

French policy for managing the post-accident phase of a nuclear accident

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Abstract—In 2005, at the request of the French Government, the Nuclear Safety Authority (ASN) established a Steering Committee for the Management of the Post-Accident Phase of a Nuclear Accident or a Radiological Emergency, with the objective of establishing a policy framework. Under the supervision of ASN, this Committee, involving several tens of experts from different backgrounds (e.g. relevant ministerial offices, expert agencies, local information commissions around nuclear installations, non-governmental organisations, elected officials, licensees, and international experts), developed a number of recommendations over a 7-year period. First published in November 2012, these recommendations cover the immediate post-emergency situation, and the transition and longer-term periods of the post-accident phase in the case of medium-scale nuclear accidents causing short-term radioactive release (less than 24 h) that might occur at French nuclear facilities. They also apply to actions to be undertaken in the event of accidents during the transportation of radioactive materials. These recommendations are an important first step in preparation for the management of a post-accident situation in France in the case of a nuclear accident.

Keywords: Nuclear accident; Emergency response; Protective measures

1. INTRODUCTION

Following the French Government Directive of 7 April 2005, the French Government tasked the Nuclear Safety Authority (ASN), together with relevant ministerial offices, to establish a policy framework to prepare and implement the necessary steps to address post-accident situations following a nuclear accident or a radiological emergency. In June 2005, the ASN formed a Steering Committee for the Management of the Post-Accident Phase in the Event of Nuclear Accident or a Radiological Emergency Situation (CODIRPA), in charge of elaborating the policy elements. The scenarios selected to develop this policy were medium-scale nuclear accidents causing short-term radioactive release (less than 24 h) that might occur at French nuclear facilities. Over nearly 7 years, 14 working groups, coordinated by ASN and involving representatives from ministerial offices, expert agencies, local information commissions around nuclear installations, non-governmental organisations, elected officials, licensees, international experts etc., developed the policy elements that were finally brought together in a summary report published in November 2012 entitled 'Policy elements for post-accident management in the event of nuclear accident' (ASN, 2012). This report begins by specifying the definitions of each stage of a nuclear accident. It then lists the principles adopted by CODIRPA to support management efforts subsequent to a nuclear accident.

2. DEFINITIONS OF THE EMERGENCY PHASE AND THE POST-ACCIDENT PHASE

2.1. The emergency phase

The emergency phase generally consists of:

- a period of threat resulting from failures in the facility, during which time the operator implements actions to return the facility to an adequate level of safety, thereby preventing potential releases;
- a period of radioactive release into the environment, should the operator have been unable to restore safe operating conditions in the facility; and
- an exit period from the emergency phase, during which time the facility returns to safe operating conditions, significant radioactive release ceases, and any further threat of release disappears.

The emergency phase is characterised by the need to take action very quickly in order to cope with the actual or potential release of radioactive substances into the environment that are likely to lead to substantial exposure of the population.

2.2. The post-accident phase

The post-accident phase generally consists of:

- a transition period (which can last up to a few weeks or a few months after the accident), during which time understanding of the actual state of contamination of the various components of the environment is still unclear and the risks of exposure to affected individuals can still be high; and
- a long-term period (which can last up to several years or even several decades after the accident), during which time long-term protective actions to control exposures, and support and recovery measures are implemented.

3. OBJECTIVES, PRINCIPLES, AND KEY POINTS OF POST-ACCIDENT MANAGEMENT

3.1. Three basic objectives

Three basic objectives have been set out in terms of managing the post-accident phase of a nuclear accident.

- Protection of the population from the dangers of ionising radiation.
- Provision of support to the populations affected by the consequences of the accident.
- Recovery of the affected territories, from social and economic perspectives.

3.2. Four management principles

Four principles have been set out in order to determine the actions to be undertaken in preparing for post-accident management and in the event of an accident.

- Anticipation – the issues at stake in post-nuclear accident management must be taken into account from as early as the end of the emergency phase.
- Justification – the measures adopted, particularly those aiming to protect the affected populations, must be justified, meaning that the expected benefits, particularly in terms of radiological harm prevented, must exceed the risk and drawbacks inherent in their implementation.
- Optimisation – population exposure to ionising radiation must be kept to a level as low as reasonably achievable, taking into account economic and societal factors.
- Shared construction and transparency – post-accident management must involve the population, elected officials, business community, and other stakeholders. The transparency of the information provided is one of the prerequisites for this cooperative spirit to be effective.

3.3. Six key points in post-accident management

There are six key points to keep in mind when implementing the objectives and principles listed above.

- Immediate delimitation of the contaminated territories (to be adjusted over the course of the transition period and beyond). This serves as the structural framework by which actions designed to protect the populations will be managed. This zoning makes it possible to implement restrictions on the consumption and release-to-market of locally-produced foods (i.e. the main source of population exposure).
- The population affected by the consequences of the accident must be given the benefit of medical and psychological care, dosimetric and epidemiological monitoring, financial support, and compensation for the damages incurred.
- The radiological situation, particularly the levels of contamination of foodstuffs and water, must be characterised as quickly as possible in order to understand the extent of the contaminated territories and the potential impact of the contamination. Subsequently, a long-term radiological surveillance relying on standard practices must be implemented and maintained throughout the post-accident phase.
- A water management plan, specific to tap water, should be considered, taking into account the exposure due to contamination of the resource, while adapting the measures to be implemented and possible restrictions on water supply or distribution in accordance with the potential risk.
- A new governance based on the awareness and active participation of those affected is needed, especially where the radiological conditions allow revival of business activity and revitalisation of the affected territories.
- Action to mitigate contamination and to manage the contaminated products may generate large amounts of waste from varying sources and of different types. This makes it necessary to gradually replace the temporary solutions adopted during the emergency phase with lasting solutions.

4. MEASURES TO BE ENACTED OR INITIATED AT THE END OF THE EMERGENCY PHASE

These measures, to be implemented across contaminated territories, must be prepared and, if possible, planned upstream from the emergency phase.

4.1. Post-accident zoning and monitoring of the deposited radioactivity

The first post-accident zoning is established on the basis of predictive modelling of future population exposure to radioactivity in the inhabited zones, and to food chain contamination due to radioactive deposits. Distinction is to be made between two zones, each of which has a distinctive purpose:

- a ‘population protection zone’ (ZPP), inside which action is needed in order to lower population exposure to atmospheric radioactivity and ingestion of contaminated foods as much as possible; and
- a ‘heightened territorial monitoring zone’ (ZST), which is broader and more focused on economic management, within which specific monitoring of foodstuffs and farmed crops is to be initiated.

In particular situations of high external exposure, it may be necessary to relocate a fraction of the population residing within the ZPP. In such cases, residents will be temporarily relocated for a duration that will vary according to the level of exposure in their living environment.

4.2. Early protection and care measures for the affected population

Once the radioactive release has ended and safe operating conditions have been restored at the facility, sheltering can be lifted. A decision then has to be made, taking into account foreseeable concentrations, regarding whether the people living in the ZPP should remain there or be relocated. The return of individuals evacuated during the emergency phase will also have to be considered at this stage.

In situations where the population’s radiological exposure could come from the ingestion of contaminated foodstuffs, actions must be adopted to prohibit the consumption and release-to-market of foodstuffs following the end of the emergency phase.

As soon as feasible, a radiological control appropriate to each farming production sector should be implemented in the ZST in order to allow compliant products to be released to the market. As a precautionary measure, movement should be restricted in certain ZPPs, or even ZSTs, within which radioactive substances tend to accumulate (e.g. forests, green areas, etc.).

Another important measure to consider in organising care for the population is the establishment of public reception and information centres at the end of the emergency phase. These structures should be organised by coordination between the reception and grouping centres called for by the French Organization of Civil Security Response. They must be operational once early protective actions are lifted, and must provide response to the following important needs: reception; listening; census taking; provision of medical and psychological support; information; accommodation; emergency grants; and financial assistance to the population.

5. PLANNING POST-ACCIDENT MANAGEMENT DURING THE TRANSITION PERIOD

During the transition period, management efforts will have to shift into an increasingly participatory mode, featuring, in particular, greater involvement of the local authorities in the decision-making processes, thereby paving the way for

the long-term perspective. This will necessarily bring about regular adjustments to the post-accident management programme. The post-accident management programme should be developed along 10 lines of action:

- receiving the population;
- lowering population exposure to deposited radioactivity;
- addressing public health issues;
- refining the characterisation of the radiological situation in the environment;
- improving the radiological quality of the environment;
- managing waste;
- improving stakeholder involvement through a well-designed governance model;
- supporting and re-deploying business activity;
- providing grants and compensation; and
- informing about the situation and its evolution.

6. A TERRITORIAL PROJECT FOR LONG-TERM MANAGEMENT

The long-term post-accident period begins when the radiological consequences of the release have been characterised to a sufficient degree of precision. Hence, those active in the affected territories (i.e. elected officials, business community, professionals, and populations) can take action to manage their exposure and to set out to address the future of their territories, alongside the public authorities.

This process requires:

- a sufficiently precise understanding of the radiological conditions in the environment, foodstuffs, and people so that those affected can protect themselves adequately (this knowledge may be improved with time);
- public authorities to be re-organised appropriately but remain subject to change (depending on the circumstances);
- stakeholders to be involved in decision-making and measures taken to rehabilitate living conditions, which will be all the more effective in that they will have been planned in advance; and
- the conditions necessary to allow re-establishment of social and business activity, and the development of a shared project within the territory.

7. CONCLUSIONS

The first elements of a national policy on post-accident management were drawn up with respect to medium-scale nuclear accidents triggering short-term (less than 24 h) radioactive release that might occur at French nuclear facilities. The territories affected by radioactive deposits resulting from accidents of this type may extend across significantly broader distances than those of the off-site emergency plans (i.e. from 10 to several dozen kilometres).

The extent of the territories actually affected by the accident cannot be identified during the preparation stage, as it depends on environmental and meteorological factors. The extent can only be outlined within the specific context of a confirmed accident situation, once the radioactive release has ended, on the basis of the expert advice provided.

The CODIRPA report should be taken into account during the preparation stage, at least where it concerns early measures to be enacted upon at the end of the emergency phase and, at the local level, in operational documents specific to each nuclear site.

Once the first phase of investigation into post-accident management principles is completed, it will be necessary to consider certain topics in greater depth during the preparation stage (defining levels for the release-to-market of foodstuffs and other goods, levels for the clearance of waste, etc.).

A long-term release (over several days) involving large-scale accident management will be addressed in the next stage of the CODIRPA. While the guiding principles are generally the same, the timeline and feasibility of these measures may differ. Indeed, it may become necessary to undertake actions concurrently, in different territories, to protect the population directly exposed to the release of radioactive substances into the atmosphere and the population exposed to deposits of these substances in the environment, as demonstrated for the Fukushima Daiichi accident in Japan.

REFERENCE

ASN, 2012. Policy Elements for Post-accident Management in the Event of Nuclear Accident. Document drawn up by the Steering Committee for the Management of the Post-Accident Phase of a Nuclear Accident (CODIRPA). Autorité de sûreté Nucléaire: Paris (France), Available at: <http://www.french-nuclear-safety.fr>.