Safeguards culture on 3S interfaces

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1. Introducing 3S Culture

The nuclear energy has played a great role in global energy industry. However, since the nuclear energy was originated from the development of nuclear weapon, it was needed to much more concerns about the purpose of nuclear technology. The harmonization of 3S — safety, security and safeguards — was required to assure the peaceful use of nuclear energy.

However, the perception had started extended beyond technical aspects in safety and security issues after severe accidents such as the Chernobyl accident, 9/11 terrorism and Fukushima accident. On the other hand, no severe accident has ever happened regarding safeguards point of view. But when proliferation of nuclear weapon does happen due to violation of safeguards, the impact would be no smaller compare to the others. Therefore, it should be treated as important as the others.

In fact, safeguards culture wasn't issued first time in this paper. However, the past safeguards culture only meant the conception based upon specific purpose. But it should be generalized to extend the target and scope enough to cover any possible misbehavior. (The specific purpose meant the safeguards culture to regulate nuclear material and facilities in Newly Independent States of the former Soviet Union or to spread conception and experience to those states building new nuclear power plants that lack of knowledge and experience) [1], [2]. The safeguards culture to be mentioned in this paper has different aspects from previous cultures as it is a safeguards culture at the state level. Namely, there are huge differences in awareness of importance on implementing safeguards between decision makers and employees in the nuclear facility. To narrow these gaps, human factor must be strengthened by introducing safeguards culture. The meaning and concept of safeguards culture will be suggested by interfacing the definition, structure and approach of safety and security culture since it is the very first concept and requires a practical and efficient approach.

2. Background and Definition of each Culture

2.1 Safety culture

Nuclear safety culture was introduced first after the Chernobyl accident and have been improved ever since. The role and scope was extended to be evaluating factor during inspection regarding safety. The definition of safety culture is well described in INSAG-4 [3].

"The 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"

The deficiency of safety culture results from the lack of understanding about importance of safety. Therefore, it is considered recognizing safety as the most important value must be present prior to anything else.

2.2 Security Culture

After the 9/11 terrorism. In order to cope with these potential threat, the nuclear security culture was introduced. The amendment CPPNM first mentioned on the importance of the security culture and the IAEA definition of nuclear security culture is well described in the Nuclear Security Series No. 7. [4].

"The assembly of characteristics, attitudes and behavior of individuals, organizations and institutions which serves as a means to support and enhance nuclear security"

The significant factor of the security culture is the vigilance and questioning attitude. The external threats always exist and these threats would bring out a severe accident such as Fukushima accident. Also, security should be treated with reasonable priority among 3S.

2.3 Safeguards culture

As discussed above, the culture is suggested as the measures to develop attitude and behavior of individuals in organization. In this context, we proposed the safeguards culture as follows.

"The assembly of characteristics, attitudes and behavior of individuals and organizations that supports nuclear safeguards as a critical means of preventing the proliferation of nuclear weapons"

The safeguards culture is considered as an important value but, like other cultures, when there are conflicts among values, it should be treated due priority among 3S. Also, it is possible to have synergy between security and safeguards, when security and safeguards are well developed altogether. [5]

3. Analysis on structure of 3S culture

In order to settle these cultures in organization, the structure must be provided with detailed roles of each level. The nuclear safety culture and security culture were basically constructed based on 3-level model suggested by Dr. Edgar H. Schein. [6], [7] Therefore, the structure of safeguards culture is suggested by adoption the same model in the table. 1.

Table 1. 3-level Model of Safeguards Culture

	Safeguards Culture
Basic Assumptions	• Safeguards is important to prevent the proliferation of nuclear weapons • Correctness and completeness are vital factor
Espoused Values	•Emphasis on correctness and completeness •Safeguards personnel are better trained
Artifacts	•Accurate safeguards system •Inventory history management for nuclear materials

Even when the organization shares common and clear objectives and conception among members, each individual or department differs in responsibility depending on the position. Therefore, details must be provided according to levels and roles. The nuclear safety culture and security culture suggest that there are at least three levels; Policy Level, Management Level and Implement Level. However, unlike nuclear safety or security, the subjective to regulate safeguards is IAEA. So, we suggest the 4-levels of structure; IAEA, State, Manager and Individuals, each responsibility can be, also, defined as following;

3.1 Roles of IAEA

The IAEA must collect and maintain international concerns in safeguards as regulative subjective. It must suggest and proper regulation. The safeguards culture only exist within safeguards system. Hence, the IAEA has responsibility for establishing the safeguards system and framework to foster an effective nuclear safeguards culture.

3.2 Roles of State

Based on the safeguards system and framework provided by IAEA, the state must distribute and coordinate the responsibilities to proper organization. Also, it must define the assigned responsibilities so that personnel in the organizations understand the relationship among them. For better management and further improvement, it must provide adequate support for international and domestic cooperative network.

3.3 Roles of Organization and Manager

It must provide former rules based on regulations provided by the IAEA, and distribute resources and responsibilities inside of organization. The required information and experience must be shared with regular monitoring and evaluation. Culture largely depend on leaders who establish the environment of organization and give some motivation such incentives and sanctions.

3.4 Roles of Individuals

Each individuals must understand that each one plays adequate role in safeguards. The sensitive information must be protected to bleach the safeguards system. In order to achieve responsibilities, proper education must be provided. Also, Individuals have to effort to maintain the correctness and completeness.

4. Dissemination of Culture

Culture, a matter primarily of consciousness, may stall out or fall into complacency unless there is a continuing evolution and dissemination. Therefore, ways to provide continuous stimulation, such as education or evaluation, are necessary. As culture is the collective experience of a society whose behavior does not change easily, a more systematic and gradual approach is required. Drastic change in people's cognition is sometimes driven by accidents, so learning from past accidents can, of course, be a useful method.

There are guidelines made in relation to each culture, and they place emphasis on the improvement of awareness through education. Education on nuclear safety, the concept and value of nuclear security, as a part of a regular education program, has been made accordingly. Realizing once again the importance of appropriately reporting safeguards from the fail to report of undeclared nuclear material, the ROK has taken action to make safeguards education compulsory by law. It is considered quite meaningful in terms of the dissemination of culture, as it can be extended further and make a greater contribution to spreading the safeguards culture.

Those guidelines also provide procedures and factors associated with the assessment of culture. Staffed with SCART (Safety Culture Assessment Review Team), the IAEA has a system to evaluate the safety culture in an organization. [8] The IAEA has published an additional set of guidelines to help self-assess within an organization. [9] Assessment tools, including surveys, have been utilized for continuous feedback in regards to the nuclear security culture as well, and guidelines for self-assessment in that area are to be issued shortly. [10]

There is no recommendations regarding safeguards culture yet. As a result, there is no distinct standards to evaluate it. However, continuous management of human factors enables disseminating culture as suggested in safety and security culture. Providing feedback through regular assessment to support and spread the culture. Surveys, interviews, document review and observation

are the recommended methods. Actually, BATAN implements the self-assessment program for nuclear security culture with the IAEA. BATAN created the self-assessment team and adopted these methods to research reactors in Indonesia. It showed positive outcomes in disseminating the culture such as understanding of the employee's concerns, needs, aspirations, motivation and opinions[11]. In ROK, even though no separate self-assessment teams was organized, surveys were conducted on nuclear security culture annually. Integrating these assessment methods with safeguards culture could be effective in many ways. For example, it is possible to assess the awareness of nuclear security and safeguards, and distinct the concept of nuclear security from nuclear non-proliferation. It can raise the awareness of safeguards culture as well. Additionally, positive feedback system can be adopted to existing regular education system. However, the analysis on assessment system of culture must be more concrete after the actual awareness evaluation and different case study.

5. Significance of Safeguards Culture

As mentioned earlier, it is very necessary to be fully aware of the importance of nuclear safety, nuclear security, and safeguards — the three major pillars for the peaceful use of nuclear energy — and to fulfill all their requirements. As the IAEA is the main regulatory body for safeguards, some may misunderstand that safeguards are not the commitment of state but that of the IAEA, which is embraced by a group of countries. The duty of safeguards, however, is entrusted to the IAEA by individual countries in order to guarantee the nuclear transparency of a state and of the global society. Therefore, it would be appropriate to conclude that the duty lies on each state and each is obliged to fulfill this duty.

For effective and efficient implementation of safeguards, the IAEA has recently adopted the State-Level Concept, which requires a greater commitment of the state. Such required commitment, however, should not be confined to the state as the State-Level approach in practice can be meaningfully applied only when safeguards are voluntarily taken in facilities. Dissemination of the safeguards culture, therefore, will be able to create a high level of synergy in implementing the State-Level Concept [12].

In addition, more can be obtained by spreading the safeguards culture. The purpose of existing nuclear material accounting and control system is just preventing proliferation of nuclear weapon. But NMAC (Nuclear Material Accounting and Control) system can be a good measures to deter and detect the protracted theft of nuclear material by an insider and can potentially contribute further toward nuclear security. These concept is well described in the IAEA recommendations. State as well as facilities are the ones who should take the lead in establishing and implementing regulations for nuclear security, and who should remain proactive and vigilant in their nuclear material accounting and control efforts.

6. Future work

The aforementioned NMAC will be a quite meaningful research subject not just for strengthening safeguards culture, but also for "the security and safeguards interface". Recognizing the importance of this, the , IAEA has developed a set of technical criteria based on the IAEA implementing guide entitled *"Use of Nuclear Material Accounting and Control for Nuclear Security Purposes at Facilities(in publication)"* and a methodology to assess the use of a facilitiy's NMAC system for nuclear security. IAEA has established an expert team to continuously evaluate and apply NMAC systems going forward. In the process of such efforts, the ROK should work to select and apply appropriate features so as to build a more improved safeguards culture and to determine the best practice of "the security and safeguards interface".

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