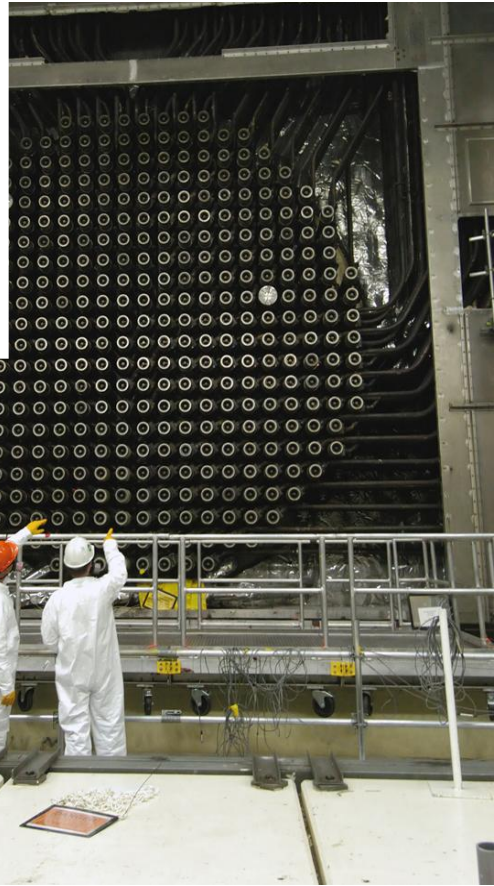
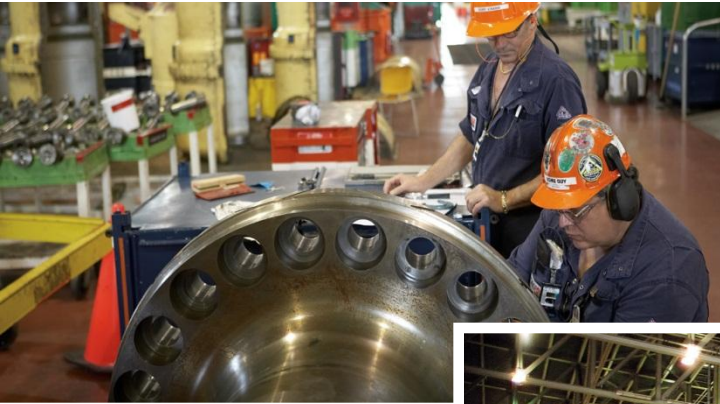


Canada



Canada's Response to Events in Japan

Overall government response

- on-going environmental monitoring on Canadian territory from coast to coast
- deployed experts to the IAEA
- video conferencing to answer questions of Canadians in Japan

Canada's Response to Events in Japan

Regulatory response - CNSC



- Activated EOC March 11, 2011
- Staffed 24 hours a day 7 days a week
- Initiated discussions with international peers
- Discussions with other Canadian government agencies
 - Health Canada
 - Foreign Affairs
 - Natural Resources Canada
 - Government Operations Centre
 - Canadian Food Inspection Agency
 - Environment Canada

Canada's Response to Events in Japan


Regulatory response - CNSC

The logo of the Canadian Nuclear Safety Commission (CNSC) is located in the top right corner. It features a stylized white atomic symbol with three elliptical orbits around a central dot, set against a red background that forms a curved shape on the right side of the slide.

- Issued a directive pursuant to the 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

Canada's Response to Events in Japan

Regulatory response – immediate actions



- CNSC site staff carried out focused inspection on
 - seismic
 - fire
 - flooding
 - backup power
 - hydrogen igniters and passive recombiners
- On-going inspection against external hazards

Canada's Response to Events in Japan

Regulatory response – immediate actions



- Inspections of spent fuel bays
 - components and equipment
 - heat sinks
 - alarms
- Availability of on-site and off-site resources

Canada's Response to Events in Japan

Regulatory response – long term measures



- Verification of defence-in-depth strategy and measures to
 - minimize frequency of abnormal operation and failures
 - control abnormal operation and detect failures
 - limit the progression of accident to within the design basis
 - control severe plant conditions (Severe Accident Management Guidelines)
 - mitigate radiological consequences (Emergency Management)

Canada's Response to Events in Japan

Regulatory response – public communication



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

Canada's Response to Events in Japan



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

Canada's Response to Events in Japan

Industry response



- Timely response by industry to CNSC directive
 - All licensees responded by April 1 2011 on short-term actions
- Enhanced environmental monitoring and reporting
- AECL program review to support CANDU fleet (national-international) and new build
 - lessons learned from all reviews
 - incorporate improvements

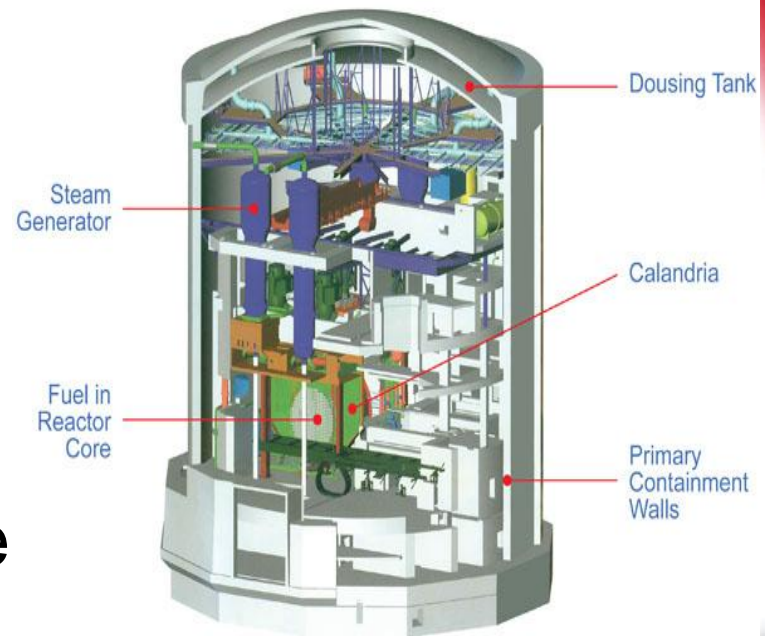
Canada's Response to Events in Japan

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

Canadian CANDU Reactor



Canada's Response to Events in Japan

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

Canada's Response to Events in Japan

Multi-unit stations – review outcomes



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



Canada's Response to Events in Japan

Station blackout – review outcomes



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

Canada's Response to Events in Japan

External hazards – review outcomes



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

Canada's Response to Events in Japan

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

Canada's Response to Events in Japan

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 minimizes heat load in the fuel bay
- Several diverse means of adding water to bays

Canada's Response to Events in Japan

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 to the public and media

Canada's Response to Events in Japan

Summary



- At all government levels, Canada responded with urgency
- Canadian nuclear industry collaborated to coordinate a comprehensive review in a very short timeline
- On-going environmental monitoring on Canadian territory and evaluation of readings from outside Canada
- Follow up actions to strengthen nuclear safety

It's time for global mandatory minimum safety standards