Licensing Process for Nuclear Power Plants in India and a comparative study with Korea and USA

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1. Introduction

India is today on the threshold of a large expansion of its nuclear power programme. There are 20 units in operation and 7 units in various stages of construction. Further expansion of nuclear power generation capacity by 2020 is planned.

Licensing process of Nuclear power plants plays an important role in ensuring safety of nuclear power plant. The licensing process is also important to investors which are mainly concerned with an expeditious process. An efficient licensing process with different licenses and prescriptive conditions is important in this respect. The licensing steps are of particular importance. They organize the necessary public participation processes and ensure that national conditions are met.

In this study the licensing process of Indian Nuclear power plants is compared against the licensing process of USA and Korea.

2. Licensing Process of Nuclear Power Plants in India

The Atomic Energy Regulatory Board (AERB) issues license for nuclear power plants in various stages as per the AERB Safety Code [1]. AERB Guide on Consenting Process for NPPs [2] provides detailed technical safety requirements on these aspects. These requirements are in line with safety standards of IAEA [3] and other international guidelines. The safety review process for these stages of a nuclear power project is briefly described below.

2.1. License for Siting

Evaluation of the proposed site is carried out as per the requirements laid down in AERB's code on Siting [4]. A detailed report on site selection is submitted by the licensee to AERB. In addition to review by AERB, the report is also cleared by Ministry of Environment and Forests and statutory bodies like Central and State Pollution Control Boards.

2.2. License for Construction

The Licensee submits a Preliminary Safety Analysis Report to AERB for review to grant the License for Construction. License for construction of projects is given in three sub-stages; Start of excavation; First pour of concrete, Start of erection of major equipment. Each of these sub-stages has their relevant review requirements and clearance for a particular sub-stage is given based on the completion of design safety review relevant to that sub-stage.

2.3. License for Commissioning

License for Commissioning of projects is also given in sub-stages; Commissioning of the Coolant and Moderator system with light water, Hot Conditioning of Primary Heat Transport System, Initial Fuel Loading, Charging Heavy Water to the system, First criticality of the reactor.

After first criticality and completion of reactor physics related tests, reactor power is raised in steps to full power with safety review at each stage.

2.4. License for Operation

The License is granted after review of NPP's performance at rated power within the commissioning consent. The applicant is required to submit a safety analysis report (Final) and the review process is carried out in accordance to the AERB code [5] and guide on operation [6]. As per Atomic Energy (Radiation Protection) Rules, 2004, the license for operation can be issued for a maximum period of five years.

After the issuance of license for operation, AERB establishes the system of regulatory review periodic regulatory inspections.

2.5 Safety review for Renewal of License

The License for operation has to be renewed as per prescribed guidelines for Periodic Safety Review. These safety reviews are of two types: a limited scope safety review called Application for Renewal of Authorization every 5 years and a very comprehensive full scope review called Periodic Safety Reviews every 10 years. Towards the end of License period, the Licensee has to submit an application to provide assurance to AERB that the NPP as a whole continues to be capable of safe operation.

3. Licensing Process of Nuclear Power Plants in USA

In 1989, the NRC established new alternatives for nuclear plant licensing, which describes a combined

licensing process, an early site permit process, and a standard plant design certification process.

3.1. Combined Operating License

A combined license authorizes construction and conditional operation of a nuclear power plant. This approach allows early resolution of safety and environmental issues. In addition, the NRC can perform a pre-application review before submittal of a license application. The process for this review is informal and involves the public.

If the application references an early site permit, the applicant must demonstrate that the design of the plant is compatible with the early site permit.

After issuing a combined license, the NRC verifies that the licensee has completed the required inspections, tests, and analyses, and that the acceptance criteria have been met before the plant can operate. NRC publishes a notice providing an opportunity for members of the public to participate in a hearing conducted by the Atomic Safety and Licensing Board.

3.2. Early Site Permit

Under the NRC's regulations [7], the agency can issue an early site permit for approval of one or more sites separate from an application for a construction permit or combined license. Such permits are good for 10 to 20 years and can be renewed for an additional 10 to 20 years.

The early site permit also has provisions for limited work authorization to perform non-safety-related site preparation activities. After the NRC staff and ACRS complete their respective safety reviews, the NRC issues a Federal Register notice announcing a mandatory public hearing. In a public meeting, the ACRS reviews each application for an early site permit, together with the NRC staff's related safety evaluation report.

4. Licensing Process of Nuclear Power Plants in Korea

The Licensing process of Korea[8] mainly consists of two stages: Construction Permit (CP) and Operating License (OL).

4.1. Construction Permit

Construction Permit is issued to an applicant, the excavation of a reactor site can commence as the first step in construction phase of the nuclear power plant. Before the issuance of the CP, a limited civil engineering procedure can be carried out with prior authorization through a site approval system. To start the construction, applicant must receive the approval of the government.

4.2. Operating License

OL can be issued when the construction activities are completed and all of the systems and components are ready to operate in a safe manner. Following this, the nuclear fuel can be loaded into the reactor and a series of core physics tests and power ascension tests can start. The safety review for an OL is conducted to confirm that the final design of the nuclear installation is in conformity with the relevant regulatory requirements and technical guidelines and that the nuclear installation may continue to operate throughout its lifetime.

5. Conclusion

The legal process followed for licensing nuclear power plants is critical to ensure the safety of nuclear power plants. The proper assessment of nuclear plants relies upon a regulatory organization that splits responsibilities and accountabilities in its licensing process.

Alongside the IAEA recommendations, most countries have developed their own licensing processes. Even though most of them put intermediary hold points at each stage, it is interesting to examine the different licenses put in place.

In case of India, it is seen that the licensing process involves many check points and separate license for each of the stages whereas in the Korean case there are two major licenses and only single license in the American case.

For US and Korea plant design can be licensed independent of its construction while in the Indian case, the design of each project is reviewed.

The combined operating license is issued for a period of 40 years in case of US whereas in India the operation license when issued is only for five years and there is a programme of license renewal, which includes PSRs.

REFERENCES

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