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Training the staff of the regulatory body for nuclear facilities: A competency framework

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FOREWORD

The uncertainties about the future of nuclear power in many countries, the ageing of the existing work force, and the consequential lack of interest of new professionals to engage in the nuclear field represent developments of major current international concern. The situation is compounded by the great reduction in higher education opportunities in the field of nuclear engineering and the elimination of nuclear engineering departments and research reactors in many universities and the loss of nuclear research facilities generally.

Competence of regulatory staff is one of the prerequisites for the safety of nuclear facilities in the IAEA Member States. Recruitment of competent regulatory staff is difficult in many countries. Also, replacement of retiring staff members requires active efforts from the management of regulatory bodies for establishing staff qualification and training programmes. International support is needed in this domain.

In 2000, the General Conference resolution GC(44)/RES/13 on education and training in radiation protection, nuclear safety and waste management urged the secretariat to "strengthen, within available financial resources, its current efforts in this area". Several elements required for the implementation of the above resolution are already in place. A strategy paper on training in nuclear, radiation and waste safety, including specialized training courses for specific target groups, has been developed at the IAEA.

The international working group on training and qualification recommended in its March meeting in 2000 that a technical document be produced on good training practices of regulatory bodies with advanced training programmes. Such a technical document would be of considerable value to many bodies. The technical document would address how training programmes for regulatory staff have been developed and implemented and include examples of training currently available. Of particular interest to regulatory agencies that have only a small staff are examples of training programmes, and their development, for individual staff members. Maintaining the qualification and competence of regulatory staff would also be addressed.

To respond to the above requests and recommendations, the purpose of this technical document is to provide guidance on training and qualification based on the competency framework required for the regulatory body to perform its functions. The main aim is to support the Regulatory Bodies supervising nuclear facilities such as nuclear power plants and research reactors.

To support regulatory training activities in nuclear installation safety, the IAEA has also developed two standardized training courses to provide basic knowledge needed for work in nuclear safety. A basic professional training course on nuclear safety was organized for the first time in 1999 in Saclay, France, in English. In 2000, the course was provided in Romania, in English, and in Brazil, in Spanish. In 2001, the course was organized as a six-week course in Saclay, France for the European countries and in Argonne, USA, for the Asian countries. For the course, a textbook was developed and used that included test questions to support and control learning. At the next level of specialized knowledge, a training course on regulatory control of nuclear power plants, aimed at new staff members in regulatory organizations with varying experience levels, has been organized in Europe on an annual basis from 1995 to 2001 in the framework of the Department of Technical Co-operation. A textbook has also been developed and used for this training course.

EDITORIAL NOTE

The use of particular designations of countries or territories does not imply any judgement by the publisher, the IAEA, as to the legal status of such countries or territories, of their authorities and institutions or of the delimitation of their boundaries.

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CONTENTS

Chapter 1
INTRODUCTION

BACKGROUND

Safety Requirements for Legal and Governmental Infrastructure for Nuclear, Radiation, Radioactive Waste and Transport Safety [1] address the issues of competencies and training of the regulatory body by requiring that: "In order to ensure that the proper skills are acquired and that adequate levels of competencies are achieved and maintained, the regulatory body shall ensure that its staff members participate in well defined training programmes. The training should ensure that staff are aware of technological developments and new safety principles and concepts."

In order to implement this requirement the regulatory body needs[1]:

- a training policy;
- budgetary provisions for training;
- an overall training programme that takes into account the operational needs and the long term need for specialists and managers;
- a training plan for each employee which is tailored to the employee's needs and role in the regulatory body. The training requirements for regulatory personnel needs to be based on the functional areas and areas of specialization;
- procedures in place for periodic review and updating of the training programme to take into account the changing needs of the organization and of the individual and scientific and technological development.

The administration of training needs to be formalized and responsibilities assigned within the regulatory body. For an effective and systematic approach to training, the regulatory body needs to consider the establishment of a training unit, either as part of its organization or with the assistance of specialized institutes.

OBJECTIVE

The objective of this report is to describe good practices and provide some practical examples of how to develop training programmes for regulatory staff using the concept of a competency framework in the context of the fulfillment of nuclear regulatory functions.

SCOPE

This report is meant for regulatory bodies overseeing nuclear facilities, and specifically, nuclear power reactors and research reactors. It concentrates on the training of staff members who perform primarily in the areas of review and assessment, inspection and enforcement, authorization, and development of regulations and guides, but can easily be extended to other

[1] The IAEA is preparing a guide on Management, Organization and Staffing of the Regulatory Body for Nuclear Facilities.

regulatory functions. A key issue is how to organize regulatory training in a systematic manner taking into account required competencies and a person's earlier education, training and experience.

The full application of the good practices described in this report may be beyond the initial capabilities of small regulatory bodies. In these cases, the framework described represents a goal to be achieved through gradual implementation of the approach.

STRUCTURE

Chapter 2 of this report describes topics related to training of regulatory body staff and presents the main regulatory functions. Chapter 3 describes the competency model used in this report and presents competencies needed for the regulatory body as a whole. Chapter 4 describes competencies needed for the various regulatory functions. Chapter 5 describes the various means by which needed competencies can be achieved in the regulatory body. Chapter 6 introduces country specific examples provided in appendices, which describe how competencies and training management are carried out in different regulatory organizations.

Chapter 2

TRAINING OF REGULATORY BODY STAFF

It is essential that regulatory bodies apply a systematic approach to identify current and desired competencies, determine the gaps, and design and implement training programmes to address the desired regulatory body competencies.

2.1. Learning policy

In order to ensure that the regulatory body has the correct and adequate competencies within the organization there is a need for a clearly defined learning policy. Learning is a lifelong process. Organizations should be committed to the training and development of their employees in order to enhance the efficiency and effectiveness of their operations, achieve their mission objectives and permit the ongoing development of a professional, competent, versatile and motivated workforce. It is important that all regulatory organizations develop a training policy that reflects this principle. Some guiding principles are:

- The most valuable asset of the regulatory body consists in its employees. Building employees' skills and knowledge is an investment in each employee and in the future of the organization.
- To enable employees to develop so they are capable of carrying out their current job responsibilities to a corporately established level of competencies.
- Adequate provisions in the budget for training and development and a demonstrable commitment from the regulatory body management.
- Positioning the organization and its employees in such a way as to meet future business requirements and challenges.
- Learning activities that are aligned with and contribute to the achievement of the regulatory organization's mission.
- Learning activities that are allocated in a fair and equitable manner in the light of business priorities, operational needs, employees' career aspirations and financial constraints.
- A combination of self-study, formal training courses, workshops, seminars and on the job training as a platform for the regulatory training programme.

2.2. Systematic approach to training

The systematic approach to training (SAT) contains five steps which are described in considerable detail in [2]. SAT is a technique that provides a logical progression from the identification of the competencies required to perform a job to the design, development and implementation of training to achieve these competencies, and subsequent evaluation of this training. SAT is a methodology that applies quality assurance to training in order to achieve the intended objectives. Its application requires considerable time. However, its application is less rigorous for regulatory bodies than for power plants.

2.2.1. Use of systematic approach to training by the regulatory body

Briefly, SAT consists of five interrelated phases as follows:

Analysis: the phase in which competencies required to perform particular jobs/tasks and the training needs to achieve these competencies are identified. Competencies are groups of knowledge, skills, and/or attitudes needed to perform a particular job. The output of this phase is a set of learning points that identify what a learner must know and do, and the criteria by which an evaluator can tell if trainees have achieved the intended goals. This phase also includes analysis of the audience and the capabilities of the trainers (including the subject matter experts.)

Design: the phase in which training needs and learning points related to specific competencies are converted to learning objectives, including evaluation strategies, which are then organized into training plans involving learning points, learning cycles and evaluation methods.

Development: the phase in which training materials and evaluation tools are prepared so that the achievement of training objectives can be confirmed. The work performed in this phase as well as in the design phase ensures that the intended training is both appropriate and adequate.

Implementation: the phase in which training is conducted in a specific training environment using the training materials that were created in the development phase. By design, specific delivery methods and tools would be used to ensure that training is delivered in an effective and efficient manner.

Evaluation: the phase in which all aspects of the training programme are continuously evaluated on the basis of data collected during each of the other phases. It is followed by suitable feedback leading to training possible programme improvements.

2.2.2. Use of project management process

Each training programme is treated as a project; that is, established project management principles are used to initiate, plan, execute, control and close the training programme. Initiating a training programme may, for example, involve preparing a business case that secures management authorization and endorsement, and, consequently, the allocation of adequate human and monetary resources. Initiating a training programme may also involve negotiating with interested stakeholders to secure the commitment of management and participants to the training programme.

Planning may involve:

- developing a written scope statement on which future decisions would be based;
- defining major milestones and specific activities that will lead to specific project deliverables;
- producing a schedule which would show the sequencing of activities and the duration of each;
- planning resources internal and external to the organization;
- estimating the cost of work item within the allotted budget;

identifying the quality assurance measures to be taken, the risks that may affect the project and the appropriate responses to be taken.

Execution of a training programme includes implementing the programme as designed, use of evaluation/verification measures to ensure that the quality of the activities and the effectiveness of its delivery.

Control relates to keeping the programme on time and within budget, and dealing with unexpected situations that may require decision making at different levels of authority. It also includes the identification of variances from the plan and taking the corrective actions timely.

Finally, the closure phase of a training programme would include analysis of the data collected from the evaluation tools, reporting the outcome to management and other stakeholders, storing the results of evaluating the learners' success in the training database, and, perhaps, modifying the training material for repeat delivery.

When the systematic approach to training is used in conjunction with the project management process, as described above, the resulting overall process is referred to as the systems approach to training in the countries of some of the regulatory bodies. In some countries, an "instructional systems design" (ISD) model, which is equivalent to the SAT, is used. The SAT approach is followed to a reasonable degree by regulatory bodies in order to achieve and maintain the core competencies necessary to carry out the mission of the regulatory body. Even in mature regulatory bodies, this commonly means that the principles of the Systematic Approach to Training are used but not necessarily with the same rigour as the operating organizations use for designing and implementing operator training programs. For example, as part of the SAT analysis phase, a more rigorous approach would include a formal job and task analysis (JTA), a formal job competency analysis (JCA), or a formal combined JTA/JCA. A less rigorous approach commonly used by mature regulatory bodies is to use a simplified SAT approach to more rapidly identify job task and competency requirements through the use of expert opinion, focus groups, and structured brainstorming.

2.2.3. Difference between training of operators and training of regulatory body personnel

Although some elements of training programmes for regulatory body personnel may be similar to some elements of operator training programmes, the overall training programmes will inevitably be considerably different since the roles of regulatory staff and operating staff are quite different. Even for training programme elements that would appear to be in common, it is often very useful if the training for regulatory body staff can be implemented using a regulatory perspective rather than an operational perspective. Because of cost considerations and economies of scale, this may or may not be feasible for individual regulatory bodies.

2.3. Methods of training

Training can be provided by a variety of methods including classroom-based training, distance learning, and on the job training. Training of a particular group need not be restricted to one training method alone; in fact training for most categories of persons will inevitably involve a combination of methods. Choice of training methods will be determined by factors such as geographical location of the participants, availability of release time from the workplace, costs and availability of equipment and materials. In order to ensure a high quality of training,

however, all training, regardless of the method of provision, follows the recommendations given by the relevant national authority.

2.3.1. Classroom-based training

Classroom based training is still the most frequently used method of training provision, and is probably the most effective training mechanism for comprehensive levels of training. It facilitates direct communication and discussion between the trainer and the participants and enables the trainer to modify a range of factors such as the depth of the course and the speed of delivery depending on the capabilities and progress of the participants. A classroom based training course will consist of a series of short lectures on specific topics from a syllabus, interspersed with practical exercises, group discussions and case studies designed to reinforce the lecture content. However, the provision of such courses is relatively expensive both in terms of the resources and efforts from the trainers and the time and subsistence costs for the participants.

2.3.2. Distance learning

Distance learning is a training method that may be an effective alternative to classroom-based training. It can be provided for all categories of persons and is particularly appropriate for people who live far from training centers or have insufficient time or funds to attend classroom-based training. It may also be an effective use of training resources where only small numbers of people need training.

Distance learning media cover a range of technologies, including paper correspondence courses, videotapes, video teleconferencing and Internet based classes. The role of the supervisor in distance learning will vary depending upon the medium used. Training through correspondence, videotape instructions and most Internet based classes provide for little or no supervisor–participant interaction. Video teleconferencing, on the other hand, lets participants and supervisors interact almost at a classroom level. The availability of cameras and microphones for Internet communications makes the access of personal computer users to Internet based distance learning much easier.

A typical distance learning package consists of a modular set of course notes, study guides and associated exercises based on specific topics from a syllabus. Participants complete the package in their place of work or at home. The training includes the completion of assessment tasks (e.g., written examinations, research assignments, problem solving exercises), which are then forwarded to a supervisor or tutor for marking and feedback. Distance learning involves a residential programme designed to reinforce the course material and to provide practical work and technical visits. The residential programme may be relatively brief, but it provides sufficient time for the participants to acquire the needed skills, problem solving methods, or other practical experiences. The role of the supervisor is important to the success of distance learning and frequent interactions between the participants and the supervisor may be necessary.

This method of training is an effective use of resources and permits the participants to study at their own pace. However the success of the training depends on the self-motivation of the student to complete the work with the minimum of direct supervision. With the increased availability of personal computers around the world, many workers now have access to a computer in the workplace. This has stimulated the development of computer-based training

packages (CBT) consisting of interactive training modules with question and answer sections. The selection of the CBT package will depend on the learning objectives planned for the training. Advice to assist with selection may be available from national authorities.

Computer based training modules usually incorporate photographs, diagrams, simulations, and video sequences. The information can be accessed and searched easily and links can be provided to a glossary of terms. Printed learning material and study guides are needed to support the CBT. Computer based training is a form of distance learning and has similar advantages and disadvantages. It can be used wherever there is a suitable computer, thus preventing the need for absence from the workplace, and the participants can work at their own pace.

2.3.3. On the job training

Classroom based training or distance learning is unlikely to cover all the practical nuclear and radiation safety aspects and skills associated with specific work tasks. Hence on the job training (OJT) is a critical component of the overall training programme. In this form of training, the participant will be working in his/her normal place of work or other suitable training site, and will be working under the direct supervision of an experienced person. The duration of on the job training will vary considerably depending on the practice. It is important that the training be provided in a systematic manner to ensure that the benefits are maximized. A training plan based on identified practical competencies may be prepared. It will include a list of topics to be covered and tasks to be carried out.

The participant's progress and achievements may be recorded on a checklist of topics and tasks. The supervisor's role is an important one, and includes ensuring that the participant receives comprehensive training and is not just used as an extra pair of hands. A staged approach to OJT ensures that the participants' progress from observing the task being performed by others, to assisting and finally to carrying out the tasks themselves. On completion of the training, the supervisor and participant prepare a comprehensive report describing the participant's progress, the areas of competence achieved and any further training needed.

2.3.4. Structured self-study

Most tasks require a detailed level knowledge or working level knowledge of specific policies and procedures for successful task performance. Structured self-study is necessary to ensure an appropriate level of knowledge of policy and procedures specific to one's job. Since this is simply an alternate training method, the same standards and controls that apply to formal classroom training, i.e., learning objectives, lesson plans, standards for successful course completion, etc. are implemented for self-study and OJT as well. Self-study and on the job training activities are more focused, structured, and sequenced to increase the effectiveness of these activities.

Self-study activities are most effective if they precede and tie directly to a subsequent formal course or on the job training activity (i.e., the student reads and studies the document, then has an opportunity to discuss and apply it). A structured self-study guide is developed for each document for which a detailed knowledge or working level knowledge is desired. Each self-study guide is structured to include the objective of the activity, specific actions required by the student, specific requirements for management involvement and oversight, and measurable

standards for acceptable completion of each activity. Related guides would be combined into a module that would link to a formal course and is required as pre-work or prerequisite for formal course attendance. This integrates and sequences learning activities such that each subsequent activity builds and expands on the previous activities.

2.4. Regulatory functions as a basis for training and qualification

2.4.1. Major and supplementary functions of the regulatory body

The major regulatory functions have been described in the IAEA Safety Standards Series, Requirements GS-R-1 [1]. This document describes the responsibilities and functions of the regulatory body and establishes four major functions of the regulatory body as authorization; review and assessment; inspection and enforcement; and development of regulations and guides. Some supplementary functions were also identified which include research and development; emergency preparedness; and international co-operation. For the purposes of this report the emphasis has been placed on identification of the competencies within the four main functions, as they will also apply to the supplementary functions. The four main functions are described below and for consistency the other functions are also listed. However no detailed consideration of the supplementary functions other than a description will be undertaken.

2.4.2. Authorization

This is the granting by a regulatory body or other governmental body of written permission for an operator to perform specific activities. Authorization includes, for example, licensing, certification, registration, etc. It is the principal mechanism connecting the legal framework of the regulatory system with the responsibilities of the principal parties; namely, the regulator and the operator.

2.4.3. Review and assessment

This is a continuous function in which the regulatory body determines whether the operator's submissions demonstrate that the facility complies throughout its life cycle with the safety objectives, safety principles, and safety criteria stipulated or approved by the regulatory body. It involves the establishment and maintenance of a satisfactory relationship between the regulatory body and the operator. This includes the review and evaluation of safety documents using technical information and professional judgment to make decisions concerning the health and safety of people in the workplace, the public and the environment and the security of the facility.

2.4.4. Inspection and enforcement

Inspection is a continuous function in which the regulatory body conducts inspections to satisfy itself that the operator is in compliance with the conditions set out, for example, in the authorization or regulations. Inspection is performed to check independently the operator and the state of the facility and to provide a high level of confidence that operators are complying with the safety objectives prescribed or approved by the regulatory body. This is achieved by confirming that the operator complies with relevant laws, regulations, license conditions, codes, guides, specifications, and practices; has strong and effective management, a good safety culture, and an effective self-assessment system; achieves and maintains the quality and

performance specified by the regulatory body for safety activities as well as structures, systems, and components; has sufficient personnel with necessary competencies for efficient and safe performance of their duties; and promptly evaluates and corrects deficiencies and abnormal conditions.

Enforcement is a function in which the regulatory body applies sanctions against an operator intended to correct and, as appropriate, penalize non-compliance with conditions of an authorization.

2.4.5. Development of regulations and guides

This is a function in which the regulatory body creates new regulations and guides or revises existing ones. Regulations are typically sets of mandatory, legal requirements that include extension and explanation of the regulatory requirement in the principal law. Guides are documents produced by the regulatory body that typically provide policy statements and practical guidance on how regulatory requirements could be satisfied. In order to establish well-founded regulations and guides, the regulatory body typically seeks and receives stakeholder views prior to issuing.

2.4.6. Supplementary functions

Research and development is a function in which the regulatory body conducts or commissions independent research to confirm specific findings. The research conducted by the regulatory body can be either confirmatory or anticipatory and it may be focused on either short term or long term regulatory needs. Emergency preparedness is a function in which the regulatory body ensures that the operators have adequate emergency preparedness arrangements in place. The role of the regulatory body varies considerably in emergency preparedness. In some cases the regulatory body must also be competent to act as part of a national organization to oversee the emergency situation and provide advice to relevant parties.

International co-operation is a function in which the regulatory body establishes arrangements for the exchange of safety related information to fulfill safety obligations and to promote co-operation. International co-operation can consist of exchange of information, mutual assistance in regulatory activities, staff training, meetings on specific subjects, and other matters. In addition, after considering the competencies for this function, the safeguard function has been included and presented in a later analysis.

2.4.7. Sample tasks for regulatory functions

Tables I and II present sample tasks for the regulatory body functions. The actual tasks for individual regulatory bodies may be different as a result of regulatory body size and organization.

TABLE I. SAMPLE TASKS FOR AUTHORIZATION AND DEVELOPMENT OF REGULATIONS AND GUIDES FUNCTIONS

Authorization	Development of Regulations and Guides
• Project manage of licensing activities	• Identify the need for new regulations and or guides
• Assess technical issues	• Identify safety issues where guidance is required or where there is an impact on the existing regulatory regime
• Interact to resolve policy issues	• Undertake consultation with stakeholders to determine what is required
• Establish plant performance measures for use in safety evaluations	• Consult with the public if appropriate and co-ordinate responses
• Manage the review and processing of license amendments and other requests requiring regulatory body approval	• Seek and use expert opinions to develop guidance material
• Co-ordinate other licensing tasks such as evaluating information received from licensees in response to regulatory requests	• Project manage production of regulatory guidance or regulations to agreed time scales
• Prepare responses to public petitions and correspondence	• Determine practices in other countries, international standards and incorporate such practices as appropriate
• Project manage decommissioning and dismantling licensing activities	• Prepare draft material and co-ordinate production of final documents
• Establish standards for the process of formulating licensing recommendations and of making licensing decisions	• Establish validity of the application of current regulations and guide and identify any practical problems. Where appropriate develop guidance on interpretation or need for amendments
• Establish a data warehouse and perform trending analysis	• Where appropriate examine the impact of regional directives, for example European Union Directives, changes in state legislation

TABLE II. SAMPLE TASKS FOR INSPECTION AND ENFORCEMENT AND REVIEW AND ASSESSMENT FUNCTIONS

Inspection and Enforcement	Review and Assessment
• Develop policy and provide overall programme management and planning for the reactor inspection and performance assessment programmes	• Assessment of technical issues
• Develop and oversee the reactor safeguards, emergency preparedness, and radiation protection inspection programmes	• Performance of safety evaluations
• Analyze and evaluate programme effectiveness and implementation	• Performance and evaluation of probabilistic safety assessments
• Review and evaluate licensee quality assurance programmes	• Performance and evaluation of consequences of radiological release and comparison with regulatory body criteria and standards
• Review and evaluate nuclear power plant administrative controls for safety committees, audits, independent engineering group, procedures and records	• Evaluation of severe accident issues
• Review and evaluate initial/pre-operational/restart test programmes for nuclear facilities	• Application of risk insights and methods to review applications for license amendments
• Process, control, review, manage and resolve allegations and take or recommend appropriate actions to address safety concerns	• Performance of risk analyses to determine the significance of operational events and inspection findings
• Perform inspections in response to allegations and reports of defective or substandard components, equipment and services	• Application of risk-informed methods to resolve regulatory issues
• Identify non-compliance with procedures and or regulations and take appropriate action	• Review of PRA/PSA submittals
• Identify the need for improvements in safety and seek corrective action	• Deterministic analysis of plant, facilities and associated safety documentation
• Report corrective actions and confirm enforcement actions in writing to the operator	• Performance of dose assessments and calculations
• Prepare inspection reports or reports of other significant activity and ensure feedback to inform decision making	• Review of operational doses
• Plan for and undertake unannounced inspections of facilities	• Analysing operating reactor events
• Organize team inspections related to plant specific performance issues or using risk informed judgments	• Review and evaluation of nuclear and thermal-hydraulic aspects of the reactor core under steady-state, transient, and accident conditions
• Identify issues which may be generic across other facilities and organize actions consistent with regulatory body practice	• Completion of engineering-related safety evaluations of licensee's implementation of regulatory requirements, changes to existing licenses including license extensions, and applications for new facilities or designs

(TABLE II cont.)

• Initiate legal sanctions in accordance with limits of authority • Gather evidence where legal sanction is anticipated and prepare documentation in accordance with regulatory body practice	• Review and evaluation of component metallurgical behavior, review of ageing effects and aging management programs • Review and evaluation of issues related to chemical engineering including hydrogen generation, post accident sampling, water chemistry, corrosion, and decontamination • Review of design criteria • Review and evaluation of seismic and dynamic qualification • Review and evaluation of external conditions such as earthquakes, human-related hazards, floods, and their threat to the functional integrity of components and systems • Review of in service testing capabilities of safety-related pumps and valves and in service inspection methods for containment components • Evaluation of risk-informed operational initiatives related to design, testing and inspection of nuclear power plant components • Review and evaluation of transient and accident conditions and impact on related plant • Review and evaluation of operational functional performance requirements or protection systems, engineered safety features actuation systems, actuation instrumentation for essential auxiliary support systems, and instrumentation and control systems provided to initiate and regulate the operation of safe shutdown systems • Review and evaluation of functional performance requirements, design, and performance of plant instrumentation providing information regarding manually initiated and controlled safety functions • Review and evaluation of pre-operational and restart test programmes for facilities • Review and evaluation of licensee training programmes and their relationship to plant operations • Review and evaluation of safety management procedures and how they are implemented • Review and evaluation of technical specifications for the facility and relationship to operating regime

Chapter 3

COMPETENCY FRAMEWORK FOR REGULATORY BODY

3.1. Competencies: Definition

Competencies are groups of related knowledge, skills and attitudes (KSAs) needed by a person to perform a particular job. Knowledge represents the depth and breadth of absorbed and retained information by the mental faculty of a person that would enable that person to deal with different situations, changes, and the unexpected. Skills are the demonstrated abilities and expertness of a person to perform a task to prescribed standards as judged by an evaluator. Attitude is the appreciation and the practiced behavior of a person to perform a job or a task with due diligence. Competencies are often wrongly expressed in a format that relates more to a description of an activity or a task. Competencies are the mental, physical and behavioral tools with which an activity or a task is executed.

A simple way to differentiate between a task and a competency is to ask oneself whether the statement describing a competency can be used to perform a task or it is a description of the task itself. For example, for a safety evaluator to perform the task of reviewing a particular part of a safety report, a required competency would involve knowledge of the paths of all reactor cooling systems and the capacity of heat sinks during all possible modes of operation. Another competency would be a skill of effective written communication that would be utilized in reporting the findings of the review and making recommendations. A third competency would be an attitude of appreciation that safety is the driving factor that must not be compromised in reviewing the safety report and formulating the recommendations.

3.2. Competency model

Several approaches have been used by the nuclear industry in the development of training programmes based on job/task/competency analyses. Also, outside the nuclear industry, many major companies have invested significant time and effort to establish the competencies they require in their businesses so that they could establish an appropriate recruitment strategy and subsequent training. It is not possible in this report to conduct such an extensive analysis for a specific regulatory body; rather the approach adopted has been to develop a model that is based on current IAEA efforts. The competency model presented in this section groups competencies into discrete categories, depicting them in terms of four quadrants. The model can be used to identify the present state of affairs and the future state of affairs for the regulatory body or for the individuals and subsequently the corresponding training needs. This approach will help to identify gaps in competencies that would be filled by either training programmes or recruitment. The competency model will prove essential for a regulatory body especially if consistency of regulatory performance is sought and for the development of staff qualification, career planning and professional progression. The competency model may also prove to be a key instrument to lead a regulatory body to effect major changes, particularly if strategic goals need to be amended and a new set of competencies may be required for new challenges.

Overall, a competency-based approach forms a significant input into the process of developing an effective regulatory body that responds to internal and external environments and the associated challenges. As indicated above, competencies comprise different sets of

knowledge, skills and attitudes. Competencies may have one or more levels. For instance, one often reads in job advertisements requirements for basic, working, or advanced knowledge in a specific field.

The advertiser and the reader assume that there exists a common understanding of these levels. However, they both may be surprised when false expectations are uncovered later. Therefore, it is highly beneficial that competencies be formally defined within the organization. Also, levels of competencies must be established and publicized to interested stakeholders with clarity over the expected standards. Standards that include indicators should carefully be established to provide, if necessary, the ability to attest that regulatory body personnel possess or have achieved a required level of competency. It is extremely difficult to set an international definition for levels of competencies and an international standard for indicators of achieving such levels. However, each regulatory body must establish its own sets of competencies, levels of competencies, and standards for evaluating whether or not personnel have achieved a prescribed level, and, as such, that these personnel would be considered qualified. Requirements for testing or certifying of regulatory body staff is not the subject of this report.

Since competencies are related to the knowledge, skills and attitudes acquired by a human being, a competency model could logically be based or linked to some known models for human behaviour and for adult learning. Numerous managerial models, training models, and human behaviour models exist in the open literature. Many of these models have a common feature; that is, they depict the human behavior or capacity for learning on four quadrants. For example, an experiential learning model includes four types of training activities; namely, experience, reflection, generalization and application, that can be tailored for four types of learners; namely, convergers (concrete experiencers), assimilators (reflective observers), divergers (abstract conceptualizers), and accommodators (active experimenters) [4]. Figures 1 and 2 present experiential learning cycle model and experiential learning styles [4, 5] to give support for the selected manner to present the competencies. Also there are a number of management models that are based on four quadrants of human personality, responsibility or delegation capabilities [6]. Therefore, there are precedents that could be considered as a reasonable base for developing a competency model with four quadrants for the purpose of this report.

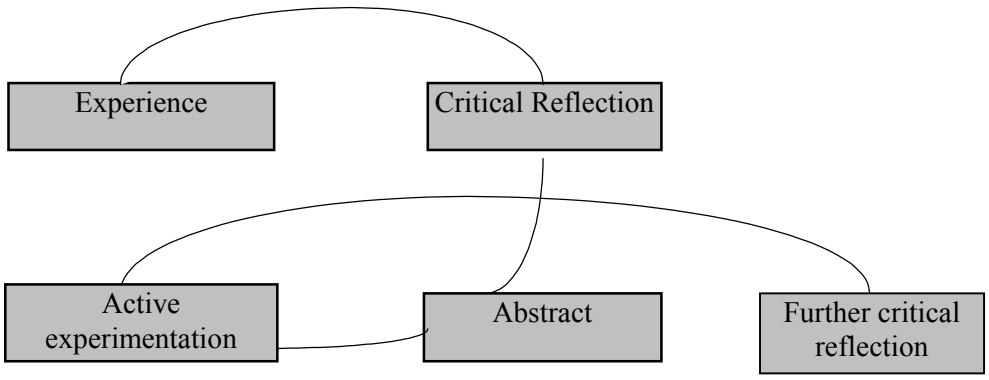

FIG. 1. Experiential learning cycle [5].

FIG. 2. Types of learners who correspond to the experiential learning styles [5].

The four-quadrant competency model presented in this report is applied to a regulatory body. Each quadrant is assigned a group of competencies that are coherent and consistent within the context of each quadrant. The first quadrant includes competencies related to the legal basis and regulatory processes that empower the regulatory body and govern its operation. Competencies relevant to basic, applied, and advanced technologies are grouped in the second quadrant. The third quarter comprises competencies that are pertinent to regulatory practices such as assessment and inspection technologies, investigation, and auditing. Finally, competencies related to personal and interpersonal effectiveness (commonly known as soft and/or human-factor skills) are included in the fourth quarter. The model is presented in Figure 3.

The following section details the four-quadrant competency model as applied to a regulatory body and provides ample examples of the knowledge, skills, and/or attitudes that are associated with each competency.

4. Personal and interpersonal effectiveness competencies 4.1. Analytical thinking, problem solving and decision making 4.2. Personal effectiveness 4.3. Communication 4.4. Team work 4.5. Management	**1. Legal basis and regulatory processes competencies** 1.1. Legal basis 1.2. Regulatory process 1.3. Regulatory guidance documents 1.4. License and licensing documents 1.5. Enforcement process
3. Regulatory practices competencies 3.1. Safety-focused analytical techniques 3.2. Inspection techniques 3.3. Auditing techniques 3.4. Investigation techniques	**2. Technical disciplines competencies** 2.1. Basic technology 2.2. Applied technology 2.3. Specialized technology

FIG. 3. Competency model quadrant-presentation for regulatory body.

3.3. Competencies related to legal basis and regulatory processes

This section addresses competencies associated with both the legal basis and the regulatory processes to which the regulatory body operates. Legal basis competencies include those related to nuclear and other relevant legislations, decrees and regulations of the central government and local jurisdictions. Regulatory processes competencies comprise KSAs related to regulatory policies, procedures and other regulatory guidance documents as well as licensing documents that the staff members employ to carry out their duties. The following paragraphs present these competencies and the associated KSAs.

This section addresses competencies associated with both the legal basis and the regulatory processes to which the regulatory body operates. Legal basis competencies include those related to nuclear and other relevant legislations, decrees and regulations of the central government and local jurisdictions. Regulatory processes competencies comprise KSAs related to regulatory policies, procedures and other regulatory guidance documents as well as licensing documents that the staff members employ to carry out their duties. The following paragraphs present these competencies and the associated KSAs.

3.3.1. Legal basis competency

This competency is the ability to read, comprehend, interpret and use relevant documents that establish the legal requirements for obtaining a license, and the powers of the regulatory staff and the limits to these powers.

List of associated KSAs:

- comprehension of the central government's nuclear laws and decrees as well as other laws and decrees that apply to a licensed nuclear facility;
- appreciation and comprehension of the applicability to the nuclear industry of the laws and decrees of the local jurisdictions and authorities;
- comprehension and demonstrated use of the regulatory body's regulations within limits as per interpretations offered by legal counsels and recorded experience;
- appreciation and demonstrated comprehension of the rights of all stakeholders affected directly or indirectly by the provisions of the legal basis of the regulatory body;
- demonstrated ability to interpret legal texts for application in the field;
- demonstrated ability to relate legal requirements to routine tasks;
- appreciation and comprehension of the interrelationship between legal documents, regulatory guidance documents and licensing documents.

3.3.2. Regulatory process competency

This competency is the performance of work in accordance with rules, regulations and established regulatory protocol to achieve the relevant regulatory objectives.

List of associated KSAs:

- appreciation of the mandate, mission and objectives of the organization;
- appreciation of measures for implementing actions to achieve the regulatory short term and long term strategic objectives and goals of the regulatory body;

- comprehension of relevant policies, procedures, guidance documents and licensing documents that are used in carrying out specific regulatory tasks as defined in the legal basis;
- appreciation of duties to process an application rigorously and in a timely manner;
- appreciation of adhering to the principles of good regulations which means that the regulatory body carries out its activities in independent, open, efficient, clear, reliable, and fair manner;
- appreciation of the necessity of involving all stakeholders, particularly the licensees, in the licensing process as per the legal basis and the established regulatory practice of the regulatory body;
- demonstrated ability to assimilate information and data gathered from several and different sources and produce a document that contains recommendations for consideration of the decision makers of the regulatory body.

3.3.3. Regulatory guidance documents competency

This competency is the capacity to produce regulations and guidance documents including policies and procedures containing practical steps on how regulatory requirements could be satisfied by the licensees and be adjudicated by the regulatory staff.

List of associated KSAs:

- appreciation and comprehension of the requirements and implications of international and national safety and industrial standards;
- awareness of the safety requirements applied in other countries;
- comprehension of the safety case; that is, the safety objectives and criteria, as related to the facilities or devices being considered for licensing;
- demonstrated ability to define the format and contents of requirements for a license application;
- demonstrated ability to define technical safety requirements for siting, design, construction, commissioning, operation, decommissioning and waste management of nuclear facilities or devices;
- demonstrated ability to identify gaps and confirm needs for the production of regulations and regulatory guidance documents;
- demonstrated proficiency in writing regulatory requirements in mandatory rules and regulations as well as in regulatory guidance documents;
- demonstrated ability to transfer legal requirements into forms which can easily become understandable and practical guidance texts;
- demonstrated ability to produce regulations and regulatory guidance documents in accordance with established formats and formal textual styles;
- demonstrated ability to ensure consistency in terminology and format and to identify needs for and justify new, or modifications to existing, regulatory documents.

3.3.4. License and licensing documents competency

This competency is the capacity to ensure that the license and the associated licensing documents are in compliance in form and contents with the regulatory requirements. This competency is related to a concept used by some regulatory bodies such as the safety case or safety envelope which is normally defined by a license and the associated licensing documentation.

List of associated KSAs:

- comprehension of the format and contents of a license produced for a nuclear facility or a device;
- comprehension of the possible options of a license;
- demonstrated ability to take the licensing recommendations into consideration and include them in the body of the license or in the accompanying license conditions;
- awareness and comprehension of how the terms of a license and the associated license conditions could be transferred into a licensee's operating safety envelope that will be guiding the inspection activities at a later stage;
- awareness, appreciation and comprehension of the licensee's documents submitted to receive a license and other relevant licensee's documents.

3.3.5. Enforcement process competency

This competency is the provision of a supportable recommendation of enforcement action in accordance with regulatory body policy.

List of associated KSAs:

- comprehension of enforcement policy and guidance;
- comprehension of an event or issue;
- comprehension of associated issues (plant performance data);
- comprehension of regulatory body procedures;
- demonstrated ability in determining what regulation and supporting documents apply to specific situations;
- demonstrated ability in identifying non-compliant situations during an inspection;
- demonstrated ability in differentiating between minor and major violations;
- demonstrated ability in evaluating corrective measures proposed by the licensee and determining if these will rectify identified items of non-compliance;
- demonstrated ability to secure corrective action by discussion and persuasion;
- appreciation and comprehension of the laws, regulations and bylaws that protect the rights of individuals;
- awareness and appreciation of the local criminal laws and their application;
- demonstrated abilities to work with the local law-enforcement units.

3.4. Competencies related to technical disciplines

This section addresses competencies associated with technology in various fields and areas that are needed by the regulatory body to carry out its overall responsibilities. The following paragraphs present the competencies and associated KSAs.

3.4.1. Basic technology competency

This competency is the comprehension of science and engineering fundamentals in a particular field equivalent to a university degree.

Some typical science and engineering fields that are common to many regulatory bodies are listed below. It should be noted that this is a sample list only and that a particular regulatory body may require competencies in other science and engineering areas:

- nuclear engineering;
- nuclear physics;
- chemical engineering;
- materials science;
- mechanical engineering;
- civil engineering;
- earth sciences;
- environmental engineering;
- computer sciences;
- electrical engineering;

List of associated KSAs:

- comprehension of one of the science fields at a basic level but not necessarily applied to nuclear industry applications, problems, or situations;
- comprehension of one of the engineering fields at a basic level and but not necessarily applied to nuclear industry applications, problems, or situations.

3.4.2. Applied technology competency

This competency is the additional comprehension and demonstrated ability to apply engineering and science concepts in relation to the nuclear industry. Some typical applied technology areas for which many regulatory bodies provide technical training for regulatory body staff are listed below. Regulatory bodies commonly provide such training to generalists to broaden their competencies in specific areas. Regulatory bodies sometimes also provide such training to specialists in areas other than their specialty to broaden their perspectives of how their specialty area relates to other areas for which the regulatory body has jurisdiction. It should be noted that this is a sample list only and that a particular regulatory body may or may not require additional competencies in these or other areas.

- reactor technology;
- fuel cycle technology;
- engineering techniques or technical issues;
- radiation protection as applied to nuclear facilities and to industrial uses of radioactive sources;
- nuclear safety technology including safety and risk analysis.

List of applied KSAs:

- comprehension of the design and operation of structures, systems, and components of regulated facilities from a regulatory perspective;
- comprehension of engineering techniques or technical issues that are applied at facilities within the jurisdiction of the regulatory body;
- comprehension and demonstrated ability in applying radiation protection principles at nuclear facilities;
- comprehension of the design and operation of industrial uses of radioactive sources from a regulatory perspective;

- comprehension of safety and risk assessment tools and techniques and how safety and risk assessment is applied within the regulatory framework of the regulatory body.

3.4.3. Specialized technology competency

This competency is the comprehension and demonstrated ability to address and resolve issues in a specialized field. Some typical scientific fields or specialized areas that are common to many regulatory bodies are listed below in addition to what is presented in Chapter 3.4.2. It should be noted that this is a sample list only and that a particular regulatory body may require competencies in other science and engineering areas:

- instrumentation and control;
- criticality analysis;
- nuclear material control;
- software reliability;
- fire protection;
- human performance engineering/human factors;
- fracture mechanics;
- corrosion chemistry;
- thermal hydraulics;
- health physics.

List of applied KSAs:

- comprehension at a deep level of a scientific field or specialized area that provides sufficiently expert knowledge to address and resolve regulatory body technical issues;
- demonstrated ability to apply the knowledge of a scientific field or specialized area with sufficient expertise to be noted within the regulatory body (and perhaps the world) as an expert in the field or specialized area.

3.5. Competencies related to regulatory practices

This section addresses competencies associated with regulatory practices which are used by the regulatory body to accomplish its mission. The following paragraphs present the competencies and associated KSAs.

3.5.1. Safety-focused analytical techniques competency

This competency is the objective analysis and integration of information using a safety focus to develop a supportable regulatory conclusion.

List of associated KSAs:

- comprehension of inspection reports, licensee reports, self-assessments, responses to generic communications, and third party reports;
- comprehension of assessment procedures;
- appreciation and comprehension of current regulatory body emphasis (sensitivity and priorities);
- comprehension of nuclear safety concepts (defence in depth, etc.);

- comprehension of PSA/PRA concepts;
- demonstrated ability in the analysis of technical information;
- demonstrated ability in the integration of technical information;
- demonstrated ability in evaluating technical programmes or issues;
- demonstrated ability in making recommendations that are supportable by reliable information.

Appreciation of maintaining objectivity and independence.

3.5.2. Inspection techniques competency

This competency is the independent gathering of information through objective review, observation, and open communications and determining acceptability of information by comparing it to established criteria.

List of associated KSAs:

- comprehension of inspection procedures;
- comprehension of inspection techniques;
- comprehension of industry codes and standards;
- comprehension of regulations and regulatory guidance documents;
- comprehension of regulatory body policies and standards for facility inspection;
- comprehension of plant specific or area specific technical information;
- comprehension of PSA/PRA concepts;
- comprehension of licensing documents, manuals and other reference material;
- comprehension of licensee work schedule;
- comprehension of previous inspection reports, allegation reports, licensee event reports, self-assessments, responses to generic communications, and third party reports;
- comprehension of root cause analyses techniques;
- comprehension of facility status;
- comprehension of regulatory body allegations procedures;
- comprehension of guidance for inspection reports;
- comprehension of procedures for control of information (such as draft and allegation);
- demonstrated ability in assessing the regulatory significance of inspection findings;
- demonstrated ability in evaluating information;
- demonstrated ability in interviewing;
- demonstrated ability in resolution of issues;
- demonstrated ability in observation;
- demonstrated ability in planning and organizing inspections;
- demonstrated ability in recognizing and addressing unusual or abnormal conditions;
- appreciation of critical thinking/questioning approach;
- appreciation of maintaining objectivity and independence.

3.5.3. Auditing techniques competency

This competency is the review of documents and/or programs for conformity to established standards and procedures and making recommendations based on the results.

List of associated KSAs:

- comprehension of the process of auditing and established standards and procedures;
- comprehension of the technical aspects of the subject matter of the audit;
- demonstrated ability in reviewing and analyzing documents against current standards and procedures;
- demonstrated ability in communicating, informing, instructing, persuading and encouraging others.

3.5.4. Investigation techniques competency

This competency is the pursue of the cause of events arising from notifications, incidents or information obtained during inspections and/or evaluations and gathering evidence in order to make regulatory decisions.

List of associated KSAs:

- demonstrated ability in explaining and interpreting procedures that apply to investigations;
- demonstrated ability in making decisions on when investigation is appropriate based on receipt of information;
- demonstrated ability in evaluating information and circumstances and making decisions if and when an inspection should become an investigation;
- demonstrated ability in identifying a strategy appropriate to the circumstance and providing advice on measures to mitigate the immediate risk;
- comprehension of established procedures to conduct investigations;
- demonstrated ability in collecting information and making decisions on relevance to legal obligations;
- demonstrated ability in investigating complaints, incidents, ill health and accidents for regulatory purposes in external organizations;
- demonstrated ability in conducting investigations of work related accidents, cases of ill health and incidents in external organizations for regulatory purposes;
- demonstrated ability in gathering and evaluating evidence in external organizations to determine ill health/accident/incident/complaint causation, appropriate enforcement action and any other action needed by the regulatory authority or duty holders;
- demonstrated ability in informing duty holders, employee/safety representatives and others, of the outcome of the investigation and actions proposed or required;
- demonstrated ability in securing appropriate reductions in risk in work activities and compliance with health and safety legislation in external organizations.

3.6. Competencies related to personal and interpersonal effectiveness

This section addresses competencies associated with the personal and interpersonal effectiveness of regulatory body personnel while carrying out regulatory activities either individually or as part of teams. Table III presents the competencies and the associated KSAs.

TABLE III. COMPETENCIES RELATED TO PERSONAL AND INTERPERSONAL EFFECTIVENESS

1. Analytical thinking, problem solving and decision making competency

This competency is approaching problems objectively, gathering and integrating information, and developing a comprehensive understanding to reach conclusions.
List of Associated KSAs:

- demonstrated ability to assess external and internal environments and consider results in decision making;
- demonstrated ability to consider the linkages among all parts of a problem and evaluate the impacts of possible solutions;
- demonstrated ability to question conventional wisdom and status quo practices with the aim of improving them;
- demonstrated ability to troubleshoot when problems occur and refine choices to be presented;
- demonstrated ability to gather information and also rely on professional judgment and experience to arrive at sound conclusions;
- demonstrated ability to make trade-offs based on a full and realistic assessment of the situation;
- demonstrated ability to identify key issues, analyze and compare data from different sources and clarify cause and effect relationships;
- demonstrated ability to switch from one type of problem to another quickly and easily distinguishing between essential and non-essential details;
- demonstrated ability to determine the sources of resistance and support to recommended options, and generate recommendations and scenarios for positioning strategies in order to build allies;
- demonstrated ability to appraise situations to determine whether the priority is to solve a problem that has occurred, make a decision on a current situation or prevent trouble in the future;
- demonstrated ability to follow a recognized systematic approach to problem solving including defining and specifying the nature and extent of the problem, identifying all possible causes, testing most likely causes against the problem specification, determining the true cause, and making a decision;
- demonstrated ability to clarify and agree the outcome or objective;
- demonstrated ability to analyze the risk and benefits of the best alternatives;
- demonstrated ability to choose the alternatives;
- demonstrated ability to identify the cause(s) of the most likely problems;
- demonstrated ability to identify cost effective preventive actions;
- demonstrated ability to identify contingent actions where necessary;
- demonstrated ability to build into work plan triggers to whether a contingent action should be implemented.

2. Personal effectiveness competency

2.1. Information technology competency

This competency is using technology to create, gather, manipulate, communicate, and/or share information.
List of associated KSAs:

- demonstrated ability to effectively use standard computer software packages and special software programs that have become part of the regulatory body's business processes;
- demonstrated ability to record, store and retrieve information using electronic means;
- demonstrated ability to manipulate and integrate electron information using appropriate software packages.

2.2. Planning and organization of work competency

This competency is effective and efficient co-ordination of tasks to achieve a desired objective.
List of associated KSAs

- demonstrated ability to set priorities and organizes work to meet established timeframes in accordance with regulatory body's requirement;
- demonstrated ability to adapt schedule and adjust priorities as changes occur;
- demonstrated ability to deliver quality work that is timely, complete and accurate;
- demonstrated ability to convert own mistakes into opportunities to learn and improve;
- demonstrated ability to make adjustments in response to feedback

TABLE III (cont.)

- accept constructive criticism;
- demonstrated ability to use time management techniques to organize workflow, set priorities and conduct appropriate follow-up;
- demonstrated ability to look for ways to self-evaluate; reflect on strengths and weaknesses;
- demonstrated ability to find simpler, faster and less costly ways to accomplish tasks or achieve objectives.

2.3. Self management competency

This competency is working independently, exercising judgment and exhibiting flexibility in the completion of activities especially during difficult or challenging situations.

List of associated KSAs:

- demonstrated ability to understand organizational norms and expectations;
- demonstrated ability to make realistic commitments based on workload and capabilities; fulfills commitments once made;
- demonstrated ability to remain optimistic when faced with adversity and attitude to see the positive in difficult situations;
- demonstrated ability to document important information and keep accurate records;
- demonstrated ability to recognize ones own strengths and weaknesses and utilize this to complete activities taking account of the need for personal training and development;
- demonstrated ability to adapt behaviour to cope with very stressful situations and sustains mental effort to achieve objectives;
- demonstrated ability to display confidence and conviction in recommending difficult or unpopular decision to stakeholders;
- demonstrated ability to ensure that the consequences of the decision are clearly understood by all;
- demonstrated ability to analyze the immediate environmental factors affecting decision making;
- demonstrated ability to assess and resolve concerns as they present themselves;
- demonstrated ability to help individuals see the positives in difficult and unpleasant situations;
- demonstrated ability to make realistic agreements with parties regarding expectations and solutions;
- demonstrated ability to adapt own behaviour to accommodate the sensitivities of others;
- seek to understand the circumstances and needs of others from their perspective while demonstrating ability to putting health, safety and security first;
- demonstrated ability to consult with concerned stakeholders when faced with critical decisions having safety implications;
- demonstrated ability to makes use of organizational time management techniques;
- demonstrated ability to provide timely and relevant information to others;
- demonstrated ability to communicate in a method and a manner and at a pace to ensure that recipients understand;
- demonstrated ability to reflect on and assess one's own performance at appropriate intervals, against current and anticipated work requirements;
- demonstrated ability to draw up, implement and regularly update one's own personal and professional development plans.

3. Communication competency

This competency is engaging in effective dialogue, representation and interaction with others (i.e. licensees, colleagues and public) through committed listening, speaking, writing or delivery of presentations. Understanding the true interests of people and delivering meaningful understandable messages.

List of associated KSAs:

- demonstrated ability to position one's self convincingly as a professional;
- demonstrated ability to communicate with authority and maintain composure when challenged, producing explanations calmly and reasonably to achieve results;
- demonstrated ability to acquire information and open dialogue through effective facilitation to determine needs, interests and expectations of various groups;
- demonstrated ability to clearly explain and articulate the regulatory body's position in a manner that instills commitment;
- demonstrated ability to use understanding of others' underlying interests, issues and motivation to gain and sustain their support for the regulatory body's initiatives and positions;

TABLE III (cont.)

- demonstrated ability to interpret contradictory or competing messages;
- demonstrated ability to provide factual answers that are in keeping with the regulatory body's position and views;
- demonstrated ability to admit to not having an answer when this is the case;
- demonstrated ability to investigate further and provides an answer as soon as possible;
- demonstrated ability to communicate complex or simple messages with clarity and impact to widely varied forums, and provide answers which reflect an awareness of the sensitivities and interests of the audience;
- demonstrated ability to convince an audience, including one that may be resistant to or uninformed regarding the message being communicated;
- demonstrated ability to respond appropriately to on-the-spot questions, using own knowledge where prepared answers are not available;
- demonstrated ability to effectively use and maintain formal and informal networks inside and outside the regulatory body's to gather intelligence, seek input to problems, or build support for initiatives;
- demonstrated ability to produce clear, concise, informed written reports and appropriate to the needs of the reader;
- demonstrated ability to remain consistent in the information and answers given to build and maintain trust.

4. Team work competency

This competency is working collaboratively with others to achieve common objectives.
List of associated KSAs:

- demonstrated ability to build effective working relationships with others at all levels, inside and outside the work unit;
- demonstrated ability to actively contribute and participate in meeting team objectives;
- appreciation of willingly asking for help from team members as well as offering assistance to them;
- demonstrated ability to contribute individual expertise and experience towards the achievement of objectives;
- demonstrated ability to maintain commitment to team objectives even when one's own ideas are not supported;
- demonstrated ability to show flexibility in response to change;
- demonstrated ability to focus the team efforts on both the process and desired objectives;
- display the confidence to let go of control-oriented processes in order that teams can take initiative and accept accountability for results.

5. Management competency

5.1. Leadership competency

This competency is exemplifying by practice tolerance, objectivity, openness and fairness in dealing with colleagues and subordinates.
List of associated KSAs:

- demonstrated ability to give timely and constructive feedback when required;
- demonstrated ability to always explain the logic behind why things should be done a certain way; where no logic prevails, investigates further to find rationale;
- demonstrated ability to be approachable and open to suggestions from others;
- demonstrated ability to assist others to resolve their issues by providing options;
- demonstrated ability to learn from past experience/mistakes and willingness to help others learn from these experiences;
- demonstrated ability to integrate and uses feedback, progress reports and lessons learned to ensure commitments are met;
- demonstrated ability to convey confidence in others' abilities and adjusts the level of authority and support necessary to suit individual and situational circumstances;
- demonstrated ability to motivate others by continuously keeping them informed of changes or new directions in the project. Demonstrated ability to provide on the job coaching as required;
  demonstrated ability to give constructive oral feedback to maintain motivation at team meetings;
- demonstrated ability to understand the task and take account of the expectations of others involved.

TABLE III (cont.)

5.2. Negotiation competency

This competency is dealing with stakeholders to achieve a consensus view over a strategy or programme of actions to achieve safety improvements.

List of associated KSA's:

- demonstrated ability to maximize goodwill and co-operation with relevant stakeholders;
- examine information from different perspectives and develop an approach which is acceptable within organizational constraints;
- demonstrated ability to establish alternative positions that may also be acceptable taking account of the position of other stakeholders;
- demonstrated ability to present position in negotiations in a clear manner in a way that instills commitment;
- demonstrated ability to resolve conflict by facilitating open discussion while ensuring that mutually beneficial solutions are proposed;
- comprehension of the limits of authority;
- demonstrated ability to analyze the immediate environmental factors affecting the negotiations.

5.3. Project management competency

This competency is completing a set of complex tasks in a co-ordinated manner to preset time, scope and budget.

List of associated KSAs:

- demonstrated ability to define projects and prepare a business plan specification;
- demonstrated ability to establish project drivers and deliverables and success criteria;
- demonstrated ability to review and evaluate outcomes against those planned;
- demonstrated ability to reflect appropriate policies and regulations;
- demonstrated ability to identify potential problems including resource allocation and alternate strategies for resolution;

- demonstrated ability to provide accurate, complete and timely project status report;
- demonstrated ability to conduct effective negotiation keeping in mind program priorities;
- demonstrated ability to use appropriate project management tools;
- demonstrated ability to contributes individual expertise and experience towards the achievement of project objectives;
- demonstrated ability to identify fruitful co-operation topics;
- demonstrated ability to benefit from other's experiences;
- demonstrated ability to inform others on useful own experiences.

Chapter 4

COMPETENCIES NEEDED FOR REGULATORY BODY FUNCTIONS

4.1. Introduction and methodology

In Chapter 3 the competency model was applied to the regulatory body as a whole. In this chapter, the competency model is applied to the main and supplementary functions of the regulatory body. For each of the regulatory body functions, there is a map of the necessary competencies by quadrant as well as a graphical illustration of these competencies.

It is important to appreciate that the competencies suggested in this report do not relate to any levels of management, hence the positions of those with supervisory responsibility have not been considered in terms of any additional competencies they may require. Also, different regulatory agencies have different infrastructures and modes of operation. Therefore, the suggested competencies for each of the main and supplementary functions may differ from one regulatory body to another, however there should be significant correspondence with the competencies outlined in this report. Finally, some regulatory bodies may have other main or supplementary functions. In this case, it is perceived that the reader could use the model and the approach described in this report to relate competencies to such functions and formulate tables and illustrations similar to those presented in this section.

Table IV contains competencies suggested for the four main regulatory functions considered in this report. As for the supplementary functions and the suggested competencies, they are included in Table V. Each of these tables contains the competencies identified for the four quadrants. Each of the functions is presented in a column. An "x" is placed against the competency that is deemed to be needed for a function, and a blank is left where the competency is deemed not to be needed. Again it should be understood that in this case the analysis represents a view of the authors on a composite regulatory body and a specific regulatory body may reach different conclusions, when it conducts its own analysis.

In Sections 4.2 to 4.5 the competency model was applied to each of the main four functions of the regulatory body. In each of these sections, the competencies needed for a specific function are written in each of the four quadrants of the competency model. The model is subsequently presented graphically in an illustration of the quadrants. In each quadrant, the percentage of the needed competencies for the function relative to the total number of competencies is displayed by one point on a diagonal scale ranging from 0 to 100%. For example, if, in a competency quadrant, two out of four competencies are needed for the function being considered, a single point at 50% on the diagonal scale is plotted. This is repeated for the four quadrants of the model, and the four points are subsequently connected. The resulting four-sided polygon depicts the bias for the function to include specific competencies from the four quadrants.

Section 4.6 represents what is labelled "core competencies". In the context of this report, core competencies are those competencies that are common to each of the four main functions of regulatory body. These core competencies could therefore be easily identified from Table IV, and subsequently presented in the four quadrants and in illustrative four-sided polygon.

TABLE IV. COMPARISON OF SPECIFIC COMPETENCIES NEEDED IN REGULATORY MAIN FUNCTIONAL AREAS

Functions / Competencies	Authoriza-tion	Review & Assessment	Inspection & Enforcement	Development of Reg. Guides
Q1: Legal Basis and Regulatory Process				
1.1. Legal Basis	x		x	x
1.2. Regulatory Process	x	x	x	x
1.3. Regulations and Regulatory Guidance Documents	x	x	x	x
1.4. License and Licensing Documents	x	x	x	x
1.5. Enforcement Process	x		x	
Q2: Technical Disciplines				
2.1. Basic Technologies	x	x	x	x
2.2. Applied Technologies		x	x	
2.3. Specialized Technologies		x		
Q3: Regulatory Practice				
3.1. Safety focused Analytical Tech.	x	x	x	x
3.2. Inspection Techniques			x	
3.3. Auditing Techniques			x	
3.4. Investigation Techniques			x	
Q4. Personal and Interpersonal Effectiveness				
4.1. Analytical thinking, problem solving and decision making	x	x	x	
4.2. Personal effectiveness	x	x	x	x
4.3. Communication	x		x	x
4.4. Team work	x	x	x	x
4.5. Management	x			

TABLE V. COMPARISON OF SPECIFIC COMPETENCIES NEEDED IN REGULATORY SUPPLEMENTARY FUNCTIONAL AREAS

Supplementary Functions / Competencies	Research & Development	Emergency Preparedness	International Co-operation*
Q1: Legal Basis and Regulatory Process			
1.1. Legal Basis		x	x
1.2. Regulatory Process			x
1.3. Regulations and Regulatory Guidance Documents		x	x
1.4. License and Licensing Documents		x	x
1.5. Enforcement Process			
Q2: Technical Disciplines			
2.1. Basic Technologies	x	x	x
2.2. Applied Technologies	x	x	x
2.3. Specialized Technologies			
Q3: Regulatory Practice			
3.1. Safety focused Analytical Techniques.	x		x
3.2. Inspection Techniques			x
3.3. Auditing Techniques			x
3.4. Investigation Techniques			x
Q4. Personal and Interpersonal Effectiveness			
4.1. Analytical thinking, problem solving and decision making	x	x	x
4.2. Personal effectiveness	x	x	x
4.3. Communication		x	x
4.4. Team work	x	x	x
4.5. Management			x

*This function includes international safeguards commitments

4.2. Competency model for authorization function

The competencies defined in Chapter 3 that are considered appropriate for the authorization function are presented in Figure 4 (see also Section 3.2 and Figure 3).

4. Personal and Interpersonal Effectiveness Competencies 4.1. Analytical thinking, problem solving and decision making 4.2. Personal effectiveness 4.3. Communication 4.4. Team work 4.5. Management	**1. Legal Basis & Regulatory Processes Competencies** 1.1. Legal basis 1.2. Regulatory process 1.3. Regulations and regulatory guidance document 1.4. License and licensing documents 1.5. Enforcement process
3. Regulatory Practices Competencies 3.1. Safety focused analytical techniques 3.2. Not applicable 3.3. Not applicable 3.4. Not applicable	**2. Technical Disciplines Competencies** 2.1. Basic technology 2.2. Not applicable 2.3. Not applicable

FIG. 4. Competency model quadrant for the authorization function.

4.3. Competency model for review and assessment function

The competencies defined in Chapter 3 that are considered appropriate for the review and assessment function, are presented in Figure 5 (see also Section 3.2 and Figure 3).

4. Personal and Interpersonal Effectiveness Competencies 4.1. Analytical thinking, problem solving and decision making 4.2. Personal effectiveness 4.3. Not applicable 4.4. Team work 4.5. Not applicable	**1. Legal Basis & Regulatory Processes Competencies** 1.1.Not applicable 1.2.Regulatory process 1.3 Regulatory guidance documents 1.4. License and licensing documents 1.5. Not applicable
3. Regulatory Practices Competencies 3.1. Safety focused analytical techniques 3.2. Not applicable 3.3. Not applicable 3.4. Not applicable	**2. Technical Disciplines Competencies** 2.1. Basic technology 2.2. Applied technology 2.3. Specialized technology

FIG. 5. Competency model quadrant for the review and assessment function.

4.4. Competency model for inspection and enforcement function

The competencies defined in Chapter 3 that are considered appropriate for the inspection and enforcement function are presented in Figure 6 (see also Section 3.2 and Figure 3).

4. Personal and Interpersonal Effectiveness Competencies 4.1. Analytical thinking, problem solving and decision making 4.2. Personal effectiveness 4.3. Communication 4.4. Team work 4.5. Not applicable	**1. Legal Basis and Regulatory Processes Competencies** 1.1. Legal basis 1.2. Regulatory process 1.3. Regulatory guidance documents 1.4. License and licensing documents 1.5. Not applicable
3. Regulatory Practices 3.1. Safety focused analytical techniques 3.2. Inspection techniques 3.3. Auditing techniques 3.4. Investigation techniques	**2. Technical Disciplines** 2.1. Basic technology 2.2. Applied technology 2.3. Not applicable

FIG. 6. Competency model quadrant for the inspection and enforcement function.

4.5. Competency model for development of regulations and guides function

The competencies defined in Chapter 3 that are considered appropriate for the development of regulations and guides function are presented in Figure 7 (see Section 3.2 and Figure 3).

4. Personal and Interpersonal Effectiveness Competencies 4.1. Not applicable 4.2. Personal effectiveness 4.3. Communication 4.4. Team work 4.5. Not applicable	**1. Legal Basis & Regulatory Processes Competencies** 1.1. Legal basis 1.2. Regulatory process 1.3. Regulatory guidance document 1.4. License and licensing document 1.5. Not applicable
3. Regulatory Practices Competencies 3.1. Safety focused analytical techniques 3.2. Not applicable 3.3. Not applicable 3.4. Not applicable	**2. Technical Disciplines Competencies** 2.1. Basic technology 2.2. Not applicable 2.3. Not applicable

FIG. 7. Competency model quadrant for the development of regulatory guides function.

4.6. Core competencies for the regulatory body

The competencies defined in Chapter 3 that are common to each of the four major regulatory body functions are considered to be core competencies. These core competencies are considered appropriate for all technical positions within the major functional areas of the regulatory body and are presented in this section. They are arranged in Figure 8 into the four quadrants of the model described in Section 3.2 and Figure 3.

4. Personal and Interpersonal Effectiveness Effectiveness Competencies 4.1. Not applicable 4.2. Personal effectiveness 4.3. Not applicable 4.4. Team work 4.5. Not applicable	**1. Legal Basis & Regulatory Process Competencies** 1.1. Not applicable 1.2. Regulatory process 1.3. Regulatory guidance documents 1.4. License and licensing documents 1.5. Not applicable
3. Regulatory practices Competencies 3.1. Safety focused analytical techniques 3.2. Not applicable 3.3. Not applicable 3.4. Not applicable	**2. Technical Disciplines Competencies** 2.1. Basic technology 2.2. Not applicable 2.3. Not applicable

FIG. 8. Competency model quadrant for the core competencies for the regulatory body.

4.7. Application of competency model

The competency model has been applied in the earlier sections as a typical representation for regulatory bodies. Figure 9 summarizes the results and provides a comparison between the main regulatory functions. It should be noted that when each individual regulatory body applies the competency model within the context of that particular regulatory body, some

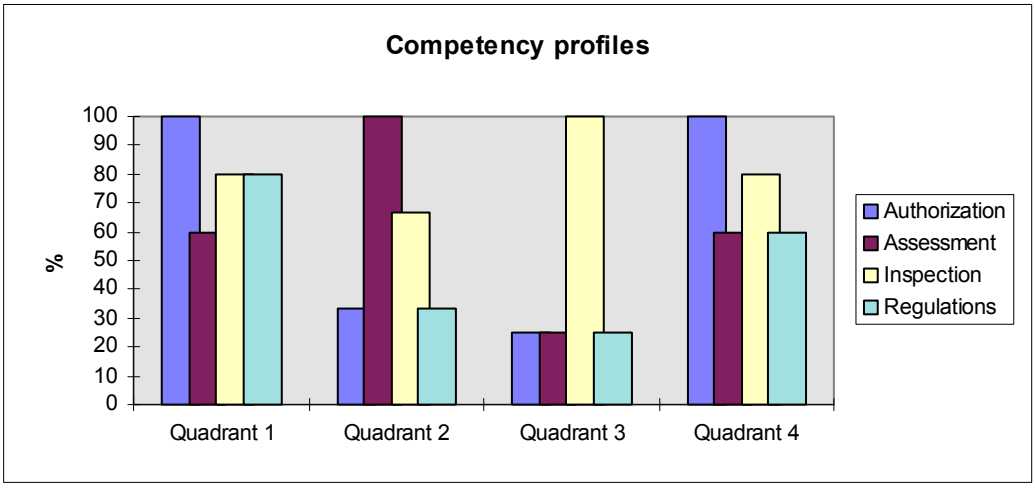

FIG. 9. Comparison of competency profiles for the main functions of regulatory body: authorization, review and assessment, inspection and enforcement and development of regulations and guides. (Percentage values have been calculated on the basis of Figs 4–8).

variations in the results should be anticipated. In general, it is expected that the results would be consistent with those presented in this report.

In order to maximize the usefulness of the competency model, individual regulatory bodies should apply the model to their functional organizational units and then to technical job families within the organizations. By doing so, the individual regulatory bodies can establish actual and desired competency profiles for technical organizational units and job families. After comparing the actual and desired competency profiles to determine the gaps, individual regulatory bodies can address the gaps using appropriate training programmes as suggested in Chapter 5.

Chapter 5
PROVISION OF NEEDED COMPETENCIES

5.1. Recruitment of personnel

The senior management of the regulatory body should review the functions that are required to be performed and determine the size and composition of the regulatory body needed to fulfill its obligations. It is difficult to determine the appropriate size of a regulatory body as it depends on a range of factors and on the number of similar facilities, the number of operating organizations, the various types of facilities, the regulatory approach adopted and the legal framework. Different countries have very different sizes of regulatory body due to these factors. Hence the competencies which will be required within a regulatory body will vary, though there will be a common requirement for basic scientific and engineering knowledge.

Ideally when a regulatory body has a complete understanding of the competencies required, across the organization, it is relatively straightforward to identify gaps due to changes in the nature of the industry or staffing changes such as anticipation of retirements. A method of addressing the gaps is to recruit. This should be based on the regulatory KSAs that are lacking within the organization or its current personnel and those that are available in the labour market. Job specifications can be established and recruitment initiated. However, it is inevitable that new recruits will still not have all of the necessary KSAs and it will be appropriate to establish a training programme to develop the newly hired. Similarly, part of the overall recruitment strategy may be to move staff to new posts, but they may also need to acquire additional KSAs. This approach requires identification of those training requirements that are essential and means through which they can be provided.

The recruitment strategy within a regulatory body will depend on a number of factors. These factors are likely to change with time and hence the regulatory body will need to review the strategy periodically to establish whether it is still appropriate and viable. Work experience, and particularly demonstrated competency, is an important consideration in selecting personnel to staff the regulatory organization. If the nuclear programme is just being established, the sources for recruitment may be limited. Similarly, the educational infrastructure may also be limited so that the numbers of potential engineering and science students is limited. Countries with established nuclear research institutes often look to these institutes for personnel with experience in the nuclear field. For situations in which a nuclear programme is well established, staff can often be recruited from many sources, including the operating organizations. Arrangements should be made to ensure that recruits from any organizations involved in the nuclear industry are not placed in roles in which they might compromise the independence of the regulatory body. Sufficient time needs to elapse to ensure that the recruits no longer have an identification with the organization from which they were recruited. In these cases, the emphasis of the training programmes will be to instill in such recruits the culture of the regulatory body and some specific knowledge, skills, and/or attitudes that regulatory staff requires to do their jobs.

A common approach for most regulatory bodies is to recruit staff against a job specification that includes qualifications and experience. Typically the recruitment pool is people who possess a first or second level university degree and who have between 5 to 10 years of experience within the nuclear industry or a related field. In the terms of the model presented in

this report these people would be considered as having already demonstrated application of their fundamental knowledge within the nuclear industry. In some cases, this recruitment may be targeted more at specialists and staff with expert knowledge. Hence the training programmes that would subsequently be developed rely heavily upon the assumption that incoming staff come with a certain level of knowledge of nuclear safety plus expertise in one or more technology fields. In this case, it is likely that sufficient knowledge, skills, and/or attitudes in some areas may be demonstrated quickly. Training plans and programmes may then focus on the competencies required for regulatory activities.

However, more recently countries have had to examine this approach in view of the ageing population of the staff of the regulatory body and the reduction in numbers of university students studying engineering and technical subjects. Some programmes involving recruitment of new or relatively new graduates have been initiated. In these cases, the knowledge base will likely be much lower and more intensive training will be required to provide the additional applied technology knowledge and demonstrate a basic level of competencies. As such, this training may initially include significant knowledge based learning as well as the other methods described to establish the desired level of competencies.

5.2. Use of contractors and consultants

The regulatory body, including a dedicated support organization if appropriate, preferably has staff capable of performing all of the regulatory functions and be competent in all of the areas listed in this report. It is neither necessary nor practicable for the regulatory body to be entirely self-sufficient in all of the technical areas. The use of consultants in specialized areas may be necessary. Occasionally, owing to a heavy short term workload, it may be necessary to augment the regulatory body's staff with consultants with knowledge and experience equivalent to that of the regulatory body's staff. This may take any of the following forms:

- experts provided by other governmental bodies, technical societies or research institutes;
- consultants or members of advisory committees of recognized skill and experience, so long as they are effectively independent of the operator or its contractors; or
- experts provided by or under the auspices of international organizations.

When such an approach is adopted it is important that the regulatory body have some basic competencies as well as staff capable of devising project programmes for the consultants and of interpreting the relevance of the results provided by the consultants within a regulatory framework.

5.3. Staff qualification system

The aim of instituting a staff qualification system is to communicate clearly the organizational requirements for the KSAs for each position. The system also provides clear guidance to the staff for career progression and staff mobility. It can also be used to establish, and prove if necessary, that the staff of the regulatory body are competent. A staff qualification system systematically documents the credentials (KSAs) needed or possessed by staff at any time.

A detailed example of a staff qualification system is found in Appendix V to this report. It suffices here to indicate that such a system could comprise three main segments: corporate policy basis, training system, and qualification verification and records. The corporate policy

bases include the legal basis and the corporate policies that promote staff training and establish staff qualification requirements.

The training system identifies stakeholders and their corresponding responsibilities. It addresses the corporate responsibility needed to support the staff qualification plans by producing the appropriate procedures, establishing databases, and categorizating the job functions and job families within the regulatory body. It also describes how the SAT would be used to define the KSAs needed to carry out successfully the responsibilities of the post (by job family) and, hence, what is needed by the incumbent to be considered "qualified". In addition, it addresses the requirements for a "standard training plan" for all posts in a job family. It also addresses the need to carry out a comparison of the required KSAs for the post with those possessed by an incumbent (a "gap analysis") and the need to identify those elements of the standard training plan needed by each individual, to ensure that every individual can become fully qualified (the individual training plan).

The qualification verification and records is a formal process by which an individual is confirmed as "qualified" to perform all the work expected of a post, and records of the qualification requirements for the job and the qualifications of the incumbent are kept. We have seen in the previous sections that the competency model described in this report can be used in identifying the needs for and the gaps in the organization's KSAs. The model can equally be used to establish the competency requirements for job families and posts within a job family. The four-quadrant model can also be used to produce the standard training plans for posts, and the individual training plans for the incumbents based on their corresponding gap analyses.

5.4. Training programme to achieve regulatory body competencies

Each regulatory body must design and implement a training programme which takes into consideration the gaps that exist between the current and desired competencies of the regulatory body and which takes into account the organization, staffing, and local conditions of that regulatory body personnel. There is no known model that would appropriately address the needs of all regulatory bodies. The recommended approach is for each regulatory body to apply the competency model described in this report to determine which competencies are applicable for appropriate categories of staff. The next step is to apply the principles of the systematic approach to training to establish and implement a training programme which addresses the needed competencies.

Many regulatory bodies design and implement their own training programmes. For those that do, it almost certainly involves some combination of courses which are presented by regulatory staff personnel and some portion of courses which are presented by outside contractors, technical institutions, or consultants. Within any given country there are often commercial organizations that provide training that is perfectly suitable for the regulatory body. However, some regulatory bodies are leaning to national or international co-operation to achieve staff training. There are many opportunities to obtain training that addresses regulatory body competencies through international and bilateral arrangements and courses that may be common to multiple countries.

For the development of systematic and individual training programmes one needs to know the work that persons are going to do. For this purpose job descriptions are vital. In this report the regulatory functions described in the IAEA Safety Standards have been selected for the

purpose. Section 2.4 presents the main regulatory functions and sample tasks typically performed under these functions.

The starting point for the training is that a person will become competent in his/her duties. For purpose of identifying all the needed competencies a competency framework is useful. The competency framework presents a selection of competencies which are typically needed in regulatory duties. For the planning of training programme for a given function or job one then picks up the needed competencies. For planning of an individual training programme for a given person for the job, one compares the existing competencies a person already has with the competencies needed for the job to find gaps. Chapters 3 and 4 describe the competency framework developed for the purpose. Appendices present a collection of country specific examples of how current qualification and training programmes are applied for provision of systematic and individual training in regulatory, technical, job specific and personal development topics.

Chapter 6

COUNTRY SPECIFIC EXAMPLES ON QUALIFICATION AND TRAINING PROGRAMMES

As stated in Section 5.4, there is no known model for training programmes that would appropriately address the needs of all regulatory bodies. Therefore, it is useful to present examples from different countries how training and qualification programmes are provided. For this purpose the report contains the following appendices.

Appendix II. The best means for the management of the regulatory body to present its commitment to training and learning is to publish a training policy. Appendix II provides an example of the learning policy of the Canadian regulatory body. Also appendix V and VI give information on the role of training policy in the U.S. and Finnish regulatory organizations.

Appendix III. For planning the training one needs to know the duties and tasks of regulatory staff members. Job descriptions are key elements for the purpose. Appendix III provides an example of task list of inspectors in France.

Appendix IV. Regulatory staff members should be competent in their duties. Appendix IV presents examples of competency profiles for two functions of the Canadian regulatory body: project officer of power reactor operations division and inspector of materials regulation division. In both cases competency profiles are given for entry level, intermediate level and senior level.

Appendix V gives an overview on qualification programmes for U.S. Nuclear Regulatory Commission personnel. Qualification and training requirements are defined for the selected U.S. NRC personnel in the nuclear reactor safety, nuclear materials safety and nuclear waste safety programme areas. Initial qualification is achieved through self-study, formal class room, and on the job training. Additional training is also specified to maintain and enhance the effectiveness of experienced personnel. These qualification programmes ensure that the NRC personnel meet minimum knowledge and qualification standards and that a standardized methodology is used. Technical disciplines covered by the formal qualification programmes are listed. Three examples on typical initial training programmes for PWR operations inspector, materials health physics inspector and materials licence reviewer are presented.

Appendix VI shows how a SAT based training programme has been organized in the 90s in the Finnish regulatory body, by utilizing the training guidance provided by the IAEA and the NEA/OECD. The experiences on administrative arrangements necessary for a small regulatory body as well as the content and amount of training are described.

Appendix VII provides an example of an internal guideline of the Finnish regulatory body for qualifying a person to the job in question and for providing an individual training programme. The guideline is applied to all professional positions in nuclear safety.

Appendix VIII offers an example to support the management of change. The appendix presents the training programme to support the new policies on the use of risk-informed regulation in the USA. The users have been divided into three categories: basic users, advanced users and expert practitioners. The training necessary for each group is described.

Appendix IX presents a proposed plan to develop and implement a Staff Qualification System in Canadian regulatory body. The appendix provides an example how to plan and design a SAT based training system in a regulatory organization.

Appendix X describes the initial training programme for an inspector of the French regulatory body. A list of training courses and length of training is presented.

Appendix XI provides a list of training courses offered by the Health and Safety Executive (HSE) in United Kingdom. The Nuclear Safety Directorate (NSD) heavily uses the standard training courses offered by HSE. The NSD training prospectus contains training events which cover both technical, legal and staff development. There is a core training element that is undertaken by all new inspectors, but subsequent training is tailored to individual needs and personal development.

Appendix XII presents the content of two basic training courses developed by the IAEA to support the Member States, meant for the new regulatory staff members. The names of training courses are Basic Professional Training Course on Nuclear Safety and Regulatory Control of Nuclear Power Plants.

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Appendix I

DEFINITIONS

The following terms are defined in order to put the discussion within this report in the proper perspective. Where possible, valid definitions from other IAEA documents have been used.

Attesting: the act of verifying, authenticating or bearing witness to a fact, a level of achievement, or a fulfilment of requirements.

Attitude: the feelings, opinions, way of thinking, perceptions, values, behaviour, and interests of an individual which allow a job or task to be undertaken to the best ability of that individual ([3] modified).

Audit: a documented activity performed to determine by investigation, examination and evaluation of objective evidence the adequacy of, and adherence to, established procedures, instructions, specifications, codes, standards, administrative or operational programs and other applicable documents, and the effectiveness of implementation.

Authorization: the granting by a regulatory body or other governmental body of written permission for an operator to perform specific activities. Authorization includes, for example, licensing, certification, registration, etc.

Certification: a formal statement of, or a formal document attesting a fact, a level of achievement, or a fulfilment of requirements.

Challenging-in: a formal activity by which an individual can prove that the individual meets a qualification.

Coaching: the act of directing, guiding, giving hints or priming with facts.

Competence: the demonstrated ability to put knowledge, skills, and attitude into practice in order to perform a job to an established standard.

Competency: a group of related knowledge, skills, and attitudes needed to perform a particular job.[3].

Core competencies: the central and most important competencies required for a regulatory activity, position or a function.

Enforcement: legal actions by the regulatory body, intended to correct and, as appropriate, penalize non-compliance with specified requirements.

Experience: an actual observation of or a practical acquaintance with facts or events that affects the person's knowledge, skills and attitude.

Expert: an individual who has special knowledge or skill in a subject.

Expertise: expert skill, knowledge or judgement.

Formal training: the use of one or more of training methods in a recordable format and in accordance with recognized approach that may lead to demonstration of required competencies.

Inspection: actions which by means of examination, observation, or measurement determine the conformance of materials, parts, components, systems and structures, as well as processes

and procedures, with defined requirements, or assess the adequacy of safety and the controls in place to ensure safety.

Knowledge: a person's range of information; a theoretical or practical understanding of a subject, and awareness or familiarity gained of a person, fact, or thing; that enable the doing in different situations and provide the capacity to cope with change or the unexpected.

Learning: the extent in which participants improve knowledge, increase skill, and/or change attitudes as a result of attending a program.[7].

Learning environment: the process by which a regulatory body commits itself to the training and development of its employees to achieve its mission objectives, and which permits the continuing development of a professional, competent, diverse, and motivated work force.

Mentoring: guidance and advice given by an experienced and trusted individual to another.

Qualification: an accomplishment fitting a person for a position or a purpose; a condition that must be fulfilled before a right can be acquired or an authority can be practised; or an attribution of a quality.

Skill: practised ability and expertness to perform a task to a specified standard.[3].

Appendix II

LEARNING POLICY OF THE CANADIAN NUCLEAR SAFETY COMMISSION

(Note: This CNSC policy on Learning is included in the CNSC Human Resources Manual as Chapter 10. The following is duplicate of the said policy.)

CHAPTER 10 — LEARNING

POLICY STATEMENT

The Canadian Nuclear Safety Commission (CNSC) believes that learning is a lifelong process and is committed to the training and development of its employees in order to enhance the efficiency and effectiveness of its operations, achieve its mission objectives and permit the ongoing development of a professional, competent, versatile and motivated workforce.

POLICY OBJECTIVES

Employee learning can be achieved through a variety of means including training courses, development programs, and activities that take place on the job and in the workplace. By supporting an environment that values learning, the CNSC will:

- Develop employees so they are capable of carrying out their current job responsibilities to a corporately established level of competencies.
- Position the organization and its employees to meet future business requirements and challenges.

GUIDING PRINCIPLES

The following principles shall guide decision making when applying this policy:

- CNSC's most valuable asset is its employees. Building employees' skills and knowledge is an investment in each employee and also in the future of the organization.
- Learning activities should be aligned with and contribute to the achievement of the CNSC's mission.
- CNSC is committed to a learning partnership where employees are responsible for their own development, and the organization is responsible for providing employees with learning opportunities.
- Learning activities should be allocated in a fair and equitable manner respecting business priorities, operational needs, employees' career aspirations and financial constraints.

ORGANIZATIONAL RESPONSIBILITIES

On behalf of the CNSC, the Executive Committee will create a work environment that supports and promotes the principles of lifelong learning by:

- allocating resources for training and development.
- linking training, development and other learning activities with future corporate challenges and strategic issues while respecting the diverse needs of the workforce.

- communicating the importance of employee learning as an investment in both the employee and the organization.
- defining the knowledge, skills, abilities and behaviours required by staff to carry out their responsibilities.

LINE MANAGER'S RESPONSIBILITIES

Employee learning is the responsibility of each and every member of the CNSC's workforce. It requires a special commitment by all line managers to create a culture of continuous learning. To this end, line managers are expected to encourage individual learning and development by:

- actively supporting the individual and corporate learning initiatives with the appropriate resources, and by providing employees with relevant developmental work assignments.
- ensuring that resources allocated to training and development activities are consistent with the short and long term operational needs and priorities of the organization.

Also,

- directors will determine their division's short and long term learning needs, and ensure that these needs are communicated to the relevant decision makers.
- line managers will meet with employees and, through honest and open discussion, identify employee learning needs. Line managers will encourage employees to evaluate their own performance and communicate new learning requirements as they arise.

EMPLOYEES' RESPONSIBILITIES

CNSC's employees play a key role in ensuring the success of the organization as a regulatory agency. To achieve its mandate, it is critical that CNSC's employees have the appropriate competencies to excel in their positions. Therefore, CNSC's employees must:

- accept responsibility for their own learning.
- recognize learning opportunities in a variety of settings and situations including assignments, special projects, participation at meetings, conferences and training courses, and actively participate in all these learning opportunities.
- assess their own individual competency in an objective manner in order to identify the training required and learning strategies needed to be fully competent in their current job, and prepare themselves to take on new responsibilities.
- communicate their learning needs to their line managers as well as provide feedback on training experiences.
- apply and share acquired learning in the workplace.

Appendix III

EXAMPLE OF TASK LIST PERFORMED BY INSPECTORS (FRANCE)

1. BACKGROUND

The French regulatory body 'DIRECTION de la SURETE des INSTALLATIONS NUCLEAIRES' (DSIN) is organized in several sub-directions related to:

- Fuel cycle and transportation;
- Nuclear Power Plant;
- Research, Waste and Dismantling;
- Inspection, Crisis, Environment;
- Safety of pressurized components (BCCN);
- International relations.

The regulatory body comprises also eight local Division for Nuclear Installation (DNI) which are covering all the different nuclear sites. For the inspection of nuclear installations, there are two levels of inspectors, inspector (i) and senior inspector (s), and three levels of defined tasks. Some tasks can be done by inspectors or senior inspector (i or s), some others can be done by inspectors but are controlled by senior inspectors (i+s), and the third level of tasks can be accomplished only by senior inspectors (s).

2. LIST OF TASKS FOR INSPECTION

2.1. INSPECTION ROUND (i or s)

2.2. DETAILED INSPECTION ROUND

- to chair the preparatory meeting and assign tasks (s);
- to collect adequate documentation (i or s);
- to participate in the preparatory meeting and in the Detailed Inspection Round (DIR) (i or s);
- to conduct the DIR (s);
- to write and sign the formal status report (i+s);
- to write and sign the summary report (s);
- to write and sign the action letter (s);
- to write and sign the inspection report (i or s);
- to make the analysis of the utility response to the action letter and to ensure they are traceable (s);
- to participate in writing inspection guidance, national thematic analysis or national DIR follow up (i or s);
- to lead inspection guidance writing, national thematic analysis or national DIR follow up (s);

2.3. PLANT OUTAGE

- to follow, on line, all events related to the outage (i or s);
- to ensure technical support in case of any concerns (s);

- to chair the outage meeting (i or s);
- to examine the outage programme (i or s);
- to recommend the outage programme approval (i+s);
- to ask the utility all the relevant elements to insure the work is done according to the programme (i or s);
- to investigate the contents of intervention's report (i+s);
- to chair the final outage meeting (i or s);
- to take part as technical expert in the final outage meeting (s);
- to write the Telex giving advice for divergence authorization (i+s);
- to take part in the startup meeting and check the adequacy with the divergence authorization (i or s);
- to check conformance with specific demands from the safety authority before reaching a 110 C temperature or divergence (i or s);
- to set-up the list of all actions during the outage (i or s);
- to write the final outage report (i or s).

2.4. SIGNIFICANT EVENTS

- to check the utility's statement, particularly on the causes of the event (i or s);
- to write the findings report (i+s);
- to publish information on Internet (i or s);
- to follow the quality assurance process (i or s);
- to write the two-month report (s);
- to check the feedback process on the site (s).

2.5. DEVIATIONS FROM TECHNICAL SPECIFICATIONS ETC.

- to check the acceptability of the deviation request (i or s);
- to write the deviation request to the technical support organization (i or s);
- to write the answer to the utility (i+s);
- to control the implementation by the utility (i or s);
- to write the two-months report (s).

2.6. EMERGENCY DRILL

- to take part in the preparatory meetings for the drill (i or s);
- to represent the local DNI on the site (i or s);
- to provide DNI assistance to the PREFET (s).

2.7. PRESSURE RETAINING COMPONENTS

- to take part in the testing process (i or s);
- to lead the ten years tests (s);
- to investigate the disposition of actions in conformance with the ministry instructions (i or s);
- to investigate deviation and generic problems (i+s);
- to control the tests made by a certified organization (i or s);
- to regulate and control certified organizations (s).

2.8. SITE

- to evaluate site organization for outages and identify gap (s);
- to follow-up improvements for safety (s);
- to verify the adequacy between the utility prioritized actions and the keeping of a good safety level (s);
- to write the site evaluation for the site database (s);
- to collect all the data for the site database (i+s).

Appendix IV

EXAMPLES OF CNSC COMPETENCY PROFILES FOR THREE LEVELS OF INSPECTORS FOR: (A) NUCLEAR POWER PLANTS, AND (B) NUCLEAR SUBSTANCES AND RADIATION DEVICES (CANADA)

This appendix contains two sets of competency profiles produced by the Canadian Nuclear Safety Commission (CNSC). Set A is for three levels (Junior, Intermediate and Experienced) of nuclear power plant's project officers (who are equivalent to resident site inspectors). Set B describes three levels (entry, intermediate and senior) of inspectors responsible for nuclear materials users and facilities, as well as licensing of radiation devices.

The material included in this appendix is intended to demonstrate how core competencies for a regulatory body could be used, expanded and tailored for specific positions and levels within such positions.

SET A — COMPETENCY PROFILES FOR PROJECT OFFICERS OF THE CANADIAN NUCLEAR SAFETY COMMISSION'S POWER REACTOR OPERATIONS DIVISION

INTRODUCTION

In the licensing system of the Canadian Nuclear Safety Commission (CNSC), a project officer is more than a resident site inspector. In addition of being inspectors, project officers are responsible for licensing matters (e.g., design changes, reactor power increase during commissioning, etc.), familiar with site details (from construction to decommissioning), aware of state of repairs and maintenance, familiar with safety culture at site, and closely familiar with staff and management of the licensee.

The competency profiles contained in this report were last revised in December 1998, and were produced by the CNSC human resource division in three separate parts, one for each of the junior, intermediate and experienced project officer. For the purpose of being included as an appendix in this IAEA document, the original three parts are combined and reformatted in three columns to facilitate comparing the competency requirements for the three levels of project officers. Also a full description was added of the role and responsibilities of the power reactor operations division, the division in which the project officers work. Finally, minor editing was done to streamline the combined text.

A. Role of power reactor operations division (PROD)

The power reactor operations division (PROD) is responsible for carrying out the following functions with regard to the safe operation of nuclear power reactor facilities.

- Review issues pertinent to the design, construction, commissioning, operation, and maintenance at nuclear power reactor facilities from the viewpoint of overall reactor safety and operation.
- Monitor the construction, commissioning, operation, and maintenance of nuclear power reactor facilities to verify compliance with regulatory requirements.

- Conduct inspections and participate in audits and evaluations of power reactor facilities to verify compliance with regulatory requirements.

- Take appropriate corrective and enforcement action, in instances where it is not clear that the regulatory requirements are being met, in accordance with the authority delegated by the commission. Advise and make recommendations to the director general (DG) of the directorate of reactor regulations of instances where the action exceeds the authority.

- Disposition requests for approval, pursuant to license conditions, from licensees of nuclear power reactor facilities, in accordance with the authority delegated by the commission.

- Advise and make recommendations to the DG where the approval exceeds the authority.

- Assess the performance of nuclear power reactor facilities in meeting or exceeding regulatory requirements with respect to construction, commissioning, operation, and maintenance of the facilities as an input to the evaluation of overall performance.

- Contribute to the activities of other segments of the CNSC's operations based on the expertise within the division.

- Contribute to national and international activities in the division's areas of responsibility.

B. Role of project officers

B.1 Role of a junior project officer

Junior project officers play an apprenticeship role in their first two years as project officers. They are graduates of a science or engineering program. They are in a continuous learning mode working closely under the guidance of an experienced project officer and play the role of an understudy. They are usually assigned specific and short term tasks under very clear guidelines. Each task is scrutinized and monitored by the experienced project officer. Junior project officers can be assigned long term assignments that do not have any nuclear safety or licensing impact. They may be called upon to monitor developments in a given area.

Junior project officers need to spend a great deal of their time observing and absorbing specific aspects of compliance monitoring, safety assessment, enforcement activities and CNSC's licensing activities at the facility. They need to get acquainted with the environment of the reactor power plant. They need to understand CNSC safety requirements and what requirements are imposed on the licensee. They need to know how the licensee operates and how they meet the imposed requirements.

Junior project officers are expected to question and probe in order to acquire the knowledge, skills and attitudes essential to progress to a level of increased responsibilities. As Junior project officers develop, they are assigned an expanded scope and depth of responsibilities.

B.2 Role of an intermediate project officer

The intermediate project officers are still primarily in a learning mode. They are given specific responsibilities but with greater freedom to achieve specific project deliverables. They are still

monitored by a more experienced project officer, but are now exposed to a wide range of nuclear power (NPP) responsibilities in various areas. They are immersed in both the culture of the NPP and their role as project officers. They are assigned areas of responsibility that can have safety implications but their work may still require the review of a more experienced project officer. They are given more freedom to investigate and to check on final products. They are required to deal with more issues. They have limited dealings with the licensee and can start assessing the findings themselves.

Even though intermediate project officers are given assignments in different areas, they can possess expertise in specific areas and still be inexperienced in others. This is a continuous stage of development, challenging learning opportunities are given to allow each officer to become an experienced project officer. This is the career development bridge that crosses from a junior project officer level to an experienced project officer level.

B.3 Role of an experienced project officer

Experienced project officers bring the depth and breadth of their knowledge and expertise to bear in monitoring, assessing and enforcing safety requirements in the plant. They can perform all project officer's activities independently with minimal supervision. They have reached this level after a number of years learning and experiencing all facets of a project officer's responsibilities. They have learned through observation and performing. Their strengths come from their ability to analyze issues and problems thoroughly and to focus on critical details while maintaining a broad strategic perspective.

Experienced project officers are called upon to address complex issues and may have to make difficult trade-offs based on a full and realistic assessment of the situation. They take into consideration what they have seen in other areas to identify and determine trends and use this as a benchmark in their decision making. Their feedback will determine the actions to be taken and their perspective will enable the formulation of sound and equitable solutions. Experienced project officers impart their knowledge and expertise to less experienced project officers by coaching and providing them with developmental and support opportunities. They are the primary interface with the licensee and play a key role in co-ordinating the services of specialists at the CNSC's headquarters. This development stage is the springboard to a supervisory role in the organization.

TABLE PRODI. COMPETENCY PROFILES FOR POWER REACTOR OPERATIONS DIVISION PROJECT OFFICERS AT JUNIOR, INTERMEDIATE AND EXPERIENCED LEVELS

Junior	Intermediate	Experienced
1. Knowledge/Expertise Acquires a **basic understanding** of: 1. CNSC mandate, vision and objectives 2. organizational structure of the Commission, directorates, divisions, their mandate, roles and responsibilities, and interrelationships to deliver services 3. formal procedures and plans of the plant 4. pressure retaining component classification 5. overpressure protection 6. operating and maintenance strategy and practices 7. the *Nuclear Safety and Control Act* (NSCA) 8. the CNSC regulations 9. Power Reactor Operating Licenses 10. Regulatory Activity Management (RAM) manual and procedures 11. CNSC licensing process 12. CNSC safety philosophy 13. codes and standards relating to power reactor design, construction, commissioning and operation 14. federal, provincial and municipal interfaces Acquires and applies a **basic knowledge** of: 1. plant operating policies and principles 2. plant safety case 3. plant systems, process, equipment design and operation 4. conventional safety 5. work protection 6. radiological protection 7. emergency operating procedures for CNSC and licensees 8. impairments manuals Acquires a **basic working knowledge** of: 1. licensee's organization Acquires a **basic understanding** of the methodology and the approach to design and conduct: 1. audits/evaluations	**1. Knowledge/Expertise** Acquires an **understanding** of: 1. CNSC mandate, vision and objectives 2. organizational structure of the Commission, directorates, divisions, their mandate, roles and responsibilities, and interrelationships to deliver services 3. formal procedures and plans of the plant 4. pressure retaining component classification 5. overpressure protection 6. operating and maintenance strategy and practices 7. the *Nuclear Safety and Control Act* (NSCA) 8. the CNSC regulations 9. Power Reactor Operating Licenses 10. Regulatory Activity Management (RAM) manual and procedures 11. CNSC licensing process 12. CNSC safety philosophy 13. codes and standards relating to power reactor design, construction, commissioning and operation 14. federal, provincial and municipal interfaces 15. procedural steps involved in producing CNSC regulatory documents Acquires and applies a **knowledge** of: 1. plant operating policies and principles 2. plant safety case 3. plant systems, process, equipment design and operation 4. conventional safety 5. work protection 6. radiological protection 7. emergency operating procedures for CNSC and licensees 8. impairments manuals Acquires a **working knowledge** of: 1. licensee's organization Acquires an **understanding** of the methodology and the approach to design and conduct: 1. audits/evaluations 2. event assessments	**1. Knowledge/Expertise** Acquires a solid **understanding** of: 1. CNSC mandate, vision and objectives 2. organizational structure of the Commission, directorates, divisions, their mandate, roles and responsibilities, and interrelationships to deliver services 3. formal procedures and plans of the plant 4. pressure retaining component classification 5. overpressure protection 6. operating and maintenance strategy and practices 7. the *Nuclear Safety and Control Act* (NSCA) 8. the CNSC regulations 9. Power Reactor Operating Licenses 10. Regulatory Activity Management (RAM) manual and procedures 11. CNSC licensing process 12. CNSC safety philosophy 13. codes and standards relating to power reactor design, construction, commissioning and operation 14. federal, provincial and municipal interfaces 15. procedural steps involved in producing CNSC regulatory documents Acquires and applies a **good knowledge** of: 1. plant operating policies and principles 2. plant safety case 3. plant systems, process, equipment design and operation 4. conventional safety 5. work protection 6. radiological protection 7. emergency operating procedures for CNSC and licensees 8. impairments manuals Acquires a **working knowledge** of: 1. licensee's organization 2. safeguards Acquires an **understanding** of the methodology and the approach to design and conduct: 1. audits/evaluations 2. event assessments

TABLE PRODI. (cont.)

Junior	Intermediate	Experienced
2. Communicating Effectively 1. Actively listens, uses open-ended questions and paraphrases to elicit information and identify issues and needs. 2. Allows others to explain a position or idea without interruption in order to comprehend the speaker's perspective. 3. Keeps others informed and up to date on matters that affect them. 4. Shares opinions when appropriate. 5. Directs relevant information to the right people. 6. Shares information with others in a clear, concise, logical and timely manner. 7. Writes clearly and concisely and ensures readability and usability of documents by using graphs, tables and similar tools when appropriate. 8. Seeks clarification when lack of understanding.	**2. Communicating Effectively** 1. Expresses self clearly and concisely in written communication using appropriate language. 2. Determines the required level of detail and key points to be made in written documents and organizes it to facilitate understanding by the reader. 3. Prepares and delivers clear and well organized presentations, demonstrating a thorough understanding of the presented material. 4. Establishes credibility by speaking clearly and persuasively in a public speaking forum. 5. Shares information clearly and at a level of understanding of the audience without holding back information necessary to others. 6. Continuously strives to achieve workable solutions; compromises when appropriate and when necessary. 7. Uses tact and diplomacy in conveying message ensuring the licensee understands the rationale and logic behind it. 8. Resolves conflict by facilitating discussion and proposing mutually beneficial solutions and seeks advice when appropriate. 9. Shares expertise with licensee taking the time to check their level of understanding prior to and following interaction. 10. Promotes open communication and listens effectively. 11. Seeks input and guidance when required. 12. Consults with a variety of stakeholders as appropriate. 13. Demonstrates an understanding of the complexity of the plant environment and safety requirements by offering informed, appropriate and honest advice to build respect and credibility.	**2. Communicating Effectively** 1. Effectively prepares and critiques letters, documents and reports and provides suggestions to improve the message to be conveyed. 2. Maintains composure and poise in the face of difficult situations and takes prompt action to resolve differences. 3. Admits that other's concerns are valid, demonstrating how the problem can be rectified. 4. Accepts challenges to existing ideas, procedures and policies from others by understanding and appreciating the other person's perspective, while seeking out alternate ideas and suggestions as appropriate. 5. Speaks persuasively with confidence, conviction and clarity through effective oral communication and presentations. 6. Writes clearly, articulately and persuasively, and uses written documents in an influential and effective manner. 7. Handles effectively on-the-spot questioning by management, licensee and public. 8. Tailors messages and provides answers which reflect an awareness of the sensitivities and interests of CNSC Commission members. 9. Provides answers that are consistent with facts and dispels doubts or misgivings. 10. Prepares and delivers clear and logical presentations that demonstrate a sound understanding of the subject-matter content. 11. Distinguishes and deciphers between essential and non-essential information. 12. Remains consistent in the information and answers given on issues in order to build trust and to demonstrate integrity with licensee and management. 13. Provides information and exchanges ideas in a way that promotes open and complete communication and understanding. 14. Reports critical incidents and issues that have potential safety importance to those who need to know. 15. Develops networks and works in partnership with a range of contacts within and outside CNSC to foster participation and seek feedback to improve safety practices.

TABLE PRODI. (cont.)

Junior	Intermediate	Experienced
3. Teamwork 1. Builds effective working relationships with others at all levels, inside and outside the work unit. 2. Actively contributes and participates in achieving team objectives. 3. Expresses disagreements and resolves conflict in a positive and constructive manner. 4. Understands clearly the goals of the team as well as the roles and responsibilities of each team member. 5. Obtains buy-in and support to ideas. 6. Seeks and accepts advice, suggestions and constructive criticism from other team members. 7. Displays a co-operative, unbiased attitude towards co-workers. 8. Willingly asks for help from team members as well as offers assistance to them. **4. Analytical Thinking and Problem Solving** 1. Asks appropriate questions to obtain correct information that will assist in resolving problems. 2. Verifies that information obtained is well understood by paraphrasing and summarizing key points made by provider of information. 3. Obtains data from various sources and builds an appropriate information base that is sound and valid. 4. Recognizes the limits of own expertise and knows when to seek assistance to address issues. 5. Effectively assesses risk in situations and recommends options to reduce consequences. 6. Approaches problems objectively, considering all potential solutions on an equal basis. 7. Grasps complexities and critical details quickly and accurately. 8. Makes appropriate generalizations from data and draws sound conclusions. 9. Provides input and negotiates on how relevant data is to be gathered and presented. 10. Provides supervisor with thorough background information. 11. Recognizes and responds with an appropriate sense of urgency to problems/issues as they arise and ensures that others are appropriately informed.	**3. Teamwork** 1. Contributes individual expertise and experience towards the achievement of project objectives. 2. Shares knowledge and information with team members. 3. Maintains commitment to team objectives even when own ideas are not supported. 4. Seeks to resolve differences, encouraging discussion and proposing mutually beneficial solutions. 5. Makes suggestions/recommendations to improve work quality, processes or flow. 6. Offers assistance and seeks assistance when necessary. 7. Shows flexibility in response to change. **4. Analytical Thinking and Problem Solving** 1. Focuses on critical elements of the problem while maintaining a broad strategic perspective. 2. Gathers and integrates relevant information from many perspectives and disciplines to understand multi-faceted problems. 3. Seeks input and negotiates on how relevant data is to be gathered and presented. 4. Considers the linkage among all parts of the problem and evaluates the impacts of possible solutions. 5. Assimilates and synthesizes diverse information and assesses the impact on each part of the project as well as on the project as a whole, and develops appropriate recommendations. 6. Makes timely decisions even when faced with ambiguity, or when compromise or consensus cannot be achieved. 7. Looks behind symptoms to uncover root causes and anticipates problems. 8. Looks at a variety of perspectives to recommend solutions that work. 9. Develops appropriate recommendations based on well-reasoned rationales with excellent supporting argumentation. 10. Grasps complexities and critical details quickly and accurately.	**3. Teamwork/Team Management** 1. Involves others in the formulation of plans on issues that affect them. 2. Motivates others by continuously keeping them informed of changes or new directions in the project. 3. Facilitates the group's identification of mutual roles, goals and responsibilities by helping define the team's boundaries. 4. Focuses the team efforts on both the process and desired objectives. 5. Identifies a conflict and brings it to a higher level for resolution in order that disruption to work group functions are minimized. 6. Displays the confidence to let go of control-oriented processes in order that teams can take initiative and accept accountability for results. **4. Analytical Thinking and Problem Solving** 1. Assesses external and internal environments and takes this assessment into consideration in decision making. 2. Synthesizes information compiled into a coherent picture to develop solutions. 3. Considers the linkages among all parts of a problem and evaluates the impacts of possible solutions. 4. Grasps the meaning of trends and interrelationships between the plant and its environments. 5. Questions conventional wisdom and status quo practices with the aim of improving them. 6. Confronts issues as they emerge, providing suggestions to develop alternate actions. 7. Troubleshoots when problems occur and refines choices to be presented. 8. Takes into consideration hard data as well as other information and also relies on professional judgement and experience to arrive at sound conclusions. 9. Bases decisions on well-reasoned rationales with balanced supporting argumentation. 10. Makes tough trade-offs based on a full and realistic assessment of the situation. 11. Gets to the core issues and situates them in their proper overall context. 12. Monitors the emerging environment within CNSC and the plant environment and anticipates organizational opportunities by designing solutions to current problems in ways that also address projected long term objectives of CNSC. 13. Identifies key issues, analyzes and compares data from different sources and clarifies cause and effect relationships. 14. Keeps tracks of many problems and developments simultaneously from day to day problems to broader issues. 15. Switches from one type of problem to another quickly and easily distinguishing between essential and non-essential details. 16. Determines the sources of resistance and support to recommended options, and generates recommendations and scenarios for positioning strategies in order to build allies.

TABLE PRODI. (cont.)

Junior	Intermediate	Experienced
5. Self-Management 1. Sets priorities and organizes work to meet established timeframes. 2. Adapts schedule and adjusts priorities as changes occur. 3. Delivers quality work that is timely, complete and accurate. 4. Follows established workflow processes and procedures. 5. Develops and utilizes an efficient and effective system to ensure appropriate follow-up. 6. Uses time management techniques (to do lists, day timer, diaries) to organize workflow and set priorities. 7. Converts own mistakes into opportunities to learn and improve. 8. Makes adjustments in response to feedback; accepts constructive criticism.	**5. Self-Management** 1. Makes realistic commitments based on workload and capabilities; fulfils commitments once made. 2. Uses time management techniques (to do lists, daytimer, diaries, B/F systems) to organize workflow, set priorities and conduct appropriate follow-up. 3. Deals effectively with multiple demands. 4. Changes approach rapidly to meet shifting priorities. 5. Takes responsibility for making things better; makes suggestions and follows through to ensure suggestion is actioned; perseveres and does not give up. 6. Looks for ways to self-evaluate; reflects on strengths and weaknesses; asks others for feedback and acts on the information constructively.	**5. Self-Management** 1. Aligns short and long term goals with business plan; seeks mutual agreement with Supervisor; develops and maintains a monitoring process to review successes. 2. Establishes expectations, milestones and deliverables, and identifies and uses available resources/support to achieve objectives. 3. Finds simpler, faster and less costly ways to accomplish tasks or achieve objectives. 4. Develops and implements contingency plan(s) to keep work on track. 5. Anticipates obstacles or gaps and works to continuously improve organizational capability to deliver results. 6. Examines tasks and procedures to see which ones really need to be carried out, and eliminates those that are unnecessary. 7. Remains optimistic when faced with adversity and tries to see the positive in difficult situations. 8. Documents important information and keeps accurate records.
6. Assessing Safety 1. Compares safety requirements of plant against specific areas and reports any discrepancies. 2. Analyzes findings and discusses these with experienced project officer to determine action required. 3. Looks at various aspects and builds an appropriate information base that will enable others to make sound safety decisions. 4. Assesses all aspects of safety criteria thoroughly and shares findings with project team. 5. Reflects on safety findings and communicates these in a logical and concise manner. 6. Approaches safety issues objectively and draws accurate conclusions.	**6. Assessing Safety** 1. Looks at safety guidelines and uses judgement in interpreting and assessing these. 2. Synthesizes observations in a variety of areas into a broader scope to recommend conclusions that are sound. 3. Uses judgement to determine parameters for safety assessment and decides if there is a need to widen assessment. 4. Reaches conclusions about safety of the plant only after gathering and looking at relevant safety information from many perspectives. 5. Uses a comprehensive and systematic approach for assessing safety in plant. 6. Integrates and disseminates safety findings acquired from the assessment to those concerned. 7. Analyzes safety data using appropriate framework. 8. Obtains safety findings from various sources and draws sound conclusions.	**6. Assessing Safety** 1. Knows how to apply and translate safety philosophy into safety practices. 2. Reaches overall conclusions only after rigorous examination of safety issues from a variety of perspectives. 3. Proactively seeks the identification of potential safety problems and supports continuous safety improvements in work processes and methods. 4. Analyzes safety issues and problems thoroughly by focusing on critical elements while maintaining a global perspective. 5. Involves specialists from headquarters, recognizing the limits of own professional expertise. 6. Synthesizes findings into key points for discussion with Supervisor. 7. Promotes CNSC safety regulations and safety culture throughout the plant. 8. Shows courage in challenging safety practices with the aim of improving them. 9. Draws appropriate conclusions and makes sound recommendations that provide Supervisors with knowledge and advice required to support safety decisions. 10. Evaluates feasibility and constraints of different safety options to ensure they comply with regulatory requirements.

TABLE PRODI. (cont.)

Junior	Intermediate	Experienced
7. Monitoring Licensee Compliance 1. Uses checksheets to ensure compliance of all material and housekeeping conditions. 2. Checks panels, operating logs in the field and the main control room to determine if station operating parameters are within acceptable limits. 3. Prepares and maintains records of inspection that are readable, concise and that can be easily understood by others. 4. Does straightforward observation and reports all findings in a manner that can help others reach decisions in a timely manner. 5. Understands and follows procedures consistently and seeks direction when faced with unusual situations. 6. Asks for clarification from appropriate sources on the status of the station or for the interpretation of events. 7. Requests specialist assistance when appropriate. 8. Reviews various reports and checks for compliance with terms and conditions. **8. Assessing Licensing Documents** 1. Compares findings/issues against safety reports or licensing documents to determine compliance. 2. Interprets findings of assessment to determine safety significance and impacts. 3. Assesses the licensee performance to ensure actions are completed and records information to support decisions that may need to be made. 4. Integrates information gathered from various sources to obtain a sound understanding of the problems and/or issues. 5. Absorbs and grasps information that will provide for a better understanding of licensee compliance.	**7. Monitoring Licensee Compliance** 1. Exercises sound judgement in conducting inspections by analyzing relationships among different parts of a problem. 2. Observes discrepancies, trends and interrelationships in findings and can see cause and effects relationships (A leads to B). 3. Identifies problems or issues that are not being specifically inspected. 4. Keeps abreast of all the work being done in assigned area through observation and by asking questions. 5. Understands the difficulties in implementing different types of procedures and integrates this knowledge in providing assistance to licensee. 6. Anticipates problems and their effects on safety and recommends preventative actions. 7. Is willing to take action without being told. **8. Assessing Licensing Documents** 1. Applies knowledge of safety case to identify if plant operations meet the requirements. 2. Clearly identifies specific problems in licensing documents and reports discrepancies to supervisor. 3. Recommends priorities for actions to be taken that are well reasoned with supporting argumentation. 4. Ensures changes to the facility meet standards by thorough review and assessment. 5. Provides sound recommendations to the experienced project officers on the acceptability of the degree of improvement and any licensing action required.	**7. Monitoring Licensee Compliance** 1. Synthesizes inspection and monitoring data to reach conclusions that will determine if plant is in compliance with their license. 2. Observes a number of different factors in the plant and can analyze the relationships between them (A leads to B leads to C leads to D). 3. Recognizes several likely causes of events or several consequences of actions and can think ahead of the next step to be taken. 4. Examines current situations in the light of own knowledge or of different past trends or situations. 5. Interprets non-compliance in such a way that can assist decision makers to determine if enforcement actions needs to be initiated. 6. Keeps licensee informed of findings to ensure consistent application of regulations and procedures. **8. Assessing Licensing Documents** 1. Assesses documentation of the utility against the requirements of the safety case for compliance. 2. Synthesizes information and data gathered and considers all potential solutions prior to making recommendations. 3. Prepares a detailed plan of actions that need to be taken and communicates this to all concerned. 4. Initiates action from findings and recommendations of documented licensee submissions. 5. Uses experience and subject-matter expertise in the development of licensing requirements and standards. 6. Prepares reports to be used by management in a manner that will support decisions for enforcement action. 7. Prepares a synthesis of observations that also includes the input of specialists which provides an overall regulatory view of the situation.

TABLE PRODI (cont.)

Junior	Intermediate	Experienced
9. Enforcing Licensing Requirements 1. Observes and reports problem issues to experienced project officers. 2. Gathers and compiles sound evidence to make a strong case to support enforcement action. 3. After discussion with a more experienced project officer, advises licensee of poor practices and communicates corrective actions to be taken.	**9. Enforcing Licensing Requirements** 1. Gathers critical evidence to build a case in support of enforcement action. 2. Makes recommendation for an enforcement action that is supported with sound logic and rationale. 3. Seeks and gathers legal opinions that will clarify and support the recommended enforcement action. 4. Interprets legal requirements that will enable management to gather the appropriate evidence and to defend an enforcement action. 5. Observes rules of evidence in gathering facts to build an enforcement case.	**9. Enforcing Licensing Requirements** 1. Makes a strong case for serious enforcement action with Supervisor when observing infractions. 2. Initiates and completes enforcement action for simple, lower significance infractions without prior approval of management. 3. Recognizes unusual and/or abnormal activities in plant operations and can readily determine the safety implications of these activities. 4. Recommends enforcement actions to be taken that are in keeping with the size and scope of the problem. 5. Maintains a calm approach when faced with a critical situation. 6. Solicits supervisor and management support for enforcement actions by clearly pointing out the safety implications and making a strong case for such action. 7. Initiates enforcement actions to be taken by less experienced project officers by matching individuals to assignments that are in keeping with their level of experience. 8. Identifies quickly if a situation warrants action. 9. Takes a stand on the basis of honest and critical analysis and professional judgement irrespective of popularity. 10. Demonstrates integrity through consistency of words and actions. 11. Takes a firm stand against safety practices that are not in keeping with requirements.
10. Managing Projects Not required at this level	**10. Managing Projects** 1. Establishes goals that are specific, measurable, achievable, relevant and tractable prior to developing a detailed action plan. 2. Develops, prioritizes and sequences initiatives to ensure efficiency, timeliness and consistency with project objectives. 3. Establishes clear deadlines and intermediate milestones. 4. Adapts and renegotiates priorities and plans as changes and problems arise. 5. Consults with other experts or superiors about issues and problems as required. 6. Uses information technology as a tool for planning, analysis and communication of professional work. 7. Involves others in the formulation of plans on issues that affect them. 8. Monitors progress to ensure that quality and time targets are adhered to and acts decisively, adapts and renegotiates plans as changes and problems occur. 9. Anticipates obstacles and develops contingency plans to address them.	**10. Managing Projects** 1. Provides meaningful input in the development of plans which are consistent with project goals, objectives and resources. 2. Makes effective use of project management tools. 3. Uses sound judgement to seek and obtain appropriate approvals. 4. Integrates an evaluation framework into the plan which assesses activity, identifies measurable outcomes and reflects appropriate policies and regulations. 5. Monitors project delivery against established parameters by using a variety of data gathering methods and takes appropriate measures to ensure deadlines are met. 6. Is able to identify potential problems, including resource allocation, and identify alternate strategies to resolve these. 7. Provides accurate, complete and timely project status reports. 8. Evaluates completed projects to identify areas of strength and weakness in order to incorporate lessons learned into the management of other projects. 9. Continuously strives to achieve “win-win” solutions, compromises when appropriate and perseveres when necessary. 10. Demonstrates the ability to recognize who the “real” stakeholders and decision makers are and ensures that the consequences of the negotiated terms are clearly understood by all. 11. Conducts effective negotiations keeping in mind program priorities, short to long term issues, as well as analyzes the immediate environmental factors affecting the negotiations. 12. Keeps management apprised of issues and problems and recommends appropriate options.

TABLE PRODI. (cont.)

Junior	Intermediate	Experienced
11. Dealing with Difficult Situations Not required at this level	**11. Dealing with Difficult Situations** 1. Uses judgement to decide if situation should be brought to the immediate attention of the Supervisor. 2. Displays confidence and conviction in recommending difficult or unpopular decision to stakeholders. 3. Ensures that the consequences of the negotiated terms are clearly understood by all. 4. Uses sound judgement in exercising the appropriate level of caution, pre-planning and contingency planning for each situation. 5. Analyzes the immediate environmental factors affecting the negotiations. 6. Presents, explains and defends with credibility, diplomacy and conviction CNSC position and actions concerning sensitive issues with the licensee. 7. Is able to assess and resolve concerns as they present themselves. 8. Helps individuals see the positive in difficult and unpleasant situations.	**11. Dealing with Difficult Situations** 1. Says "no" effectively by ensuring the licensee understands the rationale and logic behind the decision. 2. Synthesizes and simplifies pertinent information in order for others to get a better understanding prior to making decisions. 3. Builds consensus and influences parties to achieve mutually beneficial results. 4. Makes realistic agreements with parties regarding expectations and solutions. 5. Adapts own behaviour to accommodate the sensitivities of others. 6. Seeks to understand the circumstances and needs of licensee from their perspective while putting health, safety and security first. 7. Provides realistic expectations to the licensee, sharing what can and cannot be done and why. 8. Has the courage to enforce the right decision regardless of the displeasure brought about by such an action. 9. Consults with concerned stakeholders when faced with critical decisions having safety implications.
12. Leading and Developing Others Not required at this level	**12. Leading and Developing Others** 1. Gives timely and constructive feedback when required. 2. Shares expertise with colleagues taking time to check their level of understanding. 3. Offers suggestions to help them find the solutions to their problems. 4. Always explains the logic behind why things should be done a certain way; where no logic prevails, investigates further to find rationale. 5. Is approachable and open to suggestions from others. 6. Assists others to resolve their issues by providing options for the resolution of the matter as appropriate. 7. Learns from past experience/mistakes and is willing to help others learn from these experiences	**12. Leading and Developing Others** 1. Matches individuals to assignments to capitalize on their strengths and provides opportunities to strengthen skills and broaden knowledge. 2. Provides constructive feedback and input on a timely basis to motivate high performance and to address performance issues. 3. Integrates and uses feedback, progress reports & lessons learned to ensure commitments are met. 4. Conveys confidence in others' abilities and adjusts the level of authority and support necessary to suit individual and situational circumstances. 5. Motivates others by continuously keeping them informed of changes or new directions in the project. 6. Provides on the job coaching as required. 7. Is open and honest when helping colleagues to assess strengths and weaknesses and helps to identify learning opportunities.

SET B — COMPETENCY PROFILES FOR INSPECTORS OF THE CANADIAN NUCLEAR SAFETY COMMISSION'S MATERIALS REGULATION DIVISION (MRD)

INTRODUCTION

The competency profiles contained in this report were last revised in June 2000, and were produced in three separate parts, one for each of the Entry, Intermediate and Senior Inspectors. For the purpose of being included as an appendix in this IAEA document, the three parts are combined and reformatted in three columns to facilitate comparing the competency requirements for the three levels of Inspectors. Also a full description was added of the role and responsibilities of the materials regulations division (MRD), the division in which the Inspectors work.

A. Role of the materials regulation division (MRD)

The materials regulation division has the responsibility for carrying out the following functions to ensure that the possession, use and transport of radioactive materials and the medical uses of accelerators in Canada are carried out in a manner which protects from undue risk the health and safety of workers and the public, as well as the environment; and that the import into, and export from, Canada of radioisotopes are properly controlled.

- Manage the regulatory process applicable to the possession, use and transport of radioactive materials, the medical uses of accelerators and the import and export of radioisotopes.

- Develop and maintain a comprehensive set of standards and guides specific to the possession, use and transport of radioactive materials, consistent with the Nuclear Safety and Control Act, the CNSC regulations and policies, and complementary to the CNSC generic standards.

- Promote compliance with legislation, licenses and standards applicable to the possession, use and transport of radioactive materials, the medical uses of accelerators and the import and export of radioisotopes.

- Assess submissions related to the possession, use and transport of radioactive materials and the import and export of radioisotopes to determine their acceptability.

- Facilitate and contribute to the assessment of submissions related to the medical uses of accelerators to determine their acceptability.

- Inspect users and possessors of radioactive materials, transport packages and the medical use of accelerators to verify their compliance with legislation and licenses, and provide inspection services for other nuclear activities upon request.

- Investigate incidents or situations where non-compliance is suspected and follow up, ensuring corrections are made as needed.

- Take or recommend enforcement action where warranted when non-compliance has occurred, in accordance with delegated authority.

- Develop recommendations to the Director General regarding performance and licensing related to possession, use and transport of radioactive materials, the medical use of accelerators and import and export of radioisotopes.

- Manage the division's functions using a project management approach, by ensuring that input from other divisions is included in carrying out its own responsibilities and by contributing to the projects of other divisions.

- As part of the regulatory process, involve provincial and other federal regulatory agencies that have a responsibility or direct interest in the possession, use or transport of radioactive materials or the medical use of accelerators.

- Facilitate and participate in audits and appraisals of users and possessors of radioactive materials, medical use of accelerators and activities related to transport packages.

- Contribute to the development of generic standards, guides, policies and regulations.

- Contribute to the activities of other segments of the CNSC's operations, based on the expertise within the division.

- Audit any divisional regulatory activities carried out by others on behalf of the CNSC.

- Contribute to national and international activities related to the division's areas of responsibility.

In other words, the materials regulation division (MRD) plays essentially four (4) key roles within the Canadian Nuclear Safety Commission. The division is responsible for license assessment, license compliance and inspection, license processing of radioisotope licenses, and for regulating the transportation and packaging of nuclear substances.

In its assessment role, MRD reviews license submissions and supporting documents to determine if sufficient information has been provided to issue a license, and makes the decision on the issuance of a license. The Division is also responsible for the renewal of licenses and inspectors determine if license conditions and CNSC regulations are being met by the licensee.

In its compliance and inspection role, MRD ensures that licensees comply with regulations and license conditions. The division measures and verifies compliance and assist licensees in understanding their role and responsibilities in interpreting the regulations and license conditions. MRD may also take appropriate enforcement action against licensees who fail or refuse to comply.

In its license processing role, MRD prepares all the license documents and ensures that the composition is appropriate to the license application. They also maintain detailed databases on every license issued nationwide. They can also extract specific data and information on licensees to assist the division in its decision making process.

In its regulating role relating to the packaging and transportation of radioactive materials, MRD assesses and certifies the designs of packages for the transport of nuclear substances. It

co-operates with Transport Canada in regulating the carriage of radioactive materials, and also contributes to the development of international transport regulations and databases.

B. Role of an inspector

The Inspector has four (4) very important roles in the materials regulation division. Their primary role is one of measuring and verifying compliance against license conditions and regulations. They conduct physical inspections of licensee sites where they examine records, conduct field inspections and conduct interviews with the staff on site. Inspectors take physical measurements, collect and review samples and data, and proceed to make appropriate recommendations. They can deal with high-risk situations responding to accidents and mishaps, they issue orders and may work with other government agencies and provincial counterparts to address these situations. They prepare extensive reports and gather critical information that clearly indicate the level of compliance found during the inspection/investigation, and any follow-up action(s) required by the licensee and the CNSC.

Another important role played by inspectors is that of promoting compliance. They inform, advise and assist licensees in understanding the license conditions and regulations, and what they need to do to become and remain compliant. The inspector's knowledge and experience in the areas of investigation, enforcement and prosecution is sought in specialized project work and in training colleagues. The media also calls upon them to respond to inquiries regarding numerous investigation, prosecution and enforcement actions.

In their investigative role, inspectors strive to determine the root causes of a given problem and situation in order to identify the necessary corrective action to be taken. They investigate violations or serious resistance on the licensee's part to comply with the CNSC regulations or the license conditions. As part of their investigation, inspectors gather information and/or evidence to ensure that, if required, the appropriate enforcement action is engaged.

In their enforcement role, they take the necessary actions to assure non-compliance is rectified and to deal with any serious or high-risk situation.

Inspectors can work under extremely demanding conditions and in remote locations without the immediate support of colleagues. Their self-reliance, confidence, creativity and flexibility enables them to achieve their work objectives in spite of the hazards and often disagreeable conditions they may be exposed to.

B.1. Role of an entry level inspector

At the entry level, these inspectors are in a learning mode working closely under the guidance of a more experienced inspector. They are learning and assisting in the application of the CNSC Act, regulations and licensing documents. They participate in a structured on the job training program and are mentored and tested on an ongoing basis on what they have learned and observed. In addition to an on the job training program, inspectors at the entry level attend technical classroom training programs offered by subject-matter experts outside the CNSC in order to prepare them to work independently. They also job shadow different inspectors to gain exposure to the various types of licenses and situations

They do not perform any independent work until they have reached a designated level of experience which is determined by the section head on the recommendation of a senior

inspector. They are slowly phased into specific and clearly defined tasks such as report writing, taking physical measurements, etc. They are expected to question and probe in order to acquire the knowledge essential to progress to a level of increased responsibility. As trainees develop, they are assigned an expanded scope of responsibilities but always under the very close tutelage of a senior inspector.

B.2. Role of an intermediate inspector

Just like senior inspectors, intermediate level inspectors have the authority to act under the CNSC regulations. They perform independent inspections, continuing through their work to expand their experience base, as well as enforce regulatory requirements. They obtain advice and guidance from an experienced inspector in order to acquire more knowledge and experience in interpreting policies and in the handling more complex investigation, prosecution and enforcement activities. At this level, challenging opportunities are given in order to broaden the breadth and depth of their experience.

B.3. Role of a senior inspector

Senior inspectors bring the depth and breadth of their knowledge and experience to bear in all their responsibility areas. They can perform all aspects of their responsibilities independently. They can lead and dispense advice on investigations and enforcement actions. Their counsel is often called upon by their supervisor and others, and they are often the key point of contact for media inquiries. Their experience and knowledge enables them to act, when required, on behalf of their Section Head. They have reached this level after years of learning and by having experienced many facets of an inspector's responsibilities. They have learned through observation, questioning and performing. Their strengths come from their ability to analyze issues and problems thoroughly and by being able to focus on critical details while maintaining a broad strategic perspective. They are called upon to address complex issues and make decisions on a full and realistic assessment of a given situation using extremely sound judgement. They take into consideration what they have seen in other areas and use this as a benchmark in their decision making. Their recommendations will determine the actions to be taken and their perspective will enable the formulation of sound and equitable solutions. They train others in their field and impart their knowledge and expertise by coaching and guiding less experienced inspectors.

TABLE MRD1. COMPETENCY PROFILES FOR MATERIALS REGULATIONS DIVISION INSPECTORS AT *ENTRY*, *INTERMEDIATE* AND *SENIOR* LEVELS

Entry	Intermediate	Senior
1. Knowledge/Expertise Demonstrates **basic** knowledge of: *(basic awareness of the subject matter; requires guidance for interpretation and can apply to limited situations)* 1. CNSC and its regulatory process. 2. CNSC's mandate, vision, objectives and priorities. 3. NSC Act, CNSC Regs, TPRM Regs, Cost Recovery Regs and the contents of a number of regulatory documents. 4. TDG Regulations respecting class 7 dangerous goods. 5. The litigation process including an understanding of the legal responsibilities of the inspector. 6. Methods set out in the MRD Litigation Manual. 7. Ionizing radiation and its hazards; the principals of health physics; and radiation protection. 8. The application and use of radiation detection and measurement instrumentation and equipment and contamination control. 9. Procedures set out in the MRD Inspection Procedures Manual. 10. The industrial, medical and academic application of nuclear substances including good safety procedures and practices, and the design, operation and safety controls of approved nuclear devices and equipment. 11. The criteria which is imposed on licensees for a broad variety of situations, applications and equipment, and of the various procedures and control methods they must use to maintain the conditions of their license, and to ensure health, safety and environment safety. 12. The application and use of the MRD Integrated Licensing System (ILS-3/LOUIS) and other MRD and CNSC electronic databases and computer applications (CC:Mail, WordPerfect). 13. The applicable parts of the CNSC Emergency Response Plan.	**1. Knowledge/Expertise** Demonstrates **in-depth** knowledge of: *(sufficient to address the unusual situations and complex challenges)* 1. CNSC and its regulatory process. 2. CNSC's mandate, vision, objectives and priorities. 3. NSC Act, CNSC Regs, TPRM Regs, Cost Recovery Regs and the contents of a number of regulatory documents. 4. TDG Regulations respecting class 7 dangerous goods. 5. Ionizing radiation and its hazards; the principles of health physics; and radiation protection. 6. The application and use of radiation detection and measurement instrumentation and equipment and contamination control. 7. The application and use of the MRD Integrated Licensing System (ILS-3/LOUIS) and other MRD and CNSC electronic databases and computer applications (CC: Mail, WordPerfect). Demonstrates **good** knowledge of: *(can apply and independently undertake range of typical challenges)* 1. The litigation process, including a good understanding of the legal responsibilities of the inspector. 2. Methods set out in the MRD Litigation Manual. 3. Procedures set out in the MRD Inspection Procedures Manual. 4. The industrial, medical and academic application of nuclear substances including good safety procedures and practices, and the design, operation and safety controls of approved nuclear devices and equipment. 5. The criteria which is imposed on licensees for a broad variety of situations, applications and equipment, and of the various procedures and control methods they must use to maintain the conditions of their license, and to ensure health, safety and environment safety. 6. The applicable parts of the CNSC Emergency Response Plan. 7. Canadian Charter of Rights and Freedoms and the Criminal Code as it pertains to CNSC.	**1.Knowledge/Expertise** Demonstrates **in-depth** knowledge of: *(sufficient to address the unusual situations and complex challenges)* 1. CNSC and its regulatory process. 2. CNSC's mandate, vision, objectives and priorities. 3. NSC Act, CNSC Regs, TPRM Regs, Cost Recovery Regs and the contents of a number of regulatory documents. 4. TDG Regulations respecting class 7 dangerous goods. 5. The litigation process including a clear understanding of the legal responsibilities of the inspector. 6. Methods set out in the MRD Litigation Manual. 7. Ionizing radiation and its hazards; the principals of health physics; and radiation protection. 8. The application and use of radiation detection and measurement instrumentation and equipment and contamination control. 9. Procedures set out in the MRD Inspection Procedures Manual. 10. The industrial, medical and academic application of nuclear substances including good safety procedures and practices, and the design, operation and safety controls of approved nuclear devices and equipment. 11. The criteria which is imposed on licensees for a broad variety of situations, applications and equipment, and of the various procedures and control methods they must use to maintain the conditions of their license, and to ensure health, safety and environment safety. 12. The application and use of the MRD Integrated Licensing System (ILS-3/LOUIS) and other MRD and CNSC electronic databases and computer applications (CC:Mail, WordPerfect). 13. The applicable parts of the CNSC Emergency Response Plan. 14. Canadian Charter of Rights and Freedoms and the Criminal Code as it pertains to CNSC.

TABLE MRD1. (cont.)

Entry	Intermediate	Senior
2. Communicating Effectively Engaging in effective dialogue, representation and interaction with others (i.e. licensees, colleagues and public) through committed listening, speaking, writing or delivery of presentations. Understanding the true interests of people and delivering meaningful messages. 1. Listens attentively to the message being conveyed to obtain additional information or further instructions. 2. Asks probing questions when uncertain to clarify understanding or expectations of others. 3. Recalls key points and takes them into account in one's own communication. 4. Takes notes when appropriate to recall important information and details. 5. Conveys information and ideas, in writing or orally, clearly, concisely and logically. 6. Shares information regarding situation affecting others. 7. Seeks input to purpose and objectives from other experienced inspectors, and acts on the information constructively. 8. Projects a positive and professional image of self and the Division. 9. Uses appropriate business language	**2. Communicating Effectively** Engaging in effective dialogue, representation and interaction with others (i.e. licensees, colleagues and public) through committed listening, speaking, writing or delivery of presentations. Understanding the true interests of people and delivering meaningful messages. 1. Demonstrates an understanding of the complexity of the nuclear communications environment by offering, among other things, informed and appropriate advice . 2. Ensures the licensees understand the rationale and logic behind the decision, and shares what can and cannot be done and why. 3. Shares with the licensee any background of information of factors which may add to their understanding of the matter at hand so they can make an informed decision. 4. Explains what must be achieved and provides them with sufficient information to formulate a solution. 5. Encourages others to offer their ideas, approaches or opinions to resolve problems and keeps other team members informed and updated. 6. Can "read between the lines" understands not only words, but the meaning behind the message from the other person's perspective. 7. Stimulates open discussion regarding sources of conflict in an objective, value-free manner and creates an atmosphere that puts everyone at ease. 8. Reconciles disagreements tactfully in order to avoid potential conflicts. 9. Knows who to contact inside and outside the CNSC to get the information required. 10. Produces clear, concise, informed written reports with minimal supervision. 11. Delivers clear and well organized presentations, demonstrating a thorough understanding of the presented material. 12. Adapt style, tone and sophistication of language to suit the situation and the audience and the issues being addressed.	**2. Communicating Effectively** Engaging in effective dialogue, representation and interaction with others (i.e. licensees, colleagues and public) through committed listening, speaking, writing or delivery of presentations. Understanding the true interests of people and delivering meaningful messages. 1. Positions oneself convincingly as a professional, communicating with authority and maintains composure when challenged, producing explanations calmly and reasonably to achieve results. 2. Acquires information and opens dialogue through effective facilitation to determine needs, interests and expectations of various groups. 3. Clearly explains and articulates CNSC positions in a manner that instils commitment. Uses understanding of others' underlying interests, issues and motivation to gain and sustain their support for CNSC initiatives and positions. Can interpret contradictory or competing messages. 4. Communicates complex or simple messages with clarity and impact to widely varied forums, and provides answers which reflect an awareness of the sensitivities and interests of the audience. 5. Convinces an audience, including one that may be resistant to or uninformed regarding the message being communicated. 6. Responds appropriately to on-the-spot questions, even when specific responses have not been scripted beforehand. 7. Provides factual answers that are in keeping with the CNSC position and views, and is not afraid to admit not having an answer; will investigate further and get back to them with an answer. 8. Effectively uses and maintains formal and informal networks inside and outside the CNSC to gather intelligence, seek input to problems, or build support for initiatives. 9. Produces clear, concise, informed written reports. 10. Coaches and mentors less experienced inspectors to continuously develop their levels of knowledge and experience.

TABLE MRD1 (cont.)

Entry	Intermediate	Senior
3. Managing One's Self Managing one's self, one's attitude and behaviours, exercising judgement, self-reliance, maturity, confidence and flexibility to achieve work goals and in dealing with challenging work conditions. 1. Knows own role and role of others in division. 2. Respects organizational norms and does what is expected. 3. Willingly takes on additional responsibilities to achieve team objectives. 4. Trusts own ability to undertake and carry out routine work activity and to successfully accomplish the task at hand. 5. Always honours commitment made and lets others know in advance if commitment may be at risk. 6. Takes responsibility for own learning and development, asks for assistance and questions ways of doing things to acquire better understanding. Perseveres. 7. Admits when understanding is lacking, asks for clarification, and finds ways to change or improve performance without being defensive. 8. Approaches each new challenge with a fresh and open mind, and learns from mistakes and knows when to ask for help or assistance. 9. Keeps an open mind and does not prematurely arrive at a conclusion without examining information from different perspectives. 10. Understands and accepts other points of view and recognizes the value of different approaches. 11. Monitors and modifies own beliefs and behaviours regarding prejudices or personal bias. 12. Adapts behaviour in order to withstand stressful situations and maintain an acceptable level of performance. 13. Accepts what authorities see as important. Shows loyalty and helpfulness towards colleagues.	**3. Managing One's Self** Managing one's self, one's attitude and behaviours. Exercising judgement, self-reliance, maturity, confidence and flexibility to achieve work goals and in dealing with challenging work conditions. 1. Deals with varied situations, readily trusting and relying on own resources, abilities and capabilities. 2. Acts independently and can stand alone when the situation requires it. 3. Seeks advice and consults with experienced inspectors when faced with challenging situations. 4. Deals effectively with the unexpected; can hold things together during difficult situations and can easily adapt own approach to meet the needs of a situation. 5. Questions practices and norms that are not in keeping with license conditions and regulations; and takes responsibility for addressing problems, indicating actions required and following through to ensure they are carried out. 6. Is not afraid to stand by decisions that are consistent with CNSC policies and regulations when faced with opposing view. 7. Always brings potential problem of a significant nature to the attention of superiors. 8. Knows when to call upon the expertise of others in building own knowledge and experience base. Learns and benefits from associates, peers and superiors. 9. Can undertake or propose appropriate course of action to address issues or obstacles, situations or issues without waiting to be asked. 10. Is open to new ideas and initiatives; is willing to try things out. Is resourceful in managing. 11. Exercises discretion in dealing with difficult audience and situation, and diplomatically conveys approaches without offending or making matters worse. 12. Uses authority and power in a fair and equitable manner.	**3. Managing One's Self** Managing one's self, one's attitude and behaviours. Exercising judgement, self-reliance, maturity, confidence and flexibility to achieve work goals and in dealing with challenging work conditions. 1. Always remains in control and withstands adversity in a variety of situations by maintaining confidence in one's decisions in very challenging circumstances. 2. Does not waiver and stands by decisions that support CNSC policies and regulations, even if they are unpopular. 3. Remains purposeful and stays with a plan of action or position until desired goal is achieved or no longer appropriate. 4. Makes and implements decisions where information may be ambiguous but sufficient to exercise sound judgement. 5. Adapts behaviour to cope with very stressful situations and sustains mental effort to achieve objectives. 6. Remains productive through periods of transition and accepts ambiguity and uncertainty in the environment. 7. Sets an example for others by behaving in ways that are consistent with espoused beliefs and values and the 8. Division's vision and direction. 8. Demonstrates a high level of integrity in the preservation of public trust and safety. 9. Is attuned to internal politics and alert to changing dynamics within the CNSC. 10. Supports and adapts to major and relevant change that challenges established ways of operating. 11. Anticipates and proactively searches for opportunities to learn new things for current and future needs in one's job, and keeps abreast and up-to-date in area of expertise.

TABLE MRD1 (cont.)

Entry	Intermediate	Senior
4. Achieving Results Establishing and accomplishing challenging goals, setting priorities, organizing work, and bringing together the necessary resources to deliver results. 1. Identifies and understands role and expectations related to own work. 2. Strives to meet established expectations and improve performance. 3. Develops an awareness of the immediate work environment and how one's action can and cannot influence it. 4. Recognizes the different ways of doing things and applies established procedures to accomplish results in daily work. 5. Identifies short term objectives for daily work and makes realistic commitments based on workload and capabilities; fulfils commitments once made. 6. Applies priorities in selecting and ordering the activities to spend time on for daily work. 7. Deals effectively with multiple demands and changes approach rapidly to meet shifting priorities. 8. Uses time management techniques (to do lists, day timer, diaries, BF systems) to organize workflow, set priorities and conduct appropriate follow-up.	**4. Achieving Results** Establishing and accomplishing challenging goals, setting priorities, organizing work, and bringing together the necessary resources to deliver results. 1. Consistently achieves established expectations through personal commitment. 2. Establishes goals that are specific, measurable, achievable, relevant and trackable. 3. Prioritizes work activities to ensure efficiency, timeliness and consistency with results to be achieved. 4. Establishes clear deadlines, and adapts and renegotiates priorities and work activities as changes and problems arise. 5. Obtains or organizes necessary resources (e.g., instruments, staff, etc.) to meet work requirements in the field. 6. Remains accountable and delivers on commitment; keeps others informed of progress on, or barriers to achievement. 7. Understands formal and informal structures and relationships within the CNSC, anticipates the effect of one's own action on them, and adjusts to achieve work objectives.	**4. Achieving Results** Establishing and accomplishing challenging goals, setting priorities, organizing work, and bringing together the necessary resources to deliver results. 1. Strives to exceed current expectations and pushes for improved results in own performance and that of team. 2. Brings together key stakeholders who can contribute knowledge and experience in order to meet objectives, and finds ways to collaborate and exchange ideas. 3. Sees the big picture, looks ahead by anticipating and preparing for future opportunities or problems. Takes appropriate action to implement plans to avoid potential crises or to create new opportunities. 4. Assists Section Head in establishing detailed work plans, assignments and schedules for inspections and for other responsibilities to be achieved by the group. 5. Determines strengths of individual team members and assigns tasks to be performed accordingly when leading a team. 6. Publicly credits others who have performed well, and protects and promotes team reputation and cohesion. 7. Creates an environment that builds diversity and supports multiple perspectives and challenges narrow-mindedness.

TABLE MRD1 (cont.)

Entry	Intermediate	Senior
5. Solving Problems Analysing issues and problems systematically and thoroughly. Focusing on critical details while maintaining a broad perspective. Identifying risk and developing approaches while anticipating potential future problems. 1. Continually scans the environment to detect potential problems and asks questions to elicit more information to determine existence of problem. 2. Recognizes and identifies basic non-compliance problems and suggests solutions or approaches to address problems. 3. Consults with others and gathers information as necessary to identify solutions and to view problem from more than one perspective. 4. Analyzes problems by breaking them into components to determine cause and effect. 5. Determines a best course of action to resolve problems and comes up with a series of acceptable actions from defined options available. 6. Promptly reports problem observed to senior inspector during inspection and provides detailed report of findings.	**5. Solving Problems** Analyzing issues and problems systematically and thoroughly. Focusing on critical details while maintaining a broad perspective. Identifying risk and developing approaches while anticipating potential future problems. 1. Recognizes routine problems and uses experience and basic rules to identify key underlying issues. 2. Digs for information to determine root causes of problems and observes discrepancies, trends and/or inter-relationships in information or data. 3. Assesses and analyzes risk at hand and considers all factors and alternatives available to minimize negative consequences of risk. 4. Seeks others perspective who have more experience in this type of situation to fully understand all components of the risk or the situation. 5. Considers a variety of perspectives to recommend feasible approaches or solutions, and combines elements of different solutions to enhance their effectiveness. 6. Switches from one type of issue to another quickly and determines those that are more pressing and urgent. 7. Does not hesitate to undertake corrective actions to redress situation.	**5. Solving Problems** Analyzing issues and problems systematically and thoroughly. Focusing on critical details while maintaining a broad perspective. Identifying risk and developing approaches while anticipating potential future problems. 1. Diagnoses complex problems. Sees bigger picture, and gathers and integrates relevant information from many perspectives and disciplines to understand multi-faceted problems. 2. Considers linkages among all parts of problem and assesses impact and risks of possible solutions. 3. Knows who to consult and involve to seek out information to address and determine how best to resolve problem. 4. Is aware of all possible implications of a solution (legal, health, safety, environmental and financial) and considers all of these in decision making. 5. Generates and tests hunches which may explain complex situations or problems with Section Head. Integrates relevant approaches into a complete solution. 6. Bases recommendations and decisions on well-reasoned rationales with balanced supporting evidence, but also uses intuition. 7. Can easily distinguish an urgent problem from one that is not pressing and quickly determines the steps and actions to be taken. 8. Makes trade-offs and difficult and timely decisions even when faced with ambiguity or where compromise or consensus is not achievable. 9. Keeps track of day-to-day developments and broader issues.

TABLE MRD1 (cont.)

Entry	Intermediate	Senior
6. Verifying and Enforcing Compliance Ensuring licensee complies with CNSC regulations and license conditions, and taking the appropriate actions to rectify non-compliance. 1. Carries out simple tasks given and follows instructions to the letter in assisting experienced inspector in conducting inspections. 2. Acquires knowledge of CNSC regulations and license conditions by reviewing and reading documents; researching licensee file and computer database to become familiar with the details and history of the specific licensee. 3. Explains clearly what compliance entails when probed and questioned; knows what regulation and supporting documents apply to specific situation. 4. Can easily identify basic non-compliant situation when faced with this situation during inspection and can correctly state the difference between minor and major non-compliant items. 5. Articulates clearly in reporting the findings of non-compliant items identified and provides the appropriate rationale. 6. Seeks guidance from an experienced inspector to ascertain if own interpretation is in keeping with the regulations and conditions. 7. Takes accurate readings using appropriate instruments and interprets their meaning and impact, and properly scores and rates non-compliant items. 8. Enters relevant data into the MRD Integrated System (ILS-3/LOUIS), ensuring accuracy and uniformity of information.	**6. Verifying and Enforcing Compliance** Ensuring licensee complies with CNSC regulations and license conditions, and taking the appropriate actions to rectify non-compliance. 1. Prepares plans for inspections and schedules them based on set priorities in the MRD Integrated System (ILS-3/LOUIS). 2. Knows and can clearly state the differences between the different types of license and applicable license conditions, demonstrating a thorough understanding of these. 3. Selects the appropriate detection measurements and safety equipment necessary for particular inspections or anticipated site conditions. 4. Can easily distinguish between a serious and less serious non-compliance situation and identify the appropriate course of action. 5. Possesses the technical expertise to bring together advice from inside and outside the CNSC to address a compliance problem. 6. Consults with senior inspector or supervisor when faced with unfamiliar situations. 7. Indicates to licensee required corrective actions appropriate to the health and safety and environmental concerns, clearly explaining the rationale and logic behind the action. 8. Evaluates thoroughly the corrective measures proposed by the licensee and determines if these will rectify the identified items of non-compliance. 9. Deals immediately with serious non-compliance situations and proposes actions to be taken to senior inspector but does not hesitate to issue stop work orders when faced with safety and environmental concerns. 10. Collects and reviews procedures from licensees ensuring they meet policies and guidelines and that these are properly documented and filed for future reference. 11. Conducts requisite follow-ups with CNSC staff or external agencies resulting from the findings and reports on action taken. 12. Follows up on corrective actions proposed by licensee and ensures non-compliant situation is redressed and meets license conditions and regulations. 13. Shares experience with less experienced inspectors to add to their knowledge base.	**6. Verifying and Enforcing Compliance** Ensuring licensee complies with CNSC regulations and license conditions, and taking the appropriate actions to rectify non-compliance. 1. Interprets compliance expectations of license conditions and regulations that can be vague or questionable under given circumstances. 2. Initiates actions and recommendations after a thorough assessment of a situation and directs others in dealing with situation. 3. Easily diagnoses non-compliant situations or serious infractions, and knows how and where to dig for information to identify root cause to properly assess risk and determine best solution. 4. Synthesizes and simplifies the pertinent regulations and conditions for others which will enable them to take appropriate corrective action. 5. Seeks creative and better ways of promoting compliance among licensees and building better two-way communication. 6. Can look beyond the immediate problems to determine broader issues and keeps these in mind when identifying and implementing compliance and enforcement solutions. 7. Understands CNSC mission, mandate functions and uses this knowledge in decision making. 8. Works closely with others and seeks their input and expertise to acquire different perspective in dealing with high risk and/or serious non-compliant situations; evaluates pros and cons and selects best way to deal with situation. 9. Contributes to the development of policies, objectives and plans for the Division in conducting and improving inspections. 10. Coaches and mentors other MRD Inspectors to continually develop their knowledge and expertise.

TABLE MRD1 (cont.)

Entry	Intermediate	Senior
7. Investigating Situations Investigating and researching problems and issues and deciding the best course of action to be taken to address the situation. 1. Reviews previous investigation files and documents to familiarize themselves with approach to conduct investigations. 2. Observes carefully approach tactics, techniques employed by experienced inspector during an investigation, and asks probing questions to determine rational and logic behind approach. 3. Can explain when probed the approach, rationale, objective and planned course of action of a given investigation and the circumstances that leads to prosecution action. 4. Knows what proper instrumentation and safety equipment to bring to the site for specific types of investigations. 5. Takes predetermined, basic measurements and samples for analysis and safeguards samples collected. 6. Collects and compiles information and data required by experienced inspector from individuals and other sources as required for investigation. 7. Shares and reports on information or samples gathered with other team members to determine if information is sufficient or if additional information is required to pursue the investigation.	**7. Investigating Situations** Investigating and researching problems and issues and deciding the best course of action to be taken to address the situation. 1. Follows and adheres to the MRD procedures that apply to investigations. 2. Seeks appropriate authority to proceed with major investigation and prosecution action from the Section Head. 3. Consults Section Head and assigned MRD LSU contact officer regarding recommendations to prosecute towards building a solid case for prosecution, ensuring all legal requirements are adhered to and documents are obtained and prepared to support the case. 4. Evaluates if findings warrant further investigation. 5. Determines which areas need to be investigated and where efforts should be directed, as well as identifies the individuals on site who may be involved in the investigation. 6. Identifies the best ways to minimize health, safety and environmental risks, and takes immediate action. 7. Discusses with experienced inspector ways to improve the handling of an investigation. 8. Customizes investigative approach to suit the unique requirements of each investigation. 9. Collects physical evidence and appropriate samples to determine root cause of problem. 10. Questions appropriate persons to obtain sufficient information to clearly understand what caused a given situation. 11. Takes careful measurements and samples for analysis and carefully documents all relevant information and safeguards it to prevent tainting of evidence. 12. Takes statements from appropriate people, making detailed notes and paraphrasing for clear understanding of facts. 13. Conducts thorough searches of premises, assembles necessary evidence and advises those who need to know on evidence seized. 14. Keeps Section Head apprised on a regular basis on the progress of the investigation. 15. Summarizes findings in written report which contains conclusions and recommendations that are sound and well supported. 16. Is careful that nothing is said or done that could compromise the CNSC's options to take whatever enforcement action is needed. 17. Provides professional testimony that is supported by factual evidence.	**7. Investigating Situations** Investigating and researching problems and issues and deciding the best course of action to be taken to address the situation. 1. Explains and interprets MRD procedures that apply to investigation. 2. Determines when health, safety and environment issues are at stake; determines if and when an inspection should become an investigation. 3. Proposes strategy and best course of action to take on major investigations and guides others in their action throughout the investigation. 4. Identifies investigation plan for thoroughness and effectiveness ensuring no important aspect has been overlooked that could jeopardize an investigation. 5. Advises and provides specialized advice and instructions to the key personnel responsible, re: appropriate measures to take to eliminate the immediate risks and to implement preventative measures. 6. Keeps management and the commission apprised (as requested) on development of serious investigations and possible impact on CNSC. 7. Prepares detailed court briefs ensuring all information provided is factual and well supported. 8. Reviews for completeness and accuracy detailed inspection reports to be used to support enforcement action. 9. Carefully reads accused rights in prosecution action, ensuring accused fully understands why they are being charged and what assistance and rights they have access to. 10. Determines and documents the relevant information and facts that may be used as evidence in a prosecution or in a serious licensing action. 11. Works jointly with other agencies and groups to ensure proper procedures and corrective action is undertaken by responsible party. 12. Provides technical expertise to crown prosecutor to assist in building his case on all aspects of the infractions. 13. Mentors and coaches other less experienced inspectors in approaches, techniques and tactics in handling major investigations.

Appendix V

U. S. NUCLEAR REGULATORY COMMISSION PERSONNEL QUALIFICATION PROGRAMS (USA)

PURPOSE AND OBJECTIVES

Qualification and training requirements are defined for selected U. S. Nuclear Regulatory Commission (NRC) personnel in the nuclear reactor safety (NRS), nuclear materials safety (NMS), and nuclear waste safety (NWS) program areas. Initial qualification is achieved through self-study, formal classroom, and on the job training. Additional training is also specified to maintain and enhance the effectiveness of experienced personnel in identified speciality areas. These qualification programs ensure that NRC program area personnel meet minimum knowledge and qualification standards and that a standardized methodology is used for determining that inspectors, license reviewers, project managers, and technical reviewers have met the established qualification requirements.

POLICY

NRC program area personnel must understand the facilities, equipment, processes, and activities of the programs they inspect or license, as well as the criteria, techniques, and mechanics of inspection and licensing. The qualification process is intended to provide inspectors, license reviewers, and project manager/technical reviewers with sufficient information to conduct inspections and license reviews that are technically correct and in accordance with NRC regulations, policies and procedures.

Personnel assigned as inspectors, license reviewers, and project manager/technical reviewers in the NRC program areas must successfully complete the requirements for their individual inspection or licensing areas and the appropriate qualification journal. In addition to the formal requirements, other training may be necessary to supplement or enhance inspector, license reviewer, or project manager/technical reviewers development. Exemption from specific training topics may be granted under certain circumstances.

The appropriate qualification journal specifies the minimum inspector, reviewer, or project manager/technical reviewer qualification requirements. Regions and headquarters offices may customize specific qualification journals to add other requirements as appropriate. Upon completion of the training identified in the qualification journal, the inspector's, license reviewer's, or project manager/technical reviewer's understanding of the material are evaluated by an oral qualification board.

Inspectors, license reviewers, or project manager/technical reviewers undergoing qualification may perform inspections or license application reviews under the direction of a qualified inspector, license reviewer, or project manager/technical reviewer. In situations where qualification is delayed as a result of the unavailability of required formal training courses, or for other compelling reasons, qualification may be provided for those categories in which the inspector, license reviewer, or project manager/technical reviewer is considered qualified.

An individual who changes disciplines must meet or complete the training and qualification requirements for the new discipline. In such cases, previous equivalent training requirements in common between the two disciplines need not be repeated, and credit for the previous similar training will be indicated in the current qualification journal.

Temporary instructions or policy and guidance directives that focus on a specific area may necessitate inspectors, reviewers or project manager/technical reviewers receiving special training before performing inspections or license reviews. The NRC program area having lead responsibility for preparing these instructions or directives will identify these special training requirements. The schedule for preparation of any special training should allow enough advance time for the required training course to be developed and implemented before inspection or licensing is performed using the instruction or directive.

TRAINING ACTIVITIES

Personnel assigned as inspectors or license reviewers project manager/technical reviewers in the NRC program areas must successfully complete the requirements for their individual inspection or licensing areas and the appropriate qualification journal.

Written examinations are used for designated courses to evaluate the candidate's understanding of the material. The passing grade for most examinations is 70 percent. Not all courses have formal examinations. In these cases, satisfactory course completion is determined by attendance and completion of class activities. Individuals who fail examinations may be given the opportunity to review the material through self-study and may then be re-examined. If deemed desirable, individuals who fail a course may also repeat the course in accordance with established policy. In all cases, completion of formal training courses will be documented and tracked.

QUALIFICATION JOURNAL

Newly assigned inspectors, license reviewers, or project manager/technical reviewers will be assigned a qualification journal. The journal establishes the minimum training requirements for formal instruction, on the job training, local training sessions, and self-study. It is a detailed series of activities and study areas that must be completed in a specific period, usually within the first 2 years of assignment.

Attachment 1 presents technical disciplines covered by formal qualification, programmes; attachments 2 to 4 present typical examples of formal qualification programmes for three different positions.

ORAL QUALIFICATION BOARD

The board assesses the qualifications of an individual to conduct the prescribed NRC inspection or licensing program. The board will recommend to the regional administrator or office director whether or not the individual should be certified as a qualified inspector, license reviewer, or project manager/technical reviewer.

The regional administrator's or office director's certification will be documented in the inspector's, license reviewer's, or project manager/technical reviewer's official personnel file and the date entered in the training tracking system. This date determines when refresher training is due for each qualified individual.

The minimum number of personnel required to constitute a board will be three. A cross-section of qualified personnel should be included and can range from a peer-level inspector, license reviewer, or project manager/technical reviewer to a division director. Management of

at least the branch chief level should be included on each board. The peer-level member of the board should be qualified in the discipline for which the candidate is seeking qualification.

The regions/headquarters may develop a list of questions, or question bank, that include all areas of the qualification journal. These questions should allow and encourage the individual to answer in such a way as to demonstrate a depth of knowledge and understanding of a given area, rather than to simply answer "yes" or "no". Questions should focus on those situations that require the inspector, reviewer, or project manager/technical reviewer to demonstrate a knowledge of NRC policy and philosophy, as they relate to the licensee and the implementation of the nuclear materials inspection or licensing program. Questions of a technical nature should not be excluded; however, they should not represent a major area of board questioning.

INTERIM QUALIFICATION

An inspector, license reviewer, or project manager/technical reviewer who has not completed all requirements for final certification in one of the applicable areas may obtain interim qualification to independently perform inspections or conduct license reviews in specified areas for which prescribed training has been completed. To establish an interim certification, the individual's supervisor will evaluate the individual's qualifications and identify the categories for which interim qualification is appropriate. A request will then be generated through the individual's management for interim qualification in the identified areas. The request should be approved by the regional administrator or office director. Approval of interim qualification will be documented and a record kept in the individual's training file.

PROGRAM REVISIONS

This manual chapter and qualification journals are periodically (approximately every 3 years) revised to reflect the training needs of inspectors, license reviewers, and project manager/technical reviewers as determined by changes to the inspection, license reviewer, and project manager/technical reviewer procedures. When new revisions are issued, personnel who qualified under previous requirements shall remain qualified, but must complete any new formal classroom training requirements in their area within three years from the date of the revision. Personnel in the process of qualifying when new revisions are issued, may complete their qualification under their original requirements, but must complete any new formal classroom training requirements in their area within three years from the date of the revision. Waivers to specific new formal training requirements and extensions to the three year time period can be granted.

EXCEPTIONS

Inspectors, license reviewers, or project manager/technical reviewers who, through education and prior experience in the specific field, possess sufficient knowledge to meet minimum requirements, may be grandfathered. Requests for such exemptions should be made from the individual's supervisor to the office director or the regional administrator and should consider the candidate's ability to conduct inspections or licensing activities without the benefit of the additional knowledge and regulatory perspective which would be gained by attending the specific courses.

Inspectors, license reviewers, or project manager/technical reviewers qualified for one program areas need not duplicate qualification requirements that are common for another discipline. The individual, after completing the additional training required, including all of the necessary specialized and technical training for the new discipline, may receive qualification in writing from the office director or their designee without the need for a qualification board, provided that the common requirements (such as requalification courses) have been kept up to date.

Inspectors, license reviewers, or project manager/technical reviewers who, through prior experience and education, possess sufficient knowledge to meet minimum requirements, may validate specific courses through satisfactory completion of equivalency examinations. Requests for equivalency examinations should be made from the individual's supervisor and should consider the candidate's ability to conduct inspections or licensing activities without the benefit of the additional knowledge and regulatory perspective which would be gained by attending the course. Use of these examinations is generally expected to be a rare occurrence.

The regional administrator or office director has the authority to waive any requirement or extend the time period for any requirement listed for an inspector, reviewer, or project manager/technical reviewer in this manual chapter. Justification for the waiver or extension will be documented, and entered into the individual's training file.

REFRESHER AND POST QUALIFICATION TRAINING

Training requirements beyond those that are required for initial qualification are specified for experienced inspectors, license reviewers, or project managers/technical reviewers. Refresher training is required in recognition that inspector, reviewer, or project manager/technical reviewer training does not stop with initial qualification. Post qualification training should be made available for experienced inspectors, reviewers or project manager/technical reviewers on the basis of need, special circumstances, and the necessity of keeping current with inspection and licensing programs.

Attachment 1 to Appendix V

TECHNICAL DISCIPLINES COVERED BY FORMAL QUALIFICATION PROGRAMS

The following technical positions in the nuclear reactor safety, nuclear materials safety, or nuclear waste safety areas have formal qualification programs:

- Nuclear reactor safety area:

  - BWR Operations Inspector
  - Westinghouse PWR Operations Inspector
  - Combustion Engineering PWR Operations Inspector
  - Babcock and Wilcox PWR Operations Inspector
  - Reactor Engineering Support Inspector
  - Reactor Health Physics Inspector
  - Reactor Safeguards Inspector
  - Reactor Technical Specialist/Team Member
  - Reactor Emergency Preparedness or Health Physics Specialist/Team Member
  - Non-Power Reactor Inspector
  - Emergency Preparedness Inspector
  - Vendor Inspector
  - Reactor Decommissioning Inspector
  - Technical Assistance Inspector
  - Reactor Technology Instructor
  - Headquarters Operations Officer

- Nuclear materials safety or nuclear waste safety area;

  - Materials License Reviewer
  - Materials Health Physics Inspector
  - Fuel Cycle Safety Inspector
  - Fuel Cycle Safeguards Inspector — Physical Security
  - NMSS Headquarters Fuel Cycle Safeguards Inspector — Material Control and Accounting (MC&A)
  - NMSS Headquarters Transportation Packaging and Dry Storage System Safety Inspector
  - Fuel Cycle License Reviewer
  - Division of Waste Management Inspector and License Reviewer
  - Decommissioning Inspector
  - Division of Waste Management Decommissioning Project Manager/ Technical Reviewer
  - Materials Exempt Distribution License Reviewer
  - Uranium Recovery Inspector
  - Uranium Recovery Project Manager/Technical Reviewer.

Attachment 2 to Appendix V

TRAINING REQUIREMENTS FOR WESTINGHOUSE PWR OPERATIONS INSPECTOR (TYPICAL OF OTHER TECHNICAL POSITIONS WITHIN THE NUCLEAR REACTOR SAFETY PROGRAM)

The training described below is required for personnel assigned to perform reactor operations inspections at Westinghouse PWR facilities. This inspector classification is intended for staff positions of senior resident inspector, resident inspector, and regional inspectors, as appropriate.

REQUIRED INITIAL TRAINING

- Self Study and On the job Training:
  - NRC Orientation
  - Code of Federal Regulations
  - Updated Final Safety Analysis Report
  - Regulatory Guidance
  - NRC Inspection Manual
  - Industry Codes and Standards
  - Inspection Accompaniments
  - NRC Management Directives
  - Onsite Training
  - Site Emergency Plan Training
  - Site Security Plan Training
  - Site Radiation Protection Plan Training.

- Core Training
  - Fundamentals of Inspection Course
  - Root Cause/Incident Investigation Workshop
  - Inspecting for Performance Course
  - Effective Communications for NRC Inspectors
  - Site Access Training or equivalent
  - Occupational Safety Training
  - PRA Technology and Regulatory Perspectives Course
  - Power Plant Engineering Course or equivalent experience
  - Full course series in Westinghouse reactor technology (Westinghouse Technology Course, Westinghouse Advanced Technology Course, and Westinghouse Simulator Course).

Post-Qualification Training: This training will be determined by the individual's supervisor and will depend on previous work experience and planned inspection activities in specific areas.

Refresher Training: Refresher training will include the following courses and other courses as determined by management:

- Annually: Site Access Refresher Training or equivalent.

- Every Three Years: Westinghouse Technology Review Course and Westinghouse Simulator Refresher Course.

Attachment 3 to Appendix V

TRAINING REQUIREMENTS FOR MATERIALS HEALTH PHYSICS INSPECTOR (TYPICAL OF OTHER INSPECTOR POSITIONS WITHIN THE NUCLEAR MATERIALS OR NUCLEAR WASTE SAFETY PROGRAMS)

The training described below is required for all materials health physics inspectors assigned to perform radiological safety inspection, decontamination, and decommissioning activities at material licensee facilities.

Required Initial Training

- Self Study and On the job Training:
  - NRC Orientation Code of Federal Regulations
  - Office Instructions/Regional Procedures
  - Regulatory Guidance
  - NRC Inspection Manual
  - Industry Codes and Standards
  - Inspection Accompaniments
  - NRC Management Directives
  - Review of significant events at materials licensees
  - Directed Review of Selected Inspection Case Work.

- Core Training
  - Fundamentals of Inspection Course or Inspection Procedures Course
  - Root Cause/Incident Investigation Workshop
  - Inspecting for Performance Course — Materials Version
  - Effective Communications for NRC Inspectors
  - Occupational Safety Course
  - Radiation Worker Training
  - Health Physics Technology Course
  - Diagnostic and Therapeutic Nuclear Medicine Course
  - Safety Aspects of Industrial Radiography Course
  - Teletherapy and Brachytherapy Course
  - Transportation of Radioactive Materials Course.

- Specialized Training: Depending on the inspector's previous work experience and planned inspection activities, additional courses may be required in order to gain knowledge necessary for specialized inspection activities. Management will make this determination on an individual basis. For example, if an inspector is assigned activities in one of the areas listed below then that inspector should attend the appropriate training course or have equivalent experience as determined by their management.
  - Internal Dosimetry and Whole Body Counting Course
  - Safety Aspects of Well Logging Course
  - Irradiator Technology Course
  - Environmental Monitoring for Radioactivity Course
  - Air Sampling for Radioactive Material Course

- Respiratory Protection Course
- Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) Course
- Site Access Training.

- Supplemental Training: Additional training beyond that identified as Core Training. This training will be determined by the individual's supervisor and will depend on the individual's previous work experience and planned inspection or licensing activities in specific areas.

- Refresher Training: Refresher training will be conducted every three years following initial certification. Refresher training will include the following course and other courses as determined by management:
  - Fundamentals of Inspection Refresher Course
  - Health Physics Topical Review Course.

TRAINING REQUIREMENTS FOR MATERIALS LICENSE REVIEWER (TYPICAL OF OTHER REVIEWER POSITIONS WITHIN THE NUCLEAR MATERIALS SAFETY PROGRAM)

The training described below is required for all materials license reviewers assigned to perform radiological safety reviews of nuclear material license applications, except exempt distribution licenses, fuel cycle licenses, and licenses issued by the NMSS Division of Waste Management.

Required Initial Training

- Self Study and on the job Training
  - NRC Orientation
  - Code of Federal Regulations
  - Office Instructions/Regional Procedures
  - Regulatory Guidance
  - NRC Inspection Manual
  - Industry Codes and Standards
  - Licensing Site Visits
  - NRC Management Directives
  - Review of significant events at materials licensees
  - Directed Review of Selected Licensing Case Work.

- Core Training: These courses establish minimum formal classroom training requirements. Refer to Section 1246-11 for exceptions to these requirements.

  - Health Physics Technology
  - Diagnostic and Therapeutic Nuclear Medicine Course
  - Safety Aspects of Industrial Radiography Course
  - Teletherapy and Brachytherapy Course
  - Licensing Practices and Procedures Course
  - Transportation of Radioactive Materials Course
  - NMSS Radiation Worker Training.

- Specialized Training: Depending on the materials license reviewer's previous work experience and planned reviewer activities, additional courses may be required in order to gain knowledge necessary for specialized licensing activities. Management will make this determination on an individual basis. For example, if a license reviewer is assigned activities in one of the areas listed below then that reviewer should attend the appropriate training course or have equivalent experience as determined by their management:

  - Fundamentals of Inspection Course or Inspection Procedures Course
  - Internal Dosimetry and Whole Body Counting Course
  - Safety Aspects of Well Logging Course
  - Environmental Monitoring for Radioactivity Course

- Air Sampling for Radioactive Material Course
- Site Access Training.

Supplemental Training: Additional training beyond that identified as Core Training. This training will be determined by the individual's supervisor and will depend on the individual's previous work experience and planned inspection or licensing activities in specific areas.

Refresher Training: Refresher training will be conducted every three years following initial certification. Refresher training will include the following course and other courses as determined by management: Health Physics Topical Review Course

Appendix VI

USE OF SYSTEMATIC TRAINING APPROACH AT STUK (FINLAND)

1. BACKGROUND

The aim of this Appendix is to describe how systematic training approach can be achieved and maintained in the regulatory training activities in a small regulatory body. The Appendix describes regulatory training experiences of the regulatory body supervising nuclear power plants in radiation and nuclear safety authority, STUK, in Finland during the period 1991–1998 [VI.1]. The training arrangements and methods of training are described. Also the volume of training is described.

The staff size was about 70 inspectors working in the fields of nuclear safety, radiation safety, safety assessment, NPP inspection, pressure vessels, nuclear materials and nuclear waste. The inspection staff had average age of 45 years and had professional experience typically from 5 to 25 years. About 10 persons could be considered as newcomers having less than 5 years experience in their respective jobs as regulatory inspectors. They may have had long experience in other fields or in other type of organisations or they may have been newcomers directly from universities.

Training activities were started to be developed at the beginning of 90'ies. The main goals were to define some basic competence profiles of the inspectors working in different fields and to provide basic regulatory inspector training programme which cannot be received outside the regulatory organisation. From administrative point of view a training structure — organisation and administration including policy, guidelines, programmes, courses, materials and facilities had to be developed to provide systematic approach and quality in training activities.

2. THE ROLE OF MANAGEMENT AND TRAINING POLICY

The main role of management is to set goals for training. The management has the overall responsibility on the competence of their staff. The management has to provide financial and organisational means to fulfil the goals. The management has to develop precise job descriptions for all positions important to safety to be used also in the development of training programmes. The attitude of management towards the training of their staff is an important factor to be considered carefully. The means to be used by the management are to formulate and promulgate training policy.

The internal quality manual of the regulatory body is a natural place where the training policy can be presented either separately or combined with training guidelines. Also the job descriptions should be included in the internal quality manual. This is also the case in STUK.

Training policy is defined in the internal guideline defining training administration. In the training policy the following aspects are stressed:

- Starting points and goals for training such as:
  - STUK as a regulatory body
  - job descriptions

- preceding training and work experience
- qualifying a person to the job in question
- use of resources of the whole organisation
- training goals for each function.

- General objective is to provide a person with the knowledge, skills and attitudes needed to perform his/her specific job.

- Responsibilities of all involved such as:
  - management
  - training manager
  - supervisor
  - individual.

- Training of a newcomer.

- Continuing training in respect of further development of knowledge, skills and attitudes e.g. in communication and management and for international co-operation.

- Monitoring, evaluation and control of training.

3. THE ROLE OF TRAINING ORGANISATION AND ORGANISATION OF TRAINING

When training administration is concerned the following principles should be taken into account:

- Nominating Training Manager and Training Secretary.
- Defining Training Policy.
- Developing training guidelines.
- Setting qualification requirements or training goals.
- Developing systematic/ individual training programmes.
- Developing training courses and materials.
- Provision of training facilities and equipment.

A large regulatory body may need a separate training centre with several instructors especially if there are advanced training tools in use such as training simulators. A small regulatory body needs a training manager or training co-ordinator and a training secretary. Number of instructors depends on organisational arrangements. STUK uses part time instructors — all the specialists have a duty to provide training in their specific fields when needed.

An important policy issue is the amount of annual training for the inspectors. How much working time an inspector can and should spend in the development of his/her professional knowledge and skills; In STUK two to three weeks annually has been considered as suitable amount. Newcomers should spend much more time in training during the first years.

A central principle in the training activities is that the supervisor is responsible for the qualification and training of his/her subordinate. Accordingly the supervisor evaluates the

training needs of subordinate annually e.g. as a part of performance appraisal. The supervisor takes part in the planning of training with the assistance of training manager and ensures the fulfilling of the training plan. Every individual is responsible for developing himself/herself according to the offered possibilities as well as to present initiatives for identifying training needs.

If a new inspector is recruited, the supervisor takes care with the help of training Manager that the newcomer is familiarized with his/her duties according to the inspector qualification guidelines included in the internal quality manual. If necessary the supervisor nominates a personal instructor to the newcomer. The newcomer starts to work immediately. The requirement level of the tasks given to him/her increases with work experience. The supervisor shall ensure that the subordinate is able to perform a given duty.

Training manager develops training guidelines, training goals for professional staff, draws up the lines for training of staff, prepares individual training programmes and annual training programme for the whole department, arranges training courses, procures and develops training material, and follows training achievements and results. Training secretary takes care of course secretary duties, looks after the training library, keeps records etc.

Typical training facilities include an auditory, meeting rooms for group work as well as training library for self study and for supporting instructors and for loaning training materials. Computer based systems for production of lectures and overheads are necessary elements for successful training activities. Direct connection from computer through video gun to show overheads is a good method and can save materials. STUK uses Word and PowerPoint programmes for preparing materials and there is a possibility to use diskettes or direct connection from computer in the auditory. Standardised systems are also useful when international co-operation is concerned.

A small regulatory body needs assistance from outside organisations, e.g. power plant training centres are needed for simulator training. Power company training materials are also important when plant and system knowledge training is concerned. Other technical institutes are needed for specialized training e.g. in NDT methods and welding technology. International organisations are needed to collect a “critical mass” of narrow area specialists for exchange of information on current issues.

4. THE APPLICATION OF SAT METHODOLOGY

In the following the experiences gained are described by using typical terminology of SAT methodology to reflect the important elements in training development [VI.2].

4.1. ANALYSIS OF JOB AND TRAINING NEEDS

Analysis of a job is based on the job description. This phase comprises the identification of training needs and of the competencies required to perform a particular job.
The following means are used in STUK:

- **Training card** model for the identification of training needs and for the follow-up; it comprises two lists of items: general elements of regulatory training and specific elements

of regulatory training from which necessary topics could be selected for definition of the training courses needed;

- **Inspector qualification guidelines** including sub-guidelines for the definition of individual OJT for a specific job.

In the development of these means the past STUK experiences as well as international experience from OECD countries through OECD/NEA CNRA/WGIP have been utilised. General and individual elements of regulatory training contain the following items:

Basics:

- Familiarization; radiation and industrial safety.
- Nuclear safety principles/ safety culture.
- Plant and systems knowledge.
- Accident analysis and emergency preparedness.
- Quality assurance; organizational practices.

Professional:
- Regulatory control.
- Assessment skills.
- Inspection skills.
- Job specific training courses.
- On the Job Training.

Communication and management skills:
- Interpersonal relationships.
- Interview and negotiation skills.
- Effective writing skills.
- Media relationships.
- Team work.
- Leadership.

Continuing training:
- Refreshing training
- Further development of professional knowledge and skills
- Information exchange

Inspector qualification guidelines [VI.3] contain the following specific sub guides on the basis of which individual OJT programme can be developed:
- Introduction to and familiarization of the regulatory body.
- Legislation and regulatory guidance.
- Selected other guides and standards.
- Familiarization of the regulatory documentation.
- Onsite training.
- Inspection practices.
- Assessment of safety.
- Other regulatory duties and tasks.

- Training courses for technical and skills training.
- Continuing training.

When the above tools are used in the analysis of individual's training needs his/her past education and training as well as work experience are taken into account. Similarly the job description as well as separate tasks are taken into account so that an individual training programme can be designed.

4.2. DESIGN AND DEVELOPMENT OF INDIVIDUAL TRAINING PROGRAMME

The above means are rather straightforward to use and they provide individual training needs analysis for systematic individual training programme. The programme partly utilises internal training courses provided by STUK and partly individual OJT provided by supervisor and older colleagues. In case external training needs are identified this training can be organised.

Individual training planning. Training planning is based on the training analysis that takes into account job specific training requirements and individual needs of persons. Person's earlier training and work experience is also taken into account. An individual familiarization and training programme is prepared for new recruits and for those persons who are changing to another job.

The supervisor prepares with the training manager a training programme for a new recruit on the basis of job specific training goals. At the beginning the courses that can be considered as settled on the basis of earlier training, are identified and additional training is specified. In the preparation of training the courses offered by STUK are taken into account.

A key element in the personal training programme development is the Inspector Qualification Guidelines. By applying these guidelines the job specific training needs can be taken into account. What cannot be offered through training courses can be provided through individual guidance. OJT can be used also to relate theoretical knowledge and practice together so that the best learning results are achieved.

In addition to the initial training, maintaining and developing of person's knowledge and skills i.e. professionalism shall be taken into account. This presupposes actions related to the training and information exchange. Professionalism can be increased by continuing training, participating in the seminars and conferences, and by exchanging information in the house or with external organisations. Preserving of qualifications presupposes also refreshing training and working in the particular job.

In a small regulatory body training courses cannot be repeated very often because the number of participants is too small and lecturer resources are limited. In a large regulatory body resources and number of participants are larger and situation is therefore more favourable. International organisations can assist in this respect by providing certain training courses.

Annual training programme. Regulatory body should provide an annual training programme where initial training needs as well as refreshing training needs are combined together in such a manner that necessary training courses are repeated periodically.

Training manager prepares annually e.g. in September the targets for the training programme of next year. Preparation of the targets is based on the needs presented by the management and offices of the department, on the courses arranged during the preceding years and experiences from them, on the operational experiences from the nuclear power plants, and on the development of nuclear power situation and regulatory activities. Also questionnaires to collect individual training needs and wishes can be developed and distributed to get direct information from individuals. Performance appraisals are also a good form to collect individual needs inside the organisational units. After the commenting by the offices, the proposed annual training programme is given together with a budget proposal to the management of department for approval. After approval annual training programme will be published in the form of catalogue that is distributed to all the staff of department.

For training Manager a long term strategy is an important tool to provide training courses in a systematic manner and in the right order so that courses support each other and current activities of the department. Long term training strategy correlates with the long term strategy of the department. The annual training programme contains initial and refreshing courses, annual training days for presenting major plant modifications, operational experiences and regulatory changes, preparing for the annual plant outages, work safety as well as other needed matters such as communication and management training. Also other courses developing special knowledge and skills can be considered.

Monthly information hits is an useful form of training on the topical issues. According to the present practice half-an-hour information hits are given during the first Mondays of the months preceding the general department meeting. A longer training session is also possible on a topical issue if needed. When annual training programme is planned the offices should present their needs for participation in the external courses for the training budget purposes. Proposals can be made also later according to the financial possibilities of offices.

4.3. IMPLEMENTATION OF TRAINING PROGRAMMES

Internal training courses are presented in the annual training catalogue. Training facilities such as auditory are reserved. A detailed programme is planned. Lecturers are agreed. Preparation of necessary training materials is carried out by the lecturers. Lecturers can use overhead projector or video gun to have direct link from diskette or computer to show overheads. Written participant materials are prepared and copied. Control questions are prepared if necessary. Exercises and discussion topics are provided. Invitations are sent to the nominated participants and/or to the whole department depending on the training event. Course secretary assists in training material production and in distribution of information. In STUK training is normally provided in the auditory where there are excellent tools including simultaneous interpretation possibilities.

Course director runs the course and assists in keeping the schedule. A participant list is circulated. Enough time and possibilities for discussion are provided so that participants have a possibility to understand the matter and also to express their opinions. Control test question sheets are collected and checked. A feedback questionnaire is distributed to get feedback from the participants for quality control. Mistakes are corrected for the future training sessions. Results are recorded. In addition to the training courses training is given during the monthly information hits.

Mainly the own staff is used as instructors in the internal training courses. Performing as an instructor belongs to the job of professional staff. In some cases an instructor can be taken from power companies or research centres for special knowledge, new insights or for a change. In such cases where power company practices are important to be understood well it is advisable to use power company lecturers. Mutual understanding is increased if common workshops are organised in topical matters. However, budget must be taken into account.

If internal training courses cannot provide the necessary knowledge external training is arranged. Developing special skills presupposes the follow-up of external training possibilities. A person himself and the supervisor are responsible for this follow-up and necessary actions.

On the job training according to the Inspector qualification guidelines is mainly carried out inside the organisational units by supervisors and older colleagues of the newcomer. If there are several newcomers at the same phase of progress some topics can be collected together and handled in the form of training course. Individual guidelines are prepared by the supervisor in co-operation with the training manager.

Chapter 5 provides an example how training programme has been organised in a regulatory body during 90'ies.

4.4. EVALUATION OF TRAINING AND INDIVIDUAL PROGRESS

Evaluation of training means all the feedback processes from other SAT phases to improve training programme and its implementation. It also means the follow-up of training events, course evaluations and individual progress as well as maintaining training register. Course follow-up means that planned training events are kept and intended persons participate. Training manager or other course organiser provides course report which contains course programme, participants list and course evaluation. Quality of course is evaluated taking into account course content, training materials, instructor performance and general arrangements. Standard evaluation sheet should be provided. Course report is also important on the external courses; participant should comment the usefulness of the course so that other colleagues have this necessary information when they are considering this event for themselves or for their subordinates. Training manager is responsible of the follow-up and reporting to the management once a year.

Follow-up of individual progress means maintaining the training register so that all the participation's are listed in the register. Also the progress with the OJT guidelines are followed. Evaluation of person's qualifications for independent work is carried out after the planned training programme is fulfilled. There are various methods to make the follow-up of necessary training easier for training manager and supervisors. Design of the register in such a way that the requirements and fulfilment of requirements are seen at the same time, makes it easier for the training manager and supervisor to plan the future training activities. Computer program Excel is used by STUK to follow the implementation of technical training. Also certificates on the participation in the "requalification training programme" was given in 1997 and the certificates were recorded in the STUK training register. (See attachments). When training courses are organised in the future the Excel register is used to identify the potential participants. Evaluation of participant feedback and satisfaction helps to improve training activities.

5. CONTENTS OF THE CLASSROOM TRAINING PROGRAMME

In the following the structure of the training programme provided by STUK during 90'ies is described. The "requalification training programme" is also presented in Appendix 1. The programme was at the beginning technically oriented. Later when the most urgent technical topics had been covered more and more communication and management issues were introduced. The technical courses were managed to plan in a systematic manner so that the previous courses supported the following programme.

Plant knowledge course was planned mainly for experienced inspectors for refreshing at the end of 1991. The length of the course was two days lectures — one day per plant type. Each lecture contained also exercise part — altogether about 170 questions — and answering to all the questions took 1–3 days depending on the participant's knowledge level. Lecturers were experienced inspectors. 36 inspectors participated and performed exercises.

Nuclear safety technology course in 1992 was rather detailed and technical in nature. The course was organised in a module structure having 11 half a day modules. Altogether there were 36 hours lectures. Control questions were provided. Written materials were technical in nature with examples from Finnish NPP's. For the experienced inspectors the course provided detailed technical information to extend their knowledge. For the beginners it contained too many technical details that made it difficult for them to get an overview on nuclear safety principles. Lecturers were experienced inspectors. 46 inspectors participated and performed exercises.

Inspection skills seminar was organised at the end of 1992. The aim was to cover general inspection related topics such as inspector's rights and obligations and behavioural aspects etc. as well as specific inspection and assessment related topics in different technical fields as mechanical, electrical, process systems and operations. The seminar took two days and contained lectures and group discussions on topical matters. 46 inspectors participated.

Systems knowledge course (BWR technology) was organised In 1993. The course had modular structure with six modules, altogether 36 hours lectures. Control questions were provided. Modular structure was important because it made possible for the specialised inspectors to select those topics that were needed and important for them. 19 inspectors participated in the whole course and performed exercises. System course was supported by two similar three-day (21 hours) **Simulator training courses** at the NPP simulator training centre. 14 inspectors participated in simulator training (7 inspectors per course). The simulator training part was highly appreciated by the experienced inspectors.

Systems knowledge course (VVER Technology) including simulator training was provided in 1994. At the end of 1994 a course on fuel cycle including fuel transportation, fuel handling systems and waste management was organised. The course contained altogether 15 hours lectures. 22 inspectors participated. These 3–5 courses during 1993–1994 covered detailed systems knowledge and normal NPP operations training, altogether about 120 hours lectures and simulator exercises on BWR and VVER systems technology. Lecturers were mainly experienced inspectors and simulator instructors were power company staff.

Accident management: Transient and accident analysis course was provided (methods, results and topical issues) in 1995. Plant analyser APROS was also applied. 12 hours lectures

were provided. Lecturers came partly from technical research centre and partly from power companies. 38 inspectors participated. The course was supported by the two day (14 hours) **simulator training course on emergency operations (BWR simulator)** with 15 participants. A specific **course on severe accident management** was already organised in 1993 (12 hours, 30 participants, lecturers came from technical research centre). **Emergency planning and preparedness course** was provided in 1996 with 14 hours lectures and exercises. 54 inspectors participated. In addition one-day (5 hours) programme on PSA results was organised; 30 inspectors participated. These courses were supported by the two day (14 hours) **Simulator training course on emergency operations (VVER simulator)** with 15 participants. These five courses during 1995–1996 covered accident management training, altogether 70 hours lectures, exercises and simulator training.

Component knowledge: In 1996–1997 plant knowledge was deepened by going into component level. Specific training days were arranged to cover such topics as ASME code applications, relief valves, valve actuators, automation and NPP Ageing phenomena. Typically 15 inspectors participated. Lecturers were either from STUK or outside organisations.

Individual on the job training

The organisation of training courses is not the only means to provide training for newcomers. It is very important to provide an individual on the job training guideline for provision of systematic training for the specific job by the supervisor and more experienced colleagues. Application of this guideline makes it possible to plan, implement and follow the training needed for a specific job.

Continuing training

Regular refreshing training on topical issues such as plant operational experience and plant modifications, regulatory issues and results from safety research as well as preparation for annual maintenance outages are also important to be organised. Regular annual training days were organised in January to cover operational experience and in spring before outage periods to cover important outage issues.

To develop professionalism among inspectors an input is needed from outside organisations and from other countries. Therefore it was felt important to get once a year such a workshop which is general enough so that many inspectors can participate and which contains some important current topic. Power companies and technical research centre were also invited to participate to improve communication with power companies in the subject. Often the IAEA was invited to support the activity. The following typically one week workshops were organised:, ASSET-seminar on event investigation methods (26 participants) in 1992; ASCOT-seminar on safety culture (29 participants) in 1993, OECD/NEA inspector workshop on inspection practices (15 participants from STUK, altogether about 60 from OECD countries and Eastern Europe) in 1994; seminar on operational QA of NPP's (7 participants from STUK, about 25 from power companies and Eastern Europe) in 1995; internal NPP component ageing seminar (15 participants) in 1996; workshop on emergency planning and preparedness (10 participants from STUK, about 30 from Nordic countries and Eastern Europe) in 1997.

During the programme, co-operation with the IAEA was developed and several other courses and workshops were also organised as a part of the IAEA's strengthening nuclear safety regulatory bodies — programme. These courses also supported STUK training programme by providing training for newcomers and information exchange for more experienced inspectors. The following training courses were organised: regulatory control of NPP's (two weeks) in 1995, information to the public (one week) in 1995, general approach to nuclear safety (two weeks) in 1996, QA in NPP operations and maintenance (three weeks) in 1997, and operator training and licensing (one week) in 1997. About five STUK inspectors participated in each of these training events.

Communication and management skills

In 1994–1998 a lot of emphasis was put and several internal workshops were organised on internal co-operation and communication, development of working atmosphere, teamwork and management. More specific issues were development of internal QA methods, interviewing methods and contacts with news media. Development of language skills has been also an important issue as well as new computer tools and methods.

REFERENCES TO APPENDIX VI

[VI.1] ARO, I., Systematic Approach to Training — Experiences from the Training Activities of Regulatory Body Personnel in STUK, Finland, Radiation and Nuclear Safety Authority, STUK-B-YTO 173, Helsinki (1998).

[VI.2] INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Power Plant Personnel Training and its Evaluation, IAEA Technical Report Series No. 380, IAEA, (1996).

[VI.3] OECD Nuclear Energy Agency, Inspector Qualification Guidelines, CNRA/Working Group on Inspection Practices, OECD, Paris (1994).

Attachment 1 to Appendix VI

TRAINING REGISTER

PARTICIPATION IN STUK INSPECTOR TRAINING PROGRAMME (1991–1997)

Courses	Year	Organiser	Hours	Participants	Test
Work Safety	1992	STUK	4	53	Yes
Radiation Protection	1994	STUK	4	30	
Inspector Skill Seminar	1992	STUK	14	46	Yes
Inspector skill I	1995	STUK	8	12	Yes
Regulatory Control	1995	IAEA	54	3	
Inspector Skill II IQG	1995	STUK		2	
Work at IAEA, NRC				17	
Nuclear Safety	1992	STUK	36	46	Yes
General Approach to Nuclear Safety	1996	IAEA	54	3	
Plant Knowledge	1991	STUK	37	36	Yes
Plant Knowledge	1996	STUK	4	11	
System Knowledge (BWR)	1993	STUK	36	19	Yes
Simulator Course (BWR)	1993	TVO	21	14	
System knowledge (WWER)	1994	STUK	22	18	Yes
Simulator Course (WWER)	1994	IVO	21	15	
Fuel Cycle	1994	STUK	15	22	
EU-Safeguards Seminar	1994	EU	15	5	
Component Knowledge	1995	IVO/VTT	8	15	
Component Knowledge	1996	STUK	2	19	
ASME-Course	1996	TVO	7	5	
NPP Ageing Seminar	96–97	STUK	16	15	
Severe Accidents	1993	VTT	12	30	
Accident Analysis	1995	IVO/TVO/VTt	12	38	
Simulator-Disturbances (BWR)	1995	TVO	14	15	
Emergency Preparedness	1996	STUK	14	54	
PSA-day	1996	STUK	5	30	
Simulator-Disturb. (WWER)	1996	IVO	14	16	
Annual Training 1992–96		STUK	25	49	
Outage Training 1993–96		STUK	18	20	
ASSET Seminar	1992	IAEA	30	15	
ASCOT Seminar.	1993	IAEA	12	14	
Inspector Workshop	1994	NEA/CNRA	20	15	
Operational QA	1995	IAEA	14	7	
Information. to the Public	1995	IAEA	24	5	
Communication Skills	1994	STUK/Työterv.	20	60	
Interviewing Techniques	1995	Assertum	14	12	
Co-operation Skills	1995	Psyko	35	48	
Team training	1996	HAUS (STUK)	13	17	
Advanced English	1996–97	HAUS	30	33	Certification
ATK-Microsoft	1996	AddWise Oy	36	60	
Kept lectures	1991–97				

PARTICIPATION IN THE STUK TRAINING PROGRAMME AND TRAINING COSTS

In the following example case participation in the STUK training programme during 90'ies and training costs are provided. At the beginning of 90'ies an inspector qualification training programme was developed to provide necessary training courses for inspectors on the basic inspector knowledge and skills. This programme can be called as "requalification programme" because most of the participants had already considerable experience in their fields. The inspectors had a possibility to update their knowledge in the areas that they felt important. Development of the programme was based on the detailed questionnaire on the needs and wishes. The priorities were based on the results of the questionnaire.

The programme contained the topics presented in attachment 1. From newcomers point of view it would be ideal to organise the training courses during two to three years but in practise it took five to six years to organise all of them. For Training Manager it is important to know how much training can be organised during one year and how much training can be tolerated by the inspectors. Budget is also an important factor; when the own staff is used as instructors the cost of training maybe lower compared with the alternative that all services are bought from outside organisations; Then, however, inspectors' workload increases.

Figure VI.1 presents participation in the annual internal training programme (training days on the average) during the inspector "requalification programme". Typically participation varied between eight to ten days annually. Combined with the outside conference and seminar participation average amount of participation was two to three weeks in the activities to develop professionalism. Figure VI.2 presents variation in participation during the period 1994–1996.

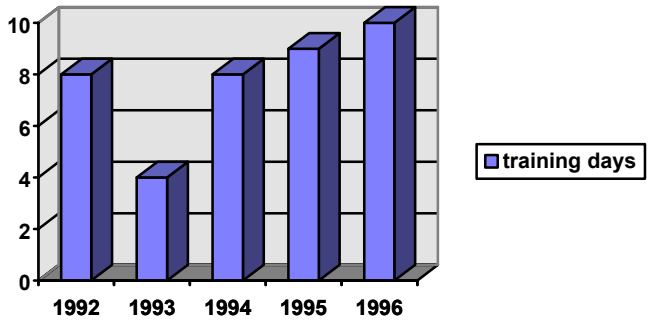

FIG.VI.1. Amount of participation (average annual training days) in the internal inspector training programme organized to cover basic inspector qualification topics in STUK in the 90s.

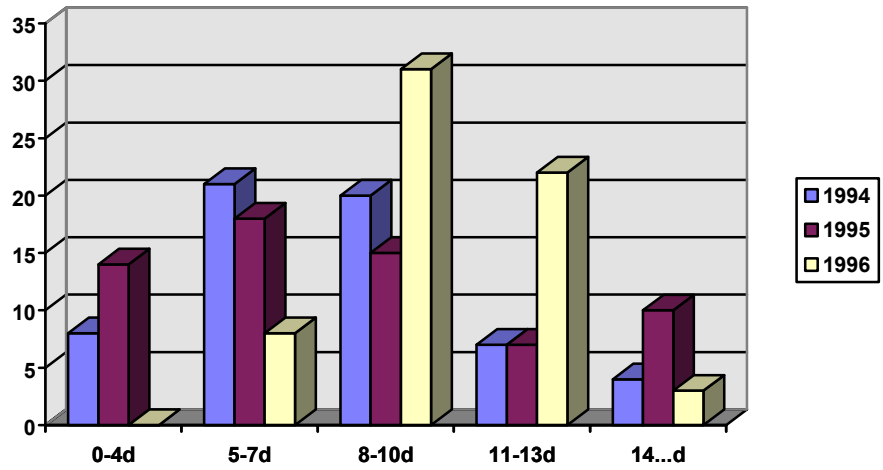

FIG. VI.2. Variation of participation in the annual training programme during the years 1994–1996. Horizontal axis presents the number of training days and vertical axis the number of persons.

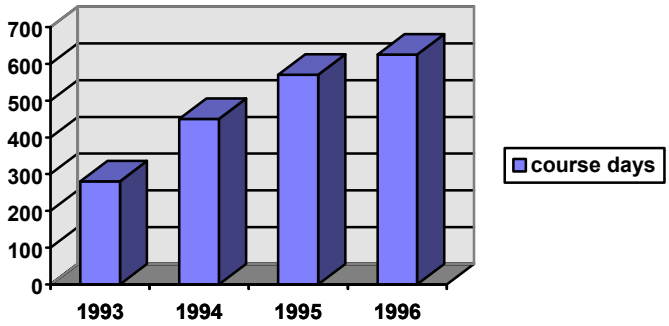

FIG. VI.3. Participation in the annual internal training programme. Total amount of annual internal course days.

Figure VI.3 presents the total amount of course days spent in the programme. Figure VI.4 presents the costs of internal training programme per person. At the beginning of programme instructors were mainly from the own house and training costs were low. At the end of the programme large part of training was bought from outside organisations and the training costs increased.

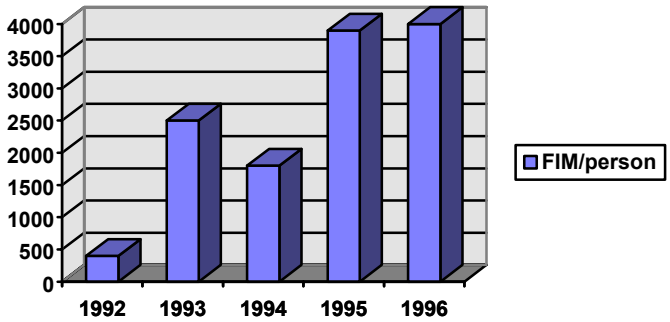

FIG. VI.4. Cost of annual internal training programme per person (FIM).

Appendix VII

ON THE JOB TRAINING GUIDELINE OF A STUK INSPECTOR (FINLAND)

The aim of this appendix is to provide an example of on the job training guideline or qualification guideline for qualifying a new person for the job in question. It offers an example from a small regulatory body how an individual training and qualification plan can be developed. Guideline is used by STUK in Finland.

QUALIFICATION AND INITIAL TRAINING PROGRAMME FOR A NEW EMPLOYEE

1. GENERAL

The quality manual of department nuclear reactor regulation contains Guide YTV 8.2 "training administration" which presents principles of training administration of the department of nuclear reactor regulation. According to the guide YTV 8.2 a personal qualification and initial training programme must be provided for a new employee.

2. OBJECTIVE AND APPLICATION

The objective of this guide is to define the methods for preparing a personal qualification and initial training programme and for ensuring its systematic implementation and documentation. This guide can be applied also to the persons changing a position.

3. RESPONSIBILITY

The supervisor of new employee prepares together with the training manager a qualification and initial training programme for the new employee by defining in a detailed manner training topics and content in each sub area presented in this guide. The supervisor is responsible for ensuring favourable conditions for training. The supervisor and subordinate take care of the implementation of programme. Training manager studies possibilities for necessary internal and external training courses. The supervisor and training manager take care of the follow-up of the programme. For ensuring successful self-study the department of nuclear reactor regulation has a training library containing necessary training materials. The supervisor has a responsibility to evaluate the knowledge, skills and attitudes in each qualification area and to document the results with signature into the follow-up form.

4. ACTIONS

This guide presents sub-areas for a qualification and initial training programme for a newcomer. The supervisor prepares together with the training manager a qualification and initial training programme for a newcomer by defining in a detailed manner training topics and content in each sub area. Training topics and content (training courses, self study, on the job training etc.) are written down in the programme. A new employee must study the application of guides, documents etc. listed in the qualification and initial training programme by himself/herself and through discussions and on the job training with the more experienced

colleagues or immediate supervisor. The aim of discussions and on the job training is to highlight the application of guides and documents in practice. A tutor can be nominated for a new employee to guide him/her in specific, well-defined topics. The new employee must be encouraged to make questions. Every employee in the department should have positive attitude to these questions and provide in an open manner his/her knowledge on the subject matter. As attachment there is a follow-up form that will be sent to the training manager when the qualification and initial training programme has been completed.

5. QUALIFICATION AND INITIAL TRAINING PROGRAMME

The following ten sub-areas are fulfilled in agreement with the supervisor, trainee and training manager.

5.1. INTRODUCTORY TRAINING

The following topics must be performed in the regulatory offices and at the nuclear power plant sites to familiarize a new employee with the regulatory body, customer organizations and the duties of the new staff member.

- Familiarization training according to the STUK manual guide HA 3.2 (administrative matters).
- Regulatory framework, organization of regulatory body.
- Employee as a civil servant, responsibilities, rights and obligations (legal aspects), right attitudes for performing regulatory duties in house and for interface with customer organizations (normal habits, communication, inspector behaviour etc.).
- Specific duties of a new staff member and the organizational unit in question.
- General overview to nuclear facilities inspected.
- Radiation protection and industrial safety at nuclear facilities.
- Site visits to nuclear facilities for familiarization, radiation protection training and pass cards.
- Organize discussions with the immediate supervisor to complete this topic and for giving the newcomer a possibility to have specific questions answered.

5.2. FAMILIARIZATION WITH LEGISLATION AND REGULATORY GUIDANCE

A general overview must be given to the new employee on legislation and regulatory guidance concerning nuclear facilities and other places of inspection to illustrate the use of legislation and regulatory guidance in the new staff member's work. The supervisor selects specific points of acts, decrees, governmental decisions and regulatory guidance for the newcomer for a detailed study to familiarize him/her with the duties and responsibilities in question. Training is provided through lectures, self-study and on the job training.

- General overview to the legislation and regulations ruling the work of regulatory body.
- Select specific regulations affecting the work of the newcomer for a detailed study.
- General overview to the regulatory guidance published or used by the regulatory body.
- Select specific regulatory guides affecting the work of the newcomer for a detailed study.

5.3. FAMILIARIZATION WITH THE OTHER GUIDELINES AND STANDARDS

A general overview must be given to the new employee on other international and national regulations, guides and standards in the field of newcomer's duties. The supervisor selects specific guides and standards for the newcomer for detailed study for giving the newcomer background knowledge on international practices. Also the internal guides necessary to the newcomer to start independent work are selected. Training is provided through lectures, self-study and on the job training.

- Overview to the safety standards of International Atomic Energy Agency.
- Overview to the selected other international and national industrial standards in the field of newcomer's duties.
- Select specific standards for the newcomer for a detailed study.
- The employee must familiarize with the application of above standards in his/her work by him/herself as well as through discussions and interviews.

5.4. FAMILIARIZATION WITH THE REGULATORY DOCUMENTATION

A general overview must be given to the new employee on the regulatory documentation such as licensing documents and their structure and contents in the field of newcomer's duties. Such regulatory documents are e.g. Final Safety Analysis Report, Tech. Specs. Document, QA manual for Operation. The supervisor selects precise chapters etc. from the licensing documents for the newcomer for a detailed study for familiarizing the newcomer with the technical safety aspects of his/her work. Training is provided through lectures, self study and on the job training. Training is repeated for each nuclear facilities.

- Overview to the structure of Safety Analysis Report and Tech. Specs. Document of nuclear facility in question from the point of view of the newcomer's duties.
- Select specific parts or chapters of the Safety Analysis Report and Tech. Specs. Document of nuclear facility for the newcomer for a detailed study.
- Select specific other documentation e.g. QA Manual or their parts for the newcomer for a detailed study.
- Overview to the documentation generated by the operator during the operation of the facility.
- Overview to the documents generated by the regulatory body during the authorization process and during the operation of facilities.
- Select specific documents generated by the regulatory body during the authorization process and during the operation of facilities for the newcomer for a detailed study.

5.5. ONSITE TRAINING

A general overview on the structure and operation of nuclear facilities as well as on the operating organization and the most important operational routines must be given to the new employee. The supervisor selects the most important organizational units, operational routines and plant systems/components which the new employee must know thoroughly for a detailed study. The familiarization is provided by resident inspector and other experienced inspectors and it takes places through guided plant tours and lectures, self study, interviews and on the job training. Training is repeated for each nuclear facilities.

Plant knowledge is developed by studying the plant areas and locations of different systems and access routes including protective clothing and devices and by studying and visiting organizational units and counterparts important to the inspector's work.

- Select specific plant areas and systems/components for a detailed study. The systems are studied by using operating procedures and drawings and by conducting walk-through with experienced inspectors.
- Select specific activities for observation of work of interest in the field of operation, maintenance, technical surveillance etc. Normal work routines and responsibilities and interaction with other organizational units are studied.
- Select specific plant routines for a detailed study such as plant management, QA, conduct of operation, surveillance, maintenance, plant modifications, outage activities, radiation protection etc. which a new inspector should know. These activities should be carried out under the guidance of senior inspector.

The staff members inspecting operations and maintenance activities must work one month under the supervision of resident inspector at the facilities which he/she inspects.

5.6. INSPECTION AND ENFORCEMENT

A general overview on the inspection activities of regulatory body and inspection guidance must be given to the new employee. The supervisor selects and provides familiarization with the most important inspection guidance and reference materials (e.g. international references) which the new employee must know thoroughly. The familiarization is carried out through lectures, self study, and on the job training and through participating in inspections with experienced inspectors.

- Overview to the inspection guidance from the point of view of inspector's duties
- Select specific internal guides and reference materials for the newcomer for a detailed study.
- Organize participation in several inspections with senior inspectors to illustrate the use of internal guidance and inspection methods in the new staff member's working area. The following topics must be handled in connection to inspections: guidance, preparation, extent of inspection, meetings, collection of information, implementation, reporting, actions after inspection, enforcement.

5.7. ASSESSMENT OF SAFETY

A general overview on the assessment activities of regulatory body and assessment guidance must be given to the new employee. The supervisor selects and provides familiarization with the most important assessment guidance and reference materials (e.g. international references) which the new employee must know thoroughly. The familiarization is carried out through lectures, self study and on the job training as well as through participating in the assessment tasks with experienced inspectors.

- Overview to the licensing and assessment practices in the case of new nuclear power plant and major plant modification requiring licensing.
- Overview to the assessment practices covering operating experience feedback and plant modifications from the point of view of inspector's duties.

- Overview to the specific methods used in the assessment work such as computer codes available etc.
- Select specific internal guides and reference materials for the newcomer for a detailed study.
- Organize discussions with the immediate supervisor to illustrate the use of internal guidance in the inspector's work and for giving the newcomer a possibility to have specific questions answered.
- Organize participation in several assessment related tasks in the fields of operating experience feedback and plant modifications to illustrate the use of internal guidance and assessment methods in the staff member's working area and for giving the newcomer a possibility to have specific questions answered.
- Arrange familiarization with the computational methods used in safety analysis.

5.8. OTHER REGULATORY DUTIES AND TASKS

Other regulatory duties or separate tasks cover e.g. development of regulatory guidance, emergency preparedness in the regulatory body, interface with the public, research co-ordination, internal quality assurance, legal aspects, etc. The supervisor selects precise topics and documents or chapters from the respective documents for the newcomer for a detailed study for familiarizing the newcomer with the other specific duties or aspects of his/her work.

- Overview to the internal regulatory guidance from the point of view of staff member's duties or separate tasks.
- Developing emergency preparedness knowledge through participation in the specific training course and by visiting plant and regulatory emergency facilities.
- Developing knowledge on interface with the public (INES etc.).
- Select specific internal guides for the newcomer for detailed study.
- Organize discussions with the immediate supervisor to illustrate the use of internal guidance in the staff member's work and for giving the newcomer a possibility to have specific questions answered.
- Organize participation in several activities with senior staff members to illustrate the use of internal guidance and working methods in the staff member's working area and for giving the newcomer a possibility to have specific questions answered.
- Participate in emergency exercises.
- Participate in activities related to interface with the public.

5.9. TRAINING COURSES FOR TECHNICAL AND SKILLS TRAINING

Select from the list below the training courses needed for the new recruit. Specify more precisely if necessary.

- Introductory training course of regulatory body.
- Radiation and industrial safety.
- Nuclear safety principles and technology / safety culture.
- Plant and systems knowledge including operation.
- Inspection skills course.
- Safety assessment and accident analysis.
- Emergency preparedness of regulatory body.

- Quality assurance and organizational factors.
- Specific knowledge and skills required by the job (communication, interviewing skills, specific inspection methods etc.).

5.10. ONGOING TRAINING

Inspectors need ongoing training to maintain and enhance their competence in terms of their knowledge, skills and attitudes. The supervisor identifies the training needs of his/her subordinate as a part of performance appraisal on annual basis. Included in the programme are updates on the changes in regulatory practices, plant and procedural modifications, operating experience feedback and experiences from the inspection programme. Radiation protection and industrial safety as well as emergency preparedness should be refreshed periodically. Inspectors skills are enhanced to improve e.g. communication skills, computer and language skills and career development (team work, leadership). Participation in training should be followed systematically.

6. RECORDS

As attachment there is a follow-up form that will be sent to training manager when the qualification and initial training programme has been completed. (Not included.)

Appendix VIII

STAFF TRAINING AT US NRC TO SUPPORT RISK-INFORMED REGULATION (USA)

BACKGROUND

The U. S. Nuclear Regulatory Commission (NRC) staff uses probabilistic risk assessment (PRA) and risk management as important elements of its licensing and regulatory processes. In 1991, a PRA working group was established to address concerns identified by the advisory committee on reactor safeguards with respect to unevenness and inconsistency in the NRC staff's uses of PRA. After determining staff uses of PRA and identifying needed improvements, the working group defined a set of basic principles for staff PRA use and identified three areas for improvements: guidance development, training enhancements, and PRA methods development. For each area of improvement, the working group took certain actions and recommended additional work. The working group completed its assigned tasks in 1993 published a summary report [VIII.1].

In addition to the PRA working group, two other high-level groups were established to address the concern over the NRC staff's use of PRA. The groups reviewed NRC processes, programs and practices for developing new guidance that is based on performance and the use of risk insights. In 1993, the NRC program offices collectively focused on the findings and recommendations made by the above three NRC study groups regarding the status of PRA use and its role in the regulatory process and concurred in the need to systematically expand the use of PRA within the NRC.

In 1995, the U. S. NRC issued a policy statement on the use of probabilistic risk assessment. The Commission stated its vision that "the use of PRA technology should be increased in all regulatory matters to the extent supported by the state of the art in PRA methods and data and in a manner that complements the NRC's deterministic approach and supports the NRC's traditional defence-in-depth philosophy". In 2000, the name of the plan was risk-informed regulation implementation plan (RIRIP) to characterize the nature and purpose of the plan. The RIRIP describes how to achieve the vision by applying criteria to select regulatory requirements and practices, risk-informing those requirements and practices for risk-informing implementation, and developing the necessary data, methods, guidance, and training. Thus, the RIRIP integrates the NRC's risk-informing activities.

To support the goal of improved regulatory activities through increased use of PRA technology, the plan includes an extensive training program. As the NRC shifts to greater use of and reliance on PRA methods and risk-informed regulation, all technical staff members, including inspectors, will need to develop an understanding of the strengths and limitations of PRA methods and their use. Training of the staff has been and will continue to be a critical part of the change in the regulatory culture of the agency.

A probabilistic risk assessment (PRA) training curriculum was developed, and three levels of NRC PRA users were identified. The first broad category of PRA user is the Basic User. This category consists of staff that use PRA results and require some basic information on how PRAs are performed and the results are obtained. The second category is called the advanced user and consists of staff that work with PRA models or manage contractor efforts with PRA

models. Advanced users require more extensive training. The final category is the expert practitioner. This group consists of staff that perform quality assurance and expert advisory functions as well as develop new PRA models.

The PRA training curriculum is also expanding to support NRC efforts to risk-inform programs in the nuclear materials safety and nuclear waste safety area. For these areas, a three tier approach to staff training is being planned. Tier 1 courses would be aimed at managers and supervisors, tier 2 courses at technical staff and tier 3 courses at risk analysts and specialists. In recognition of broader applicability of risk analysis tools and techniques outside of the nuclear reactor safety area, the NRC is changing the name of this training curriculum from "probabilistic risk assessment" to "risk assessment."

CATEGORIES OF NRC RISK ASSESSMENT USERS

The risk assessment training program is designed to assist staff members to develop new knowledge, skills, and/or attitudes (KSAs) in risk assessment methods and statistics. These KSAs are considered to fall into the three broad categories of basic user KSAs, advanced user KSAs, and expert practitioner KSAs. Some formal education, training, and experience is needed to obtain the KSAs for each of the risk assessment levels. As the level of KSAs move from basic user to advanced user to expert practitioner, less information can be gained in short training courses, and greater emphasis must be placed on formal education and experience. The NRC risk-assessment training curriculum serves as the baseline from which to continue staff development in this area. In addition to classroom instruction in training courses, college courses, on the job training, and industrial experience will be needed in order to acquire some of the required knowledge and experience. Placement of all NRC technical staff positions into one of the three KSA categories is the responsibility of NRC line management based on some guideline recommendations for this placement.

Typical technical positions which have been deemed as appropriate to be basic and advanced users are as follows:

- Basic users:
  - resident inspectors
  - regional inspectors
  - licensing project managers
  - operator licensing examiners
  - technical reviewers
  - technical training center instructors
  - headquarters and regional duty officers
  - reactor safety team personnel
  - technical managers
  - reactor analysis branch personnel.

- Advanced users:
  - senior reactor analysts
  - probabilistic safety analysis branch personnel
  - reliability and risk assessment branch personnel
  - performance assessment and hydrology personnel
  - event assessment personnel
  - severe accident personnel.

Expert Practitioners do not appear in the lists above because this position requires more education and experience than can be provided by the Risk Assessment training program. Also, it is recognized that NRC management may chose to provide selected individuals from the basic or advanced user categories with additional training and developmental assignments. Although the KSAs needed for basic users will be primarily obtained through training, on the job training is needed to obtain some of the most basic KSAs. Managers are encouraged to provide work assignments for all of their technical staff that will exercise their risk assessment training.

EDUCATION

College level courses in probability and statistics and reliability engineering may be needed to achieve desired the KSA levels. The availability and applicability of courses must be determined on a case-by-case basis. Some advanced level users and expert practitioners will require more extensive knowledge of the theory and development of risk assessment techniques that can be obtained through advanced degree programs. A number of universities offer such programs. The technical training staff assists managers in determining what educational requirements are needed for a particular technical position.

TRAINING

This report provides basic descriptions of the various risk assessment courses along with listings of training course sequences for basic and advanced users. More detailed course descriptions contain information about course prerequisites and examinations. Prerequisites have been established to ensure employees have previously acquired skills necessary to reasonably predict success in the training course. Recommended course sequences are used to help determine risk assessment training needs for groups of NRC employees and for individual employee development.

EXPERIENCE

On the job training and formal and informal development programs should make up the experience part of the risk assessment development program. These requirements should be formulated by the employee's supervisor. These programs should include elements that will provide the employee with sufficient opportunity to practice the KSAs that have been obtained in the education and training part of his/her development. This work should contain projects where the staff member being developed can demonstrate the ability to perform various tasks that are part of doing a risk assessment-related job, under the mentorship of a more experienced user (such as a senior reactor analyst for a basic user or an expert practitioner for an advanced user). Experience might be gained through rotational assignments performing accident sequence precursor event assessment or participation in reviews of risk-based technical specifications, for example.

BIBLIOGRAPHY TO APPENDIX VIII

U. S. NRC, A Review of NRC Uses of Probabilistic Risk Assessment, NUREG-1489 (1994).

RISK ASSESSMENT COURSE DESCRIPTIONS

Probability and Statistics for PRA (P-102): This course presents selected quantitative concepts from the fields of probabilistic modelling, statistics, and reliability theory that arise frequently in PRA. Through lecture and workshop problems, participants are presented with mathematical techniques from probability and statistics that have applications in current PRA. The topics covered include a review of classical probability and statistics, selected distributions important to PRA, uncertainty analysis techniques, and Bayesian analysis. (5 days).

PRA Basics for Regulatory Applications (P-105): This course addresses the special needs of the regulator who requires knowledge of PRA issues and insights to better evaluate the effects of design, testing, maintenance, and operating strategies on system reliability. The full range of PRA topics is presented in abbreviated form with the goal of introducing the regulatory staff to the basic concepts and terminology of PRA as applied to the inspection process. The course uses actual plant PRAs and IPEs and stresses the uses and applications of these publications in planning audits and inspections and evaluating plant safety issues. (3 days).

PRA Insights Into IPEs (P-106): This course provides a realistic, intensive opportunity to use actual PRA/IPE results and information. Through examples and workshops, students participate in a number of exercises that reinforce and build on concepts presented in the PRA Basics for Regulatory Applications course. The course is tailored to the specific needs of regional inspection personnel and licensing project managers. The course consists almost entirely of exercises and workshop problems which teach students to use PRA information as an input to real decisions regarding inspection priorities, Temporary Waivers of Compliance, integrated scheduling, license amendments, and other regulatory issues. To the extent possible, real PRA/IPE studies are used as the basis for the workshops. (2 days)

PRA for Technical Managers (P-107): This course is designed to introduce the NRC technical manager to PRA concepts including reactor and non-reactor applications. The course includes an introduction to PRA methods used in system modelling, accident progression analysis, accident consequence analysis, and performance assessment. In addition to furnishing a good understanding of the mechanics of a PRA, the course provides information on the more detailed training available to the technical staff, the current agency policy on the use of PRA, information on how the agency has used PRA in making decisions and the value of and methods for using PRA to get the most benefit from available resources. Also included is a discussion of PRA strengths, limitations, and uncertainty. (2.5 days)

PRA Technology and Regulatory Perspectives (P-111): This course addresses the special needs of Regional Inspectors, Resident Inspectors, and other technical personnel who require knowledge of PRA issues and insights to better evaluate the effects of design, testing, maintenance, and operating strategies on system reliability. The course will concentrate on the application of PRA results in inspection planning, monitoring licensee performance, and reviewing licensee risk-based submittals. (10 days)

System Modelling Techniques for PRA (P-200): This course will help develop advanced user level skills in performing event tree and fault tree analysis with numerous practice workshops. The course covers the calculation of initiating event frequencies, component failure rate calculation, and the use of "super components" to create fault trees. A second focus of the course is dependent failure analysis, including multiple Greek letter, binomial failure rate, basic parameter methods, and alpha factor methods for estimating common cause/common mode failure probabilities. (4 days)

SAPHIRE Basics (P-201): This course provides hands-on training in the use of Systems Analysis Programs for Hands-on Integrated Reliability Evaluation (SAPHIRE) for Windows to perform probabilistic risk assessment (PRA) on the PC. When the course is completed, the participants are able to: build fault tree models on the PC, assign reliability data, analyze the fault trees and develop minimal cut sets, calculate various importance measures, perform uncertainty analysis, analyze accident sequences, create and quantify accident sequences, and generate reports. (4 days)

Advanced SAPHIRE (P-202): This course provides hands-on training in the advanced features of Systems Analysis Programs for Hands-on Integrated Reliability Evaluation (SAPHIRE) for Windows to perform probabilistic risk assessment (PRA) on the PC. SAPHIRE allows the user to build and evaluate the models used in PRA. (4 days)

Human Reliability Assessment (HRA) (P-203): This course serves as an introduction to Human Reliability Assessment (HRA) including the methods used in modelling of human errors and various methods of estimating their probabilities. This course is designed to teach introductory level skills in HRA and includes a broad introduction to HRA and its applications. A discussion of HRA strengths, limitations, and results is also included. (3 days)

External Events (P-204): This course deals with the analysis of external events such as fires, floods, earthquakes, high winds, and transportation accidents. The course has been developed to provide the student with information that can be used in the review of IPEEE results. (3 days)

Accident Progression Analysis (P-300): This course deals with the portion of probabilistic risk assessment typically referred to as Level 2 analysis. The course will address accident phenomenology under post-core damage conditions and will discuss development of PRA models for this severe accident regime. The emphasis of the course is on the important modelling issues and how they are dealt with, rather than how to use specific modelling software. (3 days)

Accident Consequence Analysis (P-301): This course deals with the portion of PRA typically referred to as Level 3 analysis. The course addresses environmental transport of radio nuclides and the estimation of offsite consequences from core damage accidents. The emphasis of the course is on important modelling issues and how they are dealt with, rather than how to use specific modelling software. (3 days)

Risk Assessment in Event Evaluation (P-302): This course covers the use of PRA techniques to assess the risk significance of initiating events and condition assessments that occur at operating reactors. The course addresses the use of simplified PRA models to estimate conditional damage probability using the Graphical Evaluation Module (GEM) of the

SAPHIRE suite of programs. In addition, common cause and non-recovery probabilities will also be addressed. The course includes conventional workshops and GEM program workshops. (3 days)

Introduction to Risk Assessment in NMSS (P-400): This course introduces risk assessment concepts for Nuclear Materials Safety and Nuclear Waste Safety applications. The NRC's policy on the use of risk information as well as the framework for employing risk-informed regulation within the Office of Nuclear Material Safety and Safeguards (NMSS) is presented. Various risk assessment concepts and methodologies are introduced and discussed. Examples of the risk assessment methodologies are presented, and some of the strengths and weaknesses associated with the various methodologies are addressed. Several case studies are presented to demonstrate the risk assessment methodology used for the respective study and the risk insights gained are discussed. This course also addresses the topics of risk perception, risk communication, and risk management. (3 days)

Introduction to Risk Assessment in NMSS for Technical Managers (P-401): This course provides an overview of risk assessment concepts for Nuclear Materials Safety and Nuclear Waste Safety applications. The NRC's policy on the use of risk information as well as the framework for employing risk-informed regulation within the Office of Nuclear Material Safety and Safeguards (NMSS) is presented. Various risk assessment concepts and methodologies are introduced and discussed. Examples of the risk assessment methodologies are presented, and some of the strengths and weaknesses associated with the various methodologies are addressed. This course also addresses the topics of risk perception, risk communication, and risk management. (1 day)

RECOMMENDED COURSE SEQUENCE FOR BASIC USERS

1. Knowledge of plant systems should be obtained by attending a reactor technology full course series. This is an integrated series of classroom and simulator courses which teach NRC personnel how nuclear plant systems work and why they work that way; what to look for, how to look for it, and how to evaluate plant conditions using control board information and control room references; how to assess significance and priority; and what and how to bring issues to licensees' attention.

2. The Perspectives on Reactor Safety Course (R-800) is also recommended. This course provides a broad perspective of important reactor safety concepts with emphasis on topics important to risk.

3. The fundamental concepts of probabilistic risk assessment should be obtained from either the PRA for Regulatory Applications course (P-105) or the Fundamentals of PRA course (P-101).

4. The use of PRA results is taught in the PRA Insights Into IPEs course (P-106).

5. The PRA Technology and Regulatory Perspectives course (P-111) combines PRA fundamentals with hand-on use of IPEs. Inspectors and other regional personnel should take it in lieu of P-015 and P-106.

RECOMMENDED COURSE SEQUENCE FOR INSPECTORS AND PROGRAM MANAGERS

1. Knowledge of plant systems should be obtained by attending a reactor technology full course series. This is an integrated series of classroom and simulator courses which teach NRC personnel how nuclear plant systems work and why they work that way; what to look for, how to look for it, and how to evaluate plant conditions using control board information and control room references; how to assess significance and priority; and what and how to bring issues to licensees' attention.
2. The Perspectives on Reactor Safety Course (R-800) provides a broad perspective of important reactor safety concepts with emphasis on topics important to risk.
3. The PRA Basics for Regulatory Applications course (P-105) provides fundamental PRA concepts.
4. The fundamental concepts of probabilistic risk assessment and the use of PRA results is taught in the PRA Technology and Regulatory Perspectives course (P-111).
5. The Applied Statistics course provides basic knowledge in probability and statistics required for the remainder of the sequence.
6. The Probability and Statistics for PRA course (P-102) presents quantitative concepts from the fields of probabilistic modelling, statistics, and reliability theory that arise frequently in PRA. Successful completion of this course is necessary for the understanding of advanced topics discussed in subsequent courses.
7. The Systems Analysis Programs for Hands-on Integrated Reliability Evaluation (SAPHIRE) Basics course (P-201) provides hands-on training in the use of the SAPHIRE software to perform PRA analysis on the PC. Successful completion of this course is necessary for the Advanced SAPHIRE (P-202) and the Risk Assessment in Event Evaluation (P-302) courses.
8. The Systems Modelling Techniques for PRA course (P-200) covers the calculation of initiating event frequencies, component failure rates, and the use of "super components" to create fault trees. This course provides information that will allow the student to successfully create or modify PRA models. This course is a prerequisite for the Advanced SAPHIRE (P-202) and Risk Assessment in Event Evaluation (P-302) courses.
9. The Advanced SAPHIRE (P-202) course provides the student with information on the advanced features of the SAPHIRE software.
10. The Human Reliability Assessment (HRA) (P-203) course discusses the methods involved in modelling human error and various methods of estimating their probability. Although this information is necessary for a complete understanding of PRA methodology, the only prerequisite for this course is the PRA Basics for Regulatory Applications (P-105) or the PRA Technology and Regulatory Perspectives course (P-111).

11. The Risk Assessment In Event Evaluation (P-302) course covers the use of PRA techniques to assess the significance of initiating events and condition assessments that occur at operating reactors. This course teaches the employee how to use and modify the Graphics Evaluation Module (GEM) software to obtain PRA results. An understanding of PRA concepts, Systems Modelling, SAPHIRE and Advanced SAPHIRE courses, and HRA are necessary prerequisites.

12. The External Events (P-204) course deals with the analysis of external events such as fires, floods, earthquakes, high winds, and transportation accidents. A through understanding of PRA Level 1 is a prerequisite.

13. The Accident Progression Analysis (P-300) course deals with the portion of PRA typically referred to as Level 3 analysis. The PRA Basics for Regulatory Applications course or PRA Technology and Regulatory Perspectives course is a prerequisite.

14. The Accident Consequence Analysis (P-301) course with the portion of probabilistic risk assessment typically referred to as Level 2 analysis. The PRA Basics for Regulatory Applications or PRA Technology and Regulatory Perspectives course and the Probability and Statistics for PRA courses are necessary prerequisites.

RECOMMENDED COURSE SEQUENCE FOR SENIOR REACTOR ANALYSTS

1. Knowledge of plant systems should be obtained by attending a reactor technology full course series. This is an integrated series of classroom and simulator courses which teach NRC personnel how nuclear plant systems work and why they work that way; what to look for, how to look for it, and how to evaluate plant conditions using control board information and control room references; how to assess significance and priority; and what and how to bring issues to licensees' attention.

2. The Perspectives on Reactor Safety Course (R-800) provides a broad perspective of important reactor safety concepts with emphasis on topics important to risk.

3. The fundamental concepts of probabilistic risk assessment and the use of PRA results is taught in the PRA Technology and Regulatory Perspectives course (P-111).

4. The Applied Statistics course provides basic knowledge in probability and statistics required for the remainder of the sequence.

5. The Probability and Statistics for PRA course (P-102) presents quantitative concepts from the fields of probabilistic modelling, statistics, and reliability theory that arise frequently in PRA. Successful completion of this course is necessary for the understanding of advanced topics discussed in subsequent courses.

6. The Systems Analysis Programs for Hands-on Integrated Reliability Evaluation (SAPHIRE) Basics course (P-201) provides hands-on training in the use of the SAPHIRE software to perform PRA analysis on the PC. Successful completion of this course is necessary for the Advanced SAPHIRE (P-202) and the Risk Assessment in Event Evaluation (P-302) courses.

7. The Systems Modelling Techniques for PRA course (P-200) covers the calculation of initiating event frequencies, component failure rates, and the use of "super components" to create fault trees. This course provides information that will allow the student to successfully create or modify PRA models. This course is a prerequisite for the Advanced SAPHIRE (P-202) and Risk Assessment in Event Evaluation (P-302) courses.

8. The Advanced SAPHIRE (P-202) course provides the student with information on the advanced features of the SAPHIRE software.

9. The Human Reliability Assessment (HRA) (P-203) course discusses the methods involved in modelling human error and various methods of estimating their probability. Although this information is necessary for a complete understanding of PRA methodology, the only prerequisite for this course is the PRA Basics for Regulatory Applications (P-105) or the PRA Technology and Regulatory Perspectives course (P-111).

10. The Risk Assessment In Event Evaluation (P-302) course covers the use of PRA techniques to assess the significance of initiating events and condition assessments that occur at operating reactors. This course teaches the employee how to use and modify the Graphics Evaluation Module (GEM) software to obtain PRA results. An understanding of PRA concepts, Systems Modelling, SAPHIRE and Advanced SAPHIRE courses, and HRA are necessary prerequisites.

Appendix IX

IMPLEMENTATION PLAN FOR A "STAFF QUALIFICATION SYSTEM" (CANADA)

1. INTRODUCTION

1.1. Background

The Staff Qualification System proposed in this report is guided by and addresses the strategic directions included in the 2000/2001 and 2001/2003 corporate strategic plans of the Canadian Nuclear Safety Commission (CNSC). The following paragraphs include specific background information from these sources.

1. In the recently issued CNSC draft *Corporate Strategic Objectives 2001–2003*, Strategic Direction 3 focuses on improving the way the CNSC manages and sustains its workforce. It calls for, among other items, a co-ordinated technical and non-technical plan for CNSC staff (3.1); and states that competency profiles will be developed and approved for identified job families (3.2).

2. The *Corporate Strategic Plan 2000/2001* deals with training on the Nuclear Safety and Control Act [and the associated Regulations] (SD5), defining core competencies (SD22), support for the internal quality management, SD24), and support for the reform of the human resources (SDs 29 to 32).

3. The Executive Committee has accepted the Project-96 training recommendations. A report on the status of these recommendations has followed. Out of the four outstanding training recommendations, the most significant states that:

   "The AECB[2] should publicize the qualification requirements for those staff that are directly responsible for the inspection and analysis of licensees' facilities. This would establish the credentials for those staff and provide assurances to the public and other AECB stakeholders that the AECB staff who are directly responsible for the inspection and analysis of licensee activities are fully qualified. The process would also help in establishing that the positions of "inspectors" and "analysts" are "qualified" as required in Section 28 and 29 of the proposed Nuclear Safety Act".

1.2. Objective

To propose a plan to:

i. Develop a system in which:
   (a) Knowledge, skills and attitudes needed by staff to carry out their duties are understood and documented;
   (b) Knowledge, skills and attitudes possessed by each staff member is known;

ii. Refine and finalize the system that ensures staff is given the opportunity to obtain and maintain the necessary knowledge, skills and attitudes in a systematic and auditable way;

[2] AECB, which means Atomic Energy Control Board, is the former name for the Canadian Nuclear Safety Commission (CNSC)

iii. Address the outstanding Project-96 training recommendations that have been accepted by the Executive Committee (Reference 1).

1.3. Scope

The proposed plan covers the following topics:

i. The corporate policy bases for staff qualification;

ii. A training system that includes processes, procedures, standards and qualification requirements;

iii. A records-keeping system that verifies to the public and CNSC stakeholders that the staff are qualified.

1.4. Approach

To meet the objective stated in 1.2 above, it is proposed to establish within the CNSC a "Staff Qualification System" as briefly described in the following section.

2. STAFF QUALIFICATION SYSTEM

2.1. Introduction

Establishing a system to document the qualification, and therefore the competency, of staff is an approach that is used not only by several and diverse industries but also by several and diverse regulatory agencies. In fact, the Canadian government issued a guideline in mid 1980's on the use of a "Systems Approach to Training" to manage training programs in government departments in a manner that includes measures for quality assurance and project management principles.

Numerous industries, such as the nuclear (e.g., Ontario Power Generation), aviation (e.g., NavCan) and petrochemical (e.g., TransCanada Pipelines) industries, follow rigorous and systematic training of their staff as a matter of operational and economical prudence and to satisfy relevant regulatory requirements.

Also, several regulatory agencies concerned with aviation (e.g., Transport Canada), public security (e.g., police forces) and nuclear safety (e.g., Finland's STUK) have implemented national and international approaches and standards to training and qualifying their staff. The IAEA is currently drafting several documents that give guidance to the regulatory bodies of member-states on how to establish the credentials of their staff through a training structure.
This is a culmination of efforts over the past few years to standardize the approach to training of regulatory staff (for example: US's NRC, US's DOE, Finland's STUK, Hungary's HAEA, France's DSIN; UK's NSD, and Canada's CNSC.)

The proposed plan is based on:

i. The recent successful experience of applying and tailoring the internationally recognized Systematic Approach to Training (SAT) to the Regulations Training project within the CNSC; and

ii. Information gathered from a visit to the US NRC and US DOE, and information gathered from IAEA and OECD meetings in which our technical training staff participated.

2.2. Aim

The aim of establishing a Staff Qualification System is to:

i. Communicate clearly to employees the organization's competency requirements [i.e. knowledge, skills and attitudes (KSAs)] for each position;
ii. Provide opportunities for staff to obtain those KSA's;
iii. Confirm, when necessary, that the staff are competent;
iv. Provide information that could be used for career-progression planning and staff mobility.

2.3. Structure of the Staff Qualification System

The staff qualification system comprises three main elements: Corporate Policy Bases, Training System, and Qualification Verification & Records. Each one of these elements is described briefly in the following sections. The system is graphically depicted in Figure IX.1.

2.3.1. Corporate Policy Bases

Qualification of staff should be established and promoted on legal and corporate bases related to the *Nuclear Safety and Control Act* (NSCA), the Regulations, internal policies, and/or corporate directives.

For example:

- Section 28, subsection 29 (1), and subsection 37 (1) of the NSCA and subsection 29 (1) of the CNSC Security Regulations present that the Commission may designate analysts, inspectors or designated officers any person whom the Commission considers "qualified".
- The CNSC Regulations state in numerous places that a submission in the form of an application be forwarded to the Commission for determination (e.g., General Regulations subparagraph 3(1)(n)(i) states that "…at the request of the Commission, any other information that is necessary to enable the Commission to determine …). This implicitly indicates that the Commission and its staff must have specific competencies (knowledge, skills and attitudes) that will make them qualified to make such determination.

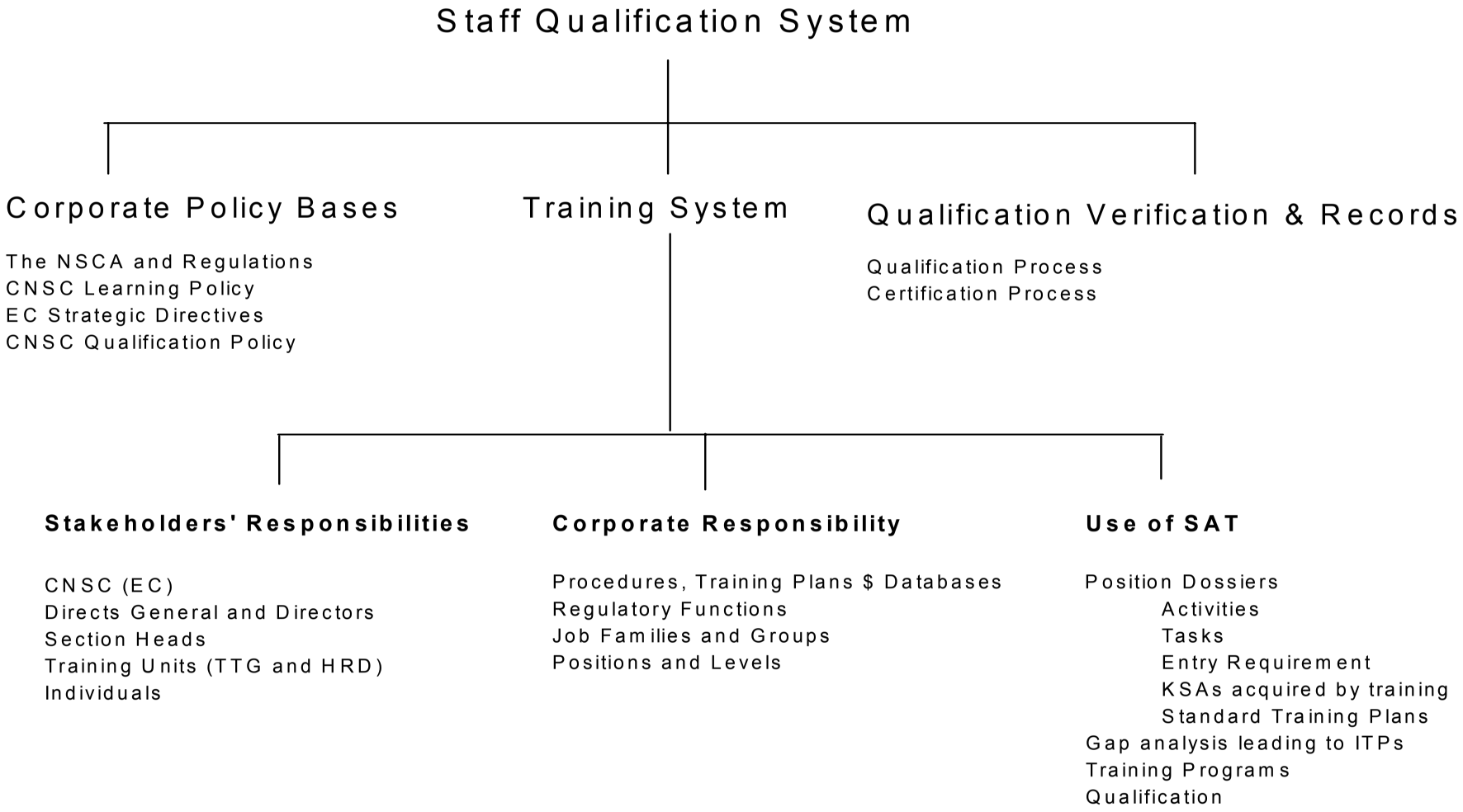

FIG. IX.1. Graphical presentation of the staff qualification system.

- The CNSC Learning Policy is a corporate tool that gives information about the organizational expectation regarding the staff's continuing learning, and the CNSC obligation to facilitate a learning environment.

- Strategic Direction 3 in the (draft) Corporate Strategic Objectives 2001–2003 addresses measures to improve the way the CNSC manages and sustains its workforce. Also, Corporate Strategic Objectives 2000/2001 deal with the implementation of training for the NSCA and supporting the human resource reform initiative.

- The Executive Committee's responses to Project-96's recommendations (Reference 1) present corporate directives regarding the training matters within the CNSC.

Additional corporate policies, such as a qualification policy, and corporate directives, such as a corporate document on competencies and qualification requirements, may be needed to complement the existing corporate policy bases.

2.3.2. *Training System*

The training system is a systemic infrastructure that provides information and guidance to all stakeholders who will be involved in the training and qualifying of the CNSC staff.

The direct stakeholders include the CNSC as an organization, the Executive Committee, directors-general, directors, section heads, training units, and individual staff members. The public at large as well as the licensees are indirect stakeholders.
The training system comprises three main components: the stakeholders' responsibilities, the corporate responsibility, and the use of SAT. A brief description of each of these components follows.

2.3.2.1. Stakeholders' Responsibilities

i. The Organization: CNSC (EC)

- Include training as a high-priority strategic objective;
- Produce policy statements related to training and qualification of staff;
- Produce directives and guidelines to link achieving qualification to career progression;
- Produce directive and guidelines to link performance appraisals to qualification requirements and training needs;
- Produce directives to institute a detailed section in the Human Resource Manual on the Staff Qualification System;
- Allot sufficient monetary and human resources for training.

ii. Directors General and Directors

- Ensure that their staff are competent through the use of the Staff Qualification System;
- Set goals for training including percentage of time dedicated for training per year;

- Commit monetary and human resources to meet the training goals;
- Encourage and maintain positive attitude toward training.

iii. Section Heads

- Define qualification requirements to corporate standards;
- Ensure that staff are qualified for the positions;
- Identify training needs of staff;
- Develop Individual Training Plans for their staff by performing gap analysis for staff members (with the assistance of the Training Units)
- Follow up and ensure that the training plans of staff are implemented (in collaboration with the Training Units);
- Support training initiatives and identify employees to serve as Subject Matter Experts (SMEs), mentors or trainers.

iv. **Training Units** (TTG and HRD)

- Set a long term implementation plan in accordance with the CNSC Corporate Strategy;
- In co-operation and collaboration with the supervisors, develop the qualification requirements, competency profiles, and Standard Training Plans for position in their units;
- Develop criteria for success indicators and corresponding guidelines including criteria for staff members who may have to repeat specific training or parts thereof to achieve the success target;
- Assist the supervisors in developing Individual Training Plans by performing gap analysis of the individuals;
- Develop an annual training program;
- Develop training courses and corresponding material;
- Provide training courses including co-ordinating delivery of training with outside training venues;
- Develop and maintain training-records databases;
- Produce annual training reports.

v. Individuals

- Complete (within a prescribed time frame) the qualification requirements of the position;
- Develop and maintain competencies (KSAs), on a continuous basis, required for the position;
- Express training needs to supervisor;
- Express career-progression goals and desire for mobility to supervisor;
- Actively express interest in participating as a SME, a mentor or an instructor in training programs.

2.3.2.2. Corporate Responsibility

As a corporation, it is important that the CNSC develops and maintains a systematic categorisation of the KSA's for each of its functions and job-families. This categorisation represents the cornerstone on which the staff qualification system would be structured. Some elements of this categorization have been developed in the last few years. The existing information within the CNSC will be used as a starting point. A brief description of each of the components comprising the corporate responsibility is presented in the following paragraphs.

i. Procedures, Training Plans and Databases

The organization should establish:

- Formal administration of training including formal policies and procedures for staff qualification and the establishment of relevant databases;
- Individual training plans for competency, career progression and professional development;
- Procedures for the use and implementation of a systematic approach to training of staff;
- Procedures for periodic review of the training system and the training programs;
- Training programs that meet the organization and individual needs.

ii. Regulatory Functions

The regulatory functions with the CNSC should be categorized to facilitate the assortment of job families and positions. For example, the IAEA categorizes a regulatory-body functions into two major groups as follow:

1. Major regulatory functions
    - Authorization;
    - Review and Assessment;
    - Inspection and Enforcement;
    - Development of Regulation and Guides;

and

2. Supplementary Functions
    - Research and Development;
    - Emergency Preparedness;
    - International Obligations and Co-operation.

iii. Job Families and Groups[3]

Categorization of work within the CNSC into job families will assist in grouping positions that could be described with one common package (see subitem 2.3.3(I) below). Identification of Job Families within the CNSC should be documented. Some examples are proposed below:

[3] This report deals only with technical positions. However, the principles contained herein can be applied to nontechnical positions.

- ***Inspectors*** (e.g., for Class I and Class II facilities, Nuclear Substances and Radiation Devices, Mines, and Packaging and Transportation);
- ***Specialists*** (SEDA [e.g., criticality, fuel and fuelling, thermalhydraulics, accident analysis, etc.], SEDE (e.g., I&C, Fire Protection, Equipment Qualification, Material Behaviour, Pressure Retaining Components, etc.], WDD [e.g., Geosciences, Decommissioning, etc.], REPD [e.g., Radiation Safety, Emergency Preparedness, Dosimetry, Health Effects, Environmental Assessment, Environmental Protection, etc.], Quality Management [e.g., QA, Human Factors, Investigation, Event Analysis, etc.], Technical Training;
- ***Analysts*** (Lab);
- ***Auditors*** (Internal Audits).

iv. Positions and Levels

Having categorized the functions and the job families, the corporation should establish a structured system in which positions and levels within these positions are identified logically and clearly. This exercise will aid in establishing the Position Description Packages described in sub-item 2.3.3.1(I) below.

2.3.3. Use of the Systematic Approach to Training (SAT)

The Systematic Approach to Training (SAT), which in some countries is called the Instructional Systems Design (ISD), has been recognized and used in the past two decades by several regulatory and government agencies, as well as several industries (for example: DND, Transport Canada, NavCan, US NRC, US DOE, US Military, OPG, AECL, TransCanada Pipelines, etc.). The government of Canada issued in mid 1980's a guideline on the use of a "Systems Approach to Training" which combines a systematic approach to training and several project management principles. In the late 1980's and early 1990's some regulatory agencies, e.g., STUK of Finland, started to apply SAT to train its staff. In mid 1990's, the IAEA and the OECD-NEA began instituting several international guidelines to use SAT both to train the licensees' personnel as well as the regulatory staff. This international effort is currently being streamlined between the two international agencies. The effort drew substantial attention and contribution of member states, of which Canada's CNSC is an active contributor. The subitems below are based on international and national practices. An example of how SAT could be applied to the CNSC is found in Attachment II.

i. Position Dossier, including position's Standard Training Plan (STP)

For each position within the CNSC, a Position Dossier should be developed by the supervisor in close collaboration with the training units, that includes, for example[4]

- A title that reflects the position, level, job family, and regulatory function;
- Roles and responsibilities of the employee;
- Activities (jobs) constituting the position;
- Tasks performed to accomplish activities;
- Entry requirements;

[4] Some of this information already exists in the PDF's.

- Competency (KSAs) requirements to execute tasks;
- Other specific requirements;
- Standards and tools for evaluating that competency and other requirements are achieved;
- A "Standard Training Plan" (STP) for the position, including prescribed training to acquire and maintain the KSA's required for the position, and the timeframe to complete such requirements.

ii. Gap Analysis Leading to Individual Training Plans (ITPs)

A systematic gap analysis should be done for each staff member to identify the difference between his/her current and desired state (i.e., the Standard Training Plan (STP)) for satisfying the position qualification requirements. Subsequently, an "Individual Training Plan" (ITP) is produced for that individual to attain training within the time frame prescribed in the position's STP. Factors (such as workload, team assignment, etc.) that may influence the completion of the ITP should be recognized and addressed. The involvement of the supervisor is essential at this step.

iii. Training Programs

Training programs should be established within the CNSC to satisfy the training needs required for the ITPs. On a yearly basis, the training units, in collaboration with the supervisors, should establish a training calendar that contains training programs which will be offered using internal or external resources. In these training programs, the SAT methodology, in full or in part, must be closely applied.

3. QUALIFICATION VERIFICATION AND RECORDS

The *Qualification Verification & Records* has two processes: the qualification and the certification processes, as described in the following sections. The intent is to have records by which a staff member could formally be confirmed "qualified" for specific work. (Note: This notion stems from section 28, subsection 29 (1), and subsection 37 (1) of the NSCA and subsection 29 (1) of the CNSC Security Regulations that state that the Commission may designate analysts, inspectors or designated officers any person whom the Commission considers "qualified".)

3.1. THE QUALIFICATION PROCESS

The qualification process is a plan that an individual follows to demonstrate that the competency (KSA's) requirements for the position have been attained and maintained[5] by that individual. A person may possess all or part of the required qualifications by virtue of previous education, training or experience. The qualification process defines the responsibilities and obligations of the supervisor and staff with regard to the individual training plan; provides methods for the evaluation of successfully achieving the competencies,

[5] In some instances re-qualification may be necessary if the task is infrequently performed or when the task is considered important to the extent that re-qualification is required periodically. In other circumstances, refresher training may be required because of technological advancement or changes in policies and procedures, etc.

and lists the information that is to be recorded in a database*1*. Organizations normally use some type of individual training log-sheet or an individual training-journal which would be signed off, every time the person achieves a qualification requirement, by the supervisor and/or the manager of the training unit. A system should be established within the CNSC to record the successful achievement of qualification goals. The qualification process must also include criteria for individuals who for some reasons cannot attain the qualification requirements within the prescribed time frame.

3.2. THE CERTIFICATION PROCESS

Certification process is simply the procedure by which a person is declared "qualified" to perform a set of specific tasks independently as described for the position. Declaring that a person is "qualified" could be done by internal or external attestation, by verification of the supervisor, a subject matter expert, peers, a formal examination process, or by a formal certification committee. Certification is a milestone that must be marked clearly in the database. In the proposed plan, a certificate is not required to be produced.

4. IMPLEMENTATION PLAN

A few components of the Staff Qualification System described above already exist within the CNSC. For instance, we have Position Description Forms (that were produced for job classification) to be used as a starting point for detailing the Position Dossiers. The competency profiles produced in the last few years for the PROD project officers and the MRD inspectors will have to be revisited, reviewed and modified for the purpose of becoming part of the Position Dossiers. Records of training do exist separately within the HRD and TTG. These data bases should be reviewed, and decisions be taken accordingly to implement a comprehensive system for the purpose of the proposed plan. The TTG has applied SAT and the principle of project management to the current regulations training (for which positive feedback was received from participants and other stakeholders). The one factor that is missing is to integrate all these existing components and add other elements in a comprehensive and cohesive corporate system.

Implementation of the proposed system will have to done in phases. Since some information currently exists for the PROD project officers and the MRD inspectors, it is proposed that these two groups be addressed at the outset as prototype. This would be followed by other inspectors and then the specialists.

Table IX.1 depicts possible steps to be taken and decisions to be made.

5. PROJECT MANAGEMENT

The entire plan will be treated as a strategic project with a designated project manager and an implementation group. All aspect of project management principles (that is, to initiate, plan, execute, control and close) will apply.

TABLE IX.1. THE 5-YEAR IMPLEMENTATION PLAN OF THE STAFF QUALIFICATION SYSTEM

Actions/Decisions	Completion Date	Output
1.1. Present draft Plan to the EC for consideration	October, 00	EC to consider
1.2. Iterative question/answer sessions with EC members	Oct/Nov, 00	Clarification provided
1.3. EC decides to proceed with detailed plan	End of Nov, 00	EC decision
2.1. TTG and HRD and (possibly) contractors to finalize detailed plan to be submitted to the EC (in the budget cycle)	Jan 31, 01	Detailed plan to EC and EC decision
2.2. Modify or expand the plan, or proceed with conditions, or ..., as per the EC decision	February, 01	Modified plan ready
2.3 EC to approve a policy regarding qualification of specific positions	March 31, 01	Qualification policy
2.3. Formulate project terms of reference, form project working group, contact stakeholders, and improve project timeline and cost estimates.	March 31, 01	Project documents, project team, timeline and budget ready
3.1. EC to approve and declare the 5-year implementation plan as a corporate strategic direction.	April 01, 01	A directive from the EC
3.2. Project team proceeds as per the project timeline.	April 01, 01	Deliverables as per project plan
4.1. The Position Dossiers for the PROD project officers and MRD inspectors be completed, as per the qualification system described in this report.	March 31, 02	Individual training plans for the staff involved.
4.2. Competency profiles will be developed for samples of the specialists (e.g., SEDA, SEDE, QA and REPD staff).	March 31, 03	Competency profiles for the selected specialist positions.

TABLE IX.1. (cont.)

5.1. PROD project officers and MRD inspectors will go through the entire Staff Qualification System	March 31, 04	Training programs for PROD project officers and MRD inspectors to complete or to confirm their qualifications.
5.2. Competency profiles for other CNSC inspectors completed	March 31, 04	Competency profiles for other CNSC inspectors
5.3. The qualification requirements for the sample specialists will be completed.	March 31, 04	Individual training plans for the selected specialists
6.1. Repeat the process for newly-hired PROD project officers and MRD inspectors.	April 01, 05	Individual training plans
6.2. The qualification requirements for other CNSC inspectors will be completed	April 01, 05	Individual training plans produced
6.3. Some of the specialists will begin to go through the Staff Qualification System.	April 01, 05	Training programs for the selected specialists to complete or confirm their qualifications
6.4. Complete the competency profiles for the remaining specialists, as well as the analysts in the CNSC lab.	April 01, 05	Standard Training Plans for the positions involved
6.4. Review the plan, the output, outcome and impact and write a report	April 01, 05	Final Evaluation Report.

6. TRANSITION CONSIDERATION

It is anticipated that a "steady-state" training schedule would be reached for several key positions by the end of the fifth year of the proposed plan. In the interim, the CNSC training units should develop a transition strategy to meet the immediate training needs of existing and newly-hired staff who may not be timely considered in the proposed 5-year plan.

BIBLIOGRAPHY TO APPENDIX IX

OMAR, A., and GILMOUR, P., A Proposed Plan to Develop and Implement a "Staff Qualification System", Canadian Nuclear Safety Commission (CNSC), Ottawa, (2000).

EXAMPLE OF HOW THE SYSTEMATIC APPROACH TO TRAINING COULD BE APPLIED TO THE CNSC

In order to gain appreciation of the resources involved in applying the Systematic Approach to Training (SAT), a partial list of how the SAT steps could be applied at the CNSC is included below.

Analysis

- Review and update information in the Position Dossier;
- Conduct gap analysis for individuals;
- Develop Individual Training Plans as needed;
- Develop and publish a corporate annual training program (e.g., in September of every year) based on the corporate strategic directives and the individual needs;
- Review and update available training courses (internal and external, national and international);
- Consider training requirements and opportunity for general and specific on the job training (OJT);
- Consider the possibility for self-directed training;
- Consider the need for continued training as per the CNSC Learning Policy.

Design

- Develop and produce learning cycles:
  - develop learning points and learning objectives;
  - decide on the training delivery methods and tools;
  - decide on the evaluation methods and tools.

Development

- Produce or modify lesson plans;
- Recruit and secure qualified trainers (lecturers, SMEs, mentors, etc.);
- Produce or modify training material (learner text, presentations and handouts);
- Produce or modify instructors' manual;
- Produce or modify evaluation tools.

Implementation

- Deliver training as per the Annual Training Program;
- Assign a course director and a course co-ordinator;
- Use Internal and/or External training facilities;
- Use appropriate and adequate equipment;
- Deliver training in accordance with the lesson plans;
- Use evaluation tools as per design and to receive additional feedback at all levels.

Evaluation

- Receive feedback during delivery of the course;
- Complete evaluation tools and analyse data collected;
- Feedback to the training framework and follow up on future improvements;
- Production of course reports by the course manger;
- Review and confirm individual training plans and assess progress and success;
- Evaluate effect of training on staff performance with the supervisors;
- Record training data in the database for subsequent qualification purposes.

Appendix X

EDUCATION AND TRAINING FOR INSPECTORS OF NUCLEAR INSTALLATIONS (FRANCE)

EDUCATION AND TRAINING

At present there is a reference list including about 40 courses for education and training. The course duration is comprised between 1 or few days up to 6 weeks. Most of the courses are not specific for the regulatory body inspectors but they were selected as relevant for the different tasks the inspectors have to cope with. The organisers of the courses are mainly Framatome, INSTN, IPSN, EDF, Guinard, DSIN, BCCN. Some courses or combination of courses are considered to be equivalent for a given purpose. The required combination of courses is different depending on the sub-direction tasks.

If we take the example of the sub-direction in charge of nuclear power plant activity, to become inspector, it is mandatory to follow the required training related to:

Nuclear engineering: 10 weeks
IPSN role 2 weeks
Inspection 1 week
Radiation protection 2 days
Legal framework 2 days
Q A 1 day

The inspector candidate has to fulfil also the following:

- a minimum of 6 to 9 month working in nuclear field or equivalent;
- to have contributed as observer to 5 inspections and to have written, as part of the training, one actions letter, a summary report and a report;
- to have followed a plant outage;
- to have followed 2 derogation process;
- to have followed 2 significant events;
- to have followed 2 Internet communication;
- to have followed 1 emergency drill.

In any case, the candidate should have a positive opinion from his management.

After becoming inspector, additional training is recommended:

- PWR nuclear safety 1 week
- Safety principles 3 days
- Emergency 2 days
- BCCN role 1 week
- International relations 1 day
- DSIN organization 4 days

- NPP immersion 2 weeks
- DIN immersion 2 weeks

To become senior inspector, it is mandatory to follow the required training related to:

- Project management
- Communication 2 days
- Severe accident 1 day
- ALARA 3 days
- Environment
- Events management 2 days
- Derogation 1 day
- Full-scope simulator 2 weeks
- Engineering simulator 1 week
- Plant normal operation 1 week

The senior inspector candidate has to fulfil also the following:

- a minimum of 4 years working in nuclear field or equivalent, but 2 as inspector;
- to have contributed to 20 inspections;
- to have leaded two plant outages;
- to have leaded 3 derogation processes;
- to have leaded 5 significant events;
- to have leaded 2 Internet communications;
- to have leaded 1 emergency drill in emergency centre or on the site;
- to have taken part in 1 emergency drill, as observer, in the PREFECTURE;
- to have taken part in 1 national thematic analysis.

In any case, the candidate should have a positive opinion from his management.
The candidate receives his certification after passing through an examination by an independent commission which comprises 9 members.

After becoming senior inspector, additional training is recommended:

- Fuel cycle and transportation 1 week
- Engineering simulator(2) 1 week
- Pumps 1 week
- Steam Generators 2 days
- Control of fabrication 2 days
- Valves 3 days
- Nuclear waste 1.5 week

Appendix XI

TRAINING IN THE NUCLEAR SAFETY DIRECTORATE (UNITED KINGDOM)

In the UK the Nuclear Safety Directorate (NSD) is part of the Health and Safety Executive (HSE). Whilst NSD has discretion to organise specific training courses to meet its own needs it makes heavy use of a range of standard training provided by HSE. As such the NSD training prospectus contains training events that cover both technical, legal and staff development. There is a core training element that is undertaken by all new inspectors but subsequent training is tailored to individual needs and personal development. The following table sets out the range of training that is available along with an indication of the core training that is undertaken by all new staff.

GROUPING OF TRAINING COURSES

Section 1 — Core and Priority Training
Section 2 — Technical Training (other)
Section 3 — Legal Training (other)
Section 4 — Personal Effectiveness and Management (other)
Section 5 — IT
Section 6 — Policy Making
Section 7 — Further Education and other

TRAINING COURSES OFFERED BY HSE

SECTION 1 — HSE CORE and NSD PRIORITY TRAINING

	HSE core courses
NS	Introducing HSE
NS*	Diploma in Health & Safety
NS*	Regulator NVQ
MD	Developing the Managers Role
MD	Middle Management Development Programme
NS	Legal Proceedings A
NS	Foundations of Health & Safety
MD	Performance Appraisal and Development Review
MD	Managing Attendance
MD	Performance Appraisal Module
MD	Development Review Module
MD	Introduction to Management

	NSD priority training
T	Refresher Site Inspection
T	Command and Control Training
T	Safety Assessment
T	H & S Management in Nuclear Industry
NS	NSD Induction
T	NSD Inspection
T	Chemical Engineering in Fuel Reprocessing
C	Team working

T Technical Topic Training (Conventional Safety)
T LOLER and PUWER Refresher Modules
T RPE Course
T Legal Proceedings Course
T Magnox & AGR Core & Coolant Issues
T IRRs update of regulations
T Human Factors Appreciation Workshop
T Human Factors Technology
T Radiological Protection (NRPB)
MD Safe Driving
PD Emergency Media Training for the Nuclear Industry/ (Phil Martin)
PD Emergency Media Training for the Nuclear Industry/(Nuclear Electric)
T Multi Agency Nuclear Response Seminar
L All Legal Courses from Section 3
C Stress training (post audit)
MD Training for Interviewers
MD Coaching and Mentoring
IT New IT courses from section 5

SECTION 2 — OTHER RELEVANT TECHNICAL COURSES

T Design & planning for H & S in Construction
T Asbestos Decontamination
T Asbestos Removal
T Assessing H & S Management — (CIMAH/NIHHS sites)
T Assessing H & S Management Systems
T Carriage of Dangerous Substances
T Construction foundation
T Electrical Safety
T Ergonomic Assessment of the Workplace
T European Standards
T Fire in Construction
T Fire Practical matters
T Gas Safety — Installation and Use
T Hazard and Risk Assessment Techniques for Chemical Plant
T & Hazardous Installations
T Hazardous Installations
T Industrial Applications
T Instrumentation/Control Systems at Chemical Plants
T Ionising Radiation (General Precautions)
T Lifting Tackle
T Management Techniques in Construction
T Mechanical Handling
T Mobile Cranes
T Pressure Systems Regulations
T Occupational Hygiene
T Quantitative Risk Assessment
T Safety in Computer Control
T Root Cause Analysis
T Safety in HSE Office Premises

T Scaffolding
T Scientific Instrument Maintenance
T Tunnelling
T Ventilation
T ASME Course Code USA
T Safety Critical Computer — Design & Testing Methods

NSD: 'Other' Technical Courses

T Reactor Engineering
T NSD ICHEM HAZOP Course
T Criticality
T Nuclear Safety Research Seminar
T Radiation Protection Supervisor
T AEA Applied Fault Tree Analysis
T AEA Hazard and Operability Studies
T AEA Introduction to Quantitative Risk Assessment
T AEA Introduction to Reliability Assessment
T AEA/Major Hazards — Introduction to Practical Risk Assessment

SECTION 3 — OTHER HSE LEGAL TRAINING

L Introduction to Investigative Interviewing (PACE)
L Investigative Interviewing & Tape Recording of Interviews
L Legal Proceedings B
L Legal Proceedings C
L Legal Proceedings D
L Legal Proceedings E
L Legal Proceedings CPI
L Law Module A (Scotland)
L Law Module B (Scotland)
L Law Module C (Scotland)

SECTION 4 — OTHER HSE PERSONAL EFFECTIVENESS AND MANAGEMENT COURSES

MD Senior Staff Course
MD Communication for Leaders
MD Resolving Staff Issues
MD Selection and Recruitment
MD Vacancy Filling Workshop
PD Total Quality Management
PD Quality Customer Relations
MD Managing Change Effectively
MD Coaching for Improved Performance
PD Training Needs Analysis
MD Committee Secretary
PD Delegation
PD Introduction to Project Management
MD Leading Meetings
PD Negotiating Skills for Managers

PD Telephone Techniques
PD Time Management
PD Successful Business Relations
PD Personal Power and Influence
PD Writing for Impact
PD Rapid Reading at Work
PD Reading to Retain and Recall
PD Effective Writing
PD Presentation Skills
PD Basic Media Handling Skills
PD Advanced Media Handling Skills
MD Stress Awareness for Managers
MD Managing Stress
MD Introduction to Management for Ethnic Minority Staff
MD Management Development for Ethnic Minority Managers
PD Personal Development for Women
PD Face to Face Skills
PD Assertiveness
PD Advanced Interpersonal Skills
PD Management NVQ Level 5 (Bands 2–3) Ref NVC MO5
PD Writing Skills for HSE Authors
PD Customer Handling
PD Vacancy Form Filling

SECTION 5 — IT COURSES

IT Introduction to Windows NT
IT Advanced Word Pro
IT Introduction to Lotus 1-2-3 for Windows NT
IT Advanced Lotus 1-2-3 for Windows NT
IT Introduction to Lotus Approach
IT Lotus CC:Mail for Windows
IT Introduction to Freelance Graphics for Windows
VDU Introduction to MS Project for Windows Version 4
VDU Visual Display Terminal (VDT) Assessors Course
VDU VDT User Course

SECTION 6 — POLICY MAKING COURSES

POL Policy Development
POL Parliamentary Business

SECTION 7 — FURTHER EDUCATION AND OTHER TRAINING ACTIVITY

FE MBA
File Review Techniques PRO
BMS/Quality/IS conferences
Foundation Course Records Management
French Language

Appendix XII

IAEA TRAINING COURSES TO SUPPORT THE TRAINING OF REGULATORY BODY STAFF

IAEA has recently developed two representative training courses to support the training of regulatory staff members.

Basic Professional Training Course on Nuclear Safety is a 6 weeks course containing 22 separate modules (see Table XII.1). The course is intended to provide an introduction to and an overview of the most important topics of nuclear safety. The course meets the needs of engineers and technical staff for a basic understanding of the broad range of topics that make up the body of fundamental background knowledge in nuclear safety. A 900 pages text book has been produced for the course. The aim has been to have in addition to lectures also good practical exercises such as simulator exercises, group works and visits to nuclear facilities as well as tests to support the learning. The course has been organized five times during the period 1999–2001 with varying length from a national 4-week course without practical exercises to a regional 9-week course with practical exercises.

Regulatory Control of Nuclear Power Plants course is meant for professional staff members of the nuclear safety regulatory body supervising nuclear power plants. The content appears from the attachment XII.1. The length of this standard training course is two weeks. The course has been organized eight times in Europe and twice in Asia during the period 1994–2001. The length of the text book is 300 pages.

TABLE XII.1. STANDARD SYLLABUS FOR A BASIC PROFESSIONAL TRAINING COURSE ON NUCLEAR SAFETY (LIST OF 22 PARTS)

I. Nuclear reactor principles	XII. Surveillance programmes
II. Radiation protection	XIII. Maintenance
III. Basic principles of nuclear safety	XIV. Plant modifications and upgrades
IV. Design of a nuclear reactor	XV. Operational safety
V. Siting considerations	XVI. In-plant accident management
VI. Safety classification of SS&C	XVII. Emergency preparedness and response
VII. Quality assurance	XVIII. Regulatory control
VIII. Deterministic accident analysis	XIX. Decommissioning
IX. Probabilistic safety analysis	XX. Waste management
X. Limiting conditions for operation	XXI. Safety culture
XI. Human performance	XXII. Public communication

Attachment 1 to Appendix XII

REGIONAL TRAINING COURSE ON REGULATORY CONTROL OF NPPs
SYLLABUS

1. LEGISLATIVE AND REGULATORY FRAMEWORK

1.1 IAEA approach
1.2. IAEA safety standards
1.3. International conventions
1.4. Legislative and statutory framework
1.5. Scope of legislation
1.6. Regulatory guidance
1.7. Safety criteria for nuclear power plants
1.8. Country specific examples

2. REGULATORY BODY

2.1. IAEA approach
2.2. Responsibilities and functions of the regulatory body
2.3. Organization and duties of the regulatory body
2.4. Licensing of a nuclear power plant
2.5. Quality assurance, self-assessment and performance reviews
2.6. Professionalism and training of the staff of the regulatory body
2.7. Country specific examples

3. ASSESSMENT OF SAFETY

3.1. IAEA approach
3.2. Stages of assessment
3.3. Assessment methodology3
3.4. Assessment of modifications
3.5. Assessment of operational experience in-house and worldwide
3.6. Periodic safety review assessments
3.7. Country specific examples

4. INSPECTION ACTIVITIES

4.1. IAEA approach
4.2. Inspection programme, types of inspections
4.3. Inspection guidance
4.4. Implementation, methods of checking for compliance
4.5 Reporting results of inspections
4.6. Actions in response to non-compliance with regulatory requirements
4.7. Country specific examples

5. DOCUMENTATION

5.1. IAEA approach
5.2. Documents generated within an authorization process
5.3. Documents generated by the operator
5.4. Documents generated by the regulatory body
5.5. Use and updating procedures for licence document
5.6. Country specific examples

6. DEVELOPMENT OF SAFETY

6.1. Regulator / operator interface
6.2. The role of regulatory body in developing safety
6.3. Use of PSA in regulatory work
6.4. Country specific examples

7. EMERGENCY ARRANGEMENTS

7.1. IAEA approach to emergency response
7.2. Monitoring and assessment
7.3. Intervention
7.4. Plans, resources and equipment
7.5. Training and exercises
7.6. Communication
7.7. Country specific examples

8. COMMUNICATION WITH THE PUBLIC

8.1. IAEA approach to nuclear communications
8.2. Role of regulatory body
8.3. Reporting operating events
8.4. INES classification
8.5. Tools and methods
8.6. Crisis communication
8.7. Country specific examples

9. TECHNICAL VISIT (highlight areas of inspection interest)

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