LE GOUVERNEMENT
DU GRAND-DUCHÉ DE LUXEMBOURG

Emergency response plan in the event of a nuclear accident

Plan d'intervention d'urgence (PIU) en cas d'urgence nucléaire

(public version)

Ministry of State

Ministry of Health

Ministry of Home Affairs

The emergency response plan (plan d'intervention d'urgence, PIU) is the Grand Duchy of Luxembourg's framework document for managing nuclear emergencies.

The concrete measures to be taken shall be decided upon by the competent authorities for national protection at the appropriate time, communicated to the public and put in place by the competent agencies and departments.

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1. Introduction

The emergency response plan (PIU) defines the action that the Luxembourg government should take in the event of a nuclear accident. It was adopted by the Council of Government on 15 October 2014.

The **objective** of the plan is to establish alert procedures and measures to protect the population in the event of a radiological emergency in general, and in the event of an accident at the Cattenom nuclear power station in particular.

The plan lays out of the following:

- the process for raising the alarm for the authorities, intervention teams and the population in the event of a nuclear emergency;
- the preventive and protective measures to be put in place in the event of a nuclear emergency.

The plan also provides those in charge of carrying it out with the tools needed to react in a flexible manner to provide the best possible protection for the population.

In practical terms, the plan covers the situation during and immediately after the accident.

The term **nuclear emergency** is used to describe a situation that results from an accident which risks leading to a leak of radioactive materials potentially dangerous for public health and the environment. Any nuclear or radiological accident, even small or medium in scale, could lead to the public being exposed to potentially harmful substances, or the environment becoming contaminated.

A state of emergency is declared from the moment when

- an accident risks causing the emission of radioactive materials that exceed the radiation protection levels set by European legislation;
- an accident risks causing a level of exposure to ionising radiation that could pose a risk to public health.

The nuclear alert is then triggered.

In the event of a severe accident in a nuclear power plant, radioactive release into the environment is most often not immediate. In a first instance, the majority of the radioactive substances are in fact confined to the inside of the reactor building. A simultaneous failure in the building's barriers and security systems can cause radioactive substances to be released into the environment. This is why the interval between the accident and the release can range from a few hours to a few days depending on how the accident unfolds.

Regardless of how the accident unfolds, the authorities monitor the situation very closely and keep the public informed on changes to the condition of the damaged reactor and on the protective measures put in place.

2. Managing the nuclear emergency

In the event of a nuclear emergency, the main concern of the authorities is how best to protect the population. The communication strategy is a central part of the emergency response plan: it aims to ensure that the internal communication chain that links those managing the crisis functions correctly, and that there is clear and efficient communication to the media and the population.

2.1. Introduction

As soon as the **Luxembourg 112 emergency call centre** (Central des secours d'urgence luxembourgeois, 112) is informed of a nuclear accident, it alerts the **Radiological Evaluation Cell** (Cellule d'évaluation radiologique), which immediately carries out an evaluation of the information available.

If the accident is likely to pose a danger to the population, the **High Commissioner for National Protection** (Haut-Commissaire à la protection nationale) is informed.

After consulting with the Rescue Services Agency (Administration des services de secours) and the Department for Radiation Protection at the National Health Directorate (Division de la radioprotection de la Direction de la santé), the High Commissioner for National Protection informs the **Prime Minister and Minister of State** who decides whether to activate the **Crisis Cell** (Cellule de crise).

The **execution of this plan** falls within the competency of the Prime Minister and Minister of State, the Minister for Home Affairs and the Minister of Health. All the other ministries, agencies and departments of the State are bound to cooperate with the implementation of the plan using all the means available to them. Local authorities are considered key partners in this.

2.2. The alert chain

ACCIDENT
Manager of the Cattenom Nuclear Power Station

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Luxembourg Emergency Call Centre
(CSU-112, Rescue Services Agency)

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Radiological Evaluation Cell

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High Commissioner for National Protection
(Haut-Commissaire à la protection nationale)

↓

Prime Minister, Minister of State

↓

Crisis Cell
Radiological Evaluation Cell *(Cellule d'évaluation radiologique)*
Communication/Information Cell *(Cellule communication/information)*

↓

www.infocrise.lu / social media / free-phone number

↓

Population

2.3. Stakeholders

In the event of a nuclear crisis, the Prime Minister can activate the Crisis Cell if necessary. The Crisis Cell initiates, coordinates and monitors the execution of all the measures intended to deal with the crisis and its effects. It is assisted by two support cells: the Radiological Evaluation Cell and the Communication/Information Cell. In addition, the Crisis Cell works closely with its foreign counterparts.

2.3.1. The Crisis Cell

The Crisis Cell operates throughout the duration of the crisis and until the situation returns to normal.

It is made up of representatives from the following administrations:

- the High Commissioner for National Protection;
- the Director of Health;
- the head of the Department for Radiation Protection at the National Health Directorate;
- the Director of the Rescue Services Agency;
- the Director-General of the Grand Ducal Police;
- the Chief of Staff of the armed forces;
- the Director of the office for crisis communication;
- the Director of the State Intelligence Service ;
- the Director of the Customs and Excise Agency;
- the Manager of the Government Communication Centre;
- a representative for the Ministry of Family Affairs, Integration and the Greater Region;
- a representative from the Ministry of Home Affairs.

The Crisis Cell can be enlarged if the circumstances require, and its members can be assisted by third parties when necessary.

2.3.2. The Radiological Evaluation Cell

In a nuclear emergency, the main mission of the Radiological Evaluation Cell is to suggest appropriate emergency measures to the Crisis Cell, **monitoring changes to the state of the damaged reactor**, the scale and changes to radioactivity in the environment and its impact on the population. The aim is to provide the best possible protection for the population against all the dangers associated with ionising radiation. The members of this cell also work closely with their foreign counterparts.

The Radiological Evaluation Cell comprises experts from the Department for Radiation Protection at the National Health Directorate and members of the Rescue Services Agency.

2.3.3. The Communication/Information Cell (CCI)

The task of the Communication/Information Cell (CCI) is to support the Crisis Cell in its efforts **to coordinate communication between the authorities and the population in the event of a nuclear crisis**. It keeps the media and citizens informed of the changing situation as well as the prescribed preventive and protective measures. Several tools are used to facilitate this communication: traditional press releases, the social network Twitter, the portal www.infocrise.lu and a free-phone hotline.

The Communication/Information Cell is presided over by the director of the Ofice for crisis communication (or by its representative), who assumes the roll of spokesperson for the Crisis Cell. Through its composition, the president ensures that the CCI is able to combat the crisis the country is facing effectively. When required, its members may call upon experts to provide assistance.

In the event of a nuclear emergency, the Communication/Information Cell is convened at the same time as the Crisis Cell and the Radiological Evaluation Cell.

2.4. Cross-border exchange of information

The communication procedures to be implemented in the event of a nuclear accident at Cattenom are the subject of a bilateral agreement between Luxembourg and France. In the event of an accident, the manager of the power station shall inform the Luxembourg authorities by means of the **SELCA system**, the System of exchange and liaison between Cattenom and the authorities (Système d'échange et de liaison entre Cattenom et les autorités), a network of dedicated telephone lines. The German Länder (states) Rhineland-Palatinate and Saarland, which are located close to Cattenom, are also part of this system.

On a **European level**, the **ECURIE alert** (European Community Urgent Radiological Information Exchange) enables Member States to exchange information in the event of a nuclear emergency. This computer system, with a star-like configuration, enables a State to launch an alert if a nuclear accident that could have cross-border consequences occurs at one of its power plants. ECURIE is based at the European Commission in Luxembourg.

2.5. Alert for the population

In the event of a nuclear emergency, the Crisis Cell calls on the Rescue Services Agency's Emergency Call Centre (CSU-112) to trigger specific alert signals via the **national siren network** to warn the public.

To avoid confusion with the fire alarm, which is a continuous tone lasting three minutes, the siren signal triggered in the event of a nuclear emergency consists of three different signals:

- **the preliminary alarm**, triggered when there is a non-imminent possibility that radioactive substances might be released in one or several areas. The signal is a warbling tone lasting one minute.
- **the nuclear alarm**, triggered when radioactive releases are imminent in one or several areas. The signal is a warbling tone lasting one minute, interrupted by two breaks of 12 seconds.
- **the all clear** (end of the alarm), which has a signal of a continuous tone that lasts for one minute.

3. The different phases of a nuclear emergency

Within the framework of the emergency response plan (PIU), a nuclear emergency is divided into three separate phases:

- the threat phase;
- the release phase;
- the post-accident phase.

3.1. The threat phase

The **threat phase** is the period when a nuclear accident occurs and a radiological emergency situation is declared.

This phase is the first stage of a nuclear emergency during which the Crisis Cell monitors the situation closely in order to be able to act when necessary. Public authorities can take advantage of the threat phase, the phase before radioactive substances are released, to put in place preventive and protective measures.

The threat phase can last several hours or several days. The Radiological Evaluation Cell is responsible for evaluating the accident situation and predicting the impact on the population.

3.2. The release phase

The **release phase** occurs when an accident at a nuclear power station causes radioactive substances to be released into the environment and, in particular, into the atmosphere.

Ambient air is the first to be contaminated. A **radioactive cloud** is formed within it. Meteorological conditions affect how atmospheric releases (gas, aerosols) spread. Two mechanisms transmit releases to the ground: dry deposition and wet deposition (rain). Radioactive deposition is higher in the event of rain.

Radioactive clouds reduce

- over time;
- as a result of radioactive decay;
- as a result of atmospheric dilution;
- as a result of the deposition of radioactive particles onto the ground.

Therefore once the radioactive cloud passes air contamination reduces, but the radioactive elements deposited on the ground continue to pose a risk as they can be dispersed again by the wind or as a result of human activity.

3.3. The post-accident phase

When radioactive substances are no longer being dispersed, the all clear is sounded.

The post-accident phase dedicated to dealing with the consequences of the accident, in particular those resulting from deposits of radioactive substances in the environment, then begins.

4. Action zones and spheres

In order to ensure that the nuclear emergency is well managed and to protect the populations affected as far as possible, the emergency response plan defines **planning zones and spheres of action** within the Grand Duchy of Luxembourg.

The country is therefore divided into a primary planning zone and a secondary planning zone.

4.1. The primary planning zone

The primary planning zone covers the territories closest to the nuclear power station. Protective measures are rolled out in this zone first, which include taking shelter and potassium iodide tablets and evacuating the population.

The primary planning zone is limited

- **to within 15 km** of the Cattenom nuclear power station in the event that evacuation is necessary;
- **to within 25 km** of the Cattenom nuclear power station in the event that potassium iodide tablets and shelter need to be taken.

The primary planning zone is divided into three alarm areas: East, Central and West. This separation enables separate alarm sirens to be triggered depending on wind direction and how urgent it is that the protective measures be implemented. The aim of creating these separate zones is **to limit the alarm solely to the areas under threat** and therefore allow the rest of the country to continue to function economically.

In the event that an evacuation is organised within the primary zone, access to the zone will be forbidden to the public.

4.2. The secondary planning zone

The secondary planning zone starts at the boundary of the primary planning zone and **covers the rest of the country**. The main towns in this zone will house the reception centres needed in the event of an evacuation. It is also possible however that the population residing in the secondary zone will need to take shelter and potassium iodide tablets.

4.3. The sphere of emergency action and intervention

The sphere of emergency action and intervention is the zone within which emergency preventive and protective measures are implemented **immediately following a nuclear accident**. This zone is not necessarily limited to the primary planning zone and can therefore include a part thereof or exceed its limits.

When needed, upon the recommendation of the Radiological Evaluation Cell, the Crisis Cell defines **a sphere for all emergency measures** based on the radiological reference levels (calculated or measured) taking into account the principles of proportionality and effectiveness. Each sphere can include one or several entire communes and/or one or several areas of one or several communes.

4.4. The post-accident sphere

During the post-accident phase, two separate zones can be defined depending on the levels of radioactive contamination measured: the Public Protection Zone (Zone de protection de la population, ZPP) and the Heightened Territorial Surveillance Zone (Zone de surveillance renforcée du territoire, ZST).

The boundaries of the **Public Protection Zone** (zone de protection de la population, ZPP) are defined by the Crisis Cell based on the recommendations of the Radiological Evaluation Cell. Within this zone, all the required measures for reducing the population's exposure to radiation can be triggered, including staggered evacuation.

The **Heightened Territorial Surveillance Zone** (zone de surveillance renforcée du territoire, ZST) is also defined by the Crisis Cell based on the recommendations of the Radiological Evaluation Cell depending on the levels of radioactive contamination measured over the area as a whole. Its boundaries exceed those of the Public Protection Zone.

Within the Heightened Territorial Surveillance Zone, commercial foodstuffs and agricultural products are monitored in order to ensure that the maximum permissible levels of radioactive contamination as provided for by European legislation are not exceeded.

5. Protective measures for the population

The emergency response plan sets out **four main protective measures** for the benefit of the public and its environment.

These measures are triggered by the Crisis Cell depending on the severity of the nuclear emergency as analysed by the Radiological Evaluation Cell.

The Communication/Information Cell communicates these protective measures to the population.

Before measures are applied and a sphere of action set, one criteria is analysed by the Radiological Evaluation Cell: the radiological dose reference level. This enables the biological effect of ionising radiation on human health to be determined.

The plan lays down measures for three different reference levels:

1. Asking the public to **take shelter** in regions that could be affected by the release of radioactive substances. Taking shelter is recommended when the population's exposure is likely to exceed the reference level of 10 milliSievert (mSv).
2. Protecting the thyroid by **taking potassium iodide tablets**. The population is ordered to take potassium iodide tablets when radiation on this organ is likely to exceed the reference level of 50 milliSievert (mSv).
3. **Evacuation of the population** in regions that could be affected by the release of radioactive substances. An evacuation is organised when the population's exposure (or that of a part of the population) is likely to exceed the reference level of 100 milliSievert (mSv).

Summary

Dose	Measure to be triggered
Effective dose of 10 mSv	Shelter for the population affected
Dose of 50 mSv on the thyroid	Instructing the population affected to take potassium iodide tablets
Effective dose of 100 mSv	Evacuation of the population affected

5.1. Preventive and protective measures

5.1.1. Taking shelter

In the event of a nuclear accident, taking shelter is a public health measure that consists of **returning to the closest solid, enclosed building temporarily**, closing the doors, windows and shutters and turning off the heating, ventilation, air conditioning and air control systems as well as rainwater collection systems if necessary.

Taking shelter is a very effective protective measure during the release phase. Inside a solid enclosed building, the walls and the roof provide you with a screening effect against radiation from the outside.

The need to take shelter ceases when the damaged reactor is in a stable state and no more radioactive materials are being released. The maximum duration of the shelter phase is 48 hours.

5.1.2. Taking potassium iodide tablets

Taking potassium iodide tablets is considered a disease **prevention method**. The aim is to saturate the thyroid gland, an organ where iodine quickly builds up, and therefore prevent absorption of radioactive iodine which can be emitted during a nuclear accident.

The decision to order the population to take potassium iodide tablets is made by the Crisis Cell on the basis of recommendations by the Radiological Evaluation Cell. The order to take potassium iodide tablets is combined with that to take shelter and a ban on consuming fresh foods that could be contaminated. Potassium iodide tablets, which are distributed throughout the country as a preventative step, should only be taken upon instruction to do so by the authorities.

5.1.3. Evacuation

Evacuation is a protective measure that consists of temporarily **moving the population affected from a set zone** in order to protect it from exposure to radiation from a damaged reactor. This is the ultimate protective measure that can be implemented when conditions require.

There are two types of evacuation: **pre- and post-release evacuation**.

Pre-release evacuation can be triggered on the condition that the radioactive cloud has not yet arrived. If the Crisis Cell judges that there is not enough time between the accident threat phase and the release phase, then the population will be advised to take shelter and take potassium iodide tablets first.

The reception centres required in case of an evacuation are situated in the main towns within the secondary planning zone.

In the event that an evacuation is organised from one particular zone within the country, the population will be forbidden from entering this zone.

5.1.4. Protection of foodstuffs and agricultural products

The plan also provides for measures to protect foodstuffs and agricultural products, including livestock and their feed.

When necessary, these measures are triggered by the Crisis Cell on the basis of recommendations by the Radiological Evaluation Cell and therefore on the basis of the levels of radioactivity measured within the country. The aim is to **preserve the different links in the food chain**.

The measures for doing so include in particular placing livestock in shelter, reducing ventilation to barns, etc., covering silage with impermeable sheeting and closing greenhouses.

5.2. Restrictive measures and bans

5.2.1. Outside activities

In the event of an accident at a nuclear power station, the authorities may forbid **any outside activities**. This measure may be taken as a preventive measure. It protects the population from any exposure to or contamination by radioactive release. These include sporting activities, children playing outside, hunting, camping and gardening. **This measure also forms part of the post-accident phase**.

5.2.2. Individual health measures

In the event of a nuclear accident the population is also encouraged to adopt individual protective measures **to prevent radiological contamination**.

These include specific health measures to reduce as far as possible the risk of coming into contact with radioactive substances and therefore avoiding contamination of people or homes:

- remain inside during the radioactive release phase;
- stop pets playing outside in gardens and other open spaces;
- do not consume freshly gathered foods.

If you must go outside during the release phase, it is recommended that you:

- wear rubber boots that are easier to decontaminate;
- remove shoes and clothes you have worn outside before entering a place of residence;
- keep clothes worn outside in a plastic bag to avoid the spread of contamination;
- promptly wash all the exposed areas of your skin and most importantly your hair by showering, ensuring that the water does not get into your eyes or mouth;
- wash pets in the shower, if necessary, being careful to avoid becoming contaminated;
- avoid any other contamination of your place of residence.

5.2.3. Clothing

Normal clothing does not provide sufficient protection against radiation. It only protects against **deposited radioactive particles**. This is why clothing should be changed after each exposure to the open air or radioactive rain.

Emergency service providers are required, depending on their role, to wear special protective clothing inside contaminated zones.

5.2.4. Protecting the airways

It is advised that in the presence of a radioactive cloud, people who cannot avoid leaving the shelter of a building should ensure they pay particular attention to protecting their airways. Tissue, soft absorbent paper, clothing or other objects can be held to **the mouth and the nose** to do so. This simple method can effectively reduce the dose inhaled in the presence of a radioactive cloud. This protective measure requires particular vigilance with babies and young children due to the danger of suffocation.

5.2.5. Specific measures for the Moselle river

Specific measures are triggered in the event of a nuclear accident affecting the waters of the Moselle river. Radioactive contamination of the water and/or mud, as well as the biological environment of the Moselle can have consequences for public health.

The planned measures aim to prevent people and livestock coming into contact with contaminated water and mud and/or the contaminated biological environment of the Moselle.

The Crisis Cell communicates all protective measures, recommendations and bans at the necessary time via the press, social media and the website www.infocrise.lu.