REQUEST FOR INFORMATION (RFI)
87055-18-0396

Date: June 13, 2019

Subject: Request for Information (RFI) regarding the provision of training courses related to all aspects of the nuclear fuel cycle

1. Background and Purpose of this RFI

The purpose of this RFI is to obtain feedback and input from industry to inform the requirements definition and potential procurement strategy for the subject project which is being reviewed by the Canadian Nuclear Safety Commission (CNSC) to determine if or how to proceed.

CNSC:
The Canadian Nuclear Safety Commission (CNSC) is the nuclear energy and materials regulator in Canada. The mission of CNSC is to regulate the use of nuclear energy and materials to protect health, safety, security, and the environment; and to respect Canada's international commitments on the peaceful use of nuclear energy. Nuclear activities are carefully regulated to ensure their safe operation.

In addition to nuclear power plants and nuclear research facilities, the CNSC regulates numerous other uses of nuclear material. Some examples include radioisotopes used in the treatment of cancer, the operation of uranium mines and refineries, and the use of radioactive sources for oil exploration and in instruments such as precipitation measurement devices.

As the federal regulator, the CNSC executes licensing decisions made by the Commission (or its designates) and continually monitors licensees to ensure they comply with safety requirements that protect workers, the public, and the environment, and uphold Canada's international commitments on the peaceful use of nuclear energy. The CNSC also offers instruction, assistance, and information in the form of regulatory documents, such as policies, standards, guides, and notices. Licensee compliance is verified through inspections and reports.

In order to execute their assigned duties, CNSC staff require a range of technical and regulatory training courses related to all aspects of the nuclear fuel cycle, from mining to plant operation to waste management. This training should be focused on (but not limited to) CANDU systems, components, and operations, and should also include radiation protection, and radiation detection and measurement instrumentation.

Additional information about the work and courses is listed in *Annex "A" – Statement of Work* and *Annex "B" Example CNSC Course Catalog*.

2. Nature of this RFI

This RFI is not a solicitation and there is no commitment with respect to future purchases or contracts.

Potential suppliers of the services described in this RFI should not reserve stock or facilities, nor allocate resources as a result of any information contained in this RFI. The procurement of any services described in this RFI will not necessarily follow this RFI. This RFI is simply intended to solicit feedback from industry with respect to the matters described in this RFI.

3. Nature and Format of Responses Requested

Respondents are requested to provide their responses to the questions in Section 6 via email to:

Contracting Authority: Alexandra Millan
Email Address: cnsc.solicitation-demandedesoumission.ccsn@canada.ca

4. Response Costs

CNSC will not reimburse any respondent for expenses incurred in responding to this RFI.

5. Treatment of Responses

a) **Use of Response:** Responses will not be formally evaluated. However, the responses received may be used by CNSC to develop or modify procurement strategies or any draft documents contained in this RFI. CNSC will review all responses received by the RFI closing date. CNSC may, in its discretion, review responses received after the RFI closing date.

b) **Confidentiality:** Respondents should mark any portions of their response that they consider proprietary or confidential. CNSC will handle the responses in accordance with the Access to Information Act.

c) **Follow-up Activity:** CNSC may, in its discretion, contact any respondents to follow up with additional questions or for clarifications of any aspect of a response.

6. Questions to Interested Parties of this RFI

1) Would you/your organization be able to provide the services outlined in the draft Annex "A" – Statement of Work (SOW) and Annex B, and be interested in bidding on any solicitation that may be issued?
2) Of the courses listed in Annex B, which ones would your organization be able to provide?
3) Do you already have existing course curriculum that covers the topics and material listed or would you have to create/significantly modify the courses?
4) In which official language(s) (English and French) would you/your organization be able to provide the services outlined in the draft Annex "A" –SOW and Annex B?
5) In which regions (cities and provinces of Canada) would your would you/your organization be able to provide the services outlined in the draft Annex "A" – SOW and Annex B?
6) What is the duration of your course (i.e. full day, ½ day), are they delivered to groups, individuals, both?
7) In what formats are they delivered i.e. in person, webex?
8) Are you able to offer any of the courses in a blended, computer-based, or e-learning format?
9) What do you anticipate being the cost for the course(s)?

7. Submission of Responses to Questions to Interested Parties

a) **Closing Date for Submission of Responses:** Suppliers interested in providing a response should deliver it by email to the Contracting Authority identified above by **July 5th, 2019**.

b) **Responsibility of Timely Delivery:** Each respondent is solely responsible for ensuring its response is delivered on time per the instructions specified in this RFI.

c) **Language of Response:** Responses may be in English or French at the preference of the respondent.

8. Enquiries

Because this is not a bid solicitation, CNSC will not necessarily respond to enquiries in writing or circulate answers to all potential suppliers/respondents. However, respondents with questions regarding the RFI may direct their enquiries by email to:

Contracting Authority: Alexandra Millan cnsc.solicitation-demandedesoumission.ccsn@canada.ca

ANNEX "A" – STATEMENT OF WORK

1. Background

The Canadian Nuclear Safety Commission (CNSC) is the nuclear energy and materials regulator in Canada. The mission of CNSC is to regulate the use of nuclear energy and materials to protect health, safety, security, and the environment; and to respect Canada's international commitments on the peaceful use of nuclear energy. Nuclear activities are carefully regulated to ensure their safe operation.

In addition to nuclear power plants and nuclear research facilities, the CNSC regulates numerous other uses of nuclear material. Some examples include radioisotopes used in the treatment of cancer, the operation of uranium mines and refineries, and the use of radioactive sources for oil exploration and in instruments such as precipitation measurement devices.

As the federal regulator, the CNSC executes licensing decisions made by the Commission (or its designates) and continually monitors licensees to ensure they comply with safety requirements that protect workers, the public, and the environment, and uphold Canada's international commitments on the peaceful use of nuclear energy. The CNSC also offers instruction, assistance, and information in the form of regulatory documents, such as policies, standards, guides, and notices. Licensee compliance is verified through inspections and reports.

In order to execute their assigned duties, CNSC staff require a range of technical and regulatory training courses related to all aspects of the nuclear fuel cycle, from mining to plant operation to waste management. This training should be focused on (but not limited to) CANDU systems, components, and operations, and should also included radiation protection, and radiation detection and measurement instrumentation.

2. Objectives

The objective is to secure the services of one (or a limited number of) training provider(s) to prepare and deliver technical and regulatory training courses to CNSC staff on an "as needed" basis. The range of required training courses include all aspects of the nuclear fuel cycle (from mining to plant operation to waste management), should be focused on (but not limited to) CANDU systems, components, and operations, and should also include radiation protection and radiation detection and measurement instrumentation. The training courses should mirror (but not be limited to) the courses listed in *Annex "B" – Example CNSC Course Catalog*.

3. Scope of Work

On an as needed basis, the Contractor must deliver training courses from a pre-determined catalogue (to be provided by the contractor), as specified (course, date, time, location, language, etc.) by CNSC. The Contractor must provide their own curriculum based on input from CNSC, must provide the required course material, and must deliver and correct course-related assessments for all learners at each course. Courses must be delivered in accordance with adult education best practices, and must contain interactive and/or practical elements as much as possible and appropriate.

4. Tasks to be Performed

- Maintain communication with CNSC points of contact to schedule and deliver training courses as required
- Work with CNSC points of contact to identify or clarify needs related to each course
- Adapt course material or delivery approach in relation to needs identified by CNSC points of contact
- Prepare and provide all required course material for each course delivery, including assessments
- Deliver courses as required, including assessments
- Correct assessments for each course and communicate results to CNSC points of contact
- Provide feedback about course participants and course delivery for each course to CNSC points of contact

5. Deliverables

For every training course delivery requested by CNSC, the Contractor must:

- Communicate via phone or email, with CNSC points of contact to schedule and deliver the training course
- Discuss via phone or email with CNSC points of contact to identify or clarify needs related to each course
- Adapt their course material or delivery approach in relation to needs identified by CNSC points of contact
- Prepare and provide printed or electronic copies of all required course material for each learner, including assessments, at least two weeks prior to the delivery of the training course
- Deliver (facilitate) the course, including assessments
- Correct assessments for each course and communicate results to CNSC points of contact via email
- Provide feedback about course participants and course delivery for each course to CNSC points of contact via email no later than one week after the delivery of the training course

ANNEX "B" – EXAMPLE CNSC COURSE CATALOG

Course Titles	Duration	Description and/or Objectives	Approximate Frequency
Fundamentals of Risk and Reliability Analysis	30 hours	Fundamentals of Risk and Reliability Analysis gives an intensive and practical treatment on the subject of engineering reliability analysis. The main emphasis is on the modeling of engineering problems and evaluation of system performance under conditions of uncertainty. The course provides a review of the fundamental concepts of probability theory and reliability analysis, explicitly taking into account the significance of uncertainty. The necessary mathematical concepts are developed in the context of engineering problems, while hands-on Excel tutorial sessions provide a practical feel and demonstration of the learned concepts. The main topics covered in the course include: • data analysis and probability estimation • distribution selection and goodness of fit • confidence intervals • reliability data analysis and computation including Bayesian methods • simulation methods • PRA and system reliability concepts Course Content: • Reliability and Basic Probability Concepts • Data Analysis Normal Probability Distribution • Monte Carlo Simulation • Common Probability Distributions • Distribution Selection • Confidence Intervals • Hypothesis Testing • Goodness of Fit • Reliability Analysis • Reliability Data Analysis • Conditional Probability • Bayesian Analysis • Regression Analysis • PSA and System Reliability Analysis • Fault Tree Analysis • Event Tree Analysis • In-Class Exercises • Course Test • Test Review • Course Summary	Offered as required
Introduction to CANDU and Nuclear Fuel	7.5 hours	This course is intended for all CNSC employees. No technical knowledge is required.	2-3 times per year

Cycle		Objectives: • Provide a historical perspective on the development of the CANDU reactor and its international presence. • Provide a brief overview of the key features of a CANDU reactor, including a comparison with the Pressurized Water Reactor (PWR) design. • Provide a brief overview of the CANDU fuel cycle (from cradle to grave) including its potential role in PWR spent fuel recycle. Upon completion of the 1-day course participants will have an understanding of the origins of the CANDU reactor, the rationale for the design approach taken, the CANDU fuel cycle, and a general understanding of how nuclear reactors work.	
Root Cause Analysis	37.5 hours	The workshop provides an introduction to: • root cause analysis • events and causal factors analysis • interviewing witnesses • failure recognition and analysis • change analysis • energy (hazard)-barrier-target analysis • analytical trees • personnel reliability • MORT analysis • assembling facts and conclusions and building a defendable argument (oral briefing) Emphasis is placed on conducting information-gathering interviews; model videotapes are used to illustrate specific interviewing techniques. Case studies are utilized to illustrate methods, foster teamwork and practice interviewing and briefing techniques. Outline: • Root cause analysis methods • Methods of data collection • Assessing risk • Investigative interviewing techniques	Offered as required

Radiation Protection	7.5 hours	By the end of this course, learners will know what questions to ask and be able to identify where to get information about how to:
		
		• protect themselves in situations where there may be contamination or external radiation dose rates
		  ○ identify the type of radiation (i.e., alpha, beta, gamma and/or neutron) and whether the radiation source is sealed or unsealed
		  ○ identify potential radiation exposure versus contamination
		  ○ identify what personal protective equipment to wear and/or use and explain why
		  ○ identify what radiation monitoring equipment to wear and/or use and explain why
		  ○ identify appropriate dosimetry equipment to wear and/or use and explain
		  ○ identify the potential dose consequence of those decisions and explain why
			6 times per year

		• compare their dose to the dose limit and explain the level of risk associated with their dose • identify their roles and responsibilities under the Radiation Protection Program for CNSC staff	
CANDU Fundamentals	70 hours	CANDU Fundamentals is designed as an introductory course in the operation of a CANDU reactor. Starting with the basics of atomic theory the course explains the construction of the reactor, its major systems and enough reactor physics so that on completion the participant will be able to understand the control and operating practices in a CANDU plant. Emphasis will be placed on nuclear safety and the systems that minimize the risk from the fission products in the reactor core.	2 times per year
CANDU Materials & Chemistry	7.5 hours	This course covers the following areas pertaining to mechanical properties: • Mechanical and Thermal Stress • Corrosion • Pressure Tubes and Fuel Bundles At the completion of training the participant will be able to: • Mechanical and Thermal Stress o define terms as they relate to materials: mechanical stress and strain, hoop stress, thermal expansion, differential thermal expansion, thermal shock & residual stress o describe factors which cause mechanical and thermal stress in a component o explain the consequences of exceeding stress limits in materials o explain why heating and cool down rates are limited o define the following properties of materials: ductility, brittleness & nil-ductility transition o explain the differences between ductile and brittle fracture o explain why a material exhibiting a ductile/brittle transition temperature has operating limitations with respect to temperature o define creep as it relates to materials o explain why a large shaft becomes deformed when at rest o explain why rolling a large shaft prior to operation reduces the deformation o describe fatigue failure and work hardening • Corrosion o describe the erosion of material o describe wear or surface failure of materials o given a plant system and associated chemical parameters with their normal operating ranges, explain the consequences of operating outside this range and the control methods used o describe the following corrosion types: uniform, galvanic, pitting and crevice, stress corrosion cracking,	At least once per year

		erosion & microbiologically induced ○ explain the importance of pH control in carbon steel based systems, including the significance of a magnetite layer, and describe the typical methods used to maintain proper control ○ explain the importance of dissolved oxygen control in carbon steel based systems, and describe the typical methods used to maintain proper control ○ explain the importance of conductivity control, and describe the typical methods used to maintain proper control ○ define the term stress corrosion cracking (SCC), and state the conditions required to promote SCC ○ explain the importance of pH control in stainless steel based systems, and describe the typical methods used to maintain proper control ○ explain the importance of conductivity control, and describe the typical methods used to maintain proper control ○ explain how scale can be formed on boiler tubes, state the adverse consequences of scale formation, and state the methods used to minimize scale formation • Pressure Tubes and Fuel Bundles ○ state the effect of radiation on materials: oils and greases, plastics, metals & concrete ○ describe the causes of creep in pressure tubes ○ describe strategies used to extend life of critically elongated channels ○ describe the process of hydrogen embrittlement and the occurrence of delayed hydride cracking and blistering of pressure tubes, including the factors affecting it ○ explain how temperature cycling and reduced heat transport pressure can be used to minimize the ○ potential for delayed hydride cracking in pressure tubes during start-up and cool-down	
CANDU Mechanical Equipment	22.5	This course covers the following areas pertaining to mechanical equipment: • Vibrations • Valves • Steam traps • Flow sheets At the completion of training the participant will be able to: • explain terms as they relate to vibration; amplitude, natural frequency, forcing frequency, damping, resonance, critical speed • explain the major factors that affect the natural frequencies of an object • identify how excessive vibration can lead to equipment damage • explain why operation at or near critical speed should be avoided • explain how mass unbalance and misalignment cause vibrations	At least once per year

		and why they can change during operation • define the terms hog, sag and eccentricity as they apply to rotating shafts • explain the origin of flow-induced vibrations and state how they can damage equipment in nuclear power plants • identify why the selection for a valve in a system is important • state the effect of a loss of control signal or actuating fluid supply on a valve position • explain why impurities in hydraulic fluid and instrument air must be minimized • state two visual methods of determining a manual valve position • identify two operational checks that can be done to check manual valve position • explain the precautions taken while operating a manual valve • explain how a solenoid valve can be used for On/Off control of a pneumatically operated valve • explain the operation of a typical electric motor valve • explain manual operation of a typical motorized valve and the associated precautions • identify the purpose of a check valve • describe the principle of operation of a check valve • state the purpose of safety and relieve valves • explain the terms as they relate to safety and relief valves: lifting pressure, capacity, popping action, blow down, chatter, flutter, and simmering • identify when it is permissible to gag a safety valve • explain the operation of a steam trap • identify three functions of a steam trap • explain how steam traps remove non-condensable gases from the systems • state the three checks that confirm the correct operation of steam traps • identify components on a flow sheet	
CANDU Fluid Mechanics	7.5	Introductory to intermediate-level course designed to explain the major fluid phenomena in a nuclear plant, including a review of basic principles and a look at the energy in a flowing fluid, siphon, two-phase flow and flow induced vibration.n Course Objectives • Convert a given value of pressure expressed on the absolute, gauge or vacuum scale to the appropriate values on either of the other two scales. • Given a pressure differential acting on a given area, calculate the force produced. • State the factors affecting pressure of liquids and gases. • Describe the difference between laminar flow and turbulent flow with respect to the velocity profile and pulsations. • Define mass and volumetric flow rates. • State the relationships between mass and volumetric flow. • State the continuity principle and apply it to determine the change to a fluid's velocity. • Explain the effect of pressure and temperature on volumetric flow rate for liquids and gases.	At least once per year

		• Define the following terms regarding a system with flowing liquid:
		  ○ Elevation head, pressure head and velocity head,
		  ○ Static pressure, dynamic pressure and total pressure, and
		  ○ Energy loss and head loss
		• State the effect of fluid viscosity and velocity on a head loss in turbulent flow.
		• State the effect of temperature on viscosity of liquids.
		• Explain the relationship between elevation head, pressure head and velocity head in a fluid system with energy losses and additions.
		• Given a simple fluid system comprised of piping with constant or varying elevation and diameter and a combination of elbows, orifices, venturis, valves, tanks and a fluid mover (e.g., pump), determine the direction of pressure and velocity changes along the system, and explain why these changes occur.
		• Describe the following terms: siphon, loop seal, and buoyancy.
		• Explain the adverse effects of gas or vapour accumulation in a siphon.
		• Define two-phase flow.
		• Describe the different forms of two phase flow.
		• Give examples of different forms of two phase flow in a CANDU plant.
		• Define cavitation.
		• Explain how cavitation can occur in a fluid system.
		• Explain how each of the following can produce large pressure spikes in a fluid system: water hammer, steam hammer, and solid operation.
		• Explain how the following operating practices minimize the risk of water or steam hammer:
		  ○ Draining of a steam or gas system,
		  ○ Venting and slow priming of a liquid system,
		  ○ Slow operation of valves,
		  ○ Starting up or shutting down a centrifugal pump with its discharge valve closed or crack opened,
		  ○ Delay between pump start-ups and shutdowns, and
		  ○ Applying cooling water to heat exchangers first.
		• Explain how a flowing fluid can cause equipment vibration.	

CANDU Electrical Systems	14	At the end of the training, learners will be able to:
		
		• Identify the purpose of each of the major components of an EPS, including:
		  ○ Cables
		  ○ Buses
		  ○ Circuit Breakers
		  ○ Fuses
		  ○ Protective Relays
		  ○ Disconnect Switches
		  ○ Transformers
		  ○ Inverters
		  ○ Rectifiers
		  ○ Converters
		  ○ Batteries
			At least once per year

		○ Generators ○ Motors • Interpret the typical single line diagram (SLD) of the station EPS (SLD are station specific) and identify the major flow paths and major components associated with EPS • Recall the following electrical design reliability principles: ○ Two divisions of the EPS ○ Two groups of the EPS ○ Classes of Power ○ Common and Unit concepts (for multi-unit stations) ○ The electrical protection system • Describe the purpose of the major systems in an EPS, including: ○ Generator, including synchronizing to the grid ○ Main Output Transformer ○ Unit Service Transformer ○ System Service Transformer ○ Automatic Transfer Scheme ○ 13.8kV Class IV Power, including listing common loads ○ 13.8kV Class III Power ○ Emergency Transfer Scheme ○ 4.16kV Class IV Power, including listing common loads ○ 4.16kV Class III Power, including listing common loads ○ 600V Class IV Power, including listing common loads ○ 600V Class III Power, including listing common loads ○ 600V Class II Power, including listing common loads ○ 250Vdc Class I Power, including listing common loads ○ 120V Class II Power, including listing common loads ○ 48Vdc Class I Power, including listing common loads ○ 45V Class II Power, including listing common loads • Identify the purpose and function of the Standby Generators • Identify the purpose and function of the Emergency Power Generators • Identify the purpose and function of the Alternate AC Generators • Recognize potential safety or environmental hazards associated with electrical equipment • Recognize what to look for when inspecting electrical equipment • Identify potential failure modes of EPS - OPEX	
CANDU Heat & Thermohydraulics	15 hours	Heat and Thermodynamics is an introductory course that covers heat and related processes. It is especially relevant to NPPs (applications in CANDU reactors) and focuses on the laws governing heat transfer from one location to another and transformation of energy from one form to another.	At least once per year
CANDU Instrumentation & Controls	22.5 hours	Intermediate course covering the measuring devices for pressure, flow, level, temperature and neutron flux. The control portion covers automatic process control.	At least once per year

CANDU Intermediate Reactors & Auxiliaries	30 hours	This course begins with a review of the basic purposes and operation of a CANDU reactor, covered in CANDU Fundamentals. The moderator and heat transport systems, along with their major auxiliaries are studied in greater depth of detail than in CANDU Fundamentals. Other systems included in this course are the special safety systems, annulus gas, and end shield cooling. In addition, you will learn about operational concerns and abnormal events.	At least once per year
Communicating Risk to the Public	15	At the end of this workshop, participants will be able to do the following: • Define risk and explain the importance of CNSC's role in effectively communicating risk to the public and the risk to the CNSC of not effectively communicating risk. • Outline the process to prepare for an outreach activity where risk communication will take place. • Develop and deliver oral presentations that communicate the risk, the CNSC's role in managing that risk and effectively address the audiences concerns about the potential risk. • During outreach activities, skillfully respond to difficult questions applying strategies to reduce risk and increase understanding.	At least once per year
Radiation Instrumentation	7.5	The overall objective of the Instrumentation Course is to provide staff with the proper methods of operating the radiation instruments used by the CNSC which are related to the requirements their job; and conducting a radiation and/or contamination survey.	3-4 times per year
Abridged CANDU Fundamentals	22.5	The Abridged CANDU Fundamentals is intended for all CNSC employees. No technical knowledge is required. The course provides CNSC staff with an overview of the basic design, control and operating practices in a CANDU plant. Upon completion of this three day course, participants will understand the basic principles of nuclear safety and the systems that minimize the risk from fission products in the reactor core.	As required
Decommissioning of Licensee Facilities	22.5	This course provides information on the basic steps in the decommissioning process and shares opex from past experiences in decommissioning.	As required