
SUPPORT DIAGRAM FOR THE SELECTION OF PRELIMINARY ACTIONS FOR POST-ACCIDENT PHASE MANAGEMENT

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Abstract:

In the event of a nuclear crisis, from the emergency to the post-accidental phase, decision makers may need specific information to choose a rehabilitation strategy among the available options. As the post accidental phase constitutes a very complex situation, involving many stakes at different levels, technical experts must be able to provide clear and argued recommendations adapted to the decision makers demand. In order to fit this problematic and to enhance its expertise capacities, IRSN is currently developing a coherent package of operational decision-aiding tools. Among them, the project of support diagram aims at clearly presenting the possible countermeasures, in time and space, in order to facilitate the selection, by the IRSN Technical Crisis Center experts, of preliminary actions for post-accidental phase management.

1 INTRODUCTION

The various activities conducted for several years now at both the national level (Becquerel exercise, preparation of IRSN CD-ROM on nuclear risk management¹, Aube post-accident workgroup) and international level (European FARMING and EURANOS programmes, etc.), have enriched the IRSN's experience in the construction of post-accident phase management strategies. The wish to play this phase during the Pierrelatte and Belleville crisis drills (November 2004 and March 2005, respectively) has accelerated the development of operational tools for this purpose, including the diagram described in the present document, constructed to assist IRSN Technical Crisis Center experts in making recommendations to authorities regarding preliminary actions for post-accident phase management.

2 GENERAL DESCRIPTION OF THE DIAGRAM

During the emergency phase and the first hours and days following the release phase of a nuclear accident, the risk governance process does not authorise broad concertation regarding the choice of protection or rehabilitation actions, but rather requires an anticipation capacity of experts. The proposed actions and the structure of the support diagram therefore meet this requirement. After these first moments, broadly concerted operating efforts involving numerous actors would be more appropriate to manage the situation and needed other kind of tool.

¹ IRSN CDROM : « Elements sur le risque nucléaire et sa gestion » - avril 2004

2.1 Proposed actions

The actions presented in the diagram are intended to minimise the risks of population exposure and environmental contamination from accidental radionuclide releases. They are also aimed at limiting the technical, economic and socio-psychological consequences for post-accident phase management in the longer term.

For the reasons previously mentioned, these actions only concern possible options where deep concertation is not necessary or possible due to lack of time, and their implementation must be justified from a radiological and technical perspective.

For example, during the first days after deposition, washing actions on roofs, roads and walls would reduce the contamination level of these target compartments by approximately 50%. After one month, their efficiency would be decreased by 30% due to the progressive fixation of radioelements on materials. Such actions have therefore been adopted for the first instants of post-accident phase management. On the contrary, the Chernobyl experience has shown that roof replacement actions during the first days after releases could have a very low efficiency in the long term due to the resuspension of radioactive particles and the human and material constraints associated with the implementation of such actions. They would be significantly more efficient if implemented in the longer term and after a series of complementary actions.

2.2 Organisation of the actions in time and space

In the diagram, actions are grouped spatially. The geographic environment is divided into inhabited, agricultural, forest and aquatic **environments**. Each environment is itself divided into **compartments** targeted by the actions to be implemented. The inhabited environment consists of *buildings*, *roads* and *green areas*. The agricultural environment is composed of *agricultural buildings* (storage, transformation or production), *cultivation covering soils at the moment of deposition*, *bare soils*, *meat herds* and *milk herds*. Forest and aquatic environment are currently not detailed. Domestic animals and subsidiary productions (oyster-farming, honey, etc.) are not taken into account in this version.

Moreover, actions are grouped in time according to the various phases describing a nuclear accident. We thus distinguish the following:

- **Preventive actions** that can be considered during the *emergency phase* and *release phase* in areas where populations may pursue normal activities. These actions are aimed at minimising the contamination of living habitats, current agricultural production (animal or vegetable), storage sites, real estate, building, animal and environmental patrimony, etc. When possible, these actions will therefore have significant impact on subsequent management of the post-accident phase.
- **Curative actions** possible *during the first days or first weeks* after the facility's *return to safe conditions*. These actions are aimed at minimising population exposure over time and reducing environmental contamination after radionuclide deposition.

2.3 Grouping of actions according to general objectives

Actions are also grouped according to general objectives, thus allowing greater flexibility in the interpretation and implementation of recommendations. For example, the '*animal protection optimisation*' objective is intended to limit the exposure of animals, as well as the ingestion of contaminated fodder crops and the production of contaminated foodstuffs associated with the breeding of these animals. Given the large diversity of breeding facilities and possible accident scenarios, multiple actions could be implemented to meet this objective. Based on this recommendation and a minimum amount of information and advice, field actors would be free to achieve this objective as best as possible using the means at their disposal.

2.4 Additional information for the choice of actions

2.4.1 Technical information

The support diagram thus allows the user to choose actions according to the accident phase, environment and compartment considered. Each action in the diagram refers to a specific **technical sheet** containing general information regarding the action (description, constraints, precautions, systematic character, etc.) and data required for the calculation of parameters to quantify the radiological and technical consequences of its application. These parameters include the following:

- Absolute and relative radiological efficiency
- Technical and human means, resources and time required to perform the action
- Time exposure of intervention personnel, dependant on the delay prior to the implementation of counter measures
- Quantity, activity level and type of waste generated

It must be noted that the IRSN is also developing a computer tool² allowing intercomparison of the various possible strategies through rapid calculation of these parameters.

2.4.2 Representatives and operators responsible for the implementation of actions

The technical sheets and the diagram also provide information on contact persons of possible assistance to IRSN Technical Crisis Center experts for formulating recommendations. The parameters for the implementation of protection/rehabilitation actions are very closely related to the local characteristics of the contaminated area. Exchanges of information with local actors would therefore allow Technical Crisis Center experts to refine their analysis. For example, the departmental agricultural and forest authorities or chambers of agriculture could provide important information regarding the agricultural occupation of soils at the moment of the accident. The same applies to the departmental health and social authorities or water distribution syndicates as regards water-related aspects. The documents also specify the information required by the contact persons to provide this assistance.

² SFRP 2005 publication: "ICAR Intercomparison tool for rehabilitation actions during the post-accident phase" (N. Réales, B. Cessac)

3 CONCLUSION

The preparation of the support diagram for the selection of preliminary actions for post-accident phase management addresses the need to enhance the operational character and efficiency of such actions. One of the main teachings of the Pierrelatte and Belleville crisis drills³ is the need to develop emergency management policy as of the end of the emergency phase to allow for efficient exchanges of information between IRSN experts and local actors, namely local technical authorities. A specific version of the support diagram intended for local actors could facilitate these exchanges. An intermediate version of the diagram has been presented to a GREF workgroup⁴ to begin bilateral reflection on the issue of post-accident phase management in agricultural areas. Similar initiatives are currently being prepared for the year 2005 in collaboration with competent actors in the urban field.

³ SFRP 2005 publication: "Management of post-accident situations: Teachings of the Pierrelatte and Belleville crisis drills" (A. Oudiz, B. Cessac, Ph. Dubiau, F. Gallay, N. Réales, E. Quentric)

⁴ GREF: Ministry of Agriculture, Department of Water and Forest Engineering