

## Roles and Responsibilities of TSOs in Strengthening the Design and Performance of NPPs.

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### **ABSTRACT**

The provision of effective technical support is essential to optimize the safe operation of nuclear power plants (NPPs) and to maximize their availability and productivity. Renewed interest in new reactor build programs, not only in countries with already established nuclear programs but also in many other countries with limited or no work force experienced in the design, licensing, construction and operation of nuclear power plants, has resulted in a need for technical, scientific and support organizations (TSOs) to support regulatory bodies in carrying out their mandated responsibilities.

The regulatory body must have adequate legal authority, technical and managerial competence, and human and financial resources to fulfill its responsibilities;

Governments and regulatory bodies thus have an important responsibility in establishing standards and establishing the regulatory framework for protecting people and the environment against radiation risks. However, the prime responsibility for safety rests with the licensee.

The TSAOs (Technical and scientific assistance organization) are expected to provide expertise, professional output, independent technical or scientific advice, competent judgment, services and assistance to the operating organization. (TSAO) can be established within or outside the utility that operates the plant, which can interface with various internal

### **KEYWORDS**

*TSOs, Responsibilities,  
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Internal TSAOs.*

and external organizations. All services and interfaces should be well defined and function effectively.

IAEA Safety Standard documents mentions that the prime responsibility for safety must rest with the person or organization responsible for facilities and activities that give rise to radiation risks. Additionally, the regulatory body shall obtain technical or other expert professional advice or services as necessary in support of its regulatory functions, but this shall not relieve the operating organization of its assigned responsibilities.

This paper discusses the Roles and Responsibilities of TSOs and TSAOs, in strengthening the safety of NPPs. This work focuses on the IAEA Safety Standard Documents, as references, and the experience of some countries. Comparative studies were performed to comply with current Egyptian situation..

## INTRODUCTION

**A** technical support organization (TSO) means an organization established (internally and/or externally) to provide support to the NPP regulatory organization in various areas, including specific research, engineering services, the development of technical improvements, legal advice, analysis and testing to support management decisions. Thus, the TSOs are expected to provide expertise, professional output, independent technical or scientific advice, competent judgment, services and assistance to the regulatory organization. The TSAOs, established within or outside the utility that operates the plant, interface with various internal and external organizations. All services and interfaces should be well defined and function effectively. In general:

- **A TSAO internal** to an NPP (or a fleet of NPPs) might have responsibilities ranging from mana-

gerial support activities to technical oversight of plant operations and performance, including maintaining the design bases and managing the configuration of the plant, and supporting near and long term programs, as well as day to day plant operation. These areas of support can be provided by various means, such as operation support, conducting quality surveillance on installed and procured items, safety inspections, assessment and qualification walk downs, design changes and design reviews, targeted maintenance, emission monitoring, testing, etc. In some plants, internal TSAO staff is grouped into a separate and independent organizational unit, while in others they are incorporated into a broader managerial structure, serving as task forces for achieving specific objectives.

- **External TSAOs** are organizations selected on the basis of competence and performance. They can be either large dedicated and multidisciplinary partners or contractors selected to fulfill highly specialized tasks under specific contractual agreements. At the receiving end, the owner/operator design authority should be tasked with the oversight and approval functions of any changes affecting safety, configuration, and performance or cost.

When a plant is being built, its design is an integrated process involving mainly external TSAOs that range from the reactor supplier and the architect engineer to the supplier and/or designers of individual components. The owner/operating organization is usually a customer of those entities but still bears the full responsibility for the correctness and adequacy of the design and configuration of the facility. In the case of newcomer countries, a mature internal TSAO is also needed as they deploy their new NPPs. Especially during construction and thereafter, gradually increasing the capacity of internal technical support may also be necessary to supplement and interface

with the external TSAOs. A competent internal and/or external TSAO can greatly support the nuclear program leaders, the appointed governmental organizations and other stakeholders to develop feasibility studies, to review site and environmental studies as part of the site selection process, and to provide all necessary information to support decisions, during the commissioning and operation phases.

To ensure that facilities are operated and activities conducted as to achieve the highest standards of safety that can reasonably be achieved measures have to be taken:

- a. To control the radiation exposure of people and the release of radioactive material to the environment;
- b. To restrict the likelihood of events that might lead to a loss of control over a nuclear reactor core, nuclear chain reaction, radioactive source or any other source of radiation;
- c. To mitigate the consequences of such events if they were to occur.

They provide the basis for requirements and measures for the protection of people and the environment against radiation risks and for the safety of facilities and activities that give rise to radiation risks, including, in particular, nuclear installations

#### ***Important Characteristics of Effective Regulatory Body***

- a) Independence from utilization or promotion organizations;
- b) Transparency to public and other stakeholders;
- c) Full authority and responsibility to make decisions on nuclear safety and security;
- d) Competency to perform regulatory activities including international obligations;
- e) Full authority to obtain information;

- f) Easy access to external support services and legal advice;
- g) Authority to cooperate with international stakeholders

#### ***IAEA Safety Standard***

***IAEA Safety Fundamental SF-1 (IAEA Fundamental Safety Principles, SF-1, Vienna, (2006)***

#### **Principle 1: Responsibility for Safety**

**The Prime Responsibility for Safety Must Rest With the Person or Organization Responsible for Facilities and Activities that Give Rise to Radiation Risks.**

Authorization to operate a facility or conduct an activity may be granted to an operating organization or to an individual, known as the licensee. The licensee retains the prime responsibility for safety throughout the lifetime of facilities and activities, and this responsibility cannot be delegated. Other groups, such as designers, manufacturers and constructors, employers, contractors, and consignors and carriers, also have legal, professional or functional responsibilities with regard to safety.

The licensee is responsible for:

- Establishing and maintaining the necessary competences;
- Providing adequate training and information;
- Establishing procedures and arrangements to maintain safety under all conditions;
- Verifying appropriate design and the adequate quality of facilities and activities and of their associated equipment;
- Ensuring the safe control of all radioactive material that is used, produced, stored or transported;
- Ensuring the safe control of all radioactive waste that is generated.

These responsibilities are to be fulfilled in accordance with applicable safety objectives and requirements as established or approved by the regulatory body, and their fulfillment is to be ensured through the implementation of the management system.

### **Principle 8: Prevention of Accidents**

#### **All Practical Efforts must be made to Prevent and Mitigate Nuclear or Radiation Accidents.**

The most harmful consequences arising from facilities and activities have come from the loss of control over a nuclear reactor core. Consequently, to ensure that the likelihood of an accident having harmful consequences is extremely low, measures have to be taken:

- To prevent the occurrence of failures or abnormal conditions (including breaches of security) that could lead to such a loss of control;
- To prevent the escalation of any such failures or abnormal conditions that do occur;
- To prevent the loss of, or the loss of control over, a radioactive source or other source of radiation.

*IAEA General Safety Requirement(GSR) Part1 (IAEA, Governmental, Legal and Regulatory Framework for Safety, Vienna, (2010)*

#### **Requirement 7: Coordination of Different Authorities with Responsibilities for Safety**

Where several authorities have responsibilities for safety within the regulatory framework for safety, the government shall make provision for the effective coordination of their regulatory functions, to avoid any omissions or undue duplication and to avoid conflicting requirements being placed on authorized parties.

#### **Requirement 11: Competence for Safety**

The government shall make provision for building and maintaining the competence of all parties

having responsibilities in relation to the safety of facilities and activities.

As an essential element of the national policy and strategy for safety, the necessary professional training for maintaining the competence of a sufficient number of suitably qualified and experienced staff shall be made available.

The building of competence shall be required for all parties with responsibilities for the safety of facilities and activities, including authorized parties, the regulatory body and organizations providing services or expert advice on matters relating to safety. Competence shall be built, in the context of the regulatory framework for safety, by such means as:

- Technical training;
- Learning through academic institutions and other learning centers;
- Research and development work.

*IAEA GSR Part 1 (Governmental legal and Regulatory Framework for Safety). (IAEA, Safety of Nuclear Power Plants Design, SSR-2/1, Vienna, (2012).*

#### **Requirement 20: Liaison with Advisory Bodies and Support Organizations.**

The regulatory body shall obtain technical or other expert professional advice or services as necessary in support of its regulatory functions, but this shall not relieve the regulatory body of its assigned responsibilities.

#### **Requirement 13: Provision of Technical Services**

The government shall make provision, where necessary, for technical services in relation to safety, such as services for personal dosimetry, environmental monitoring and the calibration of equipment.

Technical services do not necessarily have to be provided by the government. However, if no suitable commercial or non-governmental provider of the

necessary technical services is available, the government may have to make provision for the availability of such services. The regulatory body shall authorize technical services that may have significance for safety, as appropriate.

*IAEA Specific Safety Guides (SSG) – 12 (IAEA, Licensing Process for Nuclear Installations, SSG-12 (2010)*

### **Obligations, Roles and Responsibilities of the Applicant or Licensee**

The applicant or licensee has the following obligations:

- a) The applicant or licensee should have the capability within its own organization (either on-site or within the organization as a whole) to understand the design basis and safety analyses for the nuclear installation, and the limits and conditions under which it must be operated.
- b) The applicant or licensee should exercise control over the work of contractors, understand the safety significance of this work ('intelligent customer' capability) and take responsibility for its implementation.
- c) The applicant or licensee should have a design capability and a formal and effective external relationship with the original design organization or an acceptable alternative.

### **Responsibilities of Regulatory Body Concerning TSOs in Different Countries**

The provider of TSOs does not replace the regulatory body when providing support. In instances where the provider of TSOs support will need to interact with interested parties, it should be made clear that the regulatory body has approved such contact and that the regulatory body retains its responsibilities and makes the final decision.

### **Responsibilities of the Egyptian Regulatory Body (ENRRA)**

- a) The (ENRRA) shall set out procedures for meeting the requirements for the various stages of the licensing;
- b) shall review and assess the safety case and the environmental impact assessment for RWM (Radiation Waste Management) facility and activity;
- c) shall provide for the issuing, amending, suspension or revoking of licenses, subject to any necessary conditions.
- d) Shall carry out activities to verify that the operator meets these conditions.

### **Egyptian TSOs**

The Nuclear Safety Research Center (NSRC) can act as technical support organization for nuclear and radiological facilities and activities in Egypt. It can assist and support in:

- a) Establishment/preparation of regulation and guidelines;
- b) In Authorizations (permit, approval, license, etc);
- c) Performance of inspections of nuclear facilities;
- d) Review and assessment of PSAR and FSAR.

### **Responsibilities and Functions of the Regulatory Body and TSO in India (AERB) (Bajaj, 2013)**

The Atomic Energy Regulatory Board (AERB) is the national authority for ensuring that the use of ionizing radiation and nuclear energy does not cause any undue risk to the health of workers, members of the public and to the environment. AERB is responsible for the stipulation and enforcement of rules and

regulations pertaining to nuclear and radiological safety.

### **Responsibilities**

- a) Development of safety documents
- b) Safety review of nuclear and radiological installations
- c) Regulatory review of operating the nuclear and radiological installations

### **Responsibilities and Functions of the Regulatory Body and TSO in Turkey**

**Mission:** The mission of TAEK is to ensure that people and environment is protected from possible harmful effects of ionizing radiation.

The mission of the Turkish Atomic Authority (TAEK) is to lead the way for ensuring that Turkey benefits from nuclear technology and to undertake regulatory and inspectorial activities.

### **Function of RB in Turkey**

- a) Identification of basic policies and goals for nuclear safety, security and safeguards;
- b) Preparation of regulations and guides;
- c) Review and Assessment;
- d) Authorization;
- e) Inspection;
- f) Enforcement

### **TSO in Turkey**

The role of main TSOs:

- a) Assist in licensing process
- b) Generate R&A guidelines and acceptance criteria using licensing basis
- c) Review and assess PSAR and supplementary documents and perform inspections

- d) Transfer knowledge and experience to DNS

### **Responsibilities and Functions of the Regulatory Body and TSO in Finland**

#### **Regulatory Body and Supervisory Authorities in Finland**

- a) **Ministry of Trade and Industry (KTM)** (Regulatory and Institutional Framework for Nuclear Activities, Finland, OECD (2008).
- b) The Nuclear Energy Act (No. 990/1987) provides that the Ministry of Trade and Industry (*Kauppa-jateollisuusministeriö* – KTM) has overall responsibility for the use of nuclear energy in Finland (Section 54). It is also responsible for coordinating Finland's participation in the activities of international bodies and represents Finland in the International Atomic Energy Agency (IAEA), the OECD Nuclear Energy Agency (NEA) and the Nordic Nuclear Safety Research Program (NKS).

The Ministry plays a central role in the licensing system established under the nuclear energy act. Even where it is for the Government to make a decision on the construction of a new power reactor, the Ministry is responsible for coordinating and supervising the lengthy and complex application procedure which involves numerous other ministries, national and local authorities' and public hearings.

The Ministry also supervises the implementation of Finland's statutory provisions on waste management, and in particular has responsibility for administering the State Nuclear Waste Management Fund and for assessing and receiving the financial securities required from nuclear operators under the Nuclear Energy Act.

The Ministry of Trade and Industry is assisted by the national Advisory Committee on Nuclear Energy in the preparation of the most important

matters related to nuclear energy. In respect of a prosecution for an offence under the Nuclear Energy Act it is provided in the act that the prosecutor must ask for a statement on the matter from the Ministry before initiating prosecution. (Regulatory and Institutional Framework for Nuclear Activities, Finland, OECD (2008).

**c) Ministry of Social Affairs and Health**

The Ministry of Social Affairs and Health has administrative and financial responsibility for the Radiation and Nuclear Safety Authority.

The Ministry of Social Affairs and Health develops and guides policies relating to social protection, social welfare and health care. It defines the main lines of social and health policy prepares legislation and key reforms and monitors their implementation. It also handles the necessary links with the political decision-making process.

The Ministry is the supreme authority in charge of the supervision and guidance related to the protection of the population against harmful radiation. In practice, the Ministry of Social Affairs and Health drafts the legislation and other regulations on radiation protection, draws up official statements on radiation protection issues and monitors and guides the development and implementation of radiation issues. The actual actor and supervisor in both protection and other radiation legislation issues are the Radiation and Nuclear Safety Authority (STUK). It acts under the direction of the Ministry in respect of issues governed by the health protection act.

**d) Ministry of the Interior**

The responsibilities of the Ministry of the Interior include that of protection of the general public in the event of an emergency, including a nuclear incident. The nuclear energy act requires that the Ministry be consulted at various stages of the li-

censing process.

The Department for Rescue Services of the Ministry of the Interior is responsible for the prevention of fires and other accidents, operative rescue activities and civil defense. The rescue services aim to ensure the safety of people in every possible situation, from day-to-day incidents to major disasters and the threat of war. The Department for Rescue Services organizes and coordinates sensational rescue services, and monitors the availability and standard of rescue services.

**e) Ministry of the Environment**

The Nuclear Energy Act provides that the Ministry of the Environment must be consulted on various aspects of the regulation of activities involving nuclear energy and radiation hazards. Prominent amongst these aspects are issues relating to emergency planning and nuclear waste management.

**f) Ministry of Foreign Affairs**

Licensing authorities must seek comments from the Ministry of Foreign Affairs in relation to certain applications to export nuclear material. The political department deals with issues such as arms control, defense materiel export issues, defense materiel operation and international export control cooperation.

***TSOs in Finland***

**a. Advisory Committee on Nuclear Energy**

The Nuclear Energy Act (No. 990/1987) provides for the creation of a permanent consultative Committee on Nuclear Energy Issues. The Committee is appointed by the Government and works in conjunction with the Ministry of Trade and Industry.

**b. Advisory Committee on Nuclear Safety**

The Nuclear Energy Act (No. 990/1987) also

provides for the creation of a permanent consultative Committee on Nuclear Safety Issues. The Committee is appointed by the Government and works in conjunction with the Radiation and Nuclear Safety Authority.

### *Public and semi-public agencies*

- **Finnish Radiation and Nuclear Safety Authority (STUK)**
- **Legal status**

The Finnish Radiation and Nuclear Safety Authority (*Säteilyturvakeskus*– STUK) was established by Act No. 1069/1983. The act sets out the general functions of the authority, while more detailed provisions as to its structure and operations are contained in the ordinance on the Finnish Radiation and Nuclear Safety Authority (No. 618/1997).

The authority is an independent body carrying out statutory functions; however it is linked to an administrative level with the Ministry of Social Affairs and Health.

### *Responsibilities of TSOs in Finland*

The regulatory authority's principal functions are to prevent harmful effects of radiation, to regulate the safe use of nuclear energy and radiation, to carry out research on radiation protection and to provide training and information. The STUK activities are implemented in the following areas; nuclear safety regulation, radiation practices regulation, research, environmental radiation monitoring, communication, emergency preparedness and contracted services (1983 Act establishing the authority). Other legislation confers specific powers and duties on the authority. The Nuclear Energy Act, for example, gives the authority overall responsibility for the regulation of nuclear safety, physical protection, safeguards and emergency planning in the nuclear context. In order to carry out these functions, the au-

thority is required by various provisions of the act to participate in the licensing process, impose license conditions and enforce their compliance, establish and ensure compliance with rules and regulations, provide expert advice to other authorities and carry out research and development work. All other state authorities are obliged to consult the authority if a nuclear safety issue arises. Similarly, the authority is the body responsible for administering the licensing system established by the radiation protection act and for monitoring and enforcing the other requirements of that act.

STUK supervises also Posiva's research center, development and planning work for the final disposal of spent nuclear fuel and the activities of the nuclear power company's on treatment, storage and final disposal of low-and intermediate reactor waste. STUK also controls the safety of the transportation of nuclear waste and radioactive materials.

## **CONCLUSION**

From this study we can conclude that:

- 1- The regulatory body shall obtain technical or other expert professional advice or services as necessary in support of its regulatory functions, but this shall not relieve the regulatory body of its assigned responsibilities.
- 2- The provider of TSOs does not replace the regulatory body when providing support.
- 3- The government shall make provision, where necessary, for technical services in relation to safety, such as services for personal dosimeter, environmental monitoring and the calibration of equipment.
- 4- Where several authorities have responsibilities for safety within the regulatory framework for safety, the government shall make provision for the effective coordination of their regulatory

functions, to avoid any omissions or undue duplication and to avoid conflicting requirements being placed on authorized parties.

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مجلة

## التقنيات النووية في العلوم التطبيقية

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### مهام ومسؤوليات هيئات الدعم الفني لتقوية أداء وتصميم مفاعلات القوى

ابراهيم سليمان ابراهيم

يعتبر توفير الدعم التقني الفعال أمرا ضروريا لتحسين التشغيل الآمن لمحطات الطاقة النووية وزيادة كفاءتها إلى أقصى حد ممكن. كما يزيد من الاهتمام ببرامج بناء المفاعلات الجديدة ليس فقط في البلدان التي لديها برامج نووية قائمة بالفعل ولكن أيضا في بلدان أخرى كثيرة ذات الخبرة المحدودة أو التي لم تنجح في العمل في تصميم محطات الطاقة النووية وترخيصها وتشبيدها وتشغيلها.

ويناقش هذه العمل أدوار ومسؤوليات ((TSO في تعزيز تصميم وأداء المنشآت النووية. كما انه يركز على خبرة بعض البلدان ووثائق معايير الأمان التي وضعتها الوكالة الدولية للطاقة الذرية كمراجع وارشادات. وقد أجريت مقارنة ((TSO لبعض الدول حتى يتسنى لنا أخذها في الاعتبار للوضع المصري الحالي.

وخلصت الدراسة الى ان قواعد ومسؤوليات هيئة الدعم الفني (TSO) هي توفر الخبرة والمخرجات المهنية والمشورة الفنية أو العلمية والخدمات والمساعدة إلى الجهة المنوط بها تشغيل المفاعلات النووية. تتولى TSO دعم المنشأة والتفاعل مع مختلف المنظمات الداخلية والخارجية المعنية. يجب أن تكون جميع الخدمات محددة بشكل جيد وتعمل بفاعلية. وتذكر وثائق معيار الامان لوثائق الوكالة الدولية للطاقة الذرية (IAEA) أن المسؤولية الأساسية عن الامان يجب أن تقع على عاتق الشخص أو الجهة المسؤولة عن المنشأة النووية والأنشطة التي تؤدي إلى مخاطر إشعاعية. وبصورة تقليدية يجب أن تحصل الهيئة الرقابية أو غيرها من الاستشارات أو الخدمات المهنية المتخصصة حسب الاقتضاء لدعم وظائفه التنظيمية، علما بان هذا لن يعفي الهيئة الرقابية للمسؤوليات المسندة إليها.