

TURKEY'S REGULATORY PLANS FOR FOR HIGH ENRICHED TO LOW ENRICHED CONVERSION OF TR-2 REACTOR CORE

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ABSTRACT

Turkey is a developing country and has three nuclear facilities two of which are research reactors and one pilot fuel production plant. One of the two research reactors is TR-2 which is located in Çekmece site in Istanbul. TR-2 Reactor's core is composed of both high enriched and low enriched fuel and from high enriched to low enriched core conversion project will take place in year 2005. This paper presents the plans for drafting regulations on the safety analysis report updates for high enriched to low enriched core conversion of TR-2 reactor, the present regulatory structure of Turkey and licensing activities of nuclear facilities.

1.Introduction

Turkey's energy is generated mostly from coal and natural gas powered reactors and hydroelectrical power. There exists no nuclear power plants in Turkey but Turkish Energy Ministry has some plans for having a nuclear power plant on the south side of Turkey in Akkuyu.

Turkey is a developing country and has three nuclear facilities. Two of these nuclear facilities are research reactors and one of them is the pilot fuel production plant. All these nuclear facilities are located in Istanbul.

Currently, there are two research reactors in Turkey, the TR-2 and the ITU-TRR. The TR-2 is located at the Çekmece Nuclear Research and Training Center (CNRTC). Its predecessor TR-1 was 1 MW open pool reactor, which went critical in 1962, but it was shut down in 1977. In 1980, it was upgraded to 5 MW and was given the name TR-2 and first went critical in 1981. A second research reactor, the ITU-TRR, at the Technical University in Istanbul, is operated by the Institute for Nuclear Energy. It is a TRIGA Mark II and has a steady state power of 250 kW and a pulsing power of 1200 MW. Construction started in March 1975, and first went critical in 1979.

The core of ITU-TRR is composed of %20 U-235 enriched fuel elements. The core TR-2 reactor is composed of both high enriched and low enriched fuel.

2.TR-2 Reactor

TR-2 is a 5 MW, pool type research reactor located in Çekmece Nuclear Training and Research Center.

TR-2 reactor is currently being permitted to operate up to 300 kW. The reactor is at the 13 rd cycle. TR-2 core consists of % 20 and % 93 U-235 enriched, Al clad U₃Si₂ fuel.

TR-2 reactor's licence renewal activities has been finished at TAEK Nuclear Safety Department. The reactor is permitted to operate up to 300 kW. In year 2005, the high enriched to low enriched core conversion is planned to take place under the Foreign Research Reactor Spent Nuclear Fuel Acceptance Program of United States. Therefore regulatory background is planned to be prepared for this conversion. The study on regulations include the planned Formatand Content of Safety Analysis Report and renewal of its chapters due to core conversion.

3.Licensing in Turkey

Turkey is a developing country which is a member of IAEA. The regulatory activities concerning nuclear installations in Turkey are within the responsibility of TAEK. Although it has nuclear facilities from the 1960s the regulations for licensing and safety of nuclear facilities are not sufficient for a regulatory body when compared to other Agency members. There exists limited number of regulations on nuclear safety. Considering status of national nuclear power programme, TAEK Department of Nuclear Safety formed a working group for modifying of existing and drawing up new regulations when necessary. Figure 1 presents the Proposed Regulatory Structure of Turkey.[1]

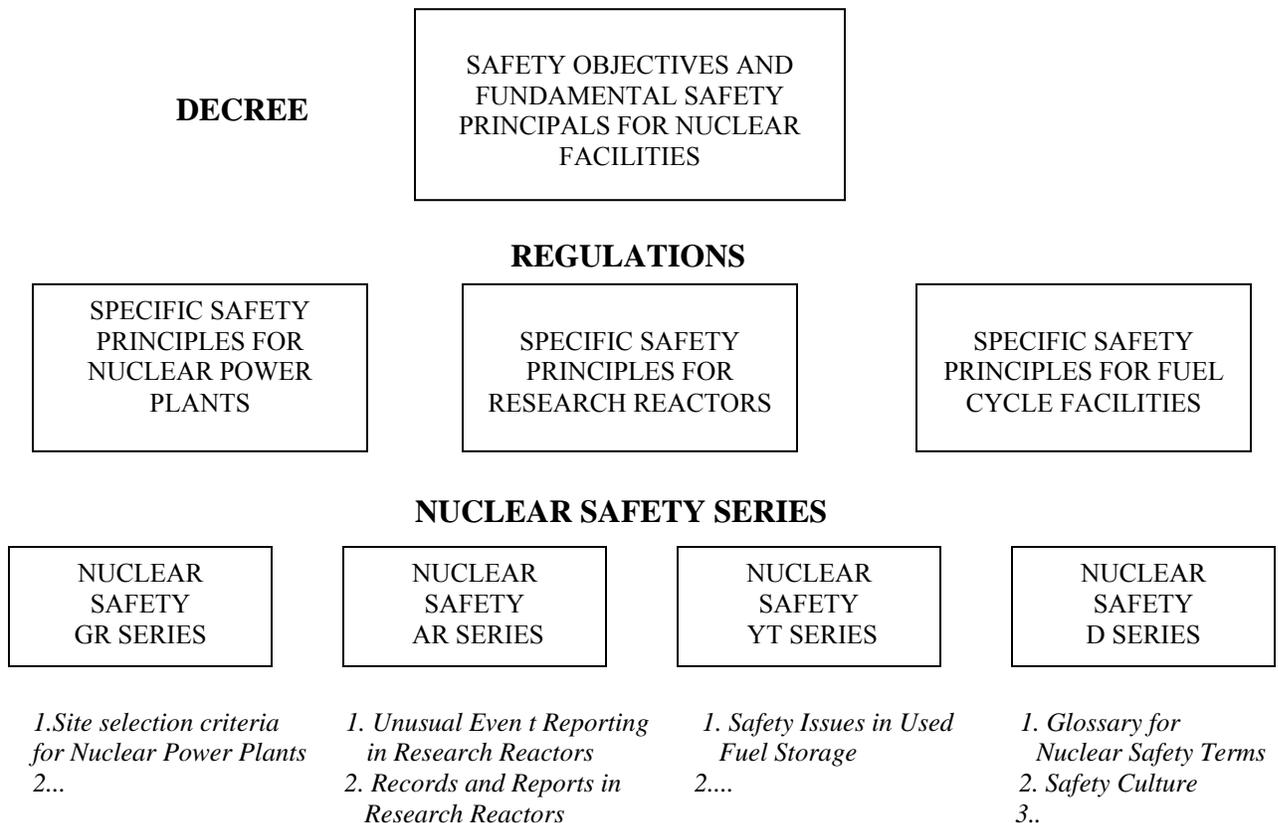


Figure 1. Turkey's Proposed Regulatory Structure

In this structure, safety objectives and basic principles, applicable to all nuclear facilities will be issued as a decree [2]. This decree will be supported with specific principles for different nuclear facilities to be drawn up in three regulations. The working group completed the work on the documents “Safety Objectives for Nuclear Installations”, “Fundamental Safety Principles for Nuclear Installations” from the regulatory structure and “Regulation for Preparation, Adoption, Entry into Force and Modification of Nuclear Safety Series Documents” as supplementary regulation. These documents were adopted by the decision making body, Atomic Energy Commission of TAEK. Hence these documents gained a legally binding status prior to be issued as a regulation.

The group is currently studying on “Format and Content of Safety Analysis Report For Research Reactors” and “Specific Safety Principles for Research Reactors”.

4. Notes about Draft Document : Format and Content of Safety Analysis Report

Among the Safety Series Documents in AR Series, two have reached the final draft from and waiting for the approval of Atomic Energy Commission of Turkish Atomic Energy Authority [3]. Those are “Unusual Event Reporting” and “Records and Reports” in Research Reactors. What is meant by final draft form for a document is the final state it reaches after being evaluated by other technical departments of TAEK and the operating organizations. Especially the ideas of operating organizations play an important role in evaluating the content of documents.

Two other documents in AR Series are being evaluated at Nuclear Safety Department. Those are Inspection Activities in Research Reactors and Format and Content of Research Reactors. Since safety evaluations and re-licensing activities of TR-2 research reactor has newly ended, Nuclear Safety Department started to prepare a document for the licensees.

Format and Content of Safety Analysis Report of Research reactors is a document being prepared by considering the following references;

- IAEA Guidelines for the review of RR Safety
- IAEA Safety Guide 35 G-1
- IAEA Draft Safety Guide on Safety Requirements for RR, DS 272
- ANS Standard 15.21, Format & Content of SAR for RRs
- NUREG 1537 Regulatory Aspects and Safety Documentation of Research Reactors[4]
- Previous Safety Analysis Report prepared by the licensee

TAEK Nuclear Safety Department takes changes in core configurations as new arrangements in the existing chapters of the safety analysis report. If we look at the main titles of the draft document we see,

- Facility description and summary
- Site characteristics
- Structures, components
- Reactor and coolant system
- Engineered Safety Features
- I&C, Electrical Power Systems, Auxiliary Systems

- Radiation Protection Program and Waste Management
- Technical Specifications
- Accident Analyses
- Utilization, Conduct of Operations
- Decommissioning
- Some other important aspects for licensee

Among those chapters, three have the highest priority and needs to be updated due to a change in core configuration. Those are reactor, reactor coolant system and accident analyses. Description of the reactor chapter includes neutronic and thermal hydraulic descriptions and the types of fuel employed in the facility.

The four chapters of the SAR is of primary importance for nuclear safety. Those are reactor, reactor coolant system, technical specifications and accident analyses chapters. TAEK wants the updates of those four chapters prior to changes in core configuration. Therefore, the operating organization will present the updated forms of those four chapters before HEU to LEU core conversion of TR-2 reactor. The main points of the changes in those chapters are;

- The reactor chapter shall include new fuel properties and material property changes due to burnup and operating conditions
- The licensee will present the new core configuration and power peaking factors, reactivity changes, neutron fluxes, etc.
- The licensee shall provide the coolability of new core. The assumptions and calculations of Safety Limits, Limiting Safety System Settings and Operational Limits shall be specified by the licensee.
- Accident analyses shall be repeated for new core. If the maximum credible accident scenario and data of the old core configuration covers the new conditions, the licensee shall prove the case.

5.Future Plans

The document on Format and Content of Safety Analysis Report will be finished by the end of 2003 and will be presented to the operating organizations to be analyzed. Nuclear Safety Department is planning to re-structure all the documentation on Nuclear Safety. So, meetings and trainings will provide great inputs for preparation of documents.

X.References

- [1] Turkey's National Report submitted to the Convention on Nuclear Safety 2nd Review Meeting, April 2002
- [2] www.taek.gov.tr/ngd web site
- [3] Format and Content of Safety Analysis Report for Research and Test Reactors, TAEA Nuclear Safety Department, draft document.
- [4] NUREG 1537 Regulatory Aspects and Safety Documentation of Research Reactors