CANADIAN NUCLEAR
WORKERS' COUNCIL

Canada's Nuclear Industry
Safety In Depth

Key Points:

- A "safety in depth" philosophy applies to all aspects of Canada's nuclear industry. This includes uranium mining, fuel processing and fabrication, harvesting of isotopes for medical and surgical sterilization purposes, design, construction, life extension activities and operation of nuclear power plants and waste management facilities.
- The health and safety of workers across the industry is paramount. Canada's nuclear industry is highly unionized. This unionization means workers have a meaningful voice when it comes to their health and safety.
- Canada's nuclear industry is among the most highly monitored and regulated in the world. The regulator listens to and is interested in the views of workers.
- The safety of every worker and the people in the communities in which they live is the number one priority of every member of the nuclear industry.
- Canada's CANDU reactors are among the safest in the world and have been designed with multiple safety barriers. These safety systems account for the possibilities of human error, equipment failure and external risks such as power outages, storms, earthquakes and other natural phenomenon.
- Due to these factors, Canada's nuclear industry has an exceptional 50 year plus track record for both radiological and conventional safety. Other Canadian electricity generation sources have excellent safety records, but no other Canadian electricity generation source can lay claim to a better safety record than that of the Canadian nuclear electricity generation sector.

Regulatory Oversight

The Canadian Nuclear Safety Commission (CNSC), an independent agency with quasi-judicial powers, protects the environment and the health and safety of workers and public. In accordance with the *Nuclear Safety and Control Act*, the CNSC regulates the use of nuclear energy and materials and Canada's international commitments on the peaceful use of nuclear energy.

The CNSC regulates all nuclear-related facilities and activities: uranium mines and mills; uranium fuel fabricators and processing; nuclear power plants; waste management facilities; nuclear substance processing; industrial and medical applications; nuclear research and education; and export and import control.

The International Atomic Energy Agency at the United Nations also provides oversight. Maximum radiation doses are based on recommended standards for radiation protection of workers and the public. These standards are set by the International Commission on Radiological Protection (ICRP) which is an international organization of independent scientists.

Designed for Safety

Persons or organizations preparing a site, constructing, operating, decommissioning or discontinuing at a nuclear facility must obtain a licence from the CNSC. Regulations stipulate the prerequisites for the licence as well as the obligations of the licensees.

Several reactor designs are used worldwide. Pressurized Water Reactor (PWR) designs are the most common type while other designs include Boiling Water Reactors, Advance Gas Cooled Reactors and the CANDU. These designs use different concentrations of uranium, moderators and coolants in the reactor core.

The CANDU (CANada Deuterium Uranium) reactor uses heavy water as a moderator and coolant and natural unenriched uranium (there is no need to increase its concentration) as a fuel. CANDU reactors can also use recycled uranium, mixed fuels and thorium.

CANDU nuclear reactor designs are among the safest in the world having multiple safety barriers to protect workers and the public in the event of an accident. CANDU's many safety systems consider human error, equipment failure and external risks such as earthquakes.

The CANDU design includes two fully independent and redundant safety systems that automatically shut down the reactor in the event of any major equipment malfunction. They also include the unique feature of thermosyphoning that maintains the cooling of the fuel in the event of a failure in the reactor cooling system.

An airtight containment building with walls of reinforced concrete up to 1.8 meters thick surrounds each reactor. This barrier is designed to prevent the release of any radioactive material to the environment in the extremely unlikely event of an accident. At nuclear power plants with multiple reactors like those in Ontario, each reactor building is connected to a common vacuum building. This is another level of safety called the negative pressure containment system and is unique to the CANDU system.

Plant operations are continuously monitored. CNSC inspectors are located on-site at these stations. All components and safety systems are subject to special testing and inspection to ensure compliance with CNSC requirements and those requirements set out in the Operating License. Failure to comply can lead to the withdrawal of an operating licence or an administrative monetary penalty, or both.

An Industry Underpinned by a Strong Safety Culture

The Canadian nuclear industry's record for both radiological and conventional safety is exceptional. Concern for safety is every nuclear industry worker's responsibility—that of their co-workers and of the nearby communities in which they live.

Workers at Canada's nuclear plants include a wide range of skilled tradespeople and specialists. Up to five percent of the personnel working in nuclear power plant are devoted entirely to safety training and monitoring e.g. radiation safety technicians as well as conventional safety specialists, emergency responders and security personnel.

Nuclear operators—the people who work in the power station's control room – are carefully selected and spend several years being trained. The CNSC sets the examinations and reviews the qualifications of applicants for this role. Training takes place in the class-room in the plants and on simulators that replicate the control room and that can be set to simulate normal and abnormal operating situations and scenarios.