SCK•CEN
STUDIECENTRUM VOOR KERNENERGIE
CENTRE D'ETUDE DE L'ENERGIE NUCLEAIRE

What if something goes wrong: nuclear emergency plan

Context

Despite all the precautionary measures that have been taken and the inspections that are carried out to guarantee that nuclear power plants and other nuclear installations work safely, the possibility of something going wrong and an increased amount of radioactive substances being released, can never be entirely ruled out. Examples of serious nuclear accidents are Windscale (United Kingdom, 1957), Three Mile Island (United States, 1979) and Chernobyl (former Soviet Union, 1986).

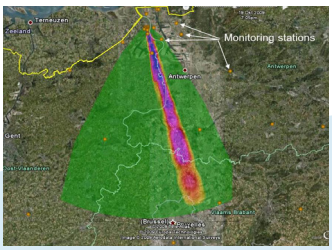
To limit the harmful effects for man and the environment, in the event of an accident, a rapid estimation initially has to be made of the seriousness of the incident. On the other hand, there must be established plans for quickly implementing specific protection measures. This is the nuclear emergency plan. In addition to international conventions concerning information exchange between countries (the International Atomic Energy Agency IAEA and the European Union) the Belgian nuclear emergency plan is defined by law. This is a federal emergency plan and primarily concerns the major nuclear plants in or in the vicinity of Belgium, but transport incidents and radiological terrorism are also taken into account.

SCK•CEN conducts research and provides services to enable better estimation of the impact of nuclear accidents, to allow founded decisions to be made in the event of an accident and for refining emergency plan organisation.

What are the risks of a nuclear accident?

Not every nuclear accident will lead to the release of radioactive substances to the environment. An accident can remain restricted to the installation alone. If increased radioactive discharges into the environment occur, mainly those released into the air and are concerning in the short-term because radioactive particles can quickly spread and reach the local residents. The radioactive cloud will contaminate the people as it passes. Radioactive substances can be inhaled and cause internal bodily contamination. This is often the major exposure in a nuclear accident. The particles can also settle on the skin, clothes and soil. Even after the cloud has passed, this will result in further irradiation of men and animals and in a long-lasting contaminated soil. This, in turn, can lead to contaminated food, such as contaminated vegetables, but also milk and meat if the animals graze on the contaminated land. If it rains, in particular, soil and food contamination can reach serious levels even at great distances from the accident.

Exposure to ionising radiation, internal through inhalation or ingestion of contaminated food and drinks, as well as external via irradiation, can affect our health. The most serious health effects are acute radiation effects and cancer. Acute radiation effects can only occur as a result of exposure to extremely high doses of radiation (in the immediate vicinity of an extremely serious accident). Cancer can be caused by lower doses and generally appears many years after the exposure to radiation.



SCK•CEN is developing atmospheric dispersion and dose models to enable rapid estimation of the seriousness of an accident. These models are being used to make estimations for accident scenarios for our own plants, but also for other plants such as Doel and Tihange. We are also developing measuring methods and strategies to evaluate the situation constantly during and after an accident. Both the model calculations and the measurements are essential methods for implementing protection measures for the population in the event of accidents.

How can people protect themselves?

A number of measures can be taken to protect the population if there is a risk of intervention limits being exceeded:

Take cover: Taking cover while the radioactive cloud passes, protects against its radiation. Properly closing windows and doors helps to reduce inhalation considerably.

Evacuation: This is very useful if it can be done before the discharge takes place. The decision can be made to evacuate afterwards, too, if the contamination of the soil makes it impossible to remain there in the long-term, for instance.

Taking iodine tablets: It has been clearly established that the major health effect after the Chernobyl accident is the incidence of thyroid cancer in children. Radioactive iodine is a substance that can be released in large quantities in nuclear accidents. The radioactive iodine is generally quite easily absorbed by the thyroid and bonded with the thyroid hormone. To avoid this, it is possible to saturate the thyroid with stable (non-radioactive) iodine to prevent the radioactive iodine being absorbed. This measure for protecting the thyroid can be highly efficient if the stable iodine is taken at the right moment (just before exposure to radioactive iodine). It was therefore decided within the context of the Belgian nuclear emergency plan to distribute stable iodine tablets around the major nuclear plants so they are quickly available if necessary.

Food measures: Measures can be taken to prevent contamination of food (such as animals not grazing in contaminated fields). There are also European guidelines that regulate the permitted contamination levels for trading in agricultural products for human and animal consumption following a nuclear accident. Contaminated food will be withdrawn from circulation, for example. People can also be advised not to eat produce from their own gardens.

The implementation of these measures requires good communication with the population. SCK•CEN is conducting scientific study into efficient communication for a nuclear emergency plan. There are often several options. The decision-making process is then complex. SCK•CEN is conducting research into methods for decision support.

How is the nuclear emergency plan organised?

If there were to be a nuclear accident in Belgium, the operator of the installation must notify the governmental crisis centre and provide sufficient information to enable the government to make a well-founded decision regarding the necessary countermeasures for the population. In emergencies of a sufficient seriousness a quicker system is started up, referred to as alarm level reflex. In that case, the governor decides on shelter measures in a specific predetermined zone.

If an accident occurs abroad, this is communicated to the governmental crisis centre in Brussels via the ministry of Foreign Affairs, the European authorities or the IAEA.

The nuclear emergency plan can be activated following the measurement of an important increase in radiation or radioactivity or any other serious indication. An automatic network called TELERAD, run by the Federal Agency for Nuclear Control AFCN/FANC, ensures the permanent monitoring of radiation levels around the nuclear installations as well as more extensively around Belgium.

Should the nuclear emergency plan be activated, radiological and technical experts meet in the 'evaluation cell' of the crisis centre and give their recommendations to the crisis committee that is led by the minister of Interior Affairs. This committee then decides which protective measures must be taken. Social-economic, operational and legal aspects are taken into consideration here. The decisions are communicated to the provinces for implementation.

The governors of the provinces are responsible for co-ordinating any actions to be taken among the public according to their own provincial nuclear emergency plans. Implementation is carried out by different services (fire, police, medical services, civil protection, etc.) in collaboration with the municipalities. Information is communicated to the public and the media by the 'info cell' that also works from the government crisis centre.

If speedy measures are required, the governor of the province makes a decision about the protective measures to be taken in a pre-determined zone around the installation immediately after being informed by the operators about the incident.

The efficiency of the emergency plan is tested several times a year during nuclear emergency exercises.

SCK•CEN is an important government partner due to not only its expertise in radiological evaluations and measurements, but also for the supervision of exercises and the refinement of the efficiency of the emergency plan. SCK•CEN also plays a major part in training for emergency situations: for several years already it has been providing training on a European level. SCK•CEN is involved in a number of European research projects concerning emergency planning, including projects concerning response in the event of radiological terrorism.

As a nuclear operator, SCK•CEN has an internal emergency plan and regularly organises nuclear emergency exercises.

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