HERCA

HEADS OF THE EUROPEAN RADIOLOGICAL PROTECTION COMPETENT AUTHORITIES

HERCA Working group on Emergencies

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Guidance document on the HERCA-WENRA-Approach:

Additional urgent protective actions during the initial phase of a nuclear emergency

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Title: **HERCA-WENRA-Approach: Additional urgent protective actions during the initial phase of a nuclear emergency**

Summary: This report identifies four discrete groups of urgent protective actions (food & feed restrictions, additional action concerning the public, protection of transport and protection of property) additional to sheltering, iodine thyroid blocking, and evacuation in the existing HWA Part II that may be appropriate in more than one country. For these additional protective actions this report proposes that they should be considered for distances appropriate to circumstances, which could for most of these protective actions, extend as far as tens of kilometres from the accident location. Additionally, this report recognises that it is unlikely for radiation protection purposes that the additional protective actions would be needed urgently, within hours, beyond the distances mentioned in the report.

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HERCA Guidance
HERCA-WENRA-Approach:
Additional urgent protective actions during the initial phase of a nuclear emergency

1. Overview

In 2014, the Heads of the European Radiological Protection Competent Authorities (HERCA) and the Western European Nuclear Regulators Association (WENRA) published the "HERCA-WENRA Approach for better cross-border coordination of protective actions during the early phase of a nuclear accident". The principles used in the Approach are those of mutual understanding, coordination, mutual trust and alignment of recommendations for decisions between neighbouring countries and territories. The aim of the HWA is to try to provide coordinated implementation of protection strategies, including the urgent protective actions of evacuation, sheltering and iodine thyroid blocking, across national borders within Europe.

This document is complementary to the HERCA-WENRA Approach (HWA) and proposes, using the same principles, the consideration by neighbouring countries and territories of a number of additional urgent protective actions to the three above that may be implemented during the initial phase of a general emergency at a nuclear power plant. The initial phase is considered to be the first few hours after the start of the emergency.

2. Urgent protective actions

Urgent protective actions are those actions which must be taken promptly (usually within hours to a day) in the event of a nuclear or radiological emergency in order to be effective, and the effectiveness of which will be markedly reduced if implementation is delayed.

The most commonly considered urgent protective actions include iodine thyroid blocking, evacuation, sheltering, actions to reduce inadvertent ingestion, decontamination of individuals and restriction of the consumption of food, milk or drinking water which may contain contamination above agreed levels.

Sometimes it may be possible and effective for urgent protective actions to be taken before or shortly after a release of radioactive material, or an exposure, and these are referred to by IAEA (GSR Part 7) as precautionary urgent protective actions.

3. HERCA-WENRA Approach (HWA) for better cross-border coordination of protective actions during the initial phase of a nuclear accident"

The objective of the HWA is to provide a coordinated approach to protective actions across national borders within Europe.

Purpose

- The HWA aims to improve coordination of protective actions taken during a nuclear emergency, so that populations living on both sides of a national border would feel equally protected.
- In the initial phase of an accident, part 1 of the HWA (General Approach) recommends rapid information exchange through existing bilateral and international arrangements. If the response is thought consistent, the neighbouring countries are encouraged to recommend to their governments to follow the recommendations given in accident country, i.e. adopt the principle "We do the same as the accident country".
- In case of a severe accident with great uncertainty about the situation, recommendations on protective actions will need to be formulated rapidly, leaving very limited time for cross border coordination during the first phase of the accident. Therefore, part 2 of the HWA (Specific Approach) contains pre-defined simplified schemes for protective actions that may be applied in these cases. It also defines the level of preparation of protective actions that should be achieved in Europe.

Part 1 (General Approach):

This focuses on the preparations for cross-border exchange of information to coordinate emergency response in the initial phase and mechanisms to enable this, e.g. bilateral agreements / Memorandums of Understanding (MoUs) and HERCA Country Fact Sheets.

The principle is that in the initial phase, if information is roughly consistent between the neighbouring country(ies) and the accident country, the default for neighbouring countries should be the same actions as the accident country, including for nationals and embassies located within the accident country, i.e. alignment of responses. If information or urgent protective actions being considered are not consistent, neighbouring countries should have arrangements in place to urgently try and agree an alternative position with the accident country, to explain differences, and align public communications.

Part 2 (Specific Approach):

This relates to the initial phase response to severe nuclear accidents where no or insufficient technical information on the plant status is available. It considers three Judgement Evaluation Factors: risk of core melt, potential for loss of containment integrity, and wind speed/direction, to make decisions on the three urgent protective actions of evacuation, sheltering and iodine thyroid blocking (dependant on wind direction, speed, stability and demography).

- Recommendation for potential / actual core melt: evacuation to 5 km, and sheltering & iodine thyroid blocking to 20 km.
- Recommendation for potential / actual core melt and loss of containment integrity: evacuation to 20 km, and sheltering & iodine thyroid blocking to 100 km.

The HWA Report (2014) identifies many obstacles to coordinated cross-border actions such as

- Misunderstanding of / delayed / unknown/ inconsistent information;
- Different action and trigger levels, different intervention levels in different countries, some of which may be mandatory by law;
- Advice only focussed on their own country / citizens;
- Different interpretation of international requirements and guidance;
- Different extendibility considerations;
- Different advice for traffic and travel; and
- Different source term assessment and modelling.

The HWA proposes a number of solutions to these obstacles such as development of HERCA Country Fact Sheets, issues to be included in bilateral agreements / MoUs, and developing a common understanding of EC and IAEA BSS.

4. Additional urgent protective actions during the initial phase of a nuclear emergency

This report identifies four discrete groups of urgent protective actions, in addition to sheltering, iodine thyroid blocking, and evacuation in the existing HWA Part II, which may be appropriate in more than one country. These are:

1. *food and animal feed restrictions ;*
2. *additional actions concerning the public ;*
3. *protection of transport; and*
4. *protection of property.*

For three of these groups this report proposes distances (radii) from the nuclear power plant within which these actions should be considered in order to reduce the risk of stochastic effects among members of the public. Additionally, this report recognises that it is very unlikely for radiation protection purposes that the additional protective actions would be needed urgently, within hours, beyond the distances (radii) mentioned for each group of additional protective actions.

As the protective actions identified in this report may affect very large areas, and taking into account the principle of justification, non-radiological factors also have to be considered when implementing these actions. Thus, the actual area where actions are warranted is likely to be smaller than the radii presented. The decision on implementing the actions should take into account the local conditions, expected consequences of the emergency, the efficiency of the protective actions and the meteorological conditions as well as alignment with neighbouring countries. Most likely, the implementation of urgent protective actions should be prioritised downwind from the accident location and later depending on the development of the situation, implemented in the full circle if considered necessary.

The IAEA's Safety Requirements (GSR Part 7) introduces concepts of Extended Planning Distance (EPD)[1] and Ingestion and Commodities Planning Distance (ICPD)[2]. The distances in this report attempt to define a common understanding of precautionary urgent actions among HERCA member countries on the distances associated with the EPD and ICPD concepts. The distances

[1] EPD is the area around a facility where some urgent protective actions may be warranted following the declaration of a general emergency to reduce the risk of stochastic effects among members of the public. EDP serves for planning purposes. In an emergency, the actual area will be determined by the prevailing conditions.

[2] ICPD is the area around a facility for which emergency arrangements are made to take effective emergency response actions following the declaration of a general emergency in order to reduce the risk of stochastic effects among members of the public and to mitigate non-radiological consequences as a result of the distribution, sale and consumption of food, milk and drinking water and the use of commodities other than food that may have contamination from a significant radioactive release.

also reflect the lessons learnt from past accidents, including those in *The Fukushima Daiichi Accident, Technical Volume 3/5, Emergency Preparedness and Response* (IAEA 2015) and *The International Chernobyl Project, Technical Report, Assessment of Radiological Consequences and Evaluation of Protective Measures* (IAEA 1991) .

In order to identify the urgent protective actions that are likely to be implemented during the initial phase of a nuclear emergency the HERCA Working Group on Emergencies carried out a survey amongst HERCA member countries. The feedback from this survey was filtered for:

- cross border relevance;
- the degree of urgency connected with the action (necessary within the first hours to a day); and
- where implementation is based on prognosis (e.g. dispersion modelling), rather than diagnosis (e.g. radiation measurements).

Dose-level-based protective actions during later phases of an emergency (e.g. relocation, decontamination, etc.) were filtered out and the actions discussed in the original HWA (evacuation, sheltering, iodine thyroid blocking) are excluded from this paper.

Of the additional urgent protective actions presented in this document, those actions that require the public to move outdoors should not be implemented in areas where evacuation or sheltering indoors is implemented. In such areas these actions would either be redundant or even be detrimental to protection of the public.

I. Food and feed restrictions

The following actions may be appropriate in the initial phase of a nuclear accident as far as tens of kilometres from the accident location, or even beyond this in some circumstances:

- Sheltering livestock, restricting grazing, protecting feed and use of uncontaminated feed where practically achievable, and without incurring additional human exposures.
- Closing ventilation in green/glass houses.
- Restricting the use of surface water and rain water where alternative water sources are available.
- Preventing or limiting contamination of drinking water (in accordance with EU legislation) including:
    - Protecting municipal water supplies and facilities.
    - Restricting use of uncovered private water supplies and cisterns.
- Temporary ban on the sale of locally produced food until the safety can be assured.

- Putting maximum permitted levels of radioactivity contamination, as described in the annexes of the EU regulation (EURATOM 2016/52), nationally into force until the Commission decisions apply.
- Advice on stopping temporarily consumption of freshly harvested home grown (e.g. green leafy vegetables) or wild food (e.g. mushrooms, berries, herbs, freshwater fish and game) until the safety can be assured

II. Additional actions concerning the public

Actions to be considered are mainly used to minimise unnecessary exposure and to reduce inadvertent ingestion until deposition levels have been assessed. The following actions may be appropriate in initial phase of a nuclear accident as far as tens of kilometres.

- Recommendation for restrictions on outdoor activities (sports, concerts, camping) and recommendations to avoid non-necessary working outside.
- Instructions on the use of protective clothing and respiration masks in dusty work.
- Advice for self-protection of the public (e.g. avoid rain, use boots, change clothes after entering the house, wash hands frequently to avoid inadvertent ingestion).
- Advice for sensitive groups such as children and pregnant women on non-essential outdoor activities.

III. Protection of transport

The following actions may be appropriate in initial phase of a nuclear accident as far as tens of kilometres.

- Traffic (road, rail, marine, aviation), harbour and airport restrictions in order to:
  - minimize unnecessary contamination of cargo and vehicles (ships, trains, airplanes, cars and trucks); and
  - control and maximise the effectiveness of movements out of and into specific areas.

IV. Protection of property

The following actions may be appropriate in initial phase of a nuclear accident as far as tens of kilometres.

- Closing ventilation etc. to minimise the contamination to indoor spaces, machinery, goods on sale, factories, and production facilities in domestic buildings (e.g. houses), public buildings (e.g. schools, nursing homes, hospitals), and commercial buildings.

5. Conclusions

All the additional urgent protective actions identified in this report may be appropriate in any country and thus may be included in planning for the initial phase (i.e. the first few hours after the start of the emergency) of a general emergency at a nuclear power plant. They may be implemented prior to radiation exposures occurring and are therefore precautionary in nature. They are likely to reduce the risk of stochastic effects among members of the public and reduce the need for extensive actions in later phases of the emergency response.

Whenever urgent protective actions are considered for implementation, the decision maker must consider the overall potential benefit of the measures proposed together with the possible detriment associated with them, such as social and economic impact. Similarly, the additional actions identified in this report may impact on other, potentially much more beneficial, urgent protective actions and reduction in their benefit must be avoided.

The actions identified are not recommended for automatic implementation, but work as a guideline for consideration of actions beyond those described in the HWA. Similarly, the distances identified attempt to define the range beyond which implementing these actions would not be warranted for radiation protection purposes without further information available. In many cases, initial implementation is likely to be at significantly smaller distances.

The degree of detail of planning required for the implementation of these additional actions in areas around a nuclear power plant should be proportionate to the distance from that plant. Closer to the plant, such as within the Precautionary Action Zone (PAZ) and the Urgent Protective action planning Zone (UPZ) these will be significantly more detailed than in the Extended Planning Distance (EPD) and Ingestion and Commodities Planning Distance (ICPD) .

In order to be applied in a timely manner, all of these actions have to rely on assumptions during the initial phase of a general emergency at a nuclear power plant where there is likely to be significant uncertainty in the developing nature of the event. If the actions were only to be implemented based on radiation measurements made during such an emergency, this would increase the risk of undue delay in implementation.

The principles of the HWA of mutual understanding, coordination, mutual trust and alignment of recommendations for decisions between neighbouring countries and territories should also be applied to these additional actions in order to provide a coordinated implementation across national borders within Europe. The practical implementation of these additional actions depends on local conditions and these may differ from one country to another. This aspect should also be taken into account in coordination of public communication.

In the event of a general emergency at a nuclear power plant, as with the HWA, the country where the accident occurs continues to have the main responsibility for judging which additional protective actions are appropriate and at which distances.

HERCA consider that in Europe, for the following four categories of additional protective actions identified in this report should be considered during the initial phase:

- *food and animal feed restrictions ;*
- *additional actions concerning the public ;*
- *protection of transport; and*
- *protection of property.*

These additional protective actions should be considered for distances appropriate to circumstances, which, for additional actions concerning the public, protection of transport; and protection of property, could extend as far as tens of kilometres, and beyond this for food and animal feed restrictions, from the accident location. During the response, the decision on how far the actions may be appropriate should take into account the local conditions, expected consequences of the emergency, the efficiency of the additional protective actions and the meteorological conditions as well as alignment with neighbouring countries. Before more details on the accident and actual releases are available, such actions are unlikely to be warranted beyond 100 kilometres for radiation protection purposes. Following the initial phase of the emergency, when more information becomes available, it may be appropriate to reduce or extend the distances for these protective actions. According to HWA, the aim should be to coordinate such decisions between the concerned countries.

6. Definitions

Extended Planning Distance (EPD). As per IAEA GSR Part 7 (2015)

Ingestion and Commodities Planning Distance (ICPD). As per IAEA GSR Part 7 (2015)

Precautionary Action Zone (PAZ). As per IAEA GSR Part 7 (2015)

Initial phase (of an emergency). IAEA Safety Glossary, 2016 Revision, June 2016

> The period of time from the detection of conditions warranting emergency response actions that must be taken promptly in order to be effective until the completion of all such actions. Such emergency response actions include … urgent protective actions … off the site.

Urgent protective action. IAEA GSR Part 7 (2015).

> A protective action in the event of a nuclear or radiological emergency which must be taken promptly (usually within hours to a day) in order to be effective, and the effectiveness of which will be markedly reduced if it is delayed.
>
> - Urgent protective actions include iodine thyroid blocking, evacuation, short term sheltering, actions to reduce inadvertent ingestion, decontamination of individuals and prevention of ingestion of food, milk or drinking water possibly with contamination.
> - A precautionary urgent protective action is an urgent protective action taken before or shortly after a release of radioactive material, or an exposure, on the basis of the prevailing conditions to avoid or to minimize severe deterministic effects.

Urgent Protective action planning Zone (UPZ). As per IAEA GSR Part 7 (2015)

7. References

1. HERCA-WENRA European Approach for cross-border Emergency Preparedness (2014)
2. IAEA GSR Part 7 Preparedness and Response for a Nuclear or Radiological Emergency (2015).