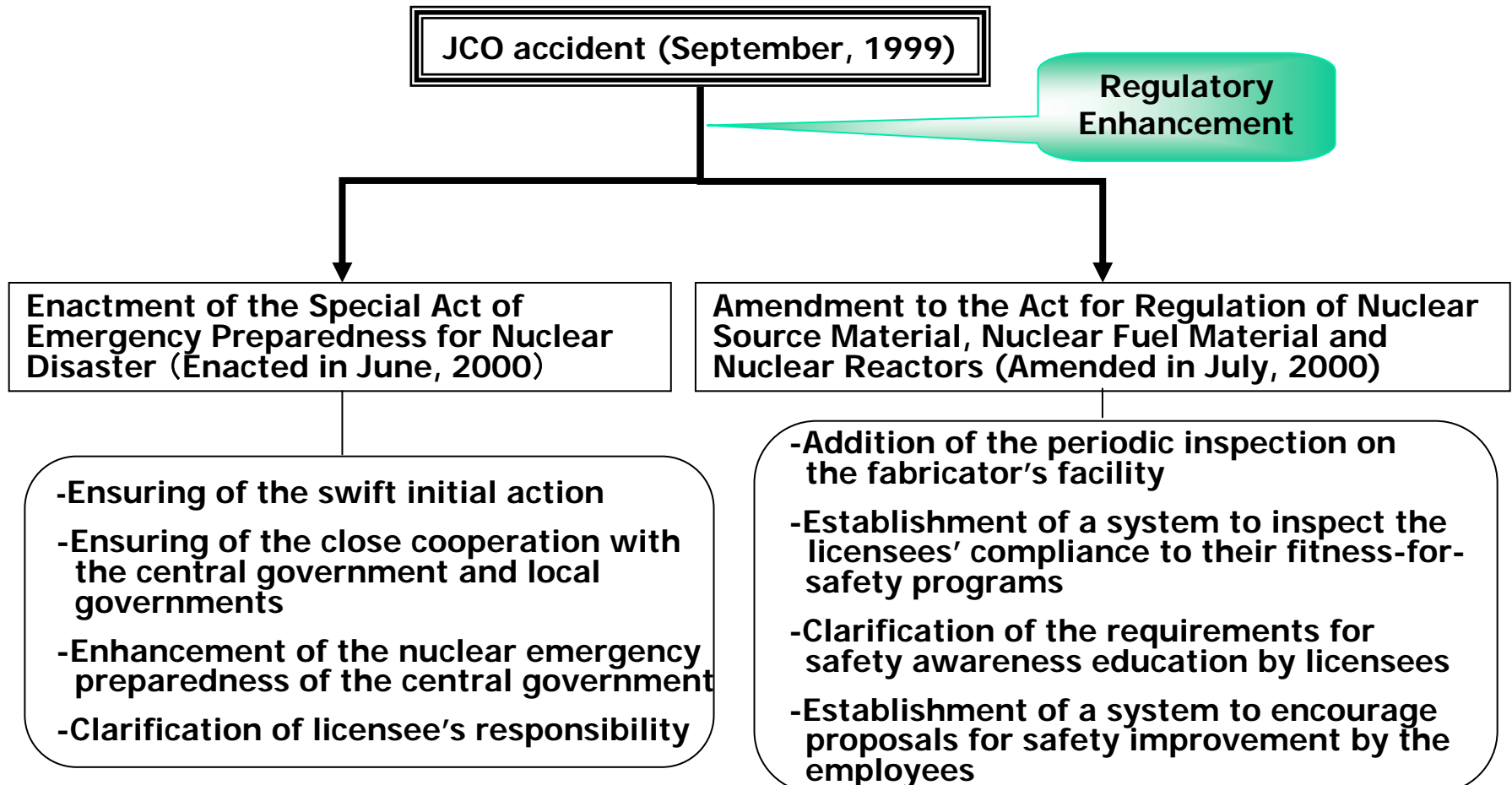


JCO Accident and Establishment of Nuclear Emergency Preparedness and Response System

International Affairs Group
Safety Information Research Division
Incorporated Administrative Agency
Japan Nuclear Energy Safety Organization (JNES)

For the Recovery of Public Confidence

Reflecting the JCO accident, **enactment of the Special Act of Emergency Preparedness for Nuclear Disaster (Special Act for Nuclear Emergency)** and **amendment to the Act for Regulation of Nuclear Source Material, Nuclear Fuel Material and Nuclear Reactors** were implemented, and the nuclear emergency response system and the nuclear safety regulations were considerably enhanced.

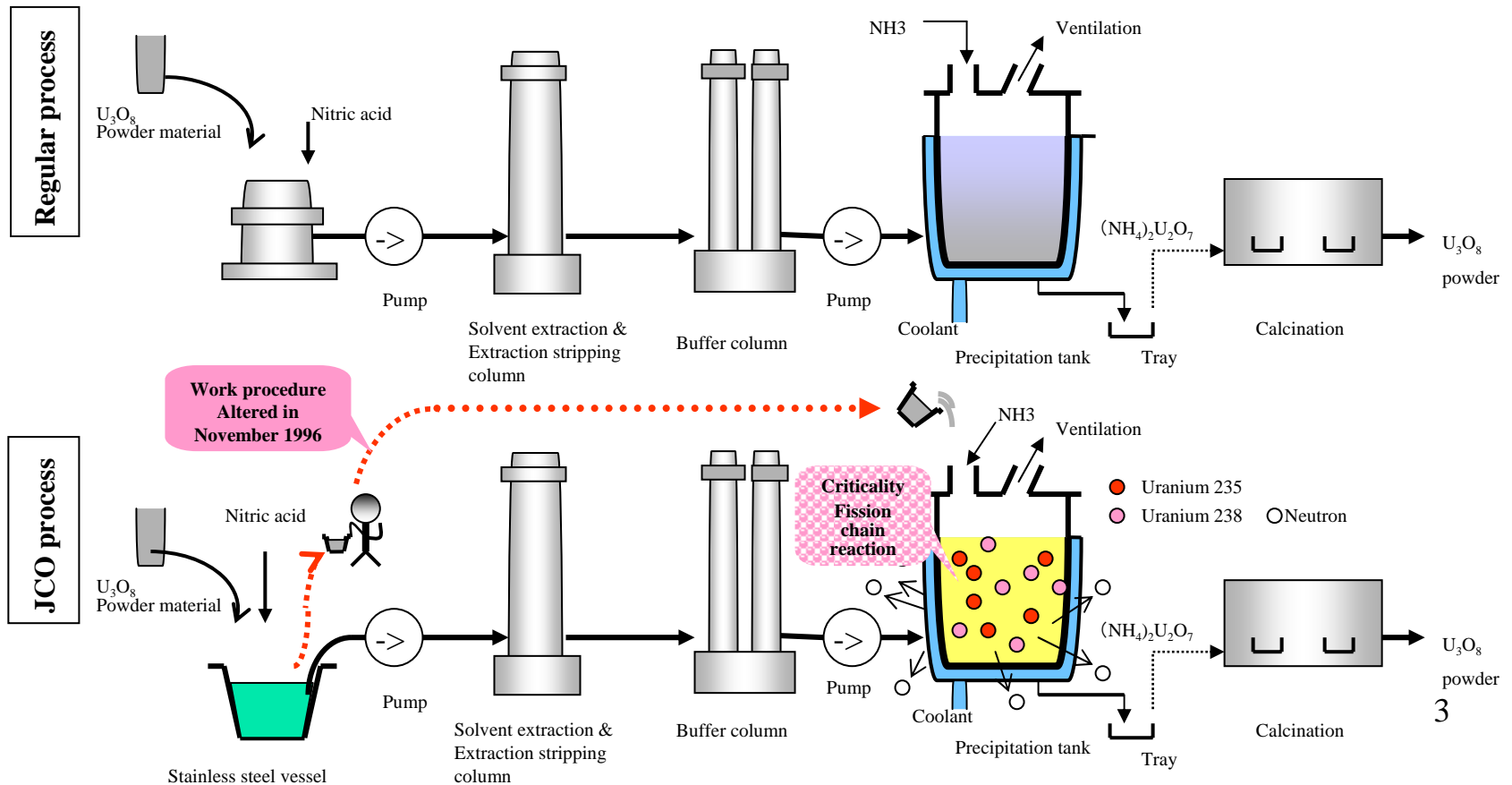


Summary of JCO Accident

Progression of the Accident

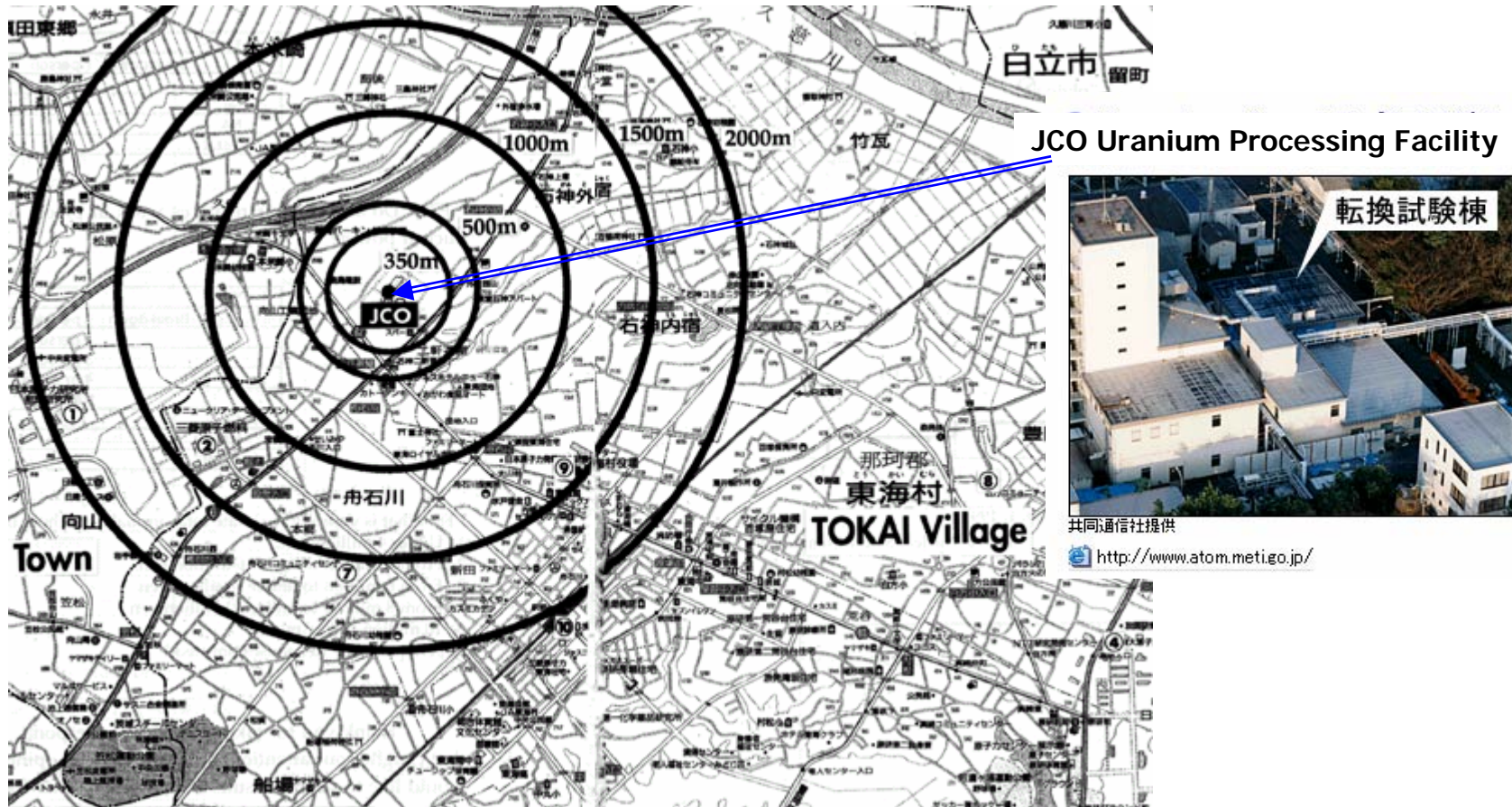
1. A nuclear criticality accident occurred on September 30, 1999, at the Tokai-mura Uranium Processing Plant of Japan Nuclear Fuel Conversion Co. (JCO).

The work procedure was altered without permission by the regulatory authority in November 1996. In that procedure, the dissolution of uranium oxide (U_3O_8) was conducted in stainless steel buckets. And homogenization of uranium oxide was performed by mechanical stirring in the precipitation tank instead of in the mass control equipment. This was done by pouring uranyl nitrate solution (made by dissolving uranium oxide (U_3O_8) in nitric acid) directly from the steel bucket into the precipitation tank. The tank did not have any function of criticality prevention. The homogenization in the precipitation tank was not even described in the altered procedure and was a further deviation from the approved procedure.



Progression of the Accident, cont.

- The balanced critical state continued for about 20 hours or more after an instant nuclear fission reaction. And radiation continued to be released into the area of circumference shown. An evacuation was conducted of the residents in the vicinity of the facility and also sheltering for the residents within a 10km radius of the facility.

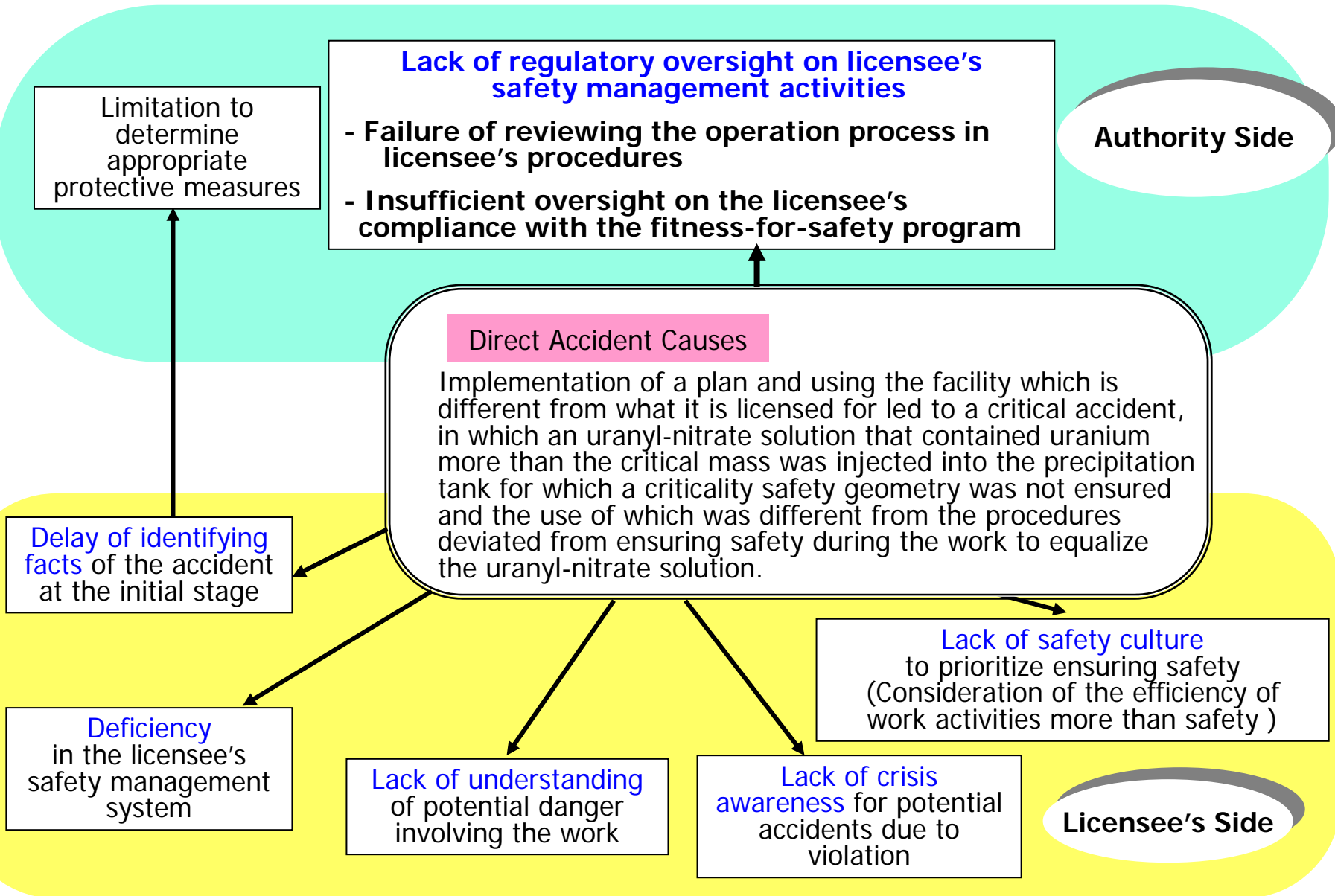


Map of JCO Inc. and the Survey Area

Progression of the Accident, cont.

3. As small amount of radioactive gaseous material produced by the nuclear fission was also discharged into the atmosphere, and the employees, persons involved in the emergency response, residents in the vicinity, etc. were exposed to this radiation. Two employees who were exposed to a large amount of radiation passed away.
4. Although the radioactive material was released outside the plant, the radiation level was low, and it did not affect the resident health or the environment. The survey results and analysis of agricultural and forestry livestock products indicated that the effect was not even observable, and the safety was confirmed.
5. It was the most serious accident in the history of nuclear power development and usage in Japan in more than forty years for the reason that it produced casualties and the temporary evacuation and sheltering of residents.

JCO Accident and Issues to be Resolved



Efforts for Prevention of Recurrences

Findings by the Accident Investigation Committee (final report) :

Although the licensee should take primary responsibility for ensuring nuclear safety, the need for further efforts by the licensee, the regulatory authority, the Nuclear Safety Commission, and the society was pointed out to prevent the recurrence based on lessons learned from the JCO accident.

Fostering of crisis awareness and advancement of a risk-conscious safety assessment

- Adequate crisis awareness is the basis of safety precautions
- Advancement of consciousness to "Risk-based Safety Evaluation "

Nuclear Business

Licensee

Thoroughness of ensuring safety

- Thoroughness of ensuring safety with work process management
- Establishment of awareness and morals of technical staff
- Implementation of risk prediction and administrative control
- Efforts for safety management by the nuclear industry as a whole

Regulatory Authority

Restructuring of nuclear safety

- Revision of the Act for Regulation of Nuclear Source Material, Nuclear Fuel Material and Nuclear Reactors
- Creation of a nuclear emergency preparedness and response system
- Staff strengthening of the nuclear safety regulators
- A considerable enhancement of the independency of the Nuclear Safety Committee and its secretariat
- Comprehensive preparation of review guides

Establishment of the nuclear safety culture and construction of a safe social system in the 21st century

Efforts to Restructure the Nuclear Safety System (1)

Enhancement of the system to ensure nuclear safety



Amendment to the Act for Regulation of Nuclear Source Material, Nuclear Fuel Material and Nuclear Reactors (Amended in July, 2000)

The Act for Regulation of Nuclear Source Material, Nuclear Fuel Material and Nuclear Reactors was amended due to the need for a considerable enhancement of the nuclear safety regulations surfaced by the JCO accident. **The key amendments are as follows:**



- Addition of a "periodic inspection" process on the Fabrication Facilities (5 of Article 16, Periodic Inspection on Facilities)
- Legislation of a system to inspect the licensee's compliance with the fitness-for-safety program. (Article 12, Article 22, Article 37, Article 50, and 18 of Article 51)
- Legislation of a Nuclear Safety Inspector System (2 of Article 67, Inspector for Nuclear Facilities and Nuclear Safety Inspector)
- Safety Awareness Education should be included in the fitness-for-safety program
- Legislation of a system for employees to propose safety improvements, and the preparation of a working environment in which it is easy to report an alleged violation to the Regulatory Authority against safety regulations etc. (4 of Article 66, Allegation to the competent minister etc.)

This system led to the allegation of wrongdoing of Tokyo Electric

Efforts to Restructure the Nuclear Safety System (2)

Enhancement of the system to ensure nuclear safety



Enhancement of the Secretariat of the Nuclear Safety Commission (NSC)

Nuclear Safety Commission (NSC) was transferred from the regulatory agency to the cabinet office to increase **independency**. **Staff of the NSC was augmented by employing specialists from various disciplines.**



Major Roles of the Nuclear Safety Commission (NSC)

(1) Deliberations on the fundamental policy of the safety regulation

- Study of basic matters such as the setting up of nuclear safety goals and development of safety culture
- Receiving of reports etc. from the related regulatory authorities concerning nuclear safety matters and examining the reports from identical perspectives
- Investigation and analysis of an accident, failure or trouble of nuclear facilities
- Study of the basis for disaster prevention accompanying the utilization of nuclear energy
- Implementation of the regulatory activity investigation (Discernment and confirmation of regulatory activities after the establishment of the permit)
- Development of "Safety Research" master plans of to prepare data required for the safety review etc.

(2) Review of the safety

- Development of safety review guidelines and standards as the criteria to confirm the basis for ensuring safety
- Implementation of review on the safety review that the regulatory agency has carried out

(3) Actions for the nuclear emergency

- Technical advices to the Prime Minister and others in accordance with the Special Act for Nuclear Emergency (Investigation Panel for Nuclear Emergency Response)

Efforts to Restructure the Nuclear Safety System (3)

For restructuring safety and a sense of safety



Information disclosure to the public

Effort on the part of those involved is essential to be communicated to the public as well as to ensure safety so as to recover public confidence which had been lost over the JCO accident. In addition, it is important to establish nuclear safety on which the public has a sense of safety.



- Routine communication by people involved with the public, particularly with the residents in the vicinity of nuclear plants**
- Public disclosure of licensee's facilities**
- Appropriate information disclosure by nuclear related persons**
- Information disclosure at the NSC Internet web site**
- Setting up of a communication box for questions and comments on the nuclear safety**
- Information sharing among the countries and people involved**
- Information dissemination through international conferences and common symposia with the nuclear society**

Efforts to Restructure the Nuclear Safety System (4)

For restructuring safety and a sense of safety



Establishment of the Special Act for Nuclear Emergency (Enacted in June, 2000)

The Special Act for Nuclear Emergency was enacted based on lessons learned from the current nuclear emergency preparedness. So, nuclear emergency preparedness by the central government, local governments, and licensees was strengthened.



- (1) To ensure swift initial activation
- (2) To ensure close cooperation with the central government and local governments
- (3) Enhancement of the emergency response by the central government
- (4) Clarification of the responsibility of licensees

Further details are shown in the following slides.

Efforts to Restructure the Nuclear Safety System (5)

<Special Act for Nuclear Emergency>

(1) To ensure swift initial activation (Article 10)

A) Clarification of the notification criteria →

Notification by the licensee

B) Clarification of the decision criteria for nuclear emergency →

Establishment of the "Nuclear Emergency Response Headquarters " and the "Local Nuclear Emergency Response Headquarters "

| Notification criteria | Decision criteria for nuclear emergency |
|---|--|
| <ul style="list-style-type: none"> ● When radiation doses of 5micro-Sv/h or more for ten minutes or more are detected with radiation measuring equipment installed near the site boundary. ● When radioactive materials equivalent to 5micro-Sv/h for ten minutes or more are detected at the site boundary with considering diffusion etc. from the normal release point such as a ventilation stack. ● When radiation doses of 50micro-Sv/h for continuous ten minutes or more or radioactive materials equivalent to 5micro-Sv/h are detected in the vicinity of the controlled area. ● When radiation doses of 100micro-Sv/h or more are detected at a point one meter away from a shipping cask ● When the possibility of criticality at a facility other than the nuclear reactor core. ● When an incident occurred according to the characteristic of each plant that may result in a nuclear emergency such as a situation incapable of reactor shutdown by control rods. | <ul style="list-style-type: none"> ● Detection of radiation doses of 500micro-Sv/h or more with radiation measuring equipment installed by the licensee near the site boundary or installed by the prefecture concerned. ● Detection of one-hundred times of numeric values of the notification event at a normal release point such as a ventilation stack, in the vicinity of a controlled area, or at a point one meter away from a shipping cask. ● A criticality state at a facility other than in the nuclear reactor core. ● An incident according to the characteristic of each plant that indicates the occurrence of a nuclear emergency situation such as a situation incapable of shutting down the liquid neutron absorber(boric acid solution) in addition to control rod insertion. |

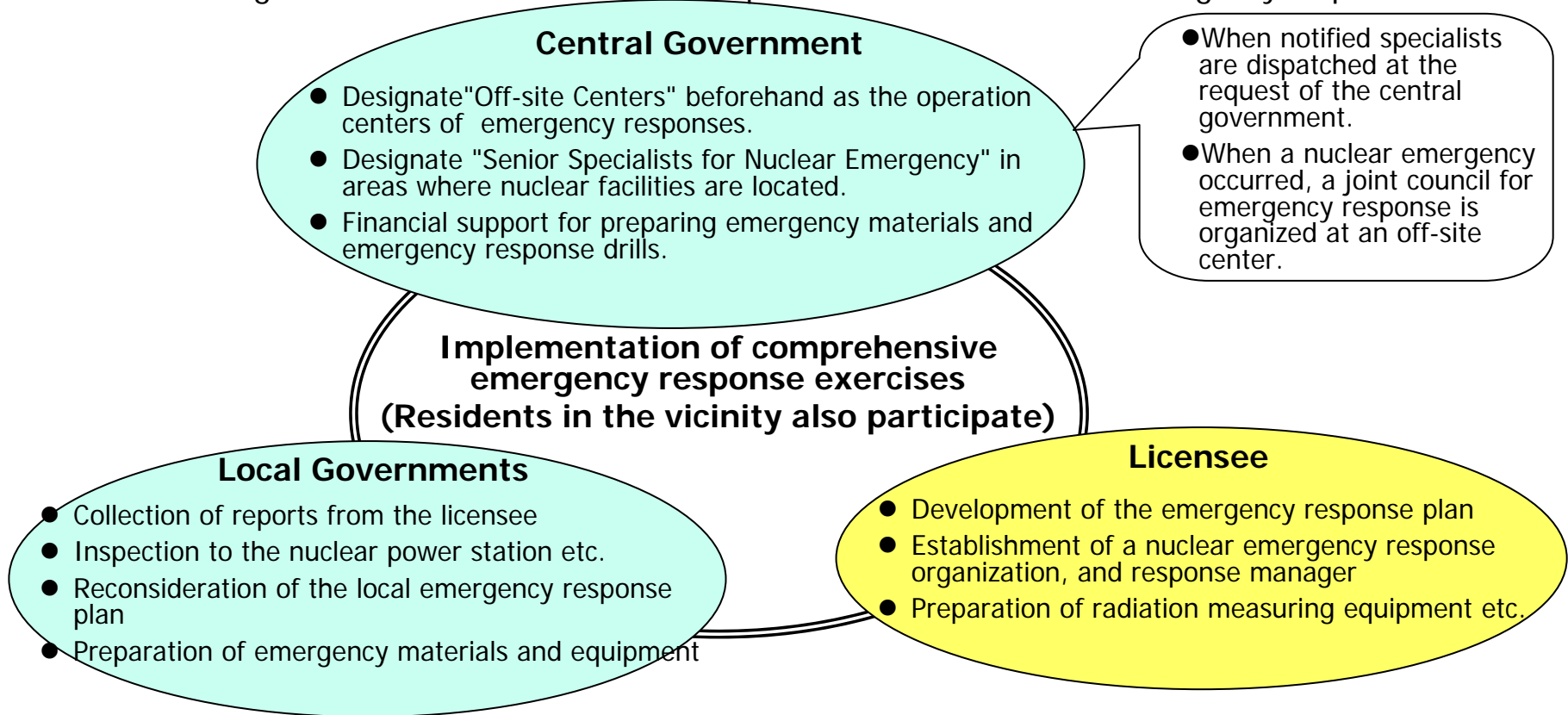
Efforts for Restructuring Nuclear Safety System (6)

<Special Act for Nuclear Emergency>

(2) To ensure close cooperation with the central government and local governments

The central government has the responsibility to regulate safety from the standpoint of preserving public's lives and property. The regulatory responsibility of the central government and fitness-for-safety responsibility of the licensee must be fulfilled to ensure nuclear safety, and it is very important to put emergency preparedness in place to be prepared for an accident.

The following measures have been taken to improve the effectiveness of emergency response.



Cooperation in routine activities among the central government, local governments, and licensees for nuclear emergency preparedness

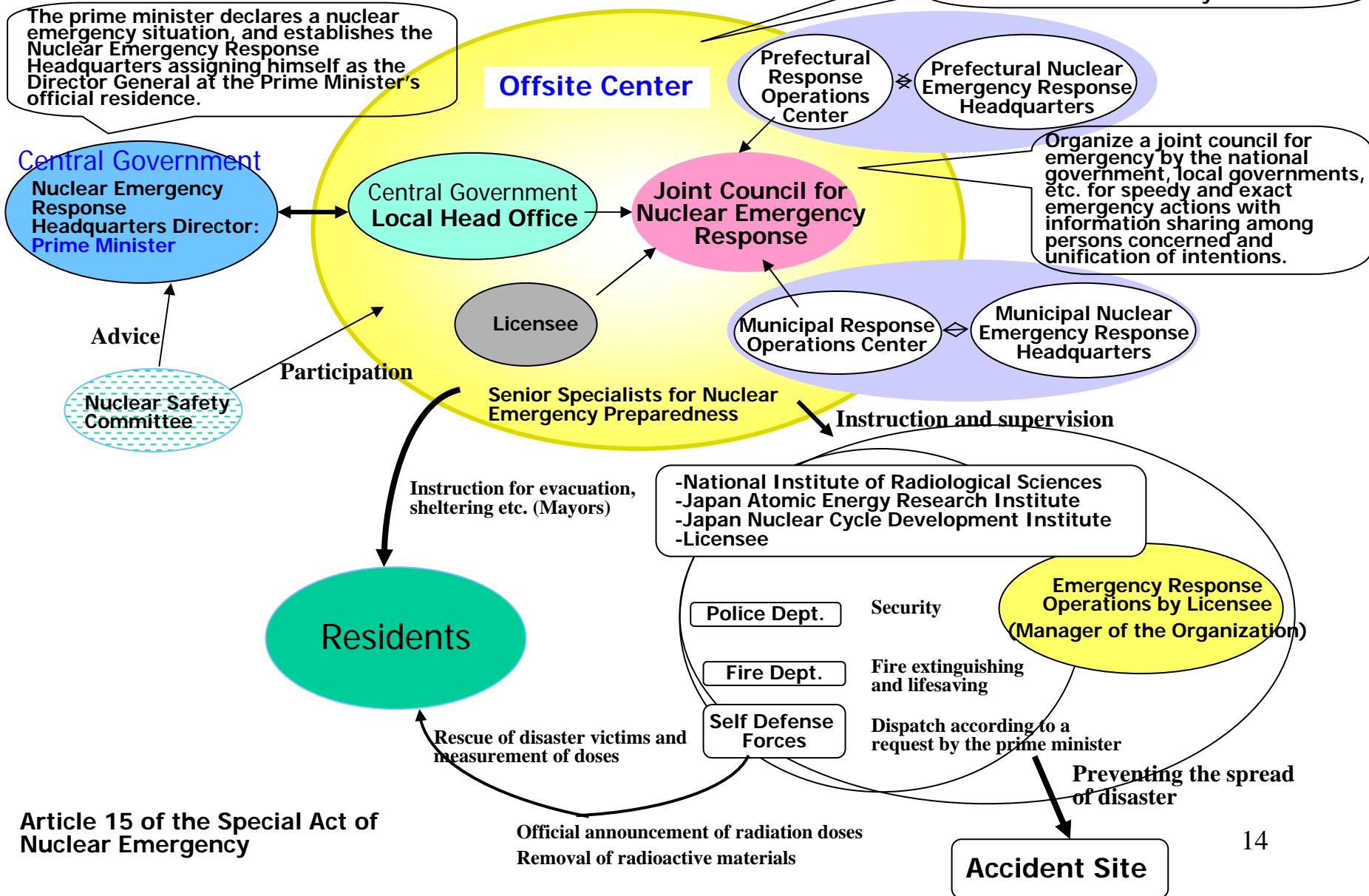
Efforts to Restructure the Nuclear Safety System (7)

<Special Act for Nuclear Emergency>

(3) Enhancement of emergency response by the central government

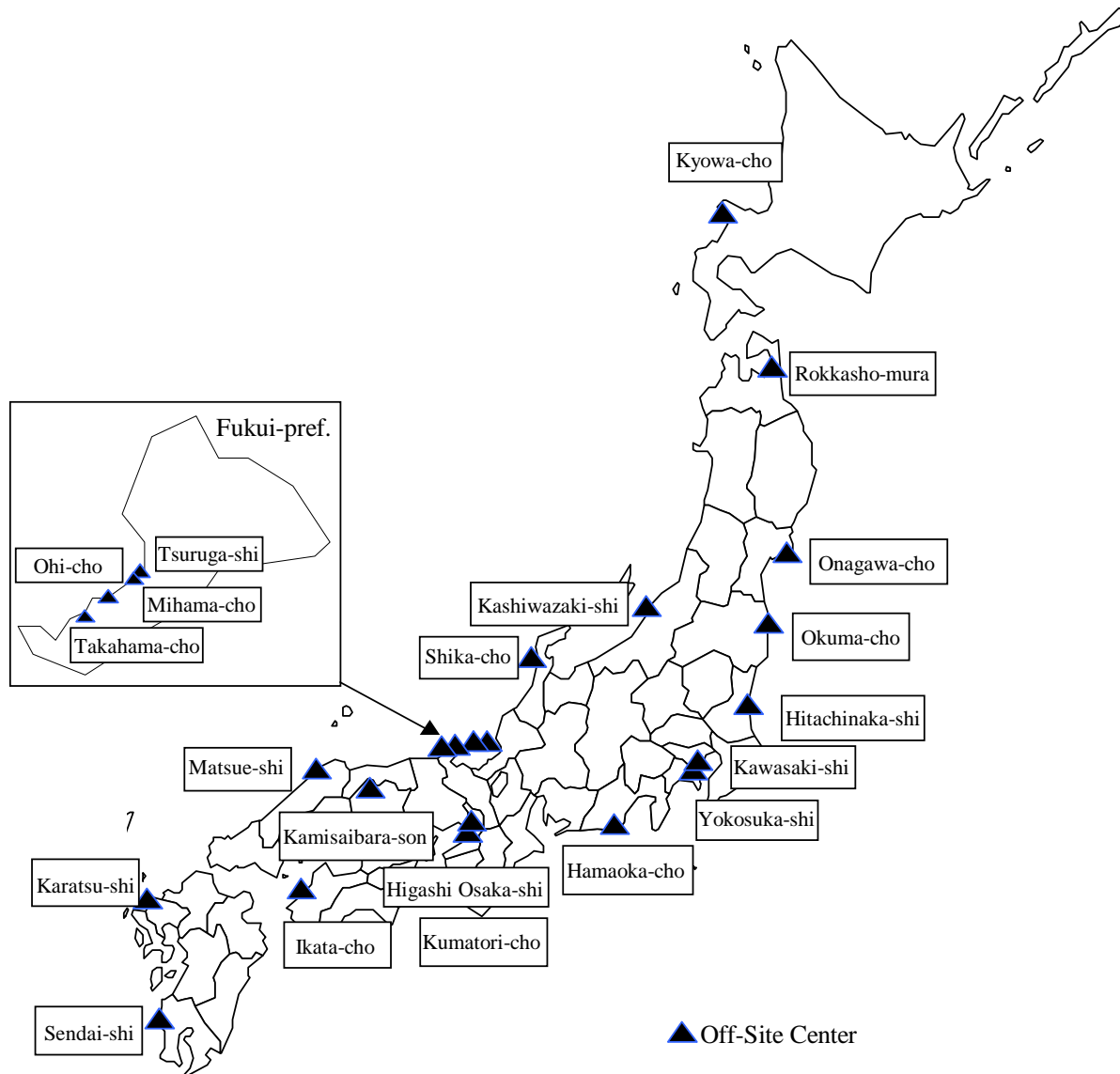
The prime minister declares a nuclear emergency situation, and establishes the Nuclear Emergency Response Headquarters assigning himself as the Director General at the Prime Minister's official residence.

The place where the national government, local governments, and the licensee gather in one room located near the site of a nuclear facility.



Article 15 of the Special Act of Nuclear Emergency

Location of Offsite Centers in JAPAN



Comprehensive Exercise for Nuclear Emergency Response

(from White Paper on Nuclear Energy, 2003)



Nuclear Emergency Response Headquarters



Offsite Center

Efforts for Restructuring Nuclear Safety System (8)

<Special Act for Nuclear Emergency>

(4) Clarification of the responsibility of licensees

Responsibility and roles of licensees to prevent a nuclear emergency were specified clearly:

- Installation of radiation monitors at the site and an official announcement of the record of radiation doses
- Notification of an unusual event (when a specified phenomenon occurs such as detection of radiation doses more than the level established by the government order near the boundary of a nuclear plant site.)
- Establishment of an "Emergency Response Plan"
- Establishment of an emergency response organization by the licensee and implementation of nuclear emergency measures
- Assignment of a nuclear emergency preparedness and response manager