Licensing Nuclear Reactors in Canada
Recent Changes to the CNSC Approach

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• Background - CNSC 101
• Motivators for change
• Changes to date
  – Major Projects Management Office (MPMO)
  – “Regulatory Contracts”
  – EA Streamlining
  – Concurrent EA and Site Application Processes
  – Generic EA and Licensing Process
  – Licensing Framework
  – The RD suite (RD-360, RD-310, RD-337, RD-346)
  – Risk Informed Decision Making
  – Technology Reviews
• Current and future efforts
• Summary
CNSC – Meeting the Challenge

• Canadian Nuclear Safety Commission (CNSC)
  – Canada’s nuclear watchdog
  – Quasi-judicial body

• Independent of, but not isolated from, government

• Regulates all nuclear facilities and activities in Canada to protect the health, safety and security of Canadians and their environment; as well as ensure that Canada meets its nuclear international obligations.
Meeting the Challenge – CNSC’s Refocus

- Safety is number one
- Clear communication
- Simplification of processes
- Clarification of requirements and expectations
- Timeliness
- Transparency
- Tracking of commitments
Parliament has Provided the CNSC with Modern Legislation

• Nuclear Safety and Control Act (2000)
• Canadian Environmental Assessment Act (1992)
• Nuclear Liability Act (1985)
  – Soon to be Nuclear Liability and Compensation Act?
• Governed by up to seven permanent commissioners appointed by the Governor-In-Council
• Members are renowned Canadians and experts in own fields

“… shall take into account the health of Canadians who, for medical purposes, depend on nuclear substances produced by nuclear reactors.”

Directive on Health of Canadians (December 10, 2007)
Priorities for the CNSC

• Ensure baseline compliance on existing facilities while regulating new major facilities (power plants and uranium mines)

• All sectors of Canadian nuclear industry regulated by the CNSC are growing:
  – Nuclear power plants
  – Uranium mining
  – Nuclear medicine
Issue:

- NRU status and lessons learned

Actions:

  - Improved communications
  - Tracking systems
  - Clarification of licensing requirements
  - Requirements for NRU licence renewal Oct 2011
- Future Supply / Contingency plan
- Other audits and self assessments
1. Understandable
2. Neutral
3. Clear Mandate
4. Open and Transparent Process
5. Fair Process
6. Timelines
7. Consistent and Predictable
8. Accountable
9. Capacity
10. Coordinated
11. Establish Rules

Road To Improvement
Neil McCrank, Minister’s Special Representative, May 2008
Report to the Honourable Chuck Strahl,
Minister of Indian Affairs and Northern Development
Changes to date

- Major Projects Management Office (MPMO)
- “Regulatory Contracts”
- EA Streamlining
- Concurrent EA and Site Application Processes
- Generic EA and Licensing Process
- Licensing Framework
- The RD suite (RD-360, RD-310, RD-337, RD-346)
- Risk Informed Decision Making
- Technology Reviews
Partner in the Major Projects Management Office (MPMO)

- CNSC signatory to MOU with MPMO
- Membership on Deputy Ministers’ Committee
- Committed to working collaboratively with MPMO
- Nuclear projects are priorities:
  - Bruce New Build in Ontario
  - OPG New Build in Ontario
  - Deep Geologic Repository in Ontario
- Committed to implementation of the Cabinet Directive on Streamlining Regulation.
Regulatory Contracts

• New approach to ensure regulatory clarity
• Outlines regulatory requirements and roles and responsibilities
• Clear understanding of deliverables and deadlines
• Progress reported on CNSC web-site
• Approach being used for major projects, e.g., new NPPs, NRU re-licensing
**Issue:**

- Integration of EA and licensing processes

**Comments:**

- Nuclear Safety and Control Act (NSCA) requires decisions (EA, siting, construction, operation) in sequence but does not prohibit parallel processes

- Objective of joint review panel agreement, with CNSC lead, is to integrate the EA and site licence decisions

- Parallel processes for EA and licensing may proceed simultaneously depending on project risk by proponent
Generic New Nuclear Power Plant Environmental Assessment and Licensing Process

Aboriginal Consultation

- Description and Application to Prepare Site
- EA and Site Licence
  - EA Determination – Application and Track
  - EA – Joint Review Panel
  - Site Licence
- Proponent Prepares Site
- Construction Licence
- Proponent Constructs the Plant
- Operating Licence
- Proponent Commissions Plant
- Decommissioning
- Abandonment

United States
Finland
France
United Kingdom
**Issue:**

- Ambiguity of licensing framework

**Comments:**

- No new nuclear power plant in Canada in 25 years
- High level processes outlined in Nuclear Safety and Control Act and Information Document 0756
- Important regulatory documents approved by Commission in June 2008:
  - RD337 - Design of New Nuclear Power Plants
  - RD346 - Site Evaluation for New Nuclear Power Plants
- Focus turning to construction licence application processes and internal review / assessment guides
Regulatory Documents (RDs)

- Regulatory documents articulate the Commission’s expectations of applicants, licensees and CNSC staff with respect to meeting legally-binding requirements.
- RDs are administrative documents that are:
  - Published in accordance with 21(1)(e) of the NSCA
  - Not legally enforceable in their own right
  - To make them enforceable, in whole or in part, need to follow some existing legally recognized process
- Several significant RDs approved by Commission
- Other RDs in process (drafting, consultation)
Purpose: **RD-360** was developed at the direction of the Commission to enhance stakeholders’ understanding, and to improve openness and transparency in decision-making regarding life extension projects.

Principles outlined in **RD-360** have been followed by the Commission and CNSC staff in past and current regulatory activities, and in decisions with respect to NPP life extension projects and return-to-service.

Approved by the Commission in February 2008.
• Key regulatory objectives for life extension projects are:
  - To assess proposed modifications against modern standards and practices;
  - To ensure adequacy of the scope of refurbishment and safety upgrades proposed by the licensee; and
  - To verify the proper execution of work by the licensee, prior to unit’s return-to-service.

• RD-360 indicates that licensees should carry out, if necessary, an environmental assessment and an Integrated Safety Review to establish the scope of work required for life extension of an NPP;

• Based on the results of the environmental assessment and an Integrated Safety Review, licensees should develop an Integrated Implementation Plan for the necessary refurbishment, safety upgrades and compensatory measures;

• Integrated Safety Review is performed in accordance with the Periodic Safety Review of Nuclear Power Plants safety guide published by the International Atomic Energy Agency; and

• A one-time application of the Periodic Safety Review to the life extension project.
RD-360 provides guidance on:

- **Project Initiation**;
- **Establishing the Integrated Implementation Plan**:
  - Environmental Assessment;
  - Integrated Safety Review;
  - Global Assessment and Integrated Implementation Plan; and
  - Confirmation of the Adequacy of the Integrated Implementation Plan.
- **Project Execution**:
  - Project Execution Planning;
  - Programs and Processes; and
  - Project Monitoring;
- **Return to Service**:
  - Commissioning Phases;
  - Milestones and Hold Points; and
  - Return to Normal Operation.
Purpose: The objective of regulatory document RD-310 is to help assure that the safety analysis in the safety analysis reports submitted in accordance with the Class 1 Nuclear Facilities Regulations is adequate.

RD-310 establishes modern high-level expectations for all nuclear power plants.

Guidance is currently being developed to provide further clarity.

Approved by the Commission in February 2008.
• Licence applicants and licensees’ responsibilities for safety analysis
• Identifying and classifying events to be analysed
• Acceptance criteria
• Analysis methodology and assumptions
• Documentation, review and updates of safety analysis
• QA for safety analysis
**RD-310: Implementation**

- **Apply RD-310 immediately to new builds**
- **For existing facilities, apply in a graduated, risk-informed, manner during a transition period:**
  - Licensees will be expected to assess compliance and develop a plan to close gaps to the extent practicable.
RD-337: Design of New Nuclear Power Plants

- Purpose: To set out CNSC expectations for the design of new water-cooled nuclear power plants
- To promote multiple levels of defence in the design
- To provide this information in a manner that provides the proponent with flexibility (i.e., as a guidance document)
- Approved by the Commission in June 2008

This document is technology-neutral with respect to water-cooled reactors
The NSCA and IAEA safety objectives provide the basis of RD-337

RD-337 establishes a set of comprehensive design expectations that is risk-informed and aligns with accepted international practices

IAEA Safety Standard NS-R-1, Safety of Nuclear Power Plants: Design is the underlying template

Adherence to RD-337 should ensure that:
  - Radiological consequences are below prescribed limits, are as low as reasonably achievable, and are taken into account in the design of an NPP
  - Likelihood of accidents with serious radiological consequences is extremely low

Safety objectives, including quantitative dose acceptance criteria and safety goals

Key safety concepts and considerations, such as:
  - Defence-in-depth
  - Designing for reliability

Expectations for:
  - Safety management
  - General design
  - Specific systems
  - Safety analysis
  - Environmental protection and mitigation
• A design envelope that includes comprehensive considerations of severe accidents
• Reliability expectations (versus setting unavailability targets for safety systems)
• Shutdown system expectations more aligned with international practice
• Sharing of safety system equipment
• Containment design to address severe accidents as far as reasonably practicable
• Consideration of malevolent acts in initial design
Purpose: RD-346 sets out CNSC’s expectations for the evaluation of sites for new NPPs prior to a proponent applying for a Licence to Prepare Site or initiating an environmental assessment (EA) determination.

In addition, RD-346 answers these questions:

- What is site evaluation?
- Where does site evaluation fit?
- Why evaluate a site before applying?

Approved by the Commission in June 2008
The investigation of a geographical area over the projected lifespan of the facility in an effort to:

1. Minimize effects of the proposed NPP and support facilities on the environment;
2. Minimize effects of the environment on the ability of the NPP to operate within the defined safe operating envelope; and
3. Identify mitigation strategies to reduce risk to the plant, the public, and the environment that may be required if the proposed NPP is sited there.
RD-346: Where does site evaluation fit?

INFORMATION GATHERING AND INITIAL SUBMISSIONS

Proponent

CONSULTATION WITH ABORIGINAL GROUPS

Inspect potential sites

NSCA

CEAA

Apply site evaluation process to selected site

Submit for application for a Licence to Prepare Site

Project Description for EA Determination

CNSC Review Criteria

CNSC Review Criteria

Onset of CNSC aboriginal consultation

Review of environmental assessment concluded

Review of information submitted for Licence to Prepare Site

Licence to Prepare Site issued

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RD-346: Why evaluate a site before applying?

- Reduces the risk of the site or project being found unsuitable during the EA or licensing
- Promotes submission of complete applications
- Promotes early Aboriginal consultation
- Leads to more efficient regulatory review
Risk Informed Decision-Making: Background

- Need for systematic process identified by Auditor General in 2000 report on federal health and safety regulatory programs
- Operations Management Committee in Jan 2005 further identified a need for guidance to reinforce a common understanding and practices among staff for risk informed decision-making
- Initiated project under Power Reactor Improvement Program
- Resulted in proposed process based on Canadian Standard and Transport Canada Civil Aviation
• Describes basic concepts of risk and risk management
• Highlights typical risk decision-making situations at the CNSC
• Outlines a decision-making process for managing risk
• Aligned with the objects of the Commission under the NSCA, government and CNSC policy
Risk Informed Decision-Making: Recent Use and Status

• Trial use in power reactor regulation includes:
  – Assign priorities to generic CANDU safety issues based on risk
  – Assessment of risk management options in Pickering Rod-Based GSS application

• Current Status
  – RIDM process incorporated in the CNSC Management System Manual
The CNSC Risk Informed Decision-Making (RIDM) Process

1. Initiate Process

2. Perform Initial Identification and Analysis of Potential Hazards
   - End
   - Go back
   - Next step and/or take action

3. Eliminate Risk
   - End
   - Go back
   - Next step and/or take action

4. Evaluate the Risk Activity
   - End
   - Go back
   - Next step and/or take action

5. Control the Risk
   - End
   - Go back
   - Next step and/or take action

6. Take Action

7. Monitor Impact

Communication with Stakeholders
**Issue:**
- Design reviews of new nuclear power plants

**Comments:**
- CNSC now reviewing designs of new nuclear power plants under consideration for Canada, starting with the ACR-1000
- CNSC - AECL MOU for design review of ACR-1000 signed on April 8, 2008
- Discussions on-going with Westinghouse (AP-1000) and AREVA (EPR)
- Projects will be 100% cost recovered from vendors
- Learning and working internationally
Current Efforts

- Existing fleet
- Refurbishments
- New build:
  - Review guides
  - Construction license applications and supporting material
  - Regulatory framework
  - ACR-1000, EPR and AP-1000 pre-licensing reviews
  - NRU licence renewal
Future Efforts

• High level:
  – Development of comprehensive “library” of regulations and supporting regulatory documents

• Working level:
  – Licence simplification
  – Periodic safety reviews
CNSC Will Not Compromise Safety…

... But We Won’t be the Bottleneck
Recruitment and Retention Challenges

• CNSC facing many of the same issues as rest of the nuclear industry
  – Competition
  – 10% annual turnover
  – 23% eligible to retire in next 5 years

• Aggressive and innovative approaches to recruitment and retention
Nevertheless we are growing

- The CNSC is a career choice in Canada’s nuclear industry - 32% growth in the past 2 years
- Vacancies
  - Reactor Safety and Assessment
  - Environmental Programs
  - Human Factors
  - Project Officers
  - and many more

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