



Canadian Nuclear  
Safety Commission

Commission canadienne  
de sûreté nucléaire

# Events in Japan



**Ramzi Jammal**

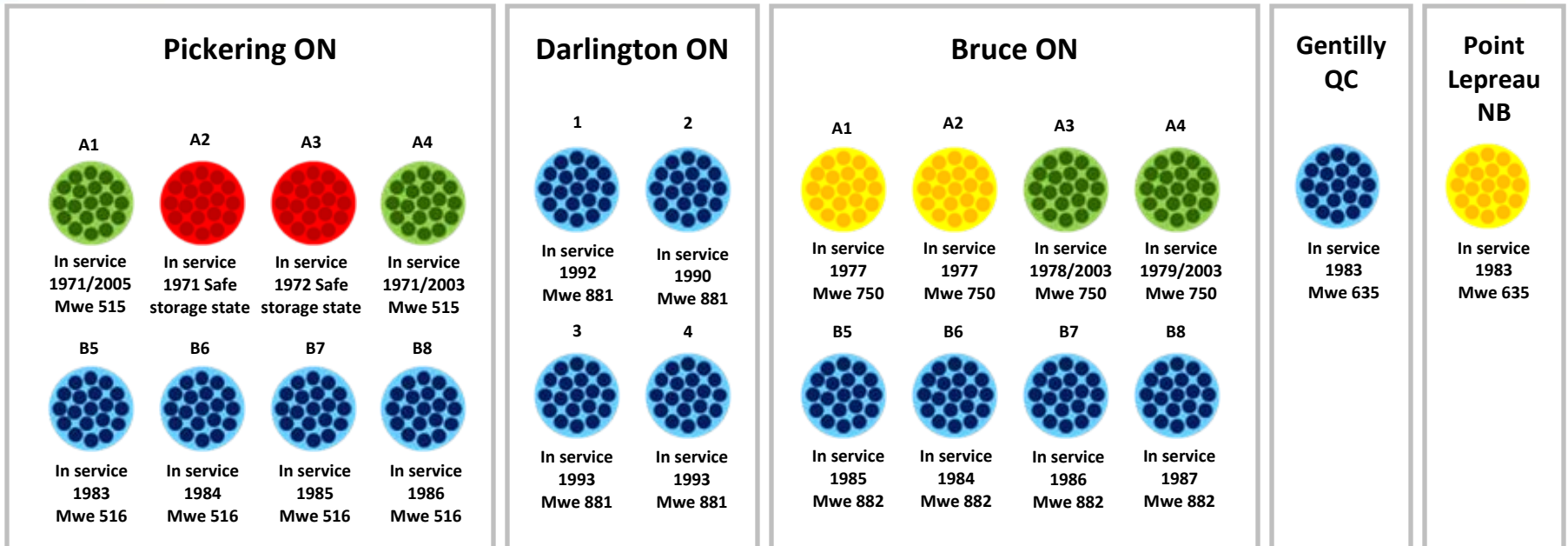
**Executive Vice-President and Chief Regulatory Operations Officer  
Canadian Nuclear Safety Commission**

**Canadian Radiation Protection Association Annual Conference 2011  
May 11, 2011 Ottawa**

# Nuclear Power Plants in Canada



# Canada's Nuclear Energy Profile



## Operable status (Average age – 25 Years)

- In service within design life
- In service / Returned to service
- Safe storage state
- In refurbishment

## Typical share of nuclear energy in total electricity generation

- Canada - 14.7%
- Quebec - 3%
- Ontario - 52%
- New Brunswick - 30%

# Overall Government Response

- ❖ Ongoing environmental monitoring on Canadian territory from coast to coast to coast
- ❖ Deployed experts to the IAEA
- ❖ Videoconferencing to answer questions from Canadians in Japan

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# Regulatory Response

- Activated Emergency Operations Centre (EOC) on March 11, 2011
- Staffed EOC 24 hours a day, 7 days a week
- Initiated discussions with international peers
- Held discussions with other Canadian government departments and agencies:
  - Health Canada
  - Foreign Affairs and International Trade Canada
  - Natural Resources Canada
  - Government Operations Centre
  - Canadian Food Inspection Agency
  - Environment Canada

# Regulatory Response

Issued a Directive pursuant to the *Nuclear Safety and Control Act* to all major nuclear facilities to:

- 🍁 review initial lessons learned
- 🍁 re-examine safety cases, with focus on:
  - external hazards
  - measures to prevent or mitigate severe accidents
  - emergency preparedness
- 🍁 implement immediate actions
- 🍁 implement long-term measures

# Regulatory Response: Immediate Actions

- ❖ CNSC site staff carried out focused inspection on:
  - seismic qualification
  - fire
  - flooding
  - backup power
  - hydrogen igniters and passive recombiners
- ❖ Ongoing inspection against external hazards

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# Regulatory Response: Immediate Actions

## 🍁 Inspections of spent fuel bays:

- components and equipment
- heat sinks
- alarms

## 🍁 Availability of on-site and off-site resources

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# Regulatory Response: Public Communication

- ❖ CNSC Web site became the site of choice
- ❖ Provided daily information updates
- ❖ Web site visits increased:
  - more than 10,000 daily visitors to the Japan updates page
- ❖ Performed source term assessment in order to advise Canadian citizens in Japan

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# Regulatory Response: Task Force

## ✿ Establishment of CNSC Task Force

## ✿ The mandate of the Task Force is:

- Review submissions from licensees who have been directed under the *Nuclear Safety and Control Act* 12(2) letters
- Assess available technical and operational information from the events at the Fukushima Daiichi NPP and identify high-level lessons learned
- Develop recommendations for short-term and long-term measures to recommend whether design or operational modifications, including supporting research, are needed
- Determine priorities for implementation of corrective actions
- Develop recommendations, as appropriate, for potential changes to CNSC regulatory requirements, inspection programs and policies

# Regulatory Response: Task Force

- The Task Force will focus on the following items:
  - external hazards which could impact Canadian NPPs (i.e., initiating events),
  - plant response up to severe core damage (i.e., assuming failed accident mitigation),
  - severe accident mitigation and management,
  - on-site and off-site emergency response, and
  - regulatory requirements review

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# Industry Response

- Public engagement and employee involvement
- Established working group under CANDU Owners Group (COG) to exchange information and define response strategies
- Verifying station capability to mitigate:
  - conditions during beyond-design-basis events
  - station blackout conditions
  - internal and external flooding events
  - other events concurrent with a seismic event

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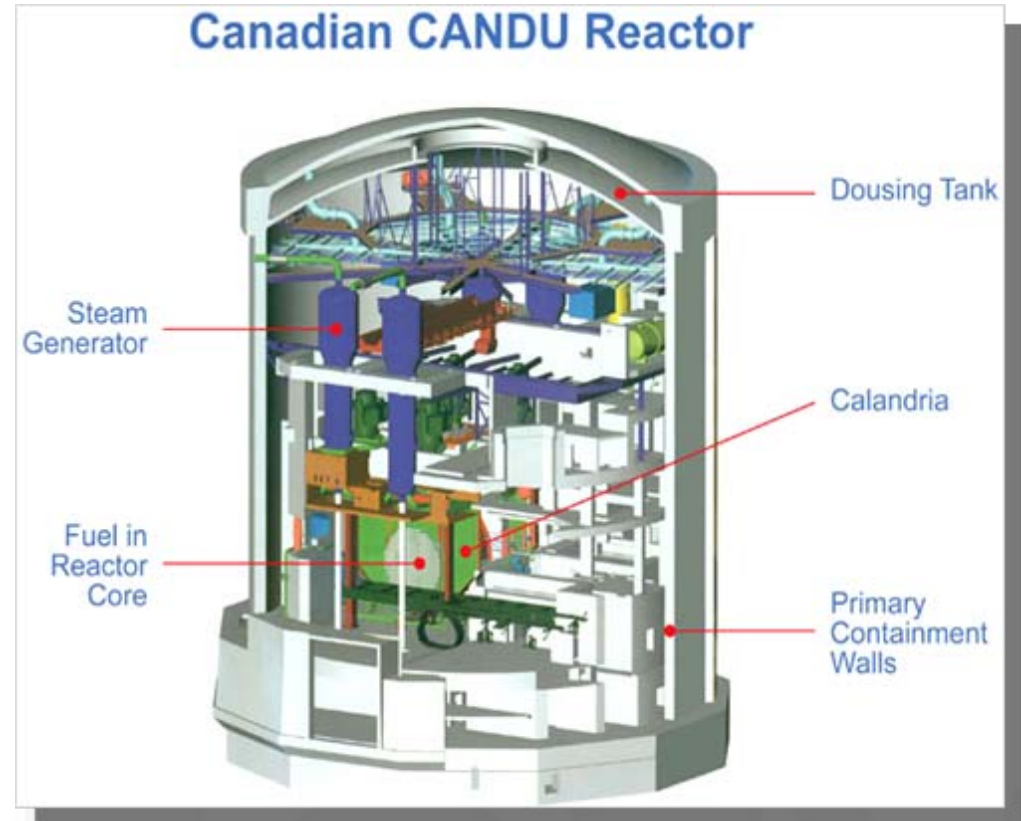
# Industry Response

- ❖ Timely response by industry to CNSC directive:
  - all licensees responded by April 1, 2011 on short-term actions
  - identified their proposed plan and schedule to meet CNSC's request
  - concluded that the overall safety case remains strong
- ❖ Enhanced environmental monitoring and reporting
- ❖ AECL product development program review:
  - review lessons learned from all reviews and findings
  - incorporate improvements into new build design

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# CANDU Safety Features: Review Outcomes

- ❖ Two-group design philosophy against common mode failure
- ❖ Large-volume, low-temperature moderator can act as a reactor core heat sink



# CANDU Safety Features: Review Outcomes

- ❖ Low-temperature shield tank surrounding the moderator to act as a further heat sink
- ❖ Passive convection cooling
- ❖ Gravity-fed dousing tanks
- ❖ Emergency filtered air discharge system

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# Multi-Unit Stations: Review Outcomes

- ❖ Interconnected containment utilizing negative pressure vacuum building
- ❖ Inter-unit feedwater tie
- ❖ Inter-unit electrical tie



# Station Blackout: Review Outcomes

- ❖ Automatic reactor shutdown
- ❖ Passive convection cooling feature
- ❖ Two independent and diverse sources of back up power

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# External Hazards: Review Outcomes

- ❖ All sites have been assessed for a range of concurrent hazards, including flooding, severe weather and seismic events
- ❖ Reactors have been designed to withstand external hazards

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# Seismic Events: Review Outcomes

- ❖ All sites located in zones of low seismic activity
- ❖ Every site has its own specific seismic hazard assessment
- ❖ Plant designs have been recently re-evaluated and confirmed to be seismically robust

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# Spent Fuel Storage Bays: Review Outcomes

- ❖ Seismically qualified double-walled pool
- ❖ Spent fuel is removed routinely into dry storage to minimize bay inventory
- ❖ On-line fuelling mitigates heat load in the fuel bay
- ❖ Several diverse means of adding water to bays

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# Emergency Management: Review Outcomes

## On-site response:

- ✦ multi-level response to ensure adequate resources and communication with province and municipality
- ✦ Severe Accident Management Guidelines

## Off-site response:

- ✦ collaboration between municipal, provincial and federal emergency management organizations
- ✦ actions to mitigate impacts

Transparency through communication with the public and media

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# Summary

- ❖ At all government levels, Canada responded with urgency
- ❖ Canadian nuclear industry collaborated to coordinate a comprehensive review within a very short time frame
- ❖ Ongoing environmental monitoring on Canadian territory and evaluation of readings from outside Canada
- ❖ Follow-up actions to strengthen nuclear safety:
  - begun to accelerate programs that will provide early benefits, in particular in the areas of severe accident management and emergency preparedness

**It's time for global mandatory  
safety standards**



**We Will Never  
Compromise  
Safety...**

**...It's In Our DNA!**



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