Regulatory Strategy for Enhancing Safety Culture of NPP Operator in Pakistan

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1. Introduction

The Pakistan Nuclear Regulatory Authority (PNRA) was established in January 2001 to ensure the safe operation of nuclear installations with zeal to foster a positive safety culture in their licensees and regulate nuclear facility to protect the public, workers and environment from the harmful effects of radiations. At present, PNRA is regulating two commercial nuclear power plants: Karachi Nuclear Power plant (PHWR, 137 Mev) and Chashma Nuclear Power Plant unit-1 (PWR, 325 MeV) operated by Pakistan Atomic Energy Commission (PAEC). For the safe operation of nuclear power plants and to avoid any incident or accident to occur, safety culture of nuclear power plant operating organization plays a key role. This paper presents the strategy to enhance safety culture of nuclear power plant operator in Pakistan.

2. Safety Culture

The traditions, values, custom, goals and practices of an organization define the culture of an organization and are reflected in the behaviors of its agents. The culture of an organization and intuitively its relationship to safety is defined as: Shared values (what is important) and beliefs (how things work) that interact with an organization's structures and control systems to produce behavioral norms (the way we do things around here) [1]. The Chernobyl nuclear disaster in 1986 is credited with defining the term safety culture as well as exemplifying a working environment that lacked a culture of safety. Several onsite events led to the meltdown of the Chernobyl reactor, but longer term issues were central to the disaster itself. Investigators determined that there existed a lack of an overall "safety culture": inadequate and unsafe reactor construction created a dangerous operating environment, standard operating procedures were not followed, and systems of communicating safety-related information were ineffective. The term 'safety culture' was first introduced by the International Safety Advisory Group (INSAG) after the Chernobyl accident and was meant to capture management and organizational factors as well as attitudes that are important to safety. In a fourth report drawn up by INSAG, the following definition was proposed: ''safety culture is that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance''[2].The Nuclear Regulatory Commission defined safety culture in a somewhat similar but more succinct way: "A good safety culture in a nuclear installation is a reflection of the values, which are shared throughout all levels of the organization and which are based on the belief that safety is important and that it is everyone's responsibility."

3. Pakistani Culture

Pakistan located in Southeast Asia, is a developing country that was born on 14 August 1947, as a result of the partition of British India. Pakistani culture, like that of many developing countries, has been characterized as collectivist, inclined towards moderate masculinity, high uncertainty avoidance and high power distance [3]. These characteristics imply that, within such a culture, there is a general unquestioning respect for authority, people integrate in the form of cohesive groups, and are emotional. The people exhibit the tougher qualities usually associated with men (being aggressive, ambitious and competitive) on the one hand, and feminine qualities (modesty and caring for others) on the other. The regulatory environment in Pakistan, which comprises safety laws, regulations, procedures, and policies, has prime importance in safety management systems. Evidence has been found, in many research studies that workers' perceptions relate to a reduction in accident rates within an existing regulatory environment. Pakistan has established a framework to regulate nuclear installations. This framework, under the PNRA Ordinance 2001, establishes national regulations and safety requirements. A system of licensing of nuclear installations is established that prohibits their operation without a license. Compliance with license conditions is ascertained by regulatory inspections and assessments and enforced with suspension, modification or revocation of licenses. In safety culture inspections, PNRA verifies that the licensee places special emphasis on safety in operation and is establishing and implementing policies that give safety matters the highest priority. PAEC further enhances safety culture and improves quality consciousness in its personnel by establishing and implementing qualification and training programs, fostering a no-blame culture and encouraging plant personnel to report safety concerns and taking

appropriate and timely corrective actions and providing feedback to plant personnel. However there exists room for further improvement of safety culture by adopting positive attitude and behavior toward safety through strategy which is described in the next section.

4. The Strategy to Enhance Safety Culture

4.1 Choosing Appropriate training approaches

It is important to recognize that the choice of training methods will influence the trainees' motivation to learn, and how much they actually learn. There are two types of learning: active and passive [4]. Active learning is more concerned with trainees doing something with the knowledge they have been taught (through performing a task or discussing the training material), whereas passive learning merely requires the trainee to receive and digest information (through listening or watching). Passive learning methods include the traditional lecture and presentations which generally involve one-way communication to a group by someone who is knowledgeable about the subject. An active learning method alternative to the lecture or presentation is the use of demonstrations. These are primarily used to demonstrate how to use a particular piece of equipment or how to conduct a particular task in a safe manner. The trainees are then invited to perform themselves. The advantages of demonstrations reside in the interest and attentiveness they can generate among trainees. The sociodramatic or 'role playing' approach is another active learning process that can be helpful in enhancing the safety culture in NPP operating personnel. Through sociodrama, plant personnel can deeply experience the feeling that they have in mind as they act as residents in their shoes, especially by the role playing and role reversal [5]. It may alter employee attitudes, values or behavior. The following figure shows how role reversal can influence perceptual and cognitive views for each party in nuclear community, especially those of regulators(inspectors), operators, residents/public, and NGO's/media, and to improve perceived safety and also enhance safety culture.

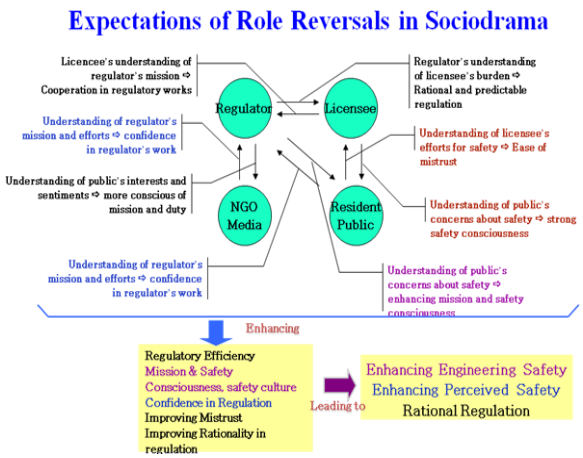

Fig.1 Diagram of conflict among stake holders

4.2 Campaigns for Nuclear Safety

The informational safety campaigns can be used to educate nuclear power plant operating personnel to work safely. Designating a day as 'Nuclear Safety Day' by arranging different events on nuclear safety on that day (e.g. technical seminars, workshops, symposiums, relays, posters, videos, films etc) can alter the belief and knowledge as well as motivate and encourage particular safety related actions.

5. Conclusion

The attitude of management and individuals of Nuclear power plant operating organization (PAEC) is generally positive and there is a desire for further improvement. PNRA promotes safety culture in nuclear installations by ensuring that it is on the agenda of the licensee(s) at the highest organizational level and then by including it in the inspection plans of nuclear installations. The safety culture can be further enhanced through active involvement of NPP personnel in the learning process (e.g. demonstration, role playing etc) and start of nuclear safety campaigns to raise the safety profile.

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