- **Emergency Planning Zones** identify areas where hazards might arise and ensure that appropriate protective actions can be taken promptly and effectively in the event of an accident.

The four zones that are designated around berths and anchorages are:

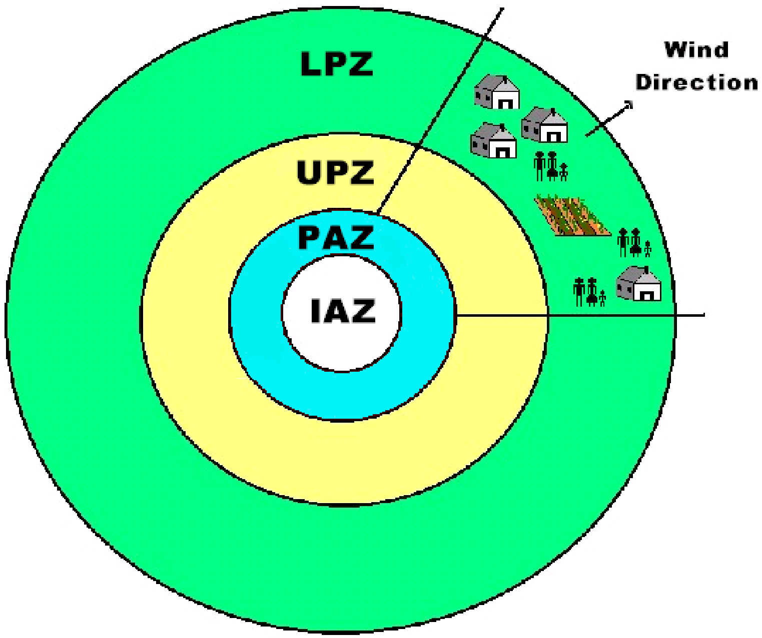
Immediate Action Zone (IAZ) is a radius of 100 metres from the NPW and represents an area around the berth within which risks would be due to airborne radioactive material and direct exposure to external gamma radiation.

The on-site personnel will implement evacuation measures within this zone, immediately the radiation monitoring alarm has sounded. In the event of a genuine alarm, this will limit radiation exposure of individuals and provide adequate time for assessing the severity of the accident. In the event of a false alarm there will be minimal disruption to normal activities within this zone.

Precautionary Action Zone (PAZ) is a radius of 600 metres from the NPW and represents an area within which risks would be due to direct external gamma radiation as well as airborne radioactive material.

Urgent Protective Action Planning Zone (UPZ) is a 30^0 downwind sector within a radius of 2.8 kilometres from the NPW and represents an area within which risks would be due to airborne radioactive material. The UPZ boundary is the distance within which it may be necessary to implement protective measures to prevent radiation doses from exceeding the individual dose assessment criterion.

Long Term Protective Action Planning Zone (LPZ) is an area of several kilometres radius from the NPW. This will vary according to the severity of the accident and prevailing meteorological conditions and would be determined by measurements of radiation and contamination levels. This represents an area within which the surrounding population may be subject to hazards associated with long term exposure to ground deposited radioactive material and ingestion of contaminated water, foodstuffs, milk and agricultural produce.



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Queensland Government
Department of Emergency Services
Emergency Management Queensland

NUCLEAR POWERED WARSHIP VISITS to the PORT of GLADSTONE

Nuclear Powered Vessels

Visits to Australian ports by either conventionally powered or nuclear powered warships (NPW) of allied nations are one of the most visible means of demonstrating Australia's commitment to defence cooperation agreements with those nations. For this reason, it is the Australian Government's clear policy that these visits be welcomed.

At this time, only NPW belonging to the United States Navy, Royal Navy and French Navy are allowed to visit Australian ports. Because of the nature of their propulsion plants, and despite the excellent safety record of their countries with respect to the operation of these vessels, it is a Government requirement that contingency arrangements be in place for all Australian ports visited by NPW in the unlikely event of an accident resulting in the hazardous release of radioactivity to the environment.

History of Visits

Nuclear powered warships have visited Queensland for over 30 years. Analysis of monitoring devices and environmental samples has revealed that no releases of radioactive material were detected, nor were any radiation levels recorded in excess of normal background levels of ionising radiation, either during or subsequent to these visits.

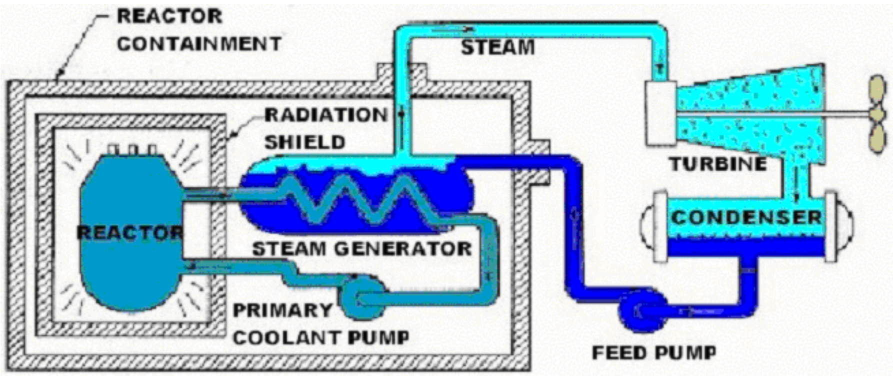
Propulsion System

A nuclear powered vessel uses conventional steam turbine machinery in the propulsion system, the energy for steam generation being supplied from the fission of fuel in a nuclear reactor rather than from the combustion of fossil fuels. NPW permitted by the Government to visit Australia use a pressurised water reactor design, which has two basic systems: the primary system and the secondary system.

The primary system consists of the nuclear reactor vessel, piping loops, pumps, and steam generators. The reactor superheats the pressurised water and circulates it through the steam generators where the heat is transferred to the secondary system without any mixture of the systems. Once the water is passed through the steam generators, it is pumped back to the reactor for reheating.

In the steam generators, the heat from the water in the primary system is transferred to the secondary system to create steam. The secondary system is isolated from the primary system so that the water in the two systems does not intermix.

In the secondary system, the steam flows from the steam generators to drive the turbine generators, which supply the ship with electricity, and to the main propulsion turbines, which drive the propeller. After passing through the turbines, the steam is condensed into water, and is fed back to the steam generators by the feed pumps. Thus, both the primary and secondary systems are closed systems in which water is recirculated and reused.



Hazards Assessments

An accident involving a reactor plant in a NPW, of sufficient severity to cause a significant exposure of members of the Australian public to radioactive materials or ionising radiation, has an extremely low probability and could only occur if there was a break of the primary coolant circuit and a loss of reactor cooling water.

Following an unlikely event of a reactor accident, radiation hazards could result from:

- External gamma radiation from the vessel or radioactive material deposited on surfaces (including skin and clothing). The external radiation is attenuated by shielding and distance.

  Gamma radiation is an intense type of ionising radiation in the form of electromagnetic waves, similar to an X-ray. It could pose a severe radiation hazard external to the vessel, particularly alongside the reactor compartment and will penetrate personal protective equipment.

- Internal radiation due to inhalation or ingestion of airborne radioactive material, in particular radioactive iodines.

The extent of the hazards depends on the type of radiation, distance, duration of exposures, weather conditions and shielding. However, distance is one of the major contributing factors. For example, a severe radiation hazard may exist directly adjacent to the vessel, however, an external radiation hazard several kilometres away from the vessel is minimal. Removing clothing contaminated by radioactive materials would further reduce the hazards to the person.

Gladstone Port Safety Plan

The Gladstone Port Safety Plan specifies the arrangements made by the Nuclear Powered Warship Visits Committee (NPWVC) to address all aspects of the routine and emergency matters associated with the preparation and conduct of a NPW visit to the port of Gladstone. It is a dynamic document and will be amended as necessitated by changes in legislation, or operational characteristics of visiting NPW and current best practice.

The Port Safety Plan has been endorsed and is validated biennially by the Visiting Ships Panel (Nuclear), which is a federal interdepartmental standing committee. The plan is also exercised annually by all response agencies.

The Port Safety Plan includes the following provisions for each visit:

- **Radiation monitoring.** A fixed radiation monitoring post to detect a significant rise in the gamma radiation level at that point will be established prior to the arrival of the NPW and will be located approximately 50 metres from the reactor compartment once the vessel has berthed. This post is staffed 24-hours per day. In addition, mobile monitoring teams are on stand-by for the duration of the visit.

- **Environmental sampling.** Marine bottom samples are taken from the berth before and after the visit of nuclear powered warships and are sent to the Australian Radiation Protection and Nuclear Safety Agency for analysis.

- **Thermoluminescent Dosemeters** are placed at various locations at and around the berth. They are used to measure the radiation fields in that location in the unlikely event of an incident.