EP&R Arrangements in Germany

Introduction

This essay is structured into four main parts. After some introductive lines on the nuclear phase out and the new Radiation Protection Act part I gives a brief overview of the German EP&R system and EP&R principles. Part II deals with Emergency Preparedness arrangements in particular including e.g. the preparation of Emergency Response Plans or exercises. Part III discusses the field of Emergency Response and especially the assessment of the radiological situation in case of an emergency, while the focus is mainly on the innovations introduced by the new legislation. Finally, part IV covers miscellaneous aspects addressed by the new Law.

As a consequence of the accident in Fukushima Daiichi the German government decided in 2011 on a gradual nuclear phase out until 2022. Nine of the 17 domestic nuclear power plants have already been switched off permanently. For the remaining eight nuclear power plants there are fixed switch off dates in place as well as limits on the amount of electrical energy produced by each of the units.

Responsibilities in emergency preparedness are organised in a variety of ways in Germany. All emergency response and civil protection measures serving to avert dangers to the civil population are summed up under the term civil protection. In accordance with the Basic Law (Grundgesetz), the aversion of dangers in the event of a disaster is a matter for the Länder. No strict distinction is however made today between civil protection and emergency response. The Ministers and Senators of the Interior of the Länder have agreed together with the Federal Minister of the Interior on an Integrated Hazard Aversion System. This means that the Federation and the Länder pool their responsibilities and capacities in a civil protection system, taking account of all causes of damage. It was advised in this regard (from 1951 to 2015) by the Protection Commission at the Federal Ministry of the Interior.

Emergency response in Germany is overwhelmingly organised on a voluntary basis (roughly 90 percent), meaning that between 1.5 and 2 million voluntary helpers form the rescue services, working in relief organisations such as the voluntary fire service (e.g. fire protection units, NBC platoons and dangerous goods trains). The Federation supports the emergency response of the Länder with the assistance of the Federal Agency for Technical Relief (THW) and the Federal Office of Civil Protection and Disaster Assistance (BBK), which are within the portfolio of the Federal Ministry of the Interior (BMI).

The structure of emergency response is governed by the law of the Länder, and hence differs from one Federal Land to another.

The situation is different in Germany when it comes to a nuclear disaster, such as in the event of an accident in a nuclear power station with radiological significance, or large-scale radiological events: The Federation does not have any competences in nuclear emergency preparedness with regard to direct hazard aversion, which includes evacuation as a possible measure. It does however have to set out stipulations, entrenched in law since 2017, with regard to radiation protection in the event of emergency exposures concerning the evaluation of hazards that might arise in the case of emergencies caused by ionising radiation. Since the promulgation of the German Radiation Protection Act (Strahlenschutzgesetz – StrlSchG) of June 2017, this has been carried out via an

I. The emergency preparedness system

Elements of the emergency preparedness system are:

1. Emergency preparedness principles (e.g. “The reference values for the protection of the population and of emergency workers to be established in emergencies are not to be exceeded where possible.”, “The ALARA principle is to be complied with in the case of the exposure of the population and emergency workers.”)

2. Reference values for the protection of the population (“100 millisievert effective residual dose within one year, calculated over all exposure pathways for the individuals affected by the emergency”) and empowerment to hand down an ordinance, so that the Federal Ministry of the Environment is able to set a lower value for an emergency that has already occurred.

3. Dose values and contamination values for the protection of the population, which are set by legal ordinance and are used as radiological criteria – i.e. projected doses – for the appropriateness of the protection measures (calling on people to stay inside, distribution of or calling on people to take iodine tablets, evacuation). The Federal Ministry of the Environment is empowered to set thresholds for contaminations caused by emergencies or dose rates, with the consent of the Bundesrat, where a danger is presumed to exist for individual members of the population if they are exceeded.

These thresholds refer to seven fields, and serve to implement optimised protection strategies. The Federal Ministry of the Environment is empowered to rescind the dose values and contamination values, as well as to adjust them on a time-limited basis (e.g. to the applicable regulations of Euratom).

In the same way as the dose values, contamination values and dose rate values, the concomitant procedures, calculations or estimates and prerequisites subject to which they apply may be established. The consent of the Bundesrat is not needed for this.

The legal ordinances in which the thresholds for contaminations caused by emergencies and dose rates are established in the seven fields require agreement with seven designated Federal Ministries, depending on their allocated competences.

4. Legal regulations on contaminated waste in case of emergency exposures are foreseen, that is legal ordinances for the management of contaminated waste as well as for the establishment and

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1 i.e. contamination or dose rates 1. for individual members of the population, 2. for drinking water, 3. for food, feed, articles of daily use and cosmetics, 4. for medicinal products and their base substances, as well as for medical devices, 5. for other products, articles and substances, 6. for vehicles, goods or luggage, and 7. for contaminated areas, in particular for contaminated land and water bodies
operation of waste facilities. The Federal Ministry of the Environment (as the highest Federal authority responsible for waste) establishes contamination values for waste and for other articles or substances with the consent of the Bundesrat. These also include contamination values which when they are not exceeded the waste may be managed as “ordinary waste” with no special protective measures. Corresponding contamination values are to be stipulated for the establishment, operation or use of waste disposal systems, for waste water disposal and for the storage, deployment or treatment (for instance incineration) of contaminated articles or substances. The BMUB regulates via a legal ordinance with the consent of the Bundesrat requirements and exceptions to the “regular” Federal laws and ordinances applicable to waste, which can be attributed to 15 regulatory areas\(^3\) in accordance with the Radiation Protection Act. The Länder establish which waste management authorities are obliged to dispose of contaminated waste caused by emergencies which cannot be treated, stored or deposited in plants or facilities intended for “regular” waste.

In urgent cases once they have occurred, the BMUB (also in its role as the Federal Ministry responsible for regulations on waste management) may issue appropriate regulations for contaminated waste for six months by means of an emergency ordinance without the consent of the Bundesrat and other Federal Ministries.

II. Emergency preparedness

(5) Joint regulations exist for the emergency plans relating to emergency planning which constitute the suitable emergency responses using specific reference scenarios. The emergency responses include both protective measures for the prevention and reduction of the exposure and contamination of people and the environment, as well as measures for medical treatment and post-exposure care. The joint regulations also contain measures for the examination, preparation, implementation and monitoring as well as amendment and withdrawal of measures and regulations for cooperation and coordination in emergencies.

The authorities that are responsible for drawing up the emergency plans coordinate in order to prepare for a coordinated emergency response, and endeavour to coordinate their emergency plans with neighbouring countries, with EU/EURATOM States, as well as with third countries.

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\(^3\) 1. the sequence of the waste avoidance and waste management measures, 2. requirements regarding safe recovery, 3. the order and implementation of waste disposal, 4. requirements of the establishment and operation of landfill sites, as well as their approval, including the approval procedure, 5. requirements of the monitoring of waste management, 6. requirements of waste collectors, transporters, dealers and brokers and their respective approval, including the approval procedure, 7. requirements of the establishment, the properties, the operation and major changes to waste facilities, of the approval of these plants, including the approval procedure, as well as of the condition of the plant and of the land on which it is situated once operation has been ceased, 8. requirements of the use of the waste water facilities, 9. requirements of the use of water bodies, incl. the dumping and discharge of substances into a water body, 10. requirements of compliance with the obligation to dispose of waste water, 11. requirements of monitoring the properties of the water bodies, 12. measuring methods and measurement procedures as part of the disposal of waste water and the monitoring of the properties of water bodies, 13. obligations incumbent on the operators of waste facilities and waste water facilities, 14. the preconditions (exceptions) for the approval of exceptions by the authorities, 15. the requirements to be adhered to in order to comply with the obligations emerging from the regulations.
As part of stakeholder participation, selected groups (highest Land authorities, Academia, environmental associations, municipalities and other stakeholders) are to be consulted on the emergency plans of the Federation, albeit emergency ordinances are excepted from this.

The examination and amendment of the emergency plans are to be updated when legal provisions are amended and carried out on a regular basis at intervals set in emergency plans.

17 regulations (administrative regulations, framework ordinances, guidelines, recommendations of the radiation protection commission and technical communications) apply as preliminary ERPs until such time as emergency plans have been issued by the Federation or legal ordinances are adopted regarding dose and contamination values for the protection of the population. These are listed in Annex 4 to the Radiation Protection Act.5

(6) The BMUB evaluates possible emergency exposures and proposes a general emergency plan of the Federation, which the Federal Government adopts with the consent of the Bundesrat. The general emergency plan is to show the reference scenarios and optimum protection strategies adjusted to it, which serve as plans for tackling emergencies on the part of the Federation and the Länder, as well as the plans of the Federation, relevant plans of neighbouring countries and international organisations (e.g. EU/EURATOM and IAEA) and plans in the context of international agreements (e.g. ECURIE, USIE, RANET, EURDEP).

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5 The situation for tackling nuclear accidents in Germany was previously as follows: The Federation published “Framework recommendations for emergency response in the area surrounding nuclear plants”, as well as the “Radiological policy for decision-making on measures for the protection of the population in case of the accidental release of radionuclides” as the radiological basis for decisions on emergency response measures. The competent authorities in the Länder have access to the RODOS (Real-time On-line DecisiOn Support) decision-support system, which is operated at “RODOS Headquarters” at the Federal Office for Radiation Protection (BfS). The Länder can either use the system themselves or task RODOS Headquarters with implementing calculations regarding accident events. RODOS is used in case of nuclear emergencies in order to implement dispersion calculations, to estimate environmental contaminations and radiation exposures, as well as to prepare decisions for protective measures. The basis for the dispersion calculations is the source term, that is the volume of released material, as well as the local dose rate measured, which is determined in Germany by the ODL measurement network with roughly 1,800 probes, and the air movements at different heights derived from weather forecasts of the German Meteorological Service.
(7) The Federal Government supplements and concretises (at the proposal of the Federal Ministry responsible for the area in question) the general emergency plan of the Federation by means of special emergency plans of the Federation, which are adopted as general administrative regulations with the consent of the Bundesrat. Nine areas of application\(^6\) are defined in the Radiation Protection Act for the special emergency plans of the Federation. The special emergency plans particularly include the essential elements defined in Annex 6 of the Radiation Protection Act (sub-divided into four areas)\(^7\).

(8) The Länder draw up general and special emergency plans of the Länder, which lend concrete shape to the general emergency plan of the Federation and to the special emergency plans of the Federation insofar as the Länder are responsible for planning or implementing protective measures. By lending concrete form to and supplementing the general and special emergency plans of the Federation and the Länder, in the context of emergency preparedness within the facilities the authorities responsible for emergency response and public safety draw up external emergency plans for stationary plant (e.g. nuclear power plants) or installations where there is a special potential for risk on the basis of provisions of Land law, taking local circumstances and precautions into account.

(9) Emergency exercises are to be carried out on a regular basis by the authorities and organisations involved in the emergency plans which are responsible for the basic and further training of emergency workers. The nature of the exercise, the scale and the emergency scenarios need to be differentiated, elements of exercises are 1. the organisational precautions for tackling emergencies and 2. the exchange of information and cooperation between the participating organisations with regard to a) the assessment and evaluation of the situation, b) the coordination of decisions and c) the implementation of appropriate protective measures.

(10) On the basis of the Radiation Protection Act, in future the Federation will procure potassium iodide tablets (or other protective substances) to block iodine, and will supply them to the population in

\(^6\) The special emergency plans include information on planning for 1. emergency response, general hazard aversion and assistance, as well as medical treatment and post-exposure care of the population and emergency workers, 2. the abstraction and supply of drinking water, 3. the production of plant and animal products, for food, feed, articles of daily use and cosmetics, 4. medicinal products and their base substances, as well as medical devices, 5. other products, articles and substances, 6. transport of goods, 7. cross-border transport of persons, vehicles, goods and luggage, 8. contaminated areas (land and water bodies), 9. disposal of waste and removal of waste water, as well as the establishment and operation of the facilities designed for such purposes.

\(^7\) Major elements of the special emergency plans of the Federation are the descriptions 1. of the legal basis, tasks and responsibilities of the Federation and the Länder and of their authorities and organisations responsible for or contributing towards emergency response, 2. of the applicable procedures and precautions for the exchange of information, cooperation, assistance and coordination in emergency response at Federal level, between the Federation and the Länder, with other countries and international organisations, as well as the bodies and institutions responsible for this exchange of information and cooperation, assistance and coordination, 3. of the interfaces with other procedures and precautions for the exchange of information, cooperation, assistance and coordination in emergency response, which are listed in the further emergency plans of the Federation and the Länder or otherwise for the exchange of information as well as cooperation, assistance and coordination in emergency response; 4. the concretisation, supplementation and application of the optimised protection strategies established in the general emergency plan of the Federation, including a description a) of the possible priority and the other measures for the protection of the population and emergency workers, as well as b) the precautions and criteria for area-specific concretisation, application and adjustment of the initiation criteria and threshold or guide values stated in the general emergency plan.
Germany, and will make them available to the Länder for storage, distribution and issuing to the population for the purpose of emergency response. In the future the federal government might also procure other protective equipment as e.g. basic breathing masks. This is however subject to ongoing discussions.

(11) The information of the population regarding protective measures and recommendations for conduct in case of possible emergencies is provided by agencies of the Federation and the Länder, whereby the information is to contain the following aspects: a) fundamental terms applying to radioactivity and its impact on humans and on the environment, b) the emergencies catered for in the emergency plans and their consequences for the population and the environment, and c) planned measures to warn and protect the population in potential emergencies. The agencies of the Federation also make recommendations to the population regarding conduct in potential emergencies, and these are supplemented and lent concrete form by the Länder.

III. Radiological situation assessment and emergency response

(12) A Radiological Situation Centre of the Federation has been established through the Radiation Protection Act for the radiological situation and emergency response. The competences of the Radiological Situation Centre of the Federation, which has been established at the BMUB, are set out in the Radiation Protection Act, and include eight task areas. The BMUB is supported by four institutions in the performance of these tasks.

Seven blocks of tasks are assigned to the obligations of the Länder in the calculation and evaluation of the radiological situation, which are also regulated by law.

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8 The task areas of the Radiological Situation Centre of the Federation are: 1. collection, evaluation and documentation of data on regional and superregional emergencies, 2. drawing up the radiological situation report, as well as readying or transmitting this radiological situation report to the Länder and to the Joint Information and Situation Centre of the Federation and the Länder in the Federal Office of Civil Protection and Disaster Assistance, 4. readying or transmitting this radiological situation report to the highest Federal authorities determined in the general emergency plan of the Federation, 5. exchange of information on the radiological situation and on its evaluation within the Federal Government and with the Länder, as well as with other Member States, with bodies and institutions of the European Union and of the European Atomic Energy Community, with third countries and with international organisations, 6. coordination of the protective measures and of the measures to provide information to the population, as well as of assistance in emergencies within the Federal Government and with the Länder, as well as with other countries, 7. information of the population and recommendations for conduct in emergencies, 8. coordination of the measurements conducted by the Federal and Länder authorities and of other organisations involved in tackling the emergency in order to complete the radiological situation report and to provide a database for dose estimation.

9 The institutions participating in the Radiological Situation Centre of the Federation are: the BMUB, the Federal Office for Radiation Protection (BfS), the Federal Office for the Safety of Nuclear Waste Management (BfE), the “Gesellschaft für Anlagen- und Reaktorsicherheit” (Reactor Safety Association, GRS) and the Federal Office of Civil Protection and Disaster Assistance (BBK).

10 The tasks of the Länder refer to the provision of various types of data and information to the Radiological Situation Centre of the Federation: 1. data to the Central Authority of the Federation for Monitoring Ambient Radioactivity, 2. communications of the individual responsible for radiation protection on a potential superregional or regional emergency, or one which has taken place, or 3. other information on a superregional or regional emergency on the territory of their Land, 4. the data that are relevant for the radiological situation on the system or radiation source, on the radiological inventory and on releases as well as assessments and prognoses of releases, 5. system-related measurement data from measurement programmes for air quality
(13) The radiological situation report is the result of the preparation, presentation and evaluation of the radiological situation (where possible with dose assessments) using the data provided by the Federation and the Länder, as well as the data collected from the monitoring of ambient radioactivity. Statutory provisions exist for a variety of exposure situations for monitoring ambient radioactivity. These provisions set six task areas\(^{11}\) to detect radioactivity as tasks of the Federation, and five task areas\(^{12}\) as tasks of the Länder. The data provided by the Federation and the Länder regarding ambient radioactivity are furthermore compiled and input into the Federation’s Integrated Measurement and Information System (IMIS) at the Central Authority of the Federation (ZdB), which belongs to the Federal Office for Radiation Protection, in order to monitor ambient radioactivity, and are made available to the Länder.

In case of a superregional emergency the radiological situation report is drawn up by the Radiological Situation Centre of the Federation, while in a regional emergency this task falls to the Land in question. The Land may, however, delegate the drafting of the radiological situation report to the Radiological Situation Centre in agreement with the BMUB, whilst conversely the Radiological Situation Centre may in consultation with the Land assume the task of drawing up the radiological situation report (where necessary also against the will of the Land). The Federal Government can determine in the General Emergency Plan of the Federation, using the reference scenarios, when a superregional, regional or local emergency is to be presumed.

An administrative agreement can determine that a Land is to provide additional data on a nuclear facility (e.g. data on nuclear power plants or regional data) for the radiological situation report carried out by the Radiological Situation Centre of the Federation.

(14) The dose estimation of the affected groups of the population which have received a dose, or which are likely to do so, is carried out by the authority that is responsible for drawing up the radiological situation report. In accordance with the Radiation Protection Act, comparing of the results of the dose estimation with the reference value, assessing the effectiveness of protective measures and conducting recommendations on protective measures, as well as examining whether reference values, dose values, contamination values or dose rate values are to be adjusted to the existing or anticipated circumstances of the emergency, are tasks for the BMUB.

(15) The decision on protective measures in an emergency is taken by the competent authorities on the basis of the legal provisions of the Federation and on the prevention of hazards for human health, for monitoring, or from other immission measurements, 6. communications on the protective measures which have been taken by the competent Land authorities, as well as on information for the population and conduct recommendations, and 7. communications on the effectiveness of these protective measures and conduct recommendations.

\(^{11}\) Tasks of the Federation are: 1. large-scale survey of radioactivity in various areas (air, precipitation, Federal waterways, the North Sea and Baltic, soil surface) and the gamma local dose rate, 2. development and establishment of sampling, analysis, measurement and calculation procedures to determine ambient radioactivity, as well as the implementation of comparative measurements and comparative analyses, 3. compilation, documentation and processing of the data that have been transmitted on ambient radioactivity, 4. establishment of dispersal prognoses, 5. development and operation of decision-support systems, 6. evaluation of the data ascertained on ambient radioactivity and 7. reading of data and documents and informing the Länder about the results of the data evaluation.

\(^{12}\) Tasks of the Länder are the determination of radioactivity in the following areas: 1. food, feed and articles of daily use acting as indicators of ambient radioactivity, 2. medicinal products and their base substances, 3. drinking water, ground water and surface water not including Federal waterways, 4. waste water, sewage sludge and waste, as well as 5. soil and plants.
the environment or for public safety, as well as on the basis of directly applicable legal acts of the European Union and of the European Atomic Energy Community. The emergency plans and the circumstances of the respective emergency are to be taken into account in the decision, whereby the radiological situation report is significant in this process, and the effectiveness of the protective measures that have been taken needs to be considered.

Cooperation and coordination in decisions regarding protective measures and their implementation, as well as the necessary\(^\text{13}\) scale of the coordination, are carried out in accordance with the emergency plans.

\(\text{(16)}\) If an emergency widely diverges from the reference scenarios in the emergency plans\(^\text{14}\), the Federal Government may separately establish in urgent cases\(^\text{15}\), by means of individual instructions for this emergency, the protection strategies that are to be applied, as well as the guideline values for emergency-related contaminations or dose rates.

\(\text{(17)}\) The information of the population affected and recommendations for conduct in emergencies are provided in accordance with the law of the \textit{Länder}\(^\text{16}\) or with the law on emergency response\(^\text{17}\). If it is not the authorities which are responsible for the emergency response that are responsible for informing the population and formulating recommendations for conduct, the BMUB promptly informs the potentially affected population in case of superregional and regional emergencies, and gives them appropriate recommendations for conduct. Which points are included in the information, appeals and recommendations for conduct are listed in an Annex\(^\text{18}\) to the Radiation Protection Act.

\(^{13}\) The extent of the coordination may not be permitted to lead to a situation in which prompt implementation is reduced or inappropriately delayed,

\(^{14}\) or in which the information on this emergency is inadequate to attribute it to a specific reference scenario.

\(^{15}\) The situation is considered urgent if 1. the optimised protection strategies or protective measures established in the existing emergency plans are not appropriate or adequate and 2. it is unlikely that legal ordinances or emergency plans can be issued or amended in good time for this emergency.

\(^{16}\) In case of a local emergency, the competent authorities will inform the potentially affected population of the emergency promptly and give them appropriate recommendations for conduct.

\(^{17}\) The competent authorities promptly inform the potentially affected population with superregional and regional emergencies which have occurred or are imminent in its area of competence and give them appropriate recommendations for conduct.

\(^{18}\) Where relevant for the respective emergency, large amounts of information and recommendations for conduct are to be made available for the population affected in line with the applicable emergency plan: 1. information on the emergency that has occurred, and where possible on its characteristics and origins, dispersion and likely development, as well as recommendations for conduct in accordance with the circumstances of the respective emergency (restriction of the consumption of specific food and water which may have become contaminated, simple hygiene and decontamination rules and recommendations to remain inside, as well as to collect and use iodine tablets, precautions in the event of an evacuation, special warnings for certain groups of the population), as well as recommendations to follow the instructions and appeals from the competent authorities), 2. information and recommendations in the preliminary warning phase (e.g. appeal to switch on the relevant communication channels, preparatory recommendations for facilities which perform public tasks, and for professions that are particularly affected) and 3. additional information on fundamental terms relating to radioactivity and its effects on people and the environment (if time permits the potentially affected population to be informed of this once more).
IV. Miscellaneous aspects

(18) Protection of emergency workers

The Radiation Protection Act regulates the information and the basic and further training of emergency workers within emergency planning\(^{19}\) and in emergency deployments, and establishes the group of individuals affected as well as the appropriate topics\(^{20}\) and contents. It also regulates the responsible agencies and their areas of competence (1. information, basic and further training\(^{21}\), 2. protection in emergency deployments\(^{22}\)).

The BMUB is empowered to regulate the essential content as well as the nature and content by means of a legal ordinance, with regard to information, as well as to basic and further training, and further regulations\(^{23}\) for the protection of emergency workers.

(19) Transition to an existing exposure situation after an emergency

The Radiation Protection Act regulates the transition to an existing exposure situation and establishes the responsibilities of the BMUB\(^{24}\) and of the Federal Government and corresponding empowerments to hand down ordinances.