Response to the Nuclear Emergency at TEPCO's Fukushima Nuclear Power Stations

Nuclear Emergency Response Headquarters
Government of Japan

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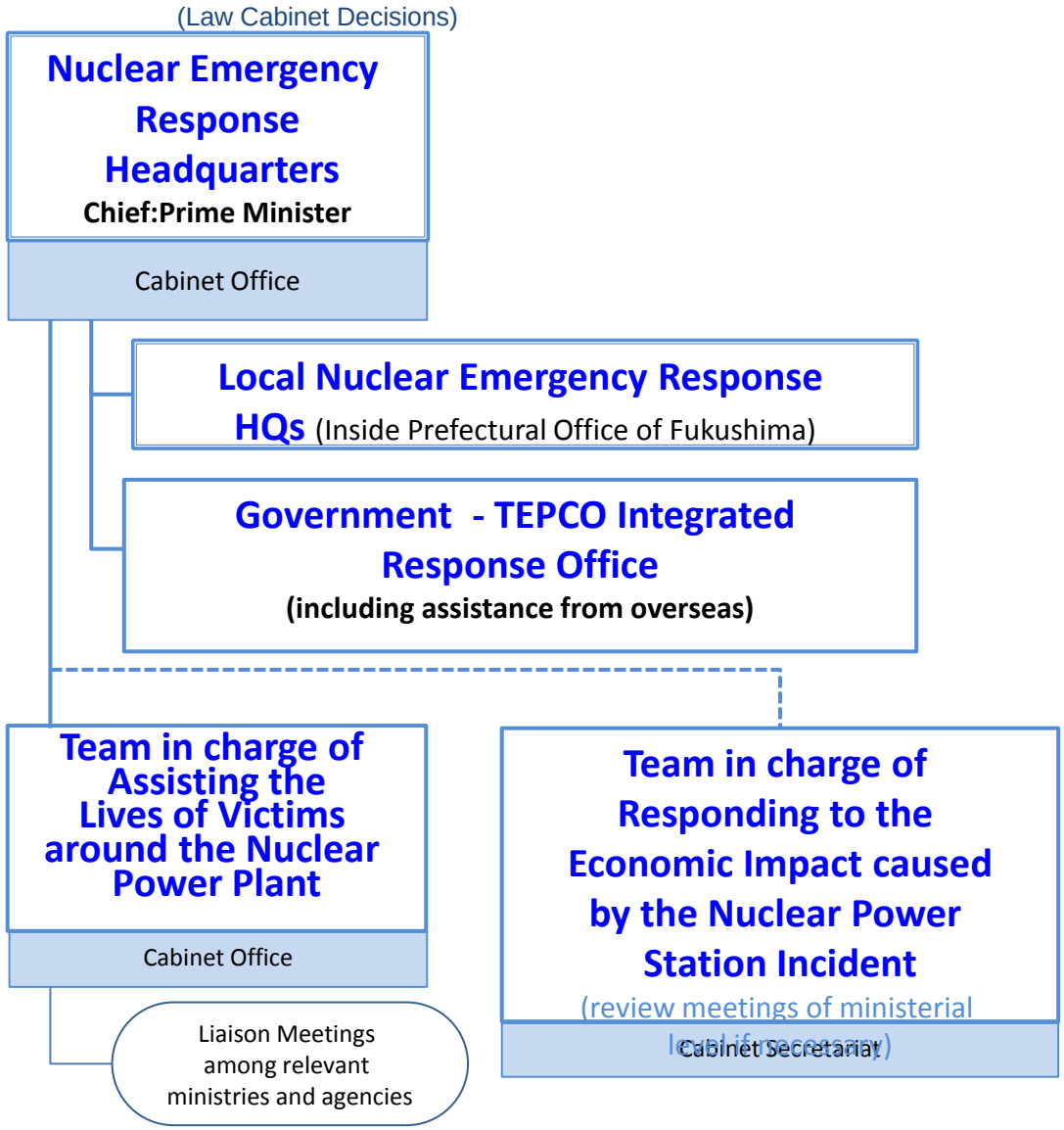
1. Measures for Protected Areas

Organization for response to the nuclear emergency

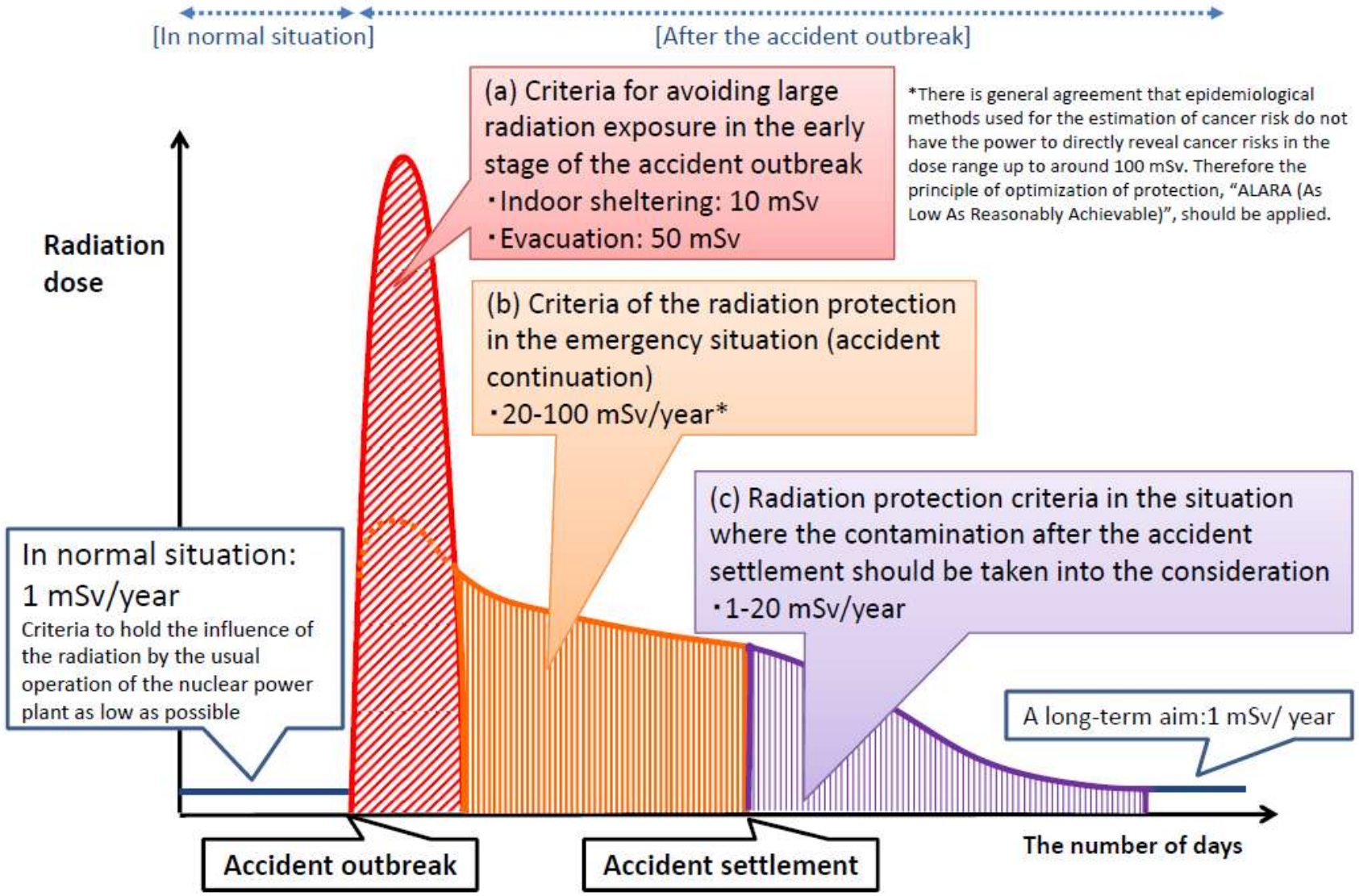


Authority of the radiation dose standard

Standard for the radiation dose	Authority
(1) Integrated radiation dose in the normal situation. • Public radiation exposure dose limit. 1 mSv/year	• Notice of Ministry of Economy, Trade and Industry • "Public notices which provide the dose limit based on the provisions of the rules about establishment operation etc. • Of the practical use nuclear reactors for electricity generation" Article 3:radiation dose out of the peripheral surveillance area. • ICRP recommendation Publication 60 (1990):Dose limit of the public radiation exposure.
(2) Integrated dose at the time of the accident	
(a) Standard for avoiding large radiation exposure in the early stage of the accident outbreak 10mSv (indoor sheltering) 50mSv (evacuation)	• The guidance of the Nuclear Safety Commission • "About the disaster prevention measures such as nuclear energy facilities" • IAEA safety requirements GS-R-2 "Preparedness and Response for a Nuclear or Radiological Emergency" (2002)
(b) Standard of the radiation Protection in the emergency situation(accident continuation) 20-100 mSv	• ICRP recommendation Publication 103 (2007) • IAEA safety requirements GSG2 "Preparedness and Response for a Nuclear or Radiological Emergency" (2011)
(C) The radiation protection Standard in the situation where the pollution after the accident has come to a settlement should be taken into the consideration 1-20 mSv/year	• ICRP recommendation Publication 103 (2007) • Reference level for protecting the public in the situation where the pollution after the accident has come to a settlement should be taken into the consideration (existing situation)

ICRP: International Commission on Radiological Protection

The idea of the criteria of the radiation dose for the radiation protection



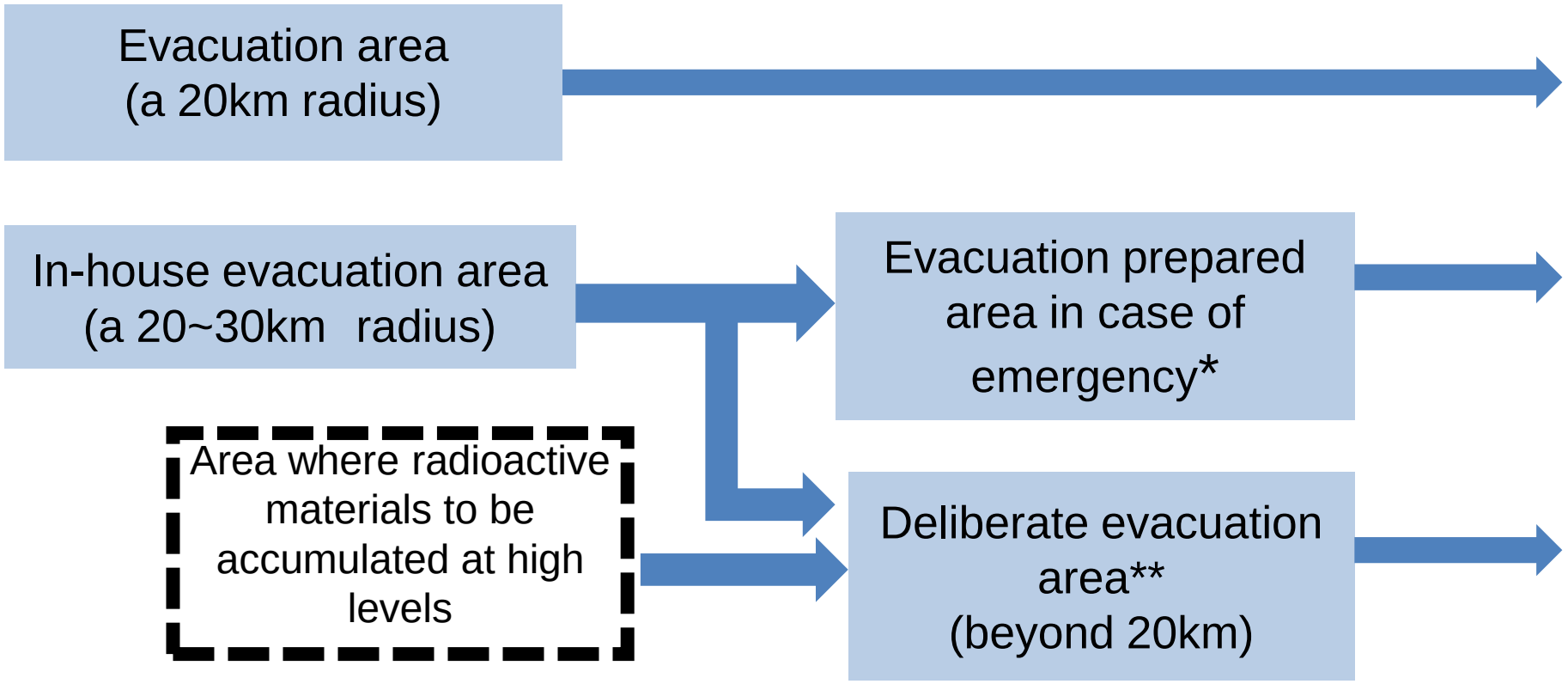
The policies for dose criteria for radiation protection

Integrated dose in accident

Radiation protection criteria for public in accident	Contents
(a) Criteria to prevent large exposure in the early stage of the accident	As for the criteria to be used for protection measures in the early stage of accidents(indoor sheltering/evacuation), the regulatory guide by the Nuclear Safety Commission, "Emergency Preparedness for Nuclear Facilities", provide criteria for projected dose as **effective dose from external exposure "10-50 mSv(indoor sheltering)" and "over 50mSv(evacuation)".** These criteria were determined by reference to the IAEA safety requirementGS-R-2 "Preparedness and Response for a Nuclear or Radiological Emergency"(2002)
(b) Criteria in the emergency situation(accident continuation)	In this accident, if people would continue to live the area with high level dose by locally accumulation of radioactive materials released from the plant, integrated dose to the people might become high level. Therefore, the Prime Minister, who is the chief of the nuclear emergency response headquarters, considering the opinion of the Nuclear Safety Commission into account, established "deliberate evacuation area". The deliberate evacuation area was set by reference to **the recommendation 2007 of ICRP in which 20-100mSv is suggested as a reference level to protect public in the emergency exposure situation and IAEA safety guidance GSG2 "Preparedness and Response for a Nuclear or Radiological Emergency"(2011) in which the countermeasures for protection in the emergency situation are described to be optimized under 100 mSv/year,** and in consideration of basic principle "Radiation exposure should be kept as low as reasonably achievable". Predicted integrated dose of 20 mSv in one year from the accident outbreak is adopted as the criteria for the deliberate evacuation area.
(c) Radiation protection criteria in the situation where contamination from past accidents should be taken into the consideration	**In the 2007 recommendation of ICRP, a standard of "1-20 mSv/year" is provided as a reference level for protecting the public from contamination after accidents(existing exposure situation).** And also, the principle of optimization of protection, "ALARA(As Low As Reasonably Achievable)" is to be applicable to the existing exposure situation.

Protected Areas

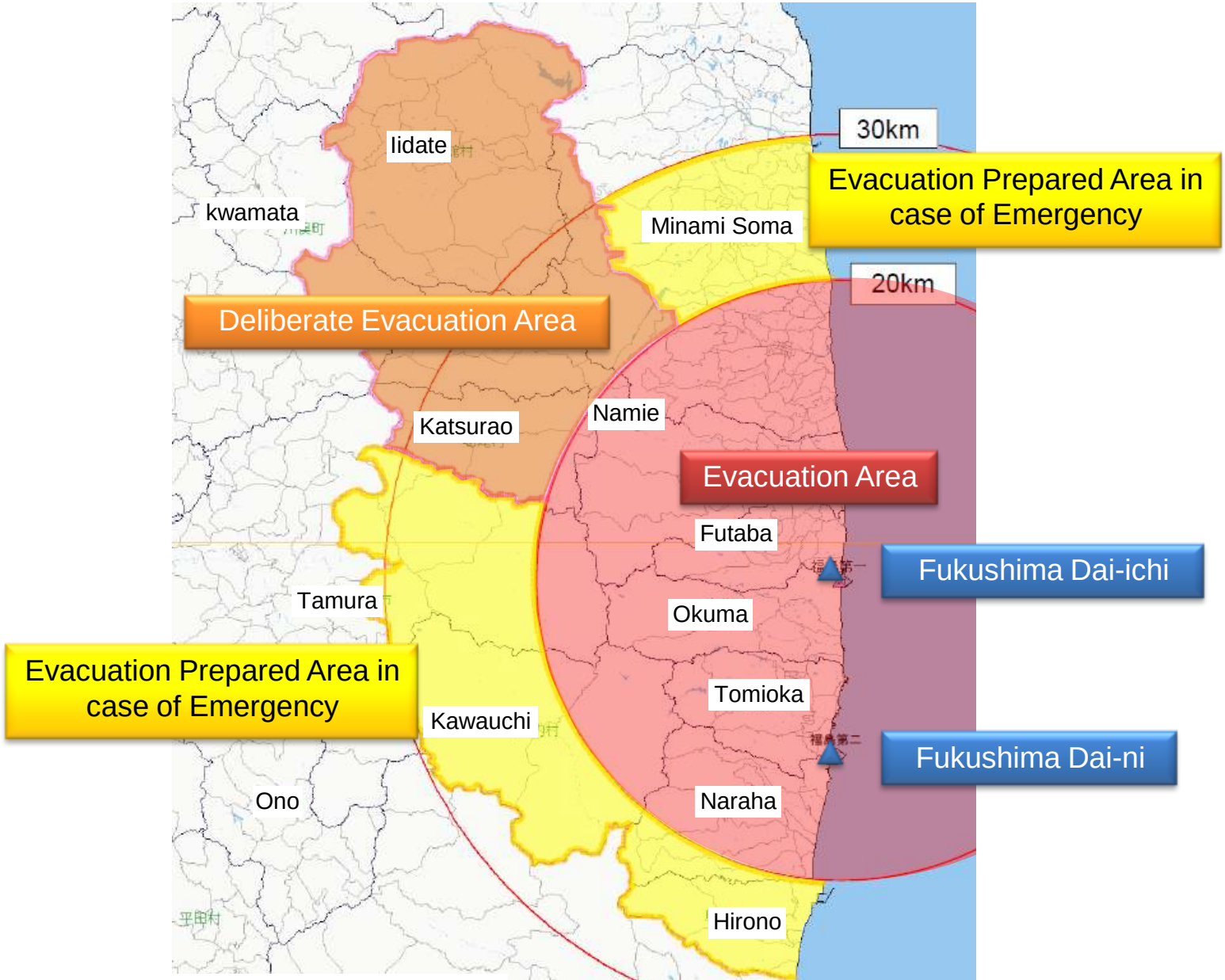
［12-15March ］ ［ 22 April ］ ［ present ］



*In-house evacuation area excluding deliberate evacuation area was renamed as evacuation prepared area in case of emergency.

**Deliberate evacuation area needed to establish for specific areas beyond 20km radius where radioactive materials are to be accumulated at high levels.

Protected Areas



Situation of distributing stable iodine

- Fukushima Prefecture distributed iodine to cities, towns and villages with administrative districts within 50km of the Fukushima Dai-ichi NPS

Form	Quantities
Pill	About 1.51 million pills for 0.75 million people
Powder	About 6,100 g for 0.12 to 0.18 million people

- No residents took stable iodine based on the instruction because the evacuation had already been completed at the time the instruction of taking iodine was issued.

Number of sufferers

Area	Number of people
Evacuation area	About 78,000 (population in this area)
Deliberate evacuation area	About 10,000 (population in this area)

2. Radiation Exposure of Residents

Residents

Situation

Actions	Results
Screening Survey	Most of the 195,354 people checked as of May31 were under the 100,000cpm limit.
Survey for thyroid exposure	Among the 1,080 children from 0 to 15 years old surveyed, there were no children who exceeded the screening criteria of 0.2 μSv/h

Future

- Fukushima Prefecture will estimate and evaluate the radiation dose for 2 million residents in cooperation with related government offices and the National Institute of Radiological Sciences (NIRS).

(Source: JAEA)

3. Measures for Agricultural Products and Drinking Water

Agricultural Products

Actions	Contents
Intake Restriction	The Ministry of Health, Labor and Welfare(MHLW) notified to each prefecture on March 17 as followings: **(1) <u>"Guideline values for food and drink intake restrictions"</u>** provided by NSC Japan should be provisional limit value for radioactive materials contained in food stuffs. (2) Any food stuffs that contain radioactive materials exceeding these values should not be consumed pursuant to Item2, Article6 of the Food Sanitation Law.
Distribution Restriction	The Prime Minister, the Director-General of the Nuclear Emergency Response Headquarters, issued instructions on March 21 relevant governors of prefectures about distribution restrictions under the provisions of Paragraph3, Article20 of Act on Special Measures Concerning Nuclear Emergency Preparedness.
Lift of Distribution Restriction	On April4, the Headquarters decided that weekly inspections should be conducted in the distribution-restricted areas and the restrictions can be lifted if inspection findings continue to be below provisional limit values three consecutive times.

Drinking Water

Actions	Contents
Intake Restriction	MHLW issued a notice to the waterworks office of the each prefectural government on March19 and 21 that drinking tap water that contains radioactive materials exceeding the guideline values etc. set by the NSC should be avoided.
Inspection of Tap Water	On April4, MHLW requested local governments to carry out the inspection of tap water mainly in Fukushima Prefecture and its neighboring ten prefectures more than once per week, while daily inspection should be conducted if the readings exceed the guideline values, etc. or they are likely to exceed them.

Guideline values for food and drink intake restrictions

(Nuclear Safety Commission)

<table>
<tr><th></th><th>Radioactive Iodine(^{131}I)</th><th>Radioactive Cesium</th><th>Uranium</th><th>Total of ^{238}Pu, ^{239}Pu,^{240}Pu,^{242}Pu ,^{241}Am,^{242}Cm,^{243} Cm,^{244}Cm</th></tr>
<tr><td>Drinking water</td><td rowspan="2">> 3x10^{2}Bq/kg</td><td rowspan="2">> 2x10^{2}Bq/kg</td><td rowspan="2">> 20Bq/kg</td><td rowspan="2">> 1Bq/kg</td></tr>
<tr><td>Milk, dairy products</td></tr>
<tr><td>Vegetables and fruits</td><td>> 2x10^{3}Bq/kg (excluding root vegetables and potatos)</td><td rowspan="3">> 5x10^{2}Bq/kg</td><td rowspan="3">> 1x10^{2}Bq/kg</td><td rowspan="3">> 10 Bq/kg</td></tr>
<tr><td>Grains</td><td rowspan="2">-</td></tr>
<tr><td>Meat, Egg, Fish, etc</td></tr>
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4. Assistance of Nuclear Sufferers

Assistance of Nuclear Sufferers

- On May17, the government issued a policy of immediate actions for the assistance of sufferers and affected municipalities from the nuclear accident as “Policy for Immediate Actions for the Assistance of Nuclear Sufferers”

Actions	Contents
Evacuation areas	(1) Securement of Secondary Evacuation Sites (2) Response to Care Receivers and Physically Challenged People (3) Establishment of a Restricted area, and Implementation of Temporary Access (4) Handing Agricultural Products and Livestock in the Areas (5) Compensation for Damage Caused to Small and Medium Enterprises (6) Support to be provided until cancellation of Evacuation Area Designation
Deliberate evacuation areas	(1) Securing Evacuation Sites (2) Response to Persons Requiring Nursing Care, Disabled Persons, etc (3) Smooth Implementation of Deliberate Evacuation Plans (4) Handling of Agricultural Products, Livestock, etc in the Deliberate Evacuation Area (5) Compensation for Damage Caused to Small and Medium Enterprise (6) Support to be Provided until Cancellation of the Deliberate Evacuation Area Designation

Assistance of Nuclear Sufferers (Cont'd)

Actions	Contents
Evacuation prepared area in case of emergency	(1) Maintaining the Foundations of Residents' Livelihood, etc and Supporting Industrial Activities (2) Handling of Agricultural Products, livestock etc, in the Evacuation Prepared Area in case of Emergency (3) Compensation for Damage Caused to Small and Medium Enterprises (4) Support to be provided until Cancellation of Evacuation-Prepared Area in case of Emergency

5. Lifting the Designation of Evacuation Areas

Lifting the designation of evacuation areas

To enhance and implement appropriate environmental monitoring

- To prepare for future dose assessment and evaluation of accumulation of radioactive materials
- To maintain continuous monitoring based on the Environmental Monitoring Enhancement Plan

Radiation protection criteria for public in accident

To examine revision of evacuation areas

- When systems to enable sound and long-term cooling of both nuclear reactors and spent fuel pools are assumed.
- When nuclear reactors are in a cold shutdown state and the release of radioactive materials are basically under control.

6. Lessons learned about Response to the Nuclear Emergency

Lessons learned about Response to the Nuclear Emergency

Items	Actions to be taken
(1) Responses to combined emergencies of both large-scale natural disasters and prolonged nuclear accident	● To prepare the structures and environments ● To enhance emergency response preparedness including effective mobilization plans to gather human resources in various fields who are involved with accident response and support for affected persons, assuming a prolonged nuclear accident
(2) Reinforcement of environmental monitoring	● To develop a structure through which the Government will implement environmental monitoring in a reliable and well-planned manner during emergencies
(3) Enhancement of communication relevant to the accident	● To reinforce the adequate provision of information on the accident status and response, along with appropriate explanations of the effects of radiation to the residents in the vicinity ● To keep in mind having the future outlook on risk factors included in the information delivered while incidents are still ongoing
(4) Adequate identification and forecasting if the effect of released radioactive materials	● To improve the instrumentation and facilities to ensure that release source information can be securely obtained ● To develop a plan to effectively utilize SPEEDI and other systems to address various emergent cases and disclose the data and results from SPEEDI, etc from the earliest stage of such cases
(5) Clear definition of widespread evacuation areas and radiological protection guidelines in nuclear emergency	● To make much greater efforts to clearly define evacuation areas and guidelines for radiological protection in nuclear emergencies