

**Observations on OPG's Nuclear
Operations after the Japan
Earthquake and Tsunami**

Could a Japan-Type Event Happen Here?

The events at the Japan nuclear facilities could not be replicated in Ontario for two reasons:

- **Durham's stable geologic location**

- Ontario's reactors are at two sites on Lake Ontario and one site on Lake Huron where major earthquakes are not expected.
- Similarly, the Great Lakes are highly unlikely to produce a tsunami that would damage the operations of our nuclear units. They are in a geologically-stable region with a geologically-stable shoreline.

- **Robust design and safety systems of OPG facilities**

- Built to resist earthquakes stronger than those that seismic studies say are likely to occur in Ontario in one in 1,000 years.

Durham Seismic Profile

Southern Great Lakes Seismic Zone

- This region has a low to moderate level of seismicity.
- Over the past 30 years, on average, 2 to 3 magnitude 2.5 or larger earthquakes have been recorded in the southern Great Lakes region.
- Three moderate sized (magnitude 5) events have occurred in the 250 years of European settlement of this region, all of them in the United States

Canadian Nuclear Plants: Built to Withstand Flooding

“In Canada, nuclear reactor sites are selected to minimize the possibility of external flooding.

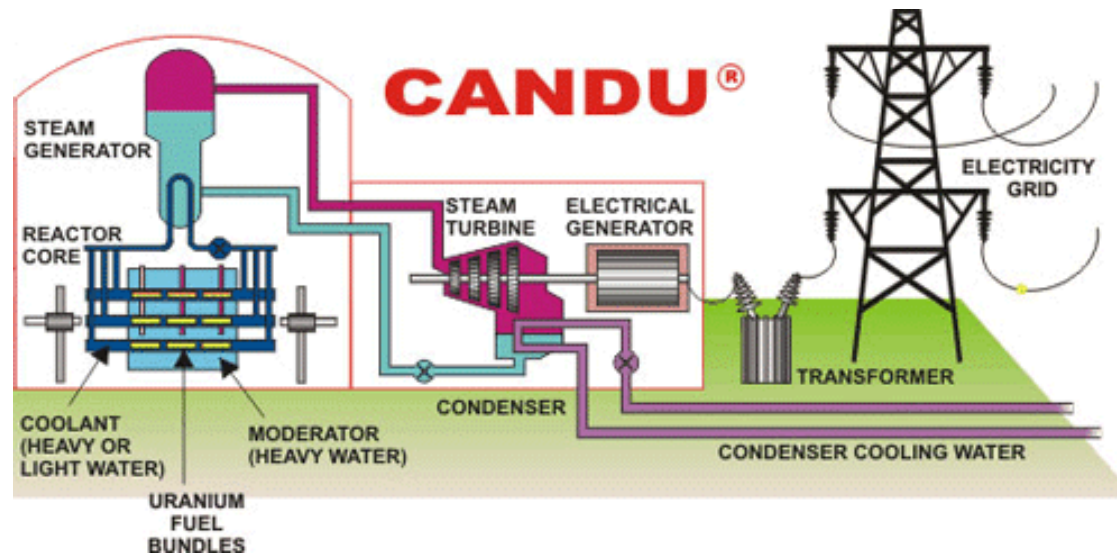
“Nevertheless, as part of an external hazard assessment, the consequences of external flooding are considered in the reactor design to ensure effectiveness of all safety-related systems credited for automatic shutdown and cooling of the reactor.”

Ontario CANDU Nuclear Safety Systems

- **Two shutdown systems:** Each reactor has two shutdown systems that can be operated manually or triggered automatically if there is a problem. In one of the shutdown systems, the unit has rods that, in an emergency, would drop rapidly into the reactor core and shut off the reaction by absorbing neutrons. Each of the stations also has a secondary means of stopping the fission reaction.
- **Unique vacuum containment:** *Unique to Ontario CANDU stations.* Every reactor is linked to a vacuum building. If steam builds up in a reactor's containment, it flows to the vacuum building. A massive pool of water at the top of the building is then sprayed onto the steam to cool it.
- **A safety net of redundant power:** Ontario's CANDU reactors have considerable redundancy in back-up power supplies. Across the nuclear fleet there is a mix of standby generators, emergency power generators, and auxiliary generators with varying degrees of seismic qualification (back up to the back up).

Over the last several years OPG has invested in upgrades to these systems and our fire suppression systems. This is one part of a commitment to ongoing safety improvements.

Nuclear Safety at OPG: Dual Shut-Down Systems



- All Canadian nuclear reactors have special safety systems that automatically shut down the reactor in the event of any major equipment malfunction and maintain cooling of the fuel in the event of a failure of the reactor cooling system.
- These systems are designed to be tested while the reactor is operating and must meet stringent availability requirements.

Nuclear Safety at OPG: Containment Systems



- OPG's reactors are enclosed in a sealed reactor building with steel reinforced, concrete walls with a thickness of up to a metre or more.
- The reactor building is connected by a large duct to the vacuum building. In the extremely unlikely event of a large leak in the reactor cooling system, steam and water is released into the reactor building. The pressure would rise, opening large fast-acting valves connecting the vacuum building to the reactor building.
- The steam and any radioactive material would be vacuumed into the vacuum building to be condensed and cooled by water sprays from the dousing-tank located at the top of the vacuum building.

Nuclear Safety at OPG: Back Up Power Systems



- In the event of an earthquake or other worse-case scenarios, OPG's nuclear emergency power system is designed to provide electrical power to certain nuclear safety-related systems that support the capability to control, cool and contain the fuel.
- OPG's emergency power and standby generators are seismically and environmentally qualified and have sufficient fuel stores to provide auxiliary power to the nuclear reactors until such time as the grid is restored.

Staff Trained in Emergency Preparedness

- **Trained, regulated, qualified staff:** In addition to the robust physical safety systems, there are many human elements to the Ontario nuclear safety program. OPG's training program has been internationally-recognized as a strength. Nuclear operators spend one week out of every five in training and evaluation programs.
- The Canadian Nuclear Safety Commission provides significant oversight with on site staff working at the nuclear stations. As well, rigorous relicensing takes place at least every five years with significant examination of operations, equipment and processes.
- **Emergency preparedness:** All nuclear power plant operators in Canada have well-established and practiced emergency procedures in place that include emergency shut down of the reactors and firefighting. These facilities are inspected regularly by CNSC personnel and emergency drills are evaluated by CNSC teams.

What's Next?

- OPG will continue to monitor the situation in Japan closely.
- OPG will work with Canada's nuclear regulator, the CNSC and nuclear industry groups such as the World Association of Nuclear Operators to understand and learn from this event.
- We will incorporate the lessons from this event into our operating experience.
- OPG – and the nuclear industry as a whole – will emerge safer as a result.