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MANAGEMENT SYSTEM – CORRELATION STUDY BETWEEN NEW IAEA STANDARDS AND THE MARKET STANDARDS

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ABSTRACT

In order to answer the growing concern of society with respect of the aspects that affect the quality of life, international and national regulatory bodies have developed standards that enable organizations to establish management systems for quality, environment and sustainable development, health, safety and social responsibility, among other functions. Within this context it is necessary to structure an integrated management system that promotes interests compatibility of several distinct and complementary functions involved. Considering this vision of the management system integration, the International Atomic Energy Agency (IAEA) decided to review the structure of safety standards on Quality Assurance – code and guides 50-C/SG-Q1/14:1996, publishing, in 2006, IAEA GS-R-3 and IAEA GS-G-3.1 standards, enlarging the management approach of the previous standards, including the possibility of integrating the functions foremost mentioned. This paper presents the results about a correlation study between IAEA management system standards - IAEA GS-R-3: 2006, IAEA GS-G-3.1: 2006 and IAEA DS349 rev. 2007, this latter still a draft standard, with those market management system standards on quality - ISO 9001:2008, environmental - ISO 14001:2004, and occupational health and safety – BS OHSAS 18001:2007, identifying gaps, redundancies and complementarities among their requirements and guidances. The purpose of the study is to provide subsidies that could contribute to the structuring of a management system to nuclear facilities that satisfies, in an integrated manner, the common and complementary requirements and guidances of IAEA and market standards.

1. INTRODUCTION

With the growing concern of society about the aspects that affect the life's quality, the management focus of the organizations, before turned almost exclusively to meet consumers' requirements as for product quality to retain market, has been expanded to meet the other stakeholders' requirements in the business, such as: environment and sustainable development, occupational health and safety and social responsibility. Thus, in addition of management system standards focused in quality function, international and national regulatory bodies have developed standards that enable organizations to meet other management segments.

In this context it's necessary to structure a thorough and effective integrated management system (IMS) that promotes the compatibility between distinct and complementary interests on several functions involved in an organization. According to the British Standards

Institution Americas [1] an integrated management system is a one that integrates all systems and processes of an organization in a complete framework, enabling an organization to work as a single unit with unified objectives.

Considering this vision of integrated management system, the International Atomic Energy Agency (IAEA)[1] decided to review the structure of safety standards on quality assurance – code and guides 50-C/SG-Q1/14:1996 [3], publishing in 2006, the management system standards, such as: IAEA GS-R-3 [4] and IAEA GS-G-3.1 [5]. These standards expand the management approach of the previous standards, including in their scopes the possibility of integration functions of the health, environmental, security, safety, quality, and economy, in the way to ensure that nuclear safety is properly considered in all activities of the organization [4].

Publication IAEA GS-R-3 does not attempt to define all those specific health, environmental, security, safety, quality, and economy requirements that have already been established elsewhere (in other IAEA publications and in international codes and standards), the purpose of the standard is to define the requirements for management these specific requirements in an integrated manner. The standard still emphasize that the integrated management system requirements cover topics that either relate directly to nuclear safety or are part of the managerial framework without which nuclear safety cannot be ensured and maintained. The safety term used in IAEA GS-R-3 refers to nuclear safety, namely the achievement of proper operation conditions, prevention of accidents or mitigation accident consequences, resulting in protection of workers, the public and the environment from undue radiation hazards [4].

The purpose of this paper is to present the results of a part of Oliveira's Master's degree research [6] about the management system new approach, recently structured in standards published by IAEA. The paper presents a correlation study among the requirements (requirements or guidances) of IAEA management system standards - IAEA GS-R-3: 2006, IAEA GS-G-3.1: 2006 and IAEA DS349 rev. 2007 [7], the latter still a draft standard, with those market management system standards on quality - ISO 9001:2008 [8], environmental - ISO 14001:2004 [9] and occupational health and safety – BS OHSAS 18001:2007 [10]; it identifies gaps, redundancies and complementarities among their requirements. The intention is to provide subsidies that may contribute to structure a nuclear facility management system (MS) that meet, in an integrated manner, the common and complementary requirements of IAEA and market management system standards mentioned above.

2. BASIS USED IN STUDY

The study of correlation between standards, the purpose of this paper, had as preliminary basis for its development the correlations presented in the references below:

- Correspondence between OHSAS 18001:2007, ISO 14001:2004 and ISO 9001:2008 standards, available on the OHSAS 18001 [10] and ISO 9001 [8]; and
- Correspondence between IAEA GS-R-3:2006, IAEA GS-G-3.1:2006, IAEA DS349 rev. 2007, ISO 9001:2000 and CNEN-NN-1.16:1999 standards, available on the Kibrit's Master's degree dissertation [11].

[1] IAEA has in its scope of work setting and promoting the application of international safety standards for the management and regulation of activities in the nuclear area [2].

The study included the cross checking of above mentioned correlations, being complemented by a review of the composition obtained. The review included the verification of ownership of the correlations obtained that was adjusted as appropriate. In complement, it was done a study correlating, per processes, documents and records required by the standards in question. The processes are those ones identified by requirements of IAEA MS standards.

3. CORRELATION STUDY - RESULT AND ANALYSIS

3.1. Correlation Between IAEA MS Standards (IAEA GS-R-3, IAEA GS-G-3.1 and IAEA DS349) and ISO 9001

The study makes two initial considerations on the correlation between IAEA MS standards and ISO 9001, namely:

- Standards Focus - While the first ones focus on the achievement and enhancement of nuclear safety [4], the second focuses on increase customers' satisfaction related to products [8].
- Standards Approach:
  - IAEA MS standards define requirements (requirements and guidances) for structuring a management system (MS) that integrates functions, such as: safety, health, environmental, quality, among others [4]. In turn, the ISO 9001 establishes requirements for structuring a MS facing to the quality function, but the MS resulting enables alignment or integration of other management system requirements, such as those relating to occupational health and safety, and environmental functions, among others [8].
  - IAEA MS standards address aspects as safety culture (including the organizational culture) and the senior management leadership and commitment (the development of individual and institutional values and behavioral expectations to support the implementation of the MS, the involvement of all individuals in implementation and improvement of the MS, etc.) [5]. These considerations give support that was observed by Wilkinson et. al. [12] and Sigler et. al. [13], on the fundamental importance of development of those aspects for the successful implementation of a system, in particular to integrated management system (IMS).
  - IAEA MS standards define more requirements and incorporate and provide more details related to ISO 9001 requirements. Thus, unless of the clarifications and complements described below, the MS of an organization that meets IAEA MS standards requirements will also meet the requirements of ISO 9001 standard.

3.1.1. Documentation required

The study identified some gaps between the documentation required by IAEA MS standards and ISO 9001. Thus, some documents and records required[2] by ISO 9001 are not required by IAEA MS standards; however, IAEA GS-G-3.1 orientates that the organization should determine which processes should be documented, on the basis of applicable statutory and regulatory nuclear safety requirements, the nature of the organization's activities and its overall strategy. Therefore, if in addition to other strategies, there is interest in meeting the requirements of ISO 9001, one organization having its MS framework structured in

[2] The term "required" is used here as explicitly required by the standard (note of authors).

accordance with the requirements of IAEA MS standards, it should formalize the following documents in its MS:
• Manual describing its MS - ISO 9001 standard requires a manual describing the quality MS. IAEA GS-G-3.1 orientates that the information of the MS should be structured in three levels, which are provided at similar information on those required for ISO 9001 quality manual.
• Documented Procedures as: control of documents; control of records; internal audit; control of nonconforming product; corrective action and preventive action.
• Records of: results of the review and actions arising from the review of requirements related to the product; education, training, skills and experience; results of evaluation and any necessary actions from the evaluation of suppliers; validation of processes for production and service provision; and reviews of MS of the organization by top management. This later record was included because its scope is broader than that required by IAEA MS standards.

3.1.2. Management commitment

IAEA MS standards are more comprehensive requiring that the senior management develops individual values, institutional values and behavioral expectations for the organization to support the implementation of the MS and act as role models in the promulgation of these values and expectations [4].

3.1.3. Customer focus

IAEA MS standards are more comprehensive expanding the aim of enhancing satisfaction, being considered the expectations of interested parties in the activities and interactions of the processes of the MS [4], and not just the customer's satisfaction as required by ISO 9001. Moreover, they require that the expectations of the interested parties shall be meet while at the same time ensuring that nuclear safety is not compromised [4].

3.1.4. Responsibility and authority

IAEA MS standards are more stringent by requiring that:
• The individual who coordinates the MS shall have specific responsibility and authority for this purpose [4]. ISO 9001 requires that the responsibility and authority shall be irrespective of other responsibilities.
• For each process a designated individual shall be given the authority and responsibility for the conduct of the process[3] [4].
• For each process, any activities of inspection, testing, verification and validation, shall be performed by designated individuals or groups other than those who originally performed the work [4].
• All individuals involved in preparing, revising, reviewing or approving documents shall be specifically assigned for the work [4].
• An organizational unit shall be established with the responsibility for conducting independent assessments, having the sufficient authority to discharge its responsibilities. This unit may be an individual or an external organization [4].
• The evaluation of the results of independent assessments, as well as, any necessary actions to be taken, shall be conducted by senior management [4]. ISO 9001 assigns this responsibility to management responsible for the audited area.

[3] ISO 9001 does not establish this requirement, but ISO 9004 recommends this practice.

3.1.5. Determination of requirements related to the product

ISO 9001 provides more details than IAEA MS standards, such as requirements for delivery and post-delivery activities, and those not stated by the customer but necessary for specified or intended use, where known.

3.1.6. Validation of processes for production and service provision

ISO 9001, unlike IAEA GS-R-3, makes clear that processes must be validated (Those which the resulting output cannot be verified by subsequent monitoring or measurement and, as a consequence, deficiencies become apparent only after the product is in use or the service has been delivered).

3.1.7. Customer property

This requirement, addressed by ISO 9001, is not treated explicitly by IAEA MS standards, but IAEA DS349 provides guidance for it to be satisfied, in topic - Managing material assets.

3.1.8. Control of records

ISO 9001 does not address requirement to establish retention time of test materials and specimens and associated records, whereas IAEA MS standards do [4].

3.1.9. Independent assessment of the MS

IAEA MS standards [5 and 7] require other types of independent assessments in addition to internal audit as required by ISO 9001, namely: surveillance on specific area or an ongoing activity, peer evaluation of safety related subjects, review of the technical content of activities and processes, and safety culture assessment.

3.1.10. Non-conformances

IAEA MS standards require that non-conformances in products and processes are identified [4], while ISO 9001 refers only to products.

3.1.11. IAEA MS standards requirements not addressed by ISO 9001

The study identifies some requirements of IAEA MS standards not addressed by ISO 9001, such as: integrated management system, safety culture, grading the application of management system requirements, managing organizational change, self-assessment and some common processes to all stages of nuclear facilities (workplace risk assessment, personal safety – industrial and radiological, configuration management, waste management, environmental management, among others).

3.2. Correlation between IAEA MS Standards (IAEA GS-R-3, IAEA GS-G-3.1 and IAEA DS349) and ISO 14001 and OHSAS 18001

Due to the similarity of the subject (in content and nature) and the structure of standards, the correlation between requirements of ISO 14001 and OHSAS 18001, with those of IAEA MS standards, are analyzed together.

Unless of clarifications and complements described below, the requirements of IAEA MS standards provide a MS framework that meets the requirements of standards ISO 14001 and OHSAS 18001.

3.2.1. Documentation required

The study identified some gaps between the documentation required by IAEA MS standards and ISO 14001 and OHSAS 18001. Thus, some documents and records required[4] by ISO 14001 and OHSAS 18001 are not required by IAEA MS standards; however, IAEA GS-G-3.1 orientates that the organization should determine which processes should be documented, on the basis of applicable statutory and regulatory nuclear safety requirements, the nature of the organization's activities and its overall strategy. Therefore, if in addition to other strategies there is interest in meeting the requirements of ISO 14001 or OHSAS 18001, or both, one organization having its MS framework structured in accordance with requirements of IAEA MS standards should formalize the following documents in its MS:

• Documented Procedures – Procedures to control (cover) situations where their absence could lead to deviations from the environmental (ISO 14001) and occupational health and safety (OHSAS 18001) policy and objectives and targets.

• Records required to ISO 14001 – Records containing information to monitor performance, applicable operational controls and conformity with organization's environmental objectives and targets; results records of periodic compliance evaluations with applicable legal requirements, results records of the periodic compliance evaluations with other requirements to which the organization subscribes; and records of environmental management system review by top management.

• Records required to OHSAS 18001 – Records of data and results of monitoring and measurement sufficient to facilitate subsequent corrective and preventive action analysis; records of the results of the periodic evaluations of compliance with applicable legal requirements; results records of the periodic compliance evaluations with other requirements to which the organization subscribes; and records of occupational health and safety management system review by top management.

• Documents containing information about identification of environmental aspects of organizational activities, products and services and determination of those aspects that have or can have significant impacts on the environment (required by ISO 14001) and the ongoing hazard identification, risk assessment and the determination of necessary controls (required by OHSAS 18001). IAEA MS standards are not explicit in this regard, but such information is provided in the Safety Analysis Reports (SAR)[5], which, according to IAEA DS349, are

[4] The term "required" is used here as explicitly required by the standard (Note of author).

[5] The SAR gives a detailed description of those aspects having safety significance and discusses the implementation of the safety principles and criteria applied during the design for the protection of operational personnel, the public and the environment. The SAR contains an analysis of the hazards associated with the operation of the facility and safety analyses of accident and sequences and safety features incorporated in the design to avoid or minimize the likelihood of occurrence of accidents and to mitigate their consequences [5].

documents required by some Member States of IAEA, being published in the design stage of the nuclear facility and updated in the other stages.

• The organization's decision to communicate externally about its significant environmental aspects (required by ISO 14001) and, when appropriate, to consult relevant external interested parties about pertinent occupational health and safety matters (required by OHSAS 18001). IAEA MS standards does not mention these types of communication, however, IAEA GS-G-3.1 orientates that the communication process should make use of appropriate channels, such as letters, emails and personal meetings.

3.2.2. Procedures for the development of processes

ISO 14001 and OHSAS 18001 define procedure as a specified way to carry out an activity or a process, it can be documented or not. In turn, IAEA GS-G-3.1 guides that processes should be identified, developed and managed in the most appropriate way and that the organization should determine which one of them is to be documented.

IAEA GS-R-3 requires that in the development of each process shall be ensured that the process requirements, such as for environmental, health and safety, among others; are to be specified and addressed. Therefore, the requirements of ISO 14001 and OHSAS 18001 are met in the proportion that the processes required of IAEA MS standards are developed, excepting the emergency preparedness and response. IAEA MS standards do not address this topic, but IAEA GS-R-3 requires that the emergency preparedness and response requirements of IAEA GS-R-2 [14] shall be identified and integrated on MS of the organization. However, this standard has its specific application to those practices and sources that have the potential for causing radiation exposure or environmental radioactive contamination that warranting an emergency intervention, it does not address to those aspects of preparedness and emergency response common to, for example, a conventional chemical plant. Therefore, to meet ISO 14001 and OHSAS 18001 requirements, the MS of a nuclear facility must establish, implement and maintain procedures to identify the emergency situations and potential accidents and how it will respond to such situations, in addition to that purely nuclear ones of IAEA GS-R-2.

3.2.3. Responsibility and authority

To meet ISO 14001 and OHSAS 18001 requirements, an MS structured according to IAEA MS standards shall provide the appointment of specific member(s) who, irrespective of other responsibilities, shall have defined roles, responsibilities and authority by environmental MS (ISO 14001) and by occupational health and safety MS (OHSAS 18001). The individual that responds directly to senior management with specific responsibility and authority by MS, required by IAEA GS-R-3, also can respond by environmental MS and occupational health and safety MS.

OHSAS 18001 requires that the organization shall ensure that persons in the workplace take responsibility for aspects of occupational health and safety over which they have control. IAEA GS-G-3.1 meets this requirement when orientates that the designated individual with authority and responsibility per each process, should have authority to assess the impact of the process on nuclear safety.

ISO 14001 and OHSAS 18001 do not deal with the following requirements addressed by IAEA MS standards:
• An individual with authority and responsibility for the management of each process shall be designated [4].
• Ensure that those individuals who are responsible for each process report, periodically, on the status of their process, to enable the individual responsible for the MS reports on the performance of the MS as a whole [7].
• All individuals involved in preparing, revising or approving documents shall be specifically assigned [4].
• An organizational unit with the responsibility and sufficient authority for conducting independent assessments shall be established. This unit may be a single individual or an external organization [4].
• Independent assessments shall be conducted regularly on behalf of senior management, who shall evaluate the results as well as shall take any necessary actions [4].

3.2.4. Independent assessment of the MS

IAEA MS standards [5 and 7] require other types of independent assessments in addition to internal audit as required by 14001 and OHSAS 18001, namely: surveillance on specific area or an ongoing activity, peer evaluation of safety related subjects, review of the technical content of activities and processes, and safety culture assessment.

3.2.5. IAEA MS standards requirements not addressed by ISO 14001 and OHSAS 18001

The study identifies some requirements of IAEA MS standards not addressed by ISO 14001 and OHSAS 18001, such as: integrated management system, safety culture, grading the application of management system requirements, satisfaction of interested parties, infrastructure and the working environment, self-assessment and some specific process, called by IAEA as processes common to all stages of a nuclear facility. Some of this requirements are not applicable to issues of the environmental MS and occupational health and safety MS.

4. CONCLUSIONS

IAEA has developed an extensive program to updating the entire corpus of their safety standards, in particular of management system, which according to *ElBaradei*[6] are of a high caliber and reflect the best practices in Member States of IAEA. One such practice is the market tendency to increase the compatibility between standards of management system, in search for integration. This practice was adopted by IAEA with the recent publication of standards treated in this study, which define requirements and provide guidance for structuring a management system that integrates the elements of various functions involved, with the main objective to ensure that the nuclear safety is not compromised.

This paper initially sought an assimilation between the visions of IAEA and market concerning to the management system of nuclear safety, quality, environmental and

[6] Mohamed ElBaradei is IAEA Director General (Note of authors).

occupational health and safety functions, concluding that IAEA MS standards address more requirements and incorporate and provide more details to the management system requirements of any other standard studied. Moreover, unlike of the other standards studied, IAEA MS standards address aspects of safety culture, which includes the organizational culture and issues of leadership and commitment of senior management, which are critical to successful implementation of one management system.

The study showed that, unless some adjustments and clarifications on requirements and guidance not explicitly dealt by IAEA, to implement a MS according to IAEA MS standards (IAEA GS-R-3, IAEA GS-G-3.1 and IAEA DS349), that considers the quality, environmental and occupational health and safety functions, the requirements of ISO 9001, ISO 14001 and OHSAS 18001 will be met. As a contribution, the study presents the description about the adjustments and clarifications on requirements related above that contribute to structuring of an integrated management system (IMS) that supports all the requirements of the standards considered.

The management system standards do not set technical requirements on safety, health, environment and quality, among others, for specific products and processes of a nuclear facility. These requirements are identified in other sources and should be integrated into the management system.

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