# Regulatory Perspective for Fire Protection and Emergency Management at Nuclear Facilities in Canada

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# Outline

- Overview of the Canadian Nuclear Safety Commission (CNSC)
- Overview of CNSC regulatory framework
- CNSC regulatory approach for fire protection
- CNSC regulatory approach for emergency management
- International activities
- Closing remarks

# Canadian Nuclear Safety Commission (CNSC) (1/2)

- Regulates the use of nuclear energy and materials to protect the **health**, **safety, security** and the **environment**; to implement Canada's **international commitments** on the peaceful use of nuclear energy; and to disseminate objective scientific, technical and regulatory information to the public

# Canadian Nuclear Safety Commission (2/2)

- The CNSC regulates all nuclear-related facilities and activities in Canada including
  - Nuclear power plants
  - Uranium mines and mills
  - Uranium fuel fabricators and processing
  - Nuclear substance processing
  - Industrial and medical applications of nuclear substances, such as nuclear medicine and cancer treatment centers
  - Research and educational facilities
  - Import/export of nuclear and dual-use substances, equipment and technology
  - Waste management facilities

# CNSC Regulatory Philosophy

- Regulatory philosophy is based on two principles
  1. Those persons and organizations subject to the *Nuclear Safety and Control Act* and regulations are directly responsible for managing regulated activities in a manner that protects health, safety, security and the environment, while respecting Canada's international obligations on the peaceful use of nuclear energy
  2. The CNSC is responsible to Parliament and to Canadians for assuring that these responsibilities are properly discharged

# CNSC Regulatory Framework – Overview


**Regulatory documents explain to licensees and applicants what they must achieve in order to meet the requirements set out in the NSCA and the regulations made under the NSCA**

**CNSC has a strong framework for regulating nuclear safety**

# CNSC Regulatory Approach

- The CNSC is responsible for setting regulatory requirements, which the licensee is obligated to meet

- The CNSC regulatory approach builds upon the principle of a graded approach and is driven primarily by
  - the risk associated with the facilities and activities being regulated
  - continuous learning from operational experience

# Safety and Control Areas (SCAs) (1/2)

- The CNSC uses SCAs to assess, evaluate, review, verify and report on regulatory requirements and performance to ensure consistency between various types of facilities and activities
- SCAs are consists into 14 Safety and Control Areas that are group according to their functional areas
  - Management
  - Facility and Equipment
  - Core control processes

# Safety and Control Areas (SCAs) (2/2)

| Management | Facility and Equipment |
|---|---|
| 1. Management System<br>2. Human Performance Management<br>3. Operating Performance | 4. Safety Analysis<br>5. Physical Design<br>6. Fitness for Service |

| Core Control Processes | |
|---|---|
| 7. Radiation Protection<br>8. Conventional Health and Safety<br>9. Environmental Protection<br>10. Emergency Management and Fire Protection | 11. Waste Management<br>12. Security<br>13. Safeguards and Non-proliferation<br>14. Packing and Transport |

**Highlighted SCAs are relevant to fire protection and emergency management**

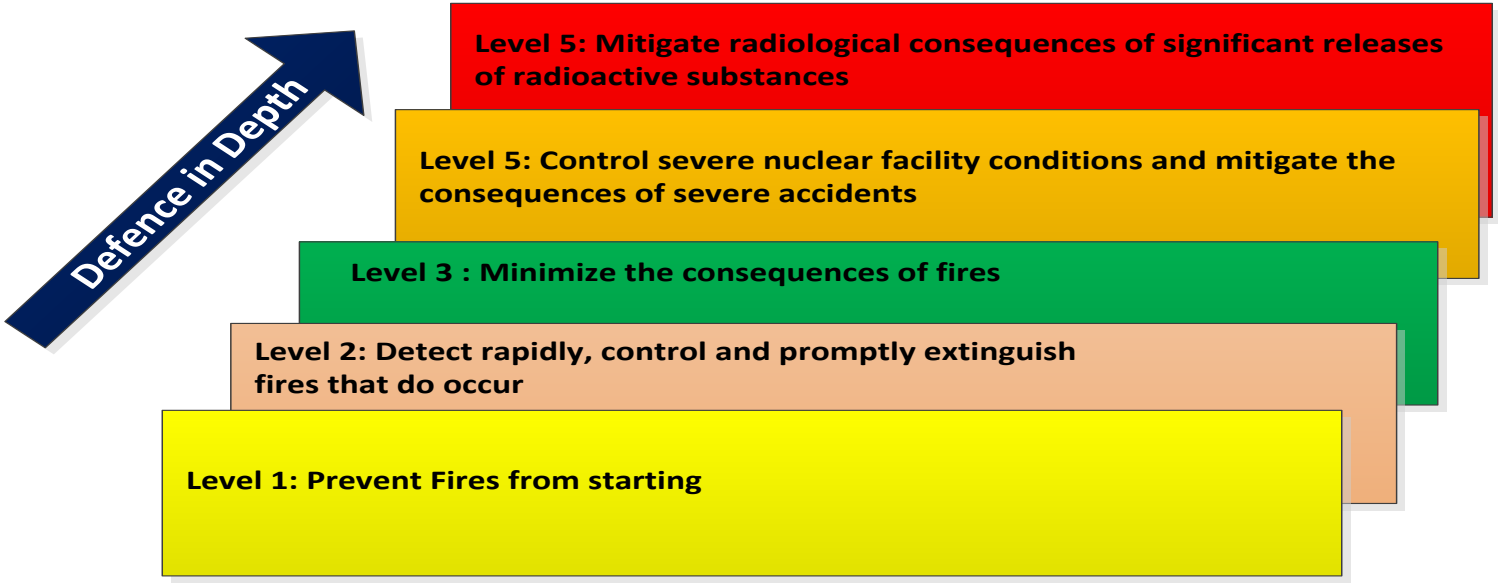
# CNSC Compliance

- CNSC staff ensure that licensees fully understand how to achieve compliance
  - foster a common understanding of safety requirements
  - plan compliance activities in a systematic and risk-informed manner
  - verify compliance through activities such as inspections, desktop reviews and other assessments of licensee performance
  - take enforcement actions when necessary to correct observed non-compliance

**Compliance effort varies in response to events, facility modifications and changes to licensee performances**

# CNSC Fire Protection Regulatory Approach (1/2)

- Based upon the implementation of the defence-in-depth (DID) principle



# CNSC Fire Protection Regulatory Approach (2/2)

- Licensee's operating licence conditions require that "the licensee shall implement and maintain a fire protection program (FPP)"
- Licence Conditions Handbook includes the appropriate standards:
  - nuclear power plants – CSA standard N293, *Fire protection for nuclear power plants*
  - other nuclear facilities – CSA standard N393, *Fire protection for facilities that process, handle or store nuclear substances*

# Fire Protection Program

- The purpose of a Fire Protection Program is to achieve and enhance fire safety by
  - identifying and referencing the procedures and processes for managing fire protection activities in a coherent manner
  - describing the planned and systematic approach necessary to provide reasonable confidence that all fire protection requirements are satisfied
  - demonstrating compliance with regulatory requirements related to fire protection

# Fire Protection Program Key Elements

## Roles and responsibilities

- Fire protection organization and its responsibilities

## Operational

- Managing the storage and handling of flammable liquids, combustible liquids, compressed gases and transient material
- Control of ignition sources
- ITM of fire protection system (FPS) and managing FPS impairment

## Fire response

- Pre-incident plan; standard operating guideline

## Design

- Engineering change control, plant design management
- Managing changes that affect fire protection

## Fire safety assessment

- Fire hazard assessment, fire safe shutdown analysis and code compliance review

## Training

- Analysis for training

## FPP performance and effectiveness

- Self-assessment, external audit, corrective action and operating experience

# FPP Improvements Implemented at Canadian Nuclear Facilities (CNFs)

- Considerable improvements in fire protection for CNFs to meet modern codes, standards and best industry practices include
  - updated fire safety assessment
  - enhancement to operational practices leading to measurable reductions in fire risk
  - completed safety upgrades including design modifications such as diking around pumps, additional fire detection, and suppression systems, fire barriers and shielding
- Upgrades based on lessons learned from the Fukushima accident are being implemented at CNFs to address extreme events and their combinations well beyond the original design basis

# CNSC Emergency Preparedness Regulatory Approach

- Licensee's operating licence conditions require that "the licensee shall implement and maintain an emergency management program"
- Licence Conditions Handbook includes the appropriate regulatory document
  - Licence Conditions Handbook references REGDOC-2.10.1, *Nuclear Emergency Preparedness and Response*

# Regulatory Document REGDOC-2.10.1

- Lists and discusses the requirements and guidance that licence applicants and licensees shall implement and consider in the design of their emergency preparedness program (EPP)
- EPPs are based on four components
  - planning basis
  - program management
  - response plan and procedures
  - preparedness

# CNSC Roles During Emergency (1/2)

- Same role before, during and after an emergency
  - provide assurance that appropriate actions are taken to limit the risk to health, safety, security and the environment
- Three missions
  - maintain regulatory oversight of licensee's emergency response activities
  - participates in Canada's whole-of-government response
  - provide onsite information to support the international response as required

# CNSC Roles During Emergency (2/2)

**Government Operations Centre**
- Federal departments
- CSNC has a seat

**FNEP Technical Assessment Group**
- CNSC forms the Onsite Conditions and Release Characteristics Group

**CNSC EOC**

**Licensee**

**Provincial Emergency Operations Centre**
- Municipalities
- Licensee
- CNSC has two seats (OPS and SCI sections)

# New Emergency Operations Centre (EOC)

- CNSC has upgraded its EOC with state-of-the-art video screens and renovated meeting rooms
- CNSC now has WebEOC software to manage emergency operations

# Background on Nuclear Power Plant (NPP) Exercises

- All NPP operators conduct emergency exercises every year
  - onsite focus, always includes notification and information to offsite authorities
  - CNSC inspections part of compliance program
- CNSC actively participated in the joint onsite/offsite exercises
  - Bruce Power's Exercise Huron Challenge in 2012
  - Exercise Unified Response, Darlington, in 2014
  - Exercise Intrepid, Point Lepreau, in 2015
  - Exercise Huron Resolve, in 2016
  - Exercise Unified Control, Pickering, December 2017

# International Activities (1/2)

- Organisation for Economic Co-operation and Development / Nuclear Energy Agency (OECD/NEA)
  - Fire Incidents Records Exchange (FIRE) Project
    - encourage multilateral cooperation in the collection and analysis of data relating to fire events
  - *PRISME-2 Project Forms a huge experimental database to be used to improve fire modelling capabilities
  - High Energy Arcing Fault (HEAF) project
    - explore the different physical factors that influence a HEAF
    - attempt to gather HEAF experimental data that can be used to better understand HEAF phenomena and risk insight as applied to NPP safety

*PRISME: Propagation d'un incendie pour des scénarios multi-locaux élémentaires - English translation: Fire propagation in elementary, multi-room scenarios

# International Activities (2/2)

- IAEA Workshop on Notification, Reporting and Requesting Assistance, Vienna
- IAEA Consultancy Meeting in Vienna on the development of the draft Safety Guide on Preparedness and Response for an Emergency during Transport of Radioactive Material
- Participated in the Workshop on the Revised Safety Requirements in Emergency Preparedness and Response (GSR Part 7)

# Closing Remarks (1/2)

- Canadian nuclear facilities are designed with robust redundant safety systems using the state-of-the-art codes and standards, and best international practices existing at the time of construction
- Fire protection and emergency management adequacy in Canada is continuously reviewed against updated modern codes and standards and safety analysis
- Fire protection and emergency management is an area with active ongoing discussions between the CNSC, industry and the international community

# Closing Remarks (2/2)

- Staff participates in a leadership position in national and international fora established to address various aspects of fire protection and emergency management
- CNSC staff ensure dissemination of state-of-the-art, science-based information to Canadian stakeholders

**CNSC has a comprehensive and systematic regulatory approach to managing regulated activities related to fire protection and emergency management**

# Thank you!

- Questions?

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