



RECENT DEVELOPMENT IN SAFETY REGULATION OF NUCLEAR FUEL CYCLE ACTIVITIES

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Abstract

Through the effort of deliberation and legislation over five years, Japanese government structure was reformed this January, with the aim of realizing simple, efficient and transparent administration. Under the reform, the Agency for Nuclear and Industrial Safety (ANIS) was founded in the Ministry of Economy, Trade and Industry (METI) to be responsible for safety regulation of energy-related nuclear activities, including nuclear fuel cycle activities, and industrial activities, including explosives, high-pressure gasses and mining.

As one of the lessons learned from the JCO criticality accident of September 1999, it was pointed out that government's inspection function was not enough for fuel fabrication facilities. Accordingly, new statutory regulatory activities were introduced, namely, inspection of observance of safety rules and procedures for all kinds of nuclear operators and periodic inspection of fuel fabrication facilities. In addition, in order to cope with insufficient safety education and training of workers in nuclear facilities, licensees of nuclear facilities are required by law to specify safety education and training for their workers.

ANIS is committed to enforce these new regulatory activities effectively and efficiently. In addition, it is going to be prepared for, in its capacity of safety regulatory authority, future development of Japanese fuel cycle activities, including commissioning of JNFL Rokkasho reprocessing plant and possible application for licenses for JNFL MOX fabrication plant and for spent fuel interim storage facilities.

1. ORGANIZATIONAL RESTRUCTURING OF NUCLEAR SAFETY REGULATION

1.1. Government Restructuring

As of January 6th this year, Japanese government was restructured, and its twenty-two ministries and agencies were reorganized into twelve. The concept and objective of the restructuring was to reform fat and rigid government structure and to realize simple, efficient and transparent administration. The reform was the fruit of the deliberation and legislation over five years. An advisory body to the Prime Minister was established in 1996 to discuss concept of the reform and to specify new structure of the government. The body made a report at the end of 1997. Relevant laws and regulations were formulated and modified to realize the reform by the end of 1999, and after preparatory period the reform took effect at the beginning of this year.

In the restructuring, Science and Technology Agency (STA), formerly responsible for safety regulation of fuel cycle activities, was merged with Ministry of Education to become Ministry of Education and Science and Technology (MEST), and the METI was reborn as Ministry of Economy, Trade and Industry (METI). With respect to nuclear energy, METI deals with energy uses aspect, and MEST with its scientific and technological side. Responsibility of nuclear safety regulation was reallocated between METI and MEST according to this demarcation. Accordingly, safety regulation of

refinery business, fuel fabrication business, spent fuel interim storage business, reprocessing business, nuclear waste management business, and relevant transportation of nuclear materials, which STA was in charge, is now undertaken by METI. (See Fig.1)

Before Reorganization	Current Status (January, 2001)
MITI Safety Regulation of: Refinery Business Commercial Nuclear Power Plant Spent Fuel Interim Storage Business	METI Safety Regulation of: Refinery Business Fuel Fabrication Business Spent Fuel Interim Storage Business Reprocessing Business Waste Management Business Commercial Nuclear Power Plant Power Reactors of R&D Stage Transportation of relevant Nuclear Materials
STA Safety Regulation of: Refinery Business Fuel Fabrication Business Reprocessing Business Waste Management Business Research Reactors Power Reactors of R&D Stage Use of Nuclear Materials Transportation of Nuclear Materials - Use, Storage and Transportation of Radioisotopes	MEST Safety Regulation of: Research Reactors Use of Nuclear Materials Transportation of relevant Nuclear Materials Use, Storage and Transportation of Radioisotopes

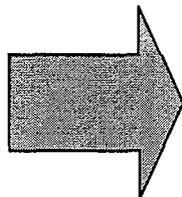


FIG. 1. Reallocation of safety regulatory responsibility.

1.2. Agency for Nuclear and Industrial Safety (ANIS)

The Agency for Nuclear and Industrial safety (ANIS) was established in the METI, to be intent on safety regulation of whole spectrum of energy-related nuclear facilities, from power reactor to fuel cycle facilities and waste management. ANIS is also independent from the promotional function of nuclear energy, which is undertaken by the Agency for Natural Resources and Energy.

There is 260 staff in the ANIS, of which about 70 was transferred from STA. Of the 260 staff, about 100 inspectors are stationed near nuclear facilities for effective implementation of inspection activities. In order to upgrade technical expertise of the ANIS staff, it employs various experts who had substantial experiences in design, construction and maintenance of nuclear facilities.

As an advisory organ to ANIS, Nuclear and Industrial Safety Subcommittee was established under the Advisory Committee for Natural Resources and Energy, consisting of experts from various fields, including nuclear engineering, laws and economics and other social sciences, industrial safety, mass media, corporate governance, and nuclear industry. The Council is expected to issue its first report, 'Consolidation of Basis for Nuclear Safety', at the end of June. The report will overview status quo of basis of nuclear safety in terms of institutional system, knowledge basis, human resources, research and training facilities, and financial resources, and discuss how to strengthen these basis.

1.3. Nuclear Safety Commission (NSC)

The most important function of NSC is to review safety examination undertaken by regulatory body in licensing of nuclear facilities to see whether the examination is adequate. It had been incorporated as a part of the governmental restructuring program to reinforce NSC, by increasing its secretariat, and

further its independence of regulatory bodies, especially from STA. Namely, it had been planned that in January 2001 the secretariat of NSC would be enlarged and transferred from Nuclear Safety Bureau of STA to newly-born Cabinet Office, which is to have strong function of government-wide planning and inter-ministry coordination.

However, the JCO criticality accident accelerated this part of reorganization program. It was pointed out that complementary safety regulation by regulatory body and NSC has to function more effectively and that NSC has to play more active role in supervising and guiding safety regulatory administration. In April 1999, the secretariat was transferred to the Prime Minister's Secretariat, and its staff was increased from 20 to 92, of which 41 have a stronger technical background.

Eventually, as of January this year, the secretariat, Office of Nuclear Safety Commission, has staff of one hundred. (See Fig.2)

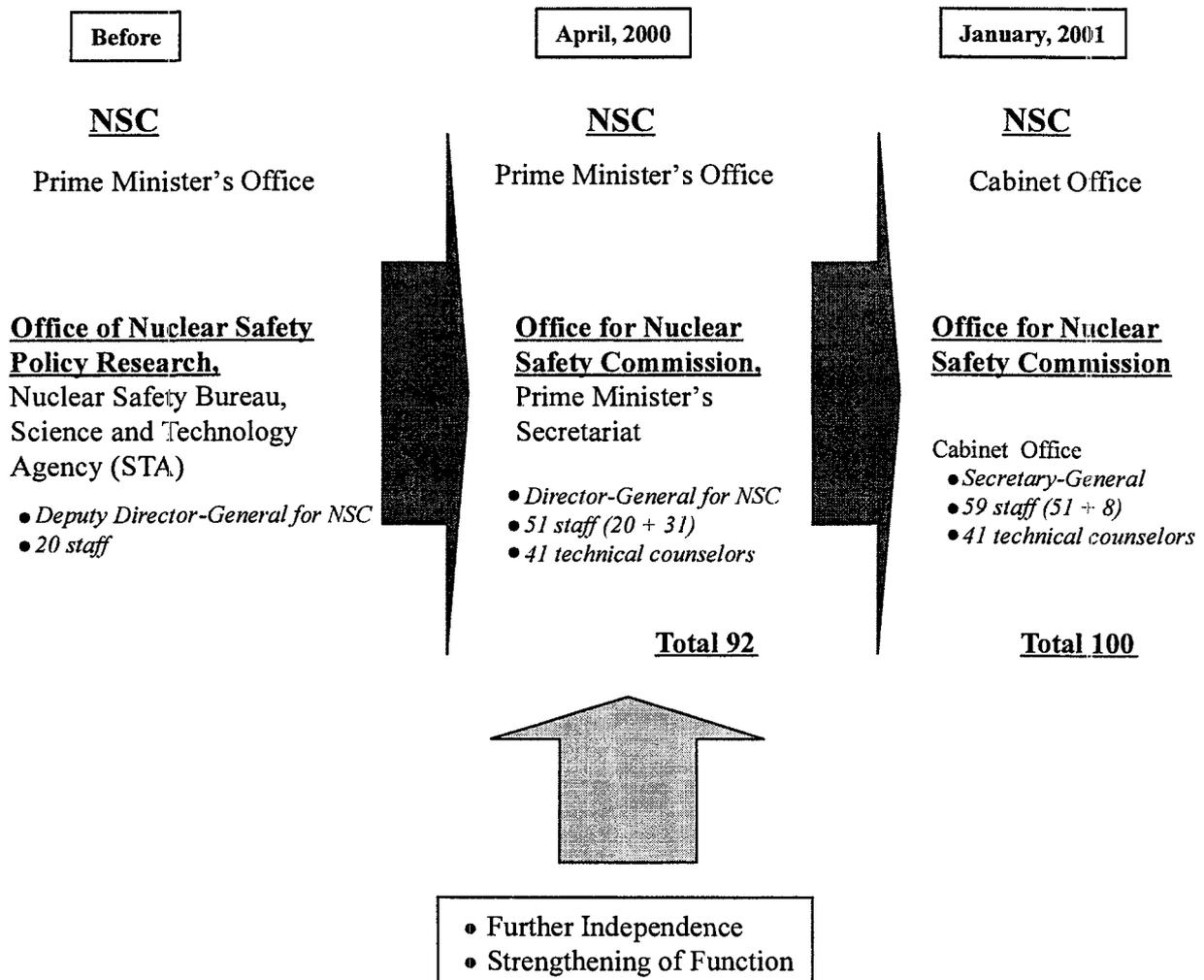


FIG. 2. Reinforcement of Nuclear Safety Commission (NSC).

2. NUCLEAR SAFETY REGULATION AFTER THE JCO ACCIDENT

The JCO criticality accident was the worst one in Japanese history of development and utilization of nuclear energy. Two workers directly dealing with the Uranium solution died of acute, excess radiation exposure.

The investigation committee of NSC found that the direct cause of the accident was infringement of rules and procedures for nuclear criticality safety by the workers dealing with the solution. However,

the committee also pointed out several underlying factors leading to the accident. First, safety management system of the JCO was incomplete, and safety culture was not rooted in the company. Second, nuclear safety education and training was not sufficiently given to the workers. Third, government's inspection function was not enough for fuel fabrication facilities.

2.1. Reinforcement of safety regulation

In responding to lessons learned from the accident, the amendment to the Law on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors was proposed by the Cabinet, and enacted by the Parliament in December 1999, to reinforce nuclear safety regulations. The amendment got effective on July 1, 2000.

The reinforced regulations include, among other, a) periodic inspection of fuel fabrication plant; b) inspection of state of observance of safety rules and procedures; c) stationed nuclear safety inspectors; and d) effective safety education and training.

a) Periodic inspection of fuel fabrication plant

METI shall carry out periodic inspection of fuel fabrication plant once a year to ensure that safety and performance of the plant is maintained. The inspection was carried out for all the six fuel fabrication plants (including two enrichment plants) through November to December last year and their safety and performance was satisfactory.

b) Inspection of state of observance of safety rules and procedures

METI and MEST shall carry out inspection of the state of observance of the safety rules and procedures in nuclear facilities under their regulatory responsibility four times a year. The safety rules and procedures are to be set out by licensees and approved by the government, and provide for, among other, operators' in-house organizational structure and responsibility for nuclear safety, operational rules and procedures for equipment of safety significance, and education and training of workers about nuclear safety. Three rounds of the inspection were carried out for eight fuel cycle facilities by the end of March, and no infringement of the safety rules and procedures were found.

c) Stationed nuclear safety inspectors

METI and MEST shall station 100 nuclear safety inspectors at major nuclear facilities, for effective implementation of the inspection.

d) Effective safety education and training

Nuclear operators shall provide their employees with substantial safety education and training, and specify program development and content of safety education and training in their safety rules and procedures.

2.2. Administrative punishment of the JCO

It was found that JCO committed a severe infringement against the Law on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors, and STA revoked, after a public hearing from the company, its license for fuel fabrication business on March 28, 2000. It was the most serious administrative action in such a case. Thereafter, JCO transferred uranium material for LWR fuel (low-enriched uranium hexafluoride and uranium dioxide powder) to other fuel manufacturers. JCO is intent on preserving its used facilities and radioactive waste safely. For the sole purpose, JCO is granted permission of uses of nuclear materials, under the supervision by MEST.

2.3. Safety review guide for fuel fabrication of enriched uranium

NSC pointed out, as a lesson from the JCO accident, that a separate safety review guide was absent for fuel fabrication facility dealing with uranium of more than 5% enrichment. NSC established safety review guide for fuel fabrication business dealing with enriched uranium of 5-20% last September.

The review guide requires, among other, that criticality accident be taken into consideration with respect to siting of the facility, that criticality control of uranium solution be, as a principle,

accomplished geometrically for any concentration. It also requires that the facility is equipped with criticality alarm, and when necessary, with counter measures to criticality accident.

3. AGENDA FOR ANIS'S FUEL CYCLE REGULATORY ACTIVITIES

ANIS is committed to enforce the reinforced regulation effectively and efficiently. In addition, it is going to be prepared for, in its capacity of safety regulatory authority, future development of Japanese fuel cycle activities, including commissioning of JNFL Rokkasho reprocessing plant and possible application for licenses for JNFL MOX fabrication plant and for spent fuel interim storage facilities.

In carrying out its regulatory function with respect to fuel cycle facilities, ANIS is going to pay attention to the latest technology and relevant knowledge and regulatory experience, both in Japan and abroad. It will also ensure coherence with regulation of power reactors, where sophistication of regulatory approach is preceding, as well as be aware of technical difference between fuel cycle facilities and power reactors.

The preparation in view of future development is ongoing with expert advice from the Nuclear Fuel Cycle Safety Subcommittee of the Nuclear and Industrial Safety Subcommittee.

3.1. JNFL Rokkasho reprocessing plant

Construction work of the reprocessing facility, whose start of operation is expected in July 2005, is in progress; 63% of the construction has been completed at the end of this March. The spent fuel storage pool has already got passed pre-service inspection in December 1999, and it began to receive spent fuel from power reactors after the JNFL's Safety Agreements with Aomori Prefecture and Rokkasho-mura and adjacent localities were concluded November last year.

Water test has begun in head-end process building in April. This means that the plant is getting into commissioning stage. Accordingly, pre-service inspection by regulatory authority is going to shift its weight more on performance and technical specification of the plant than on construction and manufacturing of building and equipment. ANIS is also to confirm, during the course of commissioning stage, whether JNFL's program for active test is adequate in terms of safety. It would be important that these regulatory activities are undertaken so that JNFL be closely acquainted with the plant, and JNFL's technical expertise are fully developed, in terms of quality and quantity of operators and other technical staff, for the operation of the plant.

3.2. JNFL MOX fuel fabrication plant

JNFL expressed its intent November last year that it will enter into MOX fuel fabrication business, responding to request from Japanese electric utilities. The company has a plan to construct and operate a MOX fuel fabrication plant for Japanese customers with the capacity of 130ton/year, and it plans to begin MOX fuel production three to four years after the operation of reprocessing plant.

NSC has begun discussion this January to establish a safety review guide for MOX fuel fabrication plant. ANIS, closely following the deliberations on the safety review guide, is going to prepare specific technical criteria and other technical material required for the safety examination of possible application for license.

3.3. Interim Storage of Spent Fuel

It is foreseen that about 7,700 tons of away-from-reactor spent fuel interim storage capacity is required in Japan by 2010. The Law on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors has already been amended to incorporate the regulation of interim storage business, and technical specification has also been established for detailed design and construction method.

NSC has begun discussion this January to establish a safety review guide for spent fuel interim storage facility. ANIS, closely following the deliberations on the safety review guide, is going to prepare

specific technical criteria and other technical material required for the safety examination of possible application for license.

3.4. JNC Reprocessing Plant in Tokai-mura

After the three and a half years of shut-down due to the fire and explosion accident in its low-level radioactive waste treatment facility, Japan Nuclear Cycle Development Institute resumed operation of its reprocessing plant in November last year, having gotten consent from Governor of Ibaraki-ken and Mayor of Tokai-mura.

The plant will have reprocessed 32 tons of spent fuel since its resumption by the end of June, and total amount of reprocessed fuel since its operation in 1977 will be about 1000 tons.

During the shutdown period, JNC reviewed safety of the reprocessing plant, and completed improvements to the plant, taking into account relevant knowledge and experiences and lessons learned from the fire and explosion accident and from the JCO criticality accident. Both STA and NSC concluded last spring that the review and the improvement of safety measures were appropriate. The plant also got passed its thirteenth periodic inspection at the end of July. The consent of the Governor and Mayor was granted after careful consideration of the resumption from safety and other viewpoints in the Governor's advisory body.

During the course of the consideration, it was concerned that the design of the plant was out-of-date and its equipment might suffer from aging. Although the sound state of the plant had been confirmed through the periodic inspection, in order to cope with the concern, JNC has been committed to periodically review safety of the reprocessing plant, and the ANIS is to confirm whether the review is adequate. The viewpoint and method for the safety review is being developed.

4. CONCLUSION

JCO criticality accident led to reinforcement of safety regulation more for safety management in operational stage of nuclear facilities rather than for design and construction stage. On the other hand, new safety regulatory structure for whole spectrum of energy-related nuclear facilities is in place.

In these circumstances, safety regulation of fuel cycle activities has to seek more effectiveness and efficiency, as well as fully prepared for future development in fuel cycle activities. The foreseen development include commissioning of JNFL Rokkasho reprocessing plant and possible application for license for JNFL MOX fabrication plant and for spent fuel interim storage facilities.

In these efforts, ANIS is going to pay attention to the latest technology and relevant knowledge and regulatory experiences, both in Japan and abroad. It will also ensure coherence with regulation of power reactors, where sophistication of regulatory approach is preceding, as well as be aware of technical difference between fuel cycle facilities and power reactors.