

## Jordan Reactor of Training and Research (JRTR) Licensing Process and Various Challenges of Nuclear Power Project in Jordan

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### 1. Introduction

In Jordan, Prior to 2001, nuclear activities were handled as a directorate in the Ministry of Energy & Mineral Resources, in 2001, a new law of Nuclear Energy and Radiation Protection (29) was promulgated to substitute for the first law (14/1987), Under this 2001 law the Atomic Energy Commission (JAEC) was established to undertake both promotion and regulation of nuclear applications in the country In July 2007, the 2001 law was modified and divided into two laws allowing the creation of two independent entities:

Nuclear Energy Law (42/2007) established the Jordan Atomic Energy Commission (JAEC) and the Nuclear Safety, Security and Radiation Protection Law (43/2007) established the Radiation and Nuclear Regulatory Commission (JNRC)

In Feb. 2008 the parliament adopted a further revision to law (42/2007 to upgrade JAEC to the level of a Commission with five commissioners reporting to the PM with the mandate to manage the nuclear program

### 2. Jordan law regulation and licensing process

Legislation and regulation in Jordan

In correspondence with Article (3) of the Jordanian Radiation Protection and Nuclear Energy Law, number (29), year 2001, the Jordan Nuclear Energy Commission was established. Later in 2007, Radiation Protection, and Nuclear Safety and Security Law, No. (43) For the year 2007, was issued initiating Jordan Nuclear Regulatory Commission.

The hierarchy documents in Jordan Laws:

- ① regulation for the act
- ② guide articles

Radiation Protection, and Nuclear Safety and Security Law, No. (43) for the year 2007, provides to regulate and control the uses of nuclear energy and ionizing radiation, and work to protect the environment and human health and property from the hazards of pollution and exposure to ionizing radiation, as well as to ensure the availability of the conditions and requirements of public safety and radiation protection, safety and nuclear security.

The Regulation of the Act provides the particulars including the detailed procedure, the format of documents, and technical standards, as entrusted by the same Act and the same law, the guides prescribe specific issues including regulatory requirements and

technical standards, as entrusted by the same Act, the same Regulation.

Hashemite kingdom of Jordan has two bodies (JNRC and JAEC) concerned with nuclear activities.

The licensing system in JORDAN is using two steps, the first one is construction permit (CP) and the second one is operating license (OL). We admit and use the Korean regulation system.

#### 2.1. Construction permits for research reactor

The person who wishes to construct RRs and related facilities in our case JAEC, shall obtain permit from the JNRC, so that, in order to obtain the CP then JAEC shall fill an application for the construction permit (CP), it's should be accompanied by most important documents such as preliminary safety analysis report (PSAR), quality assurance program (QAP) for design and construction, radiation environmental report (RER) and description on technical capability for research reactor installation and other document.

RER, Radiation environment report shall include environmental status in adjoining areas of reactor facilities and the sites.

Preparation of PSAR According to the same article in the Enforcement Regulation, PSAR shall include all safety features Information on the site of reactor facilities and Preparation for QA where the Research reactor design, construction process and organizations that will involve in ensuring the all quality activities.

The application for CP shall go under safety review to ensure that the site and preliminary design of the nuclear installation are consistent with the relevant regulatory requirement and guideline.

The safety review of CP application includes safety review of the principle and concept of reactor facility design, the evaluation environmental effects resulting from the construction.

JNRC and KINS "according to the agreement was made may/2011" are the organizations responsible to carry out the safety review of the CP application of RR, based on the result; the JNRC shall issue the CP certificate.

In case if the permit holder wishes to make some modification to the already approved document for CP, he shall fill an application for modification approval to the JNRC.

#### 2.2 Operation license for research reactor

The person who wishes to operate RRs and related facilities, shall obtain a license from the JNRC, so that, in order to obtain the OL he shall fill an application for the operation license (OL), it's should be accompanied by documents such as final safety analysis report

(FSAR), technical specifications for operation, Quality Assurance Program for operation, Radiation Environmental Report (RER), radiological emergency plan, description on the technical capability for reactor operation, description on nuclear fuel loading plan and description of the technical background and verification method for the emergency operating procedure and other document.

Preparation of RER, the radiation environment report shall include environmental status in adjoining areas of reactor facilities and the sites.

Preparation of quality assurance, the report shall contain the same content of QA program for construction.

Preparation for technical specifications provides important information regarding to reactor operation aspects.

Preparation for The final safety analysis report FSAR contains design details and safety functions of all structures, systems, components.

Preparation for emergency plan, the radiation emergency plan includes the plan for the emergency response action in order to protect the workers and public from nuclear accidents and minimize its impacts; The safety review of the application for an OL is conducted by KINS 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.

Based on the result of safety review by JNRC and KINS for the OL application, JNRC will issue the OL certificate.

In case if JAEC has to make modifications of the specifics for which the OL has been given, such as a change in the operational technical specifications or in the design that affects or may affect the safety of operating nuclear installations, it is necessary to obtain approval from JNRC for an amendment to the OL. The approval for an amendment to the OL follows the same in procedures as the application for CP. A safety review is to be conducted for the parts whose safety is affected or may be affected by the amendment to the OL.

### **3. Challenges of nuclear power project in Jordan**

Several challenges need to be addressed in order to develop Jordan's nuclear energy program:

1. Political environment and crises that around Jordan
2. Exploitation of Uranium
3. Human resources development
4. Choice of reactor technologies and implementation
5. Funding and financial resources
6. Fuel cycle and waste management
7. NGO's and anti-nuclear role

The Commission works to meet these challenges through measures including the study of forms of partnership between the government and the private sector and the use of an international nuclear operator

content of a record in nuclear safety and operational efficiency.

As well as efforts made to maximize the national interest of the uranium ores through the establishment of joint investment companies for the exploitation of these raw materials for local use and for export, in addition to dealing with various issues related to the nuclear fuel cycle and enrichment and waste. At the level of human resources, the Authority has begun to invest in the training of scientific cadres and specialized engineers and technicians in the various courses, also served on the investment in studies and in the various requirements of the infrastructure necessary for the start of this ambitious national project in preparation for the challenges of the twenty-century ahead.

### **4. Conclusions**

The licensing is the main step for the reactor operation and there are two sides in this process for the JRTR so the main dependence for licensing process of the JRTR comes as a partnership between KINS and JNRC

### **REFERENCES**

- [1] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of research reactor, IAEA, NS-R-4.vienna (2005)
- [2] Sub Lee Song, How to Increase Public Acceptance of Nuclear Power (In View of Communication Problem), 2010, KINS
- [3] INTERNATIONAL ATOMIC ENERGY AGENCY, Licensing process for nuclear installations, safety standards series no. SSG-12, Vienna, 2010
- [4] US NRC, NUREG 1537, Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors, 1996
- [5] Dr.KunMo Chung, Nuclear power and public acceptance more emphasis is being placed on public acceptance than ever before, IAEA BULLETIN, 2/1990