Our commitment to safe, responsible management

The electricity generated by nuclear power emits virtually no greenhouse-gas causing emissions. The by-product of electricity generated from nuclear power is nuclear waste, which is managed in a contained and controlled manner.

Every employee of OPG’s Nuclear Waste Management Division recognizes and accepts the responsibility for the management of our waste in an environmentally, socially and financially-responsible manner. We are dedicated, uncompromising and absolute in our commitment to the safety of fellow employees, the public, the communities where we operate, and the environment.

Our commitment to safety and the environment

OPG has been safely storing nuclear waste from the Bruce, Pickering and Darlington generating stations for almost 50 years and we are proud of our operating record and the progress we have made towards long-term solutions for the future.

Western Waste Management Facility (WWMF) employees are well trained and regard safety for employees, the public and the environment as their top priority. They have accomplished significant milestones in these areas, such as achieving long-standing records of no “Lost Time Accidents” and excellent environmental performance. Safe work planning, safe work practices and attention to detail, along with a safety-conscious work attitude, has led to this excellent safety performance.

Through employing highly qualified employees, careful planning, development of technology and equipment and the use of sound operating procedures, OPG has ensured that radioactive waste is managed safely and poses no significant risk to employees, the public or the environment.

• OPG has been safely managing radioactive waste for almost 50 years
• The Western facility manages and provides interim storage of low and intermediate level waste from OPG’s Pickering and Darlington nuclear stations and the Bruce Power stations
• The Western Used Fuel Dry Storage Facility stores used fuel from the Bruce site only.
Regulatory authority

The nuclear industry is one of the most strictly regulated in Canada. The overall regulation of nuclear reactor operation and nuclear waste management in Canada is the responsibility of the Canadian Nuclear Safety Commission (CNSC). Every aspect of the management of low and intermediate level waste and used nuclear fuel is regulated by the CNSC.

What is nuclear waste?

During the operation of nuclear generating stations, waste is produced much like any other industry. Some of this waste becomes radioactive and must be handled using special procedures. OPG categorizes the radioactive waste into low, intermediate and used fuel.

Low level waste

Low level waste consists of minimally radioactive materials that have become contaminated during routine cleanup and maintenance such as mop heads, cloths, paper towels, floor sweepings and protective clothing. These items make up about 95 percent of the total non-fuel waste volume.

Intermediate level waste

Intermediate level waste consists primarily of used reactor core components and resins and filters used to keep reactor water systems clean. Intermediate level waste is more radioactive than low level waste and requires shielding to protect workers during handling.

Low level waste from the Bruce, Pickering and Darlington nuclear generating stations is received at the Waste Volume Reduction Building at the WWMF where it may be processed through either incineration or compaction to reduce its volume or to be stored as is. Following processing, the low level waste is placed into above-ground concrete warehouse-like structures called Low Level Storage Buildings. About 3,000 m³ of low level waste is stored annually (just over the volume of an Olympic swimming pool). Storage for refurbishment waste (fuel channel waste and steam generators) from the Bruce reactors is also provided at the WWMF. The WWMF has about 88,000 m³ (35 Olympic swimming pools) of low level waste in storage as of 2016.

Low level waste is handled by trained personnel to process for volume reduction or to store as is.

Low and intermediate level waste stored at the WWMF is continually monitored to ensure the integrity of the storage containers and can be retrieved at some future date for transfer to a long-term storage facility. The WWMF will continue to add storage structures as required (subject to applicable regulatory approvals).

OPG is currently seeking approval for a Deep Geologic Repository for the long-term storage of low and intermediate level waste at the Bruce site.

Ontario Power Generation employees carefully lower intermediate level waste into an in-ground storage container.
Used nuclear fuel

Used nuclear fuel, sometimes called high level waste because it is much more radioactive, is stored at the nuclear station site where it was generated. It is stored in the station’s used fuel bay, within the station, for at least 10 years. After that time it can be transferred to above-ground storage containers.

At the Western Waste Management Facility location, only used fuel from the Bruce Power stations is stored at the interim used fuel dry storage facility. The facility consists of a processing building and storage buildings. This facility went into operation in 2002 and is designed to provide storage space for about 2,000 Dry Storage Containers (DSC). The overall Western Used Fuel Dry Storage Facility (WUFDSF) design includes four DSC storage buildings, each having the capacity to store about 500 containers. Two buildings were commissioned in 2002 and 2007, and two additional ones in 2013. Construction of future storage buildings will be staged as additional space is required, with a new storage building built about every four to seven years.

Dry storage is a proven technology in use around the world. In addition to the facility at WWMF, OPG also operates dry storage facilities at the Pickering and Darlington nuclear sites.

Dry storage process

The process of loading a dry storage container with used nuclear fuel begins first by submerging a 60-tonne container into one of Bruce Power’s water-filled used fuel storage bays. Once in the storage bay, four modules each containing 96 used fuel bundles are loaded into the container under water. The used fuel bundles have been stored in the water-filled bay for about 10 years, during which time they have cooled and become less radioactive.

The container, now holding 384 used fuel bundles, is removed from the bay and drained, decontaminated and vacuum dried. A transfer clamp secures the lid to the container which is moved to the dry storage facility with a large transport vehicle. Once received, the lid is welded to the container’s base. After the inside of the container has been vacuum dried, it is filled with helium gas. The drain port is then seal-welded.

Each dry storage container (DSC) is made of reinforced high-density concrete approximately 510 mm (20 inches) thick and is lined inside and outside with 12.7 mm (half inch) thick steel plate. This thickness of concrete provides an effective barrier against radiation. The DSC weighs 70 tonnes when full.

The helium gas provides a means of leak detection for the sealed container and creates an inert atmosphere for the storage of used fuel. Before being placed into storage buildings, the container undergoes rigorous testing to ensure that it is absolutely leak tight, and lastly, safeguard seals are applied by an inspector from the International Atomic Energy Agency (IAEA).
The used fuel dry storage process

1. Dry Storage Container (DSC) delivered from manufacturer to an OPG Waste Management Facility
2. DSC preparation and checks at DSC processing building
3. Transfer of empty DSC to the station
4. Verification of used fuel 
5. Remote loading
6. Lid placement with in-bay clamp
7. Water spray decontamination
8. Water drained from inside DSC back into bay
9. In-bay clamp removed (stays in station); transfer clamp attached
10. Remaining water drained from inside DSC
11. Initial vacuum drying
12. DSC transferred to processing building
13. Remote semi-automatic welding of DSC flange (lid to base)
14. Inspection of flange weld
15. Final vacuum drying
16. Helium backfill of DSC
17. Manual weld of DSC Drain Plug
18. Inspection of drain plug welds
19. Helium leak test of DSC
20. Paint repair, safeguards seals applied by IAEA inspectors, DSC identification label attached
21. DSC transferred to storage building
22. Indoor secure storage

Operations at the Waste Management Facility (WMF)
Operations at the Nuclear Generating Station (NGS)
used fuel storage bay area
Transfer operations between NGS and WMF
Radioactive material transportation

A record of safety

OPG has an exceptional safety record in the transportation of radioactive materials by road. In almost 40 years, there has never been a release of radioactive materials during transportation. Our drivers are some of the best trained in their field. OPG ensures that they have high-level defensive driving training.

In a typical year OPG makes about 450 radioactive material shipments, covering over half a million kilometres. Shipments (roughly 23 percent) involve the transportation of low and intermediate level waste to the WWMF. A smaller number (roughly 13 percent) involve transporting tritiated heavy water from Bruce and Pickering to the Darlington Tritium Removal Facility for processing and remaining shipments involve the transportation of empty packages to and from different nuclear stations.

All of these shipments are logged into an OPG computerized database. This program logs information about the type of material being transported, point of origin, destination, etc.

Built for safety

Many different types of packaging are used to transport radioactive materials. All of the transport packages are built to requirements specified by the Canadian Nuclear Safety Commission. For example, the intermediate level waste transportation packages used for shipping spent resins and tritiated heavy water are built to Type B standards. According to federal regulations all Type B packages must be able to withstand a nine-metre drop onto an unyielding surface; a one-metre drop onto a steel pin; 30 minutes in an 800 degree celsius fire; and eight hours immersed in 15 metres of water. Only after field testing and/or computer analysis has demonstrated the packages can survive these tests will a licence to use the packaging be issued by the Canadian Nuclear Safety Commission.

Radioactive materials transportation is also regulated by Transport Canada’s Transportation of Dangerous Goods Regulations. These regulations specify the documentation and administrative requirements in order to transport radioactive material on public roadways. The documentation must include specification of the contents on the shipping document, the labeling and placarding requirements, driver training requirements and an approved transportation emergency response plan.

Commitment to the future

OPG has an obligation to plan for the eventual decommissioning of our nuclear facilities including the Bruce Power leased reactors, and the long-term management of our nuclear wastes. OPG makes annual contributions to special funds dedicated solely for this purpose.

Our partnership with the Municipality of Kincardine to develop a Deep Geologic Repository for low and intermediate level waste on the Bruce site was endorsed by the community in 2005 and is now in the regulatory approval process. Visit opg.com/dgr

OPG has made a significant contribution to the Nuclear Waste Management Organization, which has recommended Adaptive Phased Management to the Federal government for the long-term management of used nuclear fuel in Canada, and endorsed in 2007. Visit nwmo.ca

Communicating our commitment

Although we are proud of our contributions to these initiatives, there is nothing we value more than our relationship with the people of Ontario. The safe storage of nuclear waste is done in a very transparent manner and OPG provides information in a variety of methods on nuclear waste management to the public.

For more information on our activities visit www.opg.com or email nwmd@opg.com
OPG’s Deep Geologic Repository Project
for low and intermediate level waste

A long-term storage solution
Ontario Power Generation (OPG) is seeking regulatory approval for construction of a proposed Deep Geologic Repository (DGR). This DGR, for the long-term management of low and intermediate level radioactive waste will be constructed on lands adjacent to OPG’s Western Waste Management Facility (WWMF) on the Bruce nuclear site in the Municipality of Kincardine.

For almost 50 years the WWMF has safely stored low and intermediate level waste from the Bruce, Pickering and Darlington nuclear sites on an interim basis. In 2002 the Municipality of Kincardine approached OPG to jointly review options for a long-term storage facility for low and intermediate level radioactive waste at the Bruce site.

An Independent Assessment Study identified three options deemed to be technically feasible and capable of safely storing the waste: the Deep Geologic Repository (DGR), Enhanced Processing, Treatment and Long-Term Storage and Covered Above-Ground Concrete Vault. In 2004 the Municipality of Kincardine by resolution endorsed moving forward with the DGR because of its higher safety margins.

The proposed DGR would manage about 160,000 cubic metres of low and intermediate level waste in underground emplacement rooms (200,000 cubic metres emplaced volume).

Only low and intermediate waste from OPG’s Bruce, Pickering and Darlington generating stations will be accepted for storage in the DGR. Used fuel will not be stored in the DGR.

Committed to safety
The stability and predictability of the rock formations, along with their isolating capabilities, make an ideal setting where the waste can be safely stored while the radioactivity decays.

The proposed DGR location, 680 metres (2,230 feet) underneath the Bruce site, will be constructed in low permeability limestone capped by 200 metres of low permeability shale. These rock formations, thought to be in excess of 450 million years, have remained intact and without major faults or fractures through many geologic events.

In addition, the DGR is extremely isolated from all sources of groundwater, and the pore water at the level of the repository has a salt content more than eight times that of sea water indicating that it has been trapped at this level in excess of one million years. The salt content is also an indication that the pore water isn't mixing with the groundwater above.

Verifying the site and approvals
Formal environmental assessment and licensing processes began in 2005 with the submission of the DGR Project Description. A detailed four-year geoscientific site program of studies began in 2006 to verify the suitability of the DGR site. In 2007 the Minister of the Environment referred the Environmental Assessment (EA) to a Joint Review Panel (JRP). In 2010 the four-year program of studies concluded and the Environmental Impact Statement and supporting documents were submitted to the JRP. Following a public comment period the JRP held two hearings. The detailed public hearings in 2013 and 2014 lasted 33 days.

The public hearing gave participants, the Canadian Nuclear Safety Commission (CNSC) and OPG the opportunity to provide comments on the project. The JRP closed the public registry on November 18, 2014 to prepare an EA report.

The JRP submitted its EA report to the federal Minister of the Environment May 2015 for a decision. The report outlined conclusions, rationale, recommendations and a summary of comments received from the public during the course of the public review. Aboriginal groups and the public provided comments to the Minister on mitigation measures and follow-up programs in September 2015.

On Feb. 18, 2016 the Federal Minister of the Environment and Climate Change requested OPG conduct three further technical, environmental and economic studies into its proposed DGR. Pending results of this report and the federal Minister’s decision, the JRP may issue a site/preparation/construction licence. Once the DGR is constructed, OPG will apply for an operating licence which would be reviewed and heard by the CNSC commission at a public hearing.

OPG maintains that a deep geologic repository is the right answer for Ontario’s low and intermediate level waste, and that the Bruce site is the right location.