Ontario Power Generation (OPG) has been safely managing radioactive waste from Ontario’s nuclear generating stations for over 30 years. At OPG’s Western Waste Management Facility (WWMF), waste is received from the stations and is processed and stored. Approximately 140 staff work at the Western Waste Management Facility and they ensure that the public, workers and the environment are protected from the hazards associated with the radioactive wastes that are produced.

### Safety and Environment

Western Waste Management Facility staff are well trained and regard safety and the environment as their top priority. They have accomplished significant milestones in these areas, such as achieving a long-standing record of no Lost Time Accidents. Conducting safe work planning, following safe work practices, paying particular attention to detail, along with a safety conscious work attitude, has led to this excellent safety performance.

The Western Waste Management Facility has in place an Environmental Management System (EMS) that establishes strategies, objectives and targets for the facility to improve environmental performance. The EMS is based on the ISO 14001 Standard, which provides a tool for ensuring and demonstrating a high standard of environmental responsibility. The WWMF was certified to the ISO 14001 standard in 1999 and more recently has successfully re-certified.

By employing highly qualified staff, careful planning, development of technology and equipment and the use of sound operating procedures, Ontario Power Generation has ensured that radioactive waste is managed safely and poses no significant risk to employees, the public or the environment.
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 high level waste.

**Low Level Waste**

Low level waste consists of minimally radioactive materials such as mop heads, rags, paper towels, floor sweepings and protective clothing. These items make up about 95 percent of the total non-fuel waste volume.

Low level waste from the Bruce, Pickering and Darlington nuclear stations is packed in plastic bags and placed in special shipping packages for transportation to the WWMF. It is received at the Waste Volume Reduction Building where it may be processed by either incineration or compaction, to reduce its volume. Following volume reduction the low level waste is placed in above ground concrete warehouse-like structures, called Low Level Storage Buildings.

**Intermediate Level Waste**

Intermediate level waste consists primarily of used reactor components, and resins and filters used to keep reactor water systems clean. Intermediate level waste makes up about 5 percent of the total volume of non-fuel waste produced from the nuclear power stations.

At the stations the intermediate level waste is loaded into specially reinforced and shielded transportation packages and shipped to the WWMF. Intermediate level waste, because of its radiological and physical properties, is not processed for volume reduction. It is stored mainly in steel lined concrete containers that have been set into the ground.

All of the low and intermediate level waste stored at the WWMF is continually monitored to ensure the integrity of the storage containers. The waste can also be retrieved at some future date for disposal.

**High Level Waste**

High level waste is used nuclear fuel. It is stored at the nuclear generating site where it was used. It can be stored in the station’s spent fuel bay or after a period of years transferred to above ground dry storage containers.

At the WWMF used fuel from the Bruce Power stations is stored at the used fuel dry storage facility. This facility, which is called the Western Used Fuel Dry Storage Facility, is used to store only Bruce used fuel. The Western Used Fuel Dry Storage Facility (WUFDSF) consists of a processing building and storage building. This facility is designed to provide storage space for approximately 2,000 Dry Storage Containers (DSC). The overall WUFDSF design includes four DSC storage buildings, each having the capacity to store about 500 DSCs. Construction of DSC storage buildings will be staged as additional storage.
space is required, with a new storage building being built approximately every five to seven years.

Dry storage is a proven technology in use around the world. In Canada, dry storage is used by Hydro Quebec at Gentilly, New Brunswick Power at Point Lepreau and Atomic Energy of Canada at Chalk River and Douglas Point. In addition to the WUFDSF, Ontario Power Generation also operates a dry storage facility at Pickering and is planning another similar dry storage facility at Darlington.

**Dry Storage Process**

The process of loading a dry storage container with used nuclear fuel, begins first by submerging a 63-ton 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 at least 10 years, during which time they have cooled and become less radioactive. The container, now holding 384 used fuel bundles is then removed from the bay, drained, decontaminated and vacuum dried. The container is moved under a self-contained vacuum to the WUFDSF with a large transport vehicle. Once received at the WUFDSF, the lid is welded to the container’s base and the vent port is seal-welded. After the inside of the container has been vacuum dried, it is filled with helium gas. The remaining drain port is then seal-welded. The helium gas provides a means of leak detection for the sealed container and creates an inert atmosphere for the stored used fuel. Before being placed into storage, the container undergoes rigorous testing to ensure that it is absolutely leak tight and lastly, a safeguards seal is applied by an inspector from the International Atomic Energy Agency (IAEA).

**Regulatory Authority**

The overall regulation of nuclear reactor operation and 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. The CNSC monitors all WWMF activities to ensure that the operations pose no undue risks to people or the environment.

To ensure that all used nuclear fuel can be accounted for, Canada participates in the nuclear non-proliferation treaty. The Western Used Fuel Dry Storage Facility is also monitored on an ongoing basis by the International Atomic Energy Agency.

**Dry Storage Facts...**

- **Dry storage is safe and economical**
- **It is a proven technology in use around the world**
- **The WUFDSF is used for Bruce used fuel only**
- **WUFDSF facility in-service - October 2002**
Ontario Power Generation has an exceptional safety record in the transportation of radioactive materials. In a typical year, almost two thousand truck shipments of radioactive materials are made by OPG, covering approximately 700,000 kilometres. Some of these shipments (roughly 20 percent) involve the transportation of low and intermediate level waste from the Pickering and Darlington nuclear sites to the Western Waste Management Facility. A smaller number of shipments involve transporting quantities of tritiated heavy water from Bruce and Pickering to the Darlington Tritium Removal Facility, for processing. The majority of radioactive material shipments made by OPG include the transportation of water samples to research/laboratory facilities and the transportation of tools and equipment to and from the different nuclear stations.

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

Many different types of packages are used to transport radioactive material. All of the transport packages are built to requirements specified by the Canadian Nuclear Safety Commission (CNSC). For example, the intermediate level waste transportation packages used for shipping spent resins in bulk, and for 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 centigrade 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 container be issued by the CNSC.

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

Ontario Power Generation’s radioactive material transportation program is supported by:

- Packages designed, fabricated and tested in accordance with applicable regulations and standards;
- Regular audits and safety assessments of transportation practices;
- An ongoing training program;
- Routine package inspection and maintenance; and
- A transportation emergency response plan that is audited both internally and externally by authorities like Transport Canada.

For more information about Ontario Power Generation’s nuclear waste management program and plans, please visit www.opg.com