Review of Current Off-site Nuclear Emergency Preparedness and Response Arrangements in EU Member States and Neighbouring Countries

ENER/D1/2012-474

Final Report

Appendices

UJV

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Provider of independent Nuclear Safety expertise

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Final Report
Appendices

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Prepared by:

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Analysis of Current Arrangements in the EU and Neighbouring Countries for Nuclear Off-site Emergency Preparedness and Response

Questionnaire Template

on

Data collection for Current Arrangements and Capabilities for Off-site Nuclear EP&R in Europe

STATE:	

IDENTIFICATION OF THE PERSON(S) COMPLETING THE QUESTIONNAIRE:

Organization:	
Responsibility:	
Name	
Position:	
E-mail address:	
Telephone No.:	

Organization:	
Responsibility:	
Name	
Position:	
E-mail address:	
Telephone No.:	

Organization:	
Responsibility:	
Name	
Position:	
E-mail address:	
Telephone No.:	

Data collection for Current Arrangements and Capabilities for Nuclear Off-site EP&R in Europe

1. Legislative basis

1.1 Specify the legislative basis of your nuclear EP&R arrangements (Act, Law, Regulation, etc):

Please describe:	

1.2 Specify the legislative basis of your arrangements for providing information to the public on radiological and nuclear emergencies (Act, Law, Regulation, etc):

Please describe:	

1.3 Specify the legislative provision (act, law, administrative provision, etc) enacted to comply with the following Council Directives:

Council Directive	National legislative provision to comply with Directive
96/29/Euratom of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation	
89/618/Euratom of 27 November 1989 on informing the general public about health protection measures to be applied and steps to be taken in the event of a radiological emergency	

2. Regulatory framework for the protection of the public

2.1 Specify any regulations, standards, requirements, guidance, etc, in addition to primary legislation on off-site EP&R:

Please specify:	

Provide references to where these are documented:	

2.2 Specify any emergency classification levels (e.g. emergency action levels) that have been established or used in the development of EP&R arrangements:

Please specify:	

Provide references to where these are documented:	

2.3 Specify requirements related to off-site EP&R that are a condition of the initial (and continuing) licensing of a NPP:

Please specify:	

Provide a reference to where these are documented:	

2.4 Specify the criteria and/or arrangements for declaring the termination of an emergency and, where appropriate, the transition from emergency to a recovery phase:

Please specify:	

Provide a reference to where these are documented:	

2.5 Specify the extent of emergency planning zones (EPZ) pre-established for the purposes of facilitating the implementation of different countermeasures (make multiple entries if zones differ between different types of NPP):

Countermeasure	Distance (km)
Sheltering	
Evacuation	
Iodine prophylaxis	
Food restrictions	

Please describe in free form if necessary:	

Provide a reference to where these are documented:	

2.6 Summarise the basis or rationale for the choice of EPZ (eg, dose contour based on a reference or design basis accident or on an accident with a defined probability of occurrence, other considerations, etc):

Please summarise:	

Provide a reference to where the basis is documented:	

2.7 Is the rationale for the choice of EPZ set out in any regulation, standard, guidance, etc?

YES	NO
☐	☐

If YES:

Please indicate where:	

2.8 Where the EPZ have been established on the basis of a reference accident or accident with a defined probability, specify the assumed duration and magnitude of release of the nuclides listed below and the dose/s used (ie, child/adult, meteorological conditions assumed, etc) in establishing the respective EPZ (with references to the source information if available):

Nuclide/duration/meteorology	Release		Reference
Xe-133	Bq		
I-131	Bq		
Cs-137	Bq		
Duration of release	hours		
Met conditions (eg, Pasquill category, rainfall?)	-		

EPZ	Dose (Quantity, units, child/adult, pathways considered)	Value (units)	Reference
Sheltering			
Evacuation			
Iodine prophylaxis			

2.9 In establishing EPZ, was consideration given to the possibility of the most highly contaminated areas occurring at distances far from the NPP (eg, due to the

radioactive plume encountering heavy rainfall later in its transport or as a consequence of reduced wind speeds at greater distances):

YES	NO
☐	☐

If NO:

Please describe why not:	

2.10 Was the probability of occurrence of an accident explicitly considered in establishing EPZ?

YES	NO
☐	☐

2.11 Specify any dose criteria used for the introduction of the following protective measures and indicate whether they are incorporated in regulations, standards, etc or are merely recommendations (if YES indicate where):

Protective measure	**Dose quantity and units**	**Dose to child and/or adult***	**Time period for dose integration**	**Dose Criterion (units)**	**Regulation/ standard etc?**		**Recommen-dation?**	
					YES	**NO**	**YES**	**NO**
Sheltering					☐	☐	☐	☐
Evacuation					☐	☐	☐	☐
Iodine					☐	☐	☐	☐
Food bans					☐	☐	☐	☐
Relocation					☐	☐	☐	☐

* insert multiple entries if there are separate criteria for infant, child, adult, etc.

Provide references:	

2.12 Specify any operational intervention levels (OIL) used for the following protective measures and indicate whether they are incorporated into regulations, standards, etc, or are merely recommendations (if YES, indicate where documented) and/or whether they are used by operators or other organisations in responding to an emergency (eg, contained in operating procedures) (*NB: include more than one OIL for each measure where appropriate*):

Protective measure	Operational Intervention Level*	Value (units)	Regulation/ standard etc?		Recommendation?	
			YES	NO	YES	NO
Sheltering			☐	☐	☐	☐
Evacuation			☐	☐	☐	☐
Iodine			☐	☐	☐	☐
Food bans			☐	☐	☐	☐
Relocation			☐	☐	☐	☐
Ban on goods in international trade (cargo, air freight, etc)			☐	☐	☐	☐

* Insert multiple entries if more than one OIL for a protective measure.

Provide references:	

2.13 Specify any criteria used for the termination of the following protective measures and indicate whether they are incorporated in regulations, standards, etc or are merely recommendations (if YES, indicate where documented):

Protective measure	Criterion	Regulation/ standard etc?		Recommendation?	
		YES	NO	YES	NO
Sheltering		☐	☐	☐	☐
Evacuation		☐	☐	☐	☐
Iodine		☐	☐	☐	☐
Food bans		☐	☐	☐	☐
Relocation		☐	☐	☐	☐

Provide references:	

2.14 Is plant status and/or prognoses of its development used as a basis for making decisions on the introduction of protective measures, precautionary or otherwise?

YES	NO
☐	☐

If YES, do standards, guidance or recommendations exist on which conditions (or predicted future conditions) should trigger particular protective measures:

YES	NO
☐	☐

If YES:

Please indicate where such standards, guidance, etc, on such conditions can be found. Briefly indicate the rationale for their choice:	

2.15 Is information on plant status (and/or prognoses of its development) available in real time during an emergency to those responsible for off-site EP&R?

	YES	NO
Available on line:	☐	☐
Available but not on line:	☐	☐
Not available:	☐	☐

If YES to any question, is it:

	YES	NO
Regulatory Requirement:	☐	☐
Requirement of the EP&R plans:	☐	☐
Provided voluntarily:	☐	☐

and:

Please indicate to which organisation/s such information is provided:	

2.16 Are there regulatory provisions in place to control the construction of new homes or industrial facilities within EPZ or to control changes of use?

YES	NO
☐	☐

If YES:

Please indicate their nature and provide references to where they are documented:	

3. Regulatory framework for the protection of off-site emergency services personnel and rescuers

3.1 Specify any regulations, standards, requirements, guidance, etc, in addition to primary legislation on off-site EP&R:

Please specify:	

Provide references to where these are documented:	

3.2 Specify any dose criteria used for the protection of off-site emergency services personnel and rescuers.

Please specify:	

Provide references to where these are documented:	

Are different criteria applied to female emergency services personnel?

YES	NO
☐	☐

If YES:

List the criteria applied to female emergency services personnel. Provide a reference to where these are documented:	

3.3 Specify any provisions made to monitor and record individual doses and to provide personal protection (respiratory protection, etc.):

Please specify:	

Provide references to where these are documented:	

3.4 Specify any provisions made for initial medical care and follow up of off-site personnel with doses exceeding the dose criteria:

Please specify:	

Provide references to where these are documented:	

4. Institutional arrangements

4.1 Specify the organisation/s responsible for establishing and maintaining off-site emergency plans (at local, national and cross-border levels, as appropriate) for NPP and, where there are more than one, the relationships and sharing of responsibilities between them:

Please describe:	
At local level:	
At national level:	
At cross-border level:	

Provide a reference to where these arrangements are documented:	

4.2 Are the off-site emergency plans subject to consultation prior to being finalised?

YES	NO
☐	☐

If YES, what is the nature and extent of the consultation, is the public involved and is consultation obligatory (ie, required by legal or regulatory requirement):

Please describe:	

Provide a reference to where these arrangements are documented:	

4.3 Specify the organisation/s having the power to initiate off-site emergency response:

Please specify organisation/s:	

Provide a reference to where these arrangements are documented:	

4.4 Specify the organisation/s with responsibility for making decisions on the introduction of urgent countermeasures (eg, sheltering, evacuation, iodine prophylaxis, food and drinking water restrictions):

Please specify organisation/s:	

Provide a reference to where these arrangements are documented:	

4.5 Summarise the institutional arrangements established in the preparedness phase to ensure a coherent and integrated response, including public communication, from organisations at all levels (national, regional, local) having one or another responsibility for off-site EP&R:

Please describe:	

Provide a reference to where these arrangements are documented:	

4.6 Are the institutional arrangements for nuclear off-site EP&R coherent and compatible with arrangements for other emergencies (natural or otherwise)?

YES	NO
☐	☐

If YES:

Provide a reference to where these arrangements are documented:	

4.7 Summarise the institutional arrangements for informing neighbouring countries of an emergency (over and above those required by international obligations):

Please describe:	

Provide a reference to where these arrangements are documented:	

4.8 Do you have detailed cross border arrangements in place with neighbouring countries for responding to nuclear emergencies?

YES	NO
☐	☐

If NO:

Please summarise the rationale or basis for deciding that this is not necessary:	

If YES:

Please complete the following table (*NB: if detailed arrangements are in place with more than one neighbouring country, please indicate if there are any differences in arrangements between countries*):

Countries with whom detailed arrangements are in place:	
Rationale or basis for deciding to establish detailed arrangements (ie, border within EPZ, etc):	
Summarise the nature of the arrangements (eg, the adoption of common criteria for the introduction of countermeasures to ensure consistency of response across borders; mechanisms for sharing information on accident prognosis, environmental monitoring and estimated radiological impact, etc):	
Summarise mechanisms for joint decision making on introduction and removal of countermeasures:	
Indicate frequency and summarise the nature of cross border exercises (eg, desktop, field exercises, etc):	

4.9 Institutional arrangements for responding to emergencies at NPP in third countries (question only applicable to countries with operating NPP):

Are there any significant differences in institutional arrangements for EP&R in respect of emergencies occurring at NPP within a country and those occurring at NPP in third countries?

YES	NO
☐	☐

If YES:

Please indicate their nature and summarise the rationale for any differences:	

5. Licensee's EP&R arrangements and coordination with those responsible for off-site EP&R

5.1 Are the licensee's on- and off-site EP&R plans subject to approval by the regulatory body?

	YES	NO
On-site EP&R plans:	☐	☐
Off-site EP&R plans:	☐	☐

If NO to either question:

	On-site EP&R plans	Off-site EP&R plans
Please indicate who, if anyone, is responsible for approving the plans:		

5.2 Do the licensee's organisational arrangements contain provisions for ensuring effective and timely liaison and communication with those responsible for off-site EP&R?

YES	NO
☐	☐

If YES:

Please briefly indicate the nature of the provisions:	

5.3 Specify the conditions under which an off-site emergency is declared including the criteria for classification (ie, emergency action levels):

Please specify:	

Provide references to where these are documented:	

5.4 Does the licensee have the power or responsibility to initiate off-site protective measures in the initial stages of an emergency?

YES	NO
☐	☐

If YES:

Specify the criteria on which such decisions would be based:	

Provide a reference to where these powers are documented	

5.5 a) Does the licensee have any obligations placed on it in contributing to off-site EP&R (eg, carrying out personal and environmental monitoring, holding a stockpile of iodine tablets, etc)?

	YES	NO
Regulatory Requirement	☐	☐

b) Does the licensee act voluntarily in contributing to off-site EP&R?

	YES	NO
Provided voluntarily	☐	☐

If YES to either question:

Indicate the nature of the contribution/s:	

5.6 Is the licensee required, as part of its EP&R arrangements, to provide the regulatory or other body with continuous (ie, 24/7) information on the facility status (eg, critical parameters, monitored discharges, data from fixed environmental monitoring system, etc)?

YES	NO
☐	☐

If YES:

Please list the key information supplied and how often it is updated:	

5.7 Is the licensee required, as part of its EP&R or other arrangements, to provide governmental organisations in third countries with continuous (ie, 24/7) information on the facility status (eg, critical parameters, monitored discharges, data from fixed environmental monitoring system, etc)?

YES	NO
☐	☐

If YES:

Identify the third countries and list the key information supplied and any conditions governing its supply:	

5.8 Does the licensee (or other organisation) voluntarily provide governmental organisations in third countries with continuous (ie, 24/7) information on the facility status (eg, critical parameters, monitored discharges, data from fixed environmental monitoring system, etc)?

YES	NO
☐	☐

If YES:

Identify the third countries and list key information supplied and any conditions governing its supply:	

5.9 Does the licensee have tools available (system or software) to predict the radiological impact based on plant status and how it might develop and/or on measurements of released material and levels of radiation in the environment?

YES	NO
☐	☐

If YES:

Specify the system or software used and provide a reference to it: please make multiple entries if system or software differs between NPP:	

6. Coordination of off-site EP&R - role of key stakeholders

6.1 Are the roles, responsibilities and interactions between the key stakeholders in off-site EP&R (eg, local, regional and national governments, emergency services, etc) clearly defined and formally agreed by all parties?

YES	NO
☐	☐

If YES:

Provide a reference to where these are documented:	

6.2 Is there a national coordinating authority to ensure that the functions and responsibilities of all parties are clearly assigned and understood?

YES	NO
☐	☐

If YES:

Provide the name of the coordinating authority, summarise its roles/responsibilities:	

Provide a reference to where these are documented:	

6.3 Has any assessment been made to determine whether local, regional and national resources and capabilities are sufficient for responding effectively to the accident assumed for the purposes of establishing EPZ?

YES	NO
☐	☐

If YES:

Please briefly list the main findings of the assessment and provide a reference to it:	

If NO:

Please indicate why such an assessment was deemed unnecessary:	

6.4 Are mechanisms in place to ensure timely notification of emergencies to neighbouring countries over and above obligations under the Convention on Early Notification of a Nuclear Accident and the Community's Urgent Radiological Information Exchange system?

YES	NO
☐	☐

If YES:

Indicate their nature including the countries concerned:	

7. Training and exercising of off-site EP&R arrangements

7.1 Specify the frequency and nature (eg, table top, field exercise of some or all functions, etc) of exercises/drills performed to test EP&R arrangements:

Type of exercise	Frequency (per year)	Nature of exercise/aspects exercised
On-site for each NPP		
Off-site for each NPP		
National (on and off-site)		
Supra-national (eg, with neighbouring country/ies)		
International		

7.2 Specify the frequency and nature (eg, table top, field exercise of some or all functions) of exercises/drills in which you test the extendibility of the EP&R arrangements for accidents more severe than used in the establishment of the EPZ:

Type of exercise	Frequency (per year)	Nature of exercise/aspects exercised
On-site for each NPP		
Off-site for each NPP		
National (on and off-site)		
Supra-national (eg, with neighbouring country/ies)		
International		

8. Practical aspects of protective measures

8.1 Practical arrangements for the issue of stable iodine

8.1.1 Is stable iodine used:

	YES	NO
As an isolated countermeasure:	☐	☐
Only in combination with sheltering:	☐	☐
Only in combination with evacuation:	☐	☐

If necessary clarify the actual arrangements. Provide a reference where they are documented:	

8.1.2 Specify the recommended dosage for different population groups, and the recommended frequency for repeated intakes where exposure to radioiodine continues or may continue over a more extended period:

Population	Dose (mg)	Frequency of repeat intakes
Infants		
Children		
Adults		
Pregnant women		
Others		

Provide a reference where this information is documented:	

8.1.3 Is stable iodine pre-distributed throughout particular areas (eg, EPZ)?

YES	NO
☐	☐

If YES:

Indicate the size of the area and the approximate number of people concerned:	

8.1.4 Is stable iodine pre-distributed to groups at particular risk, eg, schools, nurseries, etc?

YES	NO
☐	☐

If YES:

Indicate which groups:	

8.1.5 Where stable iodine is pre-distributed, is information/guidance provided on potential side effects, in particular for those with underlying thyroid disease?

YES	NO
☐	☐

If YES:

In what form:	

8.1.6 Where stable iodine is not pre-distributed, what arrangements are made to ensure its timely distribution following an emergency (ie, where is it stockpiled, how, where and by whom will it be distributed and how quickly is this expected to be done):

Please describe arrangements:	

Provide a reference where these arrangements are documented:	

8.1.7 What contingencies have been made to provide iodine tablets beyond the pre-planned or designated zones and/or for repeat intakes in the event of continuing exposure to radio-iodine (eg, size of regional/national stockpiles of iodine tablets)?

Please describe contingencies:	

Provide a reference to where these contingencies are documented:	

8.2 Practical aspects of sheltering

8.2.1 Would sheltering be recommended:

	YES	NO
Prior to the release of radioactive material:	☐	☐
Only after a release had occurred:	☐	☐

8.2.2 Do recommendations or guidance exist on the maximum duration of sheltering?

YES	NO
☐	☐

If YES:

Describe what is recommended:	

Provide a reference to the recommendations or guidance:	

8.3 Practical aspects of evacuation

8.3.1 Would evacuation be recommended prior to the release of radioactive material (ie, as a precautionary measure or based on plant status) or only after a release had occurred?

	YES	NO
Prior to the release of radioactive material:	☐	☐
Only after a release had occurred:	☐	☐

Briefly summarise the basis or rationale for making decisions on evacuation prior to a release occurring and provide a reference where this is described:	

8.3.2 Specify how evacuation would be achieved within EPZ (eg, self-evacuation, organised transport, combination of both, etc):

Please specify:	

Provide a reference where these arrangements are described:	

8.3.3 Are special provisions made or different criteria applied to the evacuation of groups with particular characteristics (eg, hospital patients, care homes for the elderly or the infirm, prisons, workers in critical infrastructures, etc)?

YES	NO
☐	☐

If YES:

Please summarise the provisions and criteria:	

Provide a reference to where these provisions are documented:	

8.3.4 Is the total capacity of pre-designated reception centres sufficient to accommodate the total population residing within the EPZ?

YES	NO
☐	☐

8.4 Practical aspects of food restrictions and control of drinking water

8.4.1 Are restrictions placed on food and drinking water in pre-designated areas prior to confirmatory measurements being made?

YES	NO
☐	☐

If YES:

On what basis are these areas determined:	

Provide a reference where these provisions are documented:	

8.4.2 Are the arrangements (sampling and analytic capacities, manpower, etc) for the control of food and drinking water sufficiently comprehensive and robust to provide a high degree of assurance that products entering the market have levels of radionuclides lower than those set out in Community legislation?

YES	NO
☐	☐

8.4.3 a) Has a practicable strategy been developed for the management and disposal of contaminated foodstuffs and livestock and provision made for its implementation?

YES	NO
☐	☐

If YES:

Please indicate the main features of the strategy:	

Provide a reference where the strategy is documented:	

If NO:

If there is no strategy, summarise your current arrangements:	

b) Have the implications of your strategy and/or current arrangements been assessed to determine whether they are practicable?

YES	NO
☐	☐

If YES:

Briefly summarise the findings of the assessment and where they are documented:	

If NO:

Please indicate why you believe this is unnecessary:	

8.5 Practical aspects of relocation

8.5.1 a) Has a robust and defensible strategy been developed for relocation of people from contaminated areas and provision made and/or guidance developed for its practical implementation (eg, criteria that are clear and comprehensible, capable of gaining broad public acceptance, clarity at an early stage as to whether relocation is permanent or temporary, etc)?

YES	NO
☐	☐

If YES:

Please indicate the main features of the strategy:	

Provide a reference where the strategy is documented:	

If NO:

If there is no strategy, summarise your current arrangements:	

b) Have the implications of your strategy and/or current arrangements been assessed to determine whether they are practicable?

YES	NO
☐	☐

If YES:

Briefly summarise the findings of the assessment and where they are documented:	

If NO:

Please indicate why you believe this is unnecessary:	

8.6 Practical aspects of decontamination

8.6.1 a) Has a strategy for the decontamination of contaminated areas been developed and provision made and/or guidance developed (in terms of criteria, equipment, human resources, materials, waste disposal options, preferential

decontamination of critical infrastructures, schools, etc) for its implementation?

YES	NO
☐	☐

If YES:

Please indicate the main features of the strategy:	

Provide a reference where the strategy is documented:	

If NO:

If there is no strategy, summarise your current arrangements:	

b) Have the implications of your strategy and/or current arrangements been assessed to determine whether they are practicable?

YES	NO
☐	☐

If YES:

Briefly summarise the findings of the assessment and where they are documented:	

If NO:

Please indicate why you believe this is unnecessary:	

8.7 Practical aspects of return from evacuation or relocation

8.7.1 a) Has a strategy for the return of those evacuated or relocated from contaminated areas been developed and provision made and/or guidance developed (in terms of criteria, health care, social support and counselling, reassurance, environmental monitoring, etc) for its implementation?

YES	NO
☐	☐

If YES:

Please indicate the main features of the strategy:	

Provide a reference where the strategy is documented:	

If NO:

If there is no strategy, summarise your current arrangements:	

b) Have the implications of your strategy and/or current arrangements been assessed to determine whether they are practicable?

YES	NO
☐	☐

If YES:

Briefly summarise the findings of the assessment and where they are documented:	

If NO:

Please indicate why you believe this is unnecessary:	

9. Countermeasures for farm animals

9.1 Do your EP&R arrangements contain any provision for the control and management of livestock that may be contaminated or left in evacuated or relocated areas?

YES	NO
☐	☐

If YES:

Please indicate the main features of these arrangements:	

Provide a reference where they are documented:	

10. Early warning and radiation monitoring systems

10.1 Do you have a national/regional/site specific monitoring or early warning system for detecting elevated levels of radiation or radioactive material?

YES	NO
☐	☐

10.2 Describe the main characteristics of your system or systems (*NB: provide multiple entries if there is more than one system, ie, national, site specific, etc*):

Type of monitoring	Number of detectors in system	Density of detectors in country (No/1000km^2)	Dynamic range/upper limit of detection
Gamma dose rate (with automatic real time data transmission)			
Gamma spectrum (with automatic real time data transmission)			
Gamma spectrum (delayed data transmission)			
Air samplers (with automatic pseudo real time data transmission			
Air samplers (with delayed data transmission)			

10.3 Are the results of your national monitoring or early warning systems made available in real time in both normal and emergency conditions?

Availability	YES	NO
a) To the general public within your country	☐	☐
b) To the general public in third countries*	☐	☐
c) Restricted to organisations within your country	☐	☐
e) Available to governmental organisations in third countries**	☐	☐
f) Available to supra-national organisations***	☐	☐

*If your answer for b) is YES:

Please indicate which countries:	

**If your answer for e) is YES:

Please indicate which countries:	

***If your answer for f) is YES:

Please indicate which organisations:	

Briefly summarise the rationale for, and key features of, your arrangements for making information available from national monitoring and early warning systems:	

11. National capabilities for off-site EP&R

11.1 Radiation surveys

11.1.1 Provide estimates of your total national capability for carrying out radiation surveys in areas contaminated or potentially contaminated at levels anticipated following an accident:

Type of survey	Type of measurement	Total no. of detectors or systems	Approx total no. of measure-ments per day	Approx total area surveyable per day (km^2)*	Linear flight or vehicle path surveyable per day (km)
Foot/ground/ manual based survey	γ dose rate meter				
	β/γ survey instrument				
	α/β contamination meter				
	personal contamination meter				
In situ gamma spectrometry					
Vehicle based survey (*specify no. of vehicles*)	Gamma dose rate				
	Gamma spectra				
	Air sampling				
Aerial survey	Gamma dose rate				
	Gamma spectra				
	Deposition levels				

* provide some indication of resolution of measurements along with area

11.2 Analysis of environmental samples:

11.2.1 Provide estimates of your total national capability for carrying out analyses (sample preparation and analysis) of environmental samples contaminated at levels typical of those anticipated following an accident (see also 10.2.1 and 10.2.2):

Type of analysis	Number of systems	Total number of samples that can be prepared and measured per day
Gamma spectrometry		
Alpha spectrometry		
Beta counting		

11.2.2 Are the sampling and measurement techniques and capabilities summarised above appropriate for emergency situations and/or are they regularly tested for use in this context?

	YES	NO
Appropriate:	☐	☐
Regularly tested:	☐	☐

11.2.3 Is the instrumentation summarised above appropriate for the measurement of higher levels of activity that may be encountered in an emergency and/or rapid analysis of key nuclides?

	YES	NO
Appropriate for the measurement of higher levels of activity:	☐	☐
Appropriate for rapid analysis of key nuclides:	☐	☐

11.2.4 Have provisions been made to identify and deal with contamination of the equipment/laboratory when dealing with samples contaminated at levels anticipated in emergency situations?

YES	NO
☐	☐
☐	☐

11.2.5 Have specific QA/QC procedures been develop and put in place for emergency situations?

YES	NO
☐	☐
☐	☐

11.3 Technical decision support

11.3.1 Provide information on national capabilities for providing technical input in each of the following areas in support of decision making during an emergency and its aftermath:

Capability	Scale			Name of system or software and organisation operating it in an emergency
	Local	National	European	
Atmospheric dispersion	☐	☐	☐	
Hydrological dispersion – freshwater	☐	☐	☐	
Hydrological dispersion – marine	☐	☐	☐	
Transfer through terrestrial environment	☐	☐	☐	
Transfer through aquatic environment	☐	☐	☐	
Dose assessment	☐	☐	☐	
Evaluation of different countermeasure options or strategies	☐	☐	☐	
Assimilation of model predictions and environmental monitoring	☐	☐	☐	
Integrated system comprising all of the above	☐	☐	☐	
Prognoses of plant status and accident development	YES ☐ NO ☐			

11.3.2 Are the above capabilities available 24/7 and do they operate in real time?

	YES	NO
Available 24/7:	☐	☐
Real time:	☐	☐

11.3.3 In those cases where an integrated system or approach is not used, summarise the measures that have been taken to ensure compatibility between the discrete elements and to avoid conflicting information during an emergency:

Please summarize:	

11.4 Decontamination

11.4.1 Provide estimates of your national capabilities for carrying out decontamination of various surfaces, buildings, etc, in contaminated areas:

Type of surface of building	Number per year	Area per year (km²)
Urban areas or the built environment		
Public buildings (eg, schools)		
Homes		
Critical infrastructures or facilities		

11.4.2 Do your EP&R arrangements identify the potential scale and nature of decontamination that may be required in the EPZ?

YES	NO
☐	☐

If YES:

Please summarise the nature and scale:	

11.4.3 Do your EP&R arrangements include the stockpiling (or a provision for the rapid acquisition) of equipment and materials for decontamination?

YES	NO
☐	☐

If YES:

Please summarise the provisions made:	

11.5 National capabilities for medical support and treatment

11.5.1 Medical triage:

Please summarise your arrangements for medical triage and personal decontamination:	

Please indicate where they are documented:	

Please provide an estimate of how many people per day could be processed through your triage and decontamination facilities (and the number used as the basis for planning):	

11.5.2 Emergency treatment: do you have a capability for providing emergency treatment to people potentially exposed at levels above those where clinical effects are likely to occur?

YES	NO
☐	☐

If YES:

Please summarise your arrangements:	

Please indicate where they are documented and the nature of the treatments that can be provided:	

Please provide an estimate of the total number of people who could be treated (and the number used as the basis for planning):	

11.5.3 Psychological support and counselling: do you have a capability for providing psychological support and counselling for those most affected by an accident (eg, those highly exposed, evacuees, etc)?

YES	NO
☐	☐

If YES:

Please summarise your arrangements:	

Please indicate where they are documented:	
Please provide an estimate of the number of people who could be provided with such support (and the number used as the basis for planning):	

11.6 National capabilities for assessing individual doses based on measurements of people who may have been exposed in a nuclear emergency

11.6.1 Indicate whether you have a national capability to make dose assessments based on the techniques listed below and provide an estimate of the number of measurements/dose assessments you could make per day:

Measurement technique	Number of measurements/dose assessments per day
Cytogenetics–based biodosimetry	
EPR	
Optically Stimulated Luminescence/EPR	
Activation analysis	
In vivo bioassay – fixed whole body counter	
In vivo bioassay – mobile whole body counter	
In vivo bioassay – thyroid counter	
In vitro bioassay *(specify nuclide)*	
In vitro bioassay *(specify nuclide)*	
In vitro bioassay *(specify nuclide)*	

11.6.2 Indicate the methods/software used to estimate doses from in vivo or in vitro bio-assays:

Please describe:	

11.6.3 Do you have a demonstrated capability for dose reconstruction taking account of all available information (eg, monitoring, bioassay, modelling, etc)?

YES	NO
☐	☐

If YES:

Please indicate any methods/software used:	

12. Public information and communication

12.1 Is there a legal obligation to provide information to the public on radiological and nuclear emergencies?

YES	NO
☐	☐

If YES:

Please specify the Act, Law or Regulation:	

12.2 Who is responsible for providing prior information to the public on radiological and nuclear emergencies?

	YES	NO
Licensee:	☐	☐
Regulatory authority:	☐	☐
Local government:	☐	☐
National government:	☐	☐
Other:	☐	☐

If 'Other':

Please describe:	

12.3 What is the basis for deciding which members of the public should receive prior information?

	YES	NO
Distance from facility:	☐	☐
Those within EPZ:	☐	☐
Local or regional government boundary:	☐	☐

	YES	NO
Other:	☐	☐

If 'Other':

Please describe:	

12.4 How is this information communicated?

	YES	NO
Leaflets/brochures:	☐	☐
Public meetings:	☐	☐
Training courses:	☐	☐
Other:	☐	☐

If 'Other':

Please describe:	

12.5 Are responsibilities defined within EP&R off-site arrangements for informing the public in the event of an emergency?

YES	NO
☐	☐

If YES, which organisation/s have defined responsibilities?

	YES	NO
Licensee:	☐	☐
Local authority:	☐	☐
Emergency services/civil defence:	☐	☐
National government:	☐	☐
Other:	☐	☐

If 'Other':

Please describe:	

Provide a reference to where these responsibilities and arrangements are documented:	

12.6 Are arrangements or mechanisms in place to ensure that information provided to the public by those with responsibility for EP&R in the event of an emergency is useful, timely, truthful, consistent, and appropriate?

YES	NO
☐	☐

If YES:

Please summarise the arrangements or mechanism:	

Provide a reference where they are documented:	

13. Mutual assistance

13.1 Are you a party to the IAEA Convention on Mutual Assistance?

YES	NO
☐	☐

13.2 Have you registered or indicated a willingness to provide mutual assistance on radiological and nuclear matters through the European Commission's Monitoring and Information Centre (MIC)?

YES	NO
☐	☐

If YES:

Please list the capabilities that you have indicated could be provided:	

13.3 Have you registered any of your capabilities with the IAEA RANET?

YES	NO
☐	☐

If YES, please complete the Table below indicating capabilities that have been registered or are planned to be registered:

RANET category	Capability	Registered	Planned for registration
Radiation Survey			
RS-1	Foot/manual/ground based survey	☐	☐
RS-2	*In-situ* gamma spectrometry	☐	☐
RS-3	Vehicle based survey	☐	☐
RS-4	Aerial based survey	☐	☐
Environmental Sampling and Analysis			
ESA-1	Environmental sampling	☐	☐
ESA-2	Gamma spectrometry	☐	☐
ESA-3	Alpha spectrometry	☐	☐
ESA-4	Beta counting	☐	☐
Assessment and Advice			
AA-1	Atmospheric dispersion	☐	☐
AA-2	Hydrological dispersion	☐	☐
AA-3	Radio-ecological models	☐	☐
AA-4	Dose predictions	☐	☐
AA-5	Public health protection	☐	☐
AA-6	Remediation and recovery	☐	☐
Decontamination			
DE-1	Expertise in decontamination	☐	☐
DE-2	Support in decontamination	☐	☐
Medical support			
MS-1	Medical triage	☐	☐
MS-2	Support in treatment	☐	☐
MS-3	Emergency treatment	☐	☐
MS-4	Psychological support	☐	☐
Individual dose assessments			
DA-1	Cytogenetics-based bio-dosimetry	☐	☐
DA-2	EPR	☐	☐
DA-3	Optically Stimulated Luminescence/EPR	☐	☐
DA-4	Activation analysis	☐	☐

RANET category	Capability	Registered	Planned for registration
DA-5	*In vivo* bioassay	☐	☐
DA-6	*In vitro* bioassay	☐	☐
DA-7	Internal dose calculations	☐	☐
DA-8	Dose reconstruction	☐	☐

13.4 Do you have mutual assistance arrangements in place with neighbouring or other countries?

YES	NO
☐	☐

If YES:

Please specify the countries and summarise the nature and extent of the arrangements:	

14. Extendibility of arrangements

14.1 Do your arrangements contain provisions for the extension of countermeasures beyond the pre-designated EPZ?

YES	NO
☐	☐

If YES:

Please summarise the nature of these provisions and identify any major constraints to the degree of extendibility and/or its efficacy:	

Provide a reference to where these provisions are documented:	

14.2 Are these provisions consistent and compatible with those for other emergencies?

YES	NO
☐	☐

14.3 Have these provisions for extendibility been exercised/tested and, if so, how often?

	YES	How often	NO
Exercised/Tested:	☐		☐

15. Robustness of arrangements when emergency associated with major loss of infrastructure

15.1 In developing current EP&R arrangements was account taken of contemporaneous loss or damage to major infrastructures (eg, accident initiated, or accompanied, by a major natural or man-made disaster)?

YES	NO
☐	☐

15.2 Are the current arrangements robust for such eventualities or will they need revision/enhancement?

	YES	NO
Robust:	☐	☐
Will need revision/enhancement:	☐	☐

16. Robustness of arrangements and capabilities when emergency is protracted

16.1 In developing current EP&R arrangements and capabilities was account taken of the potential for emergencies being extended in time?

YES	NO
☐	☐

16.2 Are the current arrangements robust for protracted emergencies or will they need revision/enhancement?

	YES	NO
Robust:	☐	☐
Will need revision/enhancement:	☐	☐

17. Commitment of licensee/s to EP&R

17.1 Has/have the licensee/s demonstrated continuing commitment to its/their obligations with respect to off-site EP&R?

YES	NO
☐	☐

If NO:

Please indicate any significant failings:	

18. Funding

18.1 Who bears the costs of developing, maintaining and exercising the off-site EP&R arrangements (eg, utility, local, regional or national government)?

Please describe:	

Provide a reference to where this issue is documented:	

19. Liability

19.1 Who is liable to provide compensation for harm resulting from an emergency at a NPP in your country?

Please describe:	

Provide a reference to where these obligations are documented:	

19.2 Do your EP&R plans include compensation arrangements and claims handling procedures?

YES	NO
☐	☐

If YES:

Provide a reference to where these are documented:	

15 APPENDIX B: Supplementary questionnaire on current status of arrangements and capabilities for off-site EP&R

Analysis of Current Arrangements in the EU and Neighbouring Countries for Off-site Emergency Preparedness and Response

Questionnaire

for

Collection of Data and Information on Off-site EP&R Arrangements and Capabilities in Europe

Supplementary Questions for all NPP Countries and others in EPZ

STATE:	

IDENTIFICATION OF THE PERSON(S) COMPLETING THE QUESTIONNAIRE:

Organization:	
Responsibility:	
Name	
Position:	
E-mail address:	
Telephone No.:	

Organization:	
Responsibility:	
Name	
Position:	
E-mail address:	
Telephone No.:	

Organization:	
Responsibility:	
Name	
Position:	
E-mail address:	
Telephone No.:	

Questionnaire: Data Collection for Current Arrangements and Capabilities for Off-site Nuclear EP&R in Europe

Supplementary Questions for all NPP Countries and others in EPZ

GS-R-2 Requirement		Compliant		If YES, please provide a reference to the arrangements (alternatively, briefly describe their nature). If NO, comment as appropriate.
#	**Assessing the initial phase**	YES	NO	
4.73	Arrangements shall be made to ensure that relevant information is recorded during an emergency and retained for use during the emergency, in evaluations conducted following the emergency and for the long term health monitoring and follow-up of the emergency workers and members of the public who may potentially be affected.	☐	☐	
#	**Managing the medical response**	YES	NO	
4.77	Arrangements shall be made for medical personnel, both general practitioners and emergency staff, to be made aware of the medical symptoms of radiation exposure and of the appropriate notification procedures and other immediate actions warranted if an emergency is suspected.	☐	☐	
4.78	Facilities shall make arrangements to treat a limited number of contaminated or overexposed workers, including arrangements for first aid, the estimation of doses, medical transport and the initial medical treatment of contaminated or highly exposed individuals in local medical facilities.	☐	☐	
4.79	Jurisdictions within the emergency zones shall have a medical management plan for performing triage and assigning any highly exposed members of the public to appropriate medical facilities. This plan shall include operational criteria.	☐	☐	
4.80	Arrangements shall be made at the national level to treat people who have been exposed or contaminated. These shall include: guidelines for treatment; the designation of medical practitioners trained in the early diagnosis and treatment of radiation injuries; and the selection of approved institutions to be used for	☐	☐	

GS-R-2 Requirement		Compliant		If YES, please provide a reference to the arrangements (alternatively, briefly describe their nature). If NO, comment as appropriate.
	the extended medical treatment or follow-up of persons subjected to radiation exposure or contamination. This shall also include arrangements for consultation on treatment following any exposure that could result in severe tissue damage or other severe deterministic health effects with medical practitioners experienced in dealing with such injuries.			
4.81	Arrangements shall be made for the identification, long term health monitoring and treatment of people in those groups that are at risk of sustaining detectable increases in the incidence of cancers as a result of radiation exposure due to an emergency. The monitoring shall be based on criteria that provide an opportunity to detect increases in the incidence of cancers and to treat cancers more effectively at an early stage.	☐	☐	
#	**Taking agricultural countermeasures, countermeasures against ingestion and longer term protective actions.**	**YES**	**NO**	
4.91	For the emergency zones, arrangements shall be made for monitoring the contamination levels of vehicles, personnel and goods moving into and out of the contaminated areas in order to control the spread of contamination. This shall include the setting of operational criteria for the results of the monitoring that indicate the need for decontamination or controls in accordance with international standards.	☐	☐	
#	**Mitigating the non-radiological consequences of the emergency and the response**	**YES**	**NO**	
4.95	Jurisdictions within the emergency zones shall make arrangements for justifying, optimizing and authorizing different intervention levels or action levels following an event for which agricultural countermeasures or longer term protective actions are in place. The process shall include	☐	☐	

GS-R-2 Requirement		Compliant		If YES, please provide a reference to the arrangements (alternatively, briefly describe their nature). If NO, comment as appropriate.
	arrangements for consulting the people affected. Public concern, effects on economic conditions and employment, long term needs for social welfare and other non-radiological effects of longer term protective actions shall be considered in this process. This process shall provide for exception from accordance with international standards where these are justified.			
4.96	Arrangements shall be made for responding to public concern in an actual or potential emergency. Preparations shall include arrangements for promptly explaining any health risks and what are appropriate and inappropriate personal actions for reducing risks. These arrangements shall include monitoring for and responding to any related health effects and preventing inappropriate actions on the part of workers and the public. This shall include the designation of the organization(s) with the responsibility for identifying the reasons for such actions (such as misinformation from the media or rumours) and for making recommendations on countering them. How these recommendations are to be included in the national emergency response shall be specified.	☐	☐	
#	**Quality assurance programme**	**YES**	**NO**	
5.37	The operator and the off-site response organizations shall establish a quality assurance programme, in accordance with international standards, to ensure a high degree of availability and reliability of all the supplies, equipment, communication systems and facilities necessary to perform the required functions. This programme shall include arrangements for inventories, resupply, tests and calibrations, made to ensure that these items and facilities are continuously available and functional for use in an emergency. Arrangements shall be made to maintain, review and update	☐	☐	

GS-R-2 Requirement		Compliant		If YES, please provide a reference to the arrangements (alternatively, briefly describe their nature). If NO, comment as appropriate.
	emergency plans and procedures and other arrangements and to incorporate lessons learned from research, operating experience and emergency drill and exercises.			
5.38	The operating organization and response organizations shall prepare and put in place a comprehensive quality assurance programme covering all activities which may affect the emergency response programme.	☐	☐	

Questionnaire

for

Collection of Data and Information on Off-site EP&R Arrangements and Capabilities in Europe

Supplementary Questions for non-NPP, non-EPZ Countries

STATE:	

IDENTIFICATION OF THE PERSON(S) COMPLETING THE QUESTIONNAIRE:

Organization:	
Responsibility:	
Name	
Position:	
E-mail address:	
Telephone No.:	

Organization:	
Responsibility:	
Name	
Position:	
E-mail address:	
Telephone No.:	

Organization:	
Responsibility:	
Name	
Position:	
E-mail address:	
Telephone No.:	

Questionnaire: Data Collection for Current Arrangements and Capabilities for Off-site Nuclear EP&R in Europe

Supplementary Questions for non-NPP, non-EPZ Countries

GS-R-2 Requirement		Compliant		If YES, please provide a reference to the arrangements (alternatively, briefly describe their nature). If NO, comment as appropriate.
#	**Assessing the initial phase**	**YES**	**NO**	
4.73	Arrangements shall be made to ensure that relevant information is recorded during an emergency and retained for use during the emergency, in evaluations conducted following the emergency and for the long term health monitoring and follow-up of the emergency workers and members of the public who may potentially be affected.	☐	☐	
#	**Managing the medical response**	**YES**	**NO**	
4.80	Arrangements shall be made at the national level to treat people who have been exposed or contaminated. These shall include: guidelines for treatment; the designation of medical practitioners trained in the early diagnosis and treatment of radiation injuries; and the selection of approved institutions to be used for the extended medical treatment or follow-up of persons subjected to radiation exposure or contamination.	☐	☐	
4.81	Arrangements shall be made for the identification, long term health monitoring and treatment of people in those groups that are at risk of sustaining detectable increases in the incidence of cancers as a result of radiation exposure due to an emergency. The monitoring shall be based on criteria that provide an opportunity to detect increases in the incidence of cancers and to treat cancers more effectively at an early stage.	☐	☐	

GS-R-2 Requirement		Compliant		If YES, please provide a reference to the arrangements (alternatively, briefly describe their nature). If NO, comment as appropriate.
#	**Mitigating the non-radiological consequences of the emergency and the response**	YES	NO	
4.96	Arrangements shall be made for responding to public concern in an actual or potential emergency. Preparations shall include arrangements for promptly explaining any health risks and what are appropriate and inappropriate personal actions for reducing risks. These arrangements shall include monitoring for and responding to any related health effects and preventing inappropriate actions on the part of workers and the public. This shall include the designation of the organization(s) with the responsibility for identifying the reasons for such actions (such as misinformation from the media or rumours) and for making recommendations on countering them. How these recommendations are to be included in the national emergency response shall be specified.	☐	☐	

16 APPENDIX C: Benchmarking criteria

The requirements against which benchmarking of EP&R arrangements and capabilities were carried out are listed in Table 16-1 and Table 16-2 for IAEA requirements and EU legislative provisions, respectively.

Table 16-1: IAEA requirements for preparedness and response for a nuclear or radiological emergency (IAEA GS-R-2)

General requirements	
1. Basic responsibilities	
1a[1]	Adequate preparations shall be established and maintained at local and national levels and, where agreed between States, at international level to respond to nuclear emergencies. [Questions 4.1, 4.5, 4.7, 4.8, 4.9]
1b	The State shall ensure that the regulatory body and response organizations have the necessary resources and that they make preparations and arrangements to deal with any consequences of a nuclear emergency, whether [it] occurs within or beyond national borders. These preparations shall include the actions to be taken both in and after an emergency. [Questions in sections 4, 5, 6 and 11]
1c	Legislation shall be adopted to allocate clearly the responsibilities for preparedness and response. This shall include establishing or identifying an existing governmental body or organization to act as a national coordinating authority. This authority shall ensure that the functions and responsibilities of operators and response organizations are clearly assigned and understood, and that arrangements are in place for achieving and enforcing compliance with the requirements. [Questions 1.1, 1.2, 1.3, 4.1, 6.1, 6.2, 6.3]
1d	The regulatory body shall ensure that [on-site] emergency arrangements are integrated with those of other response organizations. There shall be exercises of the emergency arrangements at suitable intervals, some of which shall be witnessed by the regulatory body. [Questions 4.5, 5.1, 5.2, 7.1, 7.2]
1e	The national coordinating authority and the response organizations shall ensure that the arrangements are coordinated with the arrangements for response to conventional emergencies.[Question 4.6]
Functional requirements	
2. Establishing emergency management and operations	
2a	The transition from normal to emergency operations shall be clearly defined [Questions 2.2, 5.3]
2b	Arrangements shall be made to coordinate the emergency responses of all the off-site response organizations with the on-site response [Questions 4.2, 4.3, 4.4, 4.5, 5.1, 5.2, 5.4, 5.5]
2c	Arrangements shall be integrated with arrangements at the national and local level for response to conventional emergencies [Questions 4.5, 4.6]
2d	Arrangements shall be made for the implementation of a command and control system for the response. In addition, arrangements shall be made for obtaining and assessing the information necessary in order to allocate resources for all response organizations [Questions 2.14, 2.15, 5.4, 5.6, 5.9, 6.1, 6.2, 11.3]
2e	Arrangements shall be made for coordinating the response between the response organizations and jurisdictions (including other States) that fall within the precautionary action zone or the urgent protective action planning zone [Question 2.6, 4.1, 4.2, 4.5, 4.7, 4.8, 6.1, 6.4]
3. Identifying, notifying and activating	
3a	Notification points shall be established that are responsible for receiving emergency notifications. These shall be continuously available [Questions 4.5, 4.9]
3b	The operator shall make arrangements for the prompt identification of an actual or potential emergency and the determination of the appropriate level of response. This shall include a system for classifying all potential emergencies that warrant an emergency intervention [Questions 2.2, 2.14, 5.3, 5.4]
3c	The criteria for classification shall be predefined emergency action levels that relate to abnormal conditions for the facility. The classification system shall be established with the aim of initiating a response prompt enough to allow for the implementation of urgent protective action [Questions 2.2, 2.14, 5.3, 5.4]
3d	Each facility shall have a person on the site at all times with the authority and responsibilities to classify an emergency and promptly and without consultation to notify the appropriate off-site notification point and to provide sufficient information for an effective off-site response [Questions 2.14, 2.15, 4.3, 4.4, 5.2, 5.3, 5.4, 5.6, 5.9]

[1] Only requirements relating to nuclear power plants have been included, and focus is on preparedness arrangements, as response requirements cannot be tested in a desktop appraisal such as this.

3e	Operators shall ensure that adequate arrangements are made for identifying a situation that warrants an emergency response and generating adequate information promptly and communicating it to the responsible authorities [Questions 2.2, 2.14, 2.15, 5.2, 5.3, 5.6, 5.7, 5.9]
3f	The responsibilities and initial response actions of all response organizations shall be defined for each class of emergency [Questions 4.3, 4.4, 4.5, 5.4, 6.1]
3g	Arrangements shall be made for response organizations to have sufficient personnel available to perform their assigned initial response actions [Question 6.3]
3h	The State shall make known to the IAEA and to other States its single warning point of contact responsible for receiving emergency notifications and information. This warning point shall be continuously available [Question 4.9]
3i	The State shall make arrangements for promptly notifying and providing relevant information to those States that may be affected by a transnational emergency [Questions 4.7, 5.7, 5.9, 6.4]
4. Taking urgent protective action	
4a	Optimized national intervention levels for taking urgent protective actions shall be established that are in accordance with international standards, modified to take account of local and national conditions, such as: (a) the individual and collective doses to be averted by the intervention; and (b) the radiological and non-radiological health risks and the financial and social costs and benefits associated with the intervention [Questions 2.11, 2.12]
4b	National guidelines in accordance with international standards shall be adopted for the termination of urgent protective actions [Questions 2.4, 2.13]
4c	Arrangements shall be made for effectively making and implementing decisions on urgent protective actions to be taken off the site, for the full range of possible emergencies. These arrangements shall include: (a) The specification of off-site emergency zones, which shall be contiguous across national borders, and which shall include: (i) a precautionary action zone, for which arrangements shall be made with the goal of taking precautionary urgent protective action before a release of radioactive material occurs or shortly after a release begins, on the basis of conditions at the facility in order to reduce substantially the risk of severe deterministic health effects (ii) an urgent protective action planning zone, for which arrangements shall be made for urgent protective action to be taken promptly, in order to avert doses off the site in accordance with international standards (b) Criteria, based on the emergency classification and on conditions at the facility and off the site, for the formulation of recommendations for urgent protective actions off the site, which are to be provided to off-site officials responsible for taking protective action, and arrangements for any necessary revision of these recommendations (c) A single position on the site at all times with the authority and responsibility promptly to recommend the protective actions to be taken to the appropriate officials off the site (d) Arrangements for the prompt notification of the off-site notification point with the authority and responsibility to take urgent protective action, including all the jurisdictions within the emergency zones [Questions 2.5, 2.6, 2.8, 2.14, 4.3, 4.4, 5.2, 5.4]
4d	The jurisdictions within the PAZ and UPZ shall make arrangements to take appropriate urgent action promptly upon the notification of an emergency. These arrangements shall include arrangements for: taking appropriate actions for the protection of emergency workers; alerting permanent, transient and special population groups or those responsible for them; taking urgent protective actions; protecting supplies of food and water; imposing restrictions on the immediate consumption of produce from farms or gardens and of locally produced milk; monitoring and decontaminating evacuees; caring for evacuees; alerting special facilities; and the control of access to and restriction of traffic by air, water, road and rail. Arrangements shall be coordinated with all jurisdictions within any emergency zone. [Questions 3.2, 4.3, 4.4, 4.5, 4.7, 4.8, 4.9, 6.1, sections 8 & 12]
4e	The operator shall ensure the availability of means of communication necessary to off-site agencies with responsibility for taking protective actions within the PAZ and UPZ at all times [Question 5.2]
5. Providing information and issuing instructions and warnings to the public	
5a	Arrangements shall be made, before and during operations, to provide information on the response to an emergency to permanent, transient and special population groups or those responsible for them and to special facilities within the PAZ and UPZ. This shall include information on the nature of the hazard, on how people will be warned or notified and on the actions to be taken in the event of an emergency. The information shall be provided in the languages mainly spoken in the zones and the effectiveness of this public information programme shall be periodically assessed [Questions 12.1, 12.2, 12.3, 12.4]
5b	Arrangements shall be made to provide promptly a warning and instruction to permanent, transient and special population groups or those responsible for them and to special facilities in the PAZ and UPZ upon declaration of an emergency class. Thus shall include instructions in the languages mainly spoken in these zones on the immediate actions to be taken [Questions 12.5, 12.6]
6. Protecting emergency workers	
6a	Arrangements shall be made to designate as emergency workers those who may undertake an intervention: to save lives or prevent serious injury; to take actions to avert a large collective dose; or to take actions to prevent the development of catastrophic conditions [Questions 3.1, 3.2]
6b	Those called upon to respond at a facility or within the PAZ or UPZ shall be designated as emergency workers. Such assisting personnel as police, fire fighters, medical personnel and drivers and crews of evacuation vehicles shall be designated as emergency workers [Questions 3.1, 3.2]

6c	National guidance that is in accordance with international standards shall be adopted for managing, controlling and recording the doses received by emergency workers. This guidance shall include default operational levels of dose for emergency workers for different types of response activities, which are set in quantities that can be directly monitored during the performance of these activities. In setting the default operational levels of dose, the contribution to doses via all exposure pathways shall be taken into account [Question 3.3]
6d	The anticipated hazardous conditions in which emergency workers may be required to perform response functions shall be identified [Question 3.1]
6e	Arrangements shall be made for taking all practicable measures to provide protection for emergency workers for the range of anticipated hazardous conditions in which they may have to perform response functions. This shall include: arrangements to assess continually and to record the doses received by emergency workers; procedures to ensure that doses received and contamination are controlled in accordance with established guidance and international standards; and arrangements for the provision of appropriate specialized protective equipment, procedures and training for emergency response in the anticipated hazardous conditions [Question 3.3]
6f	Once the emergency phase of an intervention has ended, workers undertaking recovery operations shall be subject to the full system of detailed requirements for occupational exposure [Question 3.1, 3.2]
6g	When the intervention has ended, the doses received and the consequent health risk shall be communicated to the workers involved [Questions 3.3, 3.4]
6h	The person within each response organization responsible for ensuring compliance with the requirements for the protection of workers undertaking an intervention shall be specified in emergency plans and procedures [Question 3.1]
7. Assessing the initial phase	
7a	The operators shall make arrangements to assess promptly: abnormal conditions at the facility; exposures and releases of radioactive material; radiological conditions on and off the site; and any actual or potential exposures of the public. These assessments shall be used for emergency classification and recommendations for urgent protective actions to be taken off the site. These arrangements shall include access to instruments displaying or measuring those parameters that can readily be measured or observed in the event of an emergency and which form the basis for the EALs used to classify emergencies. For these arrangements the expected response of the instrumentation or systems at the facility under abnormal conditions shall be taken into account [Questions 2.14, 2.15, 5.6, 5.7, 5.8, 5.9]
7b	For the PAZ and UPZ, arrangements shall be made for promptly assessing any radioactive contamination, releases of radioactive material and doses for the purpose of deciding on or adapting the urgent protective actions to be taken. This capability shall include arrangements for promptly conducting environmental monitoring and monitoring for contamination on people (e.g. evacuees) within the emergency zones, including the availability of designated trained teams and instrumentation. In addition, arrangements shall be made for promptly assessing the results of environmental monitoring and monitoring for contamination on people in order to decide on or to adapt urgent protective actions to protect workers and the public, including the application of operational intervention levels [Questions 4.4, 4.8, 5.5, 5.9, 6.3, section 11]
7c	Arrangements shall be made to ensure that relevant information is recorded during an emergency and retained for use during the emergency, in evaluations conducted following the emergency and for the long term health monitoring and follow-up of the emergency workers and members of the public who may potentially be affected [Supplementary questionnaire]
8. Managing the medical response	
8a	Arrangements shall be made for medical personnel, both general practitioners and emergency staff, to be made aware of the medical symptoms of radiation exposure and of the appropriate notification procedures and other immediate actions warranted if an emergency is suspected [Supplementary questionnaire]
8b	Facilities shall make arrangements to treat a limited number of contaminated or overexposed workers, including arrangements for first aid, the estimation of doses, medical transport and the initial medical treatment of contaminated or highly exposed individuals in local medical facilities [Question 3.4, Supplementary questionnaire]
8c	Jurisdictions within the emergency zones shall have a medical management plan for performing triage and assigning any highly exposed members of the public to appropriate medical facilities. This plan shall include operational criteria. [Question 11.5.1, Supplementary questionnaire]
8d	Arrangements shall be made at the national level to treat people who have been exposed or contaminated. These shall include: guidelines for treatment; the designation of medical practitioners trained in the early diagnosis and treatment of radiation injuries; and the selection of approved institutions to be used for the extended medical treatment or follow-up of persons subjected to radiation exposure or contamination. This shall also include arrangements for consultation on treatment following any exposure that could result in severe tissue damage or other severe deterministic health effects with medical practitioners experienced in dealing with such injuries [Questions 3.4, 11.5.2, Supplementary questionnaire]
8e	Arrangements shall be made for the identification, long term health monitoring and treatment of people in those groups that are at risk of sustaining detectable increases in the incidence of cancers as a result of radiation exposure due to an emergency. The monitoring shall be based on criteria that provide an opportunity to detect increases in the incidence of cancers and to treat cancers more effectively at an early stage [Question 11.5.3, Supplementary questionnaire]
9. Keeping the public informed	
9a	Arrangements shall be made for: providing useful, timely, truthful, consistent and appropriate information to the public in the event of an emergency; responding to incorrect information and rumours; and responding to requests for information from the public and from the news and information media [Question 12.6]
9b	The operator, the response organizations, other States and the IAEA shall make arrangements for coordinating the provision of information to the public and to the news and information media in the event of an emergency [Questions 12.5, 12.6]

10. Taking agricultural countermeasures, countermeasures against ingestion and longer term protective actions
10a Optimized national intervention levels and action levels for agricultural countermeasures, countermeasures against ingestion and longer term protective actions shall be established that are in accordance with international standards, modified to take account of local and national conditions, such as: (a) the individual and collective doses to be averted by the intervention; and (b) the radiological and non-radiological health risks and the financial and social costs and benefits associated with the intervention [Questions 2.11, 2.12, 8.4, 8.5, 8.6, 9.1]
10b Arrangements shall be made for taking effective agricultural countermeasures, including restriction of the consumption, distribution and sale of locally produced foods and agricultural produce following a release of radioactive material. These arrangements shall include: default OILs for environmental measurements (such as dose rates due to deposition and deposition densities) and food concentrations; the means to revise the OILs; timely monitoring for ground contamination in the field; the sampling and analysis of food and water; and the means to enforce agricultural countermeasures [Questions 2.11, 2.12, 8.4, 8.5, 8.6, 9.1]
10c In the UPZ and beyond, where relocation may be necessary as a result of a major release of radioactive material, arrangements shall be made for effective temporary relocation. These arrangements shall include: OILs for dose rates due to deposition and deposition densities; the means to revise the OILs; timely monitoring for ground contamination; the means for accomplishing relocation; and arrangements for assisting those persons who have been relocated [Questions 2.11, 2.12, 8.5]
10d For the emergency zones, arrangements shall be made for monitoring the contamination levels of vehicles, personnel and goods moving into and out of the contaminated areas in order to control the spread of contamination. This shall include the setting of operational criteria for the results of the monitoring that indicate the need for decontamination or controls in accordance with international standards [Question 8.6, Supplementary questionnaire]
10e Arrangements shall be made for the safe and effective management of radioactive waste in accordance with international standards. These arrangements shall include: criteria for categorizing waste; a plan for monitoring and sampling to characterize the contamination and the waste; measurable criteria in terms of dose reduction for use in assessing the effectiveness of decontamination efforts; a method of testing decontamination methods before their general use; a method of duly minimizing the amount of material declared as waste and avoiding the unnecessary mixing of different waste types; a method of determining appropriate methods of storage, predisposal management and disposal; and a plan for the long term management of waste [Questions 8.4, 8.6]
10f Arrangements shall be made to assess exposure incurred by members of the public as a consequence of an emergency, and the results shall be made publicly available. The assessments shall be based on the best available information, and shall be promptly updated in the light of any information that would produce substantially more accurate results. Comprehensive records shall be maintained of assessments and their updates, and of monitoring results for workers, the public and the environment [Question 11.6]
11. Mitigating the non-radiological consequences of the emergency and the response
11a Jurisdictions within the emergency zones shall make arrangements for justifying, optimizing and authorizing different intervention levels or action levels following an event for which agricultural countermeasures or longer term protective actions are in place. The process shall include arrangements for consulting the people affected. Public concern, effects on economic conditions and employment, long term needs for social welfare and other non-radiological effects of longer term protective actions shall be considered in this process. This process shall provide for exception from accordance with international standards where these are justified [Question 8.7, Supplementary questionnaire]
11b Arrangements shall be made for responding to public concern in an actual or potential emergency. Preparations shall include arrangements for promptly explaining any health risks and what are appropriate and inappropriate personal actions for reducing risks. These arrangements shall include monitoring for and responding to any related health effects and preventing inappropriate actions on the part of workers and the public. This shall include the designation of the organization(s) with the responsibility for identifying the reasons for such actions (such as misinformation from the media or rumours) and for making recommendations on countering them. How these recommendations are to be included in the national emergency response shall be specified [Question 12.6, Supplementary questionnaire]
12. Conducting recovery operations
12a Arrangements shall be established for the transition from emergency phase operations to routine long term recovery operations. This process shall include: the definition of the roles and functions of organizations; methods of transferring information; methods of assessing radiological and non-radiological consequences; and methods of modifying the actions taken to mitigate the radiological and non-radiological consequences [Questions 2.4, 2.13, 6.1, 6.2, 8.7]
12b Decisions to cancel restrictions and other arrangements imposed in response to an emergency shall be made by a formal process that is in accordance with international guidance. The regulatory body shall provide any necessary input to the intervention process. Such input may be advice to the government or regulatory control of intervention activities. Principles and criteria for intervention actions shall be established and the regulatory body shall provide any necessary advice in this regard. This process shall include public consultation. The process shall provide for exceptions from compliance with national regulations and international standards, where justified [Questions 2.4, 2.13, 6.1, 6.2, 8.7]

Requirements for infrastructure
13.Authority
13a The authority for developing, maintaining and regulating arrangements for preparedness and response shall be established by means of acts, legal codes or statutes [Questions 1.1, 1.2, 1.3, 2.1, 3.1]
13b All the operating and local and national organizations involved shall document their own role, functions, authorities and responsibilities and assent to the authorities, roles and responsibilities of other response organizations [Question 6.1]
13c Arrangements shall include the clear allocation of responsibilities, authorities and arrangements for coordination in all phases of the response [Questions 6.1, 6.2]
13d The arrangements for the delegation and/or transfer of authority shall be clearly specified in the relevant emergency plans [Question 6.1]
14.Organization
14a The organizational relationships and interfaces between all the major response organizations shall be established [Questions 4.1, 4.5, 6.1]
14b The positions responsible within each operating and response organization for the performance of the response functions shall be assigned in the emergency plans
14c Personnel shall be assigned to appropriate positions in all operating and response organizations in order to perform the functions necessary to meet the functional requirements [Question 6.3]
14d Sufficient numbers of qualified personnel shall be available at all times in order that appropriate positions can be promptly staffed as necessary following the declaration and notification of an emergency [Question 6.3]
15.Coordination of emergency response
15a Arrangements for the coordination of emergency response and protocols for operational interfaces between operators and local, regional and national governments shall be developed, as applicable. These arrangements shall include the organizations responsible for emergency services and for response to conventional emergencies. The arrangements shall be clearly documented and this documentation shall be made available to all relevant parties [Questions 4.1, 4.5, 4.6, 6.1]
15b When several different organizations or other States are expected to have or to develop tools, procedures or criteria for use in responding to the same emergency, coordination arrangements shall be put in place to harmonize the results of assessments of contamination, doses and health effects and of any other appropriate assessments made in order not to give rise to inconsistency and confusion [Questions 4.5, 4.8, 6.1]
15c Arrangements shall be made to ensure that all States within defined emergency zones are provided with appropriate information for developing their own preparedness to respond to an emergency and arrangements shall be made for appropriate transboundary coordination. These arrangements shall include: arrangements and protocols to provide information necessary to develop a coordinated means for notification, classification schemes, intervention criteria and criteria for the introduction and revoking of protective actions; arrangements for public information; and arrangements for the exchange of information between decision making authorities. The language and physical units to be used shall be determined in advance [Questions 4.7, 4.8]
16.Plans and procedures
16a Plans or other arrangements shall be made for coordinating the national response to the range of potential nuclear and radiological emergencies. These arrangements shall specify the organization responsible for the development and maintenance of the arrangements; shall describe the responsibilities of the operators and other response organizations; and shall describe the coordination effected between these arrangements and the arrangements for response to a conventional emergency [Questions 4.1, 4.5, 4.6, 6.1, 6.2]
16b Each response organization shall prepare a general plan or plans for coordinating and performing their assigned functions. Emergency plans shall be prepared which specify how the responsibilities for the management of interventions will be discharged on the site, off the site and across national borders, as appropriate, in separate but interconnecting plans [Questions 4.1, 4.5, 4.8]
16c The plans for response to a nuclear emergency shall be coordinated with any other plans (such as for physical security, law enforcement or fire fighting) that may be implemented in an emergency in order to ensure that the simultaneous implementation of the plans would not seriously reduce their effectiveness or cause conflicts [Question 4.6]
16d The appropriate responsible authorities shall ensure that: emergency plans are prepared and approved; response organizations are involved in the preparation of emergency plans, as appropriate; the content, features and extent of emergency plans take into account the results of any threat assessment and any lessons learned from operating experience and from emergencies that have occurred; and emergency plans are periodically reviewed and updated [Questions 4.1, 4.2, 4.5, 5.1]
16e Emergency plans shall include, as appropriate: (a) allocation of responsibilities for performing the required functions (b) identification of the various operating and other conditions which could lead to the need for intervention (c) intervention levels, based on a consideration of guidelines for the relevant protective actions and the scope of their application, with account taken of the possible degrees of severity of accidents or emergencies that could occur (d) procedures, including communication arrangements, for contacting any relevant response organizations and for obtaining assistance from fire fighting, medical, police and other relevant organizations (e) a description of the methodology and instrumentation for assessing the emergency and its consequences on and off the site

	(f) a description of the public information arrangements in the event of an emergency (g) the criteria for terminating each protective action [Questions 2.2, 2.11, 2.12, 2.13, 2.14, 2.15, 4.3, 4.4, 4.5, 4.8, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 12.5, 12.6]
16f	The operating organization shall prepare an emergency plan that shall be coordinated with those of all other bodies having responsibilities in an emergency, including public authorities, and shall be submitted to the regulatory body [Question 2.3, 5.1, 5.2, 6.1, 6.2]
16g	The emergency plan of the operating organization shall include the following (inter alia): (1) a description of the on-site organization, including the designation of persons for ensuring liaison with off-site organizations (2) the conditions under which an emergency shall be declared, and a description of suitable arrangements for alerting response personnel and public authorities (3) the arrangements for initial and subsequent assessment of the radiological conditions off the site (4) arrangements for minimizing the exposure of persons off the site and for ensuring medical treatment of casualties, including arrangements to take protective actions if warranted to reduce the risk of severe deterministic health effects (8) the actions to be taken by persons and organizations involved in the implementation of the plan (9) arrangements for declaring the termination of an emergency [Questions 2.2, 2.4, 5.2, 5.3, 5.4, 5.9]
16h	The operating and response organizations shall develop the necessary procedures, analytical tools and computer programs in order to be able to perform the required functions [Questions 5.9, 6.3, 11.3]
16i	Procedures, analytical tools and computer programs to be used in performing functions to meet the requirements for emergency response shall be tested under simulated emergency conditions and shall be validated as correct prior to use [Questions 7.1, 7.2]
16j	Offsite emergency plans and any transboundary plan shall be implemented by the response organizations
17.Logistical support and facilities	
17a	Adequate tools, instruments, supplies, equipment, communications systems, facilities and documentation shall be provided for performing the required functions. These items and facilities shall be selected or designed to be operational under the postulated conditions that may be encountered in the emergency response, and to be compatible with other procedures and equipment for the response, as appropriate. These support items shall be located or provided in a manner that allows their effective use under postulated emergency conditions [Questions 6.3, 7.1, 7.2, section 8, section 11]
17b	Emergency facilities shall be designated where the following will be performed in the different phases of the response: the coordination of local off-site response actions; the coordination of national response actions; coordination of public information; and coordination of off-site monitoring and assessment. These emergency facilities shall be suitably located and/or protected so as to enable the exposure of emergency workers to be managed in accordance with international standards [Questions 4.5, 4.8, 5.2, 12.6]
17c	Laboratories shall be designated to make the necessary arrangements to be able to perform appropriate and reliable analyses of environmental and biological samples and measurements of internal contamination for the purposes of an emergency response. It shall be ensured that these facilities would be operational under postulated emergency conditions [Questions 11.2, 11.6]
17d	A national emergency facility or facilities shall be designated for the coordination of response actions and public information [Questions 4.5, 12.6]
17e	Arrangements shall be made to obtain appropriate support for logistics and communication, for social welfare and in other areas from the organizations responsible for providing such support in conventional emergencies [Questions 4.5, 4.6, section 11, 12.5, 12.6]
18.Training drills and exercises [Questions 7.1, 7.2]	
18a	The operator and the response organizations shall identify the knowledge, skills and abilities necessary to be able to perform the required functions. The operator and the response organizations shall make arrangements for the selection of personnel and for training to ensure that the personnel have the requisite knowledge, skills, abilities, equipment and procedures and other arrangements to perform their assigned response functions. The arrangements shall include ongoing refresher training on an appropriate schedule and arrangements for ensuring that personnel assigned to positions with responsibilities for emergency response undergo the specified training
18b	Exercise programmes shall be conducted to ensure that all specified functions and all organizational interfaces are tested at suitable intervals. These programmes shall include the participation in some exercises of as many as possible of the organizations concerned. These exercises shall be systematically evaluated and some exercises shall be evaluated by the regulatory body. The programme shall be subject to review and updating in the light of experience gained
18c	The staff responsible for critical response functions shall participate in a training exercise or drill at least once every year
18d	The officials off the site responsible for making decisions on protective actions for the population within the PAZ and/or UPZ shall be trained in the strategy for protective action and shall regularly participate in exercises
18e	The performance of exercises shall be evaluated against established response objectives that demonstrate that identification, notification, activation and other initial response actions can be performed in time to achieve the practical goals of emergency response

19. Quality assurance programme [Questions 6.3, 7.1, 7.2, section 11, Supplementary questionnaire]

19a	The operator and the off-site response organizations shall establish a quality assurance programme, in accordance with international standards, to ensure a high degree of availability and reliability of all the supplies, equipment, communication systems and facilities necessary to perform the required functions. This programme shall include arrangements for inventories, resupply, tests and calibrations, made to ensure that these items and facilities are continuously available and functional for use in an emergency. Arrangements shall be made to maintain, review and update emergency plans and procedures and other arrangements and to incorporate lessons learned from research, operating experience and emergency drill and exercises
19b	The operating organization and response organizations shall prepare and put in place a comprehensive quality assurance programme covering all activities which may affect the emergency response programme.
19c	The operator and the off-site response organizations shall make arrangements to review and evaluate responses in emergencies and in drills and exercises, to record the areas in which improvements are necessary and to ensure that the necessary improvements are made

Table 16-2: EU legislative provisions relating to emergency preparedness and response

EU Requirements (Basic Safety Standards Directive, Public Information Directive, Regulations on food intervention levels)
BSS Directive (96/29/Euratom)
Article 50. Intervention preparation
1. Each Member State shall ensure that account is taken of the fact that radiological emergencies may occur in connection with practices on or outside its territory and affect it [Questions 1.1, 1.2, 1.3, 2.1, 3.1]
2. Each Member State shall ensure that appropriate intervention plans, taking account of the general principles of radiation protection for intervention and of the appropriate intervention levels established by the competent authorities, are drawn up at national or local level, in order to deal with various types of radiological emergency and that such plans are tested to an appropriate extent at regular intervals [Questions in sections 2, 4, 5, 6 & 7]
3. Each Member State shall ensure, where appropriate, that provision is made for the creation and appropriate training of special teams for technical, medical and health intervention [Questions 1.3, 2.1, 3.1, 6.1, 6.3, 7.1, 7.1]
4. Each Member State shall seek to cooperate with other Member States or non-Member States in relation to possible radiological emergencies at installations on its own territory which may affect other Member States or non-Member States, in order to facilitate the organization of radiological protection in these States [Questions 4.7, 4.8, 5.7, 5.8, 6.4, 7.1, 7.2, 10.3]
Article 51. Implementation of intervention
1. Each Member State shall make provision for the immediate notification to its competent authorities by the undertaking responsible for the practices involved of any radiological emergency occurring in its territory and shall require all appropriate action to reduce the consequences [Questions 2.3, 2.14, 2.15, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7]
2. Each Member State shall ensure that, in the event of an emergency on its own territory, the undertaking responsible for the practices involved makes an initial provisional assessment of the circumstances and consequences of the emergency and assists with intervention [Questions 5.3, 5.4, 5.5, 5.9]
3. Each Member State shall ensure that provision is made, if the situation so requires, for intervention related to: - the environment, to reduce the transfer of radioactive substances to individuals - individuals, to reduce exposure and organize the treatment of victims [Questions in sections 2, 3, 8, 9 & 11]
4. In the event of an emergency on or outside its territory, each Member State shall require: (a) the organization of appropriate intervention, taking account of the real characteristics of the emergency (b) the assessment and recording of the consequences of the emergency and of the effectiveness of the intervention [Questions in sections 2, 3, 4, 5, 8 & 11]
5. Each Member State shall, in the event of an emergency occurring at an installation on its territory or being likely to have radiological consequences on its territory, establish relations to obtain cooperation with any other Member State or non-Member State which may be involved [Questions 4.7, 4.8, 5.7, 5.8, 6.4, 10.3, section 13]
Article 52. Emergency occupational exposure
1. Each Member State shall make provision for situations where workers or intervention personnel involved in different kinds of intervention are liable to be subjected to emergency exposure resulting in doses in excess of the dose limits for exposed workers. To this end, each Member State shall establish exposure levels taking into account the technical obligations and health risks. These levels shall be operational guides [Questions 3.1, 3.2]
2. Each Member State shall require radiological monitoring and medical surveillance of the special emergency intervention teams [Questions 3.3, 3.4]
Article 53. Intervention in cases of lasting exposure
Where the Member States have identified a situation leading to lasting exposure resulting from the after-effects of an emergency, they shall, if necessary and to the extent of the exposure risk involved, ensure that: (a) the area concerned is demarcated; (b) arrangements for the monitoring of exposure are made; (c) any appropriate intervention is implemented, taking account of the real characteristics of the situation (d) access to or use of land or buildings situated in the demarcated areas is regulated [Questions 8.5, 8.6, 8.7, 9.1]
Public Information Directive (89/618/Euratom)
Article 5. Prior information
1. Member States shall ensure that the population likely to be affected in the event of an emergency is given information about the health-protection measures applicable to it and about the action it should take in the event of such an emergency [Questions 1.2, 1.3, 12.1]

2. The information supplied shall at least include:
    1. Basic facts about radioactivity and its effects on human beings and on the environment;
    2. The various types of emergency covered and their consequences for the general public and the environment;
    3. Emergency measures envisaged to alert, protect and assist the general public in the event of an emergency;
    4. Appropriate information on action to be taken by the general public in the event of an emergency

[Questions 1.2, 1.3, 12.1]

3. This information shall be communicated to the population likely to be affected without any request being made [Question 12.4]

4. Member States shall update the information and circulate it at regular intervals and whenever significant changes in the arrangements that it describes take place. This information shall be permanently available to the public [Questions 1.2, 1.3, 12.1, 12.4]

Article 6. Information in the event of an emergency

1. Member States shall ensure that, when an emergency occurs, the population actually affected is informed without delay of the facts of the emergency, of the steps to be taken and, as appropriate to the case in point, of the health-protection measures applicable to it [Question 12.5]

2. The information provided shall cover the points that follow which are relevant to the type of emergency:
    1. On the basis of the intervention plans previously drawn up in the Member States, the population actually affected in the event of an emergency will rapidly and regularly receive:
        (a) information on the type of emergency which has occurred and, where possible, its characteristics;
        (b) advice on protection which, depending on the type of emergency might: cover restrictions on the consumption of certain foodstuffs likely to be contaminated, simple rules on hygiene and decontamination, recommendations to stay indoors, distribution and use of protective substances, evacuation arrangements; be accompanied, where necessary, by special warnings for certain population groups
        (c) announcements recommending cooperation with instructions or requests by the competent authorities
    2. If the emergency is preceded by a pre-alarm phase, the population likely to be affected should already receive information and advice during that phase
    3. This information and advice will be supplemented if time permits by a reminder of the basic facts about radioactivity and its effects on human beings and the environment

[Question 1.2, 1.3, 12.1, 12.5, 12.6]

Article 7. Information of persons who might be involved in the organization of emergency assistance

1. Member States shall ensure that any persons who are not on the staff of the facilities but who might be involved in the organization of emergency assistance are given adequate and regularly updated information on the health [risks] their intervention might involve and on the precautionary measures to be taken [Questions 1.2, 1.3, 3.1, 3.2]

2. As soon as an emergency occurs, this information shall be supplemented appropriately, having regard to the specific circumstances [Questions 1.2, 1.3, 3.1]

Article 8. Information procedures

The information referred to in Articles 5, 6 and 7 shall also mention the authorities responsible for implementing the measures referred to in those Articles [Questions 1.2, 1.3, 2.1, 3.1, section 12]

Regulation laying down maximum permitted levels of radioactive contamination of foodstuffs (Council Regulations 3954/87 and 2218/89 and Commission Regulation 944/89)

Foodstuffs or feedingstuffs not in compliance with the maximum permitted levels shall not be placed on the market (see Annex to Regulation 2218/89) [Questions 2.11, 2.12, 2.13, 8.4.1, 8.4.2, 9.1]

17 APPENDIX D: International or European requirements, guidance or recommendations used in mapping

17.1 IAEA criteria/guidance used in mapping comparisons

Emergency planning zones (IAEA EPR-NPP Public Protective Actions [IAEA, 2013])

Table 17-1: Suggested radii of emergency planning zones for reactors >1000 MW(th)

Precautionary action zone (PAZ)	3-5 km
Urgent protective action planning zone (UPZ)	15-30 km
Ingestion and commodities planning distance (ICPD)	300 km

Guidelines for intervention levels (IAEA Requirements GS-R-2 [IAEA, 2002])

Table 17-2: Generic optimized intervention levels for initiating intervention

Type of intervention	Dosimetric quantity	Duration of exposure	Generic optimized intervention level
Sheltering	Avertable effective dose	No more than 2 days	10 mSv
Temporary evacuation	Avertable effective dose	No more than 1 week	50 mSv
Iodine prophylaxis	Avertable committed absorbed dose to the thyroid due to radioiodine		100 mGy
Temporary relocation	Total effective dose from all routes of exposure than can be averted	1 month	30 mSv

Table 17-3: Generic optimized intervention level for terminating intervention

Type of intervention	Dosimetric quantity	Duration of exposure	Generic optimized intervention level
Temporary relocation	Total effective dose from all routes of exposure than can be averted	1 month	10 mSv

Table 17-4: Generic action levels for foodstuffs

Radionuclide	Generic action level[2] (kBq/kg)
Foods destined for general consumption	
Cs-134, Cs-137, I-131, Ru-103, Ru-106, Sr-89	1
Sr-90	0.1
Am-241, Pu-238, Pu-239. Pu-240, Pu-242	0.01
Milk, infant foods and drinking water	
Cs-134, Cs-137, Ru-103, Ru-106, Sr-89	1
I-131, Sr-90	0.1
Am-241, Pu-238, Pu-239, Pu-240, Pu-242	0.001

Generic criteria for protective actions and other response actions (IAEA General Safety Guide GSG-2 [IAEA, 2011])

Table 17-5: Generic criteria

Generic criterion	Examples of protective actions and other response actions
Projected effective dose greater than 100 mSv in the first 7 days	Sheltering; evacuation; decontamination; restriction of consumption of food, milk and water; contamination control; public reassurance
Projected thyroid dose greater than 50 mSv in the first 7 days	Iodine thyroid blocking
Projected effective dose greater than 100 mSv per annum	Temporary relocation; decontamination; replacement of food, milk and water; public reassurance

Operational intervention levels (IAEA General Safety Guide GSG-2 [IAEA, 2011])

Table 17-6: Default operational intervention levels (OILs) for field survey measurements

OIL	OIL value	Response action if OIL is exceeded
OIL1	1000 μSv/h gamma dose rate at 1 m from surface 2000 counts/s direct beta surface contamination 50 counts/s direct alpha surface contamination	Immediately evacuate or provide substantial shelter Provide for decontamination of evacuees Reduce inadvertent ingestion Stop consumption of local produce, rainwater and milk from animals grazing in the area Register and provide for a medical examination of evacuees
OIL2	100 μSv/h gamma dose rate at 1 m from surface 200 counts/s direct beta surface contamination 10 counts/s direct alpha	Stop consumption of local produce, rainwater and milk from animals grazing in the area until they have been screened and assessed using OIL5 and OIL6 Temporarily relocate those living in the area; before relocation, reduce inadvertent ingestion; register and

[2] Levels to be applied independently to the sum of the activities of the radionuclides in each group

OIL	OIL value	Response action if OIL is exceeded
	surface contamination	estimate the dose to those who were in the area to determine if medical screening is warranted; relocation of people from the areas with the highest potential exposure should begin within days
OIL3	1 μSv/h gamma dose rate at 1 m from surface 20 counts/s direct beta surface contamination 2 counts/s direct alpha surface contamination	Stop consumption of non-essential local produce, rainwater and milk from animals grazing in the area until it has been screened and contamination levels have been assessed using OIL5 and OIL6 Screen local produce, rainwater and milk from animals grazing in the area out to at least 10 times the distance to which OIL3 is exceeded and assess samples using OIL5 and OIL6 Consider providing iodine thyroid blocking for fresh fission products and for iodine contamination if replacement for essential local produce or milk is not immediately available Estimate the dose of those who may have consumed food, milk or rainwater from the area where restrictions were implemented to determine if medical screening is warranted

Table 17-7: Default screening OILs for food, milk and water concentrations from laboratory analysis

OIL	OIL value	Response action if OIL is exceeded
OIL5	100 Bq/kg gross beta, or 5 Bq/kg gross alpha	Above OIL5: assess using OIL6 Below OIL5: safe for consumption during the emergency phase

Operational intervention levels (IAEA EPR-NPP PPA [IAEA, 2013])

Table 17-8: Default operational intervention levels (OILs) for ground deposition dose rates

OIL	OIL value	Response action if OIL is exceeded
OIL1	1000 μSv/h dose rate at 1 m above ground level	**Immediately**: instruct the public to take iodine thyroid blocking agent; safely evacuate; reduce inadvertent ingestion; stop consumption and distribution of all local produce, wild-grown products, milk from animals grazing in the area, rainwater and animal feed; stop distribution of commodities until they have been assessed; provide registration, monitoring, decontamination and medical screening for those in the area. **Within days**: estimate the dose to those who were in the area to determine if a medical examination or counselling and follow-up is warranted.
OIL2	100 μSv/h dose rate at 1 m above ground level	**Immediately**: instruct the public to prepare to relocate while taking actions to reduce inadvertent ingestion; stop distribution and consumption of local produce, wild-grown products, milk from animals grazing in the area and rainwater. **Within a week**: register those in the area; safely relocate those living in the area; estimate the dose to those who were in the area to determine if a medical examination or counselling and follow-up are warranted.

OIL	OIL value	Response action if OIL is exceeded
OIL3	1 μSv/h dose rate at 1 m above ground level	**Immediately**: stop distribution and consumption of non-essential local produce, wild-grown products, milk from animals grazing in the area, rainwater and animal feed until concentration levels have been assessed using OIL7; stop distribution of commodities until they have been assessed. **Within days**: replace essential local produce, milk and rainwater as soon as possible or relocate the people if replacements are not available; register and estimate the dose of those who may have consumed local produce, milk, rainwater from the area where restrictions were implemented to determine if medical counselling and follow-up is warranted.

Table 17-9: Default OIL for concentrations if I-131 and Cs-137 in food, milk and drinking water

OIL	OIL value	Response action if OIL is exceeded
OIL7	1000 Bq/kg of I-131, or 200 Bq/kg of Cs-137	Stop consumption of non-essential food, milk or water; replace essential food, milk and drinking water as soon as possible or relocate the public if replacements are not available; estimate the dose of those who may have consumed food, milk or drinking water with concentrations above the OIL to determine if a medical follow-up is warranted.

Table 17-10: Default OIL for dose rate from the thyroid

OIL	OIL value	Response action for those being monitored
OIL8	Dose rate (above background) in contact with the skin in front of the thyroid 1 to 6 days after exposure: 0.5 μSv/h for age <=7 years 2 μSv/h for age > 7 years	**Immediately**: instruct them to take iodine thyroid blocking agent if not already taken; instruct them to reduce inadvertent ingestion; register all those monitored and record the thyroid dose rate; if OIL8 is exceeded provide them with medical screening. **Within days**: estimate the dose to those whose thyroid dose rate was greater than OIL8 to determine if a medical examination or counselling and follow-up is warranted.

Guidance values for restricting exposure of emergency workers (IAEA General Safety Guide GSG-2 [IAEA, 2011])

Table 17-11: Guidance values for restricting exposure of emergency workers

Tasks	Guidance value for dose equivalent from exposure to external penetrating radiation[3]
Life saving actions	500 mSv Value may be exceeded under circumstances in which the expected benefits to others clearly outweigh the emergency worker's own health risks, and the emergency worker volunteers to take the action and understands and accepts this health risk
Actions to prevent severe deterministic effects and actions to prevent the development of catastrophic conditions that could significantly affect people and the environment	500 mSv
Actions to avert a large collective dose	100 mSv

17.2 WHO criteria/guidance used in mapping comparisons

Iodine prophylaxis

Table 17-12: Recommended single dosage of stable iodine according to age group

Age group	Mass of iodine (mg)	Mass of KI (mg)	Mass of KIO_3 (mg)	Fraction of 100 mg tablet
Adults and adolescents (> 12 y)	100	130	170	1
Children (3-12 y)	50	65	85	1/2
Infants (1 month to 3 y)	25	32	42	1/4
Neonates (birth to 1 month)	12.5	16	21	1/8

[3] Doses from exposure to non-penetrating external radiation and from intake or skin contamination need to be prevented by all possible means

Table 17-13: Recommended repeat dosages

Age group	Repeat dosage
Adults (over 18 y)	0
Adolescents (12-18 y)	1/d
Children (3-12 y)	1/d
Infants (1 month to 3 y)	1/d
Neonates (birth to 1 month)	0
Lactating mothers	0

Table 17-14: Reference levels of dose for different population groups for consideration in planning iodine prophylaxis

Age group	Exposure pathways to be considered	Reference levels[4]
Neonates, infants, children, adolescents to 18 y and pregnant and lactating women	Inhalation (and ingestion[5])	10 mGy avertable dose to the thyroid
Adults under 40 y	Inhalation	100 mGy avertable dose to the thyroid
Adults over 40 y	Inhalation	5 Gy projected dose to the thyroid

[4] Idealised levels that do not take account of the practicalities involved in planning emergency response.

[5] Ingestion of milk by infants where alternative supplies cannot be made available.

17.3 EU criteria used in mapping comparisons

European Council Food Intervention Levels (Council Regulation 2218/89/Euratom [EU, 1987a], [EU, 1989b])

Table 17-15: Maximum permitted levels for foodstuffs (Bq/kg)

	Baby foods	Dairy produce	Other foodstuffs except minor foodstuffs[6]	Liquid foodstuffs
Isotopes of strontium, notably Sr-90	75	125	750	125
Isotopes of iodine, notably I-131	150	500	2000	500
Alpha emitting isotopes of plutonium and trans-plutonium elements, notably Pu-239, Am-241	1	20	80	20
All other nuclides of half-life > 10 d, notably Cs-134, Cs-137[7]	400	1000	1250	1000

[6] Maximum permitted levels for minor foodstuffs (defined in Commission Regulation 944/89/Euratom) are 10 times higher

[7] Carbon 14, tritium and potassium 40 are not included in this group.

18 APPENDIX E: Stakeholder Group

18.1 Functions, Composition and Working Arrangements

The establishment of, and consultation with the Stakeholder Group (SG) are defined by the project implementation plan. The functions, composition and working arrangements for the SG are set out below.

Functions

The main functions of the Stakeholder Group (SG) are:

- To provide 'official' information to the project on emergency preparedness and response (EP&R) arrangements and capabilities in the EU and neighbouring countries;
- To act as an informal reviewer of work carried out within the project and, in particular of any gaps identified and of recommendations that may be made on:
    - How current arrangements and capabilities could be improved and/or made more coherent; and
    - How better use could be made of existing resources and duplication avoided.

The former will expedite the conduct of the analysis and enhance its quality through timely access to reliable information. The latter will enhance the legitimacy of the process (i.e., consequent upon the diversity of inputs and interest groups represented) and also 'stretch' the project at key stages in its execution.

Composition

The main considerations and/or underlying principles to be taken into account in establishing the Group will be:

- To ensure that it is sufficiently representative of those with an interest in and/or a responsibility for various aspects of off-site EP&R;
- To ensure that most, if not all, EU and participating neighbouring countries are represented;
- To ensure that an appropriate balance is achieved between those fulfilling policy, operational and more specific technical and administrative roles.

To achieve these ends, the SG will comprise:

- A representative from each EU and neighbouring country, designated as the national 'contact point';

- One or more representatives from each of the following interest groups:
    - Nuclear regulatory authorities;
    - Civil protection/defence organisations;
    - Other national organisations/ministries responsible for EP&R;
    - Nuclear industry;
    - Local authorities;
    - Emergency services (eg, police, fire, ambulance, etc);
    - Technical specialists;
    - Citizen groups;
    - NGO;
    - Politicians.

The national 'contact points', to be nominated by each country, will be key members of the SG. They will be responsible, inter alia, for: providing the project with 'official' information; providing a formal link between the project and national organisations with responsibility for one or other aspect of EP&R (e.g., facilitating meetings with project staff, clarification of information provided, etc); and obtaining feedback from, and consolidating views of, relevant organisations within each country on the findings of, and recommendations made by, the project. In general, they will be senior officials with responsibility for EP&R within a regulatory authority, civil defence organisation or other organisation/ministry.

The other members of the SG group (up to a maximum of about 20) will be selected by the project subject to:

- An overriding requirement that there must be at least one member (including those nominated as national 'contact points') in the overall SG group from each of the interest groups listed above; and
- Each of them must fulfil one or more of the following criteria:
    - Have a good understanding of the technical foundations, the technical skills required and the overall priorities and needs of EP&R;
    - Have profound knowledge in the legal arrangements in a country and at an international level, the national chain of command, the responsibilities of all the organisations involved in a country and the technical and managerial resources available;
    - Have experience in the management of EP&R at a national level as well as in Europe, including the interaction between the various organisations involved (participation in drills and exercises as well as in real events);
    - Be committed to the goals of the project;
    - Have a vision or interest in future improvements in arrangements and capabilities for EP&R in Europe;

- Be willing and able to allocate time and resources during the duration of the project;
- Have the skills and ability to work in a team;
- Be able to critically review and optimise concepts for EP&R;
- Be capable of assessing the practicability (from policy, operational and technical viewpoints) of any recommendations made;
- Have been active in seeking improvements in EP&R in a political or lobbying context.

In selecting the 'other' members preference will be given (all other things being equal) to those who will be able to represent wider interest groupings, e.g. ENSREG (nuclear regulators), HERCA (Heads of European Radiation protection Competent Authorities), WNA or FORATOM (nuclear industry), Association of Nuclear Power Plant Communities, regional entities such as NKS (Nordic nuclear safety research) and French/German/Swiss cooperation on nuclear EP&R, NGOs, political groupings, etc. Such members will offer wider outreach through and feedback from their groupings or networks; this, in turn, will bring added legitimacy to the process and expose the project to a broader diversity of view and input.

Working arrangements

Correspondence will be the main mode of interaction between the project and members of the SG.

SG members, designated by their countries as national 'contact points', will be the main and continuing point of contact between the project and national organisations throughout the duration of the project; in particular, they will ensure the timely provision of 'official' information, facilitate meetings between project staff and national organisations, and provide consolidated national feedback on project outcomes and recommendations.

An opportunity for more focused scrutiny, feedback and reflection by the SG on the outcomes and recommendations of the project will be achieved through two Workshops to which all members will be invited. These Workshops are scheduled to take place on 4th - 5th of July and 1st – 2nd of October 2013.

The Core Group (CG)

The purpose of the 'core group' will be to provide the project with a more focused and effective 'sounding board' for key project outcomes and recommendations prior to them being taken up with the SG as a whole; with 50 or more members, it would clearly be ineffective, if not impractical, to do this with the whole SG.

A 'Core group', comprising a much smaller group of members (about 15) from within the overall SG, will be established at an early stage of the project. Members will be selected using the following criteria:

- Ideally, at one representative from each of the interest groups listed above;
- Preference for members able to represent wider interest groupings, all other things being equal;
- No constraint on the number of representative from any single country but achieving abroad geographical balance among the members will be a secondary consideration.

International organisations, with one or another role or responsibility for nuclear EP&R (e.g., IAEA, WHO, FAO, WMO, NEA), will be informed of the scope and content of the project and made aware of any significant outcomes and recommendations. They will be invited to attend, in an observational capacity, the second project Workshop. Account will be taken in the project of relevant standards, guidance, recommendations, etc., made by international organisations and of any studies they have carried out in the area of off-site EP&R.

Correspondence will also be the main mode of interaction between the project and the 'core group' of the SG. Meetings with the 'core group' will be held if necessary, in particular where it is felt that these would enhance the efficacy of the project's implementation and/or provide more timely and focused feedback on project outcomes and recommendations. So far the only meetings planned for the CG are those immediately preceding the SG Workshops.

18.2 Membership of the Stakeholder and Core Groups

The membership of the Stakeholder and Core Groups is given in Table 18-1 and Table 18-2, respectively.

Table 18-1: Membership of the Stakeholder Group

National Contact Points	
Name	**Country**
Dr Peter HOFER	Austria
Mr Christian VAN DE CASTEELE	Belgium
Ms Marina NIZAMSKA	Bulgaria
Mr Sasa MEDAKOVIC/Mr Boris ILIJAS	Croatia
Mr Panicos DEMETRIADES	Cyprus
Ms Vera STAROSTOVA	Czech Republic
Mr Morten Helge HANSEN/Mr Carsten ISRAELSON	Denmark
Mr Uko RAND	Estonia
Ms Hannele AALTONEN	Finland
Mr Jean-Francois DODEMAN	France
Mr Johannes KUHLEN	Germany
Dr Antonios MALTEZOS	Greece
Mr Geza MACSUGA	Hungary

National Contact Points	
Name	**Country**
Mr Paolo ZEPPA	Italy
Ms Ciara MCMAHON	Ireland
Mr Marcis SLAVINSKIS/Mr Andrejs DREIMANIS	Latvia
Mr Emilis BASKYS	Lithuania
Mr Frank REIMEN	Luxembourg
Mr Paul BREJZA	Malta
Mr Wim MOLHOEK	Netherlands
Mr Krzysztof DABROWSKI	Poland
Mr Prof Carlos VARANDAS	Portugal
Mr Valentin COMAN	Romania
Mr Eduard METKE	Slovakia
Mr Igor GRLICAREV	Slovenia
Mr José Manuel MARTÍN CALVARRO	Spain
Mr Johan FRIBERG	Sweden
Mr Charles TEMPLE/Ms Sarah SWASH	United Kingdom
Mr Vanik NERSESYAN	Armenia
Ms Eldri HOLO	Norway
Mr Harry HOHL/Mr Dominique RAUBER	Switzerland

Representatives of Interest Groups	
Name	**Interest Group**
Mr Gerardo CASADO	AMAC
Mr Frank REIMEN	Civil Protection, Luxembourg
Ms Ciara McMAHON	ENSREG
Mr Olivier ISNARD	ETSON
Mr Philippe MERCEL	FORATOM/ENISS
Ms Patricia LORENZ	Friends of the Earth
Mr Yves D'EER	GMF
Mr Mariano VILA d'ABADAL	GMF
Mr Roger SPAUTZ	GREENPEACE
Mr Sigurdur MAGNUSSON	HERCA
Ms Elena BUGLOVA	IAEA
Mr Florian GERING	NERIS
Ms Dana DRABOVA	Regulatory Body
Mr Dave FARR	WANO
Ms Delphine XICLUNA	WENRA

Table 18-2: Membership of the Core Group

(all CG members are automatically members of the SG)

Name	Interest Group Represented
Ms Hannele AALTONEN	NCP
Mr Jean-Francois DODEMAN	NCP
Mr Dominique RAUBER	NCP
Mr Johannes KUHLEN	NCP
Mr Jose Manuel MARTIN CALVARRO	NCP
Ms Sarah SWASH	NCP
Mr Frank REIMEN *(replaced by Patrick MAJERUS for the July meeting*)	Civil Protection
Mr Olivier ISNARD	ETSON
Ms Ciara McMAHON	ENSREG
Mr Philippe MERCEL	FORATOM/ENISS
Mr Yves D'EER	GMF
Mr Sigurdur MAGNUSSON (*replaced by Ms Olvido GUZMAN for the July meeting*)	HERCA
Ms Elena BUGLOVA	IAEA
Mr Florian GERING	NERIS
Ms Dana DRABOVA	Regulatory Body
Mr Dave FARR	WANO
Ms Delphine XICLUNA	WENRA

18.3 Meetings of the Stakeholder Group and the Core Group

The Stakeholder Group (SG) met on two occasions, with each meeting being preceded by a meeting of the Core Group (CG) which comprised a sub-set of SG members. The Core Group also met separately on a further occasions to review the draft findings (ie, conclusions and recommendations) of the study. Members of the EC Task Force also participated in meetings of the SG, largely in an observational capacity but providing factual input where appropriate. The timing, location and main purposes of the meetings of the SG and CG are summarised in Table 18-3.

Table 18-3: Meetings of the Stakeholder and Core Groups

Meeting	Date	Location	Main purpose
CG and SG	4-5 Jul 2013	Luxembourg	Review of mapping and benchmarking of arrangements and capabilities Review outcomes of national and regional workshops and case studies on cross border arrangements
CG	11-12 Sep 2013	Stockholm	Review of draft conclusions and recommendations of the project
CG and SG	1-2 Oct 2013	Luxembourg	Review of draft final report, in particular updated mapping and benchmarking and conclusions and recommendations

18.3.1 Meeting of the CG and SG on 4-5 July

The agenda for this meeting is given in Table 18-4. The meeting focused on presentations and review of the results of benchmarking arrangements and capabilities for EP&R against EU legislative provisions and international (non-binding) requirements and their mapping, both between countries and against international guidance. Gaps and errors in information provided in response to Questionnaires by National Contact Points were identified and were rectified following the Workshop after which the benchmarking and mapping were updated.

The main outcomes of workshops/case studies on cross border arrangements were discussed with a view, in particular, to identifying good/best practice. Valuable input was obtained from NCP in other regions (in particular the Nordic region) where it had not been possible to arrange a workshop/case study due to logistical constraints; in addition, arrangements were made to hold a workshop/case study on arrangements in the 'Greater Region' which embraces the Benelux countries and regions of France and Germany.

18.3.2 Meeting of the CG on 11-12 September

The CG met in Stockholm to review the first draft conclusions and recommendations. Based on their input the conclusions and recommendations were updated and the recommendations prioritised along with an indication of to whom they were directed and/or who may be best placed to respond effectively to them. These updated conclusions and recommendations were included in the draft final report that was subsequently reviewed by the CG and SG at the final workshop.

18.3.3 Meeting of the CG and SG on 1-2 October

The agenda for this meeting is given in Table 18-5. The meeting focused on a critical review of the draft final report and, in particular, the benchmarking, mapping and the conclusions and recommendations. A few gaps remained in the information provided by NCP and a number of areas were identified where clarification was needed of responses to the Questionnaire. These gaps were largely filled and/or clarification provided following the workshop; the data base underlying the benchmarking and mapping, and the benchmarking and mapping themselves, were updated accordingly. Various recommendations were made for revision of the recommendations, including structural change (ie, regrouping), alteration of the prioritisation in some cases and who might be best placed to respond. There were divergent views among members of the SG on some recommendations; in these cases, the diversity of views would be indicated in the final report where they were substantive, albeit noting that the recommendations were those of the project team and not necessarily those of the SG.

Table 18-4: Agenda for meeting of the SG on 4-5 July, 2013 in Luxembourg

4th July, 2013			
Time		Title	Presenter(s)
START	END		
13:00	13:10	Introduction to the Workshop	ENCO/EC
13:10	13:20	The EC's expectations from the study	EC
13:20	13:35	Objectives, scope, content and schedule of the project	ENCO/UJV
13:35	13:45	Role of the stakeholder group	ENCO/UJV
13:45	14:00	Opening remarks from interest groups	HERCA, ENSREG, WANO, GMF, NGO, etc.
14:00	14:15	Off-site EP&R in Europe after Fukushima	Hannele Aaltonen
14:15	14:30	The European Commission's Emergency Response Centre (ERC)	EC DG ECHO
		The approach	
14:30	14:45	Approach/method for benchmarking and mapping	ENCO/UJV
14:45	15:00	*Coffee break*	
		Presentation and discussion of main project findings	
15:00	15:30	Benchmarking against current international requirements	ENCO/UJV
15:30	18.00	Mapping of current arrangements: - Emergency services personnel - Emergency planning zones - Intervention levels and OIL - Role of information on plant status - Practical aspects of protective measures - Training and exercising - Extendibility (in space and time) - Mutual assistance	ENCO/UJV plus discussion *(Typically, for each topic, the results of the mapping will be presented within 5-10 mins followed by 10-15 mins discussion)*
18:00		*Adjourn*	

5th July, 2013			
Time		Title	Presenter(s)
START	END		
		Presentation and mapping of main project findings (cont'd)	
09:00	11:00	Mapping of current capabilities - National early warning/monitoring systems - Radiation surveys - Environmental sampling - Decision support - Decontamination - Medical support/treatment - Dose assessment - Public information and communication	ENCO/UJV plus discussion *(Typically, for each topic, the results of the mapping will be presented within 5-10 mins followed by 10-15 mins discussion)*
11:00	11:15	*Coffee break*	
		Cross border arrangements	
11:15	11:30	Reference scenarios	ENCO/UJV
11:30	12:00	Case study: Czech Republic – Austria	CZ/AU
12:00	12:30	Case study: Germany – France – Switzerland	BMU
12:30	13:00	HERCA initiative on cross border arrangements	HERCA
13:00	14:00	*Lunch break*	
		Moderated discussion on improvements in EP&R	
14:00	14:30	Cross border arrangements	ALL
14:30	15:15	Other arrangements and capabilities	ALL
15:15	15:50	'Tour de table' – concluding remarks/observations of SG members	ALL
15:50	16:00	Concluding remarks and next steps	EC/ENCO/UJV
16:00		*End of Workshop*	

Table 18-5: Agenda for meeting of the SG on 1-2 October, 2013 in Luxembourg

1st October, 2013			
Time		**Title**	**Presenter(s)**
START	**END**		
13:00	**13:10**	**Introduction to the Workshop**	**EC, ENCO**

13:10	**13:25**	**Developments since the 1st Workshop**
		- **Workshops on cross border arrangements**
		  o **Germany – Switzerland**
		  o **Greater Region workshop**
		- **Discussion of draft conclusions and recommendations with NCP**
		- **Core Group meeting**
		- **Issue of draft final report**
			ENCO/UJV

13:25	**14:10**	**Overall views on the final draft report** - **ENSREG** - **HERCA** - **WENRA** - **ETSON** - **NERIS** - **FORATOM** - **IAEA** - **Greenpeace** - **GMF** - **ECTF**	**5 mins maximum from representatives of networks/interest groups**
14:10	**15:10**	**Overall views on the final report by NCP**	**2 mins maximum from each NCP**
15:10	**15:30**	**Coffee break**	
15:30	**15:45**	**Outcome of the revised benchmarking**	**ENCO/UJV**
15:45	**16:15**	**Main results of the revised mapping**	**ENCO/UJV**
16:15	**16:45**	**Main findings of cross-border workshops/case studies**	**ENCO/UJV**
16:45	**18:00**	**Discussion of some issues arising from benchmarking and mapping** - **Compliant on paper but in practice?** - **What is it reasonable to plan in detail for?** - **How confident are we about extendibility?**	**All**
18:00		***Adjourn***	

2nd October, 2013			
Time		Title	Presenter(s)
START	END		
		Detailed review of draft final report	
09:00	11:00	**Substantive comments on final draft report:** - **Revised benchmarking (Sec 6)** - **Revised mapping (Sec 7 and App G)** - **Potential improvements (Sec 8)** - **Cross border arrangements (Sec 9 and App H)** - **EC arrangements (Sec 10 and App J)** - **Activities of others (Sec 11 and App K)**	**All**
11:00	11:15	***Coffee break***	
11:15	13:00	**Substantive comments on final draft report (cont'd):** - **Conclusions and recommendations (Sec 12)**	**All**
13:00	14:00	***Lunch break***	
14:00	14:30	**Substantive comments on final draft report (cont'd):** - **Conclusions and recommendations (Sec 12)**	**All**
15:15	15:45	**'Tour de table' – concluding remarks/observations of SG members**	**All**
15:45	16:00	**Concluding remarks and next steps**	**EC, ENCO**
16:00		***End of Workshop***	

19 APPENDIX F: Questionnaire on potential improvements in off-site EP&R

Analysis of Current Arrangements in the EU and Neighbouring Countries for Off-site Emergency Preparedness and Response

Short Questionnaire

on

Potential Improvements in Off-site EP&R in Europe

STATE:	

IDENTIFICATION OF THE PERSON(S) COMPLETING THE QUESTIONNAIRE:

Organization:	
Responsibility:	
Name	
Position:	
E-mail address:	
Telephone No.:	

Organization:	
Responsibility:	
Name	
Position:	
E-mail address:	
Telephone No.:	

Organization:	
Responsibility:	
Name	
Position:	
E-mail address:	
Telephone No.:	

Short Questionnaire on
Potential Improvements in Off-site EP&R in Europe

Following the accident at the Fukushima NPP:

Have you reviewed or are you in the process of reviewing your arrangements and capabilities for off-site EP&R in your country?

YES	NO
☐	☐

If YES, has this review been completed and conclusions/recommendations formulated?

YES	NO
☐	☐

If YES:

Can you provide us with the conclusions and/or recommendations of the review:	

If the review is ongoing, when is it scheduled for completion?

Please provide estimated date of completion:	

If NO,

Have you concluded that your EP&R arrangements and capabilities remain 'fit for purpose'?

YES	NO
☐	☐

If NO:

Please provide other reasons for not undertaking a review at this time:	

Taking account of experience and lessons learned post-Fukushima and of the outcome of any ongoing or complete review of the EP&R arrangements and capabilities in your country,

Have you identified any gaps in your arrangements/capabilities or any areas where improvements would significantly enhance the efficacy of EP&R within your country (eg, organisational structures, scenarios used for planning, designation of EPZ, criteria for countermeasures, etc)?

Please list any significant gaps or areas for improvement identified:	

Have you identified any areas where improvements in cross border arrangements would significantly enhance the efficacy of EP&R in neighbouring countries and/or in Europe more widely (eg, organisational arrangements, shared access to real time monitoring data and prognoses, regional (ie, supra national) centres for providing technical support to decision makers, more frequent and focused exercises, etc)?

Please list any significant areas identified:	

Have you identified any areas where EP&R could be improved either in your own country or in Europe more widely by making better use of resources and capabilities (eg, mutual assistance, shared development and use of rarely used and expensive capabilities, regional or supra-national centres providing technical support for decision making, bio-dosimetry, medical treatment of over-exposed people, aerial survey, etc)?

Please list any significant areas identified:	

20 APPENDIX G: Results of mapping of current status of arrangements and capabilities for EP&R

This Appendix comprises the mapping of responses to each of the questions in the questionnaire on the current status of arrangements and capabilities for off-site EP&R (see Section 14 - Appendix A), with the exception of those that were more appropriately addressed in the benchmarking.

20.1 Regulatory framework for protection of the public (Questions 2.1 – 2.4)

All countries, even those without NPPs, have some regulations, standards, requirements or guidance in addition to primary legislation to provide a framework for protection of the public in the event of a nuclear emergency.

All NPP countries have a system for classifying abnormal events at NPPs with links to the need to take particular off-site actions. Many of these correspond to the IAEA emergency class descriptions (general emergency, site area emergency, facility emergency, alert). However, few countries provided further details about any emergency action levels or other criteria for determining the class of emergency. Belgium and Spain provided the clearest description of their classification systems and the urgent protective actions that would be triggered for each category of accident.

Most classification systems are based around the severity of the accident. Two countries have classes of emergency which reflect the kinetics of the emergency and the response: France has a 'reflex' mode in which predefined countermeasures would be implemented in the event of an accident with rapid kinetics (defined as events where releases are predicted within the first 6 hours); Belgium has defined levels N0 to N3, which increase in severity, and a level NR, for events with rapid kinetics (defined as all events involving short term radioactive releases likely to lead to exposure that exceeds guideline intervention levels within a period of less than 4 hours). In both cases, these rapid kinetic categories are based on the need to take immediate, predetermined action before the relevant decision makers have had the opportunity to consider the appropriate response. It is arguable, however, that the concept of taking prompt, pre-planned action upon identification of an actual or potential emergency should underpin arrangements more generally and not just those for events with rapid kinetics.

All NPP countries, with the exception of Sweden, include requirements relating to off-site EP&R as conditions of licensing of NPPs. The response from Sweden did not address the question of licence conditions, but stated that the county administrative board needs to have off-site EP&R plans in place before the NPP can enter into operation. License conditions typically cover requirements relating to notification and the provision of information, the adequacy of emergency response arrangements and the conduct of emergency exercises.

On the criteria for termination of an emergency, some countries stated they had no specific criteria: the decision would be for the relevant authorities to make depending on circumstances. Other countries mentioned only general criteria, such as NPP under control, radioactive releases having stopped (or being no greater than normal levels), etc. Few non-NPP countries had criteria for termination. Very few countries addressed criteria for the transition from emergency to recovery phases. Spain did address this issue and acknowledged the need to improve its plans to deal better with the recovery phase.

20.2 Emergency Planning Zones (Questions 2.5 – 2.10 and 2.16)

A comparison of Emergency Planning Zones (EPZ) is made in Figures 20-1 to 20-4 for sheltering, evacuation, iodine prophylaxis and food restrictions; in each figure comparisons are made between countries and with IAEA guidance (EPR-NPP PPA [IAEA, 2013]). The comparisons are limited to countries with commercial operating NPP[8] and countries without NPP but whose borders fall within the EPZ of a neighbouring country. The rationale for the choice of EPZ in each country is summarised in Table 20-1. The EPZs for each urgent countermeasure are considered in turn. The adoption of different terminology (and occasionally concepts) between countries is a complicating factor but, in general, does not prejudice the broad findings that emerge from the comparisons.

20.2.1 Sheltering

EPZ for sheltering (see Figure 20-1) vary from a few km to 30 km. By far the majority fall within a range of 10 to 30 km, with only AM and the UK having smaller zones. For comparison, IAEA guidance (EPR-NPP PPA [IAEA, 2013]) on the sizes of emergency zones where arrangements need to be made for taking urgent protective actions (which include sheltering) suggests ranges (for NPP greater than 1 GW(th)) from 3 to 30 km (comprising a Precautionary Action Zone (PAZ) of 3 – 5 km and an Urgent Protective Action Planning Zone (UPZ) of 15 – 30 km).

[8] Therefore countries without commercial operating NPP, but with commercial NPP which have been shut down and de-fuelled (eg, Italy and Lithuania) have not been included in the comparisons even though they may still have defined EPZ around their NPP.

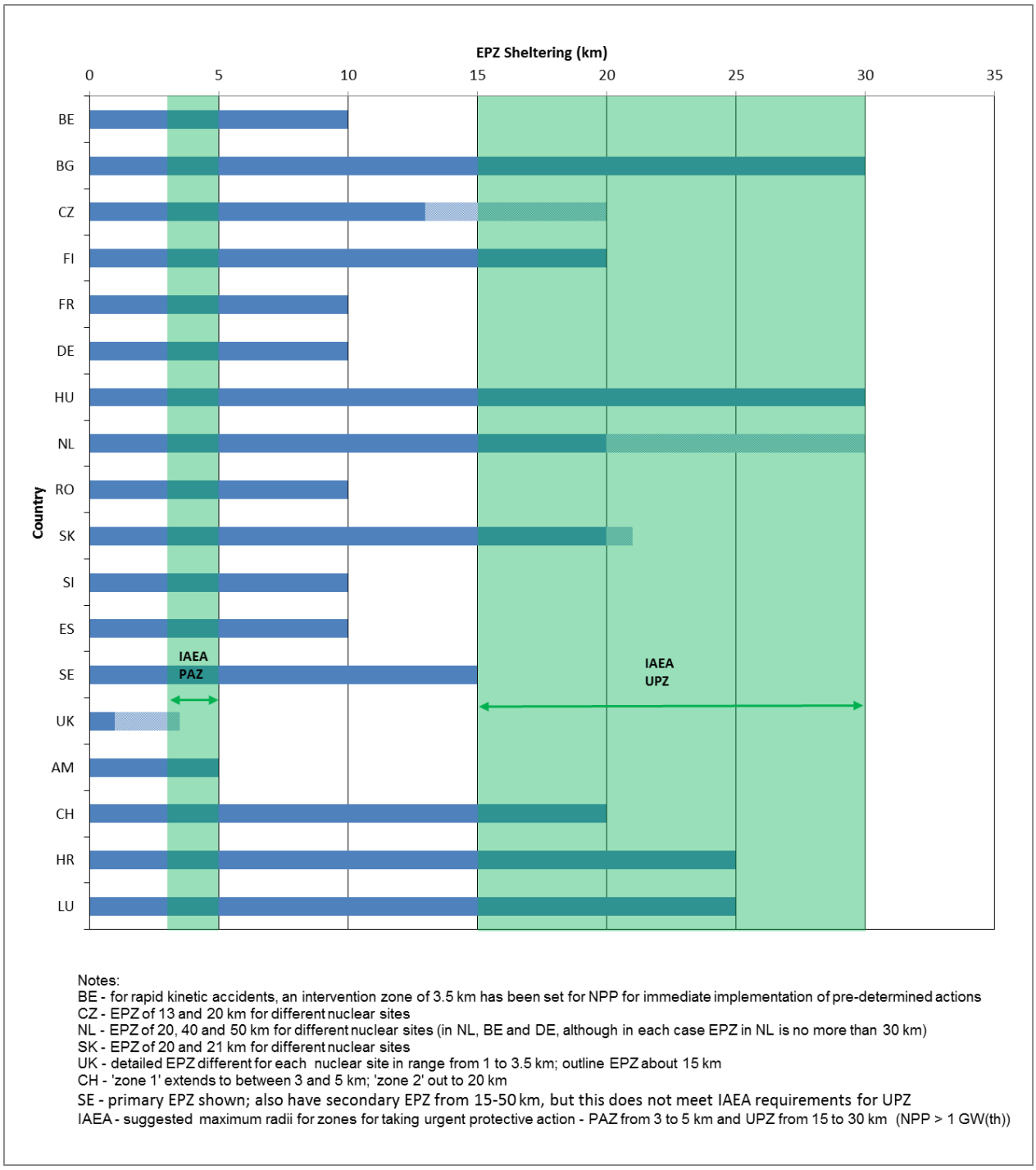


Figure 20-1: EPZ for sheltering

20.2.2 Evacuation

EPZ for evacuation (see Figure 20-2) vary from a few km (UK) to 30 km (BG and HU). In two thirds of the countries, the EPZ is 10 km or less. For comparison, IAEA guidance (EPR-NPP PPA [IAEA, 2013]) on the sizes of emergency zones where arrangements

need to be made for taking urgent protective actions (including evacuation) suggests ranges from 3 to 5 km (PAZ) and 15 to 30 km (UPZ).

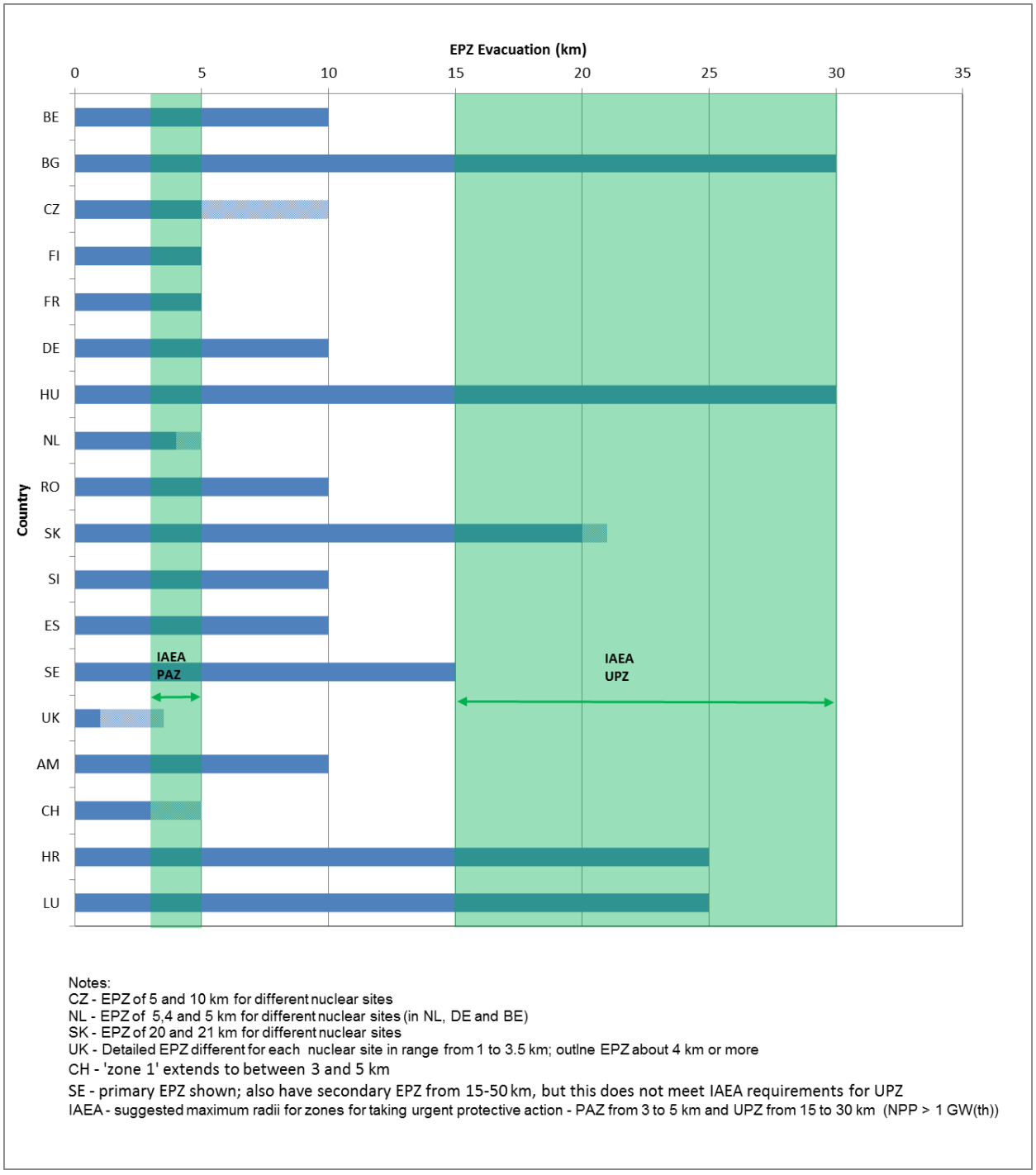


Figure 20-2: EPZ for evacuation

20.2.3 Iodine prophylaxis

EPZ for iodine prophylaxis (see Figure 20-3) vary over a wide range from a few km (UK) to 100 km (DE). By far the majority fall within a range of 10 to 30 km, with only AM and the UK having smaller zones and DE a larger zone. For comparison, IAEA guidance (EPR-NPP PPA [IAEA, 2013]) on the sizes of emergency zones where arrangements need to be made for taking urgent protective actions (including iodine prophylaxis) suggests ranges (for NPP greater than 1 GW(th)) from 3 to 5 km (PAZ) and from 15 to 30 km (UPZ). The comparisons, however, need to be qualified in one important respect. In many countries, centralised arrangements and capabilities exist to provide iodine prophylaxis far beyond the EPZ (eg, in Bulgaria to the whole country); however, these arrangements tend to be governed by outline or contingency planning, rather than detailed planning and demonstration of their efficacy through frequent exercising. Consequently, the large disparity in the EPZ for DE in Figure 20-3 compared with other countries, may not be reflected in practice in the actual distribution of iodine following an accident.

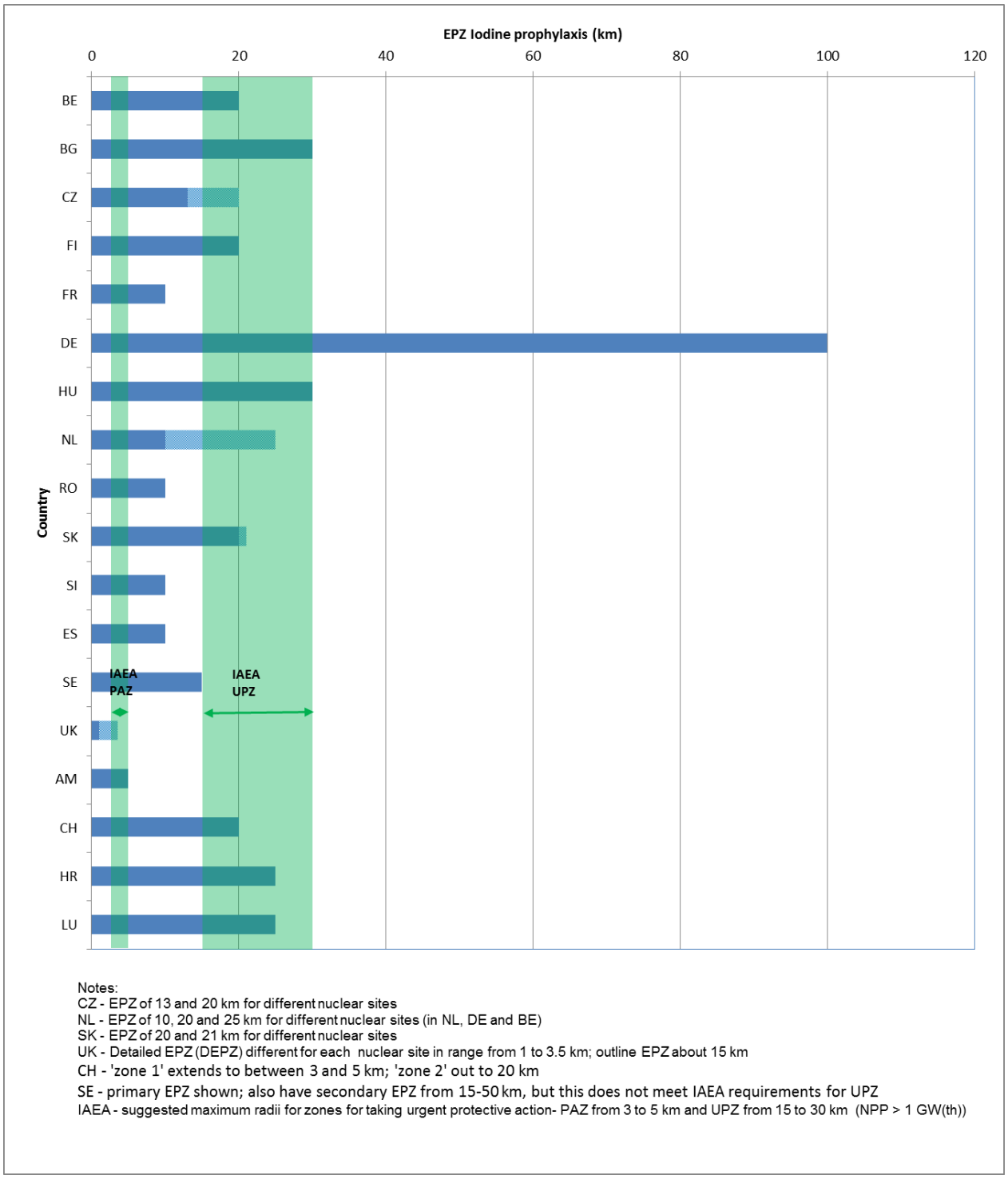


Figure 20-3: EPZ for iodine prophylaxis

20.2.4 Food restrictions

Many countries did not report an EPZ specifically for food restrictions. For those that did, there was wide variation in the extent of the EPZ. In some cases, the reported EPZ were broadly similar to those for other urgent countermeasures. In others, the extent of the EPZ was much greater (eg, HR (100 km), HU (300 km) and BE, DE and CH (the whole country)). For comparison, IAEA guidance (EPR-NPP PPA [IAEA, 2013]) on the maximum radius (for NPP greater than 1 GW(th)) for the Ingestion and Commodities Planning Distance (ICPD) is 300 km. These comparisons also need to be qualified in one important respect. Notwithstanding the differences in EPZ shown in Figure 20-4, in practice restrictions on foodstuffs would be largely the same in all EU countries (ie, in compliance with the Community Food Intervention Levels (CFIL).

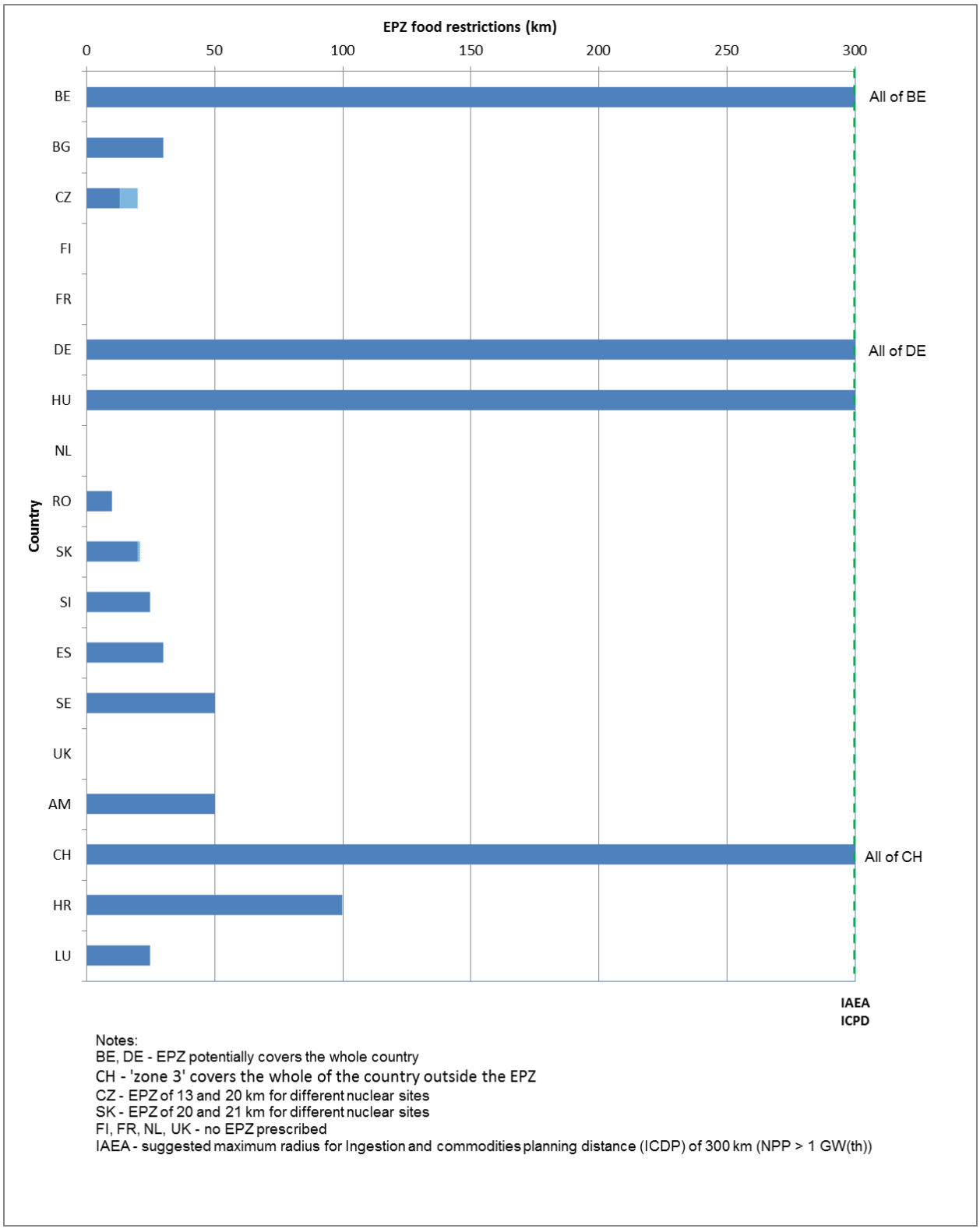


Figure 20-4: EPZ for food restrictions

20.2.5 Rationales for the selection of EPZ

The rationales for the selection of the EPZ are summarised in Table 20-1. In most cases, the distances have been determined on the basis that the estimated dose from an assumed release in assumed weather conditions would not exceed a specified intervention level or other level of dose. Significant differences are, however, apparent between countries in the assumptions made with respect to these three assumptions or quantities (ie, magnitude of assumed release, assumed weather and intervention level adopted). Not surprisingly, therefore, there are significant differences in the extent of the resulting EPZ.

Table 20-1: Rationales for the selection of EPZ

Country	Rationale for EPZ
Belgium	Radius corresponding to estimate of 10 mSv equivalent dose to the thyroid of a child for a 'quick kinetic' accident
Bulgaria	Based on a severe accident with partial core damage and a 'non-negligible' probability of occurrence that would lead to doses less than intervention levels for urgent countermeasures beyond that distance
Czech Republic	Based on two most severe types of accidents (large LOCA and large primary-to-secondary leakage both combined with station black-out), most probable weather stability category D (5m/s) and worst radiological consequences F (2m/s) sheltering 50 mSv, iodine prophylaxis 100 mSv, evacuation 500 mSv.
Finland	Rationale and extent of EPZ initially based on those adopted in other countries but subsequently confirmed by evaluation of doses from BDBA (100% release of noble gases and 10^{15} Bq of iodine-131)
France	Rationale not provided
Germany	Based on BDBA. Rationale for EPZ currently under review.
Hungary	Based on IAEA recommendations – upper bound of range recommended
Netherlands	Based on probabilistic calculations for a release comprising 1% of iodine radionuclides, plus varying amounts of other dose relevant nuclides; for each countermeasure, the EPZ has been set at a distance beyond which the doses would be less than the respective intervention level some 68% of the time (ie, one standard deviation).
Romania	Based on the following considerations: for accidents with partial core meltdown, doses beyond EPZ would be less than the generic intervention levels; for the most severe accident involving melting of the whole core, doses beyond the EPZ would not present an immediate risk to life; provides a sufficient basis for planning that can be easily extended if necessary
Slovakia	Based on a severe accident with partial core damage and a 'non-negligible' probability of occurrence that would lead to doses less than intervention levels for urgent countermeasures beyond that distance
Slovenia	Based on international guidance and approaches adopted in the vendor country (USA) that supplied the NPP but taking account of local circumstances.
Spain	Based on USNRC criteria (1998)
Sweden	Based on release categories in USNRC WASH-1400 ('Rasmussen') report published in 1975, including the most severe accident postulated without consideration of its probability of occurrence.

Country	Rationale for EPZ
United Kingdom	Balance between ensuring plans are sufficiently extensive to cope with serious emergencies and avoiding waste of resources through over-planning for most improbable emergencies. Extent of detailed EPZ (DEPZ) based on a reasonably foreseeable accident (DBA) specific to each NPP. Requirement for general contingency plans ('extendibility planning' or outline EPZ) to consider the need for countermeasures beyond the DEPZ for larger, less likely accidents, out to about 15 km for sheltering and iodine prophylaxis and about 4 km for evacuation.
Armenia	Based on DBA. Rationale for EPZ currently under review and consideration being given to BDBA.
Switzerland	Radius of inner EPZ based on results of PSA studies in the early seventies (ie, USNRC WASH 1400) – worst accident would not lead to doses from cloud-shine in excess of 1 Sv beyond inner zone. Radius of the outer zone based on general considerations of risk and speed of travel of dispersing radioactive material. Subsequent studies have confirmed the validity of radius settings, but discussions on appropriateness of approach are ongoing.
Croatia	Hazard assessment of neighbouring NPP
Luxembourg	Governmental Decision, currently under review.

Not all countries have reported the values assumed for the three key quantities but, those that have, provide a good indication of the degree of variability. The magnitudes of assumed releases vary over several orders of magnitude; some countries assume a design basis accident (DBA) for the purposes of establishing EPZ while others assume the largest severe accident identified in PSA studies (molten core and the release of a substantial fraction of the more volatile elements). The variation in assumed weather conditions is also considerable ranging from 'average' to 'adverse' and in some cases to the 'worst' (represented by the 68th or 99.5th percentile in two different countries). The assumed intervention levels also differ significantly, varying by more than an order of magnitude between countries and often relating to different dose quantities (eg, avertable or projected dose, dose integrated over different time periods, etc). Given the extent of the variability between assumptions, it is surprising that even greater differences are not apparent between EPZ in different countries.

In most countries with NPP, the probability of occurrence of an accident was not an explicit consideration in determining the extent of the EPZ (or, more exactly, in the choice of the magnitude of the accident assumed for these purposes); only five countries (CZ, NL, RO, SI, CH) reported that consideration had been given to this aspect. Surprisingly, only one country (UK) appeared to address explicitly what it was reasonable to plan for (in detail) in the establishment of EPZ, noting especially the need to achieve a proper balance between ensuring that plans are sufficiently extensive to cope with serious emergencies while avoiding the waste of resources through over-planning for the most improbable emergencies. This aspect warrants broader reflection in terms of the very low probabilities predicted for severe accidents, the effective use of limited resources and comparability with EP&R for other technological sectors and/or natural disasters.

In most countries, controls are placed on the construction of new developments (eg, homes, industrial facilities, etc) within a prescribed distance of a NPP; exceptions include DE, NL, SK and ES. The radius around each NPP where these controls are exercised varies between countries but, in general, encompasses only a small fraction of the overall EPZ; typically, it falls within a range of about 0.5 to 5 km.

20.2.6 Summary

The principles underlying the establishment of EPZ are common in most countries. Notwithstanding this, the sizes of EPZ in practice differ considerably because of large differences in the assumptions adopted with respect to the assumed magnitude of the accident, weather and intervention level. These assumptions, inter alia, reflect differences in view as to what it is reasonable to plan for.

Rationalisation of these differences, or achieving greater harmonisation in the sizes of EPZ, is not likely to be achieved easily, at least not based on technical considerations alone. Notwithstanding their apparent technical underpinning, the choices of EPZ reflect a large measure of socio-economic and political judgement. Initiatives at a political level may be more successful in bringing about change in this area, for example were a political consensus to emerge on the benefits of adopting more consistent EPZ (ie, in terms of credibility and public acceptance of emergency arrangements).

It would be over-simplistic and wrong to infer that arrangements in one country were better than those elsewhere based solely on a comparison of the relative extents of EPZ. EPZ are but one element of broader emergency arrangements and these would need to be assessed holistically to reach sound judgements on such matters.

20.3 Intervention Levels (IL) and Operational Intervention Levels (OIL) (Questions 2.11 – 2.13)

20.3.1 Dose criteria for introduction of protective measures

Most countries (both nuclear and non-nuclear) provided information on the dose criteria used for the introduction of all of the protective measures listed, apart from food restrictions (where reference was generally made to criteria based on concentrations of radionuclides in foods). The doses to be used with the criteria were defined in different ways (external dose, whole body dose, effective dose, dose equivalent or absorbed dose to specified organs, avertable dose or projected dose over different time periods), and some countries provided a range of values for their dose criteria, or specified different values for children, so comparisons were not always straightforward. Nevertheless, comparisons were possible and these are illustrated in Figure 20-5 to 20-8 and discussed further below.

The dose criteria were most often laid down in regulations or standards (21 out of 30 responding countries), and were incorporated in recommendations in eight of the remaining countries (information about this was not provided by Germany).

For **sheltering,** typical whole body or effective dose criteria vary between 5 and 10 mSv, with a few values as low as 1 mSv (for the lower end of a range) and upper values up to 50 mSv (for the upper end of a range). A few countries define specific values for children of 1 mSv. Where specified, these dose criteria are most often based on an integration period of 2 days. Figure 20-5 shows the IAEA generic optimised intervention level for sheltering (for avertable dose in a period of no more than 2 days) from IAEA GS-R-2 [IAEA, 2002] for comparison[9]. It is noteworthy that very many countries (19 out of the total of 30 responses) appear to have based their intervention levels, as least in part, on this generic optimised intervention level.

[9] The IAEA's more recent GSG-2 [IAEA, 2011] provides a set of generic criteria for protective actions in terms of the dose that has been projected and that are compatible with reference levels within a range of 20-100 mSv. These are also indicated in the figures.

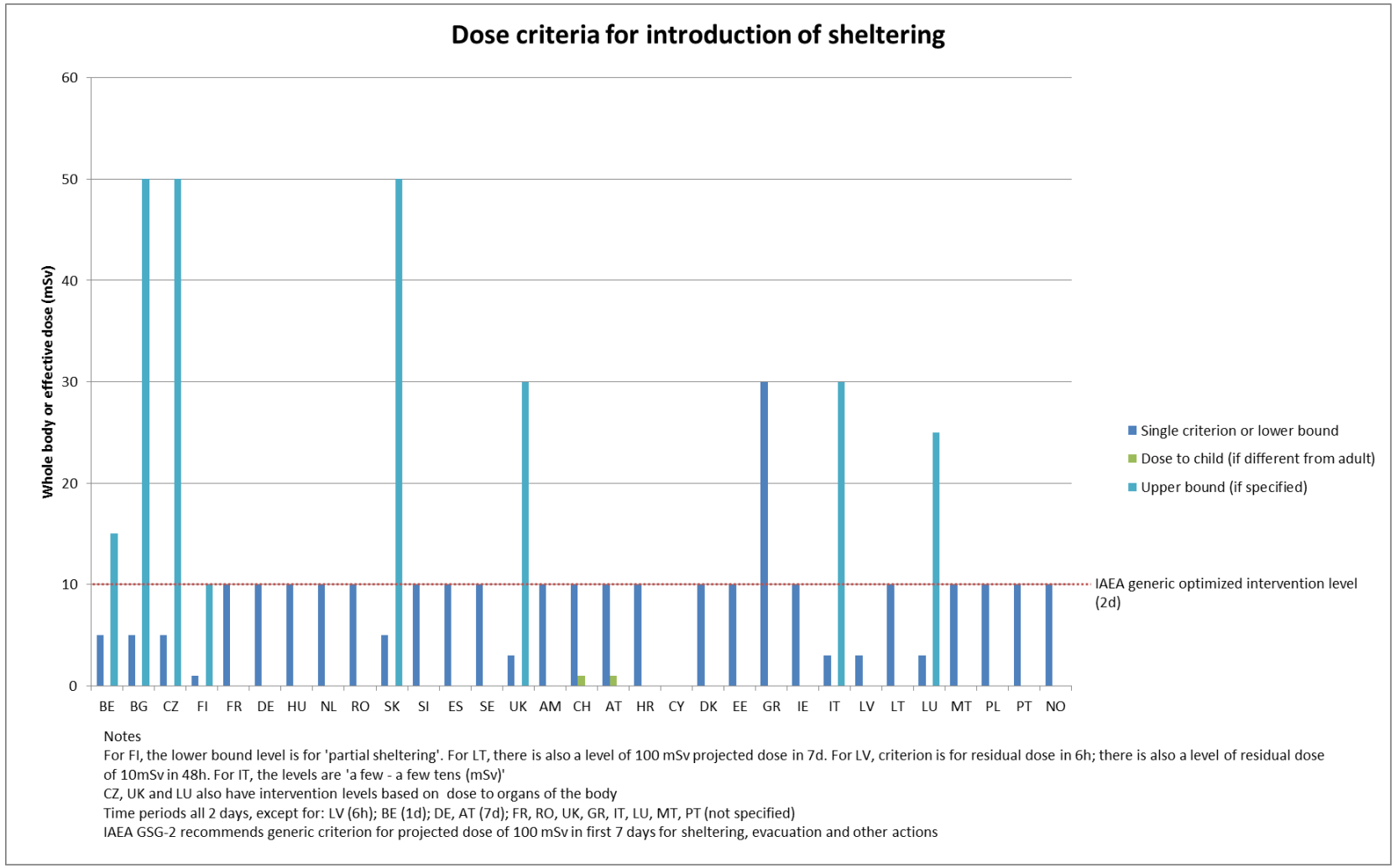


Figure 20-5: Dose criteria for the introduction of sheltering

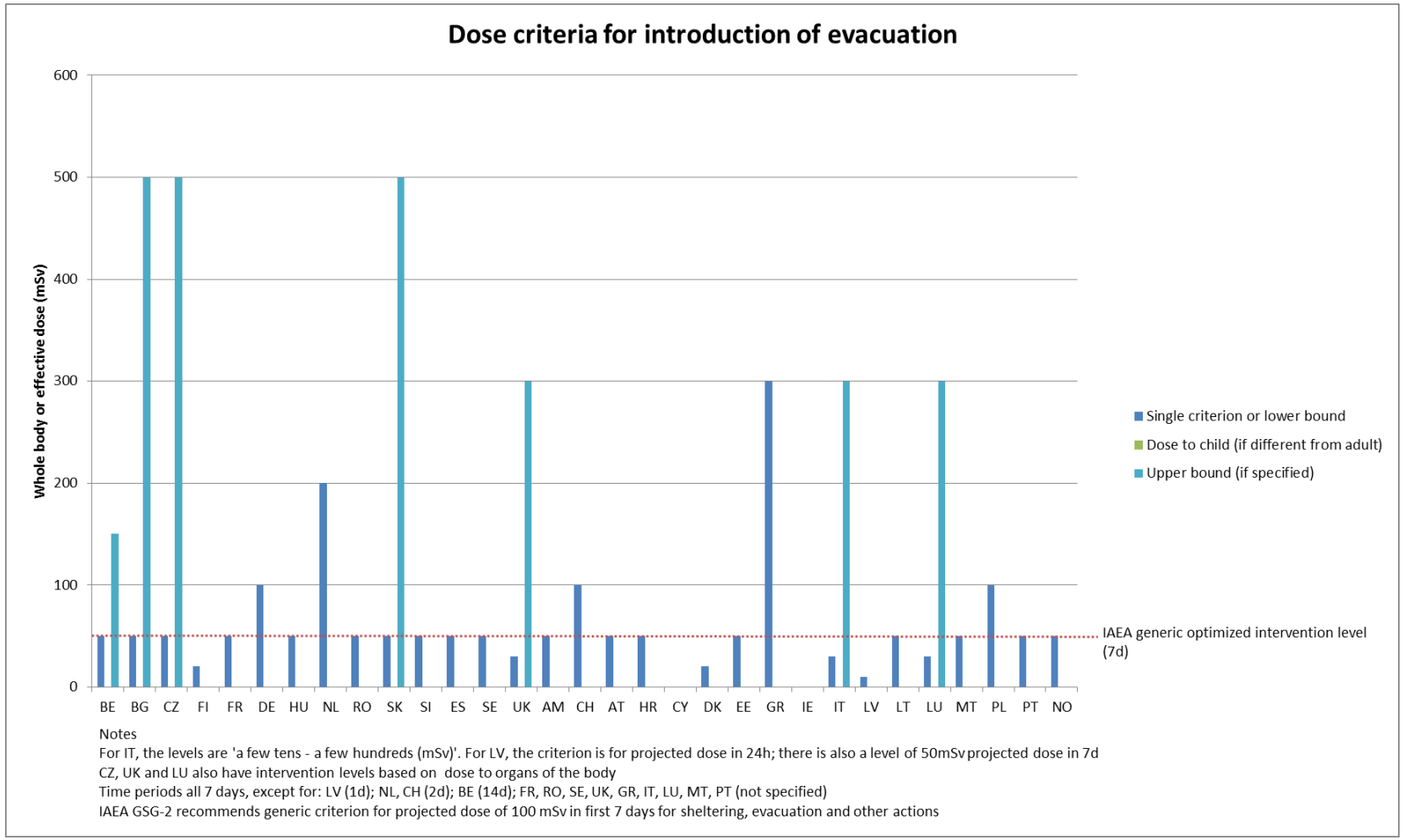


Figure 20-6: Dose criteria for introduction of evacuation

For **evacuation**, typical whole body or effective dose criteria lie between about 50 and 300 mSv, with a few values as low as 20 or 30 mSv (generally for the lower end of a range) and a few as high as 500 mSv (for the upper end of a range). There were no separate criteria specified for children, Where specified, the criteria were most often for an integration period of 7 days. Figure 20-6 shows the IAEA generic optimised intervention level for temporary evacuation (for avertable dose in a period of no more than 1 week) for comparison (GS-R-2 [IAEA, 2002]). It is again noteworthy how many countries (18 out of 29 responses) appear to have adopted intervention levels in line with this generic criterion.

For **iodine prophylaxis**, there is more variability in the dose criteria used. Most countries use absorbed dose or dose equivalent to the thyroid as the basis for criteria and many specify separate criteria for children and adults. The adult dose criteria typically lie between about 50 and 200 mGy, and range as low as 10 mGy (for the lower end of a range) and as high as 1,000 mGy. For children, the dose criteria lie generally between 10 and 50 mGy, with values as low as 5 mGy and as high as 100 mGy. Time periods for dose integration are generally not specified. For comparison, Figure 20-7 also shows the IAEA generic optimised intervention value (GS-R-2 [IAEA, 2002]) for iodine prophylaxis (for avertable committed dose to the thyroid due to radioiodine). There are again several countries (9 out of 29) which appear to have simply adopted this criterion.

For **food restrictions**, only the Czech Republic, Finland, Sweden and Ireland provided information on dose criteria. In Finland, Sweden and Ireland, a single dose criterion of 1 mSv per year was specified; the Czech Republic specified intervention levels in terms of ranges of 5 to 50 mSv in a year for effective dose and 50 to 500 mSv in a year for equivalent dose in an organ.

For **relocation**, many countries specified criteria for both temporary and permanent relocation. Figure 20-8 shows a comparison of dose criteria for temporary relocation. The dose criteria typically vary between about 10 and 50 mSv, and range as high as 500 mSv (for the upper end of a range). Where specified, the dose criteria were generally for an integration period of 1 month. Figure 20-8 shows the IAEA generic optimised intervention level (for the dose accumulated in a month) for initiating temporary relocation (GS-R-2 [IAEA, 2002]), and indicates that many countries (14 out of 21 responses) again appear to have adopted this criterion. All ten countries which provided a dose criterion for permanent relocation specified the IAEA intervention level of 1 Sv lifetime projected dose (GS-R-2 [IAEA, 2002]).

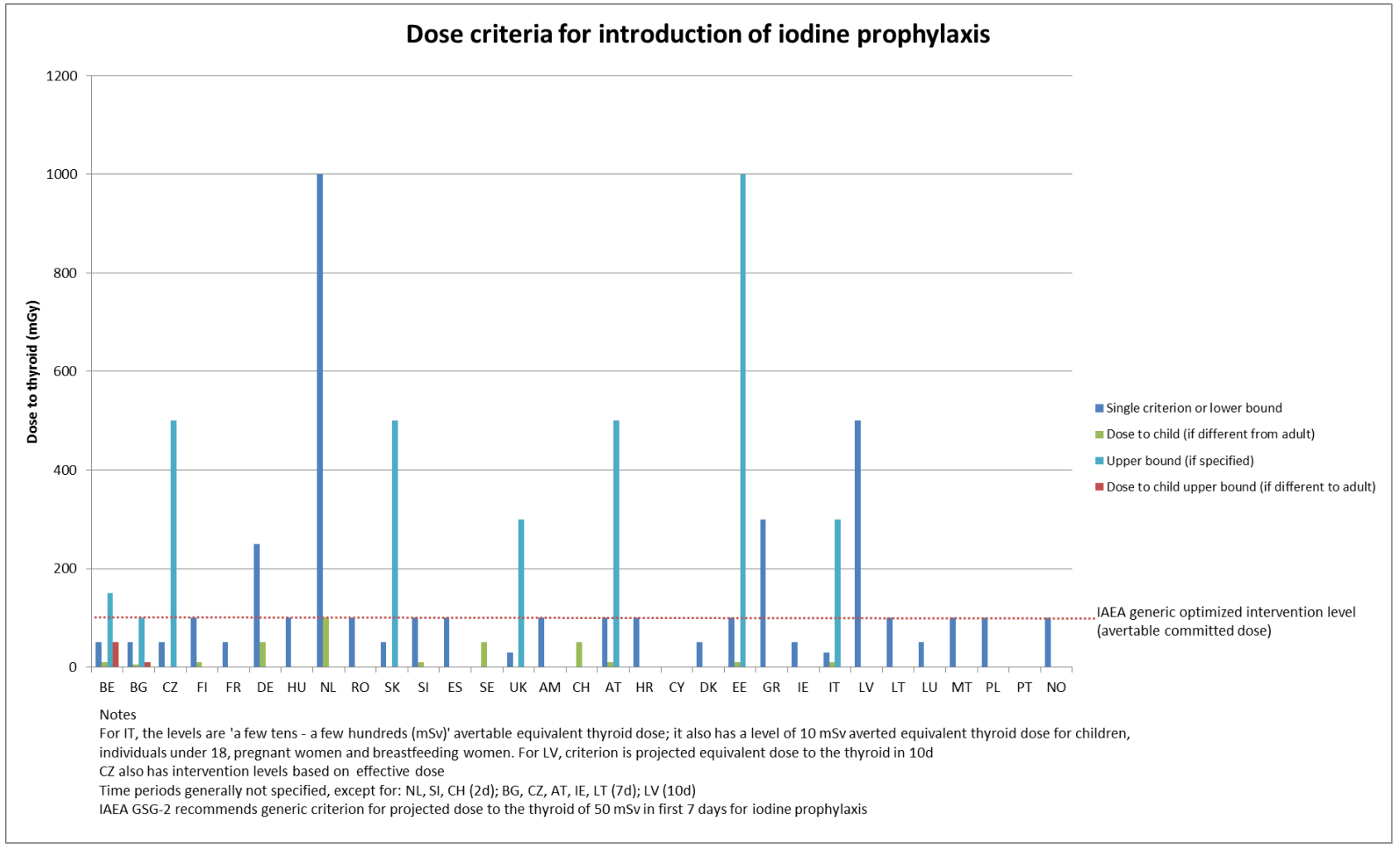


Figure 20-7: Dose criteria for the introduction of iodine prophylaxis

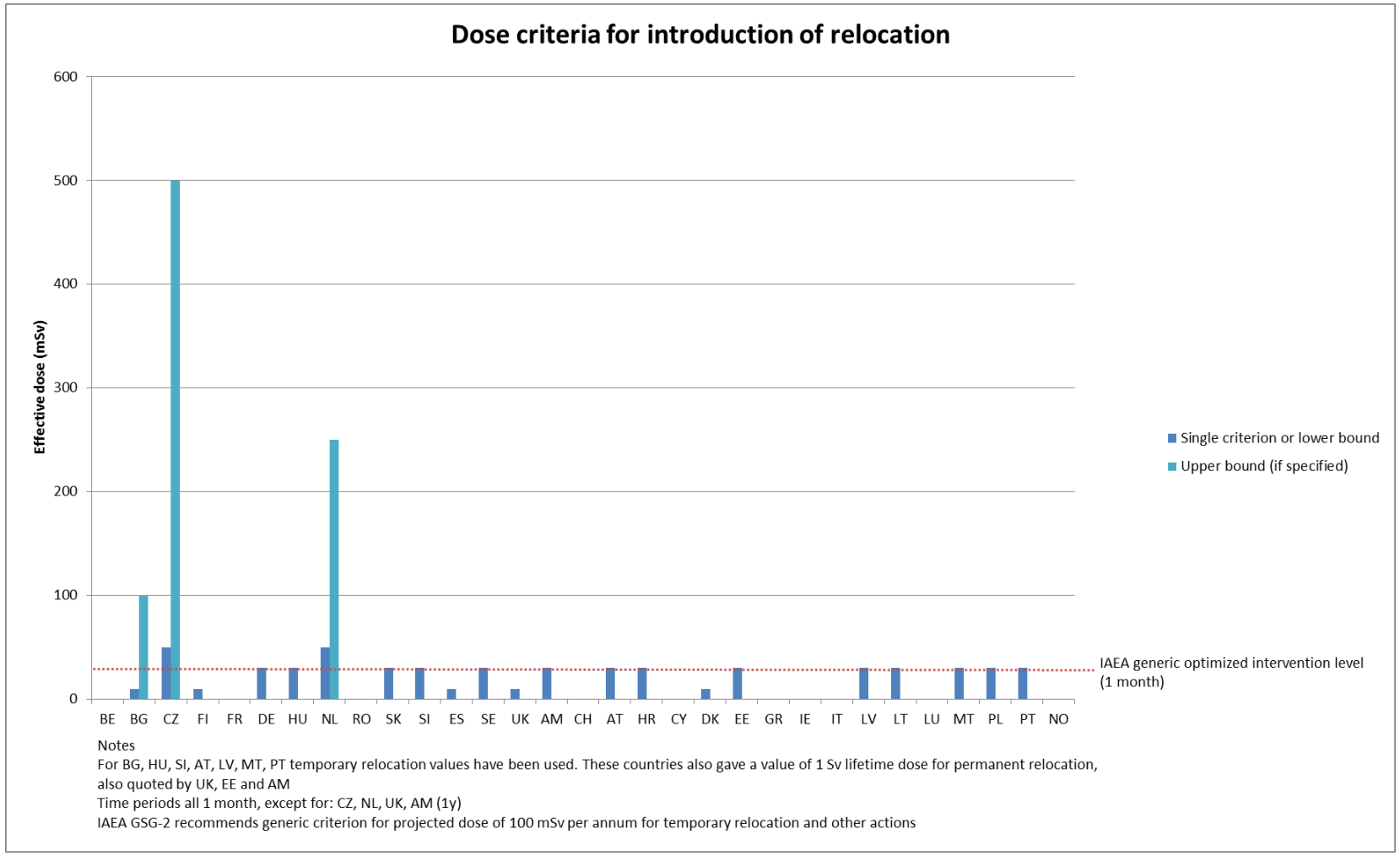


Figure 20-8: Dose criteria for introduction of relocation

20.3.2 Operational intervention levels (OIL)

Countries were able to provide much less information about the operational intervention levels used for protective measures. Many countries repeated information about dose criteria in their responses to this question, and others provided no answer. Those countries that were able to respond (between 6 and 15 countries depending on the protective measure) provided criteria covering a wide range of potentially measurable quantities, including gamma dose rate at a metre, external dose rate, alpha and beta surface contamination, air concentrations (alpha, beta, gamma, and specific radionuclides), deposition levels (alpha, beta/gamma, and specific radionuclides), as well as, for food restrictions, concentrations of radionuclides in foodstuffs. Comparisons were therefore even more difficult than for dose criteria.

For **sheltering, evacuation and relocation**, the most common response of those countries that were able to respond (between 9 and 11 countries) were operational intervention levels corresponding to IAEA default OILs for field survey measurements (IAEA GSG-2 [IAEA, 2011] and/or EPR-NPP PPA [IAEA, 2013]), where OIL1 corresponded to the criteria used for sheltering and evacuation, and OIL2 corresponded to the criteria used for temporary relocation.

For **iodine prophylaxis**, Bulgaria and Lithuania provided operational intervention levels corresponding to OIL3 (again a default OIL for field survey measurements from GSG-2 [IAEA, 2011]), and Estonia provided a similar value corresponding to OIL8 (for measurable thyroid dose rate, see EPR-NPP PPA [IAEA, 2013]). The other six countries able to respond used an external gamma dose rate of 100 microSv/h (considerably higher than the OIL3 value of gamma dose rate at 1 metre of 1 microSv/h).

The IAEA default OILs for field survey measurements were established for decisions on a range of response actions (see Tables 17-6 and 17-8 in Appendix D), not simply sheltering, evacuation, iodine prophylaxis or relocation. In addition, as IAEA GSG-2 [IAEA, 2011] makes clear, the default OILs may not be appropriate depending on the radionuclides present and the characteristics of the measuring instruments to be used. Only Finland appears to have developed its own specific operational intervention levels. The widespread absence of responses to this question and the apparent reliance of the responses that have been provided on IAEA default OILs suggest that this is an area where countries are generally failing to follow IAEA guidance and where considerably more work is needed.

For **food restrictions**, the most common response of the countries able to respond (7 out of 15 responses) was to refer to European Council Food Intervention Levels (CFILs). Of the others, a few (Romania, Estonia, Latvia, Lithuania) referred to other levels for concentrations in foods, including values corresponding to IAEA default screening OIL5 for food, milk and water concentrations from laboratory analysis (GSG-2 [IAEA, 2011]). Belgium and Latvia provided OILs based on ground deposition of I-131, Cs-134/137 and, in the case of Belgium, Sr-90; Bulgaria and Estonia provided values corresponding to OIL3; and Romania and Armenia provided a value of 1 microSv/h external dose rate (equivalent to the OIL3 gamma dose rate at 1 metre). Finland

again provided a unique set of OILs based on external dose rate and alpha, beta and gamma air concentrations (and Sweden reported that, together with other Nordic countries, and led by Finland, it is nearing the end of a process to implement a set of OILs (those reported by Finland) through the Nordic Flag Book). While CFILs, and other levels for concentrations in foods, would undoubtedly be relevant in this context, it is somewhat surprising that more countries did not appear to have developed OILs based on more immediately measureable quantities such as dose rate or ground deposition.

For restrictions on goods in international trade, only six countries responded, three of whom quoted a surface dose rate (above background) of 0.2 microSv/h, and one a surface dose rate of 0.5 microSv/h. The other two countries provided quite different quantities and criteria. Similar considerations to those set out above for other protective measures apply.

20.3.3 Criteria for termination of protective measures

Generally fewer than half of the countries that responded to the questionnaire (between 6 and 16 out of 30) were able to provide criteria for the termination of protective measures. The criteria varied widely, encompassing criteria for maximum duration (of sheltering and evacuation), maximum dosage (for iodine prophylaxis), external dose rate, deposition levels (alpha and beta/gamma), avertable or projected doses, and food concentrations (for food restrictions). Comparisons have, therefore, again been difficult to make. As reported by Sweden, the Nordic countries are working together to develop common criteria and OILs for the termination of protective measures.

For the **termination of sheltering and evacuation**, the most common criterion provided was for the maximum duration of the countermeasure (2 days for sheltering and 7 days for evacuation). The implication of these maximum duration criteria is, presumably, not that those sheltering would automatically cease to do so after that time, or that those evacuated would automatically return, but that, if it was not safe to cease sheltering or to return after this time, those sheltering would be evacuated and evacuation would become relocation. For both sheltering and evacuation, the next most common criteria provided were the same as the dose criteria used for the introduction of the countermeasure. In contrast, Poland provided a criterion for termination of evacuation of an effective dose of 10 mSv in 30 days (cf. its criterion for introduction of evacuation of an effective dose of 100 mSv in 7 days). Denmark and Finland provided criteria for the termination of sheltering and of evacuation expressed as an external dose rate of less than 10 microSv/h.

For the **termination of iodine prophylaxis**, the most common criteria provided were absorbed or equivalent dose to the thyroid equal to the value used for the introduction of the countermeasure (3 out of the 7 countries able to provide criteria). In addition, two countries provided criteria for dose to the thyroid that were within the range of values used for the introduction of the countermeasure. Two countries (Finland and Sweden) provided a criterion based on the maximum number of dosages of iodine tablets. For Finland, there was a comment that if more than two doses were

needed, evacuation should be considered; for Sweden, the maximum number of dosages were only specified for infants and for pregnant and breastfeeding women.

For **termination of food restrictions**, the only criteria mentioned were CFILs.

For **termination of relocation**, (apart from Denmark which provided criteria expressed in terms of external dose rate) all countries responding provided criteria expressed in terms of avertable or projected effective dose. These responses are shown in Figure 20-9, together with the IAEA generic optimised intervention level for termination of relocation for the dose accumulated in a month (from GS-R-2 [IAEA, 2002]).

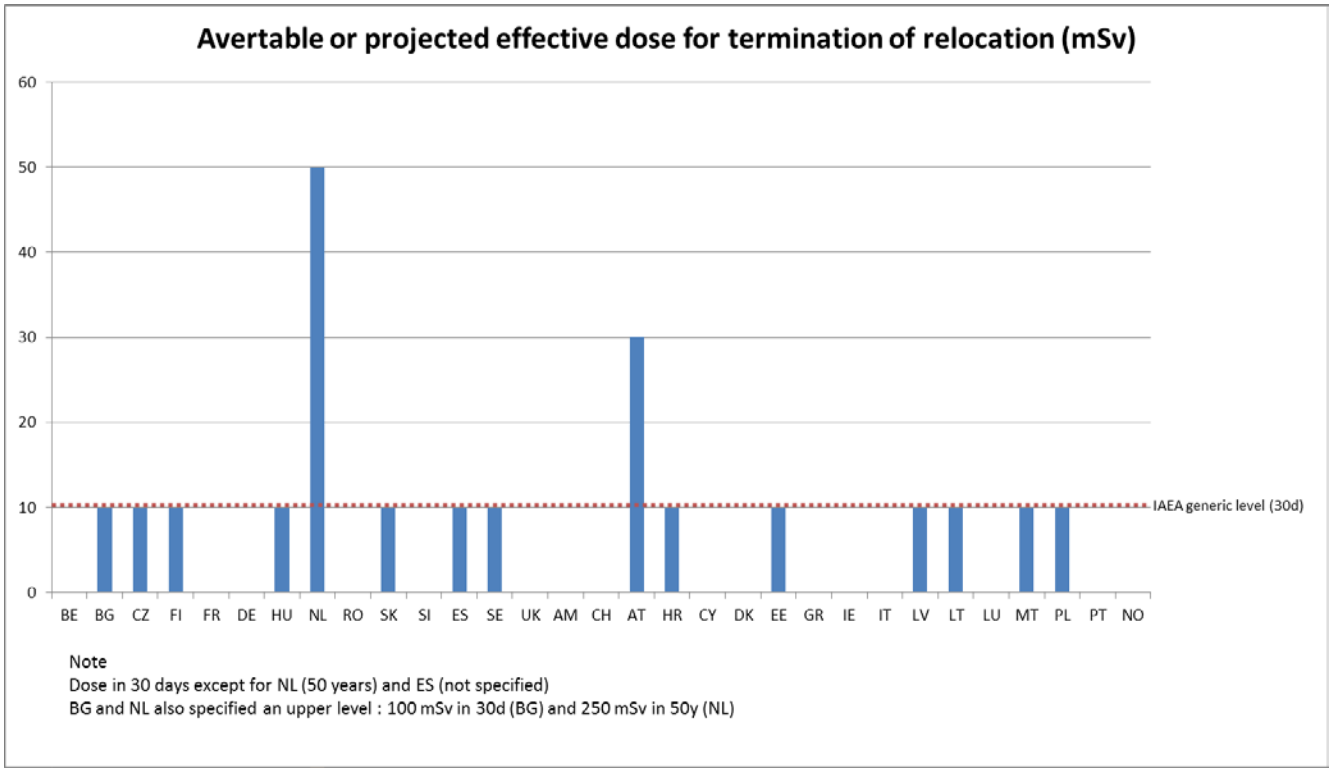


Figure 20-9: Avertable or projected effective dose for termination of relocation

All of these countries, apart from the Netherlands and Austria, would appear to have adopted the IAEA generic intervention level.

20.4 Plant status (Questions 2.14 – 2.15)

EP&R arrangements in all NPP countries use the status of the nuclear power plant and/or prognoses of its development as a basis for making decisions on the introduction of protective measures. In nearly all of these countries (14 out of 16), there are standards, guidance or recommendations setting out the conditions which should trigger particular protective actions. And, in all of these countries except the UK, information about plant status and/or prognoses of its development is available in real time to those responsible for off-site EP&R, either on line (10 countries) or

otherwise (5 countries). In the UK such information is available, but not in real time. In nearly all cases (there is no information about this from the UK), this is a regulatory requirement. It is also a requirement of EP&R plans in eight countries and provided voluntarily in three.

Plant status and/or prognoses of its development is also used as the basis for decisions on protective measures in six out of the 12 non-nuclear countries which replied to these questions. However, (setting aside the responses from Italy and Lithuania, which relate to NPPs that are no longer operating) relevant information about plant status only appears to be available in Luxembourg (where it is provided voluntarily as part of the agreement on information exchange between France and Luxembourg) and Croatia, the two non-nuclear countries with territory within the EPZ of NPPs in neighbouring countries. Portugal also stated that this information was available, but not online, and was provided voluntarily to the Portuguese Environmental Agency, but did not indicate what NPP such information related to (presumably those in Spain).

20.5 Regulatory framework for the protection of off-site emergency personnel and rescuers (Questions 3.1 – 3.4)

Most countries have some regulations, standards, requirements or guidance in addition to primary legislation to provide a framework for the protection of off-site emergency services personnel and rescuers.

The dose criteria set out in the responses varied in their applicability, with countries specifying different levels for volunteers and non-volunteers, or different levels for different types of emergency action (eg, urgent protective actions, actions to prevent the development of the emergency, life-saving actions, etc), or different criteria for whole body dose and dose to different organs of the body. A summary of the criteria that could be compared is presented in Figure 20-10.

The figure shows criteria expressed in terms of effective or whole body dose (if specified) for the following situations:

- A general dose objective for emergency situations;
- A general upper level for emergency situations (eg, to carry out urgent protective actions);
- An upper level for exceptional circumstances (eg, to prevent development of the emergency, serious injury or large collective dose);
- An exceptional level for life saving actions only.

Many countries allow for these dose criteria to be exceeded for life saving actions, but do not specify any additional criterion for these circumstances.

Typically, the dose criterion for carrying out general urgent protective actions vary between about 50 and 100 mSv or mGy, but can be as low as 20 mSv/mGy or as high

as 250 mSv/mGy. The dose criteria for actions to prevent the development of the emergency, serious injury or large collective dose typically lie between about 100 and 500 mSv or mGy. Where specified, dose criteria for life saving actions generally vary between 250 and 500 mSv/mGy. The IAEA guidance values for restricting exposure of emergency workers are also shown in Figure 20-10 for comparison (although the IAEA criteria draw a distinction between actions to avert a large collective dose and actions to prevent the development of catastrophic conditions). This shows that the criteria used for emergency workers are generally in line with the IAEA guidance.

Most countries place restrictions on pregnant and lactating women taking part in emergency response actions. Otherwise, no different criteria appear to be applied to female emergency services personnel.

The responses of countries on the provisions made to monitor and record individual doses and to provide personal protective equipment varied in detail. Most countries identified the need for individual dose assessment and personal protection against inhalation and external contamination. In some countries a whole spectrum of dose meters and monitoring techniques are available for use according to the situation, including: individual dosemeters; group dosemeters; measurements of dose rates at regular intervals; or recording locations and times of work for later dose reconstruction. They are complemented in other countries, as appropriate, by neutron dosemeters and whole body counters for the assessment of internal exposures. In contrast, only five countries provided information about how the doses accumulated during interventions in emergencies would be recorded and retained, for example in a central dose register. No information was provided on how any such data would be used subsequently.

A few nuclear countries were unable to provide information about provisions for medical care and follow up. Those that were able to do so generally did not provide a detailed response. The information which has been provided indicates that the need for medical care and follow up of personnel with doses exceeding the dose criteria for emergency personnel has been recognised as an important issue and that criteria and/or obligations of specific organisations have been formulated. The answers are, however, generally not specific enough to allow conclusions about how well arrangements have been implemented. With a few exceptions, the non-nuclear states did not answer this question.

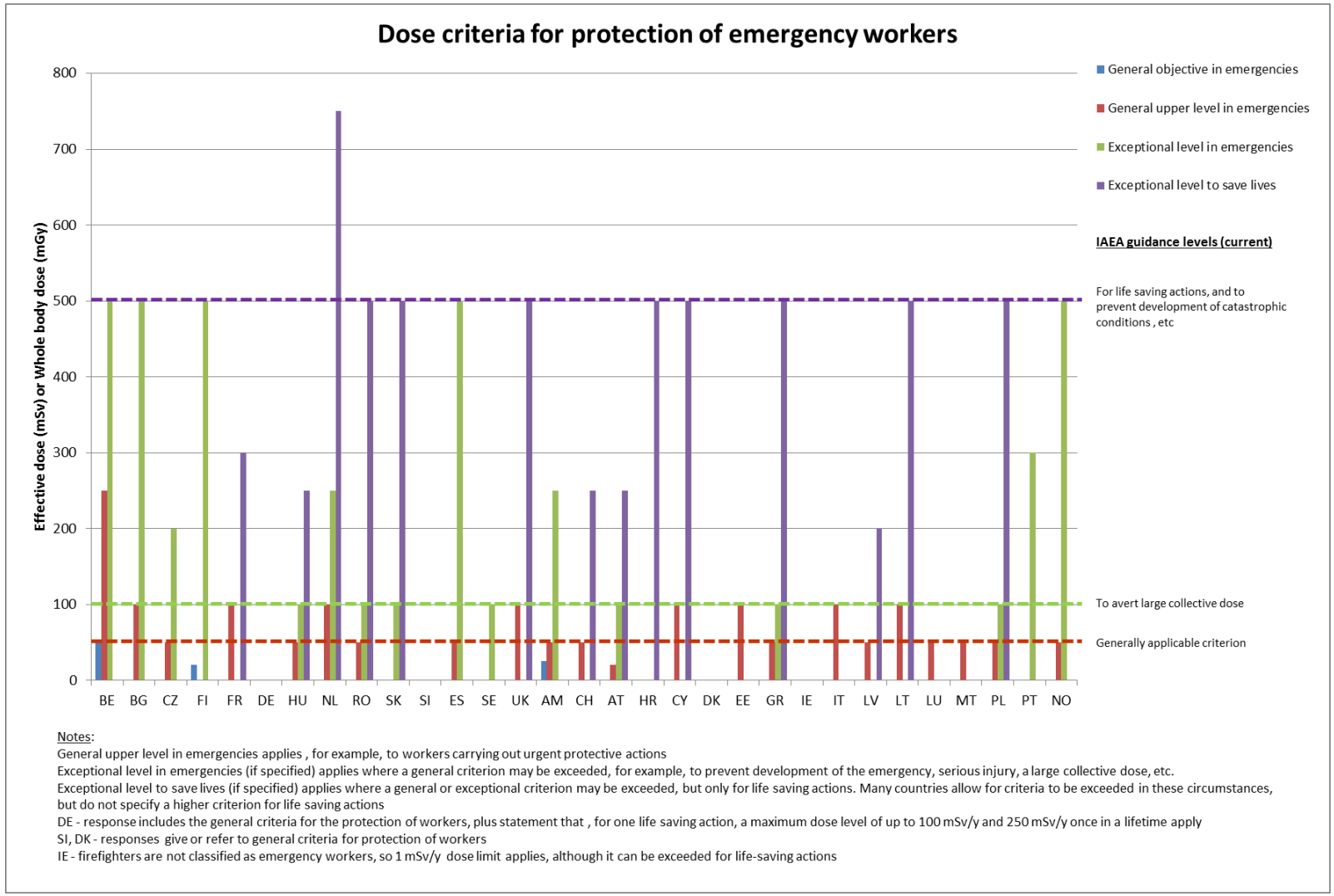


Figure 20-10: Dose criteria for protection of emergency workers

20.6 Institutional arrangements (Questions 4.1 – 4.9 and 6.4)

20.6.1 Local and national institutional arrangements

Most nuclear countries identified different organisations with responsibilities for off-site emergency plans at local and national levels. Among non-nuclear countries, some (e.g. Austria, Italy, Lithuania, Poland, Portugal and Norway) similarly identify municipal or regional organisations with responsibility at local level and national organisations at national level. The remainder only identify organisations at national level. For most countries, the same organisations are responsible at a national level and for cross border arrangements.

Many countries identified more than one organisation with responsibilities at both local and national levels without always identifying any one (or the lead) organisation with ultimate or overall responsibility. Specifically, several countries (Czech Republic, Finland, Sweden, UK, Armenia, Switzerland, Luxembourg, Norway) listed a number of Ministries at national level with responsibilities for those aspects of the emergency plan falling within their remits. Clearly, in these circumstances, coordination between these various elements of the plan is crucial to avoid gaps and overlaps in arrangements. Equally, where a single organisation has responsibility at local or national level, consultation and coordination with other organisations with relevant responsibilities and expertise will be important.

In most countries, off-site emergency plans are subject to some form of consultation prior to being finalised, although this does not necessarily always include public consultation. In general, the purpose of consultation appears to be to ensure input from other organisations with relevant responsibilities and expertise. Ensuring coordination of plans is considered further in relation to questions 6.1 to 6.3 below.

Among nuclear countries, the organisations identified as having the power to initiate the off-site emergency response encompass national level Ministries, regulatory bodies, regional authorities, local authorities, local political leaders (Prefects), emergency/civil protection services, as well as the NPP operators, and in some cases more than one of these. Many countries (Bulgaria, Czech Republic, Finland, Hungary, Slovakia, Sweden, UK, Armenia) allow for initiation of the off-site emergency plan by the nuclear power plant operator, generally through an alert system (eg, sirens) within the emergency zone(s). In some of these cases (Bulgaria, Czech Republic, Finland, UK), the alert system automatically triggers some immediate protective actions (sheltering, taking of pre-distributed iodine tablets) by the population alerted.

In non-nuclear countries, it is generally a national level organisation that initiates the emergency response. This is the case even in the countries (Croatia and Luxembourg) with territory within the EPZ of NPP in neighbouring countries.

In nuclear countries, aside from the urgent actions triggered by the initiation of the emergency plan by the NPP operator, decisions on other urgent actions are generally

taken by authorities at local, regional or national level, with advice provided by the NPP operator, the regulator and/or other bodies with specialist expertise. In some case, decisions on some specific protective actions are reserved for particular Ministries (eg, in Finland and the UK, decisions on iodine prophylaxis need to be taken by the relevant Health Ministry).

In non-nuclear countries, decision making bodies are mostly national level authorities. In Estonia, decisions on some countermeasures (drinking water and food restrictions) can only able to be made by Ministries with relevant responsibilities.

Few countries provided details in their questionnaire responses about how the activities of the various organisations involved are coordinated in the preparedness (planning) phase to ensure a coherent and integrated emergency response. Some referred to meetings of coordination committees, some to emergency exercises, as providing a means to test the coherence of the response, and others to decision support systems. In Belgium, there is a hierarchical structure in which the plans of each administrative level need to be approved by the level above. But generally, there was little information provided about mechanisms to ensure the necessary degree of clarity about issues such as who makes decisions, who directs monitoring activities, etc. References to where such information could be found were often provided, but it was beyond the scope of the project and resources available to scrutinise this and/or analyse differences and commonalities in detail (although the material has been reviewed for the purposes of benchmarking).

All countries, apart from Austria (which was equivocal), claim that their institutional arrangements for nuclear off-site EP&R are coherent and compatible with arrangements for other emergencies. In most cases this is achieved through the establishment of plans for the whole range of emergencies, of which nuclear emergencies make up one particular subset.

Most nuclear countries have no significant differences in the institutional arrangements for EP&R between emergencies occurring at NPP in their own country and those occurring in other countries. In those countries that did have significant differences in arrangements, the differences generally stemmed from the lower likelihood of the need to take urgent protective actions at local level in such circumstances.

20.6.2 Cross border Institutional arrangements

Nearly all countries indicated that they have mechanisms in place to ensure timely notification of emergencies to neighbouring countries over and above obligations under the Convention on Early Notification of a Nuclear Accident and the Community's Urgent Radiological Information Exchange system. Only Armenia, Cyprus and Malta indicated that they do not. Many countries mentioned the mechanisms established under these international agreements (ECURIE and USIE) in this context, as well as bilateral arrangement with neighbouring countries and others. Many also referred to agreements on information exchange.

In the context specifically of detailed cross border arrangements, 19 countries - 12 with NPP and 7 without NPP - claimed to have these in place. The countries with NPPs that do not have detailed cross border arrangements in place comprise Czech Republic, Slovakia, Slovenia and Armenia.

The following responses on detailed arrangements are the most noteworthy:

- France has established arrangements with all its neighbouring countries (UK, Belgium, Luxembourg, Germany, Switzerland and Spain) and works with these countries on a number of initiatives. Two examples have been provided: firstly, a five country report (covering France, Belgium, Luxembourg, Germany and Switzerland) has been produced on harmonisation of iodine prophylaxis; and secondly, the "Greater Region", comprising several French, Belgian, Dutch, Luxembourg and German regions, and has organised an extensive cross border emergency exercise to test international cooperation.
- The Nordic countries (Norway, Sweden, Finland, Denmark and Iceland) have a long-standing cooperation agreement in which information sharing mechanisms have been jointly agreed and criteria for protective actions have been, or are being, harmonised. Joint full scale emergency exercises are held every 3-5 years.
- Bulgaria has detailed arrangements with Romania, as Romania has territory within the EPZ of the Bulgarian NPP. Arrangements include sharing of detailed information, including on accident prognosis, substances released, the results of monitoring, and planned and implemented countermeasures, but there are no mechanisms for joint decision making on countermeasures, nor have there been joint exercises of emergency arrangements for the NPP.
- Similarly, Switzerland has detailed arrangements with Germany, as Germany has areas within the EPZs of two Swiss NPPs. Arrangements do not include common criteria, but do provide for rapid consultation between German local authorities and the National Swiss Emergency Operations Centre on the implementation of urgent protective actions. German authorities participate in full scale emergency exercises at the two Swiss NPP; these take place about every four years.
- Slovenia and Croatia acknowledge the need for, and are beginning work to develop, detailed and harmonised cross border arrangements because of the proximity of the Slovenian NPP to the border with Croatia.

20.7 Licensee's arrangements and coordination with those responsible for off-site EP&R (Questions 5.1 – 5.9)

The responses to questions in this section are summarised in Table 20-2 below. These questions all relate to arrangements by the NPP licensee and therefore are only applicable to NPP countries.

In all countries the NPP licensee's on-site EP&R arrangements are subject to regulatory approval; however, off-site arrangements are only subject to such approval in less than half (6 out of 16) of the countries. Where there was no regulatory approval of off-site plans, this was generally because off-site arrangements were not the responsibility of the licensee and were subject to different approval mechanisms. This raises the question of how, under such arrangements, coherence and consistency is ensured between on-site and off-site plans.

All countries were confident that the NPP licensee's organisational arrangements contained provisions for ensuring effective and timely liaison and communication with those responsible for off-site EP&R. Provisions described include requirements to notify authorities in the event of an emergency within prescribed timescales, for the licensee to send a representative to the off-site emergency command centre to provide liaison, for dedicated communications systems to be in place between the licensee and off-site authorities, and for direct online connection to be established between the NPP's systems and those of the regulatory body, so that the regulator has the same information about NPP plant status and site monitoring information as the licensee.

Most countries gave a similar answer to the question about the conditions under which an off-site emergency is declared, including the criteria for classification, as they gave in response to the earlier question about emergency classification levels used in the development of EP&R arrangements. There were again references to the IAEA emergency class descriptions (general emergency, site area emergency, facility emergency, alert), and categorisations of emergencies based on severity. The information provided on emergency action levels or other criteria varied: some countries mentioned abnormal conditions at the NPP (such as loss of reactivity control or loss of core structural integrity), the plant status or the breaching of barriers; others referred to releases predicted to lead to avertable doses above intervention levels for urgent countermeasures.

In most countries, the NPP licensee has the power or responsibility to initiate off-site protective measures in the initial stages. This is usually only until the relevant crisis centre has been established. Those countries which stated that the licensee does not have this power or responsibility are Belgium, Germany, the Netherlands and Slovenia. In the case of Germany and the Netherlands, this answer is somewhat inconsistent with each country's earlier reply to the question about which organisations did have this power, where the NPP operator/licensee was mentioned. There are also possible inconsistencies for Romania, Spain and Switzerland, which did not mention the licensee in answer to the earlier question.

Table 20-2: Mapping of responses to questions about EP&R arrangements by the NPP licensee

Licensee's EP&R arrangements and coordination with those responsible for off-site EP&R	BE	BG	CZ	FI	FR	DE	HU	NL	RO	SK	SI	ES	SE	UK	AM	CH
Licensee's on-site EP&R plans subject to approval by the regulatory body?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Licensee's off-site EP&R plans subject to approval by the regulatory body?	N	Y	N	Y	N	Y	N	N	N	Y		Y	N	Y	N	N
Arrangements provide for effective and timely liaison and communication with those responsible for off-site EP&R?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Licensee has power/ responsibility to Initiate off-site protective measures?	N	Y	Y	Y	Y	N	Y	N	Y	Y	N	Y	Y	Y	Y	Y
Licensee has obligations to contribute to off-site EP&R?	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	N	Y	Y	Y
Licensee act voluntarily in contributing to off-site EP&R?	Y	N	Y	N	Y	N	Y	N	N	Y		Y	Y	Y	N	N
Licensee required to provide regulatory or other body with continuous information on the facility status?	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Licensee required to provide 3rd country governmental organisations with continuous information on facility status?	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N
Licensee voluntarily provides 3rd country governmental organisations with continuous information on facility status?	N	N	Y	N	N	N	N	N	Y	Y	N	N	N	N	N	Y
Licensee has tools to predict the radiological impact?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N

Y Response of 'Yes'
N Response of 'No'

In most countries the NPP licensee has obligations placed on it to contribute to off-site EP&R. In three of the countries where it does not have such obligations (Belgium, Hungary and Sweden), the licensee acts voluntarily to do so. Only in the Netherlands does the licensee neither have obligations nor act voluntarily to contribute. In a few countries (the Czech Republic, France, Slovakia, Spain and the UK), the licensee acts voluntarily as well as having obligations placed on it. The types of contribution mentioned most often include environmental monitoring and the stockpiling of potassium iodide/iodate tablets. Some countries also mentioned that the licensee contributes financially to off-site EP&R.

In nearly all countries, the NPP licensee is required to provide the regulator or other body with continuous information on the facility status. The only exception is Belgium. The information required to be provided and its frequency ranges from notification reports on the situation sent every one to two hours to continuous automatic transmission of critical plant parameters and monitoring data (numbering several hundred parameters every minute) via dedicated data links.

The licensee is required to provide such information to governmental organisations in third countries only in France, but does so voluntarily in the Czech Republic, Romania, Slovakia and Switzerland. In the case of France, the licensee is required to provide data from fixed environmental monitoring systems to Belgium, Luxembourg, Germany and Spain to fulfil bilateral agreements. In the case of the Czech Republic, there is a monitoring device provided by Austria which has been installed at the Regional Centre in Ceske Budejovice to provide data on radiation levels. Slovakia provides environmental monitoring system data from the Mochovce NPP to Hungary. Switzerland shares the results of environmental measurements and situation reports with Germany.

All countries apart from Switzerland report that NPP licensees have tools available to predict radiological impact, based on plant status and how it might develop, and/or on measurements of released material and levels of radiation in the environment. Countries mentioned different software and systems in this context; software and systems mentioned by more than one country include the software tool ESTE (mentioned by Bulgaria and Slovakia), and RODOS (Bulgaria and Romania).

20.8 Coordination of off-site EP&R – role of key stakeholders (Questions 6.1 – 6.3)

All countries, with the exception of Greece (which did not answer this question), state that the roles, responsibilities and interactions between the key stakeholders in off-site EP&R are clearly defined and formally agreed by all parties.

All countries, with the sole exception of Greece, which did not answer, state that they have a national coordinating authority to ensure that the functions and responsibilities of all parties are clearly assigned and understood. Countries generally identified relevant Ministries, or (in the case of Belgium, Finland, Hungary, Romania, UK, Austria, Cyprus, Switzerland) committees or groups of Ministries (and sometimes other organisations), as fulfilling this role, but provided only limited information

about the roles and responsibilities of their respective organisations. Only Romania, the UK and Lithuania provided a clear description of these responsibilities and how coordination was achieved.

Countries gave a more varied response to the question about whether an assessment has been made to determine the adequacy of resources and capabilities at local, regional and national levels. Many non-nuclear countries responded to the effect that this question did not apply to them because it made reference to 'the accident assumed for the purposes of establishing the EPZ'. Neither of the two non-nuclear countries with territory within the EPZ of NPPs in neighbouring countries (Luxembourg and Croatia) had carried out such an assessment, although Luxembourg admitted that any such accident would be likely to need to make use of all the resources available. Of the nuclear countries which had not carried out such an assessment, most were planning or in the process of doing so. In this context, Slovenia posed the pertinent question of what constituted sufficient resources. Of those countries which stated that they had carried out such an assessment, several referred to programmes of emergency exercises, during which resources and capabilities for EP&R would be tested.

20.9 Timing and exercising of off-site EP&R arrangements (Questions 7.1 – 7.2)

Figure 20-11 illustrates the responses of those countries with NPP on the frequency of emergency exercises/drills at each NPP per year.

Some countries provided frequencies of drills and testing of specific functions as well as of all functions on site; others only the frequencies of testing of some functions or only the frequencies of testing of all functions on site. All countries carry out testing of at least some, if not all, of their on-site EP&R arrangements at least once per year. In principle, these testing schedules should enable on-site staff responsible for critical response functions to participate in a training exercise or drill at least once every year, in line with IAEA requirements (GS-R-2 [IAEA, 2002]). Whether this is the case for any off-site staff responsible for critical response functions (for example, in local response organisations) is less clear, as the frequency of testing of off-site EP&R arrangements is often less than once per year per NPP.

Figure 20-12 shows the reported frequencies of exercises of national, supra-national (cross-border) and international EP&R arrangements. This includes both nuclear and non-nuclear countries. Several countries did not provide quantitative estimates of frequencies or did not answer this question.

The figure shows that the frequency of exercises of national arrangements varies from six per year (the mid-point of between four and eight per year) in Denmark[10] to about once every five years in Bulgaria and Slovenia. The IAEA requirement for staff

[10] But this may apply to exercising national arrangements in response to all emergencies as opposed to specifically for nuclear emergencies

responsible for critical response functions is again shown for comparison, as there may be such staff involved in national and international arrangements.

Specific cross-border exercises were mentioned by Belgium (in relation to French NPP), the Netherlands (in partnership with Belgium), Austria (in partnership with the Czech Republic), Estonia (in relation to its neighbours), Italy (in partnership with Switzerland), Luxembourg (in relation to the French NPP at Cattenom), and by Switzerland (in partnership with Germany). At international level, reference was most often made to CONVEX, INEX or ECURIE exercises.

There were fewer clear answers to the subsequent question about the testing of the extendibility of EP&R arrangements. Several countries stated that their emergency exercises were not limited to accidents used in the establishment of the EPZ, so the same frequencies applied. Some simply repeated the frequencies provided in answer to the previous question, and others provided no estimates. France reported that, following Fukushima, it had carried out an exercise of a nuclear accident occurring in combination with a natural disaster and that it planned to do more of these in future. The Netherlands stated that its policy was not to test scenarios more extensive than those used for planning. The responses to this question were generally not very consistent with the responses to a subsequent question about the extendibility of EP&R arrangements (see below) where this issue is discussed further.

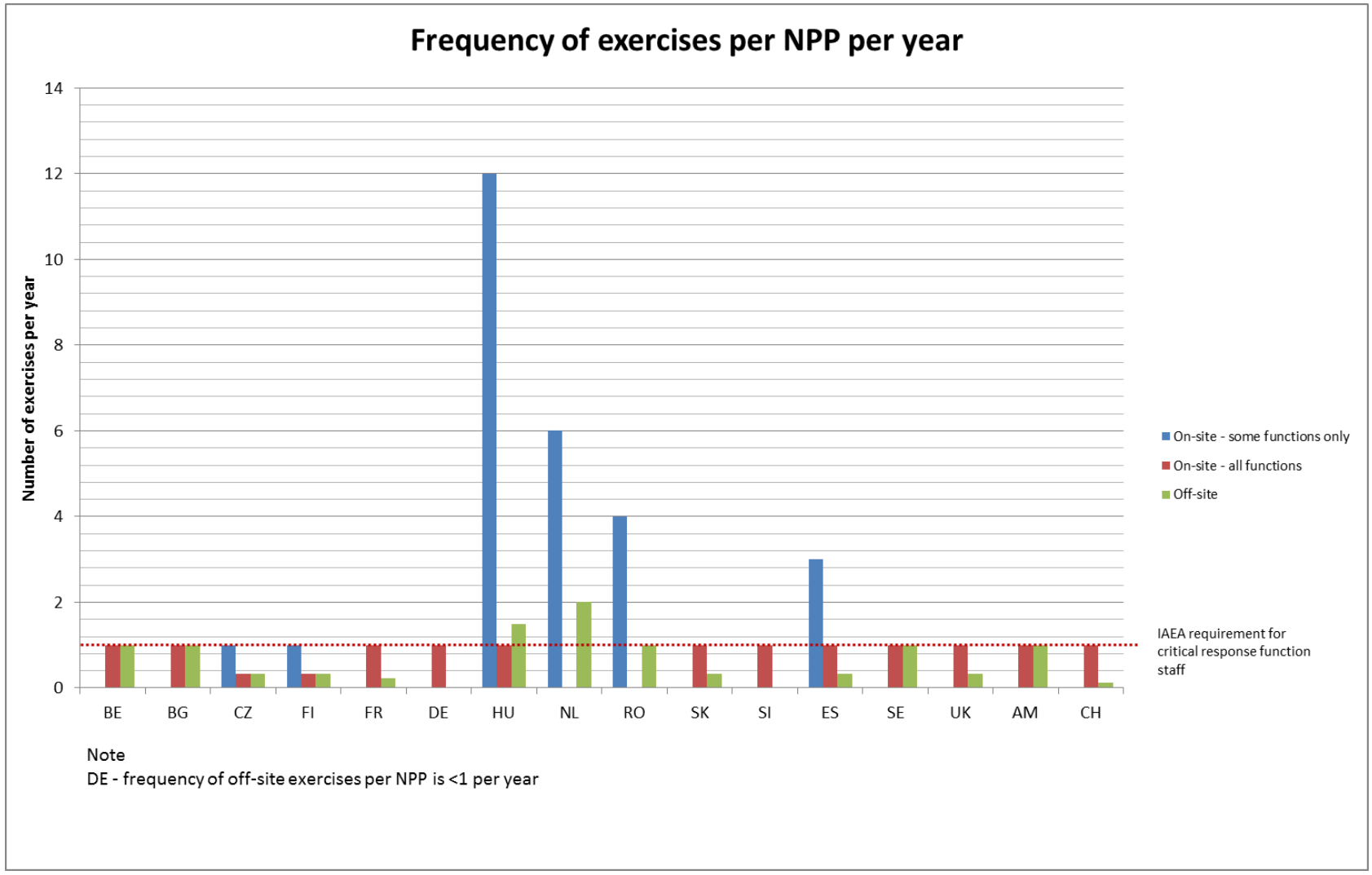


Figure 20-11: Frequency of emergency exercises per NPP per year

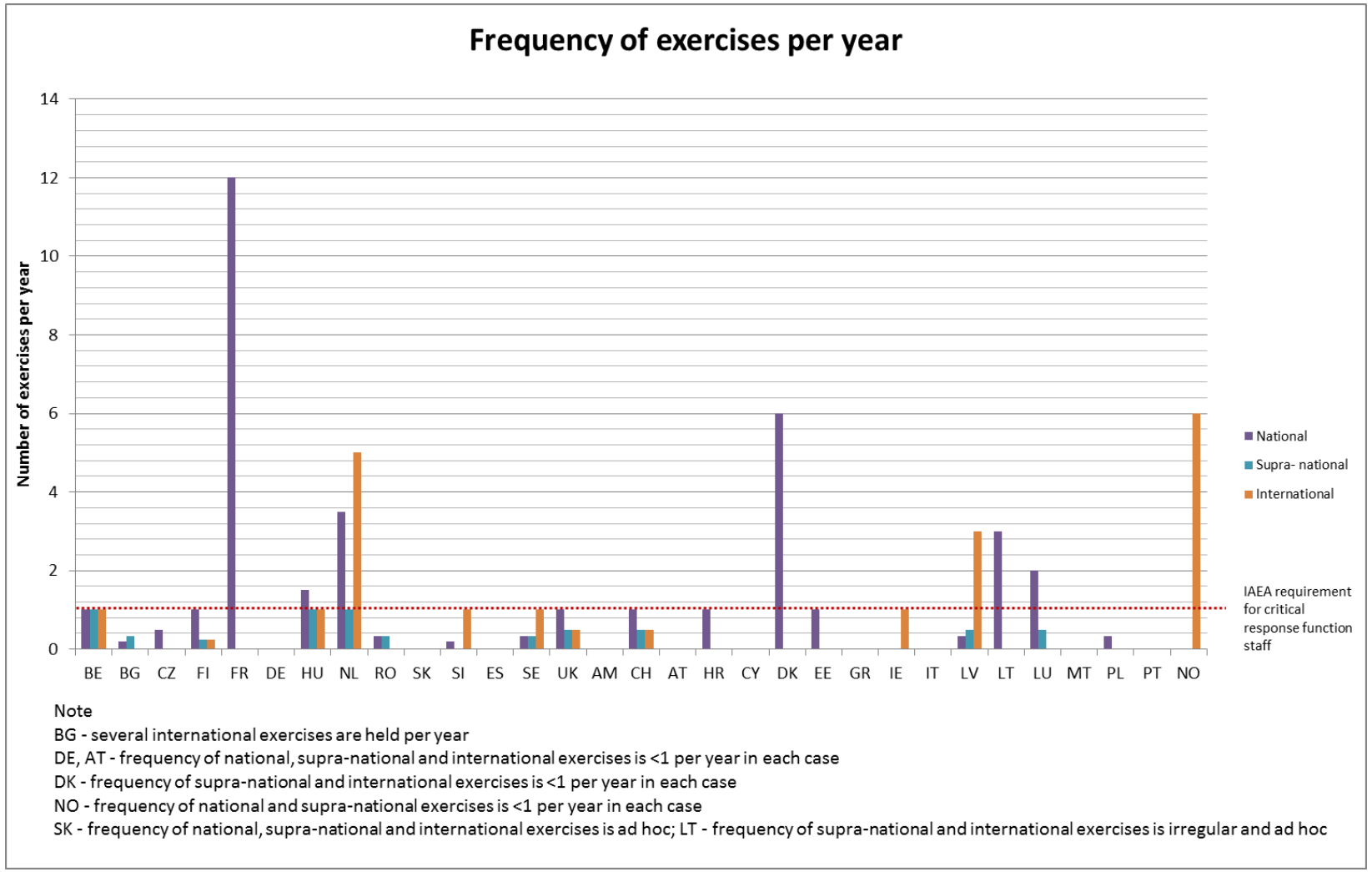


Figure 20-12: Frequency of emergency exercises at national and international levels

20.10 Practical aspects of protective measures

20.10.1 Issue of stable iodine (Questions 8.1.1 – 8.1.7)

The use of stable iodine among the countries which responded is illustrated in Figure 20-13. Croatia is still developing its strategy on iodine prophylaxis and four non-nuclear countries (Estonia, Ireland, Malta and Portugal) responded 'No' to all three options, as the use of stable iodine is not considered applicable to their circumstances.

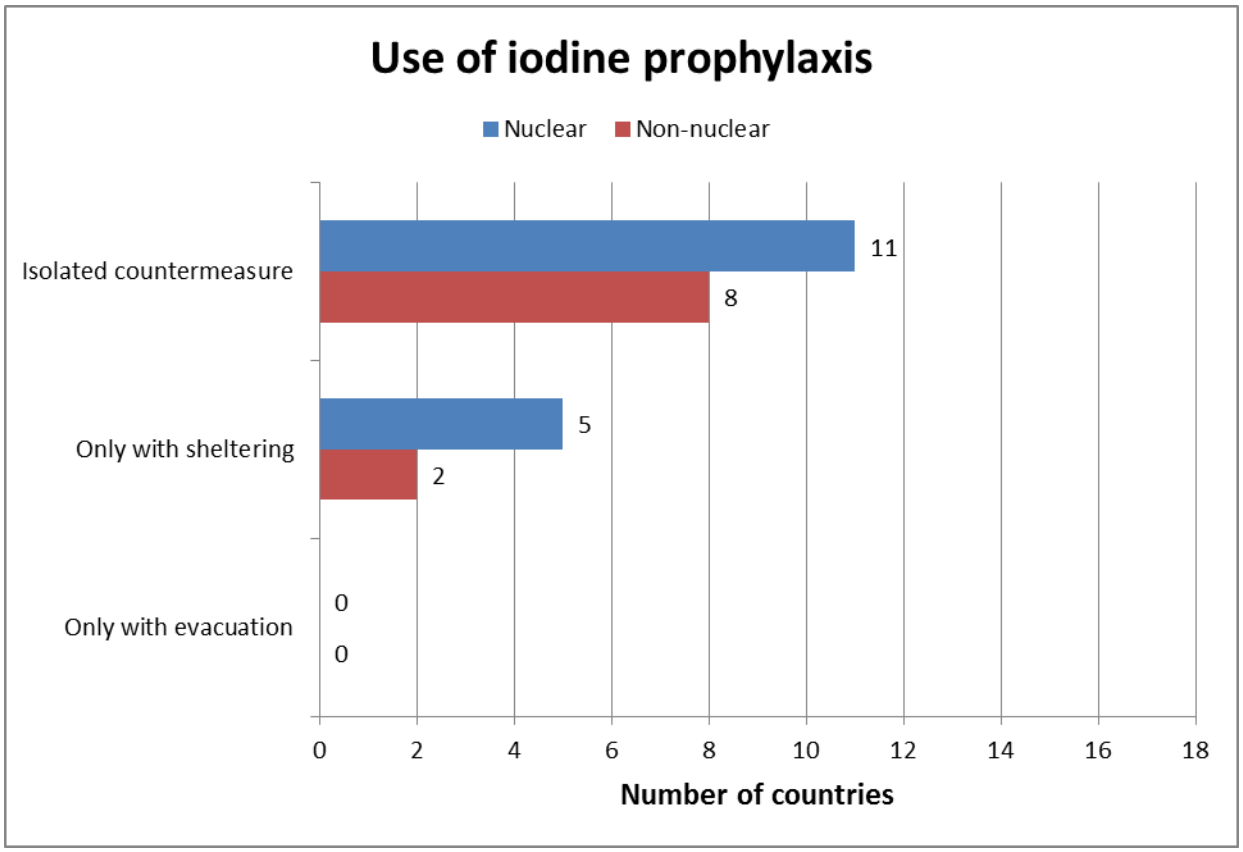


Figure 20-13: Use of stable iodine with other protective measures

Most countries (both nuclear and non-nuclear) would use stable iodine as an isolated countermeasure. Some would use it in only in combination with sheltering; none would use it only in combination with evacuation.

All of the responses about the recommended dosages of stable iodine were the same as the dosages recommended by the WHO [WHO, 1999] (see Appendix D), although recommendations on dosages have not yet been established in Armenia and Croatia. The only differences related to whether the dosages were specified in terms of quantities of iodine or iodide. Table 20-3 and Table 20-4 below summarise the responses on recommendations about repeat dosages.

Table 20-3: Number or frequency of repeat intakes (countries with NPP)

	BE	BG	CZ	FI	FR	DE	HU	NL	RO	SK	SI	ES	SE	UK	AM	CH
Neonates (<1 month)	1	0	1	0		1		0	1/d	0			0	0		0
Infants (1 month-3 years)	1	<1g total	1	0		1	1	0				1/d	1/2d	0		1/d
Children (3-12 years)	1	<1g total	1	1		1	1	0	1/d			1/d	1/2d	0		1/d
Adults	1	<1g total	1	1		1	1	0	1/d			1/d	1/2d	0		1/d
Pregnant women	1	1	1	1		1		0		1		1/d	1	0		1

Notes:

For Belgium, it is not clear from the response whether one or two repeat doses are "not excluded"
1/d indicates one repeat of the recommended dosage per day; 1/2d indicates one repeat of the recommended dosage every two days
France and Slovenia do not set a predetermined limit on repeat intakes; Slovakia only does so for neonates and pregnant women
Armenia has not yet established recommendations on dosages

Table 20-4: Number or frequency of repeat intakes (countries without NPP)

	AT	HR	DK	EE	GR	IE	IT	LV	LT	LU	MT	PL	NO
Neonates (<1 month)	0						0		0	3 (1/d)		0	1
Infants (1 month-3 years)	1/d		1/2d		1/2d		1/d		0	3 (1/d)		0	1
Children (3-12 years)	1/d		1/2d		1/2d		1/d		1/d	4 (0.5/8h)		0	1
Adults	1/d		1/2d		1/2d		1/d		1/d	4 (0.5/8h)		0	1
Pregnant women	0		1		1/2d		1		0	4 (0.5/8h)		0	1

Notes:

For Lithuania, daily dosages may be repeated for children and adults only up to a maximum of 10 days; for Latvia, administration should not be continued beyond 7 days
3 (1/d) indicates a repeat of the recommended dose per day up to a maximum of three times the initial recommended dose (i.e. four times the initial dose in total); 4(0.5/8h) indicates a repeat of half of the recommended dosage every 8 hours up to a maximum of four times the initial recommended dosage (i.e. five times the initial dose in total)
Croatia has not yet developed recommendations on dosages; for Estonia, Ireland, Malta and Portugal iodine prophylaxis is not considered applicable

Most countries place some limit on the number of dosages of stable iodine that would be administered. The Netherlands and the UK do not recommend any repeat administration. Eight other countries do not recommend repeat administration to neonates, and in some case infants. Many limit repeat administration to one or more groups to one additional dose. Bulgaria allows a total administration up to 1g of iodine for all except neonates and pregnant women. In Luxembourg, three or four additional doses are allowed in total with different frequencies (either one repeat dose every day, or half a repeat dose every 8 hours). Other countries only limit the frequency of repeat intakes. None of these responses appears to be fully in line with the WHO guidance on repeat intakes, which suggests repeat intakes only for infants, children and adolescents (see Section 17 - Appendix D).

The responses on arrangements for pre-distribution of stable iodine are summarised in Figure 20-14. All nuclear countries pre-distribute stable iodine in particular areas. Stable iodine is also pre-distributed in particular areas in Austria, Latvia, Lithuania and Luxembourg. In all nuclear countries, the relevant areas are the EPZ or areas within a defined distance of the NPP(s) (although the response from Slovenia indicates that the pre-distribution has yet to take place). In Luxembourg, the relevant area is within 25 km of Cattenom NPP (in France), and in Lithuania the relevant area is within 50 km of Ignalina, a closed NPP.

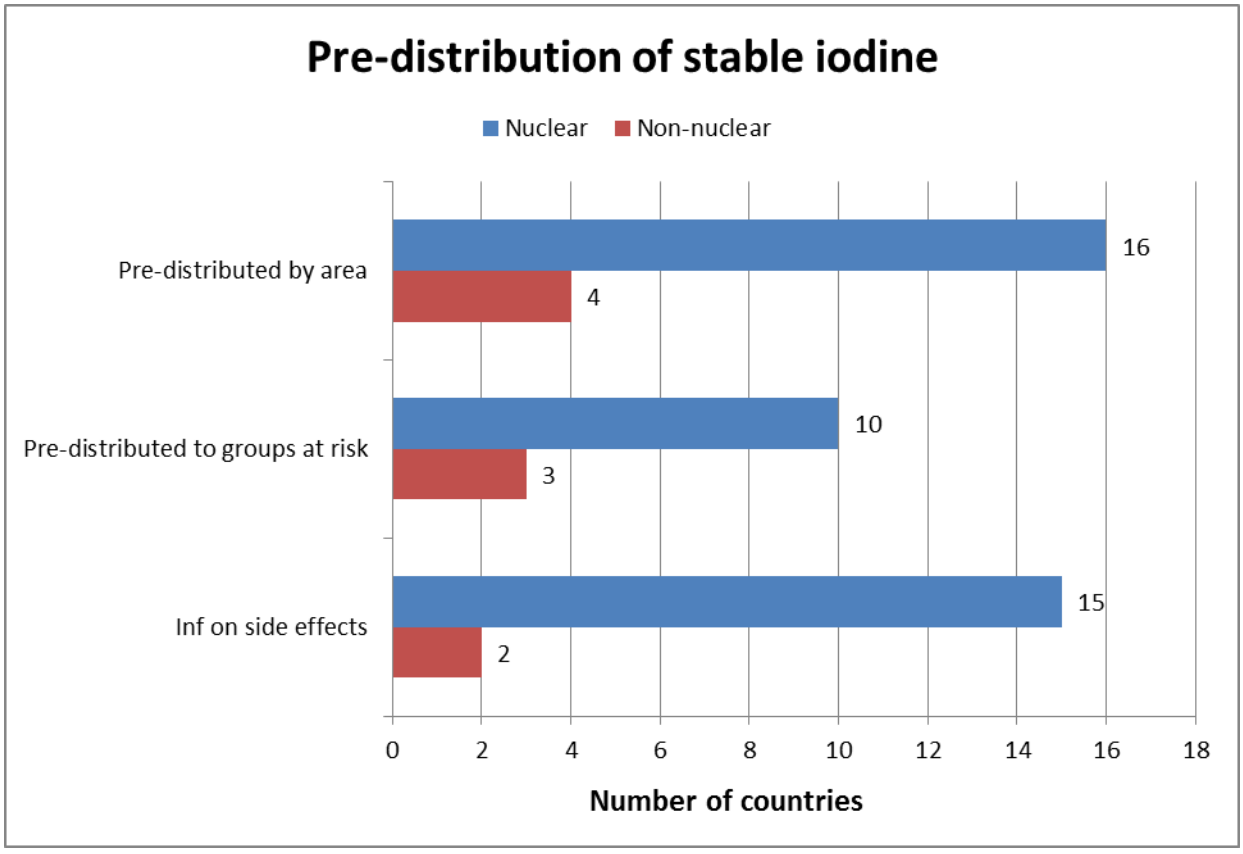


Figure 20-14: Pre-distribution of stable iodine

Only four countries provided information about the areas and numbers of people concerned. This information is summarised in Table 20-5.

Table 20-5: Areas and numbers of people concerned for stable iodine pre-distribution

Stable iodine pre-distribution	CZ	NL	SK	SE	LT
Area (km^2)	1,790		2,641	1,060	
Number of people	162,300	240,000	410,000	25,000 households	75,000

Most nuclear countries also pre-distribute stable iodine to groups at particular risk; the five that do not are Germany, Hungary, the Netherlands, Romania, Spain and Sweden. Austria, Lithuania and Luxembourg are the non-nuclear countries which pre-distribute stable iodine to groups at risk. Pre-distribution is generally to schools, nurseries and hospitals.

Information/guidance about potential side effects is provided by all countries which pre-distribute stable iodine, except Latvia and Lithuania. This is generally provided in a leaflet inside the box containing the tablets.

Most nuclear countries have additional stocks of stable iodine and arrangements for its distribution if necessary. The location of these additional supplies varies and includes civil protection or emergency response units, pharmacies, regional or national centres, and the NPP operator.

20.10.2 Sheltering (Questions 8.2.1 – 8.2.2)

The responses to the questions about the practical aspects of sheltering are summarised in Figure 20-15. In the event of an accident, all nuclear countries would recommend sheltering prior to the release of radioactive material. Of the non-nuclear countries, eight (Croatia, Ireland, Italy, Latvia, Lithuania, Luxembourg, Portugal and Norway) would also recommend sheltering prior to the release; others would recommend it only after a release has occurred. Malta and Cyprus did not consider this question relevant to their circumstances.

Nearly all countries have recommendations or guidance on the maximum duration of sheltering; only the UK, Greece and Poland do not. Of those countries which do have such recommendations/guidance, most recommend a maximum duration of 48 hours. Belgium, France, Germany and Luxembourg do not envisage sheltering for longer than 1 day, although in Luxembourg it could be extended to 2 days if evacuation was being organised; the Netherlands recommends a maximum duration of six hours.

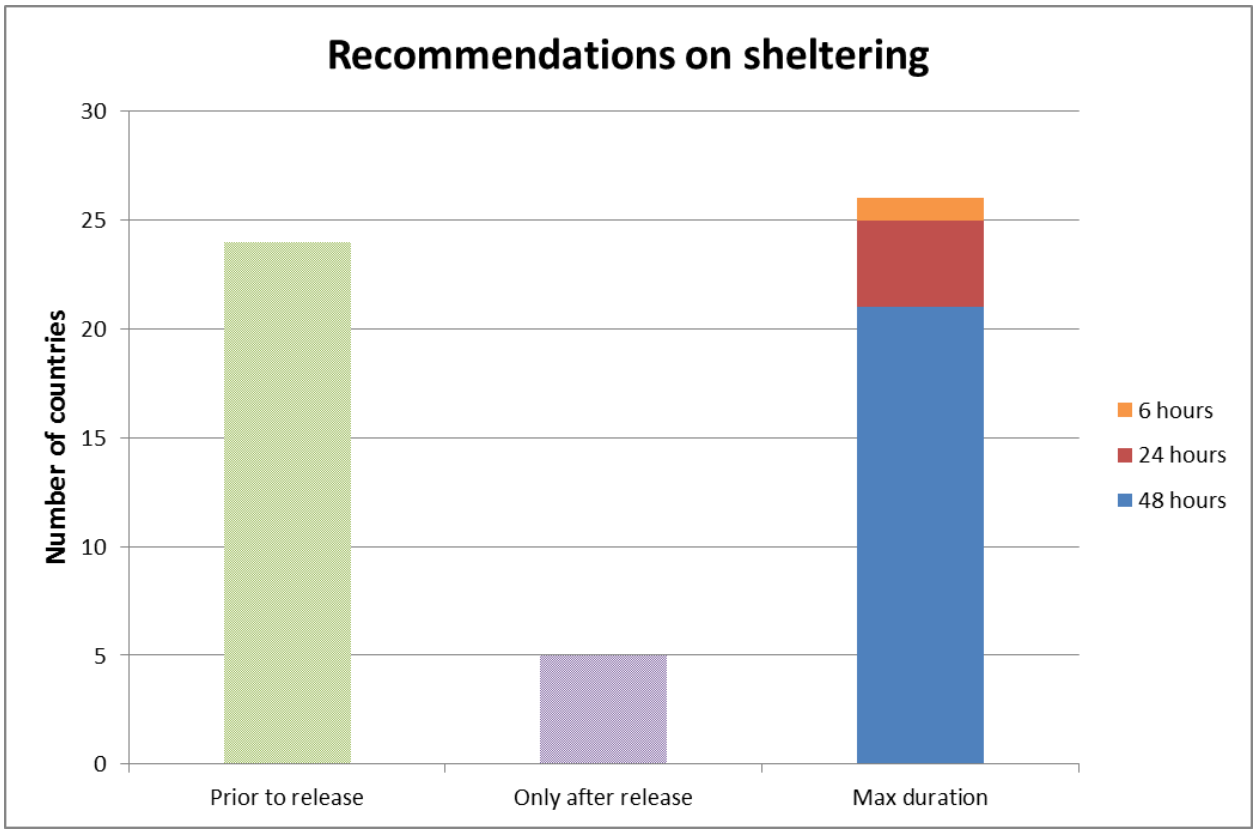


Figure 20-15: Recommendations on sheltering

20.10.3 Evacuation (Questions 8.3.1 – 8.3.4)

Figure 20-16 summarises the responses on whether, in the event of an accident, evacuation would be recommended prior to a release or only after a release had occurred. All nuclear countries, apart from the UK, would recommend evacuation prior to the release. Many non-nuclear countries did not consider this question applicable to their circumstances; of those that did, Croatia, Italy, Latvia, Lithuania, Luxembourg, Portugal and Norway would recommend evacuation prior to the release, and Greece and Poland only after the release had occurred. In general, decisions about evacuation prior to the release would be based on an assessment of the status of the NPP concerned, and predictions of potential releases and their consequences in comparison with intervention levels.

Not all countries provided information on how evacuation would be achieved. Of those that did, all reported that it would be by a combination of self-evacuation and organised transport.

Figure 20-17 summarises the responses on other practical aspects of evacuation. It indicates that most nuclear countries do make special provisions within evacuation plans for particular groups. The exceptions are Germany and Slovenia. Among non-nuclear countries, three do and four do not do so. The provisions made generally relate to hospitals, care homes, social institutions, schools and prisons.

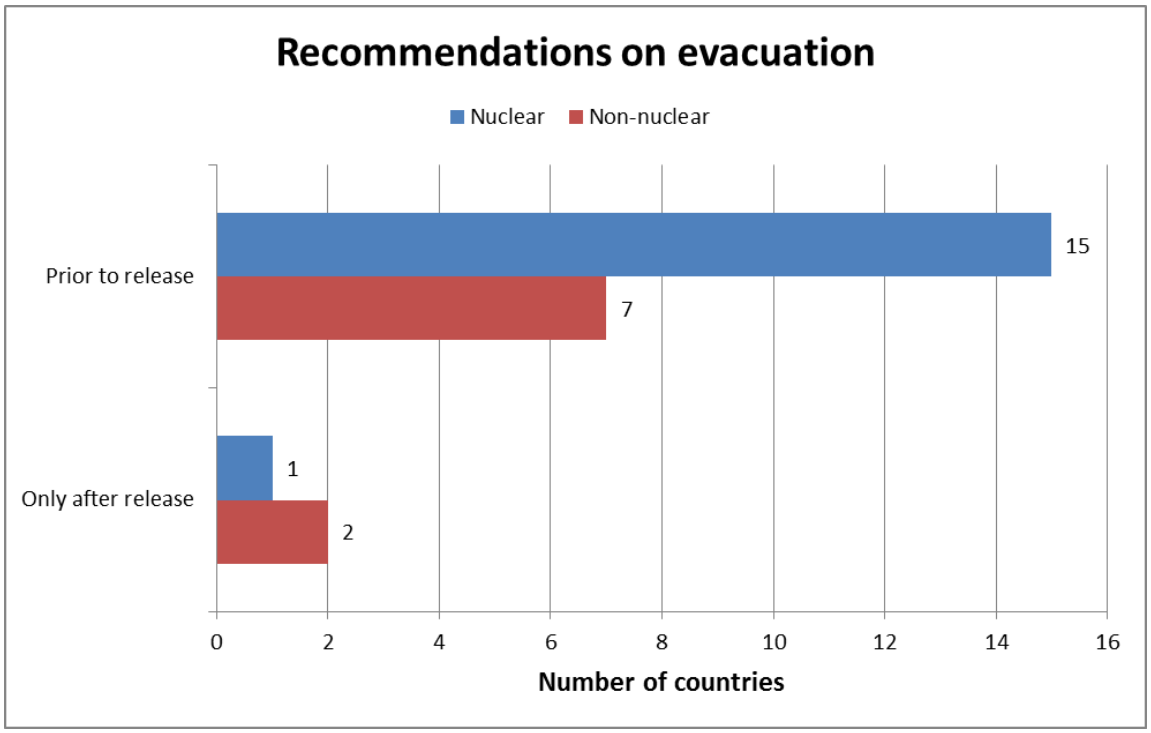


Figure 20-16: Recommendations on evacuation

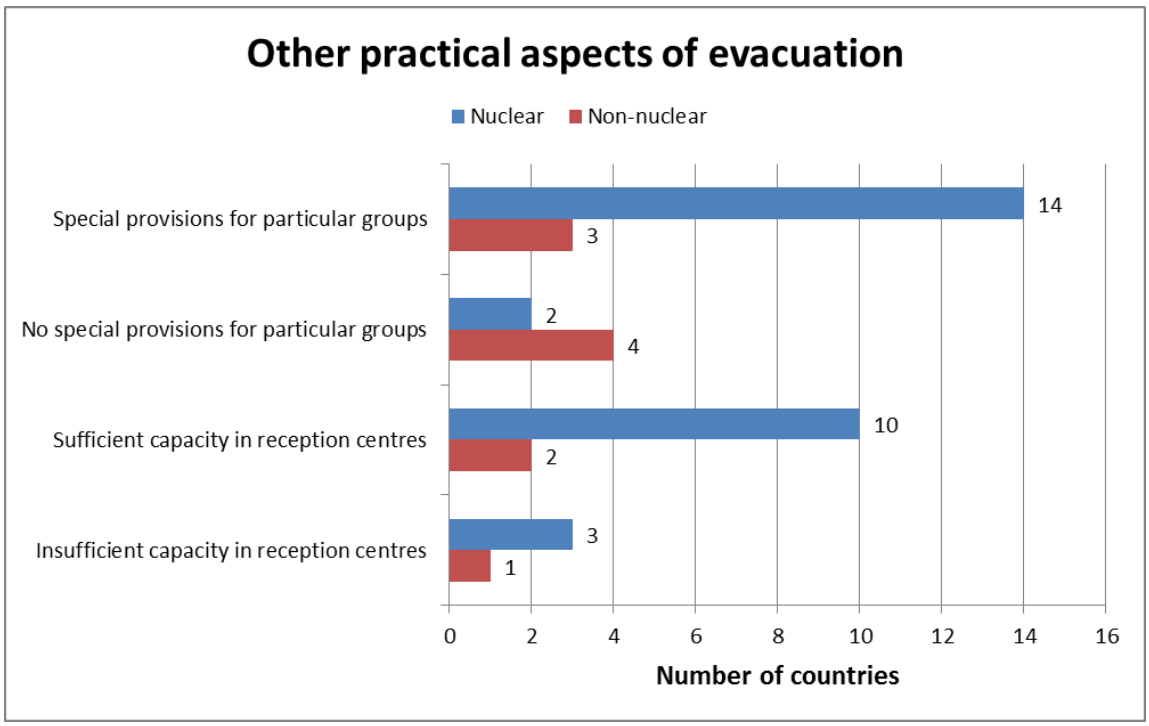


Figure 20-17: Other practical aspects of evacuation

Most countries claimed that their pre-designated reception centres did have sufficient capacity to accommodate the total population residing within the EPZ, although three countries (Belgium, Slovenia and the UK) did not answer this question (and it is clearly only applicable to countries with territory within an EPZ). The Czech Republic, Romania, Switzerland and Luxembourg were the only countries that acknowledged that their reception centres may have insufficient capacity.

20.10.4 Food and drinking water restrictions (Questions 8.4.1 – 8.4.3)

The responses to the questions about the practical aspects of food and drinking water restrictions are summarised in Figure 20-18.

All nuclear countries would, in the event of an accident, place restrictions on food and drinking water in pre-designated areas prior to confirmatory measurements being made. Among non-nuclear countries, Austria, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta and Norway would impose such restrictions, whereas Croatia, Denmark, Estonia, Greece, and Poland would not. Where countries provided further information about how these areas would be determined, the response was generally that it would be on the basis of model predictions about potential contamination levels, although Belgium and Ireland indicated that nationwide restrictions could be put in place as a precaution.

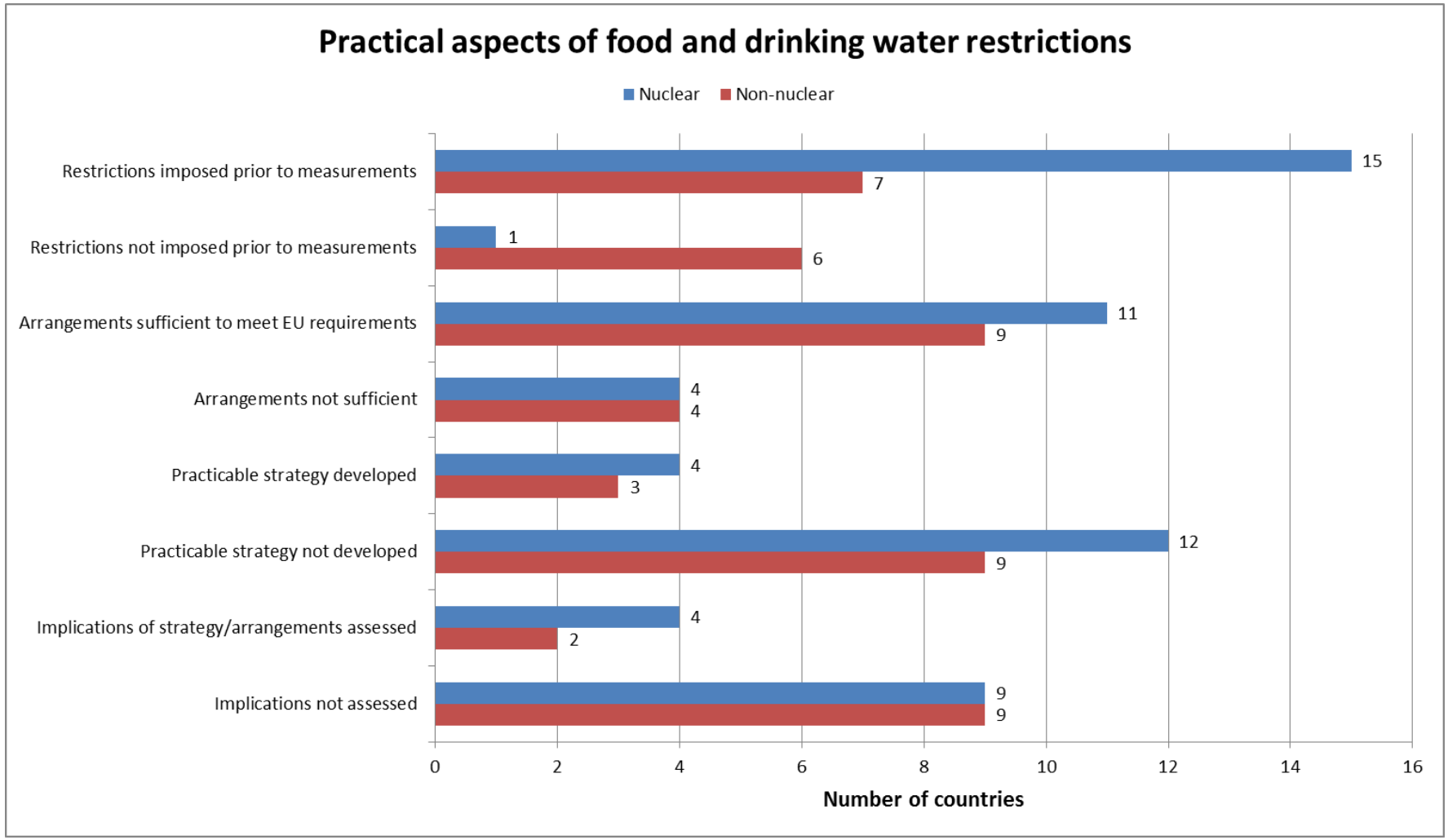


Figure 20-18: Practical aspects of food and drinking water restrictions

The Czech Republic, Cyprus and Portugal did not answer the question about whether arrangements for the control of food and drinking water were sufficiently comprehensive and robust to provide a high degree of assurance that products entering the market would meet EU requirements. Of those countries that did answer, four nuclear (Romania, Slovakia, Sweden and Armenia) and four non-nuclear (Croatia, Estonia, Latvia and Norway) countries acknowledged that their arrangements were not sufficiently comprehensive and robust.

Only seven countries (Bulgaria, Finland, France, the UK, Austria (partly), Ireland and Lithuania) claimed to have developed a practicable strategy for the management disposal of contaminated foodstuffs and livestock, and made provision for its implementation. None of these countries was able to provide much in the way of further information about the features of their strategy; instead reference was made to guidance on options or to arrangements for disposal of waste. Bulgaria and the UK referred to the establishment of a working group in the event of an accidental release which would develop appropriate actions. Austria admitted that its strategy was not yet fully developed, and Ireland that, if large amounts of food were contaminated, "there would be issues with waste management beyond those anticipated in the plans". Few countries without a strategy provided detailed information on their current arrangements; in general, either reference was made to guidance, or arrangements were described as ad-hoc. Hungary referred to guidance which includes "processing and dilution with less contaminated food and feed" as a suggested solution; whether this approach would be viable in practice, in the face of consumer concerns, is questionable.

Similarly, few countries (Bulgaria, Finland, Germany, Hungary, Austria (partly) and Poland) had assessed the implications of any strategy or current arrangements to determine whether they were practicable. In addition, several countries (France, Slovenia, Spain, Cyprus, Greece, Lithuania and Portugal) did not answer this question. No summary information was provided about the findings of any assessments that had been carried out and few reasons were put forward as to why such assessments were not considered necessary. Sweden considered the problem of wastes from decontamination activities to be much greater than that of food wastes. Estonia replied that it was unlikely that contamination of foodstuffs would reach levels that would prohibit the usual means of disposal, and Malta pointed out that there were no NPP within 1000 km, so it had made no arrangements.

20.10.5 Relocation (Question 8.5.1)

The responses to the questions about practical aspects of relocation are summarised in Figure 20-19. As with food and drinking water restrictions, only a minority of countries (five nuclear and four non-nuclear) claim to have developed a robust and defensible strategy for relocation and made provision for its practical implementation. The features of the strategy most often mentioned by these countries related to dose criteria, although a few countries also pointed out that decisions would need to take account of other factors, such as social, economic and psychological effects. The UK stated that its strategy was that a working group would

be established in the event of an emergency to develop appropriate actions and criteria depending on circumstances.

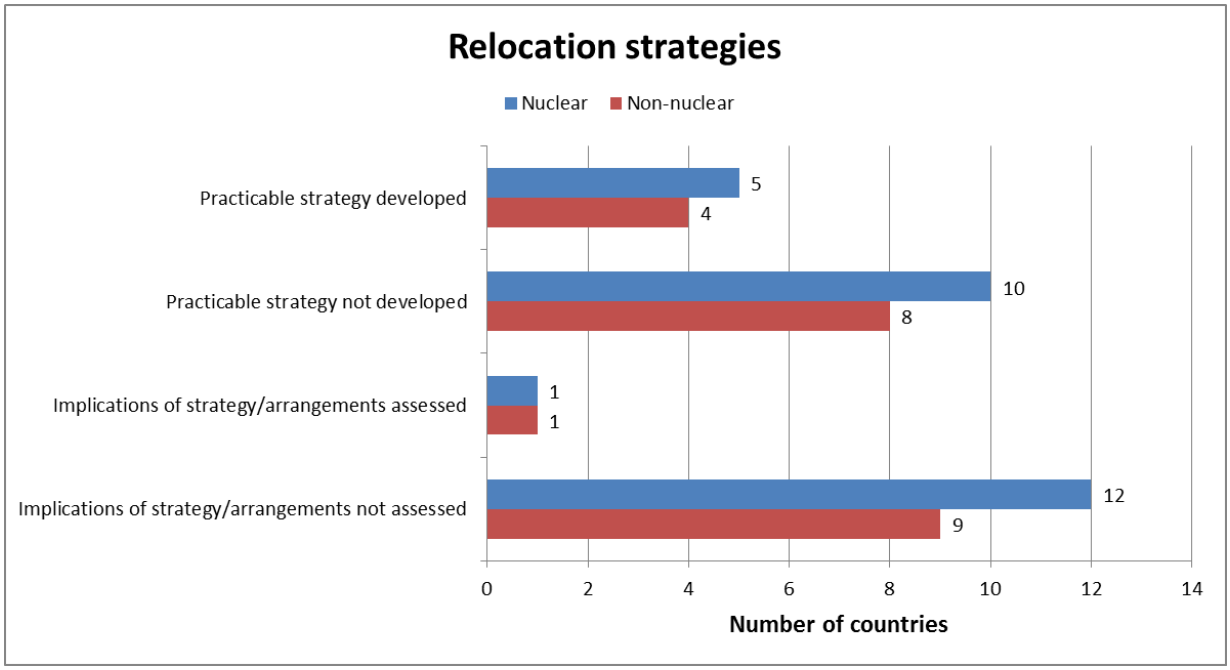


Figure 20-19: Practicable aspects of relocation

Several countries without a strategy provided no details of their current arrangements. Belgium stated that it had no current arrangements. Where further information was provided, arrangements were most often described as ad hoc. Sweden described a number of factors that would need to be taken into account in decisions about relocation (such as radiation levels, demographic circumstances, the need to maintain essential functions of society, the possibilities for decontamination) and stressed the importance of maintaining flexibility.

Only two countries (Finland and Poland) have carried out any assessment of the implications of their strategy or current arrangements to determine whether they are practicable. Neither provided much detail about the findings of the assessment. Countries which had not carried out an assessment generally did not provide any detailed reasons for not having done so. Several non-nuclear countries referred to the low likelihood of occurrence of a need to consider relocation. Hungary referred to the 'red sludge tragedy' in 2010 as providing a small scale test of its arrangements. Several countries (France, Slovenia, Greece, Ireland, and Luxembourg) again did not reply to this question.

20.10.6 Decontamination (Question 8.6.1)

The responses to the questions about practical aspects of decontamination are summarised in Figure 20-20. They show a similar pattern, with fewer countries having developed a strategy than not, and fewer having assessed the practical implications than not.

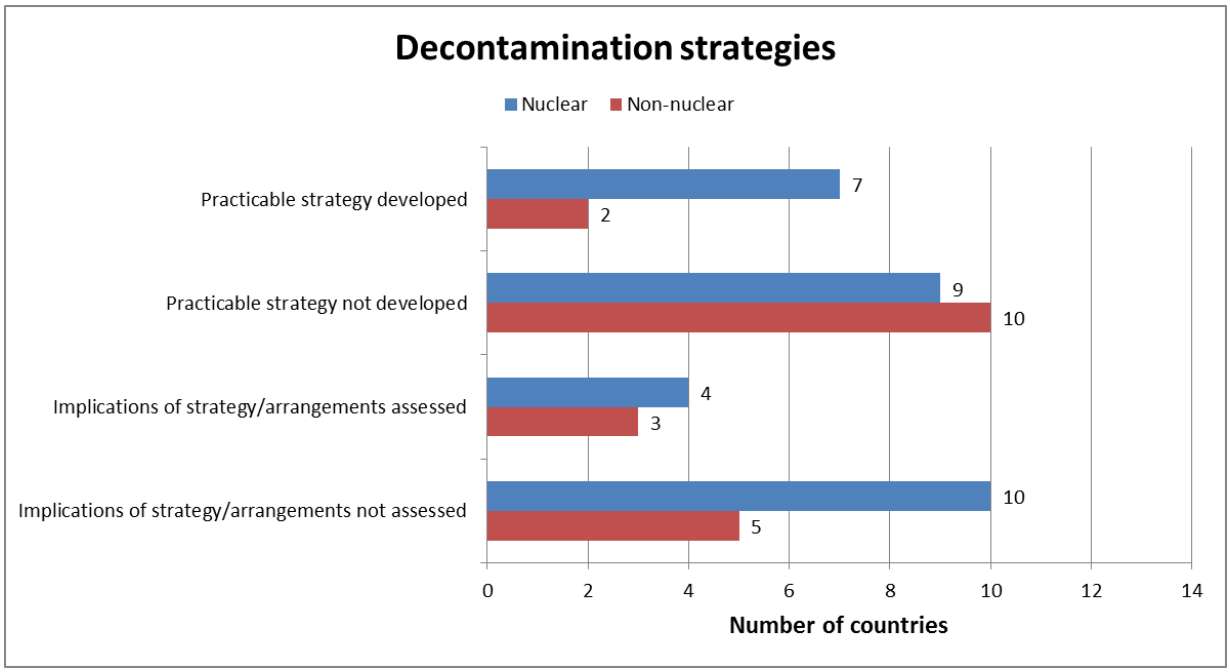


Figure 20-20: Practical aspects of decontamination

Of those countries which have a strategy for the decontamination of contaminated areas, some focused in their detailed replies more on approaches to the decontamination of people and equipment than on contaminated areas, while others referred to guidance setting out factors to be considered in selecting decontamination methods. In Sweden, strategies have been established at regional level which include a description of the decontamination organisation, the resources available, radiation measurements and what considerations need to be made in the selection of decontamination methods. Both Bulgaria and the UK state that their strategy consists of setting up a working group in the event of an emergency to develop appropriate actions and criteria. Finland described its strategy in terms of targeting decontamination on areas where a lot of people would be impacted, with special attention to areas where there are a lot of children. Countries without a strategy most often described their arrangements as ad hoc. Belgium again stated that it has no current arrangements. Denmark, Cyprus and Portugal did not answer this question.

Where the implications of strategies or current arrangements have been assessed, countries most often referred to field exercises as providing a test of practicability. Finland also referred to discussions with stakeholders and Sweden to the involvement of experts in the field. Countries which had not carried out an assessment generally did not provide any detailed reasons for not having done so. France, Slovenia, Cyprus, Denmark, Greece, Ireland, Luxembourg, Malta and Portugal did not answer this question.

20.10.7 Return from evacuation or relocation (Questions 8.7.1)

A similar pattern emerges from the responses to the questions about the practical aspects of return from evacuation or relocation – see Figure 20-21. Again, only a minority of countries have developed a strategy for the return of those evacuated or relocated and very few have assessed the implications of their strategy or current arrangements.

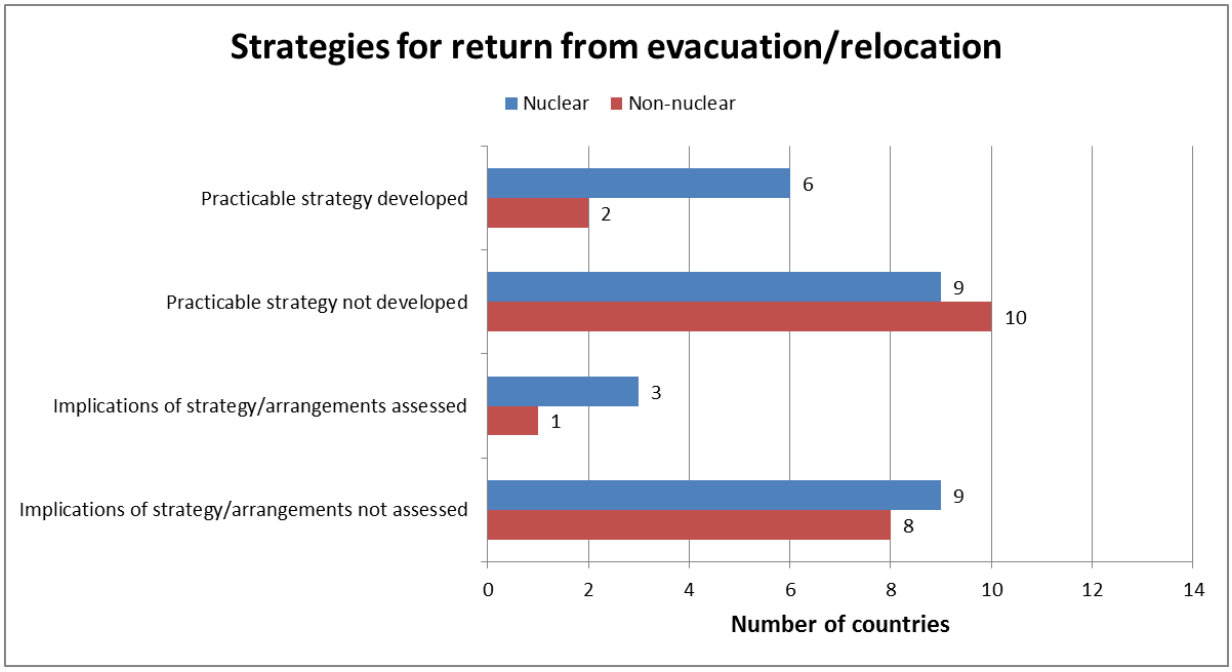


Figure 20-21: Practical aspects of return from evacuation or relocation

Countries that claimed to have developed a strategy generally referred either to guidance or dose criteria when describing the features of their strategy. The UK again referred to the establishment of a working group to decide on appropriate actions. Countries which did not claim to have a strategy generally provided few details on their current arrangements. Reference was again most often made to dose criteria. Both Belgium and Germany stated that they have no current arrangements. France, Ireland and Portugal did not answer this question.

Only four countries (the Czech Republic, Finland, Hungary and Poland) have assessed the implications of their strategies or current arrangements to determine whether they are practicable. The Czech Republic referred to frequent testing of their arrangements, mainly in the context of flooding. Few details of the findings of these assessments were provided.

Estonia considered the likelihood of its needing to implement relocation to be very low, and Austria, Lithuania and Malta considered this question to be not applicable. Otherwise little information was provided relating to why any assessments were not considered necessary. Belgium, France, Slovenia, Cyprus, Greece, Ireland, Luxembourg and Portugal did not answer this question.

20.11 Countermeasures for farm animals (Question 9.1)

Most nuclear countries include provision in their EP&R arrangements for the control and management of livestock that may be contaminated or left in evacuated or relocated areas. Only Hungary, the Netherlands, Romania and Sweden stated that they did not. Among non-nuclear countries, Austria, Ireland, Italy, Latvia, Lithuania, Luxembourg, Poland and Norway do include such provisions in their arrangements, while Croatia, Denmark, Estonia, Greece and Malta do not. The arrangements described include provisions for restricting livestock movements, feeding and housing the animals, as well as for their evacuation, decontamination and/or slaughtering.

20.12 Early warning and radiation monitoring systems (Questions 10.1 – 10.3)

20.12.1 Gamma dose rate monitors

The overall number and density of gamma dose rate monitors in national early warning or radiation monitoring systems in each country are shown in Figure 20-22 and Figure 20-23. Additional monitors are deployed around NPP but these are not included in the Figures. The number of monitors in each national system varies considerably from less than 10 to more than 2000. The density of monitors is, however, a more reliable indicator of differences between countries in terms of monitoring capability and this varies from about 0.1 to almost 10 monitors per 1000 km^2; in about half of the countries, the density of monitors falls within a range of about 1 to 5 per 1000 km^2 and, in the other half, the density is less than 1 and often considerably so. Many of these systems were installed in the aftermath of the Chernobyl accident and reflect the social and political situation then prevalent – in particular, the perceived enhanced risk of nuclear accidents in Central and Eastern Europe (CEE) and the Former Soviet Union (FSU). The higher density of monitors in Germany is a direct reflection of this and its relative proximity to CEE. The highest density of monitors is in Luxembourg and is a reflection the relatively small size of the country and the presence of NPP in neighbouring countries, ie, Belgium, France and Germany.

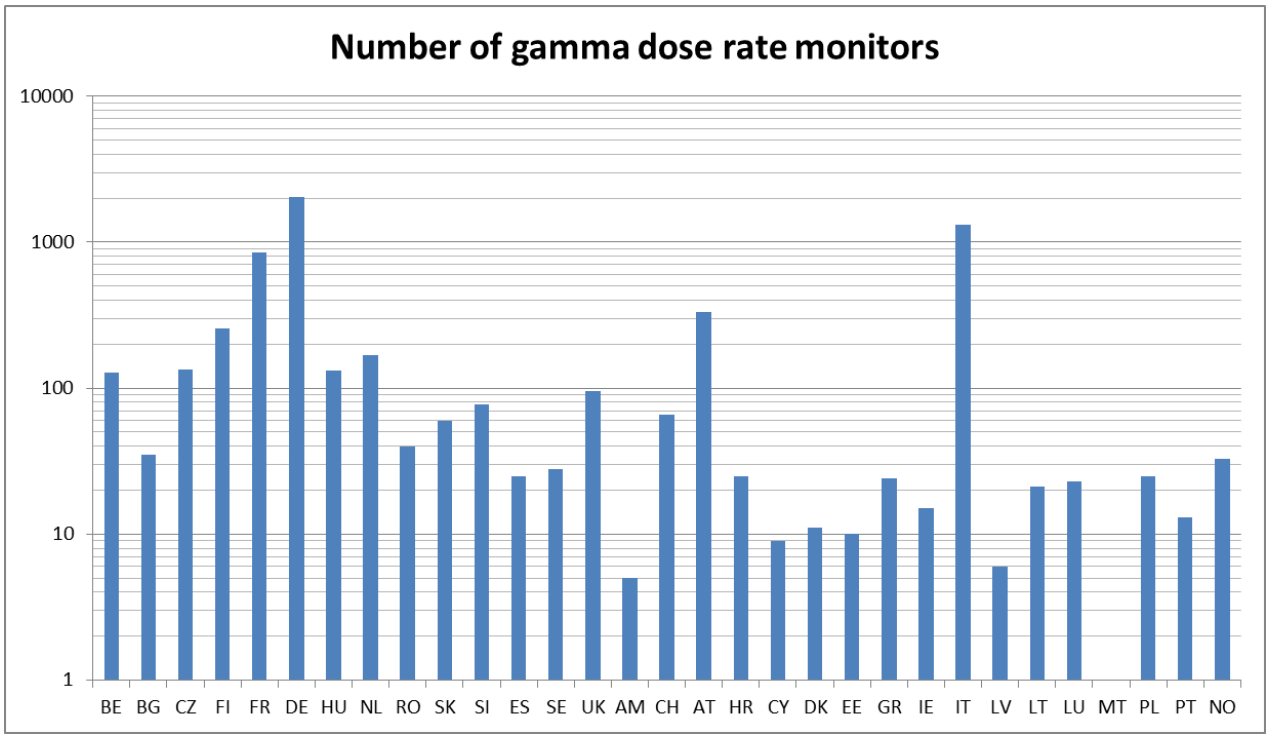


Figure 20-22: Number of gamma dose rate monitors in national early warning and monitoring systems

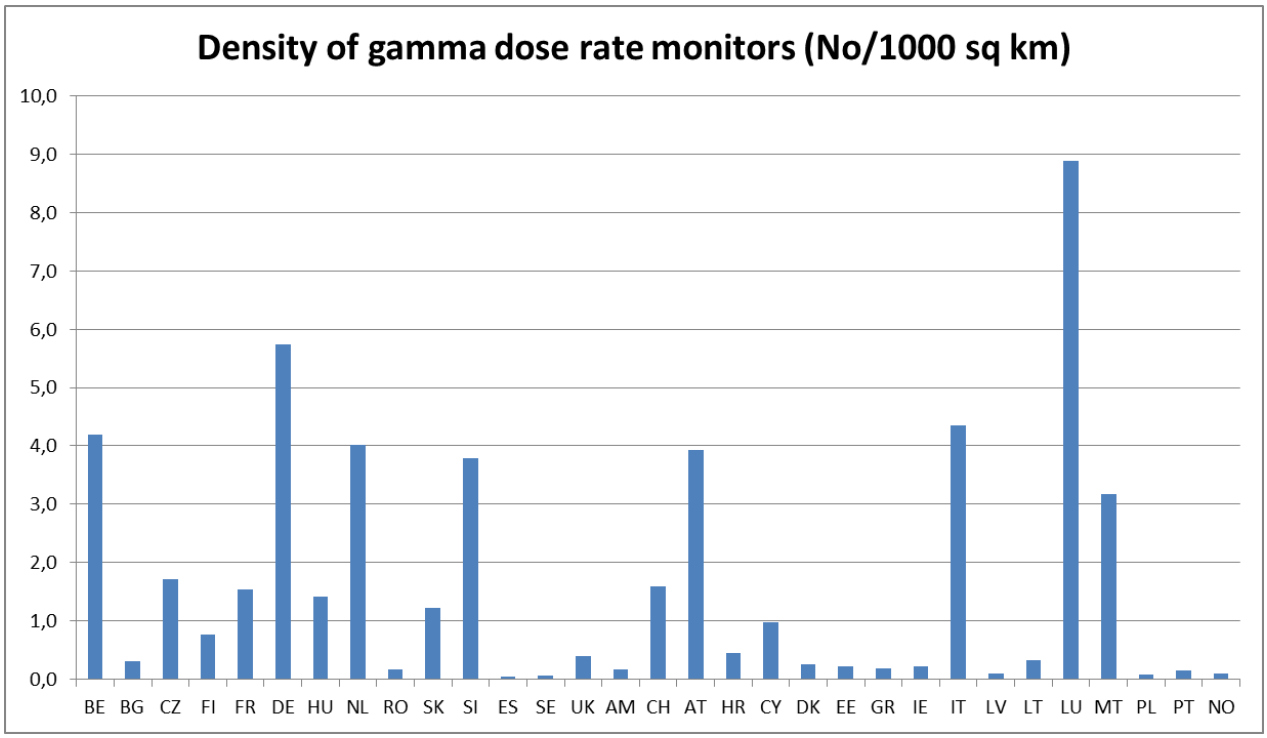


Figure 20-23: Density of gamma dose rate monitors in national early warning and monitoring systems

The extensive network of gamma dose rate monitors provides a robust system for providing early warning and an estimate of the potential significance of a release of radioactive material within Europe and/or of the arrival over the European land mass of material released elsewhere. Undue significance should not be attached to the wide variation in the density with which monitors are deployed; this is more a reflection of the political situation in the past and public attitudes and perceptions in some countries, rather than need based on technical considerations alone.

With a few exceptions (BG, SK, UK, AM, IT, and possibly also MT), the results of the early warning and radiation monitoring systems are publically available in real time within each country. Similarly, with the same few exceptions plus HR and PL, the results are publically available to third countries. All results are provided to supra-national organisations (eg, the EU through the EURDEP network with the apparent exception of LT (and also possibly AM, CY, IT and MT).

20.12.2 Gamma spectrometry

Only about one third of the countries responding to the Questionnaire have incorporated gamma spectrometers with real time data transmission within their national early warning and radiation monitoring systems (see Figure 20-24 and Figure 20-25). There is large variability between countries in both the absolute number and density of installed spectrometers. By far the highest density is in Belgium (about 2 per 1000 km^2) with the density elsewhere generally falling within a range of 0.01 to 0.1 per 1000 km^2 with the exception of Denmark and Luxembourg which are a little higher.

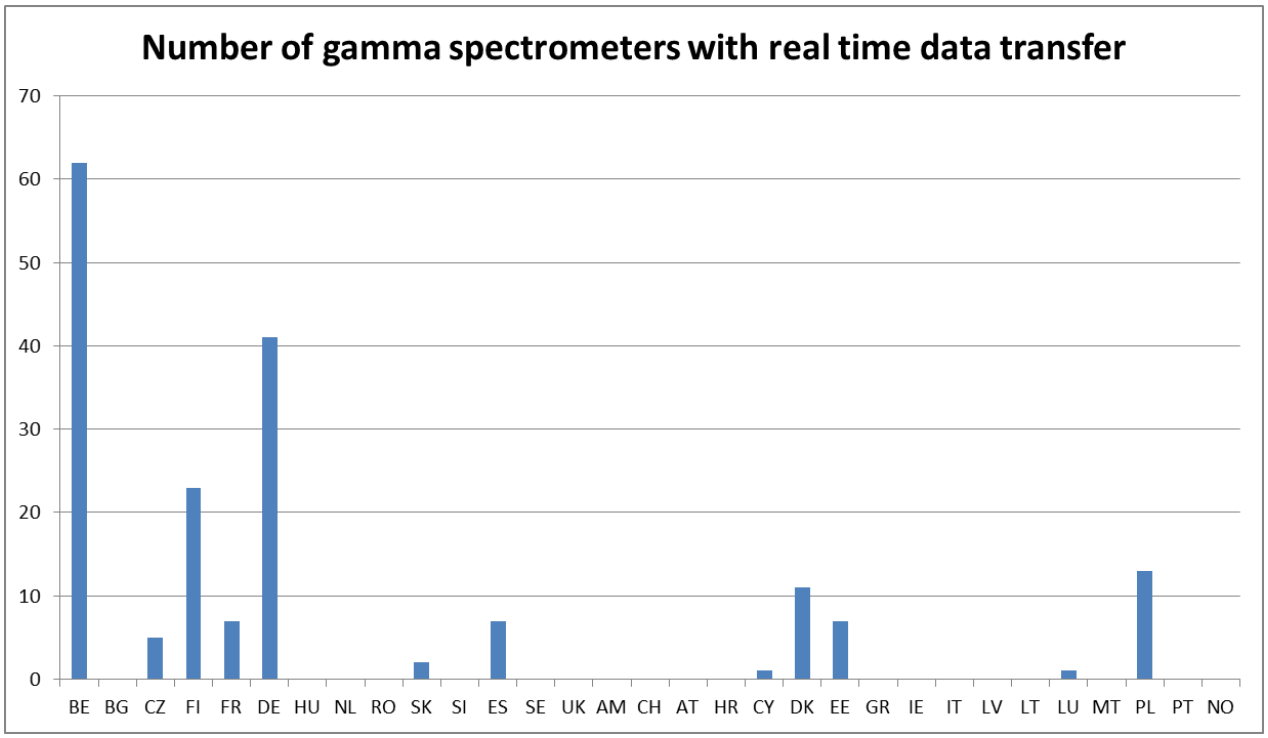


Figure 20-24: Number of gamma spectrometers with real time data transfer in national early warning and monitoring systems

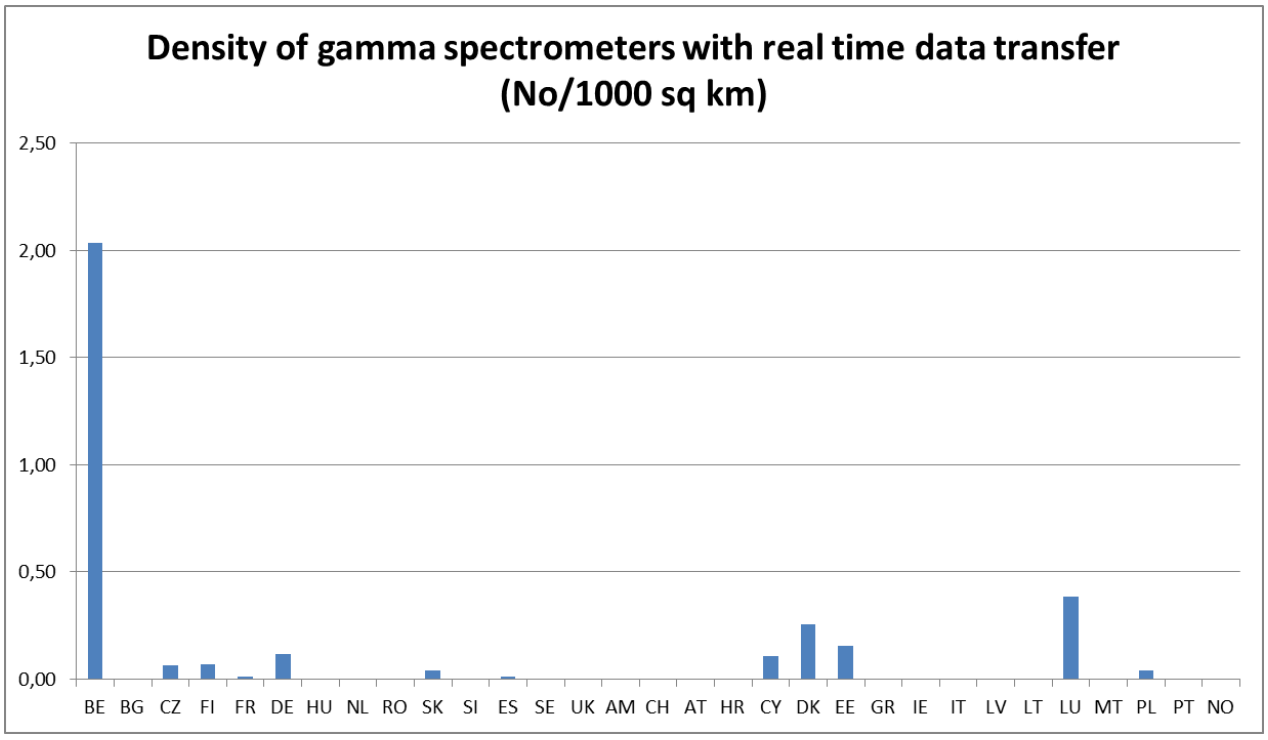


Figure 20-25: Density of gamma spectrometers with real time data transfer in national early warning and monitoring systems

Information from these spectrometers provides an early indication of the composition of any released material, which is an important input to informed decisions on how best to respond to an emergency. The absence (or relative paucity) of such spectrometers from one or other national early warning and radiation monitoring system should not, necessarily, be interpreted as a gap or a deficiency (eg, such systems may be deployed by a utility around a NPP but not part of the national system, or can be deployed manually, as necessary, in the event of an emergency). These systems have often been deployed in response to the perceived risk of accidents at NPP in third countries and their nature and extent reflect more than just technical considerations.

20.12.3 Air samplers

The number and density of air samplers incorporated within national early warning and radiation monitoring systems is shown in Figure 20-26 and Figure 20-27; a distinction is made between samplers with automatic and delayed measurements and data transmission. All countries responding to the Questionnaire (except AM and PT) have deployed one of more air samplers within their national systems. There is, however, large variability between countries in both the number and density of air samplers. Most, but by no means all, countries have deployed air samplers with automatic measurement and data transmission; their density typically falls within a range of about 0.02 to about 0.4 with a few exceptions (ie, the smaller countries where even the deployment of a small number of samplers is associated with an elevated density).

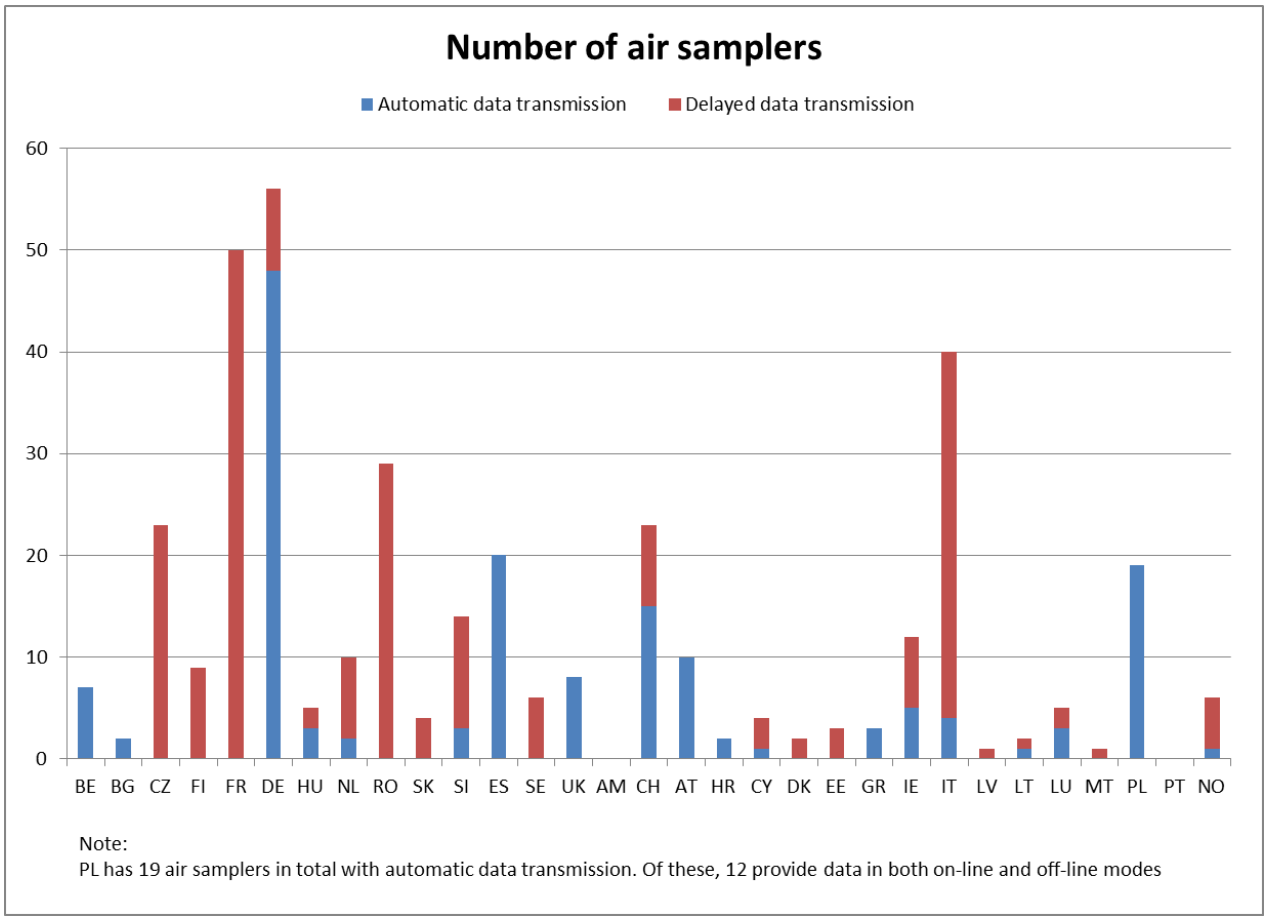


Figure 20-26: Number of air samplers in national early warning and monitoring systems

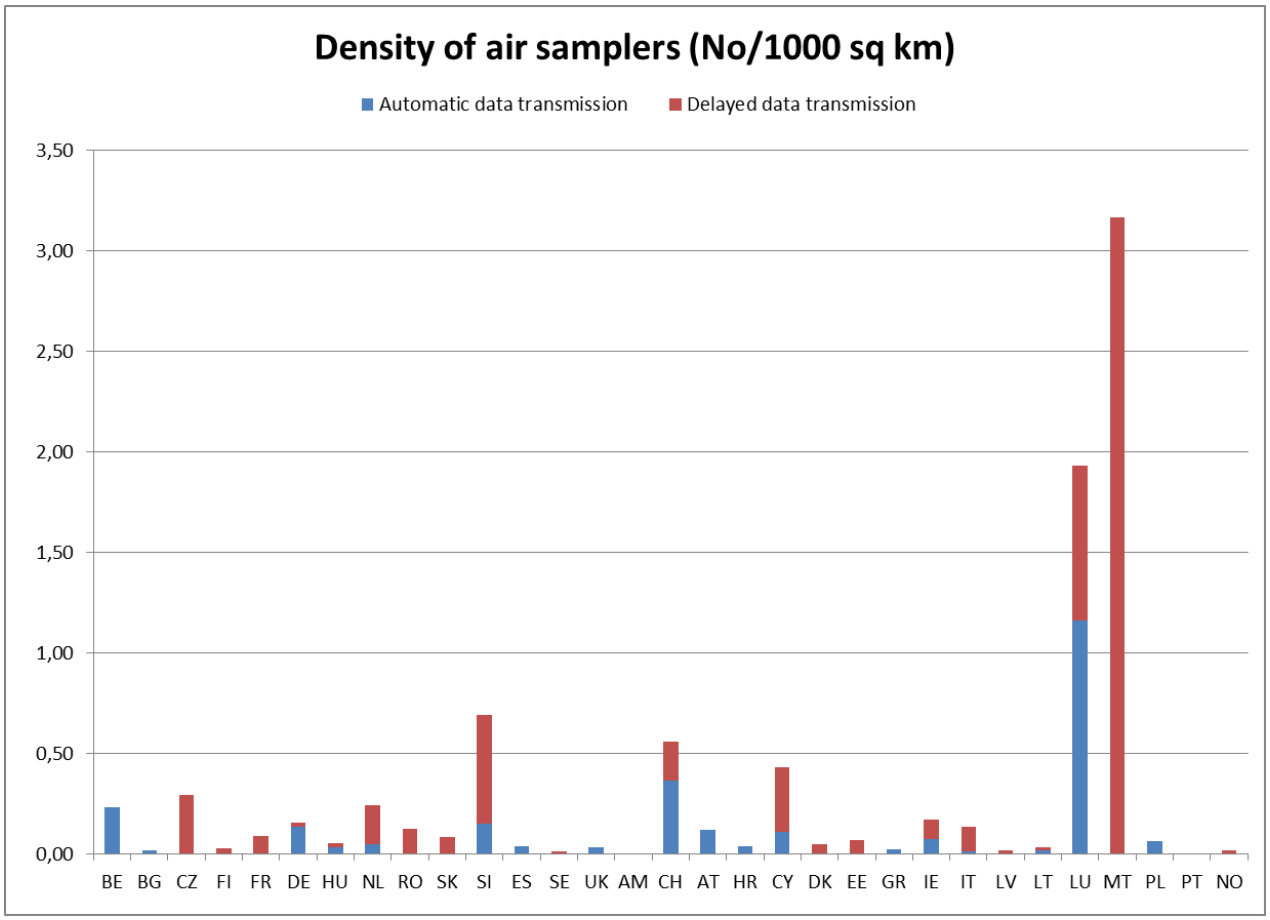


Figure 20-27: Density of air samplers in national early warning and monitoring systems

Information from air samplers also provides an early indication of the composition of any released material which is an important input to informed decisions on how best to respond to an emergency. Undue significance should not, however, be attached to the wide variation in the density with which air samplers are deployed in different countries; as for other types of monitor, these systems have often been deployed in response to the perceived risk of accidents at NPP in third countries and their nature and extent is sometimes more a reflection of this rather than need based solely on technical considerations.

20.13 National capabilities for off-site EP&R

20.13.1 Radiation Surveys (Question 11.1.1)

20.13.1.1 Vehicle based surveys

National capabilities for carrying out vehicle based radiation surveys are summarised in Figure 20-28. Capabilities are, in general, greatest in those countries with larger numbers of NPP and/or who are/were actively engaged in nuclear RTD in the civil and defence sectors. For countries with NPP, the vehicles are, in general, equipped to measure gamma dose rates, gamma spectra and air samples. An attempt was also made to assess the area that could be surveyed per day by vehicles as an input to judgements on the sufficiency of current capabilities; unfortunately, this attempt failed due to the incompleteness and/or inconsistency in responses to the questionnaire. This issue warrants further scrutiny to ensure that current capabilities are commensurate with expectations and provisions in emergency plans.

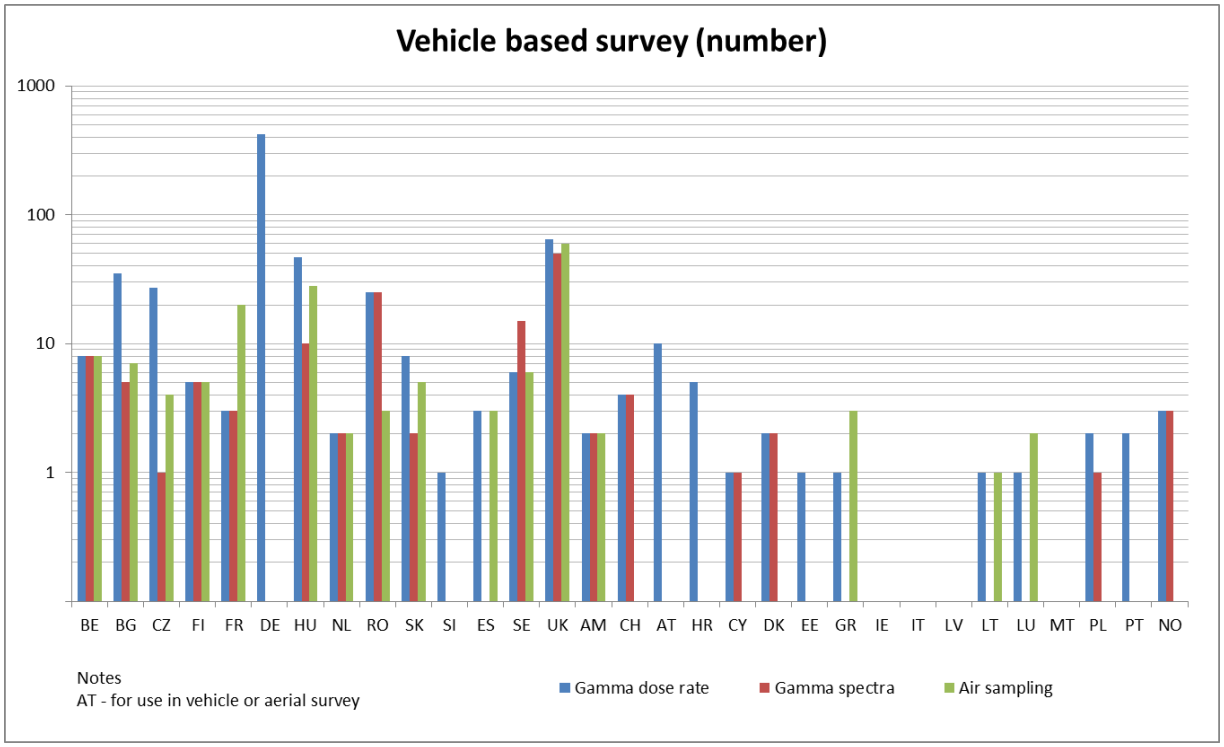


Figure 20-28: Capability for carrying out vehicle based surveys

20.13.1.2 Aerial monitoring

National capabilities for carrying out aerial surveys are summarised in Figure 20-29 with most having been established in the aftermath of the Chernobyl accident. Europe is now well endowed with capabilities in this area, although they are currently limited to about 16 countries. In most cases, a capability exists to measure (or infer) gamma

dose rates, gamma spectra and the levels of deposition of radionuclides. Aerial survey enables patterns of radionuclides deposited onto the ground to be established quickly and reliably over extensive areas following an accident; this is critical for the effective management of an emergency and for the subsequent post-accident management (ie, provision of reliable and consistent information to those affected and as a basis for sound decision making) as well as for public confidence. Notwithstanding the considerable capability for aerial survey in Europe and its effective deployment at a national level, some reservations remain over how effectively it could be deployed on a European scale due to issues of inter-calibration and potential flying restrictions. Both aspects warrant further attention and this is addressed further in the Section on Mutual Assistance.

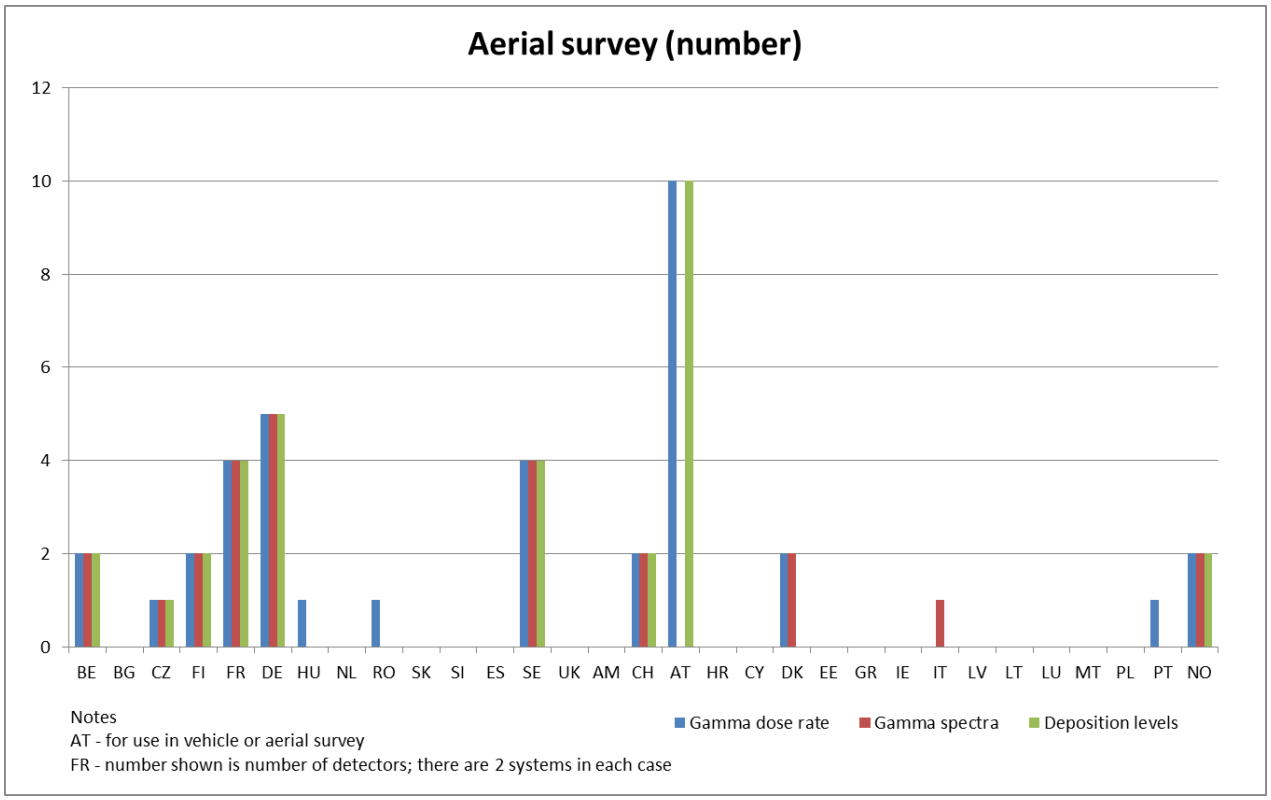


Figure 20-29: Capability for carrying out aerial surveys

An attempt was made to assess the area that could be aerially surveyed per day as an input to judgements on the sufficiency of current capabilities; unfortunately, this attempt also failed due to the incompleteness and/or inconsistency in responses obtained to the questionnaire. This issue also warrants further scrutiny to ensure that current capabilities are commensurate with expectations and provisions in emergency plans.

20.13.2 Analysis of environmental samples (Questions 11.2.1 – 11.2.5)

The national capabilities for the preparation and measuring of environmental samples using gamma spectrometry, alpha spectrometry and beta counting are summarised in Figure 20-30. It should be noted that not all countries were able to provide these

estimates, but only estimates of the number of systems. There is considerable variability between countries in their capabilities. For gamma spectrometry the capability ranges from about a few hundred to about 2000 samples per day. For alpha spectrometry, the capability in most cases ranges from about 10 to 100 samples per day, but is in excess of 1000 in Germany; in general, following most NPP accidents, the demands for alpha spectrometry would be limited and largely undertaken for confirmatory purposes. For beta counting, the capability is typically about 100 samples per day but in some cases is as low as about 10 or as high as about 1000. It is notable that several countries without NPP have comparable or larger capabilities for preparing and measuring environmental samples than some countries with NPP.

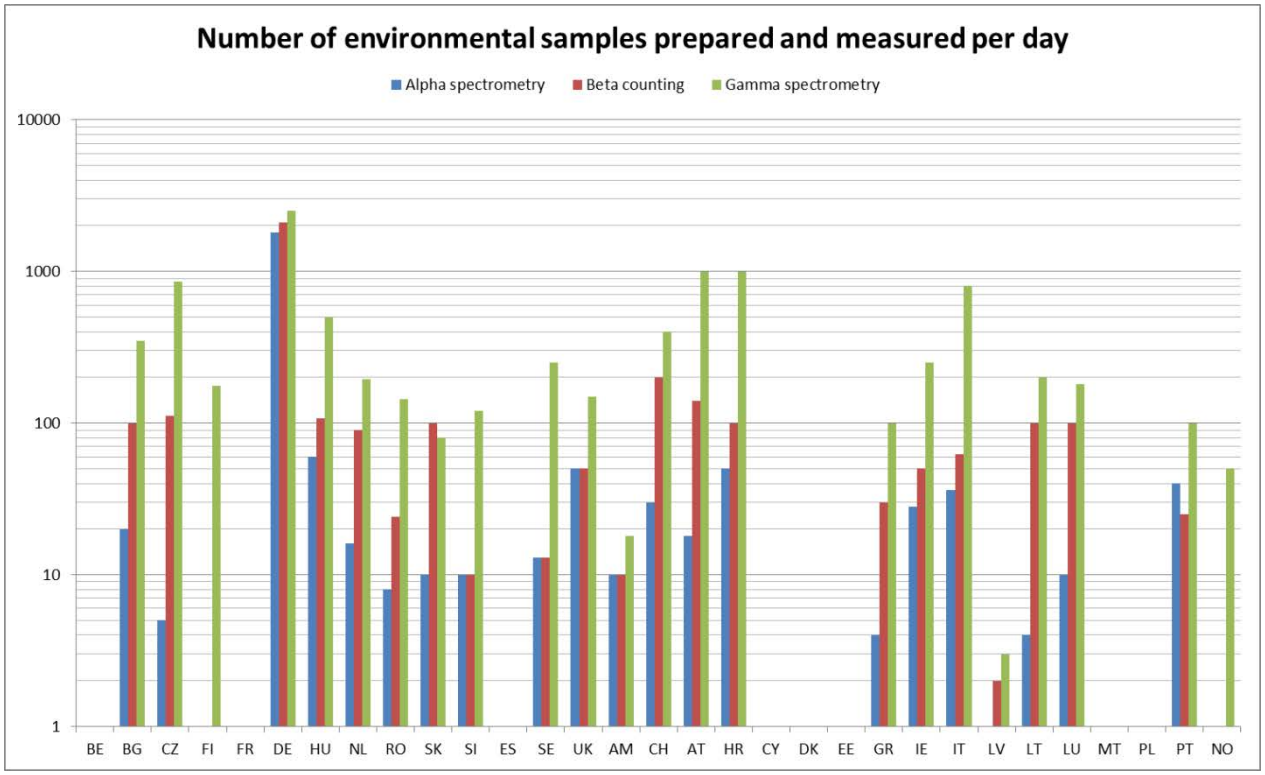


Figure 20-30: Capabilities for preparing and measuring environmental samples

In all but a few cases, the sample preparation and measurement techniques were reported as being appropriate and regularly tested for the higher levels of radionuclide concentrations that may be encountered, and for achieving more rapid throughput, in an emergency. Likewise, in most cases, QA/QC procedures appropriate to emergency situations were reported to have been developed and provisions made to deal with the risk of contamination from higher level samples. A few countries reported some limitations or reservations in respect to the above, in particular Hungary, the Netherlands, Croatia, Denmark, Estonia, Italy, Malta, Poland and Portugal.

20.13.3 Sufficiency of capabilities for radiation survey and the analysis of environmental samples

It has not been possible within the resources available for this study to make a definitive assessment of the sufficiency of the capabilities for radiation survey and the analysis of environmental samples, either at a national level or for Europe as a whole. Such an assessment would, inevitably, be inextricably linked with the scope and expectations of the emergency plan and provisions for its extendibility. It is not clear whether such systematic assessments have been conducted at a national level and/or whether these have been documented. This remains an important issue for further reflection and analysis, not only in terms of ensuring the provision of timely and reliable information for the effective management of an emergency and its aftermath, but also to satiate the inevitable demand for reassurance monitoring from civil society. It will be important to demonstrate that current capabilities are fully commensurate with provisions foreseen within existing emergency plans (and/or their foreseeable extension) and the longer term post-accident management.

20.13.4 Systems or software for technical decision support (Questions 11.3.1 – 11.3.3)

The availability of systems or software within each country for technical decision support in various areas are summarised in Table 20-6. Luxembourg and Malta have not provided any response to this question and Portugal has only responded in relation to an integrated system comprising all of the listed elements.

Atmospheric dispersion: All countries responding to the questionnaire have a capability for estimating the dispersion of accidentally released radioactive material on a national and European scale, with a few exceptions on a European scale (AM, HR, CY and DE).

Hydrological dispersion: Few countries have a capability for estimating the dispersion of accidentally released radioactive material in freshwater or marine environments. For freshwater environments only FI, DE, ES, NL, SK and AM have reported a capability at a national level with FR, UK and LT reporting capability at just a local level; only NL has reported a capability at a European level. For the marine environment only FI, FR, DE, NL, UK, IE and NO have reported a capability at a national level, with NL, UK and NO reporting a capability at a European level. The absence of this capability for 'land locked' countries is not surprising; but this still leaves many European countries bordering the sea with no capability in this area.

Transfer through the terrestrial environment: Surprisingly few countries have reported a capability for estimating the transfer of accidentally released radioactive material through the terrestrial environment. Only thirteen countries (BE, BG, FI, FR, DE, HU, SK, UK, AM, AT, LV, NO and IE) have reported a capability at a local or national level; only five have reported a capability at a European level (BG, HU, SK, UK, AT, LV). Most of the countries with capability in this area operate the ARGOS or RODOS decision support systems developed with support from the EURATOM research programme.

Transfer through the aquatic environment: Even fewer countries have reported a capability for estimating the transfer of accidentally released material through the aquatic environment. Only seven countries (FI, FR, DE, SK, UK, AM and IE) have reported a capability at a local or national level with only two of these (SK and UK) having a capability at a European level.

Dose assessment: With a few exceptions (RO, CH and HR), all countries responding this question have reported a capability for assessing doses at both local and national levels from radioactive material released accidentally to the environment, and even the exceptions have capability at one or other of these levels. Most countries with capability to estimate doses at local/national level are also capable of making estimates on a European scale (except BE, DE, ES, AM, CH, HR, CY and IE). Again, capability on a European scale is, in many countries, through the use of the ARGOS and RODOS decision support system.

Evaluation of different countermeasure options or strategies: About 60% of the countries responding to this question have a capability for evaluating different countermeasure options or strategies at a local or national level: the following countries have not reported that they have this capability – FR, NL, RO, CH, CY, EE, IT and LT. Fewer countries have this capability at a European level, namely, BG, CZ, FI, HU, SK, SE, UK, DK, GR and NO; again many of these countries operate the ARGOS or RODOS decision support systems.

Assimilation of model predictions and environmental monitoring: Less than half of the countries responding to this question have reported a capability at a local or national level to assimilate model predictions and environmental monitoring, namely, BG, CZ, FI, FR, DE, HU, SK, ES, CH, AT, HR, DK, GR, LT; of these, eight claim to have this capability at a European level, in particular, BG, CZ, FI, FR, SK, DK, GR and LT.

Integrated system containing most or all of the above elements: Twelve countries (BE, BG, CZ, FI, DE, NL, SK, AT, HR, DK, LV and PT) have reported an integrated capability or system for carrying out estimates on a local or national scale in most or all of the above areas; with the exception of BE and DE, they all claim to also have this capability at a European level. Again, many of these countries operate the ARGOS or RODOS decision support systems.

Prognoses of plant status and accident development: All countries with NPP (except AM) have reported a capability to make prognoses of the development of an accident based on plant status. A few countries without NPP also report such a capability.

Availability of technical decision support: All countries responding to this question (except UK and AM) have reported that their capabilities for technical decision support are available 24/7 and (with the additional exception of SI) in real time.

Decision support systems/software used: Some 15 countries (BG, FI, DE, HU, NL, RO, SK, SI, ES, AT, HR, GR, PL, PT and CH) have reported the use of (or plans to use) the RODOS system to support decision making in an emergency; in many of these countries RODOS is used together with other systems or software developed nationally with functionality in one or more of the above areas. Some 8 countries (SE, DK, EE, IE, LV, LT, PL and NO) have reported the use of ARGOS. Many of the models used in RODOS and ARGOS are common, with the result that there is/should be a large degree of coherence in the technical information provided in support of decision making in many countries (assuming all countries have access to the same input data).

In those countries where RODOS or ARGOS is not used, a wide range of nationally developed systems or software is used (eg, in FR (DISPRO, TRANSMER, SYMBIOSE, paZ, C3X, SILAM, etc), in UK (NAME, FARMLAND, CONDO¸ etc), in CZ (ESTE, RTARC, etc), etc).

Table 20-6: Decision support capabilities

National capabilities	Level	BE	BG	CZ	FI	FR	DE	HU	NL	RO	SK	SI	ES	SE	UK	AM	CH	AT	HR	CY	DK	EE	GR	IE	IT	LV	LT	LU	MT	PL	PT	NO
Atmospheric dispersion	Local	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y			Y		Y
	National	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y		Y
	European	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y		Y	Y			Y	Y	Y	Y	Y	Y	Y			Y		Y
Hydrological dispersion – freshwater	Local				Y	Y			Y		Y		Y		Y	Y											Y					
	National				Y		Y		Y		Y		Y			Y																
	European								Y																							
Hydrological dispersion- marine	Local				Y	Y			Y						Y									Y								
	National				Y	Y	Y		Y						Y									Y								
	European								Y						Y																	Y
Transfer through terrestrial environment	Local	Y	Y		Y	Y	Y	Y			Y				Y	Y		Y						Y		Y					
	National		Y		Y	Y	Y	Y			Y				Y	Y		Y						Y		Y					Y
	European		Y					Y			Y				Y			Y								Y					
Transfer through aquatic environment	Local				Y	Y					Y				Y	Y								Y							
	National				Y	Y	Y				Y				Y	Y								Y							
	European										Y				Y																
Dose assessment	Local	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y		Y			Y		Y
	National	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y		Y			Y		Y
	European		Y	Y	Y	Y		Y	Y	Y	Y	Y		Y	Y			Y			Y	Y	Y		Y		Y			Y		Y
Evaluation of different countermeasure options or strategies	Local	Y	Y	Y	Y			Y			Y	Y	Y	Y	Y	Y		Y			Y		Y	Y						Y		Y
	National		Y	Y	Y		Y	Y			Y		Y	Y	Y	Y		Y	Y		Y		Y	Y						Y		Y
	European		Y	Y	Y			Y			Y			Y	Y						Y		Y									Y
Assimilation of model predictions and environmental monitoring	Local		Y	Y	Y	Y		Y			Y		Y				Y	Y			Y		Y				Y				
	National		Y	Y	Y	Y	Y				Y		Y				Y	Y	Y		Y		Y				Y				
	European		Y	Y	Y	Y					Y										Y		Y				Y				

National capabilities	Level	BE	BG	CZ	FI	FR	DE	HU	NL	RO	SK	SI	ES	SE	UK	AM	CH	AT	HR	CY	DK	EE	GR	IE	IT	LV	LT	LU	MT	PL	PT	NO
Integrated system comprising all of the above	Local	Y	Y	Y	Y				Y		Y							Y	Y		Y					Y					Y	
	National	Y	Y	Y	Y		Y		Y		Y							Y	Y		Y					Y					Y	
	European		Y	Y	Y				Y		Y							Y	Y		Y					Y					Y	
Prognoses of plant status and accident development		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y		N	N		N	Y	N	Y			N	N	N
Capabilities available 24/7?		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y
Capabilities available in real time?		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y

Y	Response of 'Yes'
N	Response of 'No'

20.13.5 Decontamination capabilities for the built environment (Questions 11.4.1 – 11.4.3)

Nearly all countries have been unable to provide any estimates of their national capabilities for carrying out decontamination of the built environment. With the sole exception of Greece, even those States able to estimate national decontamination capabilities provided estimates (of the order of a few to a few tens of public buildings and homes per year) far below those potentially needed in the event of an accident of magnitude significantly beyond the design basis.

Only four countries state that their EP&R arrangements identify the potential scale and nature of decontamination that may be required in the EPZ, but none of these were able to provide any further details about the scale or nature of the decontamination that may be required. Eleven countries state that their EP&R arrangements include the stockpiling, or provision for the rapid acquisition, of equipment and materials for decontamination. However, once again, estimates of the nature and scale of these stockpiles/provisions were lacking, and arrangements were largely reliant on the resources of rescue services and civil protection bodies, plus some national stockpiles.

Although this does not necessarily indicate that capabilities are insufficient, it does indicate that very few States can be confident that they would have sufficient capabilities in the event of a nuclear emergency.

20.13.6 Medical support and treatment (Questions 11.5.1 – 11.5.3)

The existence and extent of capabilities in each country for medical support and treatment is summarised in Table 20-7, in particular for medical triage, personal decontamination, emergency treatment and psychological support and counselling. Of the countries that have responded to the relevant questions, most have indicated that they have arrangements in place for medical triage and personal decontamination; MT is the exception. Information on the extent of national capabilities is, however, more limited and has been provided by only about one third of the countries. The capability for triage and decontamination varies widely between countries, from about 10 to several thousand per day. The capability in countries with NPP is, as would be expected, generally greater.

Table 20-7: Capabilities for medical support and treatment

	BE	BG	CZ	FI	FR	DE	HU	NL	RO	SK	SI	ES	SE	UK	AM	CH	AT	HR	CY	DK	EE	GR	IE	IT	LV	LT	LU	MT	PL	PT	NO
Medical triage capability		Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	N	Y	Y	Y
Medical triage (No/day)		240				1000	30-130	1000s	96				10-100			1000						100			~50	1000		~20			
Personal decontamination capability	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y	Y	N	Y		Y
Personal decontamination (No/day)		240				1000	30-130	1000s	96				100s			200					10 - 15	250			~50	1000		~20			
Emergency treatment capability	Y	Y		Y		Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	N	N	Y		Y
Emergency treatment (No/day)		100		10-100			90				5 - 10					~10					10 - 15	2				200					10
Psychological support and counselling capability	Y	Y		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y	N	Y	N	Y		Y	Y	N	Y		Y
Psychological support and counselling (No/day)		~200				Large										1000s	Large									500	60				

Notes:

Medical triage

BG - the number is per facility (8 facilities)

DE - the number is per Emergency Care Centre

Emergency treatment

SI - in Zagreb

DE - number would depend on severity

Y Response of 'Yes'

N Response of 'No'

Decontamination

IE - arrangements under discussion for all emergencies

Psychological support and counselling

FI - not known but support for 100s in other emergencies

Most countries that have responded to the relevant question in the Questionnaire have indicated that they have arrangements in place for emergency treatment; the exceptions are SK, IE, LV, LU and MT. While the absence of such arrangements is not unexpected in those countries without NPP, their apparent absence in SK is surprising. Information on the extent of national capabilities is, however, more limited and has been provided by only about a third of the countries. The reported capability for emergency treatment varies widely between countries, from a few to a few hundred per day. The capability in countries with NPP is, as would be expected, generally greater.

Most countries that have responded to the relevant question in the Questionnaire have indicated that they have arrangements in place for psychological support and counselling following a nuclear accident; the exceptions are AM, HR, EE, IE and MT, ie, with the exception of AM, all non-NPP countries. Relatively little information is, however, reported on national capabilities and much of it is qualitative rather than quantitative. It would appear that resources for such support and counselling exist for response to emergencies more generally, and these would be accessed in the event of a nuclear emergency. It is not apparent, however, whether these resources have had any training in radiation specific issues.

It has not been possible to exercise any judgement on the adequacy or otherwise of the capabilities for medical support and treatment. Countries were requested to provide estimates of the numbers used for planning purposes (ie, for triage, decontamination, emergency treatment, psychological support, etc) but none were forthcoming. A more systematic assessment of such needs would appear to be warranted in the context of the scenarios used for the purposes of emergency planning.

20.13.7 Assessing individual doses from measurements (Questions 11.6.1 – 11.6.3)

National capabilities for assessing individual doses from different types of measurements are summarised in Table 20-8. There is wide variation between countries, both in the methods or techniques available and in the rates at which they can be used. Some countries only reported the availability of one or another technique without providing any quantitative indication of throughput (ie, UK, PL).

Some of the techniques for assessing individual doses and dose reconstruction are highly specialised and are only available in a few centres/countries, for example, electron-paramagnetic resonance in DE, ES, SE and LV; and optically stimulated luminescence in BE, CZ, DE, ES, SE, UK and EE. Access to these capabilities (and others, such as cytogenetic based biodosimetry, only available in 11 countries) elsewhere would, therefore, be important in the event of an accident in countries where they are not available. This aspect is addressed further in the section dealing with mutual assistance.

Table 20-8: National capabilities for individual dose assessment

Nuclear Countries

	BE	BG	CZ	FI	FR	DE	HU	NL	RO	SK	SI	ES	SE	UK	AM	CH
Number of measurements/dose assessments per day																
Cytogenetics-based biodosimetry	100	3	0	15		15	10	several		0	0	10-15		Y		
EPR		0	0	0		15	0			0	0	10-15	a few	N		
Optically Stimulated Luminescence/EPR	100	0	5	0		15	0			0	0	10-15	a few	Y		
Activation analysis		0	5	0		0	0			0	0			N		
In vivo bioassay – fixed whole body counter	250	180	100	30		500	50	~200		60	0	100	20-40	Y	20	50
In vivo bioassay – mobile whole body counter	50	180	100	60		100	0			15	0	80	10	Y		200
In vivo bioassay – thyroid counter	250	180	100	200		500	100	30		15	0	80	25-50	Y		314
In vitro bioassay (specify nuclide)	200 (α)	10 (^{137}Cs)	22 (^{90}Sr)	0		50 (Pu/Am)	0			0	0		10 (^{137}Cs)	Y		190 (^{3}H)
In vitro bioassay (specify nuclide)	500 (ß)					1000 (^{3}H)	0			0	0		3 (^{60}Co)			100 (^{14}C, ^{32,33}P, ^{35}S, ^{45}Ca)
In vitro bioassay (specify nuclide)	1000 (γ)					100 (^{90}Sr)	0			0	0		1 (^{238}U)			10 (^{90}Sr), 8 (α)

Demonstrated capability for dose reconstruction?		Y	Y	Y		Y	N	Y	N	Y	N	Y	Y	Y	N	Y
Software used			IMBA	IMBA et al		In house	GA-NAAS			PCXMC			IMBA	IMBA		IDEAS

Non-nuclear Countries

	AT	HR	CY	DK	EE	GR	IE	IT	LV	LT	LU	MT	PL	PT	NO
Number of measurements/dose assessments per day															
Cytogenetics–based biodosimetry						7			0	0			Y	10	0
EPR						0			4	0			0		0
Optically Stimulated Luminescence/EPR					~200[11]	0			0	0			0		0
Activation analysis						0			0	0			0		0
In vivo bioassay – fixed whole body counter	200	Y		<=75		15	30	100	0	20			Y	20	a few
In vivo bioassay – mobile whole body counter						0		300	0	0			0		~60
In vivo bioassay – thyroid counter	200					30	40	300	0	30			Y		~100-150
In vitro bioassay (specify nuclide)	250					0		200 (γ)	0	10 (γ)					
In vitro bioassay (specify nuclide)	32					0		3 (Pu)	0	1 (^{90}Sr)					
In vitro bioassay (specify nuclide)						0		200 (^{3}H)	0	4 (^{3}H)					
Demonstrated capability for dose reconstruction?	Y			N	N	N	N		N	Y		N	Y		Y
Software used	IMBA									IMBA					IMBA

Y Response of 'Yes'
N Response of 'No'

[11] Thermoluminescence

Capabilities for in-vivo monitoring are much more prevalent: fixed whole body monitors are available in some 23 countries, mobile whole body monitors in 12 countries, and thyroid monitoring in 19 countries. The number of measurements that can be made per day varies considerably between countries and reflects, at least partially, the historical size of the nuclear programme and of the supporting RTD infrastructure. The number of whole body measurements that can be made with fixed counters generally range from a few tens to hundreds per day; the variation in the rates for mobile whole body measurements and for thyroid measurements is comparable. These national capabilities for whole body and thyroid monitoring appear to be considerable; however, a careful and systematic assessment (if it does not already exist) should be made of their adequacy in relation to the scenario/s assumed/adopted for the purposes of emergency planning and the anticipated public demand for personal monitoring that may ensue following any nuclear accident, if only for reassurance. Mutual assistance could, of course, make up for any limitation in a country's capabilities, but would need appropriate planning.

Fourteen countries have institutes with recognised capabilities for individual dose reconstruction. Most of the countries which provided a response use the IMBA software (based on ICRP bio-kinetic and metabolic models) for the purposes of estimating doses from incorporated nuclides, but 'in-house' software/models are also used in some countries. This represents a major European capability that should be sufficient to cope with most eventualities; it would, however, probably need to be better coordinated/integrated were full and effective use to be made of it in any future accident that may affect Europe.

20.14 Public information and communication (Questions 12.1 – 12.6)

The responses to the questions about arrangements for public information and communication are summarised in Table 20-9, for nuclear countries, and in Table 20-10, for non-nuclear countries.

All countries impose a legal obligation to provide information to the public on radiological and nuclear emergencies. For EU Member States, this is a requirement of European law.

Table 20-9: Mapping of responses to questions about public information and communication – Nuclear Countries

Public information and communication	BE	BG	CZ	FI	FR	DE	HU	NL	RO	SK	SI	ES	SE	UK	AM	CH
Legal obligation to provide information to the public on radiological and nuclear emergencies?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Who is responsible for providing prior information to the public on radiological and nuclear emergencies?																
Licensee:	Y	Y	Y	Y		N	Y	N	Y	Y	Y	Y	N	Y	Y	
Regulatory authority:	Y	Y	N	Y	Y	Y	N	N	Y	Y		Y	Y		Y	
Local government:	Y	Y	Y	Y		Y	Y	Y	Y	Y		Y	Y	Y	Y	Y
National government:	Y	Y	N	Y		Y	Y	Y	Y	Y		Y	Y		Y	
Other:	Y		Y		Y		N	N				Y	Y			
What is the basis for deciding which members of the public should receive prior information?																
Distance from facility:		Y	N	N	Y	Y	Y	N	Y	Y			Y		Y	
Those within EPZ:	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Local or regional government boundary:		Y	N	Y	Y	Y	N	Y	Y	N		Y	N			
Other:	Y		N	Y		Y	N	N	Y	Y			N			
How is this information communicated?																
Leaflets/brochures:	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y
Public meetings:	Y	Y	Y	Y	Y	N	Y	Y		Y		Y	Y			N
Training courses:		Y	N	N		N	Y	N		Y		Y	N		Y	N
Other:	Y	Y	N	Y		Y	Y	Y		N			Y	Y		
Responsibilities defined for informing the public in the event of an emergency?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Licensee has defined responsibilities?	Y	Y	Y	Y	Y	N	Y	N	Y	Y		Y	N	Y	Y	Y
Local authority has defined responsibilities?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Emergency services/civil defence have defined responsibilities?	Y	Y	Y	Y		Y	Y	N	Y	Y	Y	Y	N	Y		
National government has defined responsibilities?	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y		Y	Y
Others have defined responsibilities?	Y		Y				Y	N				Y	N			
Arrangements in place to ensure information is useful, timely, truthful, consistent, & appropriate?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y

Table 20-10: Mapping of responses to questions about public information and communication – Non-nuclear Countries

Public information and communication	AT	HR	CY	DK	EE	GR	IE	IT	LV	LT	LU	MT	PL	PT	NO
Legal obligation to provide information to the public on radiological and nuclear emergencies?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Who is responsible for providing prior information to the public on radiological and nuclear emergencies?															
Licensee:							N	N	N	Y			Y	N	Y
Regulatory authority:		Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y
Local government:			Y	Y			N	Y	Y	Y	Y		Y	Y	Y
National government:	Y		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Other:		Y					N	Y	N		Y		N	Y	N
What is the basis for deciding which members of the public should receive prior information?															
Distance from facility:		Y							N	Y			Y		Y
Those within EPZ:		Y	Y						Y	Y			N		Y
Local or regional government boundary:			Y						N		Y		N		Y
Other:	Y				Y		Y	Y	N			Y	Y		Y
How is this information communicated?															
Leaflets/brochures:	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y		N		N
Public meetings:			Y			Y	N	Y		Y			N		Y
Training courses:		Y				Y	N	Y		Y			N		N
Other:	Y				Y	Y	Y		Y	Y	Y	Y	Y		Y
Responsibilities defined for informing the public in the event of an emergency?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Licensee has defined responsibilities?			Y				Y	N	N	Y			Y	N	Y
Local authority has defined responsibilities?	Y		Y				Y	Y	Y	Y	Y		Y	Y	Y
Emergency services/civil defence have defined responsibilities?		Y	Y	Y		Y	Y	N	Y	Y	Y		N	Y	Y
National government has defined responsibilities?	Y		Y	Y		Y	Y	N	Y	Y	Y	Y	Y	Y	Y
Others have defined responsibilities?					Y	Y	N						N		Y
Arrangements in place to ensure information is useful, timely, truthful, consistent, & appropriate?	Y	N	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y

Y Response of 'Yes'
N Response of 'No'

20.14.1 Prior information

In many countries, the responsibility for providing prior information is shared among all or most of the institutions listed (licensee, regulatory authority, local and national government). Among nuclear countries, only France, Slovenia and Switzerland have allocated this responsibility to one organisation (to the regulatory authority, to the licensee, and to the local authority, respectively). Similarly, among non-nuclear countries, only Austria and Estonia gave the responsibility to one organisation (to national government and the regulatory authority, respectively). Sharing the responsibility for providing prior information among more than one organisation raises the issue of how consistency is ensured.

Among nuclear countries, local was authorities were mentioned most often as having responsibility for providing prior information; among non-nuclear countries, it was national government and the regulatory authority.

Among nuclear countries, the most common basis for deciding which members of the public should receive prior information was those within the EPZ. Among non-nuclear countries, there was usually some other rationale unrelated to distance from any facility or local or regional boundary, mainly because only two of these countries have territory within the EPZ of NPP.

Most countries used more than one method for communicating this prior information, although Romania, Slovenia and Switzerland rely on leaflets or brochures, and the UK, Malta and Poland rely on other methods. Leaflets or brochures provide the method used most often by both nuclear and non-nuclear countries for communicating prior information. Public meetings are also frequently used. Websites were mentioned most often as providing another communication method.

20.14.2 Informing the public in the event of an emergency

All countries have defined responsibilities within their EP&R off-site arrangements for informing the public in the event of an emergency. Among nuclear countries, these responsibilities have, in all cases, been defined for more than one of the organisations listed, and, in about half of the cases, they have been defined for all of the organisations listed. The local authority has defined responsibilities in all nuclear countries. Among non-nuclear countries, also, responsibilities have generally been defined for more than one of the organisations listed. For non-nuclear countries, the national government has defined responsibilities for informing the public most often, followed by the local authority and the emergency services/civil defence. These responses again raise the question of how to ensure information provided to the public in the event of an emergency is consistent.

Four countries admitted that they did not have "arrangements or mechanisms in place to ensure that the information provided to the public by those responsible in the event of an emergency is useful, timely, truthful, consistent and appropriate" – a GS-R-2 [IAEA, 2002] requirement. Many countries did provide summary descriptions of

their arrangements for coordinating communication to the public in the event of an emergency, but others did not.

20.15 Mutual assistance (Questions 13.1 – 13.4)

The status of arrangements for mutual assistance between countries and with supra-national organisations is summarised in Table 20-11.

All countries participating in this study are party to the IAEA Convention on Mutual Assistance with the exception of Malta. Notwithstanding this, fewer than half of countries have registered capabilities with IAEA's RANET (Response Assistance NETwork), which is the implementing mechanism for the Mutual Assistance Convention; only eleven countries (CZ, FI, FR, DE, HU, RO, SI, SE, UK, AT, NO) have so far registered capabilities but IE and CH also plan to do so.

Table 20-11: Mutual assistance arrangements

	BE	BG	CZ	FI	FR	DE	HU	NL	RO	SK	SI	ES	SE	UK	AM	CH	AT	HR	CY	DK	EE	GR	IE	IT	LV	LT	LU	MT	PL	PT	NO
Party to IAEA Convention on Mutual Assistance?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
Registered/indicated willingness to provide assistance through MIC?	Y	Y	Y	N	Y	N	Y	N	Y	Y	N	Y	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	Y	N	N	Y	Y
Registered capabilities with IAEA RANET?	N	N	Y	Y	Y	Y	Y	N	Y	N	Y	N	Y	Y	N	Y/N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	Y
Mutual assistance arrangements with neighbours/others?	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	N	Y	N	Y

Y Response of 'Yes'
N Response of 'No'

A comparable number (thirteen) of countries (BE, BG, CZ, FR, HU, RO, SK, ES, AT, IT, LU, PT, NO) have registered (or expressed a willingness to register) capabilities with the European Commission's Emergency Response Coordination Centre (ERCC, formerly MIC), in particular, in the context of the radiological and nuclear aspects of responding to CBRN emergencies. It should be noted that the differences between the countries registered (or planning to register) under RANET and those registered with ERCC/MIC may reflect differences in the type of assistance being considered by the responding organisations: primarily radiological in the case of RANET and conventional in the case of ERCC/MIC.

Some twenty-four countries have indicated that they have bi-lateral arrangements in place for mutual assistance with other European countries. Some others claimed to have such agreements, but then only provided details on early notification and information exchange agreements. These arrangements between countries are illustrated in Figure 20-31. There are inconsistencies in the information provided by some countries (ie, as to whether particular bi-lateral arrangements are in place). Some of these can be attributed to differences in whether, in their responses, countries have only considered agreements specifically relating to radiological/nuclear emergencies, or whether they have included mutual assistance agreements covering a wider range of emergencies. The existence or otherwise of such arrangements will need to be verified by the countries concerned.

Those countries that have registered (or are planning to register) capabilities for mutual assistance with RANET are summarised in Table 20-12; an indication is given in each case of the nature (or category) of mutual assistance offered. By far the majority of registered or planned capabilities fall into the following four categories: radiation survey; environmental sampling and analysis; assistance and advice; and individual dose assessment. By comparison, there are few capabilities registered or planned to be registered in the areas of decontamination (two) and medical support (four). The overall number of capabilities registered (or planned to be registered) by each country are illustrated in Figure 20-32.

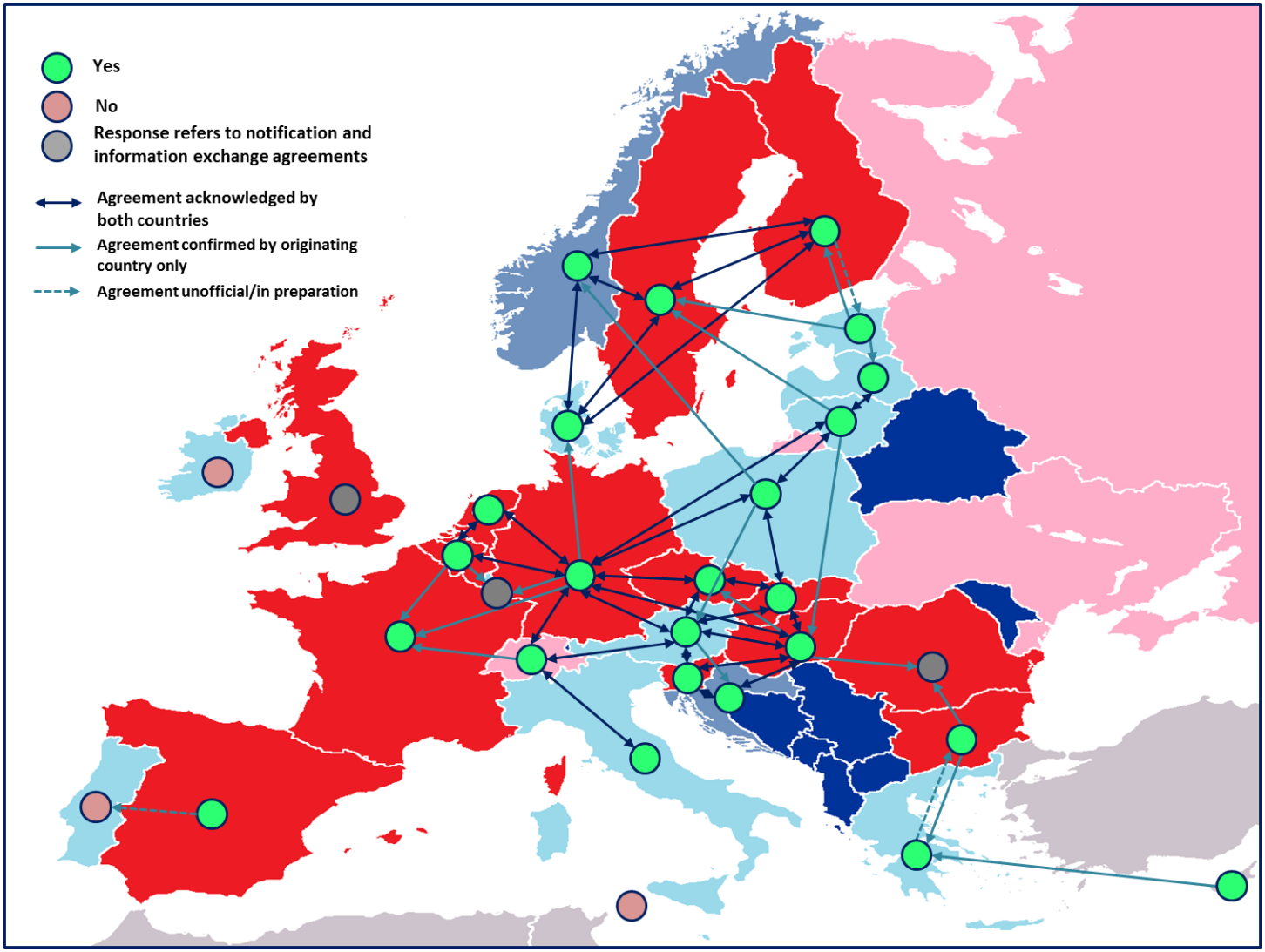


Figure 20-31: Bi-lateral arrangements for mutual assistance

Table 20-12: Capabilities registered or planned to be registered with RANET

		BE	BG	CZ	FI	FR	DE	HU	NL	RO	SK	SI	ES	SE	UK	AM	CH	AT	HR	CY	DK	EE	GR	IE	IT	LV	LT	LU	MT	PL	PT	NO
Radiation Survey																																
Foot/manual/ground based survey	RS-1			R	P	R	P	R		R		R		R			P	R														
In-situ gamma spectrometry	RS-2			R	P	R	P			R		R		R			P															
Vehicle based survey	RS-3			R	P		P	R				R		R				R														
Aerial based survey	RS-4			R		R	P			R				R				R														
Environmental Sampling and Analysis																																
Environmental sampling	ESA-1			R		R		R		R		R		R	R		P							P								
Gamma spectrometry	ESA-2			R	P	R	P	R		R		R		R	R		P							P								R
Alpha spectrometry	ESA-3			R		R	P					R		R	R		P															
Beta counting	ESA-4			R		R	P			R		P		R	R		P															
Assessment and Advice																																
Atmospheric dispersion	AA-1			R	P	R	P	R				P			R																	
Hydrological dispersion	AA-2																															
Radio-ecological models	AA-3						P								R																	
Dose predictions	AA-4			R	P	R	P	R		R		P		R	R																	
Public health protection	AA-5				P	R		R		R				R	R																	
Remediation and recovery	AA-6			R		R									R																	
Decontamination																																
Expertise in decontamination	DE-1																															
Support in decontamination	DE-2									P		P																				
Medical support																																
Medical triage	MS-1					R																										
Support in treatment	MS-2					R		R																								
Emergency treatment	MS-3					R																										
Psychological support	MS-4																															
Individual dose assessments																																
Cytogenetics-based bio-dosimetry	DA-1				R	R	P	R							R																	
EPR	DA-2						P																									
Optically Stimulated Luminescence/EPR	DA-3						P																									
Activation analysis	DA-4																															
In vivo bioassay	DA-5			R		R	P								R																	
In vitro bioassay	DA-6			R		R	P								R																	
Internal dose calculations	DA-7			R		R	P	R							R		P															
Dose reconstruction	DA-8			R		R		R							R																	

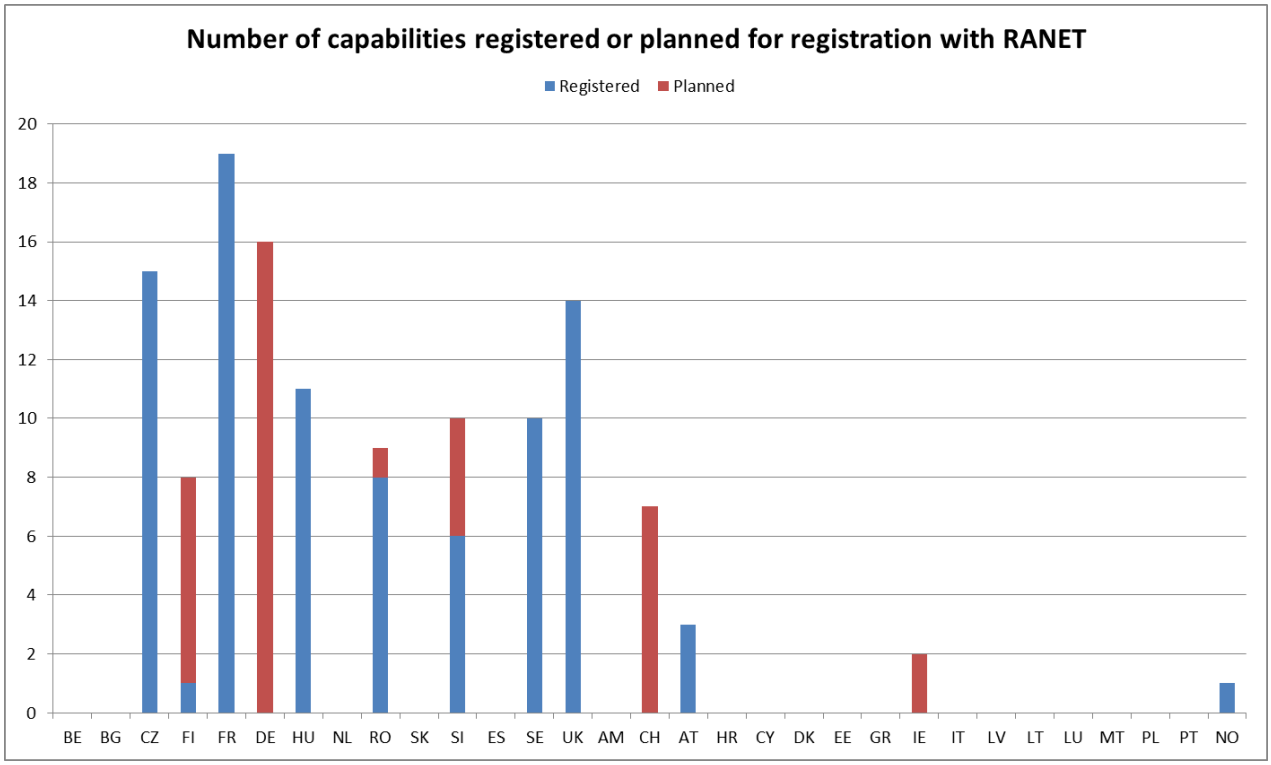


Figure 20-32: Capabilities registered, or planned for registration, with RANET

The number of European countries registering capabilities with RANET, and the overall number of capabilities registered, remains modest relative to the overall European capabilities. There has, however, been an improvement compared with the situation in mid-2010 but not, perhaps, as much as might have been expected in the aftermath of the Fukushima accident. The number or registered capabilities from European countries has now increased to 88 and those planned for registration to 37.

20.16 Extendibility of arrangements (Questions 14.1 – 14.3)

Information on the extendibility of arrangements is summarised in Table 20-13 but only for countries with NPP and countries without NPP whose boundaries fall within an EPZ for a NPP in another country.

Table 20-13: Extendibility arrangements mapping

	BE	BG	CZ	FI	FR	DE	HU	NL	RO	SK	SI	ES	SE	GB	AM	CH	HR	LU
Arrangements contain provisions for extension of countermeasures beyond EPZ?	Y	Y	Y	Y	Y/N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y
Provisions consistent with those for other emergencies?	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y
Provisions for extendibility exercised/tested?	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	N	Y	Y	Y	N		Y

Y Response of 'Yes'
N Response of 'No'

All countries, with the exception of AM and HR, reported that their arrangements for EP&R included provisions for their extension beyond the EPZ (the situation for FR needs clarification as response was Y/N); all countries (except DE, and HR, which did not reply) indicated that these provisions were consistent with the provision for extendibility in response to other emergencies. The extendibility of arrangements is exercised in all countries apart from DE, SI, ES and CH (and possibly also HR) and the frequency with which this is done is indicated in Figure 20-33. Little or no information was provided on the nature of these tests or exercises and they may differ considerably between countries (eg, in NL the extendibility tests are limited to sounding sirens). This aspect warrants a more detailed analysis to form considered judgements on the appropriateness of extendibility arrangements and their testing or exercising.

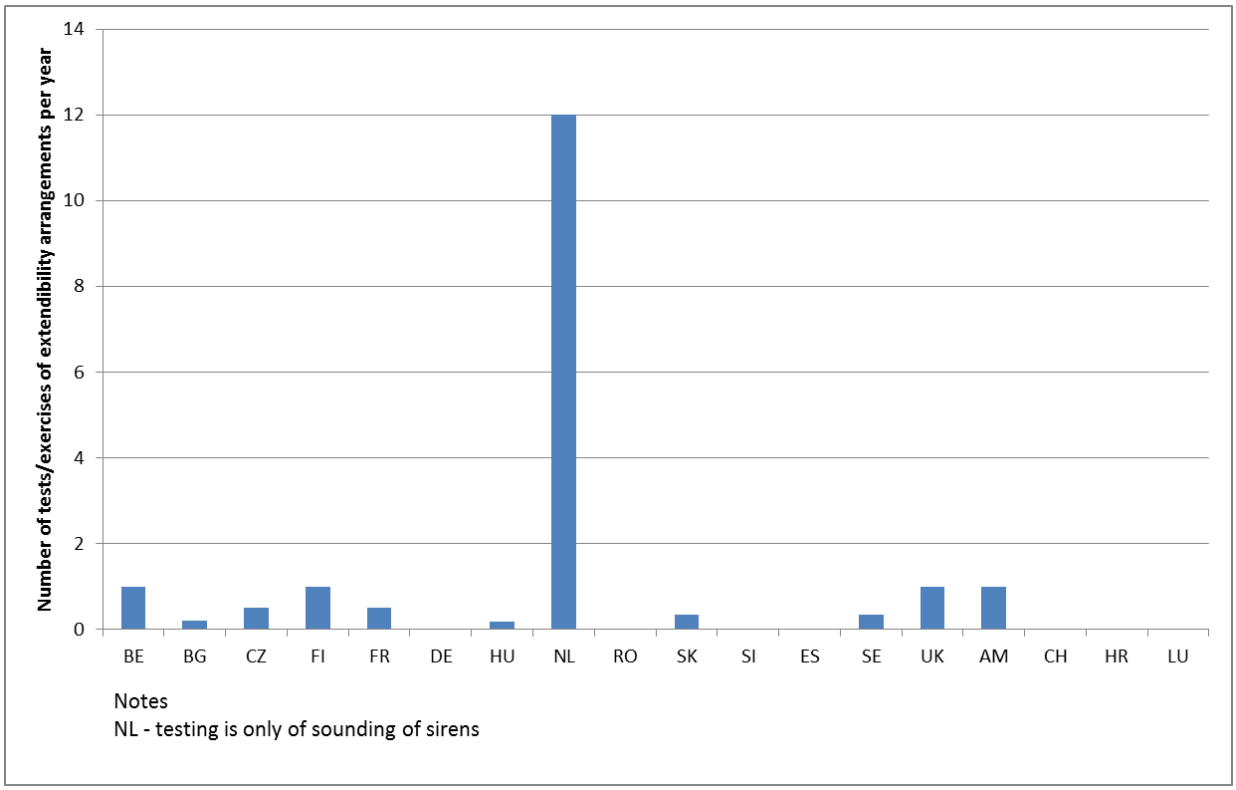


Figure 20-33: Frequency of testing/exercising extendibility arrangements

20.17 Robustness of arrangements when emergency is associated with a major loss of infrastructure (Questions 15.1 – 15.2)

Responses on the robustness of arrangements when an emergency is associated with a major loss of infrastructure are summarised in Table 20-14 and Table 20-15; note that a number of countries with NPP did not respond to some or all of the questions in this section. For countries with NPP, just over half report that they have taken account of such eventualities in their planning; those who have not include FR, DE, HU, NL, ES and CH. Even fewer countries claim that their arrangements are robust against such eventualities; those who believe they are not include BG, HU, NL, SK, ES, SE and CH. All countries, with the exception of UK, indicate that their arrangements need to be improved to better deal with such situations. The responses to the three questions in Table 20-14 appear not to be fully consistent for some countries and should be validated by those providing the responses. Inevitably, considerable judgement has been exercised in responding to the questions in this section; an assessment, therefore, needs to be made of the extent to which the basis for these judgements has been comparable across countries. Notwithstanding this, there is a broad consensus that arrangements need to be improved in respect of emergencies accompanied by major loss of infrastructure.

Table 20-14: Robustness of arrangements when emergency associated with a major loss of infrastructure – Nuclear Countries

	BE	BG	CZ	FI	FR	DE	HU	NL	RO	SK	SI	ES	SE	UK	AM	CH
When emergency associated with major loss of infrastructure																
Account taken of contemporaneous loss or damage to major infrastructure?		Y		Y	N	N	N	N	Y	Y	Y	N	Y	Y	Y	N
Current arrangements robust for such eventualities?		N		Y	Y	Y	N	N	Y	N		N	N	Y		N
Current arrangements will need revision/enhancement?	Y	Y		Y	Y		Y	Y		Y		Y	Y	N	Y	Y

Table 20-15: Robustness of arrangements when emergency associated with a major loss of infrastructure – Non-nuclear Countries

	AT	HR	CY	DK	EE	GR	IE	IT	LV	LT	LU	MT	PL	PT	NO
When emergency associated with major loss of infrastructure															
Account taken of contemporaneous loss or damage to major infrastructure?	Y	N	Y	N	N		N	N	Y	Y	N	N	N		Y
Current arrangements robust for such eventualities?		N	Y	N			N	Y			Y	N	N		Y
Current arrangements will need revision/enhancement?	Y	Y	Y	N	Y		Y	N		Y		N	Y		Y

Y Response of 'Yes'
N Response of 'No'

20.18 Robustness of arrangements when emergency is protracted (Questions 16.1 – 16.2)

Responses on the robustness of arrangements when an emergency is protracted are summarised in Table 20-16 and Table 20-17; note that a number of countries with NPP did not respond to some or all of the questions in this section. For countries with NPP that responded, most (eleven out of fifteen) reported that they have taken account of such eventualities in their planning; those who have not include DE, HU, NL and ES. However, fewer than half considered that their current arrangements were robust to protracted emergencies. And most countries (apart from FI and UK) considered that current arrangements needed to be improved in this respect. As in the preceding section, considerable judgement will have been exercised in responding to the questions in this section; likewise, an assessment also needs to be made of the extent to which the basis for these judgements has been comparable across countries. Notwithstanding this, there is a broad consensus that arrangements need to be improved for responding to protracted emergencies.

Table 20-16: Robustness of arrangements for protracted emergencies – Nuclear Countries

	BE	BG	CZ	FI	FR	DE	HU	NL	RO	SK	SI	ES	SE	UK	AM	CH
When emergency is protracted																
Account taken of potential for emergencies being extended in time?	Y	Y		Y	Y	N	N	N	Y	Y	Y	N	Y	Y	Y	Y
Current arrangements robust for protracted emergencies?		N		Y	Y	Y	N	N	N	N		N	Y	Y		N
Current arrangements will need revision/enhancement?	Y	Y		N	Y	Y	Y	Y	Y	Y		Y	Y	N	Y	Y

Table 20-17: Robustness of arrangements for protracted emergencies – Non-nuclear Countries

	AT	HR	CY	DK	EE	GR	IE	IT	LV	LT	LU	MT	PL	PT	NO
When emergency is protracted															
Account taken of potential for emergencies being extended in time?	Y	N	Y	Y			Y	N	Y	Y	Y	N	Y	N	Y
Current arrangements robust for protracted emergencies?		N	Y	N			N	Y		Y		N	N	N	Y
Current arrangements will need revision/enhancement?	Y	Y	Y	Y			Y	Y	Y		Y	N	Y	N	Y

Y Response of 'Yes'
N Response of 'No'

20.19 Commitment of licensee (Questions 17.1)

All nuclear countries confirmed that their NPP licensees have demonstrated continuing commitment to their obligations with respect to off-site EP&R.

20.20 Funding (Question 18.1)

Among nuclear countries, the organisations involved bear their own costs of developing, maintaining and exercising the off-site EP&R arrangements in five countries (Czech Republic, Finland, France, the Netherlands and Switzerland). The NPP operator bears all the costs in only three countries (Belgium, Sweden and the UK – at local level). Otherwise, the costs fall on local and national government. In non-nuclear countries, the costs are generally borne by national government. As noted by Slovenia, this does not seem consistent with the polluter pays principle.

20.21 Liability (Questions 19.1 – 19.2)

Most nuclear countries describe arrangements regarding liability to pay compensation that are in accord with relevant international conventions: the utility/NPP operator is liable up to a prescribed limit; above that limit, liability falls on the state. The only exception would appear to be Switzerland, which states that the owner of a NPP is liable for nuclear damage without limitation.

The majority of NPP countries do not include compensation arrangements and claims handling procedures within EP&R plans. Those countries which do so comprise Belgium, Bulgaria, the Netherlands, Spain, Sweden and the UK.

21 APPENDIX H: Cross border arrangements

This Appendix comprises three Sections. The first sets out the purpose and role of the cases studies in this report, in particular to elucidate key issues and identify good/best in relation to cross border arrangements for EP&R. The two other Sections comprise summaries of actual case studies, namely AT-CZ, DE-FR and the Nordic Region, where issues are elucidated.

21.1 Case studies – purpose, scope and content

21.1.1 Purpose

The purpose of the case studies is to:

- Elucidate the key issues that influence or determine the effectiveness of cross border arrangements for EP&R;
- Contribute to the identification of best practice, gaps and inconsistencies in cross border arrangements and capabilities;
- Contribute to an assessment of how cross border arrangements could be enhanced and more effective use made of available resources.

21.1.2 Cross border arrangements

The significance of particular cross border arrangements will vary considerably depending on the nature and magnitude of an accident and the proximity of the affected NPP to the border of borders of neighbouring or more distant countries. The range and extent of cross border issues that may be encountered are encapsulated in several scenarios described in Section 21.1.4 below. These scenarios provide the framework for evaluating the efficacy of cross border arrangements in the selected case studies.

21.1.3 Case studies

The following case studies have been developed for the purposes of elucidating cross border issues:

- A NPP in the Czech Republic and cross-border arrangements with Austria;
- NPPs in France and cross border arrangements with Germany and other neighbouring countries; and
- Successful approaches to cross border cooperation in the Nordic Region.

The cross border arrangements for each case study have been evaluated in terms of the scenarios set out below; not all scenarios are relevant to each case study and consideration has been limited in each case to those that are.

The first two case studies were presented at the first Workshop held in Luxembourg on 4-5 July, 2013 and at subsequent regional workshops (see Section 22 - Appendix I). The efficacy of cross border arrangements was evaluated in each case; this provided input to judgements on best practice, identification of gaps and inconsistencies and how arrangements could be enhanced and made more effective. The case studies are described in Sections 21.2, 21.3 and 21.4 below, together with the main outcomes of their evaluation.

For each case study, consideration has been given to the following, to the extent that they are relevant:

- The establishment of a clearly defined and regularly tested command structure.
- The availability of sufficient technical and human resources.
- The arrangements for information of the competent authorities for EP&R by the operator/the competent authority(ies) in neighbouring countries about the plant status and its development.
- The decision making process to declare an emergency.
- The continuous assessment of the radiological situation inside the NPP and in the mostly affected territories outside (who does what?).
- The implementation of a pre-defined and agreed protection strategy based on harmonised OILs.
- Mutual assistance during the implementation of response actions in the near and the far field.
- The termination of individual protective measures based on pre-defined and agreed criteria.
- Standardised public communication procedures.

21.1.4 Scenarios for Evaluating Cross Border Arrangements

The nature and range of cross border arrangements that may need to be established can be largely encapsulated by those that would be required in response to one or other of the following six scenarios:

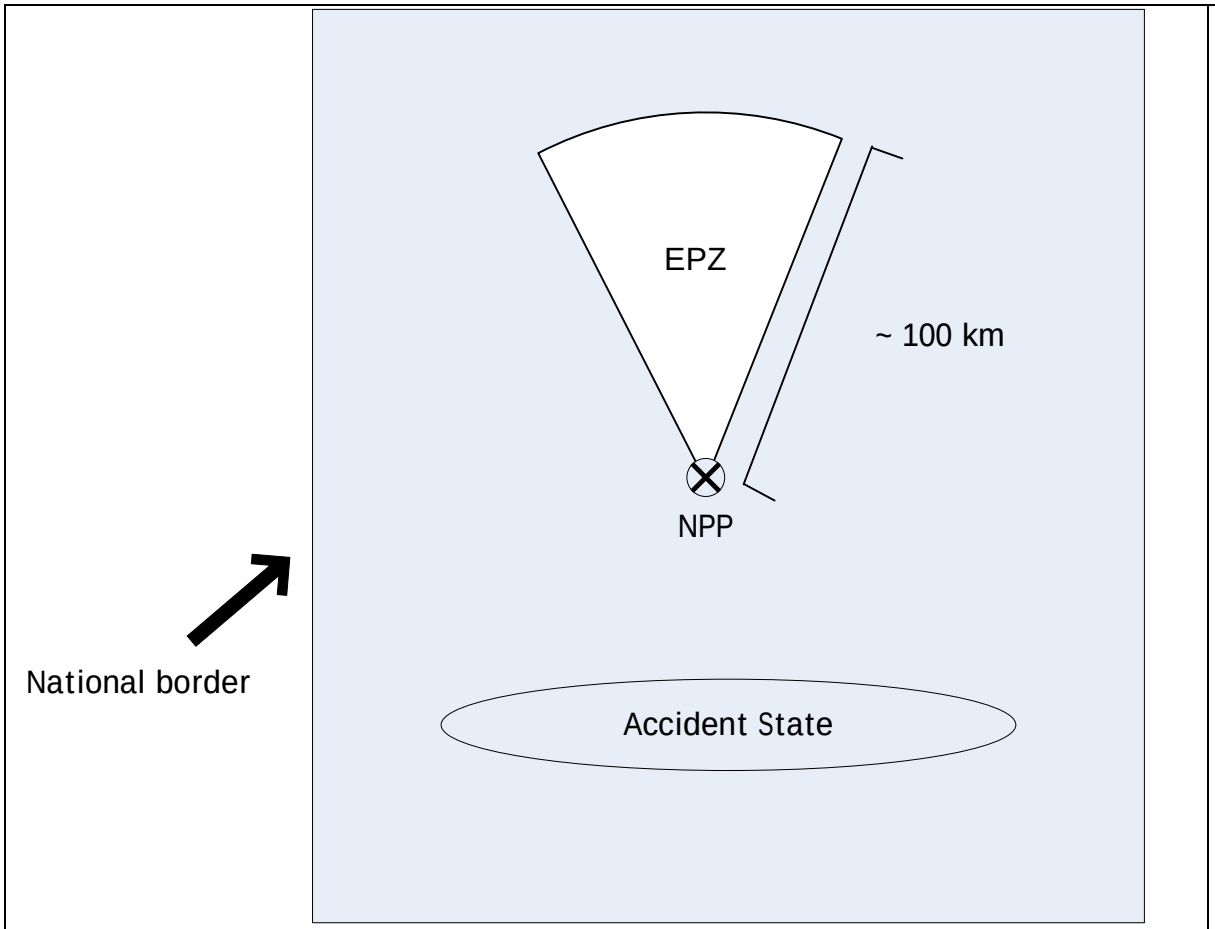
1. A nuclear emergency in a state in which the NPP is operated and where the off-site consequences are limited to the jurisdiction of this state.
2. A nuclear emergency in a state in which the NPP is operated and where the off-site consequences are not limited to the jurisdiction of this state, eg. there is a major impact in
    a) One neighbouring state requiring urgent protective actions;
    b) Several neighbouring states requiring urgent protective actions.

3. A nuclear emergency in a neighbouring state in which the NPP is operated with major off site consequences and the need to initiate urgent protective actions:
    a) In both states (the accident and the neighbouring state) at comparable levels;
    b) Mainly to the neighbouring state.
4. A nuclear emergency in far distance to a state with no direct radiological consequences for the far distant state.

The characteristics of the six stylised scenarios are summarised below.

Undue significance should not be given to the extent (about 100 km) indicated for the EPZ in the following scenarios – it is solely indicative and chosen to encompass both urgent protective measures (sheltering, evacuation, relocation, iodine prophylaxis) as well as other measures at greater distances to reduce exposures via ingestion (food bans, controls on agriculture, etc).

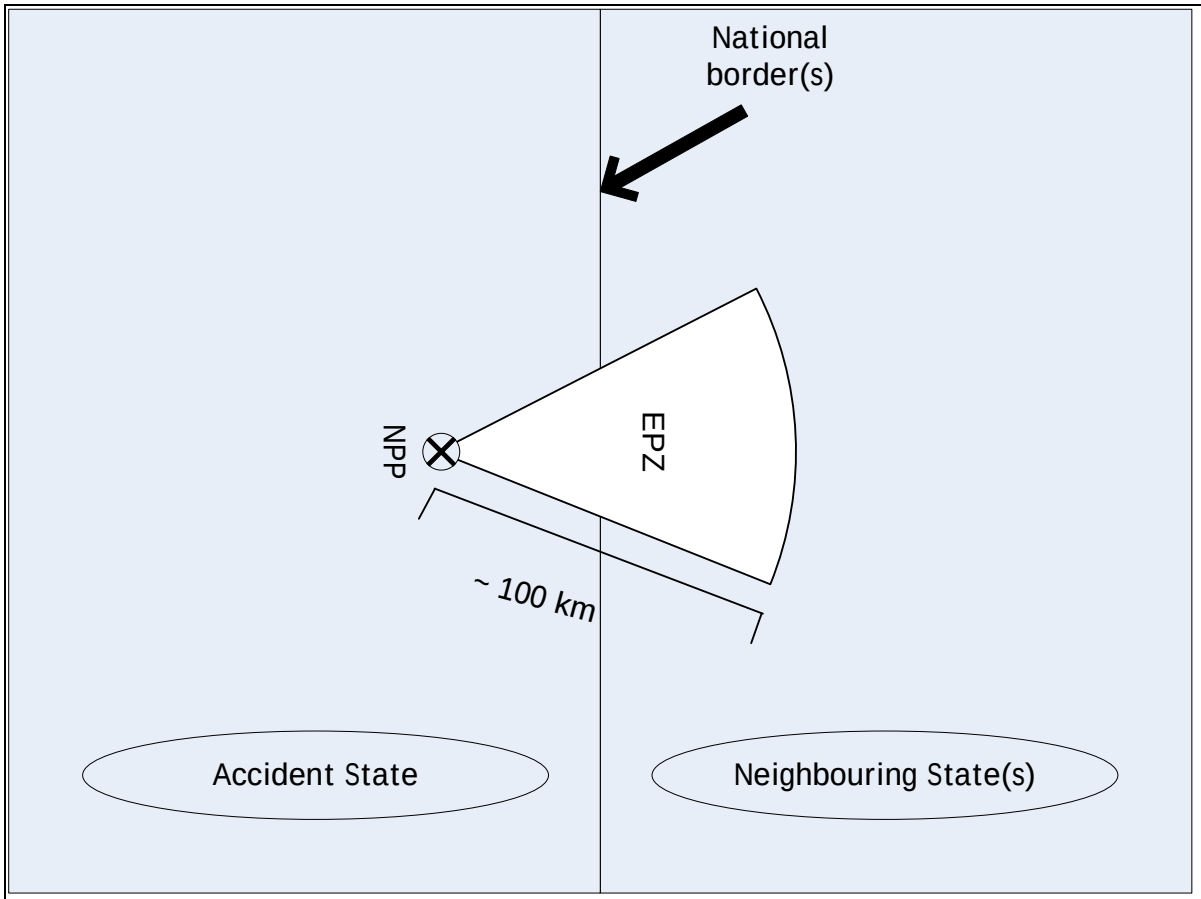
Scenario 1



Specific cross border issues

(1) Technical/personal assistance in assessing the radiological situation and/or in decision aiding from neighbouring states/international organisations
(2) Information exchange with neighbouring countries and with international organisations
(3) Need for regulations for food and/or international trade

Scenario 2a and 2b

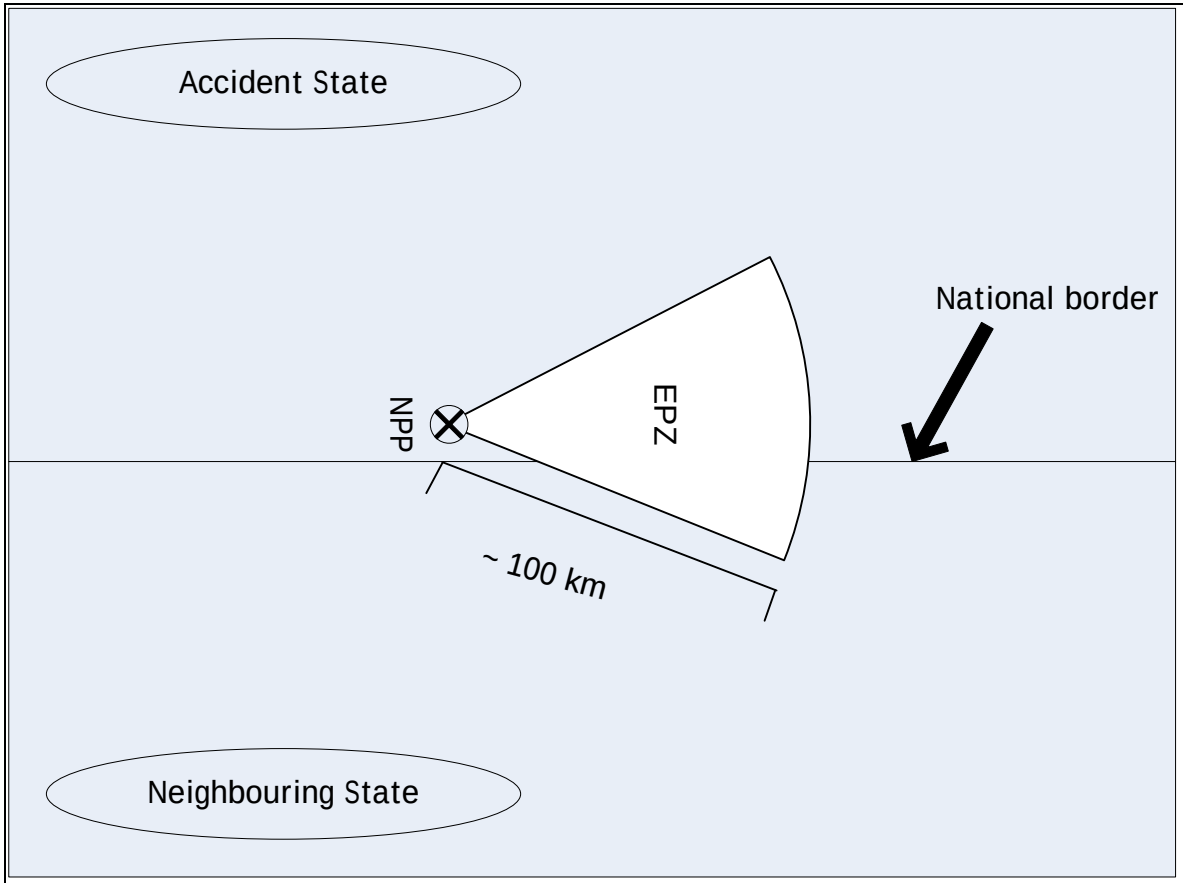


Specific cross border issues

(1) Early warning of neighbouring state(s) – need for harmonised approaches
(2) Provision of information on source term, plant status, monitoring data, to neighbouring state(s)
(3) Provision of information on early protective actions - need for harmonised approaches
(4) Assessment of the radiological situation in both states – decision making and information of the public
(5) Cross border(s) technical and personal assistance/exchange of technical representatives in support of decision aiding

Is there a need for harmonisation of the issues described above among European states/regional groups of states?

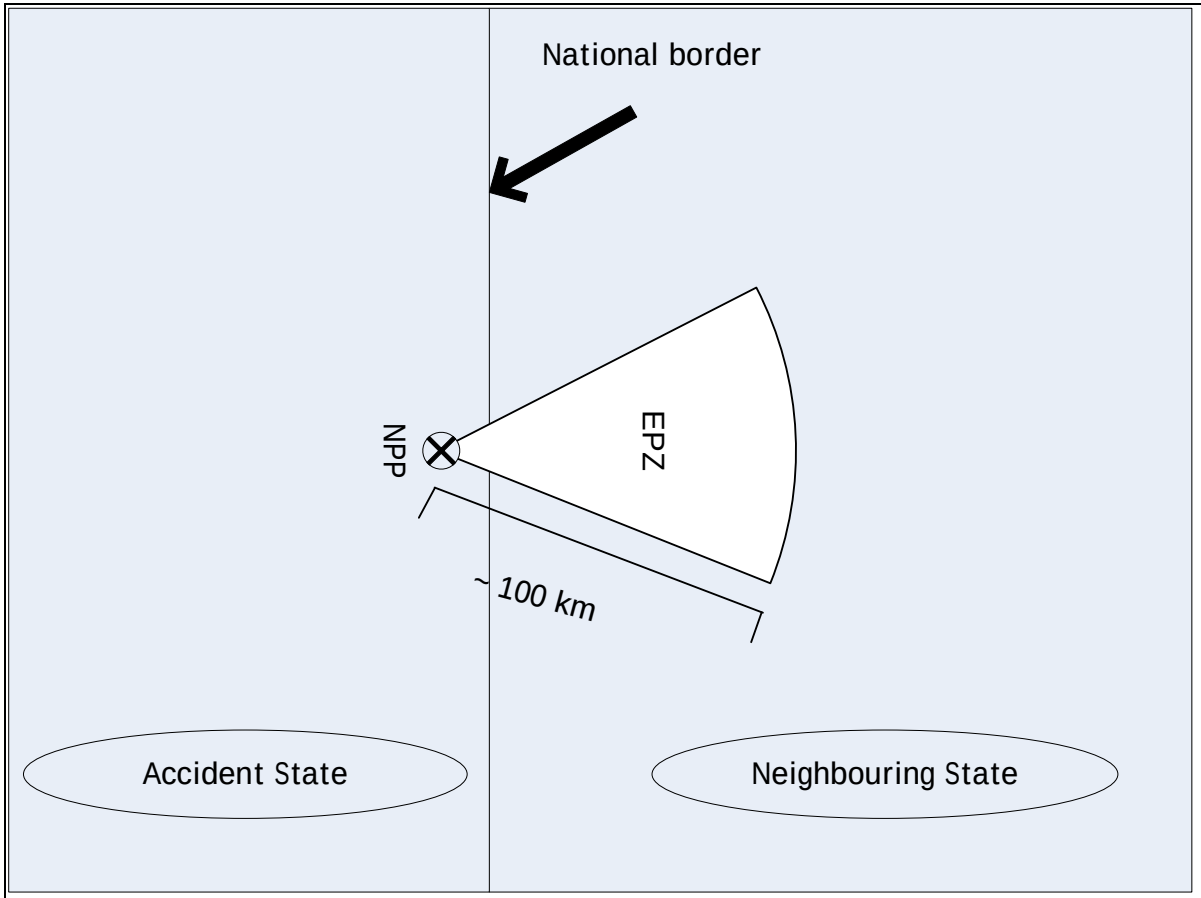
Scenario 3a



Specific cross border issues

Like Scenario 2 but with special emphasis on harmonised near field early warning, urgent protective actions, assessment of the radiological situation on both sides of the national border.

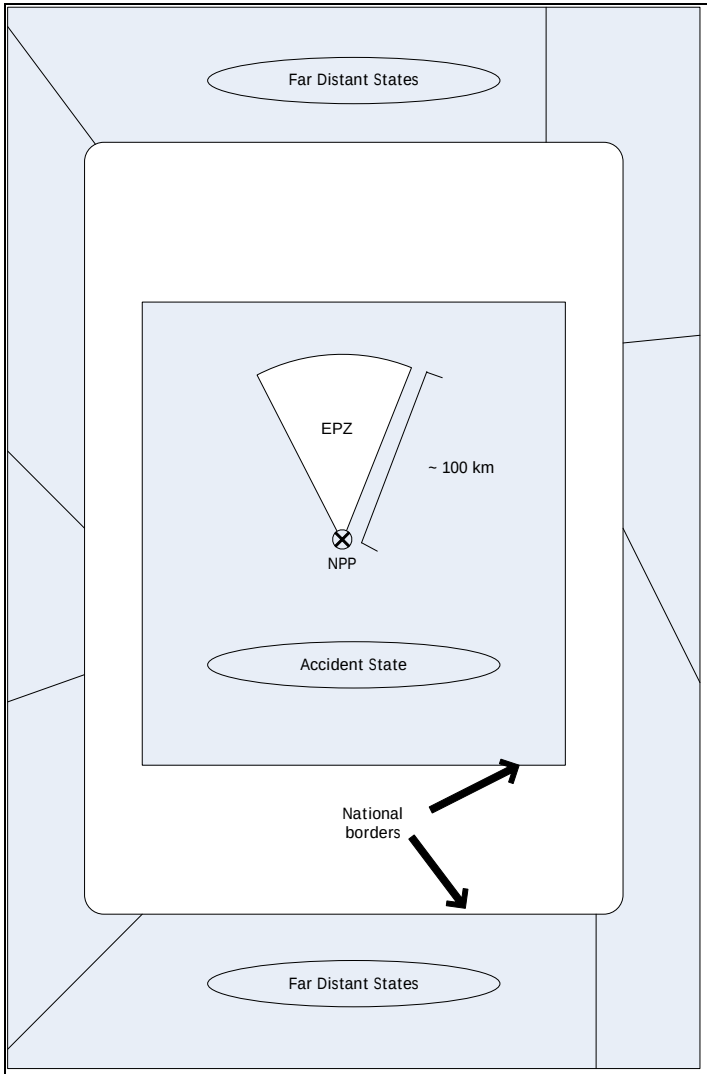
Scenario 3b



Specific cross border issues

(1) Accident state has access to all in-plant information; with the exception of urgent protective actions in the near field around the NPP no further urgent protective actions are required in accident state.
(2) The neighbouring state needs to implement the full spectrum of urgent protective actions both in the near field and at far distance.
(3) The specific issues described in Scenario 2 become more urgent and detailed cross border organisational arrangements are absolutely essential

Scenario 4



Specific issues

(1) Assessment of the radiological impact (if any) of the accident on the population in the far distant state
(2) Recommendations for the protection of national citizens living/staying in accident state during the emergency (based on assessments and recommendations of accident state and/or on own assessments)
(3) Reassurance measures for citizens returning home from accident state
(4) Limitations on food imports from accident state
(5) Limitations on mobility and free trade (ships, aircraft)

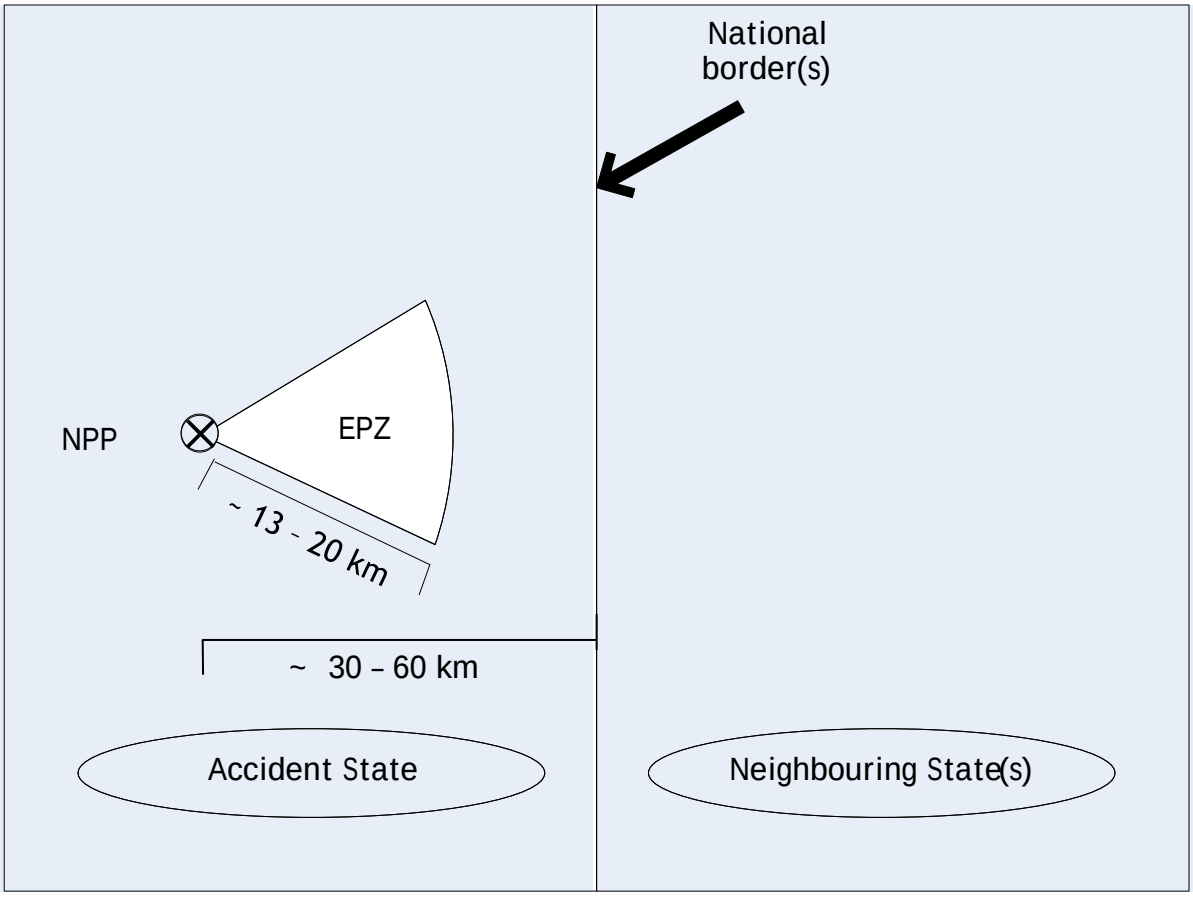
Is there a need for harmonisation of the issues described above among European states/regional groups of states?

21.2 Summary of Czech – Austrian case study

Bilateral cooperation between the Czech Republic and Austria in the field of nuclear and radiological EP&R (prepared by SÚJB and BMLFUW)

- Situation: 2 NPPs in the Czech Republic – Temelín (2 units, WWER-1000/320) and Dukovany (4 units, WWER-440/213) - with a minimal distance of their sites to Austrian border of about 50 and 30 km.

- Scenario 2 (slightly adapted) is applicable:
  A nuclear emergency in a state in which the NPP is operated and where the off-site consequences are not limited to the jurisdiction of this state, e.g. a major impact in Austria requiring (urgent) protective actions (e.g. sheltering and Iodine blocking) cannot be excluded.

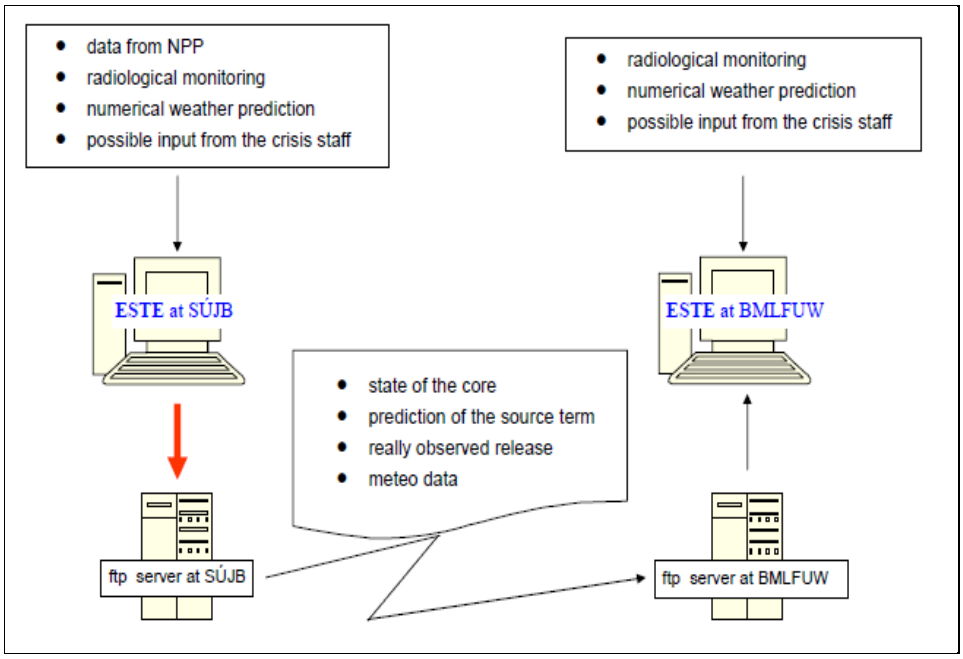


- Specific cross border issues for adapted scenario 2: Bilateral Cross Border Cooperation between the Czech Republic and Austria

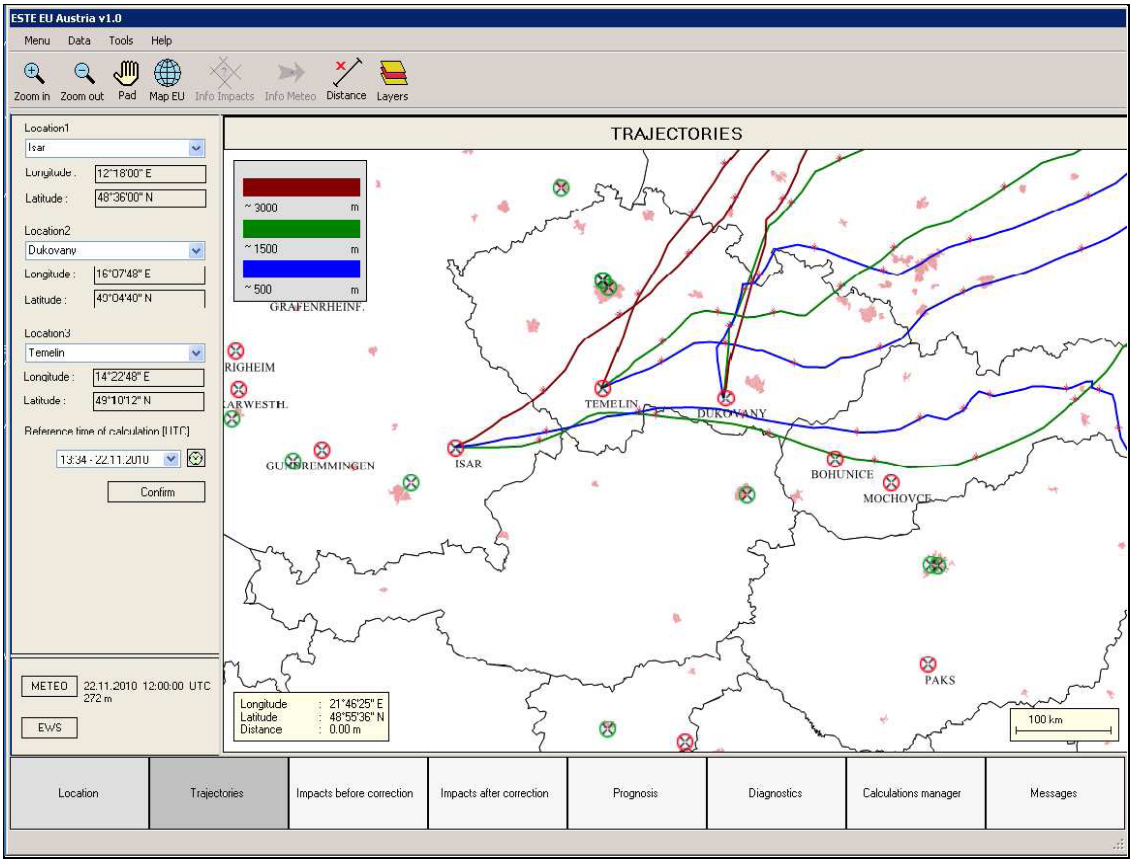
Area of cross border co-operation	Implementation
Early warning of neighbouring state	Bilateral agreement and international early notification requirements (IAEA, EC), clear information pathways and procedures
Information on small events/incidents at Temelín NPP	Information Hotline / Quick information on small events/incidents from Czech Rep. (SÚJB) to Austria (BMI and BMLFUW)
Provision of information on source term, plant status to neighbouring state	Installation of the ESTE decision support system both in the Czech Republic (SÚJB) and in Austria (BMLFUW). Data exchange between ESTE system at SÚJB and BMLFUW in case of exercises and in case of emergency: • data on the plant status (Status of the core) • source term data (prognosis and real source term) • on-site meteorology Exchange of dispersion results and trajectories from the Austrian TAMOS system
Provision of information on monitoring data to neighbouring state	Automatic exchange of measurement data between the Automatic Monitoring Systems of Austria and the Czech Republic Installation of an automatic air monitoring station in České Budějovice (with data access for the Czech Rep. (SÚJB) and Austria (BMLFUW))
Provision of information on early protective actions	Bilateral agreement and international early notification requirements (IAEA, EC), clear information pathways and procedures
Bilateral exercises	Monthly tests of ESTE data exchange, yearly bilateral exercise with ESTE data exchange. Austrian participation as observer in the exercises at NPPs Temelín and Dukovany
Yearly Bilateral Expert Meetings	Exchange of information in the field of radiation protection, EP&R and nuclear safety
Summary/Conclusion:	For nuclear accidents at NPPs Temelín and Dukovany Austria (BMLFUW) has in principle the same information relevant for off-site EP&R as the Czech Republic (SÚJB).

- History of bilateral cooperation in the field of radiation protection and nuclear safety:
    - Bilateral Agreement between the Czech Republic and Austria to Settle Issues of Common Interest in Connection with Nuclear Safety and Radiation Protection: 1990, updated in 2006;
    - Melk Protocol: Establishment of Information Hotline: 2001;
    - Arrangement between SÚJB and BMLFUW on the installation and use of automatic air monitoring station in České Budějovice: 2001;
    - Arrangement between SÚJB and BMLFUW on the exchange of gamma dose rate data from radiation early warning systems: 2001;
    - Arrangement between SÚJB and BMLFUW on data exchange between ESTE and TAMOS codes: 2004;
    - Installation and operation of ESTE in Austria (BMLFUW): 2005, ESTE EU: 2010;
    - Bilateral exercises since 2005.

- ESTE Data Exchange:



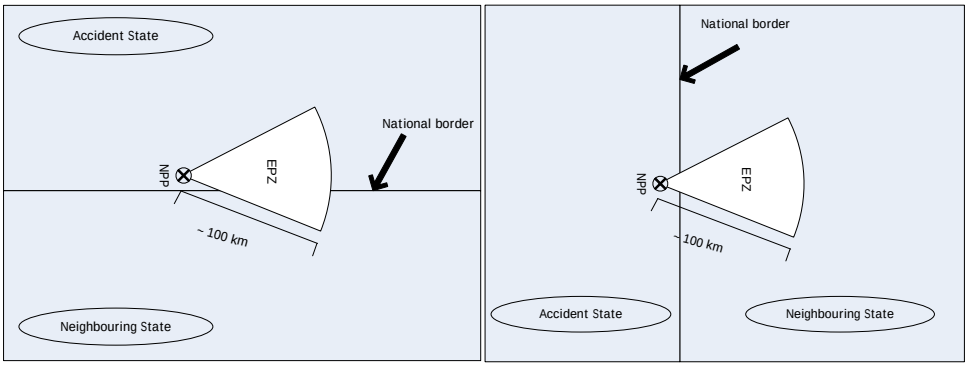
- ESTE EU User Interface:



21.3 Case Study on the cooperation between Germany, France and other countries in the field of nuclear and radiological EP&R

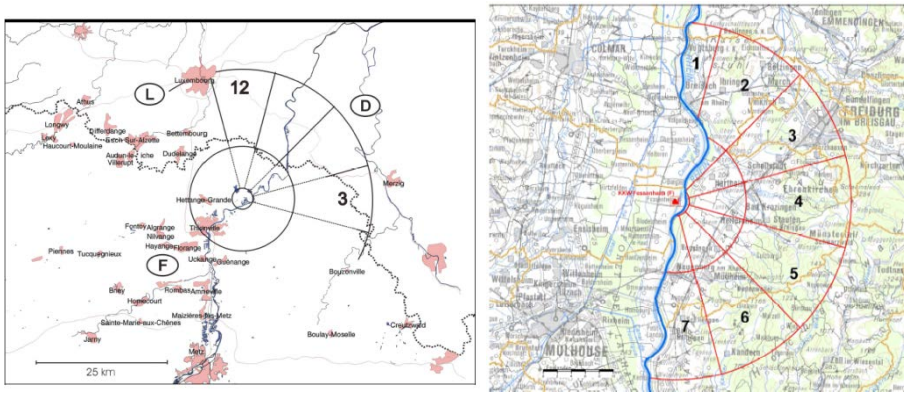
Background

Agreements on the cross border cooperation are established between Germany and neighbouring states: Denmark, the Netherlands, Belgium, Luxembourg, France, Switzerland, Poland and Check Republic. Key elements of these agreements are the information exchange, the co-operation and the mutual assistance in case of a nuclear or a radiological emergency. Detailed arrangements exist for more than 30 years between Germany, France and Switzerland. These agreements include a wide range of scenarios with possible cross border radiological consequences for the population on both sides of the border; the main focus is, however, on nuclear emergencies of German (Phillipsburg), French (Fessenheim and Cattenom) and Swiss (Leibstadt) NPPs which are all located very close to the national borders as described in scenario 3a and 3b as illustrated below.



Scenario 3a Scenario 3b

Details of the cross border planning on German territory are given in the following figure for the NPPs Cattenom and Fessenheim.



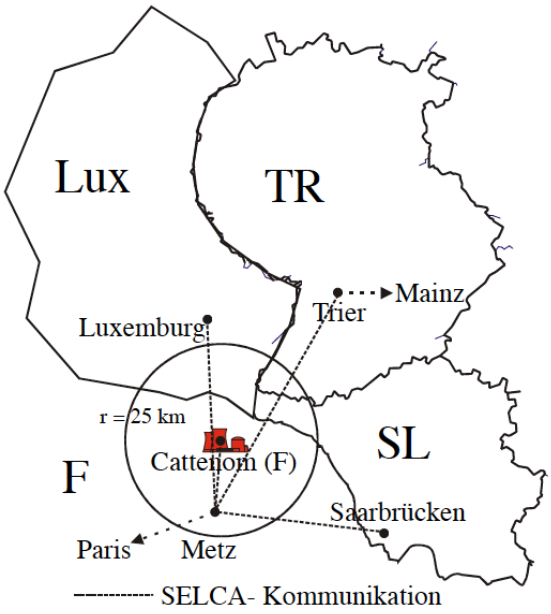
Standing Committees are established, which include representatives of the competent authorities both at governmental and local level. They meet regularly (typically once per year) to discuss and further develop the existing arrangements based on new

findings on protection standards as well as on lessons learned from regular cross border exercises or real emergencies (Chernobyl, Fukushima).

Basic elements of the existing agreements

The existing arrangements are based on mutual agreements between state authorities aiming at harmonisation of standards and procedures of protection for the population on both sides of the border. The existing arrangements for information exchange include all key information required for planning for and response to an emergency, including the implementation of protective measures. National contact points are established and technical means for rapid and secure information exchange are implemented and operational and their functions are regularly tested. Unless otherwise stated, the information exchanged is for internal use only.

Details of the existing technical infrastructure for information exchange are given in the next figure for the NPP Cattenom.



Elements of preparedness arrangements

The bilateral agreements include a list of information topics, which are essential for planning and preparedness:

- Information about the NPP;
- Typical release scenarios and source terms;
- Details of the emergency planning including the crisis organisation;
- Technical infrastructure available for the surveillance and assessment of the radiological situation off-site as well as in greater distances; measurement strategies;

- Intervention levels;
- Protective measures;
- Provisions for the information of the public.

The following table summarises the intervention levels used in Germany (D) and France (F).

Table: Intervention levels in France and Germany

Measure		Intervention Levels		Integration times and exposition paths
		Organ dose (Thyroid)	Effective dose	
Sheltering	**D**		**10 mSv**	Effective dose (external exposure over 7 days) plus committed dose resulting from inhalation during 7 days.
	F		**10 mSv**	Calculation method at the time of writing this report, based on an integration time of 24 to 48 hours, may be revised in the future.
Iodine prophylaxis	**D**	**50 mSv** Children, adolescents and pregnant women **250 mSv** Adults from 18 to 45 years		Committed organ dose resulting from radio iodine inhalation during 7 days.
	F	**50 mSv**		
Evacuation	**D**		**100 mSv**	Effective dose (external exposure over 7 days) plus committed dose resulting from inhalation during 7 days.
	F		**50 mSv**	
Permanent relocation	**D**		**100 mSv**	External exposure in 1 year by deposited radionuclides.
	F	Not determined		
Temporary relocation	**D**		**30 mSv**	External exposure over 1 month.
	F	Not determined		

Differences in the approaches used and in the numerical values of the interventional levels are discussed by the standing committees with the aim to achieve further harmonisation. Potential areas of required mutual assistance are identified as much as possible in advance.

Information exchange between the parties during response

There is agreement that the following information will be exchanged after the declaration of a nuclear emergency:

- Characterisation of the actual situation and information about the expected future development;
- Assessment of the probability of a release to the environment;
- Meteorological information (actual and prognostic);
- Characteristics of the (potential or actual) release;
- Measurement data;
- Expected radiological consequences for the population;
- Planned, recommended or implemented protective measures;
- Press releases.

The competent authorities agree to synchronise their protective measures whenever possible.

21.4 Cross border co-operation between the states of the 'Nordic Region' (Denmark, Finland, Iceland, Norway, Sweden) in the field of nuclear and radiological EP&R

This note is based on material published by the partners of the Nordic co-operation as described in the "The Nordic Manual", 2006, and on additional material given in the references. A summary of the various agreements is given in Appendix 1; the objectives of the co-operation are summarised in Appendix 2.

The purpose of this note is to explore the existing bi- and multi-lateral cross border arrangements for off-site nuclear EP&R in the 'Nordic Region' and identify potential areas for improvement.

21.4.1 Status

Various bilateral agreements on cross border co-operation, which include information exchange, co-operation in planning of and the implementation protective actions as well as mutual assistance in case of a nuclear or radiological emergency have been established between the partners. Initial establishment was in the aftermath of the Chernobyl accident. In the early days the agreements covered only NPP accidents and the detection of fallout products. Based on experience, the scope of the practical implementation of agreements has been expanded.

The agreed information exchange existing to date cover a wide range of scenarios:

- Nuclear and radiological incidents and emergencies;
- Events or threats of malicious use of radioactive material;
- Threats or malevolent acts concerning nuclear facilities;
- Small scale events, such as rumours and minor incidents, with consequences limited to a public concern and interest by the media, and/or a need for exchange of technical information between nuclear and radiation safety regulatory bodies, have been included.

The arrangements in place include all phases of such events as well as obligations regarding early notification of abnormal events or detection of abnormal levels of radiation and the exchange of information between competent authorities.

There is a unique feature in the existing arrangements on cross border co-operation: the Nordic countries have agreed on joint harmonised intervention levels as well as on joint harmonised operational intervention levels and other triggers not only for the early phase of a nuclear or radiological emergency (including radiation situations resulting from malicious acts) but also for the intermediate phase and the transition to recovery. The new ICRP concept has been fully implemented. The joint harmonised Nordic intervention criteria are documented in the "The Nordic Flag Book"; they have been approved by the DGs of the Nordic countries in August 2013; the final, edited version of the document will be publicly available by the end of 2013. The "The Nordic Flag Book" includes feedback received through a review by an international team of experts in 2011 organised by NEA.

21.4.2 Specific areas of cross border co-operation

In 1993 the heads of the Nordic radiation protection and nuclear safety authorities established a working group (NEP) for co-operation, co-ordination, exchange of information and assistance in the field of emergency planning and response.

NEP's tasks are:

- To exchange information, experience and good practice between the Nordic nuclear and radiation safety authorities on ongoing and planned projects and work in the field of nuclear and radiological emergency planning, preparedness and response. The information exchange includes the following areas:
    - General information about nuclear installations (construction, safety systems, operation, radiation protection, consequence mitigating actions and onsite and off-site emergency arrangements);
    - Emergency Action Levels (EALs);
    - Generic and Operational Intervention Levels (GILs and OILs);
    - Action zones;

- Distribution of iodine tablets;
- Description of activating emergency response;
- Monitoring strategies;
- Response times;
- Duty system in all the Nordic authorities;
- National legislation concerning crisis management and public information.

- To take initiatives and make proposals for joint projects related to emergency matters.
- To co-ordinate and improve mechanisms and arrangements for notification, information exchange and assistance between the Nordic authorities involved in emergency situations.
- To review the use of communication tools for emergency situations and carry out tests on a regular basis.
- To follow and, when beneficial and possible, coordinate participation in and to actively taking part in the Nordic and international development in the field of nuclear and radiological emergency planning, preparedness and response.
- To communicate, co-operate and co-ordinate, where appropriate, the implementation of international standards and guidelines into national arrangements in the Nordic states.

Agreed guidelines for information exchange during all kinds of events, which might be of acute interest to the others are integral part of the existing arrangements. There is agreement amongst the partners that confidential or classified information shall not be made available to a third party without the consent of the originator. Information and experiences gained in exercises and drills is regularly exchanged between the participating countries. Furthermore, other Nordic countries are regularly invited to take part in the exercises organised by one of the Nordic countries. In addition, NEP is organising regular, unannounced communication exercises to test duty systems of the Nordic authorities.

All states are required to plan, prepare and dedicate resources to respond to the consequences of a nuclear or radiological incident/emergency. In October 1963, Denmark, Norway, Sweden and Finland signed an agreement to assist each other in case of radiological hazards - the Nordic mutual assistance agreement - in connection with radiation accidents between Denmark, Finland, Sweden and Norway. In addition, all Nordic states have ratified the Convention on Assistance in the case of a Nuclear Accident or a Radiological Emergency, and have registered their capabilities in the IAEA Response and Assistance Network (RANET). Requests for assistance can be made directly from one Nordic state to another on the basis of the Nordic mutual assistance agreement. Requests for assistance can also be made directly from one state to another or to IAEA, on the basis of the Assistance Convention. In requesting or providing assistance the Nordic countries follow RANET guidelines and procedures.

Active co-operation in public information issues is aiming at harmonised approaches on how the media and the public are informed during radiological incidents and nuclear emergencies.

The interaction with international organisations (IAEA, OECD/NEA, WHO, EC) is an integral part of the work. Information on co-operation with the Baltic States and Russia as well as within the NATO Partnership for Peace programme is regularly updated during NEP meetings.

21.4.3 Key issues identified

A key aspect within the Nordic co-operations is the organisation of cross border exercises. The most recent one was held on March 14, 2013 by Finland (Loviisa NPP) as a joint Nordic-Baltic nuclear emergency exercise with Sweden, Norway, Denmark, Iceland, Estonia, Latvia and Lithuania participating. The exercise objectives were to test technical and operational issues such as the co-operation and communication between countries in general terms as well as co-ordination of actions between participating countries' radiation and nuclear safety organisations and between the Ministry for Foreign Affairs of Finland and the embassies in Helsinki.

Altogether more than 1000 experts took part in the exercise. In Finland, being the accident country, approximately 60 organisations at national, regional and local level with about 600 participants were involved. Other countries exercised, tested, and trained mainly their national level arrangements with a somewhat smaller number of participations. The radiation and nuclear safety authorities in all countries took actively part in the exercise. The participation from Ministries for Foreign Affairs, embassies and other organisation varied much between the countries.

The following key issues were identified for further reflection and follow-up.

21.4.3.1 Threat Assessment

All countries reported having used background information that was available. However, the sources were very different: two countries reported using Finri (STUK's protected emergency website), two EU stress test reports, one country media and other open source information, and one country other reports on the Loviisa NPP. The lack of a central source of information for NPP characteristics was a clear problem during Fukushima accident, and the same lack of an obvious source for background information was apparent during this exercise.

Conclusion: A common source for technical information during an emergency would be needed. An international project within WENRA aims to create a technical database for this purpose. There is a need for additional Nordic-Baltic discussion on ways to share technical background information that is sufficiently detailed.

21.4.3.2 Atmospheric Dispersion

The Nordic MetNet (Nordic Network of Meteorological Services Engaged in Nuclear Emergency Preparedness) has prepared an exercise report on their part, which includes comparisons of dispersion calculations. The overall dispersion patterns described in the participants' reports are quite similar. However, it is noteworthy that due to various differences in plotting (such as scales used and altitude ranges used in plotting), the maps have very different sizes of areas plotted as dispersion areas even though they display basically the same dispersion.

Conclusion: Careful consideration is needed before using dispersion images in public communication, as the images may be misleading to the general public. Any illustrative images must be self-explanatory.

21.4.3.3 Decision making

The countries participating in the exercise all issued similar information on decisions and advice, such as to avoid unnecessary travel to southeast Finland and to follow the instructions of Finnish authorities, but the sizes of the "danger" areas reported varied. In addition, advice on travelling to or through the St. Petersburg area and Gulf of Finland were different. Goods and food imported from Finland were either to be measured or importing was to be temporarily stopped. To avoid decisions and advice that are needlessly different, it is critical that they are easily available to other countries. Sending information on planned or decided actions only by email does not provide this, especially considering the amount of e-mail traffic during an emergency. In the exercise the used e-mail distribution lists were also limited to Nordic countries, so other countries both nearby and further away did not receive them at all.

Conclusion: Using existing international systems, such as USIE, for providing the information on decisions made would increase the reliability of decision making in neighbouring countries.

21.4.3.4 Resources and assistance

The scenario of the exercise represented a very challenging and severe situation with prolonged releases into the environment. Most countries indicated that by using all available personnel their radiation and nuclear safety authorities had adequate resources for the first day of the emergency. However, many countries, especially Finland as the accident country, recognised that having enough resources available to handle the upcoming days would be challenging. Several countries conducted initial estimations on where international assistance might be required and/or could be provided. Actual actions based on these estimations would have started on the second day of the emergency.

Conclusion: There is a need to further assess the question of sufficiently available resources as well as to demonstrate in exercises that the results of such deliberations are robust.

21.4.3.5 Communication between domestic organizations

The participating countries used various methods for communicating with other domestic organisations (phones, email, extranet pages, situation information software, TETRA phones and video calls). In contrast to this, communications with other countries, other than reception of the information from Finland, was done almost solely by e-mail with some additional phone contacts. In addition to Finland, only two countries submitted information on their decisions and advice to USIE. As a result, the information flow between countries was far slower and more fragmentary than inside the countries.

A video conference between Nordic countries was an agreed mechanism for the co-ordination of actions, but not held due to ending of the exercise before the scheduled time. Video conferences are useful, but e.g. practical arrangements for organising it take time and, as a consequence, video conferencing is not the optimal mean for co-ordination of actions and decisions in a situation which may change rapidly. Furthermore in an initial phase, the accident country is extremely busy in handling the situation. The reliance on e-mail in the communication between the countries meant that the decisions and advice of the different countries were not available at a central location, making it difficult to have a complete picture of the situation and actions planned or initiated. The EU Commission WebECURIE webpage was not used during the exercise as it lacks an exercise site and some of the participating countries are not part of WebECURIE. However, USIE could provide the function of notification and communication of decisions made.

Conclusion: An agreed method and tool for the communication between the countries in the 'Nordic Region' would be needed to improve the efficacy of the agreed arrangements for information exchange.

21.4.3.6 Communication with media and the general public

All countries exercised public communication to test their own procedures. Different countries exercised in different ways and had different purposes concerning public communication. Finland had an exercise web page where Finnish journalists published their news stories. Estonia, Iceland, Sweden and Norway used their protected webpages for authorities' press releases and other information. There was a limited amount of co-ordination of public communication between the countries during the exercise.

Conclusion: There is a need to better co-ordinate public communication arrangements in the countries of the 'Nordic Region'.

21.4.4 References

(1) Evaluation report of the joint Nordic.Baltic exercise on March 14, 2013; Radiation and Nuclear Safety Authorities of the Nordic and Baltic countries, June 26, 2013.

(2) Protective Measures in Early and Intermediate Phases of a Nuclear or Radiological Emergency; Nordic Guidelines and Recommendations, 2013.

(3) "The Nordic Manual", Co-operation, Exchange of Information and Assistance between Nordic Authorities in Nuclear or Radiological Incidents and Emergencies, 20 June 2006; revised 29 October 2008.

BILATERAL AND MULTILATERAL AGREEMENTS

Bilateral agreements

	Finland	Sweden	Norway	Denmark	Iceland
Finland		x	x	x	
Sweden	x		x	x	
Norway	x	x			
Denmark	x	x			
Iceland					
UK			x	x	
Germany	x	x	x	x	
Netherlands			x		
Poland			x	x	
Russia	x	x	x	x	
Ukraine	x	x	x		
Lithuania			x	x	

Multinational agreements

- Nordic Mutual Assistance Agreement in Connection with Radiation Accidents between Denmark, Finland, Sweden and Norway; signed in Vienna 17 October 1963 and in force since 19 June 1964
- Agreement (for the Nordic and Baltic region) on the Exchange of Radiation Monitoring Data (signed 7 June 2001)

International Conventions

- Convention on Early Notification of a Nuclear Accident (1986)
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (1987)
- Council Decision (87/600/EURATOM) on Community arrangements for the early exchange of information in the event of a radiological emergency
- International Atomic Energy Agency, *Convention on Physical Protection of Nuclear Material and Nuclear Facilities* (Reproduced in document INFCIRC/274/Rev.1), Vienna (2005)
- World Health Organisation, *International Health Regulations*, Switzerland (2005)

Agreements for the use of INMARSAT satellite communication at Leningrad and Kola NPP's

- Leningrad and Kola NPP GAN Inspectorate Office. Practical measures for the implementation of the agreement between Finland and Russia on the early notification of a nuclear accident and on exchange of information on nuclear facilities, dated 22 October 1996

Bilateral agreements on institutional level

- VATESI. Agreement on early notification of Nuclear and Radiological Emergencies between the State Nuclear Power Safety Inspectorate of the Republic of Lithuania and the Swedish Radiation Safety Authority of the Kingdom of Sweden. December 2008.

June 26, 2013

Appendix 1: Joint objectives of the radiation and nuclear safety authorities in the NB8 countries

Objectives on international communication:

- to test co-operation, communication and coordination of actions, including protective and precautionary measures, between radiation and nuclear safety organizations in the NB8 countries; including procedures for sending liaison persons to other organizations
- to test co-operation, communication and coordination of actions between the embassies in Helsinki and elsewhere and relevant bodies in NB8 countries
- to test coordination of public communication (timing, content and communication channels)

Objectives on common procedures and decisions:

- to analyse decisions made in different countries: what kind of decisions are made, when they are made, and what were the factors behind the decisions
- to assess the potential hazard area predictions by different countries
- to evaluate protective measures according to the Joint Nordic intervention criteria ("Nordic Flag Book")
- to test cooperation and coordination of actions according to the procedures presented in the joint "Nordic Manual"

Objectives on providing assistance to other countries:

- to assess the capabilities for providing assistance to Finland and other countries where the possible fallout might have an impact

22 APPENDIX I: SUMMARIES OF NATIONAL AND REGIONAL WORKSHOPS ON POTENTIAL IMPROVEMENTS IN, AND/OR CROSS BORDER ARRANGEMENTS FOR, EP&R

This Appendix summarises the main outcomes of the following workshops:

1. Workshop with Germany on potential improvements in off-site EP&R
2. Workshop with CEE countries (AT, CZ, HU, PL, SI, SK) on potential improvements in off-site EP&R
3. Workshop with France and the UK on potential improvements in off-site EP&R
4. Workshop on cross border co-operation between Germany and Switzerland in the field of nuclear and radiological EP&R
5. Workshop on cross border arrangements in the "Greater Region" (BENELUX, and regions of Germany and France).

All five workshops were conducted under Chatham House rules.

22.1 Workshop with Germany on potential improvements in off-site EP&R

Location: BMU, Bonn
Date: 18 April 2013

The Workshop was held in the context of a study being carried out by ENCO/UJV, under contract to DG ENER, on 'the current status of off-site nuclear EP&R in EU Member States and neighbouring countries'. The findings of this study will be presented in two subsequent Workshops to be held in Luxembourg on 4-5 July and 1-2 October, 2013: the first will be concerned with a review of current arrangements and capabilities including the identification of gaps, inconsistencies, best practice, etc; and the second will be concerned with the identification of, and making recommendations on, potential improvements. Information on current arrangements and capabilities and on potential improvements is being collected by means of Questionnaires. Detailed background information on the status of the project was provided. In the discussion potential members of the SG/CG have been identified.

The German participants provided detailed information on the current legal structures as well as the technical and practical arrangements available in the area of off-site nuclear EP&R. Addition information was provided on the post Fukushima discussions in the country as well as with neighbouring states and at international for aiming at the further development of the current arrangement.

The discussions focused on the following issues:

- Extent/adequacy of detailed emergency arrangements;
- Opportunities for improving cross border arrangements;
- More effective use of resources and capabilities;
- How best to achieve improvements in EP&R?

Results of the discussions:

A review of EP&R arrangements was ongoing in SSK and RSK. The major outcomes of this review were likely to be known by the end of 2013 but with work continuing till around the end of 2015.

- The existing recommendations for EPZ are not based on agreed standard release scenarios but rather on intervention criteria. Conceptual work is underway to make the rationale for the recommended standards and procedures more transparent and to achieve better flexibility in their application (development of a decision table/matrix which includes release scenarios beyond design basis). It is expected that a recommendation of the SSK will be agreed by the end of 2013 to expand the currently applied EPZ. The need for extendibility of the planned EPZ based on the actual situation after an accident has always been and will in future be an integral part of the response system. This requires deliberations about the availability of technical and personal resources beyond design basis planning.
- For decades Germany has pursued strategies to improve cross border arrangements, in particular with its neighbours in France, Austria, Switzerland and the Netherlands. Detailed bilateral agreements and arrangements, as well as standing committees to discuss the practical aspects and to further develop the existing arrangements are in place. The arrangements are regularly tested in cross border exercises. The ultimate goal of all these activities is to agree on harmonised standards and procedures across national borders. Beyond arrangements specific to a local situation (eg, around Fessenheim, Cattenom or Leibstadt), Germany is open for and would support the establishment of regional solutions, for example with its neighbours Luxemburg, the Czech Republic and Belgium. With a fully developed 24/7 IMIS/RODOS system, Germany has achieved a high technical standard; the products of this system are already shared with some neighbouring states and Germany is open to share the available information on request with further states and/or with the EC.
- The need for more effective use of resources and capabilities has been an issue for many years and there are good examples in place how this is already done: the costs for the further development and the maintenance of the RODOS system is shared between as many as 11 users in Europe. Other opportunities have been identified such as aerial gamma-spectrometry systems or the networks for bio-dosimetry. Germany is open to use options provided by the EC to further develop the technical arrangements available at EU level.

- Germany will continue to actively engage in the further development of off-site nuclear EP&R in the country as well as in Europe as a whole. Beyond the mechanisms (national, bilateral) already applied the activities of HERCA and WENRA are considered to offer the best opportunities to achieve reliable results; regional initiatives may also have an important role to play, in particular in enhancing cross border arrangement and mutual assistance.

22.2 Workshop with CEE countries (AT, CZ, HU, PL, SI, SK) on potential improvements in off-site EP&R

Location: ENCO, Vienna
Date: 6/7 May 2013

The meeting was held in the context of a study being carried out by ENCO/UJV, under contract to DG ENER, on 'the current status of off-site nuclear EP&R in EU Member States and neighbouring countries'. The findings of this study will be presented in two subsequent Workshops to be held in Luxembourg on 4-5 July and 1-2 October, 2013: the first will be concerned with a review of current arrangements and capabilities including the identification of gaps, inconsistencies, best practice, etc; and the second will be concerned with the identification of, and making recommendations on, potential improvements.

Status of the project, working arrangements and available results

ENCO provided detailed information on the status and on key organisational/management provisions of the project, in particular, the role of the Stakeholder Group and the Core Group as well as the objectives of the National/Regional 'Workshops on Improvements'.

Responses to the questionnaire on potential improvements in EP&R had identified a need for improvements in several areas, in particular the following:

- Scenarios for emergency planning;
- Cross border arrangements;
- Emergency Planning Zones;
- Intervention criteria;
- Monitoring;
- Decision support;
- Mutual assistance;
- Commodities;
- Adequacy of resources.

Potential improvements identified by countries in Central and Eastern Europe were broadly in accord with the above list (which represents a distillation of responses from all countries) but even greater emphasis or importance was attached to cross border arrangements (including information exchange, joint and more realistic exercises, shared use of assets and capabilities, etc).

The results of the questionnaire (ie, identified areas for potential improvements) were used to prioritise the issues addressed in the Workshop).

Objectives of the Workshop

The workshop had four objectives:

- To assess the status of existing arrangements and capabilities inside & between the EU MS and neighbours in the region AT, CZ, HU, SI, SK, PL;
- To identify best practice, gaps and inconsistencies, in particular related with cross border arrangements;
- To assess how current EP&R could be more effective (better use of available resources/avoid duplication, etc);
- To make recommendations for improvements.

The discussions focused on the following issues:

- Extent/adequacy of detailed emergency arrangements.
- Opportunities for improving cross border arrangements.
- More effective use of resources and capabilities.
- Mutual assistance.
- How best to achieve improvements in EP&R.

Results of the discussions

General

Common to most countries in the region is their limited geographical extension and size of their population as well as the limitations of resources available for EP&R as compared to the full spectrum of resources that might be required to protect their population in a nuclear emergency, eg,. to avoid deterministic health effect and to keep the risk of stochastic effect as low as reasonably achievable. Some of the countries in the region operate NPPs, others don't; some have long lasting and extensive experience in cross border cooperation and information exchange, based on bilateral or multilateral cooperation agreements as well as in cross border exercises, others don't. In some of the non-nuclear countries parts of the national territory may fall within the EPZ.

Notwithstanding the vast experience already gained from bilateral arrangements in the region, there remains much potential for further improvement. Experience gained bi-laterally needs to be more fully exploited across the region as a whole (ie, dissemination of good/best practice) and weaknesses in current arrangements need to be addressed.

All countries in the region identified a need to improve cross border emergency arrangements because – given the limited geographic extension of the countries – they would, in general, expect to be affected collectively by releases of radioactive material from a nuclear emergency occurring elsewhere in Europe.

Any approach used to achieve improvements in the current situation would have to clearly distinguish between the following: firstly, national obligations to provide urgent protection in the early phase in the vicinity of an NPP and, secondly, the large scale, nation- or even EU-wide response to such an event. Given the limited resources available in many countries, improvements in cross border arrangements (including mutual assistance programs to support urgent protective actions) were identified as an option which should be further pursued (see below). This would require a continuation - and in some cases a reinforcement - of bi-lateral and/or multi-lateral efforts in the region to identify and specify future initiatives and priorities aimed at further improving cooperation in the region. Key elements in this process would be the identification of priority areas and needs and the reliability and quality of any further arrangements put in place (eg, mutual assistance programmes).

For coping with complex response arrangements, particularly in areas requiring sophisticated infrastructure (eg. bio-dosimetry, medical treatment of highly exposed people, etc) there was a clear preference for a regional/EU solution (see below); establishing and maintaining sustainable capabilities in these more specialised areas were beyond the capacity of some of the smaller countries. The development of regional centres as a potential solution to this problem had been identified in response the questionnaire on improvements; but, on further reflection, this was judged not to be practical due to insufficient critical mass in the region on which to build. Moreover, the development of such centres would require commitment and agreement at both technical and political levels, something that would not be easily achieved given other priorities.

Specific issues

Further enhancement of cross border information exchange is, and will remain, an area of high priority. This would include information in the early phase of an accident on plant status and accident progression, decisions on urgent protective measures as well as on the underlying decision making process.

In the early phase of an accident the operator has to provide early notification – based on pre-defined parameters of the plant status - to the competent national authority as an early indicator that an accident with potential off-site consequences could not be excluded with certainty. This early alert would allow some flexibility and time to establish both the national crisis organisation for the NPP in question and to inform the pre-established contact point(s) in neighbouring states based on agreed

protocols for such an information exchange. In principle, the direct notification of a neighbouring country by an operator could accelerate the response in that country; however, there was a consensus that this was not a preferred option.

Bi-lateral and multi-lateral arrangements are already in place in the region and they are regularly tested in cross border exercises. The further development of these arrangements, aimed at continuous improvement, should be based on further bi-lateral/multi-lateral discussions and the findings of exercises. Identified gaps and/or weaknesses in existing arrangements (eg, cross-border arrangements between CZ and DE, language issues, developing guidance for informing neighbouring countries, etc.) need to be addressed.

Several technical systems are available at national and supra-national levels for the rapid exchange of on-line and laboratory measurements characterizing the situation in the environment. While these are valuable, there is the need for further harmonisation and standardisation and the development of methods to make better use of the plethora of data for supporting and enabling more soundly based decision making.

Various technical systems for decision support are operated at national and regional levels in the region as well as at EU and international levels. There is a need for consolidation and/or rationalisation of the existing situation. At local/regional level decisions on urgent protective measures have to be based on the rapid assessment of the situation by the competent national authority. This assessment would, in principle, inform decisions taken both in the NPP country and, at least initially and in principle, in neighbouring countries. For this process to work effectively, neighbouring countries would need to have trust in the assessment made by the NPP country and full transparency would be required with regard to the information underpinning any assessment. Achieving this outcome would be challenging and could only be realised through regular training, realistic exercising and building trust between the parties over an extended period of time. But it would bring the considerable advantage of neighbouring countries not having to establish and maintain the current level of capability and operability of decision support systems.

For decision support at far distances and during later stages of an emergency, more centralised approaches (eg, at an EU or regional level) could have merit and there was a broad consensus that such options were worthy of further investigation (see below).

The harmonisation of EPZs and intervention criteria (both intervention levels per se and operational values) remains a difficult issue. Underlying concepts/principles for their establishment and the values selected in different countries and at international levels span a wide range; such differences are not surprising as the values adopted reflect a mixture of scientific, socio-economic and political judgements. Experience has shown that these differences cannot be resolved on scientific grounds alone. Further efforts are required to resolve this issue, which is a major impediment to gaining public confidence in measures taken in response to an accident (ie, when widely differing criteria and responses are taken in neighbouring countries).

Recognition that this issue can only be resolved through a political, as opposed to a scientific, process would be a major step forward.

EPZ is an essential feature of any preparedness system; within the EPZ urgent protective measures as well as the required technical and human resources are planned to provide timely and effective protection to the population. It is not possible to find a compelling technical explanation for differences in EPZ for the same type of NPP in different countries. These differences have numerous origins, not least the adoption of practice in vendor countries (ie, countries who originally supplied the NPP) and widely differing judgements as to what is considered reasonable to make detailed planning for in the wider socio-economic-political context. Harmonisation of EPZ was recognised as an important goal that would contribute to enhanced public confidence in emergency arrangements. But, as for intervention levels, its achievement would most likely require initiatives/accord at a political level (ie, it is more than a technical issue). Achieving harmonisation bilaterally or regionally level may be a first step in the process of achieving wider European agreement.

Given the low probability of occurrence of severe nuclear emergencies with major off site consequences, exercises are a key element of any emergency preparedness system. They have to be as realistic as possible to identify limitations and needs for improvement in the preparedness arrangements. Many of the national, bi-lateral and multi-lateral arrangements available in the region already fulfil these criteria. Realistic exercises have to test the capability of extending urgent protective measures beyond EPZ and in situations in which key infrastructures (electricity supply, communication, etc.) fail for reasons unrelated to the nuclear accident. Both types of situation require outline planning beyond the more detailed planning available within the EPZ and based on a graded approach. Situations of this nature require the implementation of a national plan for emergency preparedness, which would include resources beyond those allocated in detailed planning of the response to nuclear emergencies. Situations of this kind have already been exercised in parts of the region and this practice should be more widely extended in future.

Mutual assistance between neighbouring countries, in the region and at European level, is considered a helpful mechanism, in particular to compensate for limitations in the availability of highly specialised capabilities; the latter may be required in complex situations following a severe nuclear accident. Mutual assistance arrangements could enable the more effective allocation of personnel and technical resources at national level. Examples of this kind would be specialised measuring capabilities for alpha/beta measurements, areal gamma spectrometry, thyroid- or WBC measurements or the treatment of highly exposed individuals. It would be highly beneficial to organise mutual assistance at EU level by combining, in a fully transparent fashion, the specialised resources available in the Member States in modules, which could be activated in an emergency situation if needed. Such modules would have to fulfil clear pre-defined objectives and would have to include a QA/QC system. In addition such arrangements at EU level would have to address issues such as liability of those providing assistance.

The EU's Civil Protection Mechanism (CPM) could play a key role in this process, in particular when new legislation comes into force with the establishment of an

Emergency Response Centre (ERC); the latter will become the "operational heart" of the EU's emergency preparedness and response and humanitarian aid arrangements. It was recognised that the ERC could also act as a single registration point in Europe for the RANET system of the IAEA and that the merits of such an arrangement should be further explored (ie, reducing the administrative burden on Member States).

In addition, it was recognised that the ERC had the potential to provide common services that could reduce the effort that individual Member States had to allocate to particular aspects of EP&R, for example in making outputs of Decision Support Systems generally available, (ie, characterising the radiological situation across the whole of Europe); this potential should be further explored.

Consideration should also be given to the potential role of NATO in this area as they were also active in off-site EP&R.

22.3 Workshop with France and the UK on potential improvements in off-site EP&R

Location: DECC, London
Date: 14 June 2013

The Workshop was held in the context of a study being carried out by ENCO/UJV, under contract to DG ENER, on 'the current status of off-site nuclear EP&R in EU Member States and neighbouring countries'. Detailed background information on the scope, the objectives and the status of the project was provided prior to the workshop. The objectives of the project are a detailed assessment of the existing situation of off-site nuclear EP&R in EU and the identification of options for improvement. The primary objective is not the establishment of new legislation; it is rather the attempt to make use of political opportunities for improvements after the accident in Fukushima.

The discussions focused on the following issues:

- Difficulties in the interaction between the NCPs and the project;
- Rationale of EPZ/extendibility;
- Cross border arrangements;
- Better use of resources;
- Mutual assistance.

Results of the discussions

The NCPs of UK and France stated that, due to other commitments in the countries and the need to involve a large number of organisations and agencies in the completion of the Questionnaires, it had not been possible to meet the deadline for the submission of complete responses.

Due to an internal re-organisation in ONR, the nominated NCP for the UK is no longer available for the project and a new NCP has yet to be nominated. Sara Swash will act as the national contact point for the project until a new NCP is nominated. As a consequence, the UK would not be able to participate in the workshop on 4 and 5 July and it is unlikely that missing/incomplete responses to the Questionnaires can be provided by this date.

A review of the monitoring arrangements for public protection and reassurance is currently under development UK. No major problems with the existing arrangements have been identified so far.

Rationale of EPZ/extendibility

The national approaches to define EPZ are generally similar but a wide range of variability in

- The sizes of EPZ;
- Rationales/assumptions adopted;
- What is judged reasonable to plan for (in detail);

is observed. It is obvious that judgements of various nature play a key role in the choice of EPZ. Explanations for the differences are often missing. Therefore, the wide range of the EPZ could be (mis-)interpreted as major differences in public protection.

The UK set out how their approach is underpinned by sound technical principles, local circumstances and regulatory judgements - and highlighted that the apparent variability in approaches between countries could be managed by clear communications.

One aspect, which has not been sufficiently discussed so far, is the time dependence of the EPZ (reflex phase, later phases) which is fully implemented in the French prepared arrangements. It was emphasised that the EPZ is – in combination with a number of other tools and criteria such as sound provisions for the extendibility of planning within an all hazards approach – a holistic tool, which provides input to, but does not define the ultimate level of, the protection level of the population. The ongoing WENRA activities were mentioned in this context.

Cross border arrangements

A great number of cross border arrangements between France and its neighbours are available; so far little emphasis has been paid to rationalise resource allocation across

borders. The conceptual activities of HERCA/WENRA in this field are supported by UK and France.

Better use of resources

There are various options available such as capacity building, twinning activities or networking of specialised laboratories (eg. for biological dosimetry).

Mutual assistance

Both countries are in favour and support the IAEA RANET system. They did not express an interest in a European solution and would consider such a solution as a duplication of efforts. One area where a European solution might be beneficial is the organisation of information exchange between Member States. The solution would need to clearly show that it added value to existing IAEA information exchange mechanisms and did not duplicate or provide extra burdens for countries or the IAEA.

22.4 Workshop on cross border co-operation between Germany and Switzerland in the field of nuclear and radiological EP&R

Location: Freiburg
Date: 25 July 2013

Status

Agreements on cross border co-operation, which include information exchange, cooperation in planning and the implementation of protective actions, as well as mutual assistance in case of a nuclear or radiological emergency, have been established between Germany and Switzerland. The agreements cover a wide range of scenarios but the main focus is on EP&R specific to the NPPs Leibstadt (CH) and Beznau (CH).

A standing committee has been established between Germany and Switzerland (DSK) including sub-committees dealing with the full spectrum of EP&R. The mandates of these committees, who meet regularly (once a year), specify the scope and objectives of the work:

- Information about the status and potential future developments related to EP&R including planning of protection measures.
- Early notification in case of a nuclear event with cross border significance.
- Regular exercises.

This work includes common planning arrangements as well as the implementation and operation of technical infrastructures for fast information exchange.

Existing agreements

The bilateral agreements include a list of information topics, which are essential for planning EP&R:

- Information about the NPP.
- Typical release scenarios and source terms.
- Details of the emergency planning including the crisis organisation.
- Technical infrastructure available for the surveillance and assessment of the radiological situation off-site as well as in greater distances.
- Measurement strategies.
- Intervention levels.
- Protective measures.
- Provisions for the information of the public.

Differences in approaches and in numerical values are identified and discussed with the aim to achieve further harmonisation; potential areas of mutual assistance are identified.

After the declaration of a nuclear emergency the following information will be exchanged:

- Characterisation of the actual situation including information about the radioactivity released and information about the expected future development.
- Assessment of the probability of a release to the environment.
- Meteorological information (actual and prognostic).
- Characteristics of the (potential or actual) release.
- Measurement data.
- Expected radiological consequences for the population.
- Planned, recommended or implemented protective measures.
- Press releases.

The competent authorities agree to synchronise their protective measures whenever possible, especially in the early phase of an accident.

Topics of the workshop between Germany and Switzerland

A one-day workshop with participation from Germany (Federal and State levels) and Switzerland (Federal level) focussed on specific aspects of the co-operation between the two countries.

The main topics of the workshop were:

- Establishment of a clearly defined and regularly tested command structure.
- Availability of sufficient technical and human resources.
- Arrangements for information of the competent authorities for EP&R by the operator/the competent authority(ies) in neighbouring country(ies) about the plant status and its development.
- Decision making process to declare an emergency.
- Continuous assessment of the radiological situation inside the NPP and in the mostly affected territories outside (who does what?).
- Implementation of a pre defined and agreed protection strategy based on harmonised OILs.
- Mutual assistance during the implementation of response actions in the near and the far field.
- Termination of individual protective measures based on pre defined and agreed criteria.
- Standardised public communication procedures.
- Cross border arrangements.

Results

Legal status: The existing agreement on cross border co-operation in EP&R is based on fundamental decisions at governmental level which are codified by high-level legal documents; these initiatives started in 1980; while the content of these agreements has been maintained over the years, the detailed content of the underlying operational documents have been regularly updated and substantiated. Information exchange about incidents with or without (the potential) of off-site consequences have been and are still key issues of these agreements. The identification of national contact points is part of the agreements.

Command structure: both Germany and Switzerland have established clearly defined national, regional and local command structures; the national contact points for cross border co-operations have been identified; the interaction between the various organisations is regularly tested.

Decision making: The arrangements in place include provisions for situations requiring fast responses; the participation of liaison officers from Germany in decision-making processes as well as consultation between the heads of the decision making organisations on both sides of the border is part of the agreed procedures. Detailed criteria for long term protective measures as well a remediation measures are not available yet but they will be discussed in the future in the context of the implementation of the recommendations of ICRP. The question of OILs will be included in these discussions.

Information exchange: Starting in 2005 a detailed concept for information exchange has been developed, agreed and tested. It includes detailed specifications for the exchange of data and information under normal and emergency situations (alert, early and late phase) as well as for incidence without off-site consequences. For an efficient bilateral exchange of information protected emergency web sites are used. In case of Switzerland and Germany the external partners have almost the same access to the information as the domestic authorities.

Mutual assistance: A stand-alone, comprehensive agreement on mutual assistance entered into force in 1988; it is part of a cross border all hazard approach and addresses all types of emergencies; it clearly defines legal responsibilities for the management of such situations as well as the coverage of costs and liability.

Extendibility of existing arrangements: It is obvious from previous exercises that there might be a need to extend pre-planned protective arrangements both in time and in geographical extension – the application of an all hazard approach in preparedness might help to overcome shortages of the required resources; nevertheless, there might be a shortage of highly specialised professional expertise, such as trained and experienced medical doctors for screening and early treatment or laboratories specialised in measuring infrequent occurring radionuclides; shortages of this kind should be dealt with at European or international level.

Conclusions

The participants agreed on the following results and conclusions:

- Decades of tedious work and continuous consultation resulted in sound and sustainable bilateral agreements. However, some parts of these agreements and arrangements are not binding from a legal point of view. Bilateral exercises showed more than once that success can depend on gentlemen's agreements between individual officers. Furthermore, the portfolio is still uncompleted, inhomogeneous and its scope varies drastically with cardinal direction. The details of the existing bilateral agreements in central Europe are different in nature and the arrangements in place for the situation between Germany and Switzerland might be used as examples of good practice.
- Standardised and binding European rules for a framework for bilateral agreements are highly desirable. These should not only cover technical issues but also issues of costs and liability. As a consequence, such a framework would exceed the scope of current EU and IAEA recommendations.
- From the point of view of the meeting participants such a framework agreement for bilateral or multilateral cross border co-operation should cover among others the following points:
- Sharing of information (at a very detailed level):
    - Instantaneous exchange of information (notifications, alerts, forecasts, summary of measured data, plant parameters, countermeasures);
    - Routine exchange of standardised measurement results;

- Direct access to results from respective online tools of expertise;
- Access to respective civil protection and alert schemes;
- Access to detailed site descriptions.

- Familiarity with the respective organisation (local, regional and federal / national, both non-emergency situations and emergency situations). As a direct consequence: compulsory meetings of all players.
- A quorum of cross-border exercises.
- A decision-making process to declare an emergency or to lift measures (following a Top-Down-Approach, where applicable including respective consultation in real-time).
- Implementation of a pre-defined and agreed protection strategy (Following a Top-Down-Approach, preferentially based on EAL/OIL).
- Mutual assistance.
- Public communication procedures.

Such a legally binding framework would harmonise the portfolio of bilateral agreements, ease the implementation and execution of protective measures and raise the European level of emergency preparedness and response.

22.5 Workshop on cross border co-operation between States of the "Greater Region" (Belgium, France, Germany, Luxembourg, the Netherlands) in the field of nuclear and radiological EP&R

Location: Chateau de Senningen, Luxembourg
Date: 27 August 2013

The Workshop was held to explore current bi- and multi-lateral cross border arrangements for off-site nuclear EP&R in the "Greater Region" and identify potential areas for improvement. It was held under the auspices of the study (Review of current off-site nuclear emergency preparedness and response arrangements in EU member states and neighbouring countries) being carried out by ENCO on behalf of DG ENER of the EC. The Workshop was attended by about 15 participants with representatives from BE, DE, FR, LU, NL, EC and ENCO.

Status

Various bilateral agreements on cross border co-operation, which include information exchange, co-operation in planning of and the implementation protective actions as well as mutual assistance in case of a nuclear or radiological emergency have been established between the states in the Grand Region. The agreements cover a wide range of scenarios but the main focus is on EP&R specific to the NPPs Cattenom (FR) and Emsland (DE).

Standing committees have been established including sub-committees dealing with the full spectrum of EP&R. These committees are working at two levels: on national level (ASN-IRSN, eg. DRP-ASS) and, at a local level, "groupe contact" with DRP-ASS, Préfecture, CNPE Cattenom and Federal states (civil protection and radiation protection authorities from Saarland and RLP). The mandates of these committees who meet regularly specify the scope and objectives of the work:

- Information about the status and potential future developments related to EP&R including planning of protection measures.
- Early notification in case of a nuclear event with cross border significance.
- Regular exercises.

This work includes common planning arrangements as well as the implementation and operation of technical infrastructures for fast information exchange.

Discussions on cross border issues in the "Greater Region"

Discussions on cross border issues in the "Greater Region" were structured under ten separate topics (see below), albeit recognising that, inevitably, there was interaction/overlap between them.

1. Clearly Defined and Regularly Tested Command Structure (ie, how do national systems and structures work together (ideally in a seamless way, to ensure the continuity of protection across national borders)

There is no common system of command structure across the region. Each country has its own structure and arrangements for decision making but there is effective communication (especially locally) in most if not all cases to ensure timely response in neighbouring countries. In some areas such as in the radiological assessment the communication is far more effective between the national players, in other areas obviously the local exchanges are the faster channels. Bi-lateral arrangements differ between each pair of countries, reflecting their evolution over time in the local, regional, national social and political contexts.

WENRA, in its work on mutual assistance between regulatory bodies, has recommended the deployment of Liaison Officers from the neighbouring country to the accident country. Such arrangements already exist (eg, NL-BE, LU-FR, etc) but it was noted that care would need to be taken to avoid a plethora of Liaison Officers from across the EU wishing to be present in a national crisis centre – rather it would need to be restricted to the potentially most affected (eg, neighbours or near-neighbours). The role/functions of Liaison Officers have been defined in FR-LU cross border arrangements and may be a useful model for use elsewhere.

In most, if not all cases, it appeared that cross border cooperation was limited to exchanges of information, timely notification of alerts, etc, that would facilitate effective and timely response in neighbouring countries. Decision making would always remain a national prerogative and caution should be exercised in making any

attempt to change this; in particular, it may have negative and potentially unforeseen outcomes, including loss of trust and confidence that was judged critical by many as essential for effective cross border arrangements (eg, 'top down' approach being developed by HERCA). There is a strong need to further strengthen the coordination of decisions; there have already been attempts in the greater region to achieve that during exercises, but more efforts are needed. The top-down approach being developed by HERCA/WENRA is believed to bring us closer to that goal.

It was noted, however, that it was not enough just to exchange information; rather, in the preparedness phase, there was a need for more intensive interaction across borders to better understand respective policies and practices – and guidance or a template on how best to achieve this could be helpful.

There was broad accord that current cross border arrangements were largely fit for purpose and had evolved over the years to reflect what was practically and politically possible. Improvements could be made, however, and should be pursued when opportune. A wide range of views had been expressed by NCP (either in other fora or in providing written input to the project) in how improvements could be made; these ranged at one extreme from putting in place a legislative framework setting out requirements for cross border arrangements, through the development of a softer voluntary arrangement having the same outcome, to the other extreme which is essentially the status quo, ie, seeking improvements through individual bi-lateral arrangements.

There was a broad recognition that, at least, it would be helpful to codify current best practice that could be used as a model elsewhere; the development of a voluntary 'code of practice' or something with similar effect (eg, HERCA/WENRA recommendations) were worthy of further consideration.

2. Availability/sufficiency of resources

There were reservations (to varying degrees) in most countries over the adequacy of resources for treating large numbers of over-exposed people and likewise for the triage and biological dosimetry of even larger numbers. It was recognised that there was a European pool of expertise but it was less clear if this was adequate if the demand was more than a few (treatment) or a few hundred (triage). The dilemma here (and in some other areas) was to agree on what is it reasonable to plan for. The issue was largely one of extendibility, in particular had the region made any plans or arrangements for sharing expertise and/or resources – apparently not.

Some reservations were expressed as to whether effective support could be expected or relied upon from neighbours in an emergency, ie, when responding to national issues would be the priority. However, such arrangements may be more effective in a wider European context.

The availability of expertise and resources for decontamination was not judged to be a problem; in particular, as arrangements in BE, FR and LU had been exercised fairly recently in a civil protection context under a trilateral cooperation agreement.

The potential of RANET and MIC (now ERC) to help in this respect was recognised but there was a need to avoid duplication by introducing any new mechanisms.

Other areas where more attention should be given to the development of regional approaches were aerial monitoring (in particular overcoming long recognised problems regarding clearance for monitors being carried on military platforms) and, in light of Fukushima experience, enhancing provisions for the monitoring of water bodies, especially those with shared borders.

3. Informing competent authorities about plant status, etc

Arrangements for gaining access to, and the nature of, information exchanged on plant status and prognoses of accident development appeared to differ between the various bi-lateral arrangements. Some countries expressed a wish for better access to information on plant data/status in order to make informed and independent judgements on the potential progression of an accident; others were satisfied with what they received. However, it was apparent that these aspects had probably not been sufficiently exercised in the past and may be matters that warrant further attention in the future. The SELCA system was used for initial alerting in addition to the flow of information to Competent Authorities but it was not clear to what extent information on plant status was (or could be) included in the SELCA system. Consideration should be given to whether the SELCA approach should be codified as part of good/best practice for cross border arrangements.

For countries with nuclear expertise, there could be benefit to having greater access to plant data (ie, at a similar level to that available for NPP within their own countries). However, a clear distinction should be made between plant data that were needed for making prognoses of accident development and those that would better inform effective emergency response.

4. Decision making process to declare an emergency

Decision making is a national responsibility and is likely always to remain so. No provision appeared do exist in existing bi-lateral arrangements for co-decisions on the declaration of an emergency or the introduction of protective measures. In addition to legal constraints (ie, national responsibilities) in terms of what could be done with regard to joint decision making across borders, the need for rapid decisions/action in the early stages of an emergency would largely preclude co-decisions between neighbouring countries. This constraint did not apply, however, at later stages of an emergency and in decisions related to the removal of protective measures; in such situations, the merits of co-decision across borders warrants further consideration. Meanwhile, the timely exchange of information and rationale/s for various decisions (where practicable in advance of action being taken) remained the most effective way to proceed – with decisions in neighbouring countries taking account of what had been done elsewhere in arriving at their own decisions.

5. Continuing assessment of the radiological situation

Differences were apparent in existing bi-lateral arrangements regarding monitoring across borders. In some cases there was a seamless transition, ie, the neighbouring country was able to carry out monitoring across borders into the accident country, and vice versa, and all information was shared; in others this was not the case. These cross border arrangements were exercised to varying extent. There did not appear to be any arrangements in place to share key/expensive assets (eg, aerial survey) that may be used for rapid assessment of the radiological situation across borders.

Consideration should be given to existing practices to determine those aspects that could be codified into good/best practice for cross border arrangements.

6. Protection strategies based on harmonised OIL

There are marked differences between countries in Europe in the use made of OIL, notwithstanding their inclusion as a requirement in IAEA GS-R-2; discussions on their use and practical value are ongoing in some countries. There was a broad consensus that any attempt to develop and use harmonised OIL would not bring a solution to the longstanding failure to harmonise IL.

7. Mutual Assistance

This aspect has already been addressed, at least partially, in previous sections consequent upon the inevitable links and overlaps between the respective topics. The key issues and/or areas where: there remain differences of view on the relative importance to be given to bi-lateral arrangements for mutual assistance, mutual assistance within Europe under the auspices of MIC (now ERC), and mutual assistance internationally under the IAEA Convention implemented by RANET. Further consideration needed to be given to how Europe or regions within it could make best use of existing mechanisms with a view to further developing and enhancing the level, timeliness and quality of assistance they would receive should it ever be needed and vice versa. It was recognised that arrangements for mutual assistance were difficult to exercise.

8. Termination of protective measures

No arrangements appeared to be in place for co- or joint-decisions on the termination of protective measures that were in place across borders. The potential benefits of joint-decisions were recognised, in particular as there would not be the same time constraints as in the early stages of an emergency. However, more time would not necessarily make joint decision making easier, ie, due to the greater opportunity for broader social and political considerations to enter the process. As a minimum, information on and a shared understanding of what neighbouring countries were doing should be the aim.

9. Standardised communication

Wide variation in practice was again evident in different bi-lateral arrangements. Some bi-lateral arrangements provided for consultation between the countries before any public communication was made but this did not appear to be the norm. The importance of this issue was widely recognised, in particular avoiding communications from neighbouring countries prejudicing or conflicting with actions being taken or information being provided in the accident country. In some cases, albeit in a broader emergency context, cross border communication arrangements were frequently exercised. Consideration needed to be given to the merits of codifying good/best practice in this area.

10. Cross border arrangements in the region (ie, between the five concerned countries)

There was a majority view that it would be imprudent, at this time, to try and develop a legislative framework governing what should be done with respect to cross-border arrangements for responding to a nuclear emergency; at present the political situation was not opportune for such an initiative and any such attempt would likely be widely opposed. There was, however, greater potential for largely achieving the same outcome through the use of a softer mechanism, eg, codification of good/best practice (ie, code of practice) in cross border arrangements in Europe. HERCA/WENRA could perhaps take the lead in developing this. It was recognised that failure to put in place more common arrangements (or good practice) for cross border EP&R using a softer mechanism would greatly enhance the risk of legislative action.

23 APPENDIX J: SUMMARIES OF MEETINGS WITH DG ECHO AND DG ENER ON EP&R ARRANGEMENTS AND CAPABILITIES IN THE EC

This Appendix summarises the purposes and main outcomes of the following two meetings:

23.1 Meeting with DG ECHO on EP&R arrangements in the EC (especially the ERC)

Location: DG ECHO, Brussels
Date: 17 April 2013

The meeting was held in the context of a study being carried out by ENCO/UJV, under contract to DG ENER, on 'the current status of off-site nuclear EP&R in EU Member States and neighbouring countries'. The findings of this study will be presented in two subsequent Workshops to be held in Luxembourg on 4-5 July and 1-2 October, 2013: the first will be concerned with a review of current arrangements and capabilities including the identification of gaps, inconsistencies, best practice, etc; and the second will be concerned with the identification of, and making recommendations on, potential improvements.

ECHO provided detailed information on the current status of the Civil Protection Mechanism (CPM), on ongoing legislative developments and on the planning for the establishment of new legal structures as well as the technical and practical arrangements available/foreseen once the new legislation came into force.

The discussions were focused on the following issues:

- Current (and planned) interfaces between CPM and DG ENER's arrangements for responding to accidents at nuclear installations: MIC's involvement in the relevant operational mechanisms at the EU level such as ECURIE, EMERCOM, CODEX?
- Opportunities for enhancing the efficacy and cost-effectiveness of arrangements within the Commission for responding to nuclear accidents by deeper integration of CPM and DG ENER activities.
- Potential role of MIC in relation to mutual assistance within the EU (and beyond) in the event of a nuclear accident: MIC as the initial (or even sole) contact point for the IAEA RANET?
- Potential role of MIC in establishing (or facilitating the establishment of) European capabilities for responding to an emergency where these were expensive and only rarely used (eg, medical treatment of over-exposed people, aerial survey, biological dosimetry, etc).

Results of the discussions

General

A proposal for a Decision of the EUROPEAN PARLIAMENT and of the COUNCIL on a Union Civil Protection Mechanism is under discussion. This proposal is to replace the Council Decisions on the Civil Protection Mechanism, (which facilitates reinforced cooperation between the Member States and the Union in the field of civil protection), and the Civil Protection Financial Instrument, (which provides funding for the actions under the Mechanism to ensure protection against natural and man-made disasters). The proposal contributes to Europe's 2020 objectives to increase the security of EU citizens and build resilience to natural and man-made disasters as an important part of the Stockholm Programme and the EU Internal Security Strategy. Furthermore, by supporting and promoting measures to prevent disasters, EU Civil Protection policy would reduce the costs to the EU economy from disasters.

Based on this legal framework, improvements in the areas discussed during the meeting are very likely and should be pursued further with high priority.

The Emergency Response Centre (ERC) will become the new "operational heart" of the new EU Civil Protection Mechanism. It will replace and upgrade the functions of the previous Monitoring and Information Centre (MIC). Beyond that it will play a key role as a coordination hub to facilitate a coherent European response during all types of emergencies, both inside and outside Europe. By merging the current Crisis Room for humanitarian crises and the Monitoring and Information Centre (MIC) for civil protection, the ERC will foster increased cooperation between the civil protection and humanitarian aid operations.

The ERC and the EU Civil Protection Mechanism will improve joint planning and response coordination in Europe and therefore complement the role of the Member States. To ensure the highest quality standards, this rapid response capacity will include a certification process for the resources made available to the pool. The ERC will initiate a process to identify gaps in the panoply of European assistance and of proposals on how these gaps can be covered, through financial support from the EU or other means. The ERC will be able to deal with several simultaneous emergencies in different time zones, around-the-clock (24/7).

An increased co-financing of transport (beyond the current 50%) will enable assistance delivery to the country affected within a few hours with no budget constraints for individual Member States offering the assistance. Pooling and consolidating shipments from various countries to the affected country will boost the efficiency of the European response.

Specific

The new legislative framework and the establishment of the ERC would provide numerous opportunities for enhancing preparedness and response to nuclear and radiological emergencies which should be fully exploited by those concerned, both

Member States and within the EC. The more significant opportunities included the following:

- Further enhancement in cooperation between DG ENER and EG ECHO in the field of emergency preparedness and response to radiological and nuclear accidents; this is already being pursued under the auspices of a MoU between the two Directorate Generals.
- Evaluating the potential use of MIC/ (or the ERC) as a single point of contact between IAEA's RANET system and the EU (ie, all mutual assistance from EU member states being coordinated through MIC/ERC).
- Explore interests and or commitment of EU MS to use MIC/ERC as the single point of contact with RANET.
- Identify capabilities/modules (especially those which are expensive and rarely used) that could be included within the 'European Pool of Assets' with a view to making more effective use of limited resources within; examples discussed were the sharing of resources for environmental monitoring (aero gamma spectrometry) or biological dosimetry and of special protective chemical products (iodine tablets) or specialised medical treatment capabilities for people with high radiation exposures.
- Where appropriate, seek financial support from the new Mechanism to establish, reinforce and/or ensure the continuous availability of key capabilities/modules.
- In principle, MIC/ERC would be open to including outputs from decision support systems enabling these to be more widely available; the practicality of doing this should be explored further by those systems which have found wide usage in Europe (eg, RODOS).
- MIC/ERC should consider gaining access to CTBTO data, which would be valuable in any future radiological or nuclear emergency.
- The potential for MIC/ERC to provide common information and advice to Embassies, etc, (at least to EEAS) following accidents in third countries should be explored.
- The framework for the interaction between DG ECHO and ENERGY and the specific future role(s) of ERC and the EU Civil Protection Mechanism in the field of emergency preparedness and response to nuclear accidents have still to be defined in a MoU, which is currently under development.

23.2 Meeting with DG ENER (D3) on EP&R arrangements under EURATOM

Location: EC, Luxembourg
Date: 3 July 2013

Major findings:

No comprehensive review has been performed after Fukushima at the level of the EC as a whole eg, related to the global crisis mechanism system for the central management in the EC.

There are no formal mechanisms in place within DG ENER to review implementation of EU legislation related to radiation protection; in particular no peer reviews are being performed or planned for existing regulations; the exception being the HASS Directive.

The new EU BSS defines many new details for radiological protection (such as the protection of workers) and for public communication; there is a need to support the transposition of the new regulations in the member states and to demonstrate compliance with the regulations in application; a suitable arrangement is needed to achieve this ambitious goal.

An internal review was carried out of EC's EP&R arrangements and capabilities post Fukushima (ECURIE, EURDEP) and lessons learned within the scope of DG Energy have been identified. These include:

- Accelerated installation of web ECURIE
- Installation of and access to audio-conferencing system – now being used for communications between competent authorities (eg, HERCA, WENRA)
- More sample types to be included in EURDEP
- Staff resources for EP&R increased through arrangements and training of personnel in Safeguards
- Arrangements with SANCO re foodstuffs.

Technical support arrangements are available to demonstrate the adequacy of the arrangements in the member states (EURDEP/DETECT) as well as of the data reported by Member States but there are options available to improve the performance standards of the Radiation Protection unit, eg. by:

- Increasing the number of exercises (communication checks, full exercises);
- Making better use of the data received by member states to characterise the radiological situation in Europe as a whole and taking lead in informing EU citizens in third countries (eg, via EEAS);

- Use of national organisation (under contract) to provide technical support to DG ENER in an emergency (eg, prognoses, etc) works effectively and the periodic change of contractor (via open tendering) is not considered to be detrimental or leading to a loss in efficiency.

There is a potential for further optimisation of current arrangements (technical and organisational) between DG SANCO (foodstuff regulation) and DG ENER – Radiation Protection; a MoU to better define the interrelations (eg an MoU) would be helpful.

There is a need to involve more senior people (in DG ENER and the Commission more widely) in exercises.

Better use of external personnel (JRC, Petten, EURO CONTROL) could improve the operational capabilities of DG ENER – Radiation Protection in an emergency.

Cooperation with ERC (for which a MoU already exists) would contribute to harmonizing the communication system at EC level; this would include:

- The operation of a 24/7 contact point in Brussels for real time information exchange;
- Shifting the responsibility for mutual assistance arrangements (liability, QA/QC) to ERC as a one stop shop for mutual assistance in Europe;
- Operation of the ECURIE system (long term);
- Coordination of provision of prognoses of radiological impacts in an emergency.

24 APPPPENDIX K: SUMMARIES OF THE ONGOING AND PLANNED ACTIVITIES AND INITIATIVES BEING TAKEN BY INTERNATIONAL ORGANISATIONS AND EUROPEAN NETWORKS OR ASSOCIATIONS IN THE AREA OF OFF-SITE EP&R

24.1 European Commission

The activities and initiatives related to off-site nuclear EP&R being taken or implemented by the EC are summarised in the following four sub-sections dealing respectively with legislative and related matters, initiatives in response to the Fukushima accident, research and development and cooperation with third countries under the Instrument for Nuclear Safety Cooperation (INSC).

24.1.1 Legislative and related matters

The Basic Safety Standards (BSS) Directive (96/29/Euratom) is currently being revised and, in the process, will integrate the provisions of other related Directives, including the Public Information Directive (89/618/Euratom). The revised Directive is at a very advanced stage in its progress through Council and is expected to be adopted in late 2013. The Commission proposal, which was made in May 2012 is set out in COM(2012) 242 final and the current status of the text in Council (as of August 2013) can be found in Council document 8682/2/13 REV 2.

The proposed revision to the BSS Directive contains a number of significant changes and new provisions related to EP&R reflecting international and other developments in the field since the existing Directive came into force in 1996.

The revision follows the situation based approach introduced by ICRP Publication 103 and distinguishes between existing, planned and emergency exposure situations. With regard to the management of emergency exposure situations, the current approach based on intervention levels is replaced by a more comprehensive system comprising an assessment of potential emergency exposure situations, an overall emergency management system, emergency response plans, and pre-planned strategies for the management of each postulated event.

The essential elements to be included in an *emergency management system* (prior assessment emergency exposure situations, allocation of responsibilities, efficient coordination, cooperation and communication measures etc) and in an *emergency plan* (reference levels for exposure, optimised protection strategies, pre-defined generic criteria, default triggers or operational criteria etc) are specified.

The need for efficient management of an emergency with cross-border consequences is recognised through provisions for enhanced cooperation between Member States in emergency planning and response. The proposed revision requires Member States to cooperate with other Member States and with third countries which may be involved

or are likely to be affected by an emergency, with a view to sharing the assessment of the exposure situation and coordinating protective measures and public information by using bilateral or international information exchange and coordination systems.

The introduction of reference levels in emergency and existing exposure situations allows for optimising protection as well as consideration of other societal criteria, which is particularly relevant in a post-accident phase.

In addition, revisions have been proposed to the Nuclear Safety Directive in light of a legislative review mandated by the European Council and supported by the European Parliament and others, and the results of the "stress tests" (see below). The proposals amend, strengthen and supplement the existing directive, by combining technical improvements with wider safety issues such as governance, transparency and on-site emergency preparedness and response. The proposed amendments aim to enhance the regulatory framework, by:

- Strengthening the role and effective independence of the national regulatory authorities;
- Enhancing transparency on nuclear safety matters;
- Strengthening existing principles, and introducing new general nuclear safety objectives and requirements, addressing specific technical issues across the entire lifecycle of nuclear installations, particularly NPPs;
- Reinforcing monitoring and exchange of experiences, by establishing a European system of peer reviews;
- Establishing a mechanism for developing EU-wide harmonised nuclear safety guidelines.

These proposals will be discussed in the Council.

24.1.2 Initiatives in response to the Fukushima accident

Immediately after the Fukushima accident in March 2011, the European Council requested that the safety of all EU nuclear plants should be reviewed, on the basis of a comprehensive and transparent risk and safety assessment ("stress tests"). The European Commission and the European Nuclear Safety Group (ENSREG) agreed to work on these EU stress tests to assess how nuclear power plants can withstand the consequences of extraordinary triggering events such as earthquakes or flooding, potentially leading to multiple loss of safety functions requiring severe accident management. All the operators of nuclear power plants in the EU had to review the response of their nuclear plants to those extreme situations.

Although the review of severe accident management may include emergency preparedness measures managed by off-site services for public protection, this topic was not in the scope of the stress tests. Furthermore, in consideration of comments and suggestions at public meetings on the stress tests and considering the events of

Fukushima accident, the topic of off-site emergency preparedness and response arrangements in EU countries has been acknowledged as an important area to be reviewed by both ENSREG and the Commission.

As a first step, the Commission initiated the present study "Review of Current Off-Site Nuclear Emergency Preparedness and Response Arrangements in EU Member States and Neighbouring Countries" which is the subject of this report. The study is intended to complement the findings of the stress tests, and provide an indication of potential areas for future Community policy action, as well as identify priority areas and further follow-up.

24.1.3 Research and Development

24.1.3.1 Background

The Euratom Treaty establishing the European Atomic Energy Community (Euratom) was "created to coordinate the Member States' research programmes for the peaceful use of nuclear energy. It helps to pool knowledge, infrastructure, and funding of nuclear energy". FP7 is the abbreviation for the Seventh Framework Programme for Research and Technological Development which is the EU's main instrument for funding research in Europe 2007-2013. During FP7, work will be undertaken to further improve the coherence and integration of this system including the characterisation of contamination and rehabilitation of accidentally contaminated territory. This will involve the development of common tools and strategies which will be tested in operational environments. Within FP7 research activities are funded in the areas of emergency management and rehabilitation: "First steps are being made to develop a methodology for optimising the design of monitoring systems that can make a timely and effective impact on the decision-making process. This is especially important as over the next decade many of the monitoring systems put in place following the Chernobyl accident will require replacement or upgrade."

Previous Framework Programmes have also funded research relevant to this project, eg. the RODOS (ftp://ftp.cordis.europa.eu/pub/fp5.../docs/rodos.pdf), EURANOS (www.euranos.fzk.de/) and FARMING (www.ec-farming.net) projects as well as the TMT Handbook (http://www.tmthandbook.org/).

Some additional projects funded by DG ENTR may also provide valuable input to the project although they address mainly R&D on security (CBRN, dirty bombs, detection, prevention, …). Relevant research funding at EC level on the same topics are coordinated actions are also funded by DG HOME.

24.1.3.2 FP7 Research Projects

Four research projects addressing the management of nuclear and radiological emergencies were launched in FP7. These projects were started to develop new tools and methods in updating radiation monitoring networks and decision support systems,

to make the national operational systems in Europe more coherent, and to support the creation and operation of a European platform on emergency and post-accident preparedness and management. Experiences gained during the past years have indicated that competent authorities in the EU member countries should apply a more coherent approach and compatible working procedures in nuclear emergencies.

24.1.3.2.1 The DETECT project

The DETECT project (http://detect.sckcen.be/en) was carried out between July 2009 and December 2011. It aimed primarily at developing a tool to optimise the position of environmental radiological monitoring devices to be used during nuclear emergencies. In the aftermath of the Chernobyl accident in 1986, many European countries installed monitoring systems for radioactive contamination in the environment. These systems serve the purpose of providing early warning about radiological emergencies. Many of the older monitoring systems require updating. The project produced the DETECT Optimization Tool (DOT) to help in optimising the locations of gamma dose rate monitoring stations from a national perspective. Negotiations with the European Commission on transfer of DOT to the JRC in Ispra are ongoing. The objective is that JRC makes the tool available to EU national competent authorities and takes responsibility for its maintenance.

24.1.3.2.2 The NERIS-TP project

The NERIS-TP project (http://resy5.fzk.de/NERIS-TP/), which started in February 2011; it aims at supporting the creation and operation of a European association (NERIS Platform, http://www.eu-neris.net) to further improve emergency response and recovery preparedness and management in Europe, and to close gaps idenified from previous EU research projects, by addressing the following topics:

- Support the creation and operation of a European platform on emergency and post-accident preparedness and management to further improve emergency response and recovery preparedness in Europe.
- Improve the early and late countermeasure models EMERSIM and ARGOS-EC (both for screening), ERMIN (inhabited areas) and AgriCP (agricultural production) by implementation of the new ICRP approach for emergency and existing situations.
- Strengthen the preparedness at the local/national level by establishing dedicated fora, developing new tools or adapting the tools developed within the EURANOS projects.
- Coupling existing emergency information systems with the European Decision Support Systems RODOS and ARGOS by developing a web based interface and a meteorological model chain that provides meteorological data for the assessments from freely available world-wide data.

Before its end in February 2014, the NERIS-TP project will organise a dissemination workshop (Oslo, Norway, 22-24 January 2014). The workshop programme will address the strengthening of the post-accident emergency preparedness at national, regional

and local level using new tools and methods. Stakeholder experience from Europe and experience and views from Japan and international organisations will be also reported and discussed.

Cooperation is on-going between the NERIS Working Group on Local Preparedness and the FAIRDO Project (Fukushima Action Research on Effective decontamination Operation) operated since March 2012 by the Institute for Global Environmental Strategies (IGES) of Japan. In order to improve the exchange of information, provide mutual expertise on emergency and recovery management and identify common methodological developments, a NERIS – IGES cooperation agreement is waiting for signature.

24.1.3.2.3 The PREPARE project

The PREPARE project (http://www.prepare-eu.org), carried out between February 2013 and January 2016, aims at closing gaps that have been identified in nuclear and radiological preparedness in Europe following the initial evaluation of the lessens learned from the response to the Fukushima accident. Among others, gaps have been identifed related to operational procedures for dealing with long lasting releases, cross border problems in radiation monitoring and food safety, and missing functionalities in decision support systems ranging from improved source term estimation and dispersion modelling tools to the consideration of hydrological pathways for European water bodies in decision support systems. In addition, the need was identified to improve the information flow between individual countries in general inside Europe.

The following tasks have been identified and will be performed in six research work packages:

- Developing operational procedures for long lasting releases: Following the Fukushima accident a review of existing procedures for long lasting releases and the identification of possible needs for improvements will be performed at the European level by conduct of scenario calculations.
- Establishing a platform for information collection and exchange: The objective of this task is to develop scientific methods and tools that could be used by a European Platform (i.e. as a single focal point) for the collection and analysis of information from any nuclear or radiological event, particularly regarding the consequences and any further developments.
- Implementing existing recommendations in operation: Following the Fukushima accident it became obvious, that the recommendations or requirements which already existed in Europe (EURATOM regulations) and at international level (IAEA, Codex Alimentarius) were not so easy to implement. Methods for improving this situation, which would facilitate the implementation into operation at least on a European level will be developed.

- Provisions to better integrate terrestrial aspects in decision support systems: The Fukushima accident clearly demonstrated the importance of source term estimations, which are not only based on information from the plant operator. Methodologies and tools to cope with and eliminate the identified deficits of the atmospheric dispersion models of ARGOS and RODOS in representing physico-chemical properties of the emitted radionuclides will be developed.
- Improvements to better take account of aquatic aspects by decision support systems: The aquatic models in decision support systems are far less developed than those for terrestrial ecosystems. This was apparent for the Fukushima accident as during the first month, there was no simulation of the activity released into the ocean. The project is aiming at integrating state of the art aquatic models into the RODOS DSS and to couple them with countermeasure simulation models. The new capabilities will be scrutinised with data available for several important European aquatic systems.
- Improving communication with the public: The overall objective of this work package is to investigate the conditions and means for relevant, reliable and trustworthy information according to its needs to be made available to the public at the appropriate time (both during a nuclear emergency as well as in the post-emergency phases). Information needs in this context refer to the understanding of the evolution of the accident, its management (and the related potential risks) and the capacity of the population and communities to prevent or mitigate individually and collectively harm arising from the threat.

24.1.3.2.4 The OPERRA project

The OPERRA project started on June 1 2013 (duration: 48 months). It aims at establishing a coordination structure that has the legal and logistical capacity to administer future calls for research proposals in radiation protection on behalf of the European Commission. Among OPERRA's initiatives are setting-up of a sustainable organisation to manage radiation protection research in Europe; the involvement of key partners in radiation protection as well as national and international funding agencies; and the enrollment of universities and academic partners, notably from new EU Member States, major stakeholders and authorities as well as other technical platforms inside and outside Euratom. The OPERRA consortium includes inter alia the NERIS platform, which deals with issues related to nuclear emergency management (see *24.1.3.2.2*).

OPERRA will exploit the synergies of Euratom and other EC programmes considering the most relevant joint program areas and mechanisms for funding joint activities. The project will also strengthen the links with national funding programs as well as the European education and training structures. It will take steps towards a greater involvement of new Member States who could benefit from increased participation in the radiation research programmes. At the end of the OPERRA project, a federating body with an appropriate legal and financial structure and scientific advisory board will exist to organise joint programming of radiation protection research and education and training in a number of domains including nuclear emergency management.

24.1.3.2.5 The COMET project

The COMET (Coordination and Implementation of a pan-European instrument for radioecology) project started in 2013. It will complement, and build upon, the foundations laid by the European Radioecology ALLIANCE and the ongoing FP7 STAR Network of Excellence (2011-2015) by close interaction with the European platforms on nuclear and radiological emergency response and recovery (NERIS), low dose radiation risk (MELODI) and the relevant training networks (e.g. EUTERP, ENEN). COMET will initiate innovative research on key needs jointly identified by the radioecology community, the (post) emergency management (NERIS) and low-dose research communities (MELODI); strong envolvement of research organisations from countries where major nuclear accidents have occurred (COMET partners include organisations in Japan and Ukraine) is integral part of the R&T strategy of the project.

One of the overriding aims of the projects *24.1.3.2.4* and *24.1.3.2.5* are to arrive at a situation with better interaction between endusers and the research community to provide better means to the address endusers needs in the design of research projects and to improve the oppoertunities to implement research activities in operational systems of emergency preparedness and response.

24.1.4 Cooperation with third countries on EP&R under INSC

Cooperation with third countries in the area of EP&R is one of the priorities of the EU's International Nuclear Safety Cooperation programme. Several projects have been implemented in this area, or are in the process of being implemented, including the following:

- Installation of the RODOS decision support system in the Incident and Emergency Centre of SNRCU in Ukraine;
- Installation of the ARGOS decision support system at the Nuclear Regulatory Authority (CNEN) in Brazil and its customisation to local conditions;
- Installation of the RODOS decision support system in the Nuclear Regulatory Authority (NNSA) in China;
- Enhancing capabilities in emergency management in several key institutes in China;
- Enhancing national and regional preparedness for responding to radiation incidents and emergencies in some non-EU countries (in cooperation with IAEA);
- Development of a regional approach for EP&R in South East Asia, in particular in the context of the planned use of nuclear energy in several countries in the region;
- Strengthening and harmonising national arrangements for EP&R in countries in Africa, Asia and the Pacific, Latin America and the Caribbean and improving compliance with international standards (in cooperation with IAEA).

In broad terms, the various projects are aimed at enhancing capabilities for EP&R in the various countries with a view to bringing them broadly in accord with best European practice.

24.2 West European Nuclear Regulators Association (WENRA)

In March 2012, WENRA reviewed activities that its members had undertaken in order to learn lessons from the TEPCO Fukushima Dai-ichi nuclear accident (eg, European Stress Test, national reports and reviews, etc). Against this background, WENRA concluded that a number of important matters should be noted or addressed. One of these concerned mutual assistance, in particular amongst regulatory bodies. A sub-group of the Reactor Harmonisation Working Group (RHWG) was established to review and develop, as necessary, arrangements for mutual assistance amongst regulatory bodies in responding to nuclear accidents in a Member State of WENRA or elsewhere.

The sub-group recognised the importance of improving mutual knowledge and understanding among regulatory bodies in the preparedness phase in order to be better placed to assist each other in the event of an actual emergency. In this context, the sub-group initiated the following nine actions:

- Action 1: to create a database on reactors and emergency preparedness;
- Actions 2&5: to exchange and try to coordinate technical and radiological assessments made by its members;
- Action 3: to promote the organisation of seminars on EP&R;
- Action 4: to find a mechanism to communicate effectively between competent authorities on specific topics;
- Action 6: to encourage the exchange of personnel in the preparedness phase;
- Action 7: to create the function of a “liaison officer” between an accident country and other European countries;
- Action 8: to provide experts and technical support to help an affected country;
- Action 9: to recommend the use of audio-conferences.

These actions are aimed at addressing the following objectives:

- Reinforce mutual knowledge on reactors and the organisation of EP&R in Europe;
- Promote the organisation of regular seminars on EP&R in order to reinforce mutual understanding;
- Establish mechanisms for timely and effective communication between competent authorities on specific topics, in particular during emergencies;
- Reinforce the mutual confidence and understanding by sending regulatory personnel to other safety authorities;

- Send a “Liaison Officer” in emergencies to the Regulatory body of the accident country to improve confidence;
- Have qualified experts that will be available (in quantity and competences) to support the nuclear safety authority of the “accident” Member State;
- Recommend the use of audio-conferences in emergencies between regulatory bodies in order to have the same level of information and to be able to exchange of the actions they recommend.

A Task Group has been proposed to define the information to be included in the database and subsequently to develop it (Action 1). Use will be made of the information collected from European countries under the auspices of the DG ENER project (ie, this study) on ‘a review of current off-site nuclear EP&R arrangements in Member States and neighbouring countries’. Descriptions of the organisation of EP&R in each country are being prepared with a view to them being placed on WENRA and HERCA public websites.

The coordination among regulatory bodies of technical and radiological assessments is being pursued through a HERCA-WENRA Joint Group using a ‘top-down approach’ (see Section 24.3) and is well advanced (Actions 2 and 5).

With a view to reinforcing mutual confidence and understanding, long duration (1 year minimum) exchanges of personnel between regulatory bodies is being explored together with more frequent participation in exercises, training and inspections (Action 6).

The sub-group has recommended that use be made of the framework of the IAEA Assistance Convention (including its implementation through the RANET mechanism) in providing support to nuclear safety authorities in a country where a nuclear emergency has occurred (Action 8). For the countries not wishing to use the RANET framework (ie, preferring to operate within a WENRA framework), a template has been prepared for ‘an assistance plan for requesting external help directly from WENRA members’.

Recommendations have been made for regulatory bodies to make greater use of audio-conferencing (ie, the EC “click and meet” system) in emergencies in order to ensure that all have timely access to the same level and quality of information and to off-site actions that are to be taken to mitigate the consequences of any emergency.

A number of other activities aimed at effectively addressing the above objectives are being pursued together with HERCA with a view to avoiding duplication.

24.3 Heads of European Radiological protection Competent Authorities (HERCA)

The need for a more harmonised approach within Europe with regard to the management of nuclear and radiological emergencies was identified as a top priority at the inaugural meeting of HERCA in 2007. More recently, events at the Fukushima Daiichi NPP in March 2011 dramatically illustrated that similar needs exist for responding to nuclear emergencies occurring at great distances from Europe.

Given the importance it attached to off-site EP&R, HERCA established, from its outset, a Working Group on Emergencies (WGE). The initial focus of the WGE was on accidents occurring within the boundaries of the HERCA member countries, in particular to develop practical and operational solutions that were capable of providing broadly uniform responses to any serious radiological emergency, regardless of national borders. An early achievement was the development of a document on emergency preparedness "Practical Guidance – Practicability of Early Protective Actions" [HERCA, 2011]; this covers the definition, aim and rationale of three early countermeasures: sheltering, evacuation and thyroid blockage. The planning phase, the intervention phase and the lifting of protective actions are discussed, as well as risk/benefit considerations and linked actions.

Following the accident at Fukushima Dai-ichi NPP, the mandate of the WGE was extended to cover the coordination and harmonisation of responses of European authorities to emergencies occurring anywhere else in the world, irrespective of how distant they may be from Europe.

The WGE, increasingly in cooperation with WENRA, has made substantive progress on both fronts (ie, emergencies occurring inside Europe and elsewhere) and this is summarised below.

24.3.1 Emergencies occurring elsewhere in the world (ie, outside Europe)

The findings of the WGE were approved by HERCA in June 2013 and published in the following report: '2013-07-01 - HERCA/ Emergency Preparedness/ Practical proposals for further harmonisation of the reactions in European countries to any distant nuclear or radiological emergency' [HERCA, 2013]. The report, inter alia, contains practical recommendations for HERCA members on: how to increase the consistency of national decisions within Europe in response to a distant nuclear or radiological emergency; advice to be provided to nationals both those living, working in or visiting a country where an emergency has occurred; measures that need to be taken in the home country; and good communication and response, in particular to avoid distrust among nationals in, and citizens of, the accident country as a result of the distribution of inconsistent information; enhancing preparedness for the return of people from an affected country or region. These recommendations are summarised below.

a) Recommendations for HERCA members during a crisis

- HERCA members should establish contact between themselves by making use of the contact list of HERCA members to be able to exchange information on specific topics of interest. The relevant IAEA and EC mechanisms should enable an effective supply of information from the accident country or from any other affected or third country.
- Each HERCA member should establish links with their national embassy/consulate in the accident and affected countries.
- Each HERCA member should organise the translation into its national languages of key documents issued by the authorities in the accident and affected countries. If translations are available in a HERCA country, they can be shared among other countries.
- Each HERCA member may consider, if feasible, the sending of a radiation protection expert to their local embassy/consulate, and for making contact arrangements with other national experts being seconded to embassies/consulates in the country, to establishing a European coordination. Otherwise, each country's embassy should have clear arrangements for communication with experts in their home country.
- Each HERCA member should coordinate with authorities in other HERCA countries concerning the assessments being undertaken to inform or advise on protective actions for nationals abroad and on monitoring of travellers returning from the region and of imported food/goods.
- Authorities in HERCA countries should provide information to enterprises importing goods from the accident and/or affected countries, and coordinate any actions regarding such goods.

b) Advice to nationals of HERCA countries living or working in the accident or affected countries

- Nationals of HERCA countries living or working in the accident and affected countries should as a matter of principle follow the recommendations provided by the local authorities in the accident and affected countries concerning protective actions (sheltering, stable iodine intake, evacuation, food bans …).
- However if authorities in HERCA countries suspect that the accident and/or affected countries are not offering the expected level of radiation protection to their population, HERCA members should have the liberty to issue specific recommendations to their nationals based on their knowledge and understanding of the situation in the accident and affected countries. These recommendations should be harmonised as far as is possible on the necessary timescale between competent authorities of HERCA countries (through HERCA).
- Nationals of HERCA countries living or working in the accident and affected countries should establish contact with their embassy/consulate and provide them with information about their situation, location and contact details.

c) *Advice to nationals of HERCA countries visiting the accident or affected countries*

- While the situation is not fully understood or if it is confirmed to be severe, non-essential travel to the countries or regions affected or threatened should be advised against. People should avoid travelling to the (vicinity of the) affected countries and areas.
- People travelling to the accident and/or affected countries should register with and stay in touch with their national embassy/consulate.

d) *Actions to be prepared/taken in HERCA countries*

- Upon return of nationals from the accident or affected countries, and especially from the region where the emergency has taken place, authorities in HERCA countries should provide information in the first airport or harbour reached, including to passengers in transit, and organise making contact. Authorities should have a template available for giving information to travellers, describing the problem, an indication of the health risk if available, a contact point (phone number, e-mail address …) for further information and a questionnaire for the travellers to complete in case further contact is needed (see chapter 6).
- If needed, authorities in HERCA countries should be prepared to offer radiological screening and possibly internal dosimetry analysis to those who would request such contamination control, if agreed to be necessary and appropriate. Further proportionate arrangements should be in place in the country of residence of the passengers, in particular to provide psychological support and information in their native language.
- Authorities in HERCA countries should organise and prepare the control of food products imported from a country where the accident has taken place, and in case it would be needed, the temporary storage, elimination, decontamination, or the return to the country of origin. This should be organised in the first airport or harbour reached, also for products in transit (maximum permitted levels of radioactivity are laid down in EC regulations).
- Authorities in HERCA countries should organise and prepare the control of non-food products imported from the accident or affected countries, and in case it would be needed, the temporary storage, elimination, decontamination, or the return to the country of origin. This should be organised in the first airport or harbour reached, also for products in transit. Criteria for the control of non-food products should be agreed upon between HERCA members prior to issuing instructions to customs offices and harbour authorities. International guidance on this matter should be pursued by IAEA. Authorities in HERCA countries should organise other controls, such as and in case it would be needed, for the monitoring and if necessary decontamination of planes or ships that have landed or harboured in, or close to the accident or affected countries or planes having flown through the cloud (radioactive plume).

- Authorities in HERCA countries should issue specific information on radiological risks and recommendations for customs officers and various worker categories (crew, luggage handling workers, dockyards workers etc).
- Authorities in HERCA countries should organise information for their population regarding the safety of imported goods and the actions taken.
- Authorities in HERCA countries should define a "minimum emergency kit" ready to be sent to embassies/consulates (for example, protective material such as protective overall, gloves, masks and stable iodine tablets. Experts could be sent in support of their embassy/consulate to explain the situation and provide adequate information to their nationals in the accident or affected countries (see also appendix 7.3).

e) Avoid wherever possible creating confusion and causing distrust

- Authorities in HERCA countries should not unilaterally decide (unless justified and concerted between European authorities) supplementary actions, not following local authorities' decisions/recommendations, or "going above" the recommended actions, e.g. unilaterally increasing the radius of the zone from which nationals should evacuate.
- Authorities in HERCA countries should not systematically evacuate their own nationals from the accident or affected countries or affected areas if not necessary (States could provide assistance to those who would prefer to leave the country, especially pregnant women and families with small children).
- Authorities in HERCA countries should not declare a systematic embargo on food and non-food products from the affected country.
- Authorities in HERCA countries should prepare for rapid coordination and implementation of response actions.

24.3.2 Emergencies occurring in Europe

The WGE has recently developed very general terms for a new approach, termed the "top down" approach [Majerus, 2013]. It foresees cooperation and coordination between neighbouring countries, or neighbouring territories, as the main pathway. The basic aim is to develop mechanisms for implementing protective actions during an emergency in a consistent way along national borderlines without necessarily changing fundamental national arrangements. The idea is to take the prevailing differences into account, and to elaborate ways of how to find "compromise" solutions in any given situation. The aim is not to propose a theoretical framework to deal with radiological emergencies, nor – necessarily - to propose a uniform framework to deal with such situations, but to come up with practical, operational solutions leading ideally, in the case of a cross border emergency situation, to the implementation of countermeasures independent of national borders.

A number of important basic principles have been identified that will need to be accepted and followed to ensure the success of approach in practice; these include:

- Development of the necessary confidence in the assessment done by HERCA member countries.
- Development of a common technical analysis at the European level and a mechanism for sharing the information with all other participating countries.
- Development of a mechanism for the coordination of decisions at a very early stage and subsequently throughout the crisis.
- Sharing of knowledge of the national arrangements and differences with regard to neighbouring countries, especially concerning intervention levels if these are significantly different in one of more countries in a neighbouring group of countries.
- Decision takers need to better understand the negative effects of unilateral decisions.

At the Tenth meeting of HERCA in Paris, France, 30-31 October 2012, the Board of HERCA confirmed that this new approach met its overall expectations and visions. The principles underlying the approach will be finalised by the end of 2013 and a road map for the further development and implementation of the approach is under discussion.

24.3.3 References

HERCA: Emergency Preparedness. Practical Guidance – Practicability of Early Protective Actions, 2011. http://www.herca.org/herca_news.asp?newsID=14

HERCA: Emergency Preparedness - Practical Proposals for further Harmonisation of the Reactions in European Countries to any Distant Nuclear or Radiological Emergency, July 2013. http://www.herca.org/herca_news.asp?newsID=28

Majerus, P., HERCA: Views on achieving Cross-border Consistencies during a Nuclear Emergency, Radiation Regulator, 1(2), pp 67-72, 2013.

24.4 Summary of the Nuclear Energy Agency's (NEA) Committee on Radiation Protection and Public Health's (CRPPH) activities in the area of EP&R from 2011 - 2013

24.4.1 Background

Under its new Mandate, NEA/CRPPH is responsible for radiation protection studies and experience exchange in the light of the following goals:

- To provide its Members with a high-level, visible forum for exchange and discussion;
- To seek common understanding of identified issues;
- To advance the "state-of-the-art" in radiation protection theory, regulation and practice;
- To advance policies that bring the system of radiation protection more in line with modern societal needs;
- To promote international co-operative projects.

The NEA/CRPPH activities had two main objectives following the Fukushima accident:

- Learning from the experience and improving for the future, and
- Making the expertise of the CRPPH available to the Japanese.

In response to the accident in Fukushima the NEA/CRPPH established two groups that provided a focus for NEA's response to the accident in the areas of EP&R. In May 2011 the Expert Group on Radiological Protection aspects of the Fukushima accident (EGRPF) was established by the CRPPH as a focal point for Fukushima activities, with support from the CRPPH Working Party on Nuclear Emergency Matters (WPNEM), in areas of radiological protection and emergency management issues. Each of the committees and groups have been working co-operatively with all relevant international organisations, in particular the International Atomic Energy Agency (IAEA) and the European Commission (EC). The EGRPF developed a survey of emerging issues and lessons and sent this to NEA members. The survey inquired as to any post-Fukushima Daiichi NPP accident national policy modifications foreseen or being implemented to address the return to evacuated areas; clean-up criteria; management of decontamination wastes; communications issues; and education and development of radiological protection culture. The results of this survey were discussed by the CRPPH in May 2013 during a Topical Session on Recovery Management, and will be included in a summary report on this important issue.

All NEA Member countries took early action to ensure and confirm the continued safety of their operating nuclear power plants (NPPs) and the protection of the public. Many countries and the international radiological protection community in general, are revisiting approaches to emergency management and recovery, in

addition to revising regulatory requirements to better cope with external hazards and severe accidents, in order to be better prepared nationally for accident situations. This includes reviewing national preparations for post-accident recovery, for transition from the emergency to recovery and revising the legislation for the nuclear safety authority to enhance the level of independence, technical competence, and transparency of the regulatory body. Improvements in international communications and information/expertise exchange among regulatory authorities and their technical crisis centres and among relevant international organisations are also being studied and developed.

From the experience gathered by NEA it is evident that there is a clear need to better balance the "resources" applied to "nuclear safety" (in the classic engineering sense), to "emergency planning and response", and to "recovery". It seems that "nuclear safety" is the primary focus of post-Fukushima efforts (e.g. stress tests, etc.), whereas, up to now emergency management and recovery management, which have emerged as huge problems, are not the main focus of national or international efforts and reviews.

A fundamental key message from the accident is that, while there are lessons being learned, analyses being conducted, and information being collected to support safety enhancements, at the conceptual level nuclear safety practices and approaches do not require significant changes based on what has been learned from the accident. The existing national and international requirements already in place provide an effective framework for accidents within the design basis, and efforts are underway to enhance these frameworks to better address accidents that, although unlikely, may result in catastrophic consequences, if unmitigated.

Countries are pursuing long term plans for addressing the human and organisational challenges of accident management under harsh environmental conditions that may be encountered simultaneously with response to severe accident. Common actions addressed by the countries include:

- Training and exercises for implementing mitigation strategies during single and multi-unit events.
- Improvement of capacity to communicate both internally (onsite) and externally (off-site).
- Re-evaluation of staffing levels for extended and multi-unit events. For example in one country licensees are being requested to assess the number of qualified workers necessary for the Emergency Response Organisation.

Besides that, several countries are developing site specific Alternative Emergency Management Centres (or to enhance the existing facilities) to support emergency workers duties, including improving protection of equipment, tools and procedures for emergency workers.

Some countries are investigating the impact of stress on staff behaviours including emotional, psychological and cultural aspects associated with emergency response and associated training and support.

Some countries are evaluating the qualifications of emergency staff for their duties, and whether the human actions are achievable during multi-unit events with extreme external conditions.

24.4.2 Global findings

As a result of all these efforts the following global and specific findings have been reported.

Emergency preparedness and planning

Following the accident, NEA Member countries reviewed and updated national, regional, provincial, municipal and local emergency plans and guidance. This included in some countries conducting local and national exercises to identify possible areas for improvements in emergency arrangements, particularly in the coordination among the different national organisations involved. Further, many countries began to upgrade their national, regional, off-site and on-site emergency response centres.

Changes to regulatory framework

Member countries are implementing a certain number of regulatory changes to improve the effectiveness of the emergency plans for situations with severe damage to the local, national or regional infrastructure that could be caused by an external initiating event. The adoption of the improvements is based on the specific assignment of emergency duties in each country (the responsibility of the on-site actions is always on the side of the nuclear operator but the off-site plans are in general the duty of the local or national organisations). Relevant actions related to this issue are:

- Increase in the training and exercising of the emergency plan(s), including a clear intention to extend the type of scenarios to be exercised, beyond the current international practices.
- Assessing new staffing and communications needs for severe conditions, specifically for multiunit and prolonged SBOs and other long-lasting events.
- Enhancements to existing Emergency Control Centres and/or building new ones with reinforced resistance to external events and to high radiation conditions at the site, and reassessment of the internal and external communications capabilities.
- Assessing capabilities to receive assistance from outside after events affecting the existing infrastructures. Both the impact on the onsite emergency response teams and the local off-site responders are being considered.

- Enhancing the onsite, off-site and national radiological monitoring capability. According to the national regulation this could be the responsibility of nuclear operators or public organisations (regulator and/or local or central authorities).

Crisis Communication

A significant challenge encountered by both the Japanese authorities and the broader international community was effective communication including the public. The NEA working Group on public communication of Nuclear Regulatory Organizations (WGPC) organised a Crisis Communication Workshop (Madrid, 9-12 May 2012) which brought together senior-level regulators, stakeholder (media, NGOs, industry, and parliamentary and municipality representatives to identify efficient approaches and practices to improve crisis communication, to take into account the lessons learned from the accident, and to collect insight for future guidance on international aspects of regulators' crisis communication. The results were used to update and strengthen the WGPC' Roadmap for Crisis Communication; the new version was adopted in December 2012.

Enhancement of communication systems

Most of the countries have initiated activities to reassess the robustness of the communication systems between onsite and off-site emergency response organisations, especially during extended blackout conditions. Different improvements have being identified and are being implemented. Some countries are looking at diverse means of communication – for example including satellite communications for onsite to off-site; as well as hard wired data transfer from the plant to off-site emergency centres.

It has also been recognised that significant improvements are needed for international communications and information exchange among national regulatory organisations and their crisis response centres. As such, the international information exchange aspects of nuclear emergencies are also being reviewed in order to improve capabilities to communicate reliable data, information and decisions quickly and effectively among national authorities and their emergency and technical crisis centres from all countries affected, directly or indirectly, by nuclear emergencies.

Long term efforts to enhance emergency planning and preparedness

One important lesson learned after the Fukushima Daiichi NPP accident is the need for strengthening the roles and training of the local emergency response organisations to help coordinate actions in the event of an emergency. To fully validate the current situation, a review of existing emergency exercises (such as in terms of frequency and scope) involving local and national responding organisations, with the focus on the implementation of the appropriate enhancements, is being addressed by different countries.

Some member countries are reviewing their emergency planning philosophy to assure that it is appropriate to address the challenges posed by the Fukushima Daiichi NPP accident. Such aspects as long-term sheltering and distribution of stable iodine are key considerations, as are the criteria and approaches for instigating and terminating countermeasures. As part of this assessment, some member countries are also looking at re-evaluating the size and nature of their emergency planning zones. It is worth noting that the practicality of extending existing detailed emergency planning zones beyond current levels and potentially into high population urban areas is a constraint, so each country is taking the appropriate actions based on the actual situation of the NPP sites. The use of various types and sizes of emergency planning zones (e.g., for evacuation, for sheltering, for food restrictions, for reassurance measurements, etc.) is also under consideration. An activity that had been previously undertaken by many countries, but that is now a higher priority after the Fukushima Daiichi NPP accident is to try to enhance the cooperation with neighbouring countries in emergency situations, including the participation in coordinated drills and exercises.

24.4.3 Specific findings

Radiological Protection

a) Changes to regulatory framework

In general, most of the member countries believe their current regulations are sufficient to ensure that the operators have the resources and procedures for protecting workers from high levels of radiation when responding to a severe accident. However, some countries are considering improvements in this area. Different actions are being considered and in some cases implemented:

- Some countries are increasing readily available resources for protecting people, including personal protective equipment for onsite workers and also for the new workers and support arriving at the site.
- Different analyses of human and material resources needed for radiological protection in case of severe accident are currently being carried out in many countries.
- Stockpiling equipment (new logistical centres being created, in some cases on site, in some cases remote from the sites) is being considered by some countries, while others are looking for long term gaps.
- According to the international experience, and taking into account the lessons learned from the Fukushima Daiichi NPP accident, some countries are re-evaluating the dose limits for emergency workers.
- Emergency workers training, guidance and information are being implemented in many countries.

b) Enhancements for public protection

Many countries, and the international radiological protection community in general, are revisiting approaches to emergency management and recovery in order to be better prepared for accident situations. Enhancements include such things as consideration of the need for long-term sheltering and possible alternatives, and the need to focus more resources on recovery planning and preparation. The need for stakeholder involvement in planning and preparation activities has been reinforced by the Fukushima accident, and remains a challenge, in particular in clean-up and recovery activities.

c) Enhancements for worker protection being developed and implemented by the nuclear power industry

In some countries, the industry is developing enhancements for worker protection during severe accident conditions. For example, some licensees or operators [UK, USA] are currently conducting further studies surrounding issues such as managing the traumatic, psychological, stress and family effects that staff and other responders may encounter during a severe and prolonged nuclear emergency. In Spain, the licensees are considering implementing additional actions to maintain the habitability of the Control facilities (e.g., Main and Secondary Control Rooms) and onsite Emergency Centre during a prolonged station black out.

d) Enhancements to onsite and off-site monitoring

In relation to the monitoring capabilities, and taking into account the assigned responsibilities of the different "parties" for real time monitoring (operator, regulator, others), in general member countries are reviewing their existing capacities. These reviews are including the effectiveness and efficiency of the existing capacities and, where appropriate, identifying enhancements for consideration. Some actions are being taken to enhance the onsite and off-site monitoring of radioactive releases during accidents, and the determination of source terms to support off-site protective measures recommendations. Additionally, inverse source term estimation approaches (based on monitor's reading) are also being considered and analysed.

Regulatory Infrastructure

Many of the regulatory authorities and their oversight organisations in NEA Member countries undertook a review and, if appropriate, a revision of their legislative framework for nuclear safety regulation and undertook changes to the functions and responsibilities of the regulatory body – particularly in the areas of independence and competence.

In addition, many NEA Member countries reported that they strengthened bilateral and regional collaboration, will host or are planning to host international peer review missions, and participating in other relevant international activities.

a) Changes to regulatory infrastructure to enhance the independence and technical competence

Some countries are confident of the level of independence their regulators have. This situation has been reached in many cases by national initiative, but the international processes, and especially the IAEA's Integrated Regulatory Review Service (IRRS) missions and the Convention on Nuclear Safety (CNS), have played an important role in the improvement of this relevant aspect. Also some other countries are now revising the legislation for the nuclear safety authority to enhance the level of independence and technical competence of the regulatory body. Many member countries are using the conclusions of IRRS missions to ensure adequate independence and competence and identify any shortfalls and areas for improvement. Financial capability and existence of technical safety expertise are also being evaluated by member countries to ensure that the independence and technical capability is maintained de Facto as well as De Jure. Where applicable, research programmes are being reviewed for their adequacy in supporting the current and future technical capability and competence. International cooperation of regulators and technical safety organisations is seen as an important aspect of maintaining and enhancing these capabilities.

b) Changes to enhance openness and transparency

Many countries believe they currently have a robust and proactive policy of openness and transparency in their decision-making processes – where many of their decisions and decision-making documents are open to the public. Also member countries are striving to increase the level of openness and transparency for all their regulatory activities – as encouraged by IRRS recommendations and NEA guidance.

c) To improve communication during a crisis

All countries are conducting activities to improve the capabilities of the regulatory body to effectively communicate with internal and external stakeholders during a crisis. Many countries are reviewing and updating their crisis communication plans and exploring the use of web and social media during crisis situations. For example, countries are improving the reliability of web sites, and developing robust web sites for crisis situations. In addition, crisis communication teams are being trained for emergency situations. During a crisis, web pages may be changed to focus on information to the public specific for the crisis.

Emergency preparedness and planning

Following the accident, NEA Member countries reviewed and updated national, regional, provincial, municipal and local emergency plans and guidance. This included in some countries conducting local and national exercises to identify possible areas for improvements in emergency arrangements, particularly in the coordination among the different national organisations involved. Further, many countries began to upgrade their national, regional, off-site and on-site emergency response centres.

a) Changes to regulatory framework

Member countries are implementing a certain number of regulatory changes to improve the effectiveness of the emergency plans for situations with severe damage to the local, national or regional infrastructure that could be caused by an external initiating event. The adoption of the improvements is based on the specific assignment of emergency duties in each country (the responsibility of the on-site actions is always on the side of the nuclear operator but the off-site plans are in general the duty of the local or national organisations). Relevant actions related to this issue are:

- Increase in the training and exercising of the emergency plan(s), including a clear intention to extend the type of scenarios to be exercised, beyond the current international practices.
- Assessing new staffing and communications needs for severe conditions, specifically for multiunit and prolonged SBOs and other long-lasting events.
- Enhancements to existing Emergency Control Centres and/or building new ones with reinforced resistance to external events and to high radiation conditions at the site, and reassessment of the internal and external communications capabilities.
- Assessing capabilities to receive assistance from outside after events affecting the existing infrastructures. Both the impact on the onsite emergency response teams and the local off-site responders are being considered.
- Enhancing the onsite, off-site and national radiological monitoring capability. According to the national regulation this could be the responsibility of nuclear operators or public organisations (regulator and/or local or central authorities).

b) Enhancement of communication systems

Most of the countries have initiated activities to reassess the robustness of the communication systems between onsite and off-site emergency response organisations, especially during extended blackout conditions. Different improvements have being identified and are being implemented. Some countries are looking at diverse means of communication – for example including satellite communications for onsite to off-site; as well as hard wired data transfer from the plant to off-site emergency centres.

It has also been recognised that significant improvements are needed for international communications and information exchange among national regulatory organisations and their crisis response centres. As such, the international information exchange aspects of nuclear emergencies are also being reviewed in order to improve capabilities to communicate reliable data, information and decisions quickly and effectively among national authorities and their emergency and technical crisis centres from all countries affected, directly or indirectly, by nuclear emergencies.

c) *Long term enhancements being developed by the nuclear industry, responsible government agencies, and local responders to enhance emergency planning and preparedness*

One important lesson learned after the Fukushima Daiichi NPP accident is the need for strengthening the roles and training of the local emergency response organisations to help coordinate actions in the event of an emergency. To fully validate the current situation, a review of existing emergency exercises (such as in terms of frequency and scope) involving local and national responding organisations, with the focus on the implementation of the appropriate enhancements, is being addressed by different countries.

Some member countries are reviewing their emergency planning philosophy to assure that it is appropriate to address the challenges posed by the Fukushima Daiichi NPP accident. Such aspects as long-term sheltering and distribution of stable iodine are key considerations, as are the criteria and approaches for instigating and terminating countermeasures. As part of this assessment, some member countries are also looking at re-evaluating the size and nature of their emergency planning zones. It is worth noting that the practicality of extending existing detailed emergency planning zones beyond current levels and potentially into high population urban areas is a constraint, so each country is taking the appropriate actions based on the actual situation of the NPP sites. The use of various types and sizes of emergency planning zones (e.g., for evacuation, for sheltering, for food restrictions, for reassurance measurements, etc.) is also under consideration. An activity that had been previously undertaken by many countries, but that is now a higher priority after the Fukushima Daiichi NPP accident is to try to enhance the cooperation with neighbouring countries in emergency situations, including the participation in coordinated drills and exercises.

Stakeholder Engagement

Effective decision-making for implementing countermeasures will be enhanced, and decision-makers will be better able to respond based on validated facts and informed advice through training and exercises, providing the local, regional, and national government officials responsible for off-site emergency preparedness a better understanding of what is happening during an accident, and with whom they will be working with should an accident occur.

The implementation of protective measures, however, remains problematic, in particular as the situation transitions to longer-term recovery, and those evacuated or sheltered wish to return to their “normal” lives. This transition requires significant resources and efforts to effectively engage with stakeholders and appropriately understand and address their concerns. This is particularly complex in a post-accident situation where public trust may often be low. A significant complicating factor is the lack of conclusive scientific understanding of the levels of risk caused by low-level radiation exposures (i.e. from zero to under a few 10s of mSv in a year). The NEA’s CRPPH has assessed relevant recovery management issues and will, in an internationally coordinated fashion, work to address such questions encouraging and promoting stakeholder engagement.

International Aspects of Emergency Preparedness

The Fukushima Daiichi NPP accident showed that countries, whose territory would not be directly affected by the accident, responded as quickly as they could to collect information and supply recommendations to their citizens in Japan. The diversity of national recommendations, and in particular the differences between Japanese protection recommendations and those of foreign governments for their own citizens in Japan, suggests that mechanisms to share technical information among governments should be improved. The NEA's INEX exercises have focused on this issue, and will continue to study national approaches to making such decisions. In addition, should a large accident occur there could be a need for urgent actions in countries adjacent to the accident state. Many countries, in Europe in particular, have for some time worked bilaterally and regionally to coordinate approaches for the implementation of urgent countermeasures. Further discussion of such coordination, perhaps in the context of the international notification and assistance conventions, could be of value.

Trade and Transportation Issues

Although international agreements exist concerning post-accident trade in food, these standards were not used, and no standards existed for post-accident trade in goods. International discussions of these issues are ongoing. The NEA's CRPPH is discussing with the IAEA a framework for the development of criteria for the management of international trade in food and goods from post-accident, contaminated territories.

24.4.4 References

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NEA: Summary of the fourth International Nuclear Emergency Exercise (INEX 4), OECD/NEA No 7143, OECD, 2013.

24.5 International Atomic Energy Agency (IAEA)

24.5.1 Background

The International Atomic Energy Agency (IAEA) is an independent intergovernmental, science and technology-based organization, in the United Nations family, that:

- Serves as the global focal point for nuclear cooperation;
- Assists its Member States, in the context of social and economic goals, in planning for and using nuclear science and technology for various peaceful purposes, including the generation of electricity, and facilitates the transfer of such technology and knowledge in a sustainable manner to developing Member States;
- Develops nuclear safety standards and, based on these standards, promotes the achievement and maintenance of high levels of safety in applications of nuclear energy, as well as the protection of human health and the environment against ionizing radiation;
- Verifies through its inspection system that States comply with their commitments, under the Non-Proliferation Treaty and other non-proliferation agreements, to use nuclear material and facilities only for peaceful purposes.

The IAEA Secretariat's roles in preparedness and response for a nuclear or radiological emergency draw from the Convention on Early Notification of a Nuclear Accident (Early Notification Convention) and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Assistance Convention) as primary legal instruments that establish the international framework to facilitate the exchange of information and the prompt provision of assistance in a nuclear or radiological emergency, its Statute, IAEA safety standards etc. (see Figure 1) and include:

- Exchanging/sharing official information, including assessment and prognosis in an emergency; coordinating assistance upon request; informing the media/public and coordinating inter-agency response (emergency response role), and
- Developing the IAEA's EPR related safety standards, guidance and tools, assisting Member States in establishing or enhancing their EPR systems, providing appraisal services, and maintaining and strengthening the Secretariat's and inter-agency response preparedness (emergency preparedness role).

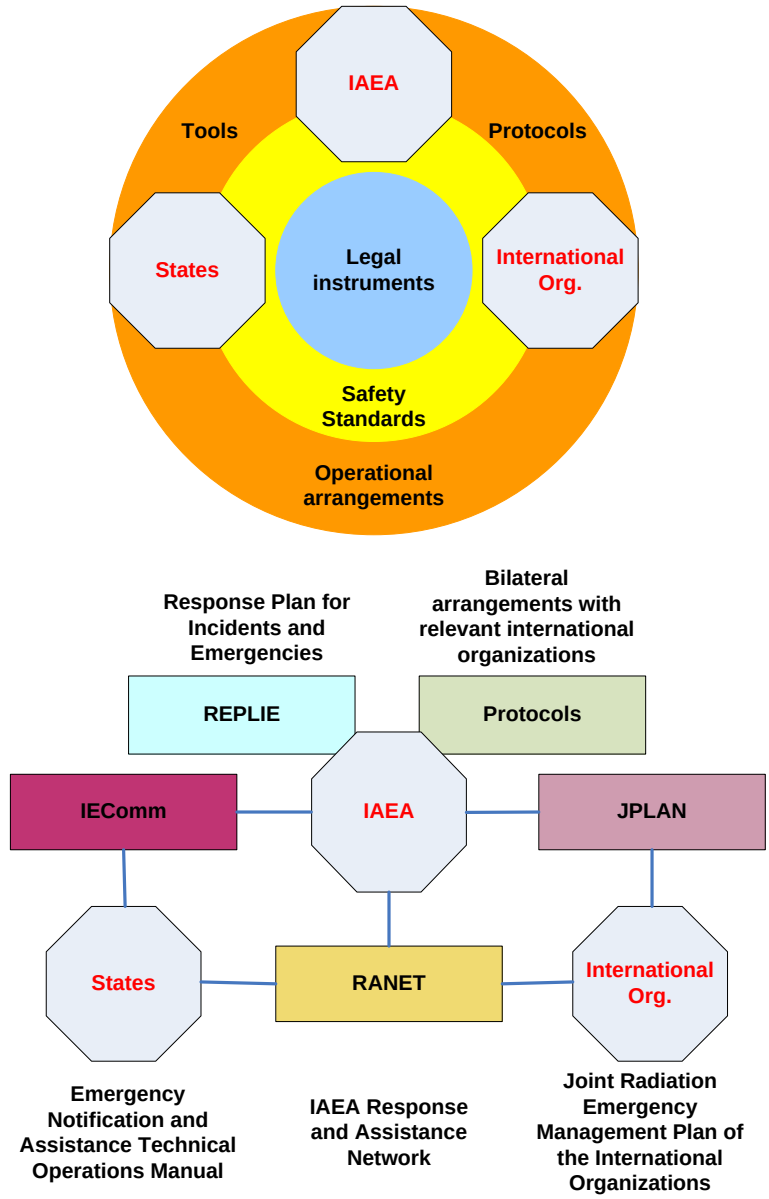

Figure 1: The international EPR framework

The IAEA Secretariat fulfils the emergency preparedness and response roles through the Incident and Emergency System (IES) with the Incident and Emergency Centre (IEC) being a custodian of the IES. Within its mission, the IEC is a global focal point for preparedness and response for nuclear and radiological incidents and emergencies irrespective of their cause (either due to mechanical failure, human error, natural disaster or nuclear security event) and world's centre for coordination of international emergency preparedness and response assistance.

24.5.2 International safety standards, guidance and practical tools in EPR

The IAEA safety standards on preparedness and response for a nuclear or radiological emergency currently comprise the IAEA Safety Requirements on Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GS-R-2 published in 2002, and two supporting Safety Guides[12]. In addition, the IAEA Secretariat has also been developing guidance and technical tools (see Figure 2) covering in detail particular aspects of emergency preparedness and response (EPR), to support Member States and relevant international organizations in implementing the IAEA safety standards.

Since 2011, the following guides, guidance and training material in EPR have been developed and made available to Member States:

- Safety Guide on Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSG-2 (2011);
- Generic Procedures for Response to a Nuclear or Radiological Emergency at Research Reactors, (EPR-Research Reactors 2011) and associated training materials;
- Generic Procedures for Response to a Nuclear or Radiological Emergency at TRIGA Research Reactors, (EPR-Triga Research Reactors 2011);
- Cytogenetic Dosimetry: Application in Preparedness and Response to Radiation Emergencies, (EPR-Biodosimetry 2011) and associated training materials;
- Considerations in Emergency Preparedness and Response for a State Embarking on a Nuclear Power Programme, (EPR-Embarking 2012) and associated training materials;
- Lessons Learned from the Response to Radiation Emergencies (1945-2010), (EPR-Lesson Learned 2012);
- Communication with the Public in a Nuclear or Radiological Emergency, (EPR-Public Communication 2012) and associated training materials;
- Actions to Protect the Public in an Emergency due to Severe Conditions at a Light Water Reactor, (EPR-NPP Public Protective Actions 2013).

[12] The Safety Guide on Arrangements for Preparedness for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GS-G-2.1 (2007), provides recommendations on the implementation of the Safety Requirements established in IAEA GS-R-2. The Safety Guide on Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSG-2 (2011), supports IAEA GS-R-2, providing guidance on the criteria for use in EPR.

Figure 2: Overview of existing IAEA safety standards, guidance and tools in EPR

In 2011, a review and revision of the IAEA Safety Requirements GS-R-2 was initiated in order to take into account and address the latest improvements and experience gained since 2002. The various activities undertaken during this process highlighted that there was not any gap identified in the present requirements in the light of past emergencies or a need for their substantial revision; however, some areas requiring further clarification and more detailed explanation were identified. Particular support during the revision process has been given to the need to have a comprehensive set of generic criteria for use in EPR, development and revision of operational criteria to support prompt implementation of protective actions and other response actions and the need to place the criteria and any information that is communicated to the public in an emergency in perspective in terms of the health hazard in a way that is understandable to the public.

The GS-R-2 revision process is expected to be completed in 2014. The revised Safety Requirements will be Part 7 of the General Safety Requirements (GSR Part 7) within the overall structure of the IAEA Safety Standards Series.

24.5.3 Appraisal of national EPR arrangements and capabilities

The principal tasks of the responsible authorities both in the State where an emergency occurs and in any other potentially affected States are to protect life, health, property and the environment; and to provide timely, consistent and appropriate information regarding, inter alia, the event, its consequences and the actions taken. These tasks can be performed effectively only if emergency arrangements and capabilities are in place to ensure a timely, managed, coordinated

and effective response at the scene and at the local, regional, national and international levels. Establishment of these arrangements in line with IAEA Safety Requirements GS-R-2 and supporting guides contributes to an effective and harmonized response at any level and still remains a challenge for many Member States.

In order to strengthen the implementation of safety standards and guidance in EPR and to provide for their application, the IAEA continually undertakes various training events on different aspects in EPR using standardized training materials, provides experts missions and works on supporting the establishment of capacity building centres. In addition, at the request of Member States, the IAEA provides appraisal services. The Emergency Preparedness Review (EPREV) focuses on independent assessments of national preparedness for responding to nuclear or radiological emergencies irrespective of their cause against the international safety standards (i.e. Safety Requirements GS-R-2 and supporting safety guides).

Since 2011, several activities have been conducted by the IAEA in close cooperation with Member States in relation to EPREV with the aim of assessing the effectiveness of the EPREV service and of enhancing benefits and ensuring the quality of this service. An analysis of findings from the EPREV missions conducted since 2004 was carried out to identify those areas which require further attention in improving compliance with the IAEA safety standards in EPR, to identify good practices in those Member States that have hosted EPREV missions, and to promote the sharing of experience. In the light of the accident at the Fukushima Daiichi Nuclear Power Plant (Fukushima Daiichi Accident); areas that require specific attention in evaluating a Member State's preparedness to respond to a severe nuclear emergency were also analysed and discussed.

EPREV has been recognized as a very useful tool to maintain or enhance the credibility of the EPR arrangements and capabilities within a State and to identify in an objective and independent manner the areas where improvements may be required and the best practices. Thus, an increasing interest in EPREV has been noted in recent years, with a total number of eight missions being conducted in 2012 (see Figure 3).

In addition to EPREV, the regulatory aspects of EPR are also evaluated within the framework of Integrated Regulatory Review Service (IRRS) missions.

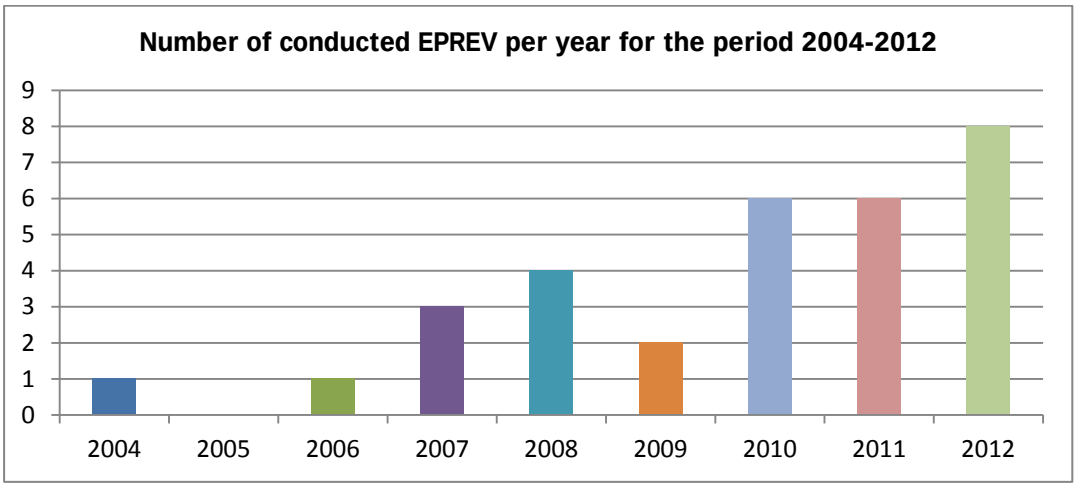

Figure 3: EPREV conducted per year since 2004

24.5.4 Notification, Information Exchange and Assistance Mechanism in a Nuclear or Radiological Emergency

24.5.4.1 Notification and Information Exchange

The IAEA has specific functions assigned to it under the Early Notification Convention and the Assistance Convention and convenes biannual meetings of the parties to the both Conventions. In April 2012, the sixth meeting of representatives of the competent authorities identified under the Early Notification and Assistance Conventions was held. At this meeting, the latest EPR arrangements, the response to the Fukushima Daiichi accident, international assistance and recent developments in the area of safety and security were discussed and a number of actions were recommended with the aim to further strengthen the EPR framework.

The next meeting is scheduled for May 2014.

24.5.4.1.1 The Operations Manual for Incident and Emergency Communication (IEComm)

In response to the need to reinforce the implementation of emergency notification, reporting and information sharing in a nuclear or radiological emergency in light of the past emergencies (including the Fukushima Daiichi accident) and to contribute to strengthening the implementation of the Early Notification Convention, a revised operations manual was developed and became operational on 1 June 2012. The Operations Manual for Incident and Emergency Communication (EPR-IEComm 2012) presents an operational tool for the implementation of the Early Notification Convention and is a successor to the previous Emergency Notification and Assistance Technical Operations Manual (ENATOM). The manual contains enhanced communication protocols for contact points identified under the both Conventions, as well as the latest developments in tools for information exchange such as the Unified

System for Information Exchange in Incidents and Emergencies (USIE), launched in July 2011. In addition, the manual establishes specific expectations for the IAEA Secretariat and for the States and international organizations regarding notification of and information exchange during a nuclear or radiological emergency by introducing specific response time objectives (consistent with IAEA safety standards) for the initial emergency notification and the provision of follow-up information and sets up a new improved exercise regime.

24.5.4.1.2 The Unified System for Information Exchange in Incidents and Emergencies (USIE)

In 2011, the Agency streamlined incident and emergency communications by developing and implementing a new, web based incident and emergency communication system, the Unified System or Information Exchange in Incidents and Emergencies (USIE). USIE represents a common platform for incident and emergency reporting and offers, in comparison to the previous web based emergency communication system, improved reporting capabilities, enhanced alert system, capabilities for direct bilateral communications and a more secure platform. USIE is fully compatible with information exchange for web services based on the International Standard for Radiological Information Exchange (IRIX) developed by the IAEA and its partners. Recent developments in emergency communications, such as USIE and the Global System for Mobile communications (GSM), offer greater utilization of multiple communication channels made available through the internet.

Since its launch in 2011, USIE has been continuously improved to provide more functionality and to allow contact points to conduct routine tasks themselves. Additionally, a number of workshops have been held to provide training on incident and emergency communication and on USIE on national, regional and interregional levels.

The IAEA has carried out an active outreach programme to encourage Member States to register with the USIE. As a result, the number of registered external users on USIE noted an increase by 30% in 2012.

24.5.4.1.3 The International Radiation Information Exchange (IRIX) standard

The International Radiation Information Exchange (IRIX) standard is an information exchange format designed to facilitate web based exchange of relevant emergency information and data among organizations that respond to nuclear or radiological emergencies, and in particular the exchange of emergency information among national authorities that have responsibilities assigned under the Early Notification Convention.

The version 1.0 of the IRIX standard was issued together with complete documentation in March 2013. In addition to USIE, the IRIX standard is currently implemented in the web based European Community Urgent Radiological Information Exchange (WebECURIE) and European Union Radiological Data Exchange Platform (EURDEP) systems. Further actions by the IAEA for promoting its wider use among the Member States and the international organizations are under consideration.

24.5.4.1.4 The International Radiation Monitoring Information System (IRMIS)

The IAEA is working on the establishment of the International Radiation Monitoring Information System (IRMIS). IRMIS, which is built on EURDEP technology, will serve as a global platform for collecting and displaying real-time radiation monitoring data from national and international monitoring systems. This system is envisaged to collect radiation monitoring data from national and international data providers using the IRIX standard, store the data safely in a database, and allow users to query the database, download the data or display them in various ways. The pilot use of IRMIS is planned to start by the end of 2013.

24.5.4.1.5 Fukushima Monitoring Database

On 7 September 2012, the IAEA Secretariat (through the IEC) launched a database of radiation measurement results collected following the Fukushima Daiichi accident – so called, the Fukushima Monitoring Database (FMD). The FMD is available to all Member States and the public and provides results of near and far field radiation measurements performed in 2011 (starting on 11 March and ending with the cold shutdown condition announced by the Government of Japan on 16 December 2011). The FMD also contains radiological monitoring results from other Member States that provided them to the IAEA Secretariat (IEC).

24.5.4.2 The Response and Assistance Network (RANET)

As part of the IAEA Secretariat's strategy for supporting the practical implementation for the provision of assistance in accordance with the Assistance Convention, the Response and Assistance Network (RANET) was established in 2000, as an operational mechanism to provide assistance in different technical areas with the help of registered national capabilities. RANET is a network of States Parties to the Assistance Convention. National Assistance Capabilities (NACs) in RANET consist of suitably qualified experts, teams and resources registered by the State Parties that can be made available, upon request, in order to provide a timely response – on a regional basis – to a nuclear or radiological emergency. These capabilities cover specific areas such as radiation survey, environmental sampling and analysis, assessment and advice, decontamination, medical support, dose assessment, source search and recovery, and advice on emergency response actions.

RANET has been subject to continuous improvements since its establishment. The latest RANET related enhancements include/relate to:

- Publication of the new EPR-RANET 2013 document that entered into force on 1 September 2013, which includes new functional area for Nuclear Installation Assessment and Advice, to which Member States are encouraged to register their capabilities;

- Launching the RANET database on registered national assistance capabilities on the USIE (2013);

- Developing minimum compatibility guidelines;

- Increased number of registrations in RANET and expansion of registered capabilities.

24.5.4.3 Exercises within the framework of the Early Notification and Assistance Conventions (ConvEx)

Emergency response drills and exercises are a key component of a good emergency preparedness programme and a powerful tool for verifying and improving the quality of emergency response arrangements and capabilities. Therefore, the IAEA Secretariat prepares and conducts regular communication drills and exercises, called Conventions Exercises (ConvEx), at three levels of complexity, mostly covering the response in an early phase of a severe nuclear or radiological emergency. These communication drills and exercises are being held in line with the exercise regime as set in the EPR-IEComm 2012. Each exercise is thereafter evaluated and evaluation shared with all contact points.

ConvEx-1 exercises have the objective: to test that National Warning Points are continuously available, whether fax contacts and USIE alert channels are accurate and that Contact Points can access USIE properly. Such exercises were held in December 2011 and August 2012.

ConvEx-2 exercises have the objective: to test whether National Competent Authorities can appropriately fill out reporting forms and to drill the appropriate procedures for information exchange and requesting and providing assistance. Of particular interest are the ConvEx-2b exercises conducted every year over a period of up to three days to provide Member States with the opportunity to test the national and international processes for requesting and receiving international assistance and/or for providing international assistance following a nuclear or radiological emergency. Two such ConvEx-2b exercises were conducted in 2012 and 2013 providing inputs for further strengthening the international assistance mechanism.

ConvEx-3 exercises have the objective: to test the full operation of the information exchange mechanisms and requesting and providing assistance. The next full scale ConvEx-3 exercise is hosted by Morocco and will be held in November 2013. For the first time, this exercise will give an opportunity to test whether Member States and relevant international organizations are prepared to respond effectively to a radiological emergency initiated by a nuclear security event by testing their emergency plans and procedures and coordination between all relevant response organizations.

24.5.5 Inter-Agency coordination in EPR

Many international organizations have — by virtue of their statutory functions or of related legal instruments — general functions and responsibilities that encompass aspects of preparedness and response for nuclear and radiological emergencies. Moreover, some regional organizations (e.g. the European Commission) are party to legally binding international treaties and have directives and regulations that bear on emergency response arrangements among their member countries.

The Inter-Agency Committee on Radiological and Nuclear Emergencies (IACRNE) is a coordination mechanism among relevant international organizations for ensuring that coordinated and consistent arrangements and capabilities for preparedness and response for nuclear or radiological emergencies are developed and maintained at the international level. The IACRNE maintains the Joint Radiation Emergency Managements Plan (JPLAN), which describes the interagency framework for preparedness for and response to an actual, potential or perceived nuclear or radiological emergency, irrespective of its cause. The JPLAN constitutes an integral part of the international EPR framework.

The IACRNE convenes regular biannual meetings and, as necessary ad-hoc meetings. Since 2011, two regular meetings (December 2011 and May 2013), one ad-hoc meeting (October 2012) and one VTC (February 2013) of the IACRNE were held where the relevant international organizations analysed the lessons identified in response to the Fukushima Daiichi accident, discussed different aspects of inter-agency coordination in EPR, agreed on specific actions for further improvements and contributed to the development of revised JPLAN and revised safety standards in EPR.

In the light of the Fukushima Daiichi accident, when IACRNE and its JPLAN were used as a basis in coordination of the inter-agency response, this mechanism proved to be useful and effective. With account taken of the lessons identified in the inter-agency response to the Fukushima Daiichi accident and the new arrangements/initiatives introduced since 2011, the sixth edition of the JPLAN (EPR-JPLAN 2013) was published in 2013 (effective as of 1 July 2013).

Currently, a total of 17 international organizations are IACRNE members with two of them becoming IACRNE members after 2011.

24.5.6 Communication with the public in a nuclear or radiological emergency

Although the current safety standards and guides (particularly, IAEA Safety Requirements GS-R-2 and Safety Guides GS-G-2.1 and GSG-2) highlight the importance of public communication in EPR, the IAEA urged itself to provide practical guidance to those responsible for keeping the public and media informed and for coordinating all sources of official information to ensure that a consistent message is provided to the public before, during and after an emergency. The Communication with the Public in a Nuclear or Radiological Emergency (EPR-Public Communication 2012) was published in 2012. The EPR-Public Communication 2012 was accompanied with training materials published the same year. Both the EPR-Public Communication 2012

publication and the training materials have been used in various training activities in public communication held since 2012 on national, regional and interregional levels.

In addition to EPR-Public Communication 2012, it is worth to mention the EPR-NPP Public Protective Actions 2013 publication (published in 2013) as it addresses aspects of public communication in the case of a severe emergency at a nuclear power plant. Namely, this publication describes a system for putting into perspective the radiological health hazard from a measured quantity or calculated dose in a simple and understandable format for both the public and the decision-makers. Moreover, this publication defines the concept of 'safe' in an emergency and describes when possible health concerns may exist and when a situation is dangerous to health.

24.5.7 Other relevant activities in EPR

24.5.7.1 Emergency Preparedness and Response Expert Group (EPREG)

With an objective to enhance international EPR, the IAEA Board of Governors in 2004 approved the five-year International Action Plan for Strengthening the International Preparedness and Response System for Nuclear and Radiological Emergencies. In 2010 the action plan activities ended with a report that identified activities that need to be addressed by Member States and the IAEA Secretariat, recommended key strategic elements for successful implementation of sustainable EPR systems, and provided a number of detailed recommendations on international communications, international assistance and sustainable infrastructure. One of the key strategic elements recommended was to establish a senior EPR advisory group that would provide advice on EPR matters to the IAEA's Deputy Director General, Head of the Department of Nuclear Safety and Security. The Emergency Preparedness and Response Expert Group (EPREG) was established at the end of 2012 as a standing body of senior experts (currently in total of 16 experts covering all regions) with high professional competence and demonstrated leadership in the field of preparedness and response for nuclear or radiological emergencies to provide advice to the IAEA Secretariat on actions needed to ensure continuous and coordinated EPR enhancement and implementation strategies. EPREG held two meetings in 2013 (in February and August).

24.5.7.2 IAEA Action Plan on Nuclear Safety

In the light of the Fukushima Daiichi accident, the IAEA convened a fife day Ministerial Conference on Nuclear Safety (Vienna, 20 to 24 June 2011) with the aim to learn lessons from the accident and strengthen nuclear safety throughout the world. At the conference, a Ministerial Declaration was adopted which, inter alia, requested the Director General to prepare a draft Action Plan on Nuclear Safety (Action Plan) that provides a comprehensive framework of actions to strengthen global nuclear safety. The Action Plan was approved by the Board of Governors and endorsed unanimously by the 55th regular session of the General Conference in September 2011.

The Action Plan covers different aspects of EPR including: the review of the IAEA safety standards and strengthening their implementation; strengthening national and international EPR arrangements; strengthening appraisal services including EPREV and encouraging Member States to host peer reviews; exploring mechanisms for enhancing the effective implementation of the Early Notification and Assistance Conventions; strengthening the emergency notification system, and reporting and information sharing arrangements and capabilities; enhancing the transparency and effectiveness of communication including assessing the effectiveness of INES as a communication tool in the light of the Fukushima Daiichi accident. Activities summarized above in EPR area are in line with the recommendations of the Action Plan.

In addition, the Action Plan expanded the IAEA Secretariat's response role to cover the need for the IAEA Secretariat "… to provide Member States, international organizations and the general public with timely, clear, factually correct, objective and easily understandable information during a nuclear emergency on its potential consequences, including analysis of available information and prognosis of possible scenarios based on evidence, scientific knowledge and the capabilities of Member States.". The IAEA Secretariat has been working on defining the objectives, process and limitations for the operational implementation of the IAEA's response role in an emergency at a nuclear power plant with regard to analysis of available information and prognosis of possible consequences and likely emergency scenarios since 2011. At the 57th General Conference 2013, the work accomplished on this matter was presented to Member States at a side event organized by the IEC.

24.5.7.3 Fukushima Comprehensive Report

In the light of the Fukushima Daiichi accident, the IAEA has undertaken activities for producing a comprehensive report on the Fukushima Daiichi accident. The aim of the report is to provide an authoritative, factual and balanced account of the Fukushima Daiichi accident, its causes and consequences. The report is intended to build on the existing worldwide knowledge of the accident. The report will, inter alia, cover the EPR area. The report is planned to be finalised in 2014.

24.5.7.4 Response to events

In addition to all the activities undertaken in EPR area since 2011 and the response to the Fukushima Daiichi accident in line with its mandate and role, the IAEA is either directly informed or indirectly becomes aware of events involving or suspected to involve ionizing radiation on a regular basis and takes actions upon such information as appropriate.

Namely, in 2011, the IAEA was directly informed or became aware of 105 events involving or suspecting to involve ionizing radiation. In nine of them the IAEA took actions for the purpose of authenticating and verifying information with external counterparts or providing and sharing official information, and offered its services in six cases including the Fukushima Daiichi accident. In addition, one request for assistance from the Government of Bulgaria was received and the requested

assistance deployed through RANET. In 2012, of 219 events involving or suspecting to involve ionizing radiation, the IAEA took response actions in 34 events and offered its good offices in 17 events. Following requests from Member States, three field assistance missions were carried out.

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IAEA Report on Preparedness and Response for a Nuclear or Radiological Emergency in the light of the Accident at the Fukushima Daiichi Nuclear Power Plant, IAEA, Vienna (2013)

24.6 ENSREG

ENSREG, the European Nuclear Safety Regulators' Group, is an independent authoritative expert body composed of senior officials from national regulatory or nuclear safety authorities from all Member States in the European Union and from the European Commission.

Since its formation in 2007, ENSREG has worked to improve the cooperation and openness between Member States on nuclear safety and radioactive waste management, improve the transparency on these issues and advise the European Commission, as appropriate, on additional rules in these fields. Specifically, ENSREG's activities have included the advancing of a programme of self-assessments and peer reviews of Member States' nuclear regulatory bodies in cooperation with the IAEA and development of guidance on the implementation of the Nuclear Safety and Waste Directives to facilitate a consistent and high standard of implementation of the directives. The guidance has included a framework to assist regulatory bodies in addressing the challenges of ensuring the availability of suitably qualified staff and knowledge resources in the nuclear field, guidance on the information on nuclear safety regulation to be made available to the general public and the format of the national reports to the Commission under the Nuclear Safety and Waste Directives. In addition to promoting the improvement of transparency arrangements at a national level, ENSREG has sought to enhance openness and transparency at an EU level. This has been done through the development and maintenance of an ENSREG website that provides independent, authoritative information on nuclear safety, radioactive waste and spent nuclear fuel management and their regulation and the organisation of ENSREG led conferences, accessible to all stakeholders, to further the central mission of ENSREG regarding continuous improvement.

One of the key roles that ENSREG has played was the organisation of the "stress tests" of nuclear power plants and subsequent peer review following the Fukushima accident. Following the request from the European Council in March 2011, ENSREG and the European Commission, with the support of WENRA, initiated reviews of EU nuclear plants on the basis of a comprehensive and transparent targeted risk and safety assessment (the so-called "stress tests") in light of the Fukushima lessons learned. Stress tests were conducted by licensees and reviewed by the national regulators who prepared national reports. The national reports were peer reviewed through a process organised and overseen by ENSREG and an action plan prepared built on existing instruments like the Convention on Nuclear Safety (CNS) with a goal of using existing resources effectively. The peer review process has shown the value of EU regulators working together towards a shared goal of continuous improvement in nuclear safety, while showing a clear commitment to openness and transparency.

The stress tests were a targeted reassessment of the safety margins of nuclear power plants in the light of the events which occurred at Fukushima, namely, extreme natural events challenging the plant safety functions and leading to a severe accident. The reassessment was designed to be an evaluation of the response and robustness of the nuclear power plant and its safety systems when facing a set of extreme situations, assuming that key safety systems are lost, and a verification of

the preventative and mitigation measures in place. In particular, plant operators were expected to report on the response of the nuclear power plant and responsiveness of the preventive measures, noting any potential weak points and cliff-edge effects. Cliff-edge effects are sharp or step changes in events, for example the exhaustion of the capacity of backup batteries following the loss of external power for an extended time or flooding of the plant due to a flood barrier being exceeded.

In addition to the specific areas of nuclear safety considered in the stress tests, such as severe accident management, the Fukushima accident highlighted the need for robust off-site emergency preparedness arrangements. This view was echoed by the stakeholders that participated in the public meetings organised to present the ENSREG stress tests. ENSREG places a high priority on this topic and, indeed, the Action Plan prepared after the stress tests and peer reviews proposed the following activities: that HERCA and WENRA be asked to jointly develop improved guidance on mutual assistance between regulators; and that a joint European study, including EC, ENSREG and others, as appropriate, be carried out to identify issues to be addressed in order to implement effective off-site emergency preparedness (beyond mutual assistance) at the European level in the event of a severe accident which has radiological consequences in several European countries. The study should encompass all aspects of off-site emergency preparedness including health, disaster management/civil protection and food safety organisations.

25 ANNEX I: TENDER SPECIFICATIONS

TENDER SPECIFICATIONS

Invitation to tender No. ENER/D1/2012-474 concerning

Review of Current Off-Site Nuclear Emergency Preparedness and Response Arrangements in EU Member States and Neighbouring Countries

I. SPECIFICATIONS

I.1. Introduction

Nuclear safety and security are of the utmost importance to the EU and its people. Hence, ensuring highest possible standards of nuclear safety, security and emergency preparedness and response (EP&R) is a central concern of nuclear energy policy, as much in Europe as globally[13].

Immediately after the Fukushima nuclear accident, the European Council required that "the safety of all EU nuclear plants should be reviewed, on the basis of a comprehensive and transparent risk and safety assessment ("stress tests")". The European Council also asked the Commission to "review the existing legal and regulatory framework for the safety of nuclear installations and to propose any improvements that may be necessary".

Furthermore, the Council set up an Ad-hoc Group on Nuclear Security of Members States experts with the participation of the Commission to analyse security threats and the prevention of, and response to, incidents due to malevolent or terrorist acts.

The European Commission and the European Nuclear Safety Regulators Group (ENSREG)[14] agreed to work on the EU Stress Test for nuclear power plants, to

[13] Communication from the Commission to the Council and the European Parliament on the interim report on the comprehensive risk and safety assessments ("stress tests") of nuclear power plants in the European Union (SEC(2011) 1395 final).

[14] ENSREG meeting of 12 – 13 May 2011, based on the technical specifications proposed by WENRA (Western European Nuclear Regulators Association). See ENSREG declaration on www.ensreg.eu

assess how nuclear installations can withstand the consequences of various unexpected unintended events.

The technical scope of the stress tests[15], considers the following issues:

- Initiating events,
- Consequence of loss of safety functions from any initiating event conceivable at the plant site,
- Severe accident management issues.

Although the review of severe accident management may include emergency preparedness measures managed by relevant off-site services for public protection (fire-fighters, police, health services etc.), this topic is out of the scope of the EU stress tests. Hence there is a need to study the off-site nuclear emergency preparedness and response arrangements in EU member states and neighbouring countries.

In the light of the evolving lessons learned from the Fukushima accident, the importance of ensuring appropriate off-site EP&R arrangements has been clearly acknowledged. In the EU, specific actions and decisions in the area of EP&R in case of a nuclear emergency are taken mainly at national level. However, since a nuclear emergency in one country has the possibility to affect neighbouring countries – the cross border cooperation and coordination are of importance even amongst countries without a nuclear programme.

The preliminary results of the stress tests show that some EU Member States and neighbouring countries have already started to evaluate emergency management provisions under "beyond design-basis" accident conditions (i.e. accidents which are possible, but were not fully considered in the design because they were judged to be too unlikely) and identified possible improvements.

Further, a range of relevant EU legislative instruments are already in place[16], on the basis of which several mechanisms[17] could be activated in case of a nuclear emergency.

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15 EU "Stress Tests" Specification, Declaration of ENSREG, 13.5.2011 on www.ensreg.eu

16 Basic Safety Standards Directive (Council Directive 96/29/Euratom, under a recast procedure), the Public Information Directive (Council Directive 89/618/Euratom), the ECURIE Decision (Council Decision 87/600/Euratom), the Civil Protection Mechanism legislation (Council Decision 2007/779/EC, Euratom; Council Decision 2007/162/EC, Euratom; Commission Decision 2007/606/EC, Euratom; Commission Decision 2008/73/EC, Euratom; Commission Decision 2010/481/EU, Euratom) as well as the foodstuffs and feeding stuffs regulations following the Chernobyl accident (Council Regulation 733/2008/EC with the subsequent amendments) and special provisions in case of a future accident (Council Regulation 3954/87/Euratom with the subsequent amendments; Commission Implementing Regulation No 297/2011/EU with the subsequent amendments).

17 European Community Urgent Radiological Information Exchange (ECURIE), EUropean Radiological Data Exchange Platform (EURDEP), Reconciliating National Forecasts of Atmospheric Dispersion

I.2. Purpose of the contract

A study is required to analyse current arrangements between EU Member States and EU neighbouring countries with regard to off-site nuclear EP&R arrangements and capabilities.

The analysis shall centre on the coherence of current arrangements and how the preparation and response to a nuclear accident related emergency in the EU or its neighbourhood could be made more effective. The study shall identify how these arrangements could be optimised to make better use of resources and avoid duplication, both nationally and across borders, with the aim that those at risk from an accident in a nuclear installation are sufficiently protected.

In the *first phase* of the work, the rules, guidance and standards and current arrangements applied within the EU member states and neighbouring countries shall be compared; then gaps, inconsistencies and/or best practices, including cross-border arrangements, shall be identified. In the *second phase*, recommendations for improvements shall be made. During both phases of the work, the Contractor shall closely cooperate with:

(i) a Commission Task Force and (ii) a Group of Stakeholders (see below).

A thorough review of the completeness of the current nuclear EP&R arrangements and capabilities and identification of gaps and inconsistencies are the most important sections of the study. Conclusions and recommendations shall result from the analysis performed by the Contractor on this basis.

Specifically, the effectiveness of emergency organisation and crisis management at national and cross-border levels shall be considered. The division of tasks and responsibilities between national and local authorities, the means for establishment of an emergency response organisation involving national and regional representatives, the methods of coordination between different task groups, the communication and decision-making process shall be studied. The capabilities in terms of manpower and equipment resources, policies and practices for training, rehearsal of contingency plans, guidance to local populations, role of emergency services (civil protection, rescue, fire fighting), local hospitals and medical staff in the EP&R plans shall also be analysed. In addition, the response procedures in the event of extensive infrastructural damage and long repair times the existing strategies for the protection of the population shall be assessed in view of an accident of prolonged duration.

Such an analysis shall also take into account the geographical component of a nuclear plant's specific risk, including the various definitions of the zones around a plant in which special restrictions need to be applied. The criteria for establishing emergency action and risk zones in different countries shall be

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(ENSEMBLE), Radioactivity Environmental Monitoring (REM), the Community Civil Protection Mechanism in particular through its Monitoring and Information Centre (MIC) etc.

reported on. Although mainly focusing on off-site arrangements in case of emergencies, the study shall include mention of the arrangements for coordination and communication between nuclear site licenced operators (who have the responsibility for on-site actions) and the local and national authorities who coordinate off-site response.

Further, the study shall look – again both at national and cross-border levels – at good practices in existing arrangements; and improvements that could be made in the areas of preparatory information to local residents, effective communications to broadcast alerts, practicalities of evacuation of large populations, guidance in the use of stable iodine tablets, availability of detection equipment for large numbers of dose evaluations, common standards and criteria for countermeasures such as sheltering and evacuation, special arrangements to deal with agricultural livestock, arrangements to meet public and international demands for information, manpower and resources needed for environmental monitoring, training, drills and exercises for EP&R personnel. Any arrangements to increase awareness of the public on radiation uses and protection standards shall be mentioned.

Questions to be answered

In summary, the study has to respond to the following three questions:

1. ***What is the status of the existing arrangements inside and between EU Member States with regard to off-site nuclear EP&R capabilities?***

   Note: The study shall also consider the corresponding arrangements inside EU neighbouring countries and between Member States and neighbouring countries[18], to the extent possible based on publicly available information, and furthermore through direct contact with the relevant authorities in these neighbouring countries if they are willing to respond.

2. ***What are their key gaps and inconsistencies, including cross-border arrangements?***

   - ***To illustrate the issues on a detailed technical and organisational basis, this analysis shall be complemented by two types of detailed case studies, one on arrangements inside 1-2 particular EU Member State(s) and 1-2 between different EU Member States.***

3. ***Which proposals for areas of possible improvements could be developed therefrom?***

[18] i.e. at least countries considered most relevant for this topic and being covered by the EU Neighbourhood Policy (ENP), being member countries of EFTA, being countries included in the current EU enlargement agenda as well as Switzerland and the Russian Federation.

Scope of the study

The scope of this comparative study shall cover all EU Member States and at least a representative set of the EU neighbouring countries as specified in the above footnote.

When accomplishing the study, it is important that the Contractor carefully maps and takes into account the work already completed or being performed on the topic, e.g. by governmental institutions, academia and international organisations (NEA, IAEA, EC-services, etc.), in order to avoid duplication.

The collection of data to be used for the study shall include not only freely available information such as reports, surveys, conference proceedings, internet, etc., but rely primarily on official documents and comments from the relevant institutions in all countries covered by the study via direct contacts ("Stakeholders Group" (see below)).

Information Template

A template of the most relevant issues to be covered by the data collection shall be developed and used to structure the information collected on a country-specific basis in order to make it cross-comparable.

Amongst others, the following EP&R-related issues shall be identified on a country-specific basis and cross-compared:

- Institutional responsibilities for onsite and off-site EP&R[19];
- Off-site EP&R regulatory background, e.g.:
  - Emergency classification levels
  - Requirements for licensing and re-licensing;
  - Emergency planning zones
  - Regulations and guidances used
- Content of Licensees' EP&R Plans:
  - Organisation for coping with radiological emergencies
  - Assessment actions
  - Activation of emergency organisation
  - Notification procedures
  - Emergency facilities and equipment
  - Training and rehearsal arrangements
  - Maintaining emergency preparedness
  - Onsite protective actions during hostile actions[20]

[19] An effective emergency response is the product of mutually supportive planning and preparedness among several parties: licensees that operate the nuclear installations; local, national and supra-national (e.g. cross-border) institutions; and private and non-profit groups that provide emergency services.

[20] i.e. actions to ensure the continued ability of the licensee to safely shut down the reactor during a safety or security related emergency situation and perform the functions of the licensee's emergency plan.

- Coordination of Off-site EP&R – role of national and local governments, other stakeholders, and cross-border issues.
- Responder training, practice and evaluation
- Experience with EP&R Licensees' commitment to EP&R
- Funding

In all of the above issues, particular attention shall be given to cross border aspects, and use shall be made of appropriate international guidance (e.g. from IAEA, OECD-NEA).

Working Method

It is foreseen that the entire work is supervised by a "Commission Task Force", acting as an advisory board and consisting of representatives of various Commission services concerned (e.g. DGs ENER, ECHO, HOME, the JRC and the SecGen). Communication and feedback to the contractor will be provided throughout the contract, and particularly through the two foreseen workshops (see below).

In addition, the contractor is required to establish and consult with a representative "Group of Stakeholders" drawn from, for example, the nuclear industry, national regulators, local authorities, civil protection services, medical services and citizen groups. It is the responsibility of the Contractor to build-up and co-ordinate this Stakeholders Group. The tasks of this Group are to provide official relevant information in order to be able to perform the analysis and comparison work and to act as an (informal) reviewer of the work performed by the Contractor in the course of the two foreseen workshops (see below). Note that the composition of the "Group of Stakeholders" is to be proposed by the contractor, and the formulation of the group and the means of consulting and working with it are to be described in the tender response.

All meetings between the Commission and the Contractor are planned to allow in-depth discussions with these two groups.

Together with the Commission Task Force and the Stakeholders Group, an intermediate and a final workshop will have to be organised by the Contractor at the Commission's premises in Luxembourg. While the first workshop aims at discussing the draft findings of the first phase of the work, the second workshop deals with the discussion of the draft findings and recommendations resulting from the second phase.

I.3. Reports and documents to produce - Timetable to observe

Execution of the tasks begins after the date on which the contract enters into force.

In principle, the deadlines set out below cannot be extended. The Contractor is deemed solely responsible for delays occasioned by subcontractors or other third parties (except for rare cases of *force majeure*). Adequate resources and

appropriate organisation of the work including management of potential delays shall be put in place in order to observe the timetable below.

A **kick-off meeting** will take place in Luxembourg, at the latest 30 days following the signature of the contract, in order to settle all the details of the study to be undertaken. Prior to the kick-off meeting, the Contractor will provide a detailed work programme including planning of the study, information template, proposed composition of the Stakeholders Group, and other working methods. This programme will be summarised in an *Inception Report* to be submitted to the Commission in a draft version 5 days prior to the meeting and is subject to approval by the Commission.

The **first phase of work**, as defined above, will be concluded by a **1st workshop** together with the Stakeholders Group and the Commission Task Force:

- This workshop will take place 6 months after the signature of the contract at the Commission's premises in Luxembourg.
- The Contractor is responsible for the organisation of this event, incl. preparation of invitation material, minutes taking, etc.
- The Contractor will provide DG ENER with the draft interim report at least 15 days before the workshop takes place.
- The Contractor will provide the Commission Task Force and the Stakeholders Group with a brief summary of the key findings from the first phase of work at least 15 days before the workshop takes place.

On the basis of the comments from DG ENER and the outcome of the 1st workshop, the Contractor will provide DG ENER with a final interim report.

The **second phase of work**, as defined above, will be concluded by a **2nd workshop** together with the Stakeholders Group and the Commission Task Force:

- This workshop will take place 9 months after the signature of the contract at the Commission's premises in Luxembourg.
- The Contractor is responsible for the organisation of this event, incl. preparation of invitation material, minutes taking, etc.
- The Contractor will provide DG ENER with the draft final report at least 15 days before the workshop takes place. Together with the draft final report, the Contractor shall prepare a MS PowerPoint presentation of the background, working methods and results of the study. This presentation will be submitted to the approval of the Commission together with the draft final report.
- The Contractor will provide the Commission Task Force and the Stakeholders Group with a brief summary of the key findings from the first phase of work at least 15 days before the workshop takes place.

On the basis of the comments from DG ENER and the outcome of the 2nd workshop, the Contractor will provide DG ENER with a final report.

Each of the above described meetings will be officialised by minutes, written by the Contractor and validated by DG ENER. The exact dates of all meetings will be fixed by the two parties on the proposal of the Commission.

Timetable to observe

Activity/Deliverable	Date
Signature of contract by last signing party	T
Delivery of draft inception report	T+25days max
Kick-off meeting in Luxembourg	T+30days max
Delivery of draft interim report	(T+5months+15days max)=T1
1st Workshop	T+6 months
EC to approve/reject interim report	(T1 +45days max)=T2
Contractor to make any changes and deliver final version of interim report	T2+20days max
Delivery of draft final report + MS powerpoint presentation	(T+8months+15days max)=T3
2nd Workshop	T+9 months
EC to approve/reject final report	(T3+45days max)=T4
Contractor to make any changes and deliver final version of final report	T4+20days max

I.3.1. Progress reports

The **progress report (draft interim report)** showing progress of the work shall be submitted to the Commission at the latest 5 months and 15 days after the date of signature of the contract.

The Commission shall have forty-five days from receipt to approve or reject the report. Within 20 days of receiving the Commission's observations, the Contractor will submit additional information or another report.

I.3.2. Final report

The contractor will submit a draft final report to the Commission at the latest 8 months and 15 days after the signature of the contract.

The Commission shall have forty-five days from receipt to approve or reject the final report, and the Contractor shall have 20 days in which to submit additional information or a new final report.

I.3.3. Report format and publication

3 copies of the reports, **in English language**, shall be supplied in paper form and one copy in electronic form in MS Word format. If a detailed background database (whose results are included in the final report) is developed in parallel, this shall be performed in MS Excel format.

The Commission may publish the results of the study. For this purpose, the tenderer must ensure that the study is not subject to any restrictions deriving from intellectual property rights of third parties. Should he intend to use data in the study which cannot be published, this must be explicitly mentioned in the offer.

I.4. Duration of the tasks

The duration of the tasks shall not exceed 12 months. This period is calculated in calendar days.

I.5. Place of performance

The tasks will be performed on the Contractor's premises. However, meetings between the Contractor and the Commission may be held on Commission premises in Luxembourg.

I.6. Estimate of the amount of work involved

The amount of work involved to carry out this contract is assessed at 400 person-days.