

For information

Legislative Council Panel on Security

Progress on Review of the Daya Bay Contingency Plan

In response to public concern about the safety of the nuclear power stations in the vicinity of Hong Kong and to ensure that Hong Kong's nuclear emergency preparedness and response can progress with time, the Government is conducting a comprehensive review of the Daya Bay Contingency Plan (DBCP). This note reports the progress and provides relevant information as requested by Members.

Review Approach

2. The Security Bureau has set up a dedicated team to steer and coordinate efforts across the Government for reviewing the DBCP and interfacing with departmental efforts. Relevant professional and frontline departments involved in the DBCP are looking into their responsible areas to review and update their departmental plans.

3. To assist the government review efforts, the Security Bureau has set up an Expert Advisory Panel to tap the views of local experts in nuclear science and engineering, atmospheric science, radiation, medicine and related fields. The membership list is at *Annex A*.

4. In addition, a standing Radiological Protection Advisory Group (RPAG) under the Department of Health will advise the Director of Health on the following matters relating to the radiological consequences that might eventuate from radioactive releases from nuclear facilities:

- The development and subsequent review of 'Dose Models' designed for use in assessing the consequences for the public of any accidental radiation release to the environment;
- the dose limits that should apply to the population and in particular to individuals in certain critical groups;
- the criteria that should be used to interpret emergency environmental monitoring data;

and, without prejudice to any decision that may be taken by the Director of Health, during the intermediate and recovery phases, of any nuclear accident situation affecting Hong Kong to advise on –

- the interpretation of environmental radiation monitoring data and their impact on the public;
- the countermeasures that should be adopted having regard to the widely applied principle that the risks should be reduced to a level which is as reasonably practicable.

Review considerations

5. The DBCP was originally prepared on the basis of a consultancy study undertaken by the United Kingdom Atomic Energy Authority (UKAEA) on risk assessment and contingency planning with reference to international standards and practices, as well as the cooperation arrangements reached between Hong Kong and the Mainland in offsite emergencies, including radiation monitoring, notification and control of food, livestock and water from the Mainland. The DBCP has also taken into account RPAG's advice on the Intervention Levels (doses due to radiation) at which countermeasures should be taken. These are issues which will be considered in this review. We will also follow up on latest safety standards and practices being developed by international organizations and the practices of advanced countries overseas in this respect.

Risk assessment

6. We are looking into the UKAEA consultancy study with a view to examining whether there are any material and significant changes that would fundamentally affect the basis and arrangements of the original contingency plan.

7. In this connection, we are looking into the lessons of the Fukushima incident to identify any latent risks and consider any new prevention and mitigation measures. Notably, the State Council has mandated a comprehensive safety review of all nuclear power plants on the Mainland. We will as far as possible take into account the review findings (depending on the timing of the announcement of the review findings) and implementation of any new safety measures in the light of lessons learnt from the Fukushima nuclear accident.

Cooperation with the Mainland

8. Since the nuclear power stations at Daya Bay are located on the Mainland, their operation as well as contingency planning are subject to oversight of the Mainland authorities in accordance with applicable laws and regulations. We are reviewing the cooperation and notification arrangements with the Mainland in the event of off-site emergencies with a view to enhancing our emergency preparedness and response in Hong Kong.

International standards and practices

9. The International Atomic Energy Agency (IAEA) plays a leading role in promoting nuclear safety and emergency preparedness and response, among other things. In collaboration with other international organizations (including World Health Organization, Food and Agriculture Organization, World Meteorological Organization), the IAEA has been developing and promulgating standards and guidelines for countries to follow.

10. In response to the Fukushima nuclear accident, the IAEA has taken proactive actions, including organizing a fact-finding mission to Japan in May/June, and a special Ministerial Conference on Nuclear Safety in June. At its General Conference held in September 2011, an Action Plan on Nuclear Safety (Annex B) was endorsed, which set out, among other things, the requirement to review and strengthen IAEA safety standards and improve their implementation by States. The IAEA has set up a Nuclear Safety Action Team to oversee the implementation of the Nuclear Safety Action Plan. In addition, Japan will host an international conference together with the IAEA in the later half of 2012 to follow up the latest situation of the Fukushima accident and to share with the international community the experience gained and lessons learnt. We will closely follow the development.

11. In conducting the review on DBCP, it is also important to look at how advanced countries are actually doing in enhancing nuclear safety and contingency planning, especially after the Fukushima accident. We are researching in this area and have arranged duty visits to the United States, Canada, the United Kingdom and France for the experts of Government departments to exchange views with overseas counterparts in emergency response organizations, nuclear plant regulators as well as plant operators to benefit from their experience. A visit to Japan has been scheduled later this year. Relevant information is at *Annex C*.

Intervention Levels

12. One of the important concepts in emergency preparedness and response is Intervention Levels, which basically are doses due to radiation at which countermeasures (such as evacuation, sheltering, iodine prophylaxis and control of food) should be taken to mitigate the potential adverse impact to public health and safety. Internationally, IAEA and the International Commission on Radiological Protection have developed and kept under review such Intervention Levels separately.

13. To assist in the review and updating of the DBCP, the Director of Health will seek the advice of RPAG (see paragraph 4 above) regarding any necessary updates of the Intervention Levels in the light of the prevailing

international standards and practices as well as the practices of advanced countries overseas.

Impacts and countermeasures

14. In the light of the progress made in the above review efforts, we will revisit possible impacts to Hong Kong in the event of a nuclear accident and consider enhancement of countermeasures as appropriate in local circumstances. These include plume countermeasures, boundary control measures, ingestion countermeasures, radiation monitoring and decontamination measures, arrangement for disposal of radiologically contaminated waste, as well as assessment of manpower, resources, equipment and training involved.

Possible application of the DBCP outside Daya Bay

15. The Fukushima accident demonstrates that a nuclear accident which occurred at a place outside Daya Bay might possibly affect Hong Kong to different extents, depending on its seriousness and the association with Hong Kong in terms of distance, supply of food, trade in goods, travel of persons, etc. Our review will also consider whether, and if so, how best the DBCP should be enhanced to cover such eventualities.

Public education

16. Public education is an integral part of our nuclear emergency preparedness and response. To tie in with the review exercise, we are pursuing various initiatives in promoting public education on radiation safety and enhancing awareness in protective measures to be taken in case of nuclear incidents, such as television and radio Announcements in Public Interests, pamphlets, booklets, posters, thematic website, etc.

Way Forward

17. Subject to progress, we plan to complete the review by the end of 2011 and then consult members of the Panel. A large-scale comprehensive inter-departmental exercise will be conducted early next year to test the preparedness and response capability of various departments.

18. We will assess the outcome of the exercise, refine the DBCP as necessary and set out the direction for carrying out future updates and exercises.

Security Bureau
November 2011

**Expert Advisory Panel on the
Review of the Daya Bay Contingency Plan
Membership**

Non-official members:

- | | |
|---------------------------|--|
| Mr CHAN Siu-hung | - Managing Director, Hong Kong Nuclear Investment Co. Ltd. |
| Dr Vincent HO | - Chairman, Hong Kong Association of Risk Management and Safety |
| Prof KWONG Lai-wan, Dora | - Clinical Professor / Head of Department, Department of Clinical Oncology, Li Ka Shing Faculty of Medicine, The University of Hong Kong
- Council Member, Hong Kong College of Radiologists |
| Prof. LAU Kai-hon, Alexis | - Director, Atmospheric Research Center, The Hong Kong University of Science and Technology Fok Ying Tung Graduate School
- Scientific Advisor of the Hong Kong Observatory |
| Prof. LEE Chack-fan | - Chair Professor of Geotechnical Engineering, The University of Hong Kong
- Vice Chairman, Nuclear Safety Consultative Committee of Guangdong Nuclear Power Station/Lingao Nuclear Power Station |
| Ir LEUNG Kwong-ho, Edmund | - Chairman, Energy Advisory Committee
- Past President of the Hong Kong Institution of Engineers |
| Ir Dr LUK Bing-lam | - Chairman of the Nuclear Division, Hong Kong Institution of Engineers |
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- Miss YUNG Pui-man, - Deputy Secretary for Security
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- Mr CHENG Kit-man - Senior Physicist in-charge, Radiation Health Unit,
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- Mr LEUNG Wing-mo - Assistant Director, Radiation Monitoring and
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Draft IAEA Action Plan on Nuclear Safety

In June 2011 a Ministerial Conference on Nuclear Safety was convened to direct, under the leading role of the IAEA, the process of learning and acting upon lessons following the accident at TEPCO's Fukushima Daiichi Nuclear Power Station in order to strengthen nuclear safety, emergency preparedness and radiation protection of people and the environment worldwide. At the conference a Ministerial Declaration was adopted which inter alia:

- "Requested the IAEA Director General to prepare a Report on the June 2011 IAEA Ministerial Conference on Nuclear Safety and a draft Action Plan, building on the Declaration of the Ministerial Conference and the conclusions and recommendations of the three Working Sessions, and the expertise and knowledge available therein, and to promote coordination and cooperation, as appropriate, with other relevant international organizations to follow up on the outcomes of the Conference, as well as facilitate consultations among Member States on the draft Action Plan";
- "Requested the IAEA Director General to present the Report and the draft Action Plan covering all the relevant aspects relating to nuclear safety, emergency preparedness and response, and radiation protection of people and the environment, as well as the relevant international legal framework, to the IAEA Board of Governors and the General Conference at their forthcoming meetings in 2011";
- "Called upon the IAEA Board of Governors and the General Conference to reflect the outcome of the Ministerial Conference in their decisions and to support the effective, prompt and adequately resourced implementation of the Action Plan".

In considering this Action Plan, it is important to note that:

- The responsibility for ensuring the application of the highest standards of nuclear safety and for providing a timely, transparent and adequate response to nuclear emergencies, including addressing vulnerabilities revealed by accidents, lies with each Member State and operating organization.
- The IAEA Safety Standards provide the basis for what constitutes a high level of safety for protecting people and the environment from harmful effects of ionizing radiation, and will continue to be objective, transparent and technologically neutral.
- Transparency in all aspects of nuclear safety through timely and continuous sharing and dissemination of objective information, including information on nuclear emergencies and their radiological consequences, is of particular importance to improve safety and to meet the high level of public expectation. Nuclear accidents may have transboundary effects; therefore it is important to provide adequate responses based on scientific knowledge and full transparency.
- As understanding of the accident develops, additional analysis of the root causes will be carried out. Further lessons may be learned and, as appropriate, be incorporated into the proposed actions by updating the Action Plan. The High Level Conference to be organized by Japan and the IAEA in 2012 will provide an opportunity for learning further lessons and for enhancing transparency.

- The Agency's prompt and effective implementation of activities under the Action Plan will be funded through prioritization and continuing efficient use of resources from the regular budget, and through voluntary contributions of extrabudgetary resources.

The purpose of the Action Plan is to define a programme of work to strengthen the global nuclear safety framework. The plan consists of actions building on the Ministerial Declaration, the conclusions and recommendations of the Working Sessions, and the experience and knowledge therein, including the INSAG letter report (GOVIN/2011/11), and the facilitation of consultations among Member States.

The success of this Action Plan in strengthening nuclear safety is dependent on its implementation through the full cooperation and participation of Member States and will require also the involvement of many other stakeholders¹. They are therefore encouraged to work cooperatively to implement the Action Plan to maximize the benefit of the lessons learned from the accident and to produce concrete results as soon as possible. Progress on the implementation of the Action Plan will be reported to the September 2012 meeting of the Board of Governors and the 2012 General Conference and subsequently on an annual basis as may be necessary. In addition, the extraordinary meeting of the Contracting Parties to the Convention on Nuclear Safety (CNS) in 2012 will provide an opportunity to consider further measures to strengthen nuclear safety.

Strengthening nuclear safety in light of the accident is addressed through a number of measures proposed in this Action Plan including 12 main actions, each with corresponding sub-actions, focusing on: safety assessments in the light of the accident at TEPCO's Fukushima Daiichi Nuclear Power Station; IAEA peer reviews; emergency preparedness and response; national regulatory bodies; operating organizations; IAEA Safety Standards; international legal framework; Member States planning to embark on a nuclear power programme; capacity building; protection of people and the environment from ionizing radiation; communication and information dissemination; and research and development.

Safety assessments in the light of the accident at TEPCO's Fukushima Daiichi Nuclear Power Station

Undertake assessment of the safety vulnerabilities of nuclear power plants in the light of lessons learned to date from the accident

- Member States to promptly undertake a national assessment of the design of nuclear power plants against site specific extreme natural hazards and to implement the necessary corrective actions in a timely manner.
- The IAEA Secretariat, taking into account existing experiences, to develop a methodology and make it available for Member States that may wish to use it in carrying out their national assessments.
- The IAEA Secretariat, upon request, to provide assistance and support to Member States in the implementation of a national assessment of the design of nuclear power plants against site specific extreme natural hazards.
- The IAEA Secretariat, upon request, to undertake peer reviews of national assessments and to provide additional support to Member States.

¹ Stakeholders include, amongst others, governments, relevant international organizations and associations, regulatory bodies, operating organizations, nuclear industry, radioactive waste management organizations, technical support and safety organizations, research organizations, education and training institutions and other relevant bodies.

IAEA peer reviews

Strengthen IAEA peer reviews in order to maximize the benefits to Member States

- The IAEA Secretariat to strengthen existing IAEA peer reviews by incorporating lessons learned and by ensuring that these reviews appropriately address regulatory effectiveness, operational safety, design safety, and emergency preparedness and response; Member States to provide experts for peer review missions.
- The IAEA Secretariat, in order to enhance transparency, to provide summary information on where and when IAEA peer reviews have taken place, and to make publicly available in a timely manner the results of such reviews with the consent of the State concerned.
- Member States to be strongly encouraged to voluntarily host IAEA peer reviews, including follow-up reviews, on a regular basis; the IAEA Secretariat to respond in a timely manner to requests for such reviews.
- The IAEA Secretariat to assess, and enhance as necessary, the effectiveness of the IAEA peer reviews.

Emergency preparedness and response

Strengthen emergency preparedness and response

- Member States to conduct a prompt national review and thereafter regular reviews of their emergency preparedness and response arrangements and capabilities, with the IAEA Secretariat providing support and assistance through Emergency Preparedness Review (EPREV) missions, as requested.
- The IAEA Secretariat, Member States and relevant international organizations to review and strengthen the international emergency preparedness and response framework, taking into account recommendations given in the final report of the International Action Plan for Strengthening the International Preparedness and Response System for Nuclear and Radiological Emergencies, and encouraging greater involvement of the relevant international organizations in the Joint Radiation Emergency Management Plan of the International Organizations.
- The IAEA Secretariat, Member States and relevant international organizations to strengthen the assistance mechanisms to ensure that necessary assistance is made available promptly. Consideration to be given to enhancing and fully utilizing the IAEA Response and Assistance Network (RANET), including expanding its rapid response capabilities.
- Member States to consider, on a voluntary basis, establishing national rapid response teams that could also be made available internationally through RANET.
- The IAEA Secretariat, in case of a nuclear emergency and with the consent of the State concerned, to conduct timely fact-finding missions and to make the results publicly available.

National regulatory bodies

Strengthen the effectiveness of national regulatory bodies

- Member States to conduct a prompt national review and thereafter regular reviews of their regulatory bodies, including an assessment of their effective independence, adequacy of human and financial resources and the need for appropriate technical and scientific support, to fulfil their responsibilities.
- The IAEA Secretariat to enhance the Integrated Regulatory Review Service (IRRS) for peer review of regulatory effectiveness through a more comprehensive assessment of national regulations against IAEA Safety Standards.
- Each Member State with nuclear power plants to voluntarily host, on a regular basis, an IAEA

IRRS mission to assess its national regulatory framework. In addition, a follow-up mission to be conducted within three years of the main IRRS mission.

Operating organizations

Strengthen the effectiveness of operating organizations with respect to nuclear safety

- Member States to ensure improvement, as necessary, of management systems, safety culture, human resources management, and scientific and technical capacity in operating organizations; the IAEA Secretariat to provide assistance to Member States upon request.
- Each Member State with nuclear power plants to voluntarily host at least one IAEA Operational Safety Review Team (OSART) mission during the coming three years, with the initial focus on older nuclear power plants. Thereafter, OSART missions to be voluntarily hosted on a regular basis.
- The IAEA Secretariat to strengthen cooperation with WANO by amending their Memorandum of Understanding to enhance information exchange on operating experience and on other relevant safety and engineering areas and, in consultation with other relevant stakeholders, to explore mechanisms to enhance communication and interaction among operating organizations.

IAEA Safety Standards

Review and strengthen IAEA Safety Standards and improve their implementation

- The Commission on Safety Standards and the IAEA Secretariat to review, and revise as necessary using the existing process in a more efficient manner, the relevant IAEA Safety Standards² in a prioritised sequence.
- Member States to utilize as broadly and effectively as possible the IAEA Safety Standards in an open, timely and transparent manner. The IAEA Secretariat to continue providing support and assistance in the implementation of IAEA Safety Standards.

International legal framework

Improve the effectiveness of the international legal framework

- States parties to explore mechanisms to enhance the effective implementation of the Convention on Nuclear Safety, the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management, the Convention on the Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, and to consider proposals made to amend the Convention on Nuclear Safety and the Convention on the Early Notification of a Nuclear Accident.
- Member States to be encouraged to join and effectively implement these Conventions.
- Member States to work towards establishing a global nuclear liability regime that addresses the concerns of all States that might be affected by a nuclear accident with a view to providing appropriate compensation for nuclear damage. The IAEA International Expert Group on Nuclear Liability (INLEX) to recommend actions to facilitate achievement of such a global regime. Member States to give due consideration to the possibility of joining the international nuclear liability instruments as a step toward achieving such a global regime.

² This review could include, inter alia, regulatory structure, emergency preparedness and response, nuclear safety and engineering (site selection and evaluation, assessment of extreme natural hazards including their combined effects, management of severe accidents, station blackout, loss of heat sink, accumulation of explosive gases, nuclear fuel behaviour and ways to ensure the safety of spent fuel storage).

Member States planning to embark on a nuclear power programme

Facilitate the development of the infrastructure necessary for Member States embarking on a nuclear power programme

- Member States to create an appropriate nuclear infrastructure based on IAEA Safety Standards and other relevant guidance, and the IAEA Secretariat to provide assistance as may be requested.
- Member States to voluntarily host Integrated Nuclear Infrastructure Reviews (INIR) and relevant peer review missions, including site and design safety reviews, prior to commissioning the first nuclear power plant.

Capacity Building

Strengthen and maintain capacity building

- Member States with nuclear power programmes and those planning to embark on such a programme to strengthen, develop, maintain and implement their capacity building programs, including education, training and exercises at the national, regional and international levels; to continuously ensure sufficient and competent human resources necessary to assume their responsibility for safe, responsible and sustainable use of nuclear technologies; the IAEA Secretariat to assist as requested. Such programmes to cover all the nuclear safety related areas, including safe operation, emergency preparedness and response and regulatory effectiveness and to build upon existing capacity building infrastructures.
- Member States with nuclear power programmes and those planning to embark on such a programme, to incorporate lessons learned from the accident into their nuclear power programme infrastructure; the IAEA Secretariat to assist as requested.

Protection of people and the environment from ionizing radiation

Ensure the on-going protection of people and the environment from ionizing radiation following a nuclear emergency

- Member States, the IAEA Secretariat and other relevant stakeholders to facilitate the use of available information, expertise and techniques for monitoring, decontamination and remediation both on and off nuclear sites and the IAEA Secretariat to consider strategies and programmes to improve knowledge and strengthen capabilities in these areas.
- Member States, the IAEA Secretariat and other relevant stakeholders to facilitate the use of available information, expertise and techniques regarding the removal of damaged nuclear fuel and the management and disposal of radioactive waste resulting from a nuclear emergency.
- Member States, the IAEA Secretariat and other relevant stakeholders to share information regarding the assessment of radiation doses and any associated impacts on people and the environment.

Communication and information dissemination

Enhance transparency and effectiveness of communication and improve dissemination of information

- Member States, with the assistance of the IAEA Secretariat, to strengthen the emergency notification system, and reporting and information sharing arrangements and capabilities.
- Member States, with the assistance of the IAEA Secretariat, to enhance the transparency and effectiveness of communication among operators, regulators and various international

organizations, and strengthen the IAEA's coordinating role in this regard, underlining that the freest possible flow and wide dissemination of safety related technical and technological information enhances nuclear safety.

- 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 to organize international experts meetings to analyse all relevant technical aspects and learn the lessons from the Fukushima Daiichi nuclear power station accident.
- The IAEA Secretariat to facilitate and to continue sharing with Member States a fully transparent assessment of the accident at TEPCO's Fukushima Daiichi Nuclear Power Station, in cooperation with Japan.
- The IAEA Secretariat and Member States, in consultation with the OECD/NEA and the IAEA International Nuclear and Radiological Event Scale (INES) Advisory Committee to review the application of the INES scale as a communication tool.

Research and development

Effectively utilize research and development

- Relevant stakeholders, with assistance provided by the IAEA Secretariat as appropriate, to conduct necessary research and development in nuclear safety, technology and engineering³, including that related to existing and new design-specific aspects.
- Relevant stakeholders and the IAEA Secretariat to utilize the results of research and development and to share them, as appropriate, to the benefit of all Member States.

³ For example, extreme natural hazards, management of severe accidents, station blackout, loss of heat sink, feed and bleed system, containment venting system, structural integrity of containment building and spent fuel pool structure and behaviour of fuel assembly, and post-accident monitoring system under extreme harsh environment

International standards and practices

International standards

Concepts and basic principles on nuclear safety and emergency planning are enshrined in standards developed by the International Atomic Energy Agency (IAEA) and other international organizations. The objective is to mitigate the adverse effect of ionizing radiation and to protect human and the environment. These standards are kept under review by IAEA in collaboration with other international organizations, taking into account the practices of many countries.

Emergency Planning Zones

2. Regarding emergency preparedness and response, the central concept is the establishment of Emergency Planning Zones (EPZs) as defined areas around a nuclear facility for which detailed planning and preparations are made in advance to ensure that appropriate countermeasures can be applied in a timely and predetermined manner to protect the general public in the event of a nuclear accident.
3. IAEA safety standards provides for **three off-site emergency zones**: the Precautionary Action Zone (PAZ), the Urgent Protective Action Planning Zone (UPZ), and the Longer Term Protective Action Zone (LPZ). The sizes of these zones are given within a range of suggested radii.
4. The **PAZ** (with a radius of 3-5km) is the area within which arrangement should be made to implement precautionary urgent protective actions before or shortly after a major release with the aim of preventing or reducing the occurrence of severe “deterministic effect”. “Deterministic effect” refers to early death for the vast majority of major emergencies postulated for these facilities.
5. The **UPZ** (with a radius of 5-30km) is the area where preparations are made to promptly to perform environmental monitoring, to shelter in place and to implement urgent protective action within a few hours following a release. Plans and capabilities should be developed to implement sheltering, evacuation or to distribute thyroid blocking agents, etc (if appropriate).

6. The LPZ (with a radius of 50-100 km) is the area where preparations for effective implementation of protective actions to prevent the occurrence of “deterministic effect” and to reduce the risk of “stochastic effects” (e.g. cancer) from ingestion of locally grown food contaminated with radioactive deposition should be developed in advance.

7. According to the IAEA, site or facility specific analysis (e.g. power output of the nuclear reactors) could be used to determine the appropriate radii for the zones. In view of the great uncertainties involved, the application of the suggested radii by IAEA could be adjusted according to the local situations and needs (with variation up to a factor of about two). The choice of the suggested radii represents a judgment of the distance to which making advanced arrangements is reasonable in order to ensure effective response. In a particular emergency, protective actions may be warranted only in a small part of the zones. For the worst possible emergencies, protective actions might need to be taken beyond the radii suggested.

8. As we understand, most countries have introduced the EPZ concept in their nuclear contingency planning and adopted different sizes of the EPZs in practice.

9. *Appendix* provides a comparison between the IAEA safety standards and the actual practices in selected places (including the DBCP).

Practices

(A) *United Kingdom (UK)*

General Framework

10. The Department of Energy and Climate Change¹ (DECC), as the lead government department on arrangements for response to any emergency with off-site consequences from a civil nuclear site in England and Wales, co-ordinates emergency preparedness policy at national level. DECC chairs the Nuclear Emergency Planning Liaison Group² (NEPLG) which brings together organisations involved in off-site nuclear emergency planning, including nuclear

¹www.decc.gov.uk

²www.decc.gov.uk/en/content/cms/meeting_energy/nuclear/safety_and_sec/emergency_plan/neplg/neplg.aspx

operators, police, fire service, local authority emergency planning officers and Government departments and agencies which would be involved in the response to an emergency. NEPLG has formulated the “NELPG Consolidated Guidance”³ for related organizations to develop their nuclear emergency plans.

11. The Office for Nuclear Regulation⁴ (ONR), an agency of the Health and Safety Executive (HSE), is responsible for the regulation of the nuclear sector of the UK. It licenses nuclear installations and sets licensing conditions to protect the workforce, the public and the environment. In a nuclear emergency, it will monitor the accident, provide technical advice to the government, and conduct accident investigation.

12. Local authorities are responsible for the off-site emergency preparedness and response of their nuclear facilities. They are required to prepare, review, revise, test and implement an ‘Off-site Plan’. The purpose of the “Off-site Plan” is to bring together the emergency arrangements of all the off-site agencies who are involved in the response to a nuclear emergency.

Emergency Preparedness and Response

13. For each nuclear site, ONR will determine a “Detailed Emergency Planning Zone” (DEPZ), for which the local authorities are required to draw up emergency plans containing detailed arrangements for dealing with “reasonably foreseeable radiation emergencies” (i.e. the design basis accident or reference accident). The radius of the DEPZ normally ranges from 1 - 3 km depending on the site specific analysis. Within the DEPZ, the arrangements to protect the public would be planned in detail. However, it is also recognized that radiation emergencies could occur that would have consequences beyond the DEPZ. The nature of the response required is more difficult to predict and depends on a number of factors such as the characteristics of the release that has occurred and the prevailing weather conditions. To deal with this, there is a requirement that emergency plans should incorporate arrangements for extendibility beyond the DEPZ. The extendibility scenario requires the consideration of sheltering and the taking of stable iodine tablets out to approximately 15 km, and evacuation out to 4 km.

³www.decc.gov.uk/en/content/cms/meeting_energy/nuclear/safety_and_sec/emergency_plan/neplg/guidance/guidance.aspx

⁴www.hse.gov.uk/nuclear/index.htm

14. For example, Sizewell B Nuclear Power Station is situated in the Suffolk County in East England, about 30 km from Ipswich. It operates one Pressurised Water Reactor with 1180 MWe electricity output, meeting the general daily need of the Suffolk and Northfolk County. Suffolk Resilience⁵ is responsible for planning the multi-agency response (such as the emergency services, the National Health Service, local councils, etc) to major emergencies. It has drawn up a specific multi-agency plan⁶ to deal with a nuclear emergency at Sizewell. The size of the DEPZ was set at 2.4 km from the plant, based on the worst foreseeable design-basis failure (or 'reference accident') for the Sizewell A station which was shut down in 2006. Even though the reference accident for Sizewell B in current operation is smaller in impact than that which existed for Sizewell A before its shutdown, the same DEPZ as used for Sizewell A (i.e. 2.4 km) remains in place for practical reasons. The extendibility scenario has been adopted.

Public Education and Communications

15. Public authorities such as ONR, Health Protection Agency, local governments etc and plant operators engage the public in education and communications according to their own mandates through various means, including websites, magazines, newsletters, annual reports, pamphlets, booklets, videos etc.

16. For example, regarding Sizewell B Nuclear Power Station in the Suffolk County, the local authorities and the plant operator⁷ provide information to the public to prepare for any off-site nuclear emergency. The Suffolk Joint Emergency Planning Unit (a member of the Suffolk Resilience) distributes an annually updated 'emergency arrangements' pack in the form of a calendar and associated information⁸. The County Council sends a letter of advice to all Head Teachers of schools within the 4 km radius of the nuclear power station detailing the actions to be taken in the event of an off-site nuclear emergency. Emergency information signs have been placed at the approaches to Sizewell Beach car park, which is the focal point for walkers and holidaymakers.

⁵www.suffolkresilience.com

⁶www.suffolkresilience.com/docs/pdf/2011%20Sizewell%20Off%20Site%20Plan%20%20Issue.pdf

⁷www.british-energy.co.uk

⁸www.suffolkresilience.com/docs/pdf/2011_Sizewell_calendar_content.pdf

Response to Fukushima Accident

17. Following a request by the European Council, every nuclear power generating country in Europe agreed in May 2011 to apply Stress Tests on their nuclear power plants. In the UK, the tests, carried out by operators, involve targeted reassessment of each station's safety margins in the light of extreme natural events. ONR will then independently review the results of the tests. ONR requests the operators to provide comprehensive reports as input to the main UK national report due by the end of 2011.

18. In response to a request by the Secretary of State for Energy and Climate Change, the Chief Inspector of Nuclear Installations and Executive Head of ONR carried out a study into the Japanese Fukushima nuclear accident and the implications for the UK nuclear industry. The Final Report⁹ published on 11 October 2011 concluded that the UK nuclear facilities have no fundamental safety weaknesses, and recommended Government, industry and regulators to review 38 areas for improvement. Among other things, NEPLG should instigate a review of the UK's national nuclear emergency arrangements in the light of the experience of dealing with the prolonged Japanese event. This information should include the practicability and effectiveness of the arrangements for extending countermeasures beyond the Detailed Emergency Planning Zone in the event of more serious accidents. The review on nuclear emergency arrangements is currently underway and a report will be published in 2012 on progress in implementing the recommendations.

(B) *France*

General Framework

19. Nuclear Safety Authority¹⁰ (Autorite de Surete Nucleaire, ASN) is an independent French administrative authority which, on behalf of the State, regulates nuclear safety and radiation protection, in order to protect the public and the environment from the risks involved in nuclear activities. It is also responsible for informing the public about the relevant information. In the event of an emergency, ASN assists the Government by giving the competent authorities recommendations concerning the medical, health or civil protection measures.

⁹www.hse.gov.uk/nuclear/fukushima/final-report.pdf

¹⁰www.asn.fr/

20. The Institute for Radiation-Protection and Nuclear Safety¹¹ (Institut de Radio-Protection et de Sûreté Nucléaire, IRSN) is a Technical Safety Organisation which undertakes studies and research on protection and nuclear safety issues. It is the national public expert in nuclear and radiological risks, in support of the French public authorities, working with international partners and also providing services to overseas countries.

21. In the Prefecture in which a nuclear plant is situated, the Prefect as representative of the State is responsible for preparing and implementing the off-site emergency plans for nuclear accidents. With the support of the local and national public authorities (including ASN and IRSN), the Prefect would notify local residents, officials and media of any nuclear events and coordinate emergency measures and resources to protect the safety of the population.

22. At national level, the relevant ministries (Interior, Health, Defence, Environment etc) will take part in nuclear emergency management and assist the Prefect in actions.

Emergency Preparedness and Response

23. EPZs are defined for preplanning the protection measures to be implemented in the short term of an accident, i.e. sheltering, evacuation and iodine prophylaxis. Sheltering and intake of stable iodine will be implemented in the 10 km radius, while evacuation will be carried out in the 5 km radius. Protective actions may be extended beyond 10 km if conditions warrant. The French authorities also distribute in advance iodine tablets to the population within the radius of 10 km around a nuclear power plant.

24. For example, Bugey Nuclear Power Plant has four Pressurised Water Reactors generating a total electricity output of about 3600 MWe. It meets 40% electricity demand of the Rhône-Alpes region. Prefecture de l'Ain¹², where the nuclear power plant is located, has formulated an off-site emergency plan to handle a nuclear accident. The city of Lyon, second largest in France and some 35km away, is situated in the adjacent Préfecture du Rhône which does not have its own off-site emergency plan as such. In the case of a serious nuclear accident with implications beyond Prefecture de l'Ain, the handling will be escalated to the regional level as a matter of civil emergency with full support from the

¹¹www.irsn.fr/FR/Pages/Home.aspx

¹²www.ain.pref.gouv.fr

national government.

Public Education and Communications

25. ASN, IRSN and plant operators engage the public in education and communications according to their own mandates through various means, including websites, magazines, newsletters, annual reports, pamphlets, booklets, videos etc.

26. Informing the public about nuclear safety and radiation protection is one of ASN's fundamental duties. At its headquarters in Paris, it runs a Centre of Public Information and Documentation. IRSN provides a host of technical information through internet, including radiation monitoring data.

27. Nuclear plant operators play a notable role in educating the public on nuclear and radiation safety. At Bugey Nuclear Power Plant near Lyon, the operator runs a public education centre on site.

Response to Fukushima Accident

28. In response to the request from the European Council, France is carrying out stress tests on its nuclear power stations. Furthermore, France is also conducting a Complementary Safety Assessment on all its nuclear installations regarding situations similar to the Fukushima nuclear accident, plant safety and severe accident management capabilities. The two processes are expected to complete by end 2011.

29. Regarding emergency preparedness and response, it is understood that a review, which would cover the EPZ arrangements, would be launched. But the details and time frame are not known yet.

30. France is also playing a leading role in the work of the Heads of European Radiological Protection Competent Authorities¹³ which seeks to contribute to a high level of radiological protection throughout Europe. In June 2011, it approved a document on emergency preparedness entitled "Practical Guidance – Practicability of Early Protective Actions"¹⁴. More work on

¹³ www.herca.org

¹⁴ www.herca.org/documents/Practical%20Guidance%20-Practicability%20of%20Early%20Protective%20Actions_20110630.pdf

harmonisation is going on.

(C) *United States (US)*

General Framework

31. The US Nuclear Regulatory Commission (USNRC) is the principal regulator to implement federal policies on nuclear safety, public health, environmental protection and issue/renewal of nuclear power plant licenses¹⁵. The USNRC inspect the nuclear power facilities regularly to ensure that they are adequately prepared to cope with nuclear emergencies including those caused by natural disasters such as earthquakes and floods. It also carries out extensive research on nuclear safety and emergency preparedness and hosts information on its website. During an emergency, it will also provide technical advice and answer public enquiries.

32. The Federal Emergency Management Agency (FEMA) is responsible for the comprehensive planning and responses to nuclear emergencies at national level¹⁶. In case of a nuclear emergency, the FEMA will work with the US Environmental Protection Agency¹⁷ (EPA) and State/local Offices of Emergency Management (OEMs) to advise on the appropriate protective actions based on the monitoring and projected data. OEMs plan and prepare for emergencies, educate the public about preparedness, coordinate emergency response and recovery, and collect and disseminate emergency information.

Emergency Preparedness and Response

33. The US adopts a “plume exposure pathway EPZ”, with a radius of 10 miles (16 km), which is aimed at minimizing radiation absorption and providing primary protection against inhalation of airborne radioactive materials, and an “ingestion pathway EPZ” with a radius of 50 miles (80 km) for implementation of ingestion countermeasures. An USNRC document NUREG-0396¹⁸, “Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants”, establishes the concept and basis for the 10-mile and 50-mile

¹⁵www.nrc.gov

¹⁶www.fema.gov and www.fema.gov/about/divisions/thd_repp.shtm#0.

¹⁷www.epa.gov and www.epa.gov/radiation/docs/er/400-r-92-001.pdf

¹⁸www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0396/

EPZs. Another USNRC document NUREG-0654¹⁹, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants", states that "...detailed planning within 10 miles would provide a substantial base for expansion of response efforts in the event that this proved necessary." Thus, depending on wind changes or other meteorological conditions, areas outside such perimeters could be included in the protective action recommendation.

34. For example, in New York State, Entergy Nuclear Operations²⁰ (ENO) operates the Indian Point Nuclear Power Plant with two Pressurised Water Reactors generating a total power of about 2000 MWe, supplying 12-35% electricity of New York City (NYC).

35. ENO and the State Office of Emergency Management (SOEM)²¹ of the New York State (of the Division of Homeland Security and Emergency Services) have respectively prepared detailed on-site²² and off-site²³ emergency plans according to the Federal requirements. The population in the 10 miles (16 km) and 50 miles (80 km) EPZs of the nuclear power plant is about 310,000 and 17 million respectively. The plume EPZ of the station can be extended beyond 10 miles (16km) in case emergency condition warrants.

36. NYC is outside the 10 mile (16 km) plume EPZ for evacuation. The Indian Point Nuclear Power Plant is about 25 miles (40 km) from the northern part of Bronx - the northernmost of the five boroughs of NYC, about 30-40 miles (48-64 km) from Manhattan. NYC is covered by the New York State off-site emergency plan (paragraph above), and does not have another nuclear emergency plan on its own. In case of a nuclear accident affecting the city, the New York City Office of Emergency Management²⁴ will be notified by New York State partners to prepare for a response. For example foodstuff from the north might be controlled and water supply might be diverted.

Public Education and Communications

37. Public authorities such as USNRC, EPA and OEMs, and plant operators engage the public in education and communications according to their

¹⁹ www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0654/

²⁰ www.entergy-nuclear.com

²¹ www.dhSES.ny.gov

²² pbadupws.nrc.gov/docs/ML1114/ML11140A147.pdf

²³ www.dhSES.ny.gov/oem/radiological/

²⁴ www.nyc.gov

own mandates through various means, including websites, magazines, newsletters, annual reports, pamphlets, booklets, videos etc.

38. For example, in NYC, its OEM is making every effort to push public information programmes on awareness of emergency preparedness, e.g. through NY-Alert website²⁵ and propaganda pamphlets, generally and on various emergencies. New York citizens are more aware of emergencies they experienced or closer to homes, such as terrorist attacks, power outage (as happened in northeast US in 2003) and hurricanes (e.g. Katrina and Irene). The public is generally educated on emergency readiness. A register for emergency notification is available to the public.

39. In collaboration with the local governments of the four counties within the plume EPZ, ENO has issued emergency guides on nuclear accidents to the population covered. These guides provide basic knowledge and necessary information in the event of a nuclear emergency, for instance, the response actions required, the locations of the school reception centres, etc.

40. ENO has established the Emergency Preparedness Independent Expert Task Force to gather independent views, assistance and advice for nuclear emergency preparedness.

Responses to Fukushima Accident

41. A near-term task force of USNRC experts has been established to review the USNRC processes and regulations to determine if additional measures needed to be taken immediately to ensure the safety of nuclear power plants in the United States. Its report²⁶ issued in July 2011 concluded that there was no imminent risk from continued operation and licensing activities, and made a dozen of recommendations to pursue enhancements to safety and emergency preparedness. Among other things, USNRC should, as part of the longer term review, pursue additional emergency preparedness topics related to multiunit events, prolonged station blackout, decision making, radiation monitoring, and public education. After receipt of the report, USNRC is currently considering both short-term and longer-term actions to ensure nuclear plant safety in the US. No sign about any substantial revisions to the size of EPZs is detected to date.

²⁵ www.nyalert.gov/

²⁶ pbadupws.nrc.gov/docs/ML1118/ML111861807.pdf

42. In recent years, USNRC has been undertaking The State-of-the-Art Reactor Consequence Analyses project²⁷ to incorporate the results of more than 25 years of research to analyze the realistic outcomes of postulated severe reactor accidents. It remains to be seen how the Fukushima accident might affect this project which is nearly finished and undergoing peer review.

(D) Canada

General Framework

43. The Canadian Nuclear Safety Commission²⁸ (CNSC) is responsible for regulating and enforcing safety standards at domestic nuclear facilities, and administering the country's safeguards agreement.

44. The federal government is responsible for formulating the Federal Nuclear Emergency Plan (FNEP)²⁹. Health Canada³⁰ is the lead department responsible for coordinating the nuclear emergency response of more than 14 federal departments and 6 federal agencies.

45. Provinces are responsible for public safety and emergency response, and they handle nuclear emergencies with federal support.

Emergency Preparedness and Response

46. In Ontario for example, the Ministry of Community Safety and Correctional Services is responsible for the implementation of the Provincial Nuclear Emergency Response Plan³¹ (PNERP) of Ontario. PNREP divides the area around the boundary of a nuclear installation into three zones: a Contiguous Zone of 3km radius for priority evacuation, a Primary Zone of 10 km radius for detailed planning and preparedness for measures against exposure to a radioactive plume, and a Secondary Zone of 50 km radius for planning and preparation to prevent ingestion of radioactive material.

47. Accordingly, Emergency Management Ontario³² (EMO) manages off-site effect of a nuclear accident with the authority to declare and terminate nuclear emergency in Ontario. In the case of the two nuclear power stations in Pickering and Darlington (which are some 32km and 56km from Toronto), EMO also works with the local Region of Durham which has its own Durham Region

²⁷ www.nrc.gov/about-nrc/regulatory/research/soar/overview.html

²⁸ nuclearsafety.gc.ca/eng/

²⁹ nuclearsafety.gc.ca/eng/pdfs/ep-e.pdf

³⁰ www.hc-sc.gc.ca/hc-ps/ed-ud/fedplan/index-eng.php

³¹ www.emergencymanagementontario.ca/english/residents/response/plans.html

³² www.emergencymanagementontario.ca/english/home.html

Master Plan³³ and Nuclear Emergency Response Plan. The two nuclear power stations have in total 10 Heavy Water Reactors, generating total electricity output of some 6600 MWe, which meets about 30% of electricity demand of Ontario.

48. The two plants' operator Ontario Power Generation³⁴ (OPG) has comprehensive plans in place. During nuclear emergencies, OPG will provide off-site emergency support, by maintaining a supply of potassium iodide tablets in the 10km Primary Zone, and providing equipment and staff to support the municipal work on decontamination.

Public Education and Communications

49. In Ontario, regional and local municipalities promote radiation safety and emergency preparedness through various means, such as brochures, webpages, iodide pill availability advertising, community events, presentations to local groups and media invitation to exercises.

50. OPG has expanded efforts to educate the public about nuclear power generation and the related safety. At each of the two nuclear power stations in Pickering and Darlington, it runs an education centre. It provides regular information on plant performance and an annual report on environmental performance for the public.

Responses to Fukushima Accident

51. CNSC has issued orders to all major nuclear facilities to review the lessons learnt, to re-examine the safety measures and to report and action as necessary. It initiated an Integrated Regulatory Review Service³⁵ under the auspices of the International Atomic Energy Agency to review and follow up on the assessment of Canada's response to the Fukushima accident. An External Advisory Committee was set up to assess CNSC's processes and responses, and will report on its findings in 2012.

52. Ontario is conducting a review of its PNERP. It is estimated that the result will be available in 2012. At federal level, FNEP is also now under review. Timetable is yet to be known.

³³<http://www.durham.ca/departments/demo/emmerplan.pdf>

³⁴www.opg.com/index.asp

³⁵www-ns.iaea.org/reviews/rs-reviews.asp

Size of the Emergency Planning Zones

IAEA/ places \ Zone (radius)	Precautionary Action Zone (PAZ) or equivalent (km)	Urgent Protective Action Zone (UPZ) or equivalent (km)	Longer Term Protective Action Zone (LPZ) or equivalent (km)
IAEA	3 - 5	5 - 30	50 - 100
Mainland China	3 - 5	7 - 10	30 - 50
Hong Kong (DBCP)	not applicable	20	85 (whole of HK)
USA	16		80
Canada (Ontario)	3	10 ¹	50 ¹
UK	1 - 3 (extensible to 15) ²		50
France	5	10	uncertain
Belgium	10 (evacuation/sheltering) 20 (iodine prophylaxis)		whole country
The Netherlands	5 (evacuation)	10 (iodine prophylaxis) 20 (sheltering)	uncertain
Finland	5 (fast actions/ iodine prophylaxis)	20	uncertain
Switzerland	3-5	20	uncertain
Hungary	3	30	80
Czech Republic	5 - 10	13 - 20	uncertain
Japan	uncertain	8 - 10	uncertain
South Africa	5	16	uncertain

1. The Ontario Provincial has set a UPZ of 23 km and an LPZ of 80 km for the Fermi 2 Nuclear Power Generating Station which is located across the border in the in US territories.
2. UK Nuclear Emergency Planning Liaison Group may base on the scenario and apply the "extendibility principle" to extend the Detailed Emergency Planning Zone to 15 km.