

Japan's Nuclear Safety Regulation after the Fukushima Accident : Regulatory Framework Changes and Current Restart Status of NPPs

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1. Introduction

On March 11, 2011, the world experienced the second INES level 7 accident known to be the Fukushima Daiichi nuclear disaster (hereinafter referred to as the "Fukushima accident"). Considering that all INES accidents above level 5 occurred before the 1990s, the Fukushima accident of 2011 brought tension and immense changes throughout the global nuclear framework.

International organizations such as the IAEA has published the "IAEA's report by the Director General on the Fukushima Daiichi accident", which identified over 100 observation and lessons from the Fukushima accident. Moreover, the OECD/NEA published "The Fukushima Daiichi Nuclear Power Plant Accident: OECD/NEA Nuclear Safety Response and Lessons Learnt" and the "Five Years after the Fukushima Daiichi Accident: Nuclear Safety Improvements and Lessons Learnt" to emphasize the importance of global response and to identify and follow-up the lessons learnt from the Fukushima accident.

Accordingly, Japan, the country of Fukushima, has been trying to recover from their disasters in various ways. This paper aims to review Japan's regulatory framework changes and how they have affected the current status of Japanese nuclear power plants.

2. Regulatory Framework Change

2.1. Existence of Multiple Regulatory Bodies

After the Fukushima accident, Japanese public were against on restarting their nuclear power plants. In addition to the public distrust, there were also criticisms to the Japanese regulatory system. The two major problems that were criticized were regarding responsibility and independency.

First, there was an ambiguity regarding the regulatory responsibility. Before the Fukushima accident, two cabinet ministries were in charge of regulating nuclear facilities. The Ministry of Education, Culture, Sports, Science and Technology (MEXT) regulated research reactors, safeguards, radioactive isotopes, etc., and the Nuclear and Industrial Safety Agency (NISA), which was established as a special organization under the Ministry of Economy, Trade and Industry (METI), ensured the safety of commercial reactors, nuclear cycle facilities, etc. Furthermore, the Nuclear Safety Commission (NSC) under the Cabinet Office was also

available to double check the safety examinations of NISA and MEXT. Moreover, the Atomic Energy Commission (AEC) was responsible for matters of nuclear security [2]. Such complicated regulatory system brought the controversy of whom are to be primarily responsible for nuclear safety.

Second, the lack of independency of regulatory body was criticized. The primary agency in charge of commercial reactor regulation was NISA under the METI. However, METI was also responsible for utilizing and promoting nuclear energy. In other words, while METI was in charge of regulating commercial nuclear power plants, on the other hand, had been promoting the use of nuclear energy. Thus, due to the conflict of interest, there were criticisms that NISA could not successfully perform to its utmost as a nuclear watchdog and the possibilities of having biased nuclear safety policies arose.

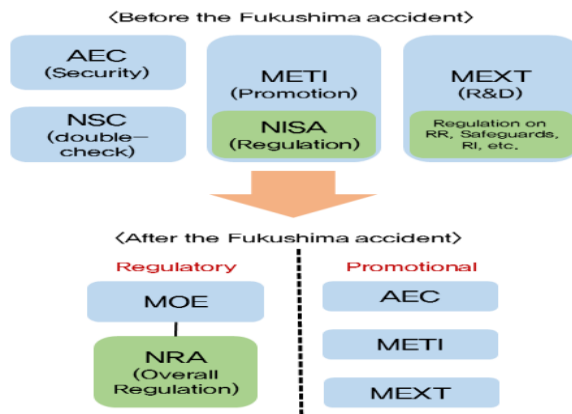
The criticisms mentioned above have also been indicated in the 2007 International Regulatory Review Service (IRRS) Report to Japan that the role of current regulatory bodies should be clarified [1].

2.2. Creation of the New Regulatory Body

Government organizations and experts lost public trust due to such complicated regulatory framework/organ, and thus the reformation of the Japanese regulatory framework was inevitable. On September, 2012, in order to separate promotion and regulation of nuclear energy and to unify works related to nuclear safety regulation, the NSC and NISA have been abolished and the Nuclear Regulation Authority (hereinafter referred to as the "NRA") was newly established as an external bureau of the Ministry of the Environment (MOE).

The creation of the new single regulatory body was the first step of the reformation after the Fukushima accident. Likewise, this rapid creation of the regulatory body was also mentioned in the 2016 IRRS Report to Japan. The report commented that the 'the prompt establishment of a legal and governmental framework supporting a new independent and transparent regulatory body with increased powers' is to be considered as a Good Practice [6].

Fig. 1. Reform of the Nuclear Regulatory Body



2.2.1. Core Values and Principles

NRA’s mission is to protect the general public and the environment through rigorous and reliable regulations of nuclear activities. To accomplish this mission, the NRA established five guiding principles for their activities:

- (1) Independent Decision Making
- (2) Effective Actions
- (3) Open and Transparent Organization
- (4) Improvement and Commitment
- (5) Emergency Response

2.2.2. Organization

The NRA has authority to establish NRA Ordinance to implement laws and Cabinet Orders, and is composed of the Chairman and four Commissioners whom are appointed by the Prime Minister with the consent of the Diet. The terms of their office are five years but may be reappointed. The NRA Chairman has the authority to appoint the staffs of the Secretariat of the NRA whom are central government officials. Soon after their establishment, the number of staff in NRA was 473. In 2014, Japan Nuclear Energy Safety Organization (JNES), technical supporting organization for NISA, merged into the NRA and its staff number rose to about 1000. NRA’s current staff number is 1250 including 330 part-time employees. Moreover, NRA’s yearly budget increased from 37.8 billion yen in 2013 to 57.7 billion yen in 2016 [3], [5].

2.2.3. Tasks

NRA is established to ensure nuclear safety of Japan and thus has the right to give permission for construction and review planned nuclear power plants and to confirm their safety. Furthermore, NRA can regulate and inspect nuclear-related activities and the physical protection of specified nuclear fuel materials. Also, it has the right to issue approvals of the design and construction of facilities, and has the authority to revoke

Reactor Installation Permits or suspend the use of such facilities.

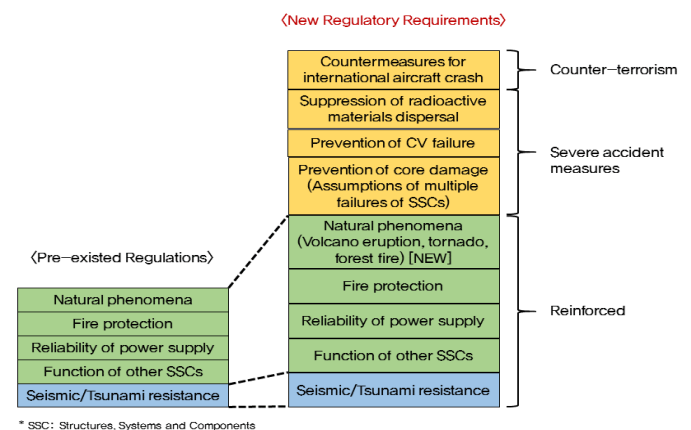
2.3. New Regulatory Requirement

Before the Fukushima accident, the regulatory requirement for securing safety was based on the regulatory requirements that were specified in the Reactor Regulation Act or the Electricity Business Act of Japan. Such requirement covered areas of human factors, quality assurance, safety assessment, radiation protection, design of nuclear power plants, etc.

After the Fukushima accident followed the enactment of the establishment of NRA and the revision of the Reactor Regulation Act. Consecutively, the discussion for the new regulatory requirements also began. By November, 2012, officials of the NRA Secretariat and JNES held five meetings discussing the creation of the new regulatory requirement. As a result, NRA established the new and revised regulatory requirement known to be the “New Regulation Requirement” and its purpose is to establish the most solid regulation system in the world. Being incorporated with the latest international knowledge, experience and the IAEA safety standards and guidelines, the New Regulation Requirement has been enforced from July, 2013.

The New Regulatory Requirement is composed of not only the old nuclear safety activities before the Fukushima accident, but also reinforced and newly added requirements. The NRA has explained that the main points of the New Regulatory Requirement are (1) strengthening countermeasures against severe accidents; (2) adoption of the latest technical knowledge and introduction of a backfit system to which even already authorized nuclear facilities will be also required to confirm; (3) the introduction of an approval system for the extension of operational periods, and (4) integration of regulations on power reactor into the Reactor Regulation Act.

Fig. 2. Outline of New Regulatory Requirements



* SSC: Structures, Systems and Components

Ever since the enactment of the New Regulation Requirement, existing nuclear facilities including

nuclear power plants and fuel facilities should apply for an examination known to be the Conformity Review. From this review, the licensees will submit applications to obtain authorization based on the back-fitting system for their operation of reactors. Through the Conformity Review, the NRA will approve Reactor Installation Permit, Construction Plan and Operational Safety programs to the licensees, and such reviews are to be conducted parallel with one another. Also, Conformity Reviews are implemented through Examination Meetings which are open to the public through attendance and online broadcasting system.

Additionally, the operational periods of Japanese nuclear reactors have been changed. Previous to the Fukushima accident, it was supposed that plants could be operated safely for around 60 years and every reactors were required to conduct technical evaluation within 30 years after commissioning and to re-evaluate its status every 10 years since then. After the Fukushima accident, as prescribed in the amended Reactor Regulation Act, the period of operation has been set to 40 years from the date of Pre-service Inspection approvals. However, with the approval from the NRA, each reactors may be extended once for less than 20 years of period [4], [5].

3. Current Restart Status of NPPs

As a result, the operation status of Japanese nuclear power plants have also changed. All 48 commercial power reactors in Japan have stopped its operation after the Fukushima accident, and all of them have been subjected to take the Conformity Review by the NRA to re-start their operation. Starting with 10 units from 5 different sites on July 8, 2013, the licensees have submitted applications for the Conformity Review for 26 units from 16 sites by the end of March, 2016 [5].

By February, 2017, total of 12 reactors have been approved by the NRA to meet the New Regulatory Requirements. The reactors that have acquired the basic design approval (Reactor Installation Permit) are as follows:

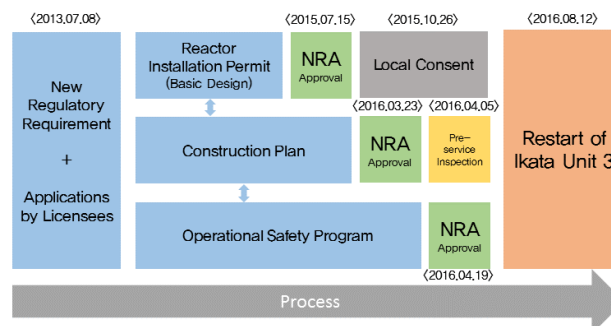
Table 1: Reactor Installation Permit Approval Status

#	Name of the NPP	Receipt Date	Completion Date
1	Ohi Unit 3/4	2013.07.08	2017.02.22
2	Takahama Unit 3/4	2013.07.08	2014.12.17
3	Ikata Unit 3	2013.07.08	2015.07.15
4	Sendai Unit 1/2	2013.07.08	2015.05.27
5	Genkai Unit 3/4	2013.07.12	2017.01.18
6	Mihama Unit 3	2015.03.17	2016.10.05
7	Takahama Unit 1/2	2015.03.17	2016.02.24

Nevertheless, although acquiring approval of the Reactor Installation Permit shows that the reactor is compatible with the New Regulatory Requirement, it does not direct to restarting of the reactor. Additional

approvals of Construction Plan, Operational Safety Program and Pre-service Inspections must be also done in order for commercial operation to start. Furthermore, although not a legal requirement, the consent from local residents should likewise be considered. An example of the restarting process is as follows:

Fig. 3. The Restart Process of the Ikata Unit 3



Up to March, 2017, there are 3 nuclear power plants, Sendai Unit 1, 2 and Ikata Unit 3, which are in commercial operation.

4. Conclusion

Every international organizations and countries have faced challenges due to the Fukushima accident. However, not as much as the country of its origin. This paper has summarized major changes in the reformation of Japan's nuclear regulatory framework and has shown how it has been applied to the Japanese nuclear power plants.

First, the new independent regulatory body, NRA, was created. The creation of NRA unified the regulatory tasks which were diffused among different governmental organizations.

In addition, the new and reinforced regulatory requirement, known to be the New Regulatory Requirement, was enacted. New and reinforced countermeasures against severe accidents, introduction of backfit system, operational periods, etc. are the main topic that are discussed in the New Regulatory Requirements.

Lastly, the New Regulatory Requirement has been applied to formulate the current status of the Japanese nuclear power plants. Currently, there are 12 reactors that have been approved to meet the New Regulatory Requirements and 3 of them in commercial operation.

To summarize, Japan has reformed all aspects of their regulatory infrastructure from reshaping regulatory organizations to fortifying its regulatory requirements. For embarking countries of nuclear energy that wish to create, strengthen or assess its regulatory infrastructure, Japan could possibly be a case study model.

REFERENCES

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