten Salt Reactor project, which will provide affordable energy for utilities and industry.

As part of the investment, the company has committed to creating and maintaining 186 jobs and creating 52 co-op positions nationally.

In addition, Terrestrial is spending at least another \$91.5 million in research and development. Throughout the two-and-a-half-year project, Terrestrial will engage with Canada's world-class nuclear supply chain, potentially creating over a thousand jobs nationally. It will also undertake gender equity and diversity initiatives, including increasing female representation in STEM fields.

This project supports the Government of Canada's Innovation and Skills Plan by building a highly skilled workforce and advancing research in new foundational technology—a key component for future economic growth and innovation. It also supports Canada's SMR Roadmap, which outlines a long-term vision for the development and deployment of this technology in Canada and the world.

SMRs are being designed at a range of scales, with the potential to replace conventional coal and fossil generation and help remote sites move off diesel with a non-emitting source of energy. They also have the potential to create new markets for nuclear energy, such as resource extraction, replace the use of fossil fuels in heavy industrial applications and increase the competitiveness of some of Canada's most important industrial sectors.

## Quotes

“The Government of Canada supports the use of this innovative technology to help deliver cleaner energy sources and build on Canada’s global leadership in SMRs. By helping to bring these small reactors to market, we are supporting significant environmental and economic benefits, including generating energy with reduced emissions, highly skilled job creation and Canadian intellectual property development.”

– The Honourable Navdeep Bains, Minister of Innovation, Science and Industry

“SMRs are a game-changing technology with the potential to play a critical role in fighting climate change and rebuilding our post COVID-19 economy.”

– The Honourable Seamus O’Regan, Minister of Natural Resources

“The Government of Canada is progressing with clear purpose to national deployment of SMRs, and it recognizes the great industrial and environmental rewards from nuclear innovation today. We thank ministers Bains and O’Regan for their vision, leadership and partnership as we advance our program to deliver affordable and cost-competitive nuclear energy to Canadian industry and households using Generation IV reactor innovation.”

– Simon Irish, Chief Executive Officer, Terrestrial Energy

## Quick Facts

- Terrestrial Energy is a Canadian industry-leading Generation IV nuclear technology company committed to delivering reliable, safe, emission-free and cost-competitive energy with a truly innovative advanced reactor design of the Generation IV class.
- The contribution is being made through the Strategic Innovation Fund, a program designed to attract and support high-quality business investments across all sectors of the economy.
- In addition to the Strategic Innovation Fund, there are hundreds of programs and services to help businesses innovate, create jobs and grow Canada’s economy. With its simple, story-based user interface, the Innovation Canada platform can match businesses with the most fitting programs and services in about two minutes.

This report by The Canadian Press was first published Oct. 15, 2020.

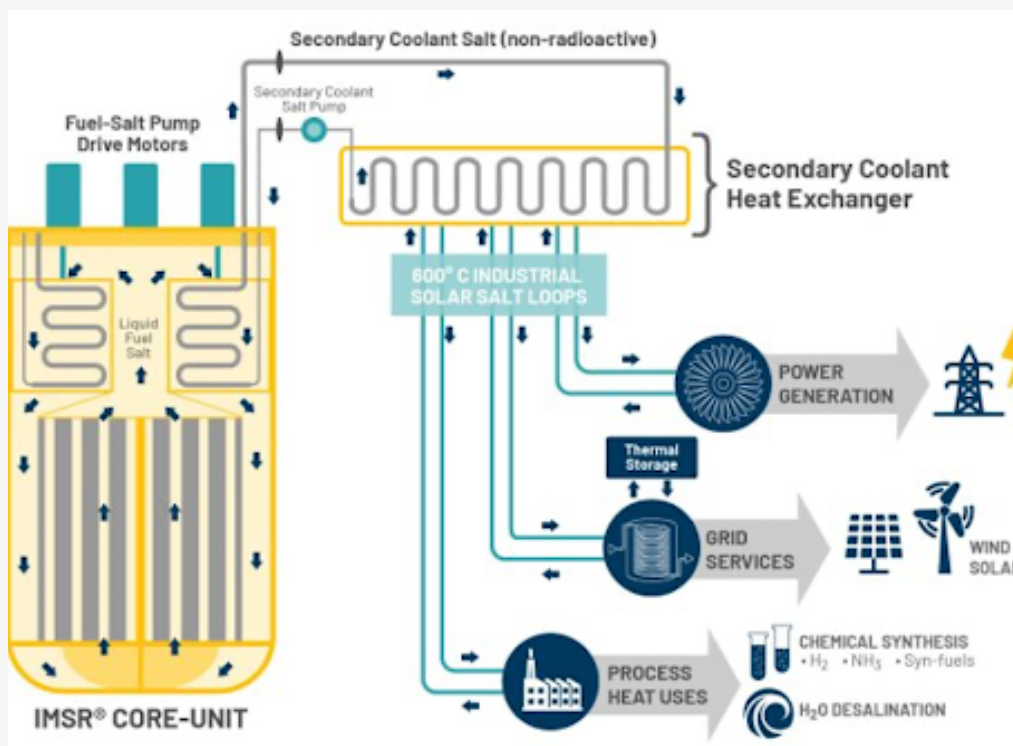
Mia Rabson, The Canadian Press

# TERRESTRIAL ENERGY'S IMSR TO GET JOINT REVIEW BY CNSC AND NRC

Posted on December 29, 2019 by djysrv

The Canadian Nuclear Safety Commission (CNSC) and the United States Nuclear Regulatory Commission (NRC) have selected Terrestrial Energy's Integral Molten Salt Reactor (IMSR®) for the first joint technical review of an advanced, non-light water nuclear reactor technology.

The selection of Terrestrial Energy's IMSR® for joint technical review follows the August 2019 Memorandum of Cooperation (MOC) between the CNSC and the NRC that further expands the agencies' cooperation on activities associated with advanced reactor and SMR technologies. The MOC's collaborative technical reviews are intended to increase regulatory effectiveness as well as reaffirm the agencies' commitment to safety and security.



Terrestrial Energy's IMSR® is an advanced reactor employing Generation IV molten salt technology with a power output of 195 MWe. It is currently the subject of regulatory engagement in both Canada and the United States.

IMSR® submissions to the CNSC for Phase 2 of the Vendor Design Review (VDR) process commenced in December 2018; the IMSR® is the only advanced reactor in Phase 2 of that process. Since February, the IMSR® has been the subject of NRC pre-licensing activities supported by grant funding from the U.S. Department of Energy.

The CEO of Terrestrial Energy, Simon Irish, said: “We look forward to participating in joint CNSC and NRC reviews of IMSR® advanced reactor technology and to support the goals set by the agencies in the August Memorandum of Cooperation.”

The CNSC-NRC Memorandum of Cooperation is intended to expand the cooperation provisions of the 2017 MOU between the two agencies to include activities associated with advanced reactor and SMR technologies, and to further strengthen the agencies’ commitment to share best practices and experience through joint reviews of advanced reactor and SMR technology designs. (CNSC statement) (NRC statement)

### **About Terrestrial Energy**

Terrestrial Energy is a developer of Generation IV advanced nuclear power plants that use its proprietary Integral Molten Salt Reactor (IMSR®) technology. IMSR® power plants will provide zero-carbon, reliable, dispatchable, cost-competitive electric power and high-grade industrial heat for use in many industrial applications, such as chemical synthesis and desalination, and in so doing extend the application of nuclear energy far beyond electric power markets.

They have the potential to make important contributions to industrial competitiveness, energy security, and economic growth. Their deployment will support rapid global decarbonization of the primary energy system by displacing fossil fuel combustion across a broad spectrum.

The IMSR integrates the primary reactor components, including primary heat exchangers to secondary clean salt circuit, in a sealed and replaceable core vessel that has a projected life of seven years. It will operate at 600-700°C, which can support many industrial process heat applications. The moderator is graphite.

The fuel-salt is a eutectic fluoride with low-enriched uranium fuel (UF<sub>4</sub>) at atmospheric pressure. Emergency cooling and residual heat removal are passive. Each plant would have space for two reactors, allowing 7-year changeover, with the used unit removed for off-site reprocessing when it has cooled and fission products have decayed. Compared with other MSR designs, the company deliberately avoids using thorium-based fuels or any form of breeding, due to “their additional technical and regulatory complexities.”

Terrestrial Energy is engaged with regulators and industrial partners to complete IMSR® engineering and to commission first IMSR® power plants in the late 2020s.

# University of Calgary Shares "A Blog about Energy Issues"

This is the video series of talks put together by the [University of Calgary's](#) Professor [Jason Donev](#) (CNS member) for [Tyche Books](#), the [Canadian Nuclear Society](#), [International Nuclear Science Week](#) and [Energy Education](#)

## **[Day 1 - The Power of Science Fiction Stories](#)**

Human imagination is a powerful tool. On one extreme, this imagination creates stories to help us understand our world and our place in it. On another extreme, imagination explores the universe and applies those discoveries into technology. Science fiction stories synthesize these two extremes of human imagination to help people find their place in a world with rapidly changing technology.

This is the first video in a series of talks put together by the University of Calgary's Professor Jason Donev for Tyche Books, the Canadian Nuclear Society, International Nuclear Science Week and Energy Education.

## **[Day 2 - New Tools Creating a Brave New World](#)**

The world's technology has changed in shocking ways over the past 150 years. Despite how unexpected these developments were, various writers predicted these shocking technologies like Skype, nuclear reactors and atmospheric breaking. Some technologies even get their names and designs from science fiction stories.

This is the second video in a series of talks put together by the University of Calgary's Professor Jason Donev for Tyche Books, the Canadian Nuclear Society, International Nuclear Science Week and Energy Education.

## **[Day 3 - Computers and Robots](#)**

From Talus in Greek mythology to Rossum's Universal Robots, from fake chess-playing machines to unbeatable computers, human imagination has always included artificial humans and artificial thinking. The world has shifted from a time when 'calculator' was a person who calculates, to devices that we have on our phones. This lecture explores some of the most surprising predictions to have come true in all of science fiction!

This is the third video in a series of talks put together by the University of Calgary's Professor Jason Donev for Tyche Books, the Canadian Nuclear Society and International Nuclear Science Week and Energy Education.

## **[Day 4 - Human Identity](#)**

Science fiction grapples with questions of identity when our genetic information changes. Laboratories explore the connection between radiation and DNA, but popular views of this connection come from comic books!

This is the fourth video in a series of talks put together by the University of Calgary's Professor Jason Donev for Tyche Books, the Canadian Nuclear Society, International Nuclear Science Week and Energy Education.

## **[Day 5 - Great Power and Great Responsibility](#)**

Technology changes what we are capable of doing. Science fiction allows us to decide who we want to be with this new power. This video explores the power of nuclear science and technology, but also looks at how stories have shaped this conversation, and will continue to.

This is the fifth and final video in a series of talks put together by the University of Calgary's Professor Jason Donev for Tyche Books, the Canadian Nuclear Society, International Nuclear Science Week and Energy Education.



## CNS held a very successful 1st International Symposium on AI, ML, Big Data Analytics and Innovation in Nuclear



CNS has successfully organized the 1st international Symposium on AI, ML, Big Data Analytics and Innovation in Nuclear. The theme of the symposium was “AI and ML for a Brighter Future for the Nuclear industry”. Industry leaders exchanged their vision and progress on innovation, especially in the field of data analytics, AI and ML. We were pleasantly surprised by the amount of advances that our industry has made in this area.

The Symposium attracted 13 virtual exhibit booths, close to 200 registrants, 12 plenary sessions and 30 technical presentations.

This was CNS's first major event that was run completely virtually, and feedback from participants and exhibitors shows that this was indeed a very successful CNS event.



# UPCOMING CNS EVENTS

GENERATION IV &  
**G4SR-2**  
SMALL MODULAR REACTORS

**VIRTUAL SUMMIT - Nov.18-19, 2020**

Canadian Nuclear Laboratories | GAIN | GOV.UK | INL | CANDU Owners Group Inc. | CCG | EPRI | ELECTRIC POWER RESEARCH INSTITUTE | IAEA | NATIONAL NUCLEAR LABORATORY

## Enabling Early Movers in SMR Deployment

**Nov. 18, 2020 (Wed): Canada : Government Support and SMR Actions**

**Free Morning Session: Government Support for SMR Action Plan**

### **REGISTRATION REQUIRED.**

- NRCan Minister O'Regan's Launch of Canadian SMR Actions Plan
- Speech from Indigenous Leader
- Speech from nuclear young entrepreneur
- Provincial Ministers Panel -SMR Collaboration as per Memorandum of Understanding (MOU) on SMR for Ontario, New Brunswick, Saskatchewan and Alberta

**Paid Registration to watch all sessions live or on demand**

Keynote Speaker : Shannon Quinn, VP, Science, Technology and Commercial Oversight, Atomic Energy of Canada Limited (AECL)

**Nov. 18 Afternoon:****Plenary Session 1: SMR Actionable Principle #1 Support the development and deployment of SMRs in Canada, with first units in operation by the late 2020s****Theme :** Advancing SMR Deployment in Canada**Session #1** - Advancing SMR Demonstration, Deployment and Research Innovation in Canada**Keynote Speaker** - Rumina Velshi, President and CEO of Canadian Nuclear Safety Commission (CNSC)**Session #2: Strategies to minimize and potentially recycle nuclear waste - Advanced SMRs in New Brunswick**

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**Nov. 19, 2020 morning:****Working with International Partners As Early Movers Enablers in SMR Deployment****Theme:** SMR Actionable Principle #3 : work together to engage with international partners to seize export opportunities and influence international standards

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**Three Keynote Addresses on Working with International Partners on SMR Deployment**  
Invited Keynote Plenary Speakers include prominent nuclear energy leaders from EU, UK and US

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**Nov. 19 Afternoon Plenary Session #3:****Enabling Advanced Nuclear Technology Deployment in the United States**

The US track is focused on initiatives and activities built on the enabling side of US Advanced Reactors Development.

**Plenary Speakers include**

- **Advanced Reactor Demonstration, National Reactor Innovation Center (NRIC), Idaho National Lab.,**
- **Versatile Test Reactor, Idaho National Lab;**
- **DOE HALEU Program**

**Nov. 19 Afternoon:****Plenary Session #4: Microreactors as Clean Energy Option for Canada****Plenary Session #5 : SMR Hybrid Energy System and Hydrogen****Plenary Speakers include:**

- **Japanese Development on HTGR Hydrogen & Heat Generation**
  - **Euratom Activities on Small Modular Reactors**
  - **Emerging Clean Energy Transition - Innovation in Nuclear Hydrogen Production**
  - **Integrated Nuclear-Renewable Energy Systems**
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**Nov. 19 Afternoon:****Plenary Session #6: Indigenous Engagement Practice for Nuclear Projects in Canada.**

Today, successful projects must include proactive and meaningful Indigenous engagement and participation. It is important that proponents and suppliers have a strong understanding of the variety of issues that must be considered when developing an effective Indigenous engagement strategy.

Attendees will hear from five experienced nuclear industry leaders who will share their practical insights on Indigenous engagement, including:

- The importance of understanding Indigenous history in Canada and local history as context setting for a project area
- Aboriginal and treaty rights
- The value of research, expertise and an Indigenous engagement capacity
- Duty to Consult: who holds it and the role of proponents
- Setting the tone for a willing project host community
- The role of partnerships, procurement, employment and training
- The importance of an Indigenous relations policy
- Canadian Indigenous regulatory requirements in today's nuclear landscape

**For G4SR-2 Webinars:**

- 2020 August 20 (Thurs) - Integrated Safety Assessment Methodology (ISAM) - Invited Speaker, Dr.Thambiayah (Nithy) Nitheanandan, Director, Canadian Nuclear Safety Commission (CNSC);
- 2020 Sept. 17 (Thurs) - Establishing requirements for Advanced Reactors – Invited Speakers: Andrew Sowder, Senior Technical Executive, Electric Power Research Institute (EPRI); Rachna Clavero, Deputy CEO, CANDU Owners Group (COG)
- 2020 Oct 20 (Tues) - Gen IV Nuclear Materials Challenge, Chaired by Dr. Colin Judge, Department Manager, Nuclear Materials Department, Industry Programs Lead | U.S.

DOE-NE Nuclear Science User Facilities, Idaho National Laboratory and Dr. Mohammadreza Baghbanan, P. Eng., Project Manager, Ontario Power Generation, CNS Division Chair for Materials, Chemistry and Fitness-for-service, Adjunct Professor, University of Toronto

- Safety Assessment and Licensing of Advanced Reactors and SMRs, Thursday December 3 2020
  - Small Modular Reactor Waste Management and Social License, Thursday January 14 2021
  - R&D Supporting Advanced Reactors and Small Modular Reactors, Thursday February 11 2021
- Nuclear-Hybrid Energy Systems and Co-Generation, Thursday March 14 2021

Please stay tuned for the Virtual Summit updates by periodic CNS email announcements and visit our web site, [www.g4sr.org](http://www.g4sr.org), currently in development with forthcoming details on the Virtual Summit and Webinars.



## CNS Short Course on CANDU Technology

### Course Overview

The CNS CANDU Technology and Safety Course, held for the last many years in March, has had to be cancelled/postponed to 2021 March on account of the COVID-19 pandemic.

In order to provide a partial replacement for the full course, a shorter, on-line course is being offered on 2020 November 13.

This on-line offering will present a small number of presentations on the technology of CANDU reactors, on:

- the basic reactor design
- CANDU thermalhydraulics
- plant refurbishment and reactor start-up tests, and
- balance-of-plant systems.

The CNS is presenting this course to enhance the professional and technical capabilities of its members (and non-members) working in, or interested in, the nuclear industry. The course is ideally suited for beginning professionals, but also beneficial to experienced professionals. Come broaden your nuclear knowledge beyond your specific area of work and your own area of expertise.

*This course is eligible for Continuing Education Units in the context of the Engineering Institute of Canada Continuing Education program.*

### Course Agenda 2020 November 13

08:15 Opening remarks, introductions, details on course schedule, breaks between sessions, continuing-education units, and on-line-platform rules and protocol.

08:30-10:00 "CANDU Design Overview", by Ben Rouben, 12 & 1 Consulting

10:10-30 Break

10:30-12:00 "Balance of Plant", by John Froats, Ontario Tech University

12:00-13:00 Lunch Break

13:00-14:30 "Refurbishment of Darlington Unit 2 + Reactor Start-Up tests", by Constantin Banica, Ontario Power Generation

14:30-15:00 "Thermalhydraulics Principles", by David Novog, McMaster University

16:30 Closing remarks, Survey

### Registration

Please register on-line via the link on the Course web page, which you can reach directly by [clicking here](#) or via the [CNS web site](#).

The registration fees are shown below, and include HST (HST # 870488889RT)

- CNS Member: \$150.00 [Must be a CNS member in good standing]
- Non-CNS Member: \$200.00
- CNS Full-Time Student Member or CNS Retiree Member: \$75.00

## CNS SHORT COURSE ON CANDU REACTOR TECHNOLOGY (ON-LINE)



Organized by:  
The Canadian Nuclear Society  
Nuclear Science & Engineering  
Division

2020 November 13 (Friday)

Course held on-line  
(Connection details to be communicated later)

Course contact (not for registration):  
B. Rouben, [roubenb@alum.mit.edu](mailto:roubenb@alum.mit.edu)

For registration questions, contact  
CNS Office, [cns\\_office@cns-snc.ca](mailto:cns_office@cns-snc.ca)

# CANDU System Chemistry Course

**9 November 2020**

**Instructors:** Dr. Pamela Yakabuskie (CNL), Mr. Jordan Lyons (UNB-CNER/PLNGS), Dr. Olga Palazhchenko (UNB-CNER)

## **Course Description:**

This is an introductory to intermediate level course, designed to provide a solid base of understanding of the synergy between plant chemistry and material corrosion/degradation. The focus is on CANDU systems, including the objectives of chemistry control, corrosion issues, and corrosion mitigation strategies. Relevant “real-life” examples will be provided along with short-form self-assessments and ample time for Q&A to ensure maximum material retention.

## **Learning Outcomes:**

By the end this course, the participant shall gain:

- Knowledge of the mechanisms of the major forms of corrosion that affect nuclear plant materials;
- An understanding of chemistry control objectives for various CANDU systems;
- An appreciation for the relationship between the chemistry, design, and materials of construction in major CANDU plant systems

## **Course Topics and Schedule:**

**Morning (3 h) – O. Palazhchenko**

### General Chemistry Overview

- pH
- Conductivity
- Purification and Ion Exchange
- Water Radiolysis

### Corrosion Principles

- Uniform Corrosion
- Galvanic Corrosion
- Pitting and Crevice Corrosion
- Stress Corrosion Cracking (SCC)
- Flow Accelerated Corrosion

Morning wrap-up assessment, Q&A, and break

System Overview: Chemistry Control & Corrosion Issues

- Introduction to CANDU systems – O. Palazhchenko
- Primary Heat Transport System – O. Palazhchenko
- Moderator – P. Yakabuskie
- Secondary Heat Transport System – O. Palazhchenko
- Auxiliary Systems – J. Lyons
  - Calandria Vault and End Shield Cooling
  - Liquid Zone Control
  - Annulus Gas

Afternoon wrap-up assessment and Q&A

**1. Course Outcomes**

By the end this course, the participant shall gain:

- Knowledge of the mechanisms of the major forms of corrosion that affect nuclear plant materials;
- An understanding of chemistry control objectives for various CANDU systems;
- An appreciation for the relationship between the chemistry, design, and materials of construction in major CANDU plant systems

**2. Course Topics**

General Chemistry Overview (1.5 h, including small self-assessment)

- pH
- Conductivity
- Purification and Ion Exchange
- Water Radiolysis
- Corrosion Principles (2 h, including small self-assessment)
- Uniform Corrosion
- Galvanic Corrosion
- Pitting and Crevice Corrosion
- Stress Corrosion Cracking (SCC)
- Flow Accelerated Corrosion

System Overview (3 h + 30 minutes for wrap up)

- Primary Heat Transport System
  - Chemistry Control
  - Corrosion Issues
    - Activity Transport
    - RIHT Rise
- Moderator
  - Chemistry Control
- Secondary Heat Transport System –
  - Chemistry Control
  - Corrosion Issues
- Auxiliary Systems –
  - Calandria Vault and End Shield Cooling System
  - Liquid Zone Control

- **To register online go to CNS Web: [www.cns-snc.ca](http://www.cns-snc.ca)**



The CNS Education and Communications Committee invites you to participate in this new webinar series. The Nuclear for Everyone Café will feature topics drawn from the Society's popular Nuclear 101 and Nuclear for Everyone short courses, presented by the courses' facilitators, with the opportunity to ask questions and share insights.

- The Nuclear 101/Nuclear for Everyone team has commenced hosting a series of webinars in two-week intervals starting in September. The first two topics, the first on Radiation and the second on Energy and the Environment, were successfully completed, with about 80 attendees.
- The remaining topics taken from the Nuclear for Everyone course , will include:
  - Oct 22 Nuclear Reactor Basics
  - Nov 5 Nuclear Medicine and Radiobiology
  - Dec 3 Nuclear Safety, Accidents and Waste
  - Dec 17 Talking Nuclear: History in Canada and the World
  - New Year: Small Modular Reactors
  - New Year: Nuclear, Risk and Public Engagement

Registration is free but required; we welcome CNS members, students and interested members of the broader community.

**To register online go to CNS Web: [www.cns-snc.ca](http://www.cns-snc.ca)**



