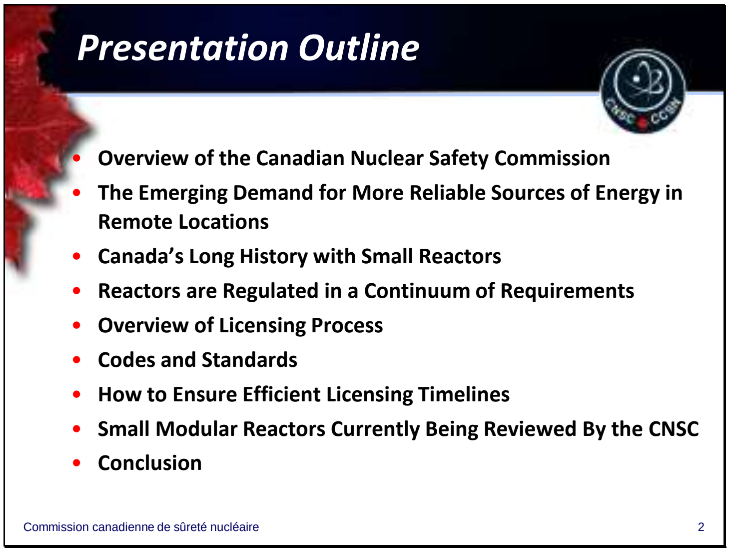
Slide 1

Self-Introduction and greetings

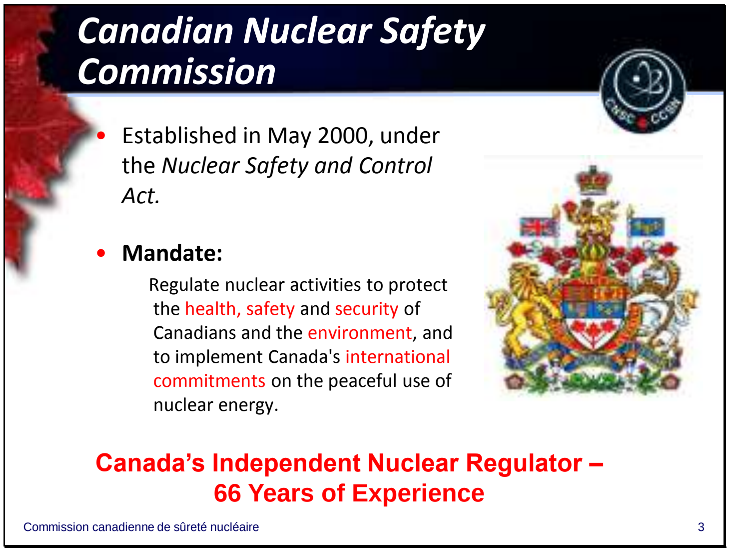
Introduce "CNSC's Readiness to Regulate Small Reactors"

Slide 2



Read slide

Slide 3



The CNSC was established in 2000 under the Nuclear Safety and Control Act (NSCA) as the successor of the Atomic Energy Control Board, which was created under the Atomic Energy Control Act in 1946.

Our mandate is to Regulate nuclear activities to protect the health, safety and security of Canadians and the environment, and to implement Canada's international commitments on the peaceful use of nuclear energy.

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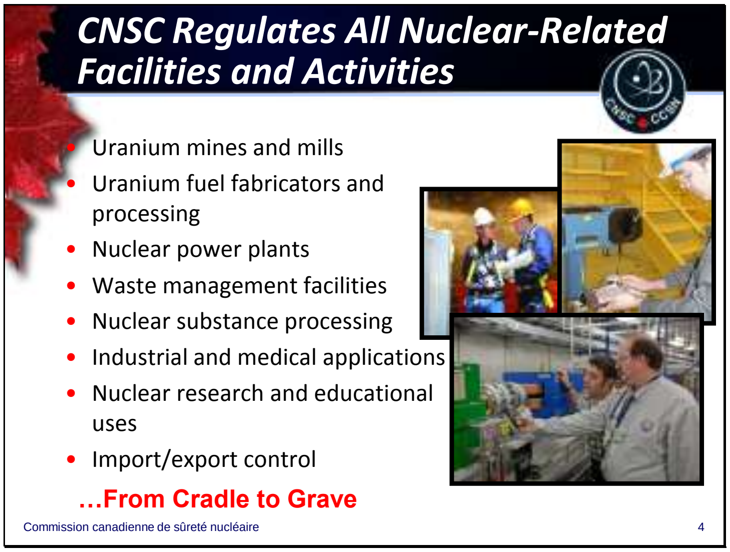

Under the Nuclear Safety and Control Act, the CNSC has jurisdiction over all nuclear-related activities and substances in Canada. This includes all segments of the nuclear fuel cycle in addition to a wide range of industrial, medical and academic uses of nuclear substances.

We regulate a wide range of activities which include: Waste management facilities, uranium mines and mills and waste management facilities.

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Decisions are made by the Commission Tribunal. The Commission Tribunal acts as an independent, quasi-judicial tribunal and court of record. It consists of up to seven members who are appointed by the Governor in Council under the authority of the Nuclear Safety and Control Act.

Before making decisions, the Tribunal looks to CNSC staff to provide expert research, analysis and opinion to support the Tribunal's decision-making process. Public meetings are used to increase transparency to the public in the decision making process of the Tribunal. At these meetings, Tribunal members are briefed about significant developments that affect the nuclear regulatory process before making a decision.

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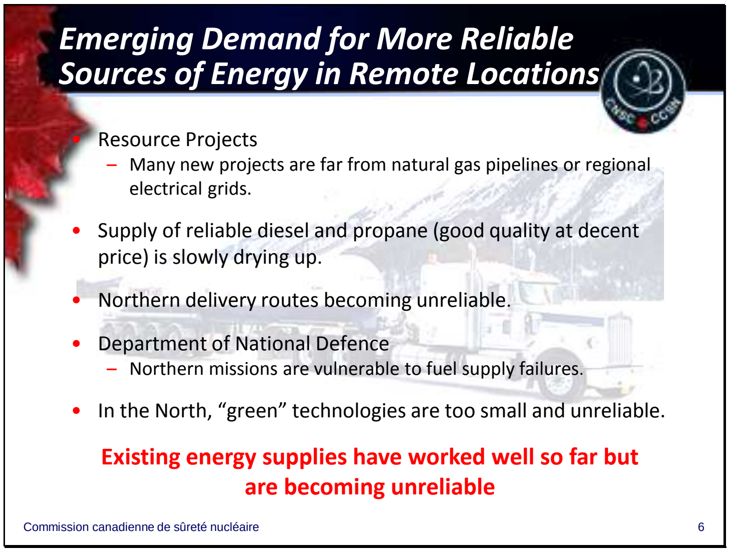

There is an emerging demand for more reliable sources of energy in remote locations especially in the North. This demand stems from the distance between new projects and natural gas pipelines or regional electrical grids. Also the increase in the price of diesel and propane add to the need for new reliable sources of energy.

In addition, northern delivery routes are becoming more unreliable and northern missions are vulnerable to fuel supply failures.

In the North, "green" technologies, like solar and wind, are too small and unreliable thus the answer seems to be leaning towards nuclear.

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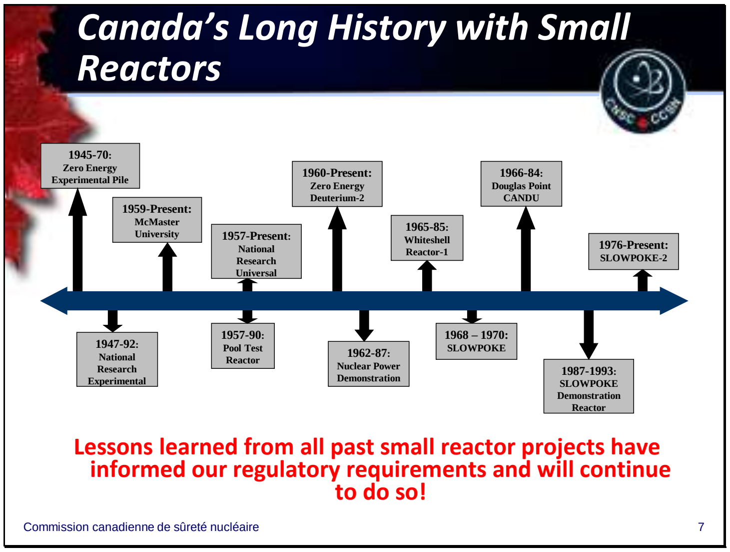

Canada is ready to regulate small reactors. We were one of the first nations to research and develop safe and efficient ways to harness nuclear energy.

From our long history, we have developed an in depth understanding and experience in the development of safety requirements for small reactors.

This timeline highlights a few small reactors milestone from the past.

To touch on a few small reactors:

- Zero Energy Experimental Pile which was rated 10 W thermal in 1945, was the first controlled nuclear chain reaction outside the United States.
- In 1947, the National Research Experimental (NRX) reactor generated the highest neutron flux available in an experimental facility in the world and provided critical information regarding nuclear power reactors.
- In 1976, commercial design for the SLOWPOKE-2 was created. It is the only reactor whose licence allows for unattended operation and was provided to eight universities and research centres, half of which are still in operation today.

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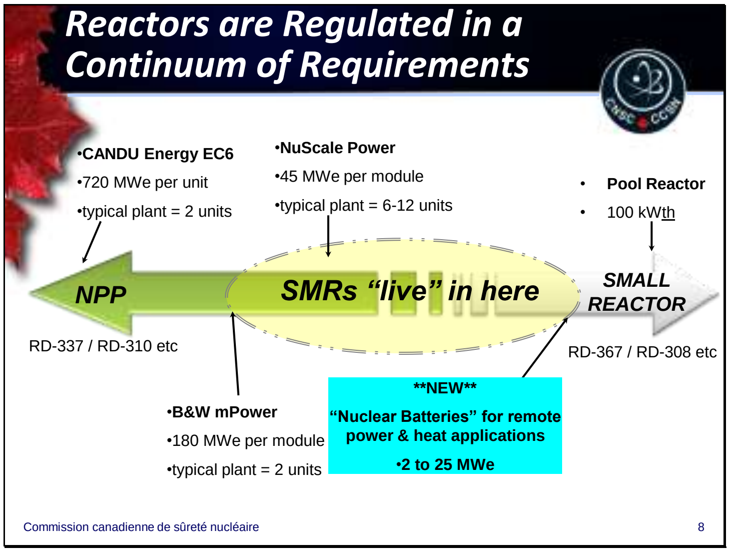

The term "Small modular reactor " is really just a marketing term and in Canada the application of requirements for a reactor design is based on a risk informed approach – that is, safety is applied in a graded manner based on risk

The CNSC recognizes that the risks posed by the different nuclear facilities can vary considerably thus it has been determined that reactors below a threshold of approximately 200 MW thermal are termed Small Reactors while reactors with a thermal power output that is approximately greater than 200 MW thermal are considered Nuclear Power Plants.

Below a rough threshold of 200 MW thermal, CNSC is prepared to be somewhat more flexible on the use of the graded approach. The threshold is not a firm fixed number but rather a guideline.

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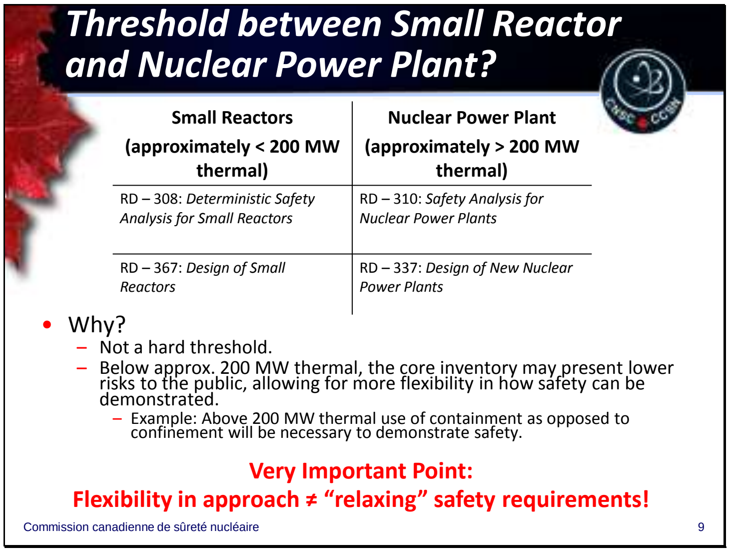

This table outlines the regulatory requirements for Small reactors and Nuclear Power plants.

Depending on thermal output, SMR designs could be small enough to be considered Small Reactors, otherwise they are considered NPPs. As mentioned before, the graded approach provides some flexibility around the 200 MW thermal threshold but it is the responsibility of the applicant to demonstrate why a design should be treated under one specific area of the regulatory continuum versus another.

Why the 200 MW thermal threshold? The 200 MW thermal threshold was chosen because below this output level, the core inventory presents potentially lower risks to the public, allowing for more flexibility in how safety can be demonstrated.

What is very important to understand here is that just because we are more flexible in safety approaches in some areas for small reactors does not mean that our requirements have been relaxed!

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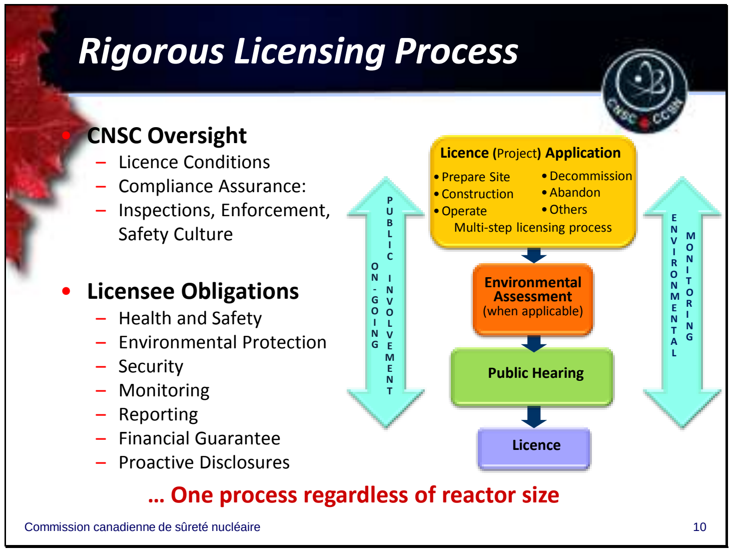

The CNSC's licensing process for small modular reactors will be the same as that used for all reactor facilities. This will require the facilities to apply for a licence for each of the five lifecycle phases. The lifecycle phases are as follows:

- Licence to prepare site
- Licence to construct
- Licence to operate
- Licence to decommission and,
- Licence to abandon the site

As seen in the figure, public and all stakeholders are involved throughout the processes.

For reactor facilities, to increase efficiency, we combine the public processes for the licence to prepare site and the environmental assessment, because much of the site information is common to these two processes but is assessed differently.

The important point is that the process is the same, regardless of the power level or size of the reactor.

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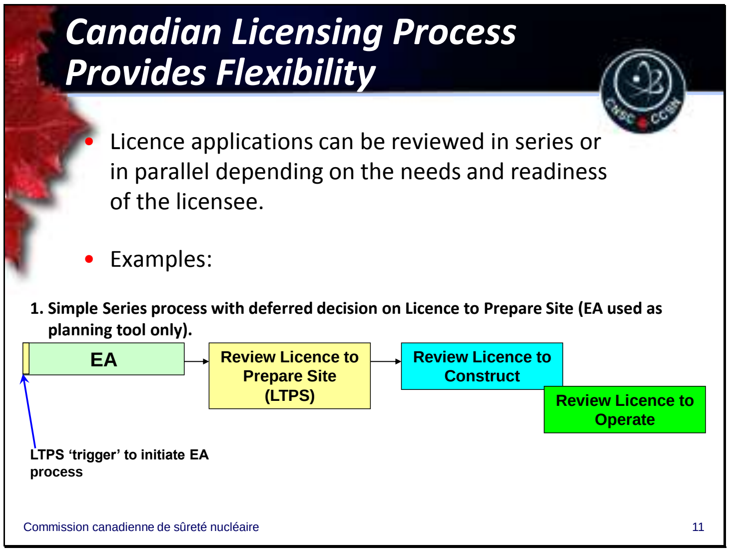

The process in Canada is designed to be responsive to the needs of the applicant. The route chosen by vendors depends on their state of readiness.

In the first example, we deal with an applicant who wants to take it nice and slow. They may not have the go-ahead from investors to commit to even a licence to prepare site and would like to use the EA process to test the waters before they commit to a project. The applicant will need a certain amount of design related information for the EA process in order to make the EA valid in the public eye.

It should be noted that once the licensee is committed to a licence to construct, it is automatically assumed that they will seek a licence to operate as soon as possible late in the construction phase.

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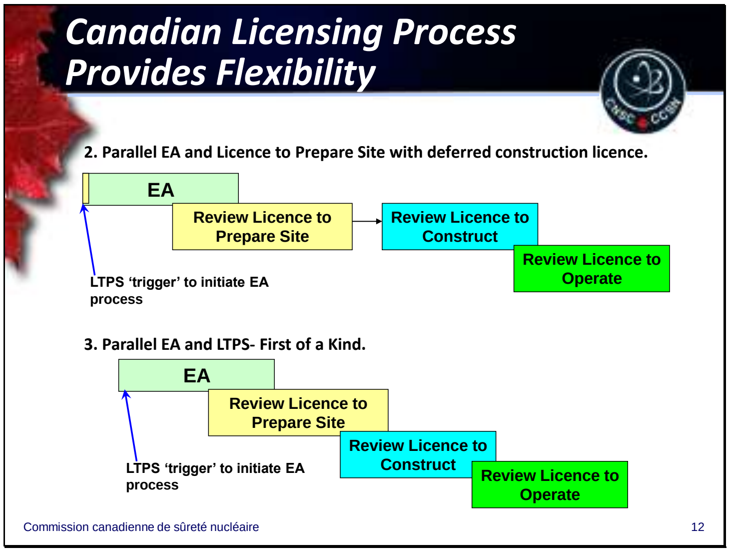

In second example, the applicant is seeking an immediate decision for a Licence to Prepare Site so the EA and site preparation licence will be done in parallel. The applicant is expecting a delay between the completion of site preparation and the submission of a construction licence application. This may be due to a delay in technology selection or funding.

In example number 3, the concept is the same as for number 2 except the applicant is ready much sooner to submit their construction licence application. This is the model that would be used for a typical existing licensee and it demands a high state of readiness.

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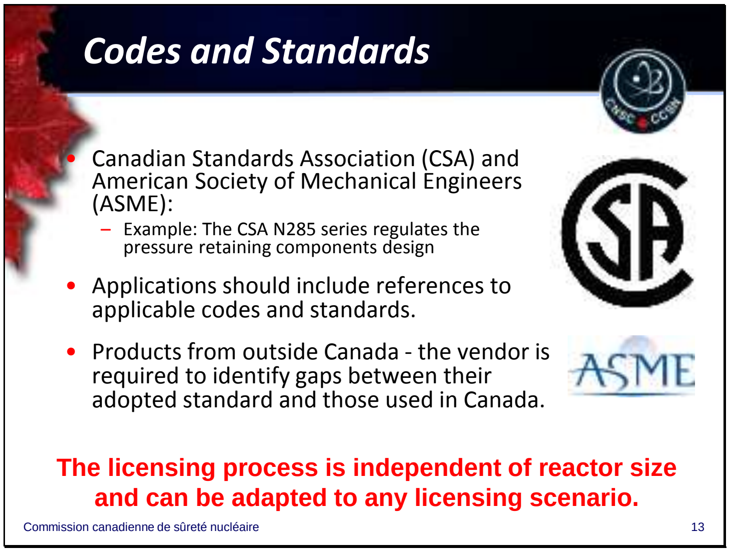

There are numerous codes and standards of which every Canadian nuclear facility must comply to.

Along with the requirements from the Nuclear Safety and Control Act and Regulatory Documents, there are engineering design rules for all structures, systems and components that must comply with appropriate engineering and safety design practices such as the Canadian Standards Association and American Society of Mechanical engineers.

ASME code example:
-ASME Boiler Pressure Vessel (BPV) Code Section III – Rules for Construction of Nuclear Power Plants
Second CSA Example:
- The CSA N286 series covers quality management, manufacturing, construction and operating phases.

For additional efficiency and clarity, it is recommended that applications include references to applicable codes and standards.

For products from outside Canada the vendor is required to identify gaps between their adopted standard and those used in Canada. Although the CNSC has cooperative agreements with most regulators, which allows us to share information as we review designs, regulatory approaches differ between countries so we would not simply accept another regulator’s review but it does help us understand where the vendor may be coming from on certain issues.

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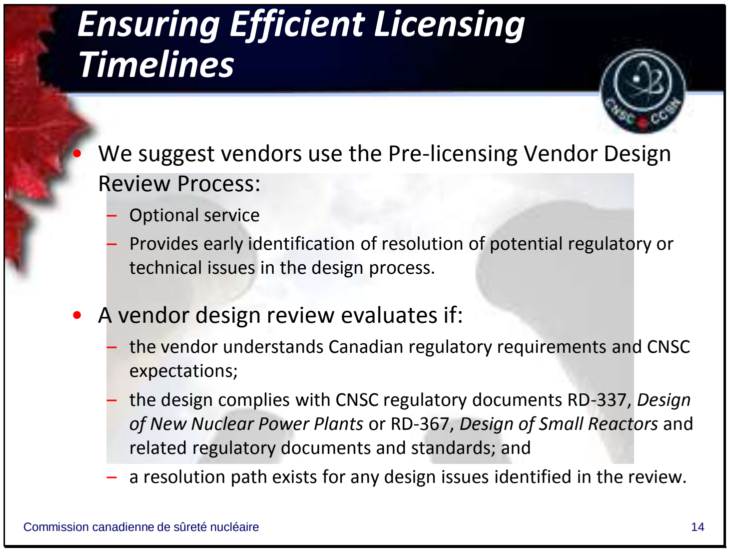

Before issuing a licence, time is required to analyze and carefully review applications so it is important for the applicant to ensure that their proposal is well prepared. To help ensure efficient licensing timelines, we suggest vendors use the Pre-licensing Vendor Design Review Process.

A pre-licensing review is an optional service that the CNSC provides for the assessment of a vendor's design for a nuclear power plant or small reactor.

This review process is intended to provide early identification and resolution of potential regulatory or technical issues in the design process, particularly those that could result in significant changes to the design or analysis.

A vendor design review evaluates if:

- the vendor understands Canadian regulatory requirements and CNSC expectations;
- the design complies with CNSC regulatory documents, and
- a resolution path exists for any design issues identified in the review.

It should be pointed out that, this service does not certify a reactor design or involve the issuance of a licence under the Nuclear Safety and Control Act.

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The applicant, and the vendors that will support the applicant, play a major role in making the licensing process as efficient as possible.

Other ways an applicant can help to ensure efficient timelines include:

- Entering the licensing process with high quality, complete and timely submittals.
- Engaging the public and aboriginal groups early and transparently and
- Developing a strong understanding of the regulatory landscape.

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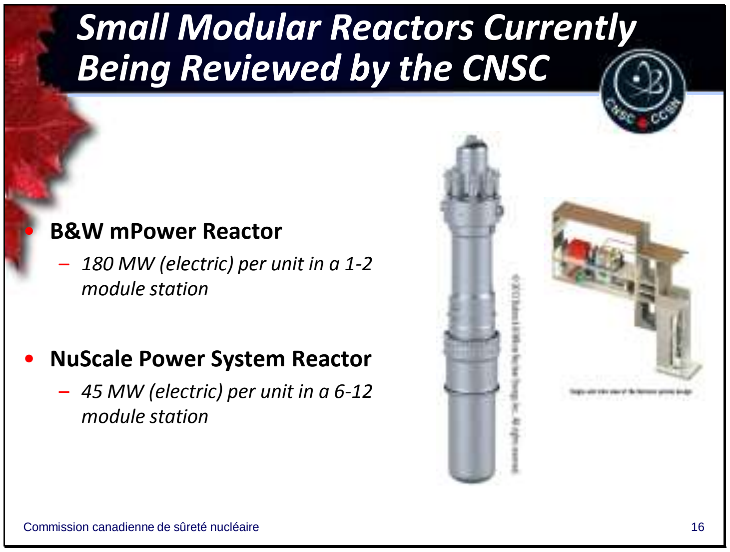

The CNSC has already been approached by multiple vendors looking to start business in Canada.

The B&W mPower reactor and the NuScale Power System Reactor are both in the first phase of a Pre-Licensing Vendor Design Review

The mPower produces 180 MW(electric) - 2 reactor module

NuScale power system reactor puts out 45 MW (e) – 12 reactor module

Starcore Power – 10 MWe static pebble-bed gas-cooled reactor; entering into a service agreement, not for a vendor design review, but to provide feedback to them on how we would deal with a gas-cooled reactor

We also plan to hold a small reactor workshop later this year to discuss policy issues around factory sealed reactors, sometimes called nuclear batteries. This is to explore policy issues around these types of reactors – examples are: design requirements for a reactor factory; security and emergency preparedness requirements for remote regions; unmanned operation, requirements for non-water cooled reactors, to name a few.

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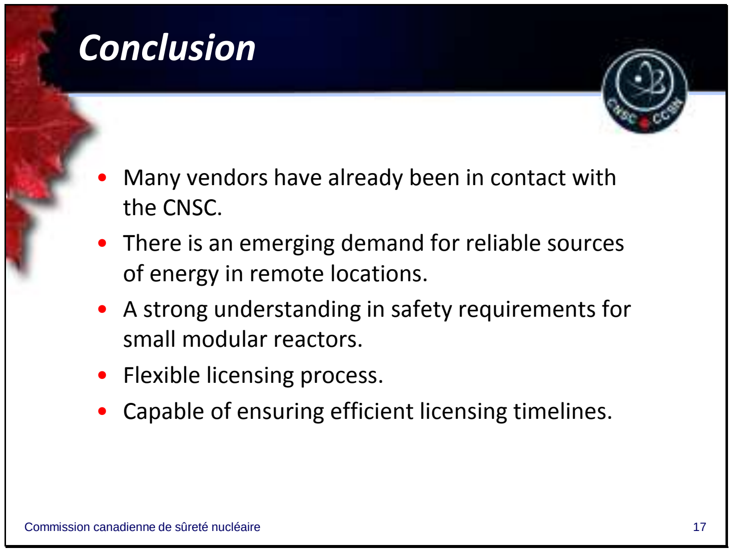

So in conclusion, the concept of small modular reactors is very real. As mentioned before, the CNSC has already been in contact with vendors who are looking to sell their product in Canada.

As the our diesel and propane supply runs low and northern delivery routes become more unreliable, the possibility of implementing small modular reactors in remote areas is being considered.

With our long history and flexible licensing process, Canada is ready to regulate small reactors.

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Commission canadienne de sûreté nucléaire
Canadian Nuclear Safety Commission
CNSC CCSN
We Will Never Compromise Safety
nuclearsafety.gc.ca
e-Docs # 3941470

Slide 19


Commission canadienne de sûreté nucléaire
Canadian Nuclear Safety Commission
Questions?
CNSC CCSN
e-Docs # 3941470