IAEA TECDOC SERIES

IAEA-TECDOC-1794

IAEA-TECDOC-1794

Guidelines on Devising a Programme for Competence Acquisition and Development among Nuclear Regulators

IAEA
International Atomic Energy Agency

GUIDELINES ON DEVISING A PROGRAMME FOR COMPETENCE ACQUISITION AND DEVELOPMENT AMONG NUCLEAR REGULATORS

The following States are Members of the International Atomic Energy Agency:

AFGHANISTAN
ALBANIA
ALGERIA
ANGOLA
ANTIGUA AND BARBUDA
ARGENTINA
ARMENIA
AUSTRALIA
AUSTRIA
AZERBAIJAN
BAHAMAS
BAHRAIN
BANGLADESH
BARBADOS
BELARUS
BELGIUM
BELIZE
BENIN
BOLIVIA, PLURINATIONAL STATE OF
BOSNIA AND HERZEGOVINA
BOTSWANA
BRAZIL
BRUNEI DARUSSALAM
BULGARIA
BURKINA FASO
BURUNDI
CAMBODIA
CAMEROON
CANADA
CENTRAL AFRICAN REPUBLIC
CHAD
CHILE
CHINA
COLOMBIA
CONGO
COSTA RICA
CÔTE D'IVOIRE
CROATIA
CUBA
CYPRUS
CZECH REPUBLIC
DEMOCRATIC REPUBLIC OF THE CONGO
DENMARK
DJIBOUTI
DOMINICA
DOMINICAN REPUBLIC
ECUADOR
EGYPT
EL SALVADOR
ERITREA
ESTONIA
ETHIOPIA
FIJI
FINLAND
FRANCE
GABON
GEORGIA
GERMANY
GHANA
GREECE
GUATEMALA
GUYANA
HAITI
HOLY SEE
HONDURAS
HUNGARY
ICELAND
INDIA
INDONESIA
IRAN, ISLAMIC REPUBLIC OF
IRAQ
IRELAND
ISRAEL
ITALY
JAMAICA
JAPAN
JORDAN
KAZAKHSTAN
KENYA
KOREA, REPUBLIC OF
KUWAIT
KYRGYZSTAN
LAO PEOPLE'S DEMOCRATIC REPUBLIC
LATVIA
LEBANON
LESOTHO
LIBERIA
LIBYA
LIECHTENSTEIN
LITHUANIA
LUXEMBOURG
MADAGASCAR
MALAWI
MALAYSIA
MALI
MALTA
MARSHALL ISLANDS
MAURITANIA
MAURITIUS
MEXICO
MONACO
MONGOLIA
MONTENEGRO
MOROCCO
MOZAMBIQUE
MYANMAR
NAMIBIA
NEPAL
NETHERLANDS
NEW ZEALAND
NICARAGUA
NIGER
NIGERIA
NORWAY
OMAN
PAKISTAN
PALAU
PANAMA
PAPUA NEW GUINEA
PARAGUAY
PERU
PHILIPPINES
POLAND
PORTUGAL
QATAR
REPUBLIC OF MOLDOVA
ROMANIA
RUSSIAN FEDERATION
RWANDA
SAN MARINO
SAUDI ARABIA
SENEGAL
SERBIA
SEYCHELLES
SIERRA LEONE
SINGAPORE
SLOVAKIA
SLOVENIA
SOUTH AFRICA
SPAIN
SRI LANKA
SUDAN
SWAZILAND
SWEDEN
SWITZERLAND
SYRIAN ARAB REPUBLIC
TAJIKISTAN
THAILAND
THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA
TOGO
TRINIDAD AND TOBAGO
TUNISIA
TURKEY
TURKMENISTAN
UGANDA
UKRAINE
UNITED ARAB EMIRATES
UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND
UNITED REPUBLIC OF TANZANIA
UNITED STATES OF AMERICA
URUGUAY
UZBEKISTAN
VANUATU
VENEZUELA, BOLIVARIAN REPUBLIC OF
VIET NAM
YEMEN
ZAMBIA
ZIMBABWE

The Agency's Statute was approved on 23 October 1956 by the Conference on the Statute of the IAEA held at United Nations Headquarters, New York; it entered into force on 29 July 1957. The Headquarters of the Agency are situated in Vienna. Its principal objective is "to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world''.

IAEA-TECDOC-1794

GUIDELINES ON DEVISING A PROGRAMME FOR COMPETENCE ACQUISITION AND DEVELOPMENT AMONG NUCLEAR REGULATORS

INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA, 2016

COPYRIGHT NOTICE

For further information on this publication, please contact:

Programme and Strategy Coordination Section
International Atomic Energy Agency
Vienna International Centre
PO Box 100
1400 Vienna, Austria
Email: Official.Mail@iaea.org

Printed by the IAEA in Austria
December 2016

IAEA Library Cataloguing in Publication Data

Names: International Atomic Energy Agency.
Title: Guidelines on devising a programme for competence acquisition and development among nuclear regulators / International Atomic Energy Agency.
Description: Vienna : International Atomic Energy Agency, 2016. | Series: IAEA TECDOC series, ISSN 1011–4289 ; no. 1794 | Includes bibliographical references.
Identifiers: IAEAL 16-01076 | ISBN 978–92–0–111016–9 (paperback : alk. paper)
Subjects: LCSH: Nuclear regulation. | Nuclear industry — Employees — Training of. | Administrative agencies.

FOREWORD

The Fundamental Safety Principles and publications on international nuclear safety standards contain requirements on training and competence management for regulatory bodies and technical support organizations in the field of nuclear safety. In accordance with these requirements, and in line with the responsibility of the IAEA to support the application of such standards, intensive work has been under way to develop nuclear safety knowledge and competence models, such as the quadrant model of competences, and tools for the systematic analysis of regulatory and nuclear safety competences.

The models and tools developed by the IAEA that offer support in nuclear safety training, with a focus on regulation, provide a general framework for the development and management of training. In order to ensure that they are effective at the national or regional level, however, these models and tools need to be adapted and adjusted to suit the countries and regions in which they will be used. Therefore, to provide practical support and guidance, typical work profiles, roles and positions within the regulatory body need to be defined in order to determine the competences required. There should also be an analysis of the resources available to meet the training needs identified. The goal of this publication, undertaken as part of the extrabudgetary programme on nuclear and radiation safety and security in Ibero-America, has been to develop practical guidelines on training specific to the Ibero-American region, in line with international safety standards and requirements. In carrying out this work, not only did the Ibero-American Forum of Radiological and Nuclear Regulatory Agencies (FORO) team achieve its objective of developing practical guidelines to serve the region, but its cooperation and feedback also contributed to the IAEA's work, resulting in the publication of Safety Reports Series No. 79, Managing Regulatory Body Competence, and of the methodology for the Systematic Assessment of Regulatory Competence Needs (SARCoN).

The IAEA officer responsible for this publication was M.J. Moracho Ramírez of the Office of Safety and Security Coordination.

EDITORIAL NOTE

This publication has been prepared from the original material as submitted by the contributors and has not been edited by the editorial staff of the IAEA. The views expressed remain the responsibility of the contributors and do not necessarily represent the views of the IAEA or its Member States.

Neither the IAEA nor its Member States assume any responsibility for consequences which may arise from the use of this publication. This publication does not address questions of responsibility, legal or otherwise, for acts or omissions on the part of any person.

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.

The mention of names of specific companies or products (whether or not indicated as registered) does not imply any intention to infringe proprietary rights, nor should it be construed as an endorsement or recommendation on the part of the IAEA.

The IAEA has no responsibility for the persistence or accuracy of URLs for external or third party Internet web sites referred to in this publication and does not guarantee that any content on such web sites is, or will remain, accurate or appropriate.

CONTENTS

1. INTRODUCTION

1.1. BACKGROUND

The effectiveness and efficiency of a regulatory body in performing its functions go hand in hand with the development of the organization's *human assets*, i.e. all the knowledge, skills and talents possessed by its staff members which make them suitable to carry out their specific activities. These attributes are referred to generically as *competences* and they should be built in a careful and balanced manner, as a central objective of the human resource development policy at the regulatory body.

Each national regulatory body has a responsibility to develop a strategy for strengthening regulatory competences [1], bearing in mind the particularities of the nuclear energy programme adopted by the country, and the human resource development and organization policy promoted by the national government and implemented by the regulator. This strategy should be integrated into the regulatory body's management system.

In the wake of the accident at TEPCO's Fukushima Daiichi nuclear power plant in 2011, the IAEA developed its Action Plan on Nuclear Safety, which was approved by the General Conference at its 55th session [2]. *Capacity building* in Member States is one of the 12 main actions identified in the Plan. The IAEA devised an integrated *capacity building* concept that addresses four main pillars: education and training, human resource development, knowledge management and knowledge networks.

In 2012, the IAEA Secretariat and the Action Plan Steering Committee drafted the Strategic Approach to Education and Training in Nuclear Safety 2013–2020 [3]. This strategic approach highlights the importance of Member States taking responsibility for safety, by developing and implementing national strategies to that end, and warns that a high level of national commitment will be required to put in place the mechanisms for building national capacity in nuclear safety.

The Ibero-American Forum of Radiological and Nuclear Regulatory Agencies (FORO), one of whose fundamental objectives is to maintain high levels of nuclear and radiation safety and security in the Ibero-American region, is fully aware of its important role, as a regional organization, in helping to achieve the goals of the post-Fukushima international Action Plan. To that end, further to the Strategic Approach to Education and Training in Nuclear Safety 2013–2020, it proposed a technical project in 2011 on training the staff of regulatory bodies in nuclear reactor safety, with a view to developing tools that would facilitate the implementation of national programmes for the acquisition, development and maintenance of competences among nuclear regulators. This proposal became the CReAN (**C**ompetences of **Re**gulators in the **A**rea of **N**uclear Safety) project, under which the present Guidelines have been developed.

1.2. OBJECTIVES

The Guidelines on Devising a Programme for Competence Acquisition and Development among Nuclear Regulators are intended to provide the outline of a programme to strengthen regulatory competences, based on the operating experience of FORO member countries with a developed nuclear programme; they are designed to optimize the resources of the Ibero-American region.

Certain parts of the Guidelines are aimed at providing assistance in developing specific aspects of this programme that are considered to be of particular interest. These parts are based on analyses and exercises carried out under the CReAN project, and on a set of good practices identified in various countries. They may be taken partially or in full, as practical guidance or as illustrative examples.

It is hoped that the recommendations contained in these Guidelines might be used, in varying degrees, by the regulatory bodies of the FORO member countries (Argentina, Brazil, Chile, Colombia, Cuba, Mexico, Paraguay, Peru, Spain and Uruguay), other organizations in the Ibero-American region, and other countries in developing their national programmes. Applicability will vary from country to country depending on the nature and scope of its nuclear programme and the stage it has reached in the implementation and development of national strategies for regulatory competence acquisition and management.

1.3. SCOPE

These Guidelines use the IAEA's Safety Reports Series No. 79 [4] as a frame of reference; they complement and supplement this document as regards the implementation of some of the main processes of competence management.

The competence management processes are classified into four main groups [4] (2.2):

(a) Processes related to competence analysis;
(b) Processes related to filling competence gaps;
(c) Processes related to measurement, assessment and improvement of competence management;
(d) Processes related to knowledge management and participation in knowledge networks.

The work carried out under the CReAN project was focused on the first two processes with the following scope:

(a) Processes related to competence analysis

The process of identifying regulatory body competences is clearly and exhaustively described in [4] and in the SARCoN methodology [5]. This process should be implemented by each organization analysing its own particularities and level of technical development. It is therefore clearly an organization-dependent process.

Little has been written, however, on the analysis of regulatory body workforces with a focus on competences. The tasks derived from the regulatory functions can be analysed, and the competences associated with these tasks determined, with a level of generality that is useful for any regulatory body in the nuclear area.

In this regard, the CReAN project's findings on defining a regulatory workforce and the corresponding competence profiles for the licensing and control of nuclear reactors, may be of general interest.

(b) Processes related to filling competence gaps

The CReAN project covered the following sub-processes:

- Staff recruitment;
- Training and development;
- Career progression.

Figure 1, inspired by the competence analysis flow chart in [4], shows the scope of the work carried out by the CReAN project. The project complements Safety Reports Series No. 79 with a set of guidelines and good practices that facilitate the implementation of national programmes for competence acquisition and development among nuclear regulators.

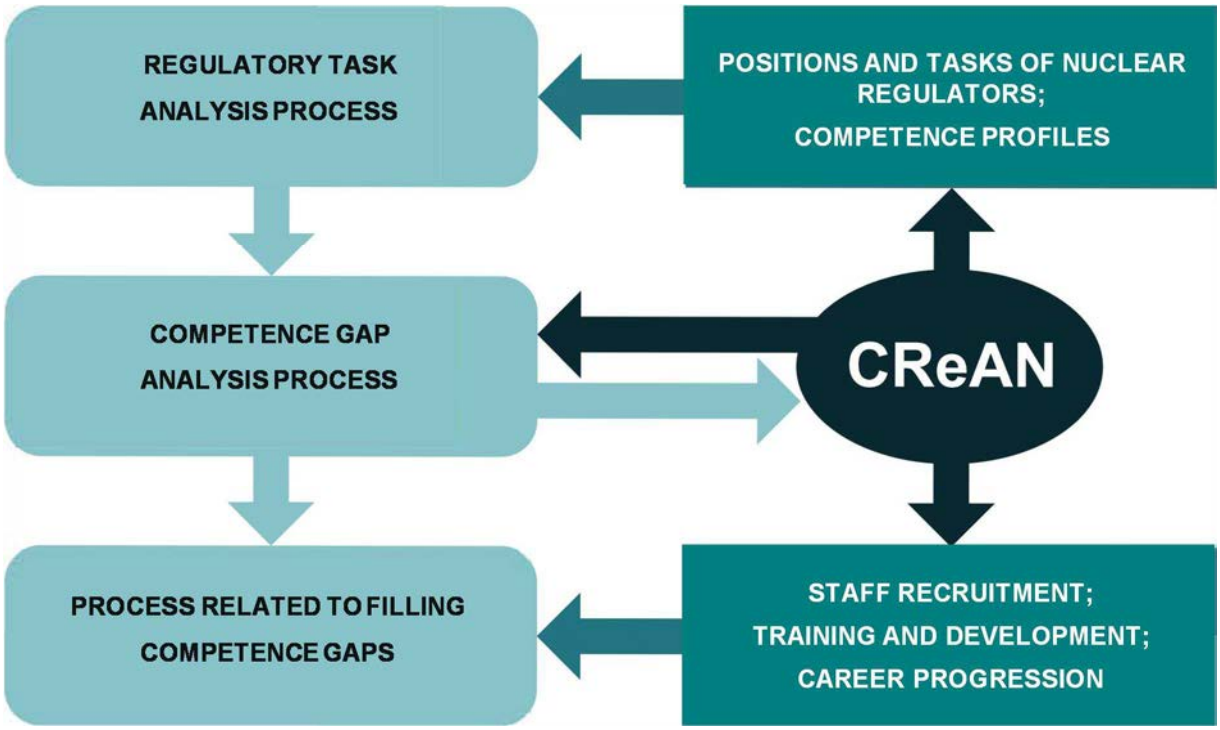

FIG. 1. Scope of the work carried out by the CReAN project

1.4. STRUCTURE

These Guidelines, in addition to this introductory section on the background, objectives and scope, include five thematic sections. The first one describes the bases upon which to devise a programme for competence acquisition and development among nuclear regulators. The four other sections address specific aspects of the programme: infrastructure for the basic and applied training of regulators; mechanisms for the recruitment of technical staff at the regulatory body; in-house training of technical staff in specific technologies; and career progression within the regulatory body.

Each section of the Guidelines is preceded by one or more quotes from Safety Reports Series No. 79 [4] which serve to guide its content. For section 3, a quote has been chosen from the IAEA's Safety Guide No. SSG-16 [7], which is also referenced in Safety Reports Series No. 79 [4].

Thematic sections 3 to 6, which represent the stages of a competence acquisition and development programme, are structured around the objectives for the stage given at the beginning of each section.

Each section uses shaded boxes to highlight specific input from CReAN project activities that might serve as a reference for developing particular elements of national competence acquisition and development programmes.

Sections 3 to 6 also include Annexes which provide further details of these inputs.

In addition, there is a short glossary defining the terms used specifically in this document.

2. OUTLINE OF A PROGRAMME FOR COMPETENCE ACQUISITION AND DEVELOPMENT AMONG NUCLEAR REGULATORS

A strategic plan for developing and maintaining competence is typically an output of the planning process. It needs to cover training and development, staffing plans, use of external support and other methods of meeting competence needs — particularly to narrow competence gaps (taken from [4] (2.1.3)).

These Guidelines are intended to help ease the planning work involved in managing the competences of nuclear regulators.

The bulk of the regulatory body's strategic planning work consists of drawing up a programme for competence acquisition and development (ProgCAD) among regulatory staff.

A simple plan for devising the ProgCAD should include at least the following steps:

- Situation analysis of national infrastructure for competence acquisition and development among nuclear regulators;
- Situation diagnosis: identification of strengths, weaknesses, opportunities and threats;
- Definition of the programme's strategic objectives;
- Development of action plans to achieve the objectives;
- Establishment of programme monitoring and evaluation mechanisms.

Below is a brief description of each of these steps, which will be expanded upon later in the Guidelines, including recommendations for their implementation.

2.1. SITUATION ANALYSIS

The design of a national programme to build nuclear regulator competences should be the product of a diagnostic assessment of the current situation as regards the capacities for training regulators in each country.

Therefore, the first task of a ProgCAD is to analyse the initial situation regarding national strategies and infrastructure for competence acquisition and development, which will help to determine the direction of future activities. The box below gives a model outline to guide the investigation. It is based on the one used in the CReAN project as the starting point for its implementation. It therefore offers some guarantee of validity for the purposes of these Guidelines.

OUTLINE FOR THE ANALYSIS OF NATIONAL INFRASTRUCTURES FOR COMPETENCE ACQUISITION AND MANAGEMENT AMONG NUCLEAR REGULATORS

OBJECTIVE

To gather the information needed to identify the components of nuclear reactor safety training and competence acquisition and management systems.

SCOPE

The infrastructure, programmes, organizational aspects, financial and human resources, methodologies, content and implementation mechanisms of the various programmes and centres established for the acquisition and management of nuclear reactor safety competences at regulatory bodies.

SOURCES SUBJECT TO CONTROL (NUCLEAR REACTORS)

- *Description of nuclear reactors (power, research or critical assembly) in operation or planned in the next five years, giving their main features: type, power, use, location, stage in reactor life cycle, age, etc.*

NATIONAL INFRASTRUCTURE FOR REGULATORY CONTROL

- *National legal base supporting the regulatory body's activities related to the nuclear reactor authorization process.*
- *Organizational units of the regulatory body with nuclear reactor regulation duties.*
- *Staff tasked with nuclear reactor regulation duties, and their current profiles.*

INFRASTRUCTURE AND MECHANISMS FOR COMPETENCE ACQUISITION AMONG REGULATORS

- *Guidelines or handbooks on the training of regulatory body staff, in particular in relation to nuclear reactors.*
- *Description of the programme or plan for competence acquisition among regulatory staff. Main stages of the plan from recruitment to appointment as a senior regulatory officer.*
- *Regulatory staff recruitment policy (established or tacit).*
- *Definition of the competences required and the related training needs for organizational units in the area of nuclear reactors.*
- *National undergraduate and postgraduate courses available for basic and applied training in nuclear reactor safety.*
- *Existing mechanisms for the specialized training required: courses, on-the-job training, internships, the use of in-house technical pedagogic infrastructure, and the services of national or foreign TSOs. International cooperation programmes.*
- *Continuing education programme for regulatory staff.*
- *Knowledge management: analysis of critical knowledge, preservation and transfer of knowledge by the nuclear regulator. Dissemination within the regulatory body of specialized knowledge acquired (training of trainers).*
- *Integration of national, regional and international nuclear knowledge and/or education networks.*

INCORPORATION OF THE NUCLEAR REGULATOR COMPETENCE ACQUISITION AND MANAGEMENT PROCESS INTO THE REGULATORY BODY'S MANAGEMENT SYSTEM

- *Commitment of the regulatory body's senior management to the regulator competence acquisition and management programme, and understanding of its strategic nature.*
- *Designation of responsibilities associated with the training process.*
- *Resources allocated.*
- *Mechanisms for assessing and measuring the outcomes of the regulator training programme (performance indicators, internal and external audits).*

2.2. SITUATION DIAGNOSIS

After studying the data on the infrastructure available to equip the regulatory body staff with the competences needed for nuclear reactor licensing and control, a situation diagnosis can be made. This may involve a SWOT (strengths, weakness, opportunities, threats) analysis of the information gathered. This diagnosis can be used as a basis for drawing up the action plans and strategies required for ProgCAD implementation.

Research carried out in seven FORO countries revealed a set of strengths, weaknesses, opportunities and threats for the Ibero-American region that are summarized in this section and analysed in greater detail elsewhere in the document. The results of this analysis, conducted under the CReAN project as the starting point to guide its development, may serve as a useful reference and another factor to consider in devising a national programme, as the analysis is based on information gathered in the Ibero-American region.

Figure 2 sets out the SWOT analysis approach used.

	Internal analysis	**External analysis**
Positive aspects	STRENGTHS • What are we good at? • What advantages do we have with respect to other regions?	OPPORTUNITIES • What opportunities are available to us? • What trends can we benefit from?
Negative aspects	WEAKNESSES • What could we be better at? • What disadvantages do we have with respect to other regions?	THREATS • What factors external to the regulatory bodies undermine attempts to minimize weaknesses?

FIG. 2. Analysis approach used: SWOT

The results of the SWOT analysis in FORO countries are given in Figure 3.

	Internal analysis	External analysis
Positive aspects	**S1.** All countries, except Brazil, share a common language. **S2.** Four FORO countries have over 40 years' experience in nuclear power reactor regulation, and another two have experience in research reactor regulation. **S3.** The region has reactors at all stages in their life cycle. **S4.** Most countries offer a substantial range of basic academic training through degrees related to the nuclear field, and many of them also have applied training options in this field. **S5.** There are two IAEA regional training centres for applied training in the region. One operates in Spanish and has more than 30 years' experience, while the other, more recently established, operates in Portuguese. **S6.** Infrastructure is available for specialized training in the nuclear field, albeit not in all technologies. **S7.** Three countries have a formal on-boarding programme. **S8.** One country has integrated the training process fully into its quality management system. This process is based on the systematic approach to training (SAT). It is included in the institution's strategic plan and action plan, and the effectiveness of the training is measured.	**O1.** Currently, there is an eagerness on the part of national, regional and international organizations around the world to share experience and knowledge in order to improve global nuclear safety: for example, the post-Fukushima IAEA Action Plan on Nuclear Safety and the European Commission's training programmes for regulators. **O2.** FORO projects provide an opportunity for frequent contact between professionals of the region, both at management and operational levels, which facilitates the development of initiatives to improve the regulatory programmes. The CReAN project, in particular, paves the way for improving regulatory staff competence building and development.
Negative aspects	**W1.** The nuclear regulator training and development programmes at regulatory bodies are largely informal and optional. **W2.** The informality of the on-the-job training and continuing education processes in all countries is notable. **W3.** The competence acquisition and development processes are not fully incorporated into the regulatory body's management system. **W4.** The competence-based approach to recruitment and human resource training and development has only recently begun to be introduced at some regulatory bodies. **W5.** The development of knowledge management programmes in these countries is in its infancy and offers only a piecemeal solution to an ageing workforce and the maintenance of regulator competences.	**T1.** Most organizations suffer problems associated with an ageing workforce. **T2.** The Ibero-American region is vast and constitutes a bridge between two geographical areas where the level of development varies greatly, thus making harmonization difficult. **T3.** The political issues related to the nuclear option, and the irregularity of funding to sustain the existing nuclear plans bring about uncertainty.

FIG. 3. Results of SWOT analysis in FORO countries

2.3. DEFINITION OF STRATEGIC OBJECTIVES

The ProgCAD activities should be guided by one or more strategic objectives. Each regulatory body will set its own objectives that must be incorporated into the institutional vision established in the management system.

As an example, the following general objective could apply to any regulatory body:

To develop an integral plan for staff training and development, with a focus on competences, in order to ensure outstanding job performance in the present and in the face of future challenges.

2.4. DEVELOPMENT OF ACTION PLANS

The main elements of the ProgCAD are the action plans establishing the strategies and tasks to be implemented to achieve the set objectives.

For the drafting of these plans, four stages have been identified in the nuclear regulator competence acquisition and development process. Different strategies will have to be adopted for the various stages.

The stages are as follows:

STAGE 1: Development and strengthening of infrastructure for the academic training of future nuclear regulators. Includes two aspects:

- Basic training (pre-university or undergraduate level);
- Training in applied technology (generally postgraduate level);

STAGE 2: Recruitment of regulatory body staff;

STAGE 3: Specific training on the job;

STAGE 4: Career progression.

The first stage usually occurs outside the regulatory body, although in some cases, the regulatory body may provide training in applied technologies as part of its own human resource development. The second stage is brief and takes place within the institution. The third and fourth stages are ongoing for practically the entirety of a person's working life.

The following sections describe and analyse each of these stages; relevant findings from the CReAN project are also included. Specific objectives are set for each stage, and strategies and/or support mechanisms for their implementation are also provided.

2.5. ESTABLISHMENT OF PROGRAMME MONITORING AND EVALUATION MECHANISMS

The regulatory body's competence building programme should be dynamic, flexible and adaptable to new pedagogical trends. As with any element of the regulatory body's global management system, ongoing improvement is required; monitoring, self-assessment and external audit mechanisms should therefore be provided.

For programme monitoring, appropriate instruments will need to be established at each organization, including performance indicators to give an overall assessment of programme implementation and effectiveness.

With regard to external assessment, national or regional external review mechanisms are recommended, along with international peer review mechanisms as appropriate, such as the IAEA's IRRS, ETRES and EduTA services.

The IAEA's Integrated Regulatory Review Service (IRRS) was designed to strengthen and enhance the effectiveness of Member States' national regulatory infrastructure for nuclear, radiation, radioactive waste and transport safety and the security of radioactive sources. The IRRS evaluates, as objectively as possible, the State's regulatory infrastructure with respect to standards and practices, and makes recommendations and suggestions. It is an in-depth

assessment of many aspects, but sub-module 3.3 [6] specifically addresses issues related to capacity building in the country.

The Education and Training Review Service (ETRES) is more specific in its scope: its objective is to assist Member States to develop and to maintain a sustainable and adequate nuclear safety education and training programme in line with the IAEA safety standards and international good practices, with due recognition of national conditions. To this end, a self-assessment is performed, followed by an international peer review of the results and implementation of an action plan to fulfil the identified needs. The international review is usually conducted by a team made up of IAEA staff, international experts and experts from countries with experience in such missions or with significant experience in educational matters.

Lastly, the Education and Training Appraisal (EduTA) peer service was established to evaluate and identify Member States' training needs in a systematic manner and to assess their education and training infrastructure in the areas of radiation protection and radioactive source safety. It can be carried out using a self-assessment tool or through an IAEA expert mission.

3. INFRASTRUCTURE FOR THE BASIC AND APPLIED TRAINING OF NUCLEAR REGULATORS

The government should identify national institutions and institutions in other States that could provide education and training and could start training in key areas relating to nuclear safety (taken from [7] (Action 87))

Stage 1 objectives:

3.1: Each regulatory body has at its disposal up-to-date and accurate information on national, regional and international undergraduate and postgraduate courses related to nuclear activities, with a view to improving its staff recruitment policies.

3.2: The regulatory body, as an institution that generates demand for knowledge, is involved and proactive in promoting and improving the academic courses on offer.

3.1. ACADEMIC COURSES FOR THE TRAINING OF NUCLEAR REGULATORS

The first objective of this stage will be achieved by analysing the national educational infrastructure for nuclear-related studies.

At the beginning of the CReAN project, each participating country drafted a national report in compliance with the outline proposed in Section 2. This task involved gathering data on the educational infrastructure for applied technology in the nuclear field, available in FORO countries. The data are provided in ***Annex I.***

The research showed that the FORO countries offer sufficient undergraduate courses in the various relevant branches of engineering and exact and natural sciences; and that the countries with a significant nuclear programme have also been able to develop a reasonable academic infrastructure in applied sciences in order to meet the applied technology training needs of future regulators.

One particular strength of the region that should be highlighted is the existence in Argentina and Brazil of two regional training centres, recognized as such by the IAEA through the signing of long-term agreements. The centre in Argentina has been running for more than 30 years, during which it has trained, with economic support from the IAEA, more than 1000 professionals from Latin America in radiation protection and nuclear safety. The centre in Brazil was established in 2011 and complements the applied training infrastructure in the Ibero-American region through the incorporation of teaching in Portuguese.

3.2. PROACTIVE APPROACH BY THE REGULATORY BODY TO VOCATIONAL DEVELOPMENT

With regard to the second objective set for this stage, the regulatory body can adopt a variety of strategies, without departing from its sphere of responsibilities, to improve the pool of professionals with the desired training. These include:

- Mechanisms to establish and encourage vocational training through close contact with universities and institutes to explain the job of a regulator and promote the concept of nuclear safety and its social impact;
- Offer of grants and internships;
- Recognition of qualifications and promotion of professional mobility between countries of the region, by standardizing training programmes.

*A good practice described in **Annex II** is the establishment and maintenance of university chairs for nuclear-related subjects; this mechanism is employed by the Spanish regulator as a means of collaborating with the university to guide studies and students towards the field of nuclear regulation.*

4. RECRUITMENT OF TECHNICAL STAFF TO THE REGULATORY BODY

A determination of the size and composition of the regulatory body required to fulfil its obligations needs to be part of this strategic planning process (taken from [4] (2.1.3)).

Planning is to ensure that there is the right number of people with the right competences at the right time to ensure timely responses by the regulatory body (taken from [4] (2.1.3)).

Stage 2 objectives:

4.1: Define and determine the size of the core workforce of regulators needed to ensure that the regulatory body is efficient and effective in its control of the country's nuclear reactors in the present and the future.

4.2: Provide mechanisms that facilitate and enhance the efficiency of the regulatory body's process of recruiting staff who will be responsible for nuclear reactor licensing and control.

4.1. DEFINING THE REGULATORY WORKFORCE

When determining the size of a regulatory body, driving factors are the particularities of the nuclear energy programme adopted by the country, and the political decision taken as regards technical autonomy in the performance of licensing and control duties. A technically

autonomous regulatory body with advanced in-house capacity for assessment and inspection requires many more people with a much higher level of specialization than a regulator that is assisted in these functions by one or more technical support organizations (TSOs).

To assist with the attainment of this objective, a core professional workforce is proposed for the regulation of nuclear power reactors. This workforce, defined under the CReAN project, has been developed with technical autonomy in mind; it comprises 28 positions, for each of which the objectives and main tasks have been defined and linked to the stages in the reactor life cycle. The number of staff per position and their respective competence levels will depend on each country's nuclear programme and the strategic size decided upon for the regulatory body. ***Annex III*** *provides further details of the model used for defining the workforce.*

Table 1 summarizes the names of the defined positions and their involvement in each stage of licensing a nuclear reactor. Following the table, the graph in Figure 4 shows how the core workforce evolves throughout the reactor's lifetime, with few positions at the beginning and end and an average of 23 specific positions during reactor construction, commissioning and operation.

TABLE 1. CORE WORKFORCE OF REGULATORS FOR THE LICENSING AND CONTROL OF A NUCLEAR POWER REACTOR

POSITION		STAGE				
		S	Con	Com	O	D
R1	NPP licensing coordinator	■	■	■	■	■
R2	Senior specialist in thermohydraulic assessment		■	■	■	
R3	Senior specialist in neutronic assessment		■	■	■	■(*)
R4	Senior specialist in natural and human-induced event analysis	■	■	■	■	
R5	Senior specialist in nuclear safety	■	■	■	■	
R6	Senior specialist in radiation protection	■	■	■	■	■
R7	Senior specialist in physical protection	■	■	■	■	■
R8	Assessor/auditor of the licensee's quality management system	■	■	■	■	■
R9	Assessor/inspector of civil and mechanical structure safety		■	■	■	
R10	Assessor/inspector of mechanical system safety		■	■	■	
R11	Assessor/inspector of electrical system safety		■	■	■	
R12	Assessor/inspector of reactor instrumentation and control safety		■	■	■	
R13	Assessor/inspector of safety systems		■	■	■	
R14	Assessor/inspector for internal flooding and fires		■	■	■	
R15	Site coordinator for engineering inspections and assessments		■	■		

S: siting; **Con**: construction; **Com**: commissioning; **O**: operation; **D**: decommissioning

(*) The need for these specialists depends on whether there is fuel present at the site.

TABLE 1. CORE REGULATORY WORKFORCE FOR THE LICENSING AND CONTROL OF A NUCLEAR POWER REACTOR (cont.)

	POSITION	STAGE				
		S	Con	Com	O	D
R16	Inspector of mechanical system construction, assembly and commissioning		■	■		
R17	Inspector of electrical system construction, assembly and commissioning		■	■		
R18	Inspector of instrumentation and control system construction, assembly and commissioning		■	■		
R19	Inspector of the main contractor's quality management system		■	■		
R20	Senior specialist in probabilistic safety assessment (PSA)		■	■	■	
R21	Senior specialist in human factors engineering			■	■	
R22	Senior specialist in organizational aspects and safety culture			■	■	■
R23	Senior specialist in severe accident analysis			■	■	
R24	Senior specialist in the assessment of operators in nuclear and radiation safety			■	■	
R25	Senior specialist in emergency plan assessment			■	■	■
R26	Site inspector			■	■	■
R27	Senior specialist in operating experience				■	
R28	Senior specialist in radioactive waste management				■	■

S: siting; **Con**: construction; **Com**: commissioning; **O**: operation; **D**: decommissioning

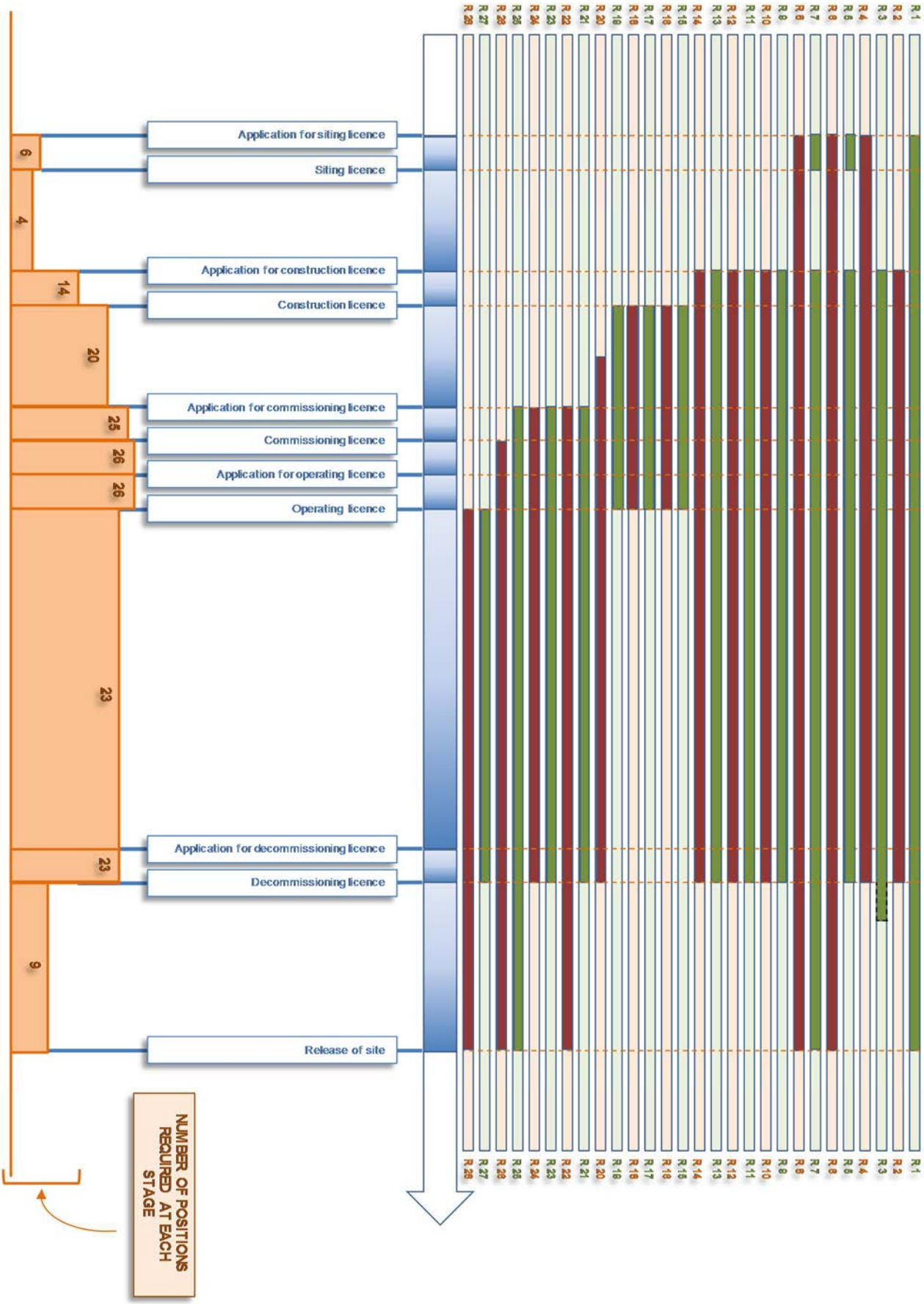

FIG. 4. Evolution of the core workforce throughout the lifetime of the nuclear reactor

4.2. RECRUITMENT TO THE REGULATORY BODY

One of the managerial duties at any regulatory body is to define the priorities for recruiting staff or procuring services based on a competence gap analysis for each sector.

The recruitment of new staff to the regulatory body will be determined by the policy governing human resource development and organization in each State, as defined by its government.

In any case, there are strategies that can be applied to the staff recruitment processes at any nuclear regulatory body to enhance their effectiveness. These strategies include:

- Competence-based definition of job profiles;
- Job advertisements specific to the position;
- Cooperation between the technical department instigating the search and the human resources department, in each of the processes mentioned above;
- Technical assessment of applicants using specific programmes designed by the organizational unit performing the search;
- Effective on-boarding (induction) mechanisms which save early training resources.

With regard to the first strategy above, each regulatory body should establish its own set of competences which it expects to be fundamental to the organization's human assets based on the scope of their responsibilities and their own development. The competences desired for a given position will then be selected from this set.

The IAEA has designed a competence management model [4] which defines a general set of competences for nuclear regulators, based on a quadrant structure. This model has been widely circulated among Member States, and many are incorporating it into their management systems.

From the outset, FORO's CReAN project decided to adopt the IAEA's quadrant model, carefully reviewing and selecting competences that were applicable to its nuclear regulators. As a result, a new general set of competences was formed, in Spanish, adapted to regulators in the countries of the region. This model can be used as reference or assistance to any regulatory body. Because this analysis was carried out in parallel to the drafting of Safety Reports Series No. 79 [4] and the latest version of SARCoN [5], the project allowed FORO to be included among the reviewers of these documents, as noted in the Foreword to [4]. ***Annex IV*** *contains the list of competences drawn up by CReAN.*

Developing induction procedures is considered fundamental to instilling the organization's culture and values in new staff members and providing them with the minimum information and knowledge they need in the early days.

Tapping into the experience accrued by regulatory bodies in FORO countries, a number of good practices related to staff recruitment and on-boarding policies have been identified under the CReAN project. These good practices may be used as illustrative examples or references; they are therefore described in ***Annex V****.*

5. IN-HOUSE STAFF TRAINING

Managers have the responsibility to identify the KSAs (knowledge, skills and attitudes) associated with each task and to determine the level of competence necessary for a specific task, taking into account the functions and structure of the organization (taken from [4] (4.2)).

The strategic plan also needs to address and to indicate the mixture of the various training methods identified and the circumstances in which each method, or mixture of methods, is to be used (taken from [4] (2.1.3)).

Stage 3 objectives:

5.1 Determine the competence profile for each position defined in the core workforce.

5.2. Have the necessary training mechanisms and resources for staff to achieve the desired competence level for each position.

5.1. DEFINITION OF PROFILES BASED ON COMPETENCES

Determining the competences needed for a given position at the regulatory body requires, first and foremost, a detailed analysis of the tasks to be performed by the incumbent.

> *The CReAN project took a particular interest in this analysis and, drawing upon the operating experience of the regulatory bodies represented, determined the objective and main tasks associated with each of the 28 regulator positions defined as the core workforce. The findings are shown in* ***Annex VI****.*

In order to construct the profiles of nuclear regulator positions based on competences, a matrix model is used that links the objective and tasks of each position to the competences needed, and their respective level. These competences are selected from the general list of competences (Annex IV).

As an example, Table 2 shows part of the matrix used to construct the profiles for position R1 'NPP licensing coordinator' and position R10 'Assessor/inspector of mechanical system safety'.

TABLE 2. COMPETENCES RELATED TO THE REGULATORY BODY'S PRACTICES FOR VARIOUS POSITIONS

NPP LICENSING COORDINATOR

Quadrant 3: Competences related to the regulatory body's practices

3.4. Inspection

Competence	Related tasks	Level required			Comments
		K	S	A	
3.4.1	T1; T3; T4	H	—	—	—
3.4.2	T2; T3; T4	H	H	—	—
3.4.3	T2; T3	M	H	—	—
3.4.4	T1; T2	M	H	—	—
3.4.5	N/A	—	—	—	Does not correspond to main tasks
3.4.6	T2	H	H	—	—
3.4.7	T5; T6	H	M	—	—
3.4.8	T3	H	H	—	—
3.4.9	T15	H	H	—	—
3.4.10	N/A	—	—	—	Does not correspond to main tasks

ASSESSOR/INSPECTOR OF MECHANICAL SYSTEM SAFETY

Quadrant 3: Competences related to the regulatory body's practices

3.1. Familiarity with facility

Competence	Related tasks	Level required			Comments
		K	S	A	
3.1.1	T1; T2; T3;T5	H	—	—	The 'high' level refers to his/her specific technical area.
3.1.2	T5; T6; T7; T9	H	—	—	
3.1.3	T5	M	M	—	—
3.1.4	T5	M	M	—	—
3.1.5	N/A	—	—	—	Considered a competence of the site inspector and, to a lesser extent, the coordinator
3.1.6	T1; T2; T3; T5; T6; T7	H	—	—	The 'high' level refers to his/her specific technical area.

Quadrant 3: Competences related to the regulatory body's practices

3.3. Assessment

Competence	Related tasks	Level required			Comments
		K	S	A	
3.3.1	T1; T2; T3; T4	H	—	—	—
3.3.2	T1; T2; T3; T7	H	H	—	The 'high' level refers to his/her specific technical area.
3.3.3	T1; T2; T3	H	H	—	
3.3.4	T1; T2; T3; T4	M	M	—	The 'high' level is assigned to the coordinator as the person with an overview of the whole assessment process.
3.3.5	T1; T2; T3	H	H	—	The 'high' level refers to his/her specific technical area.
3.3.6	T8	H	M	M	

The first column of each example sets out the secondary competences derived from the core competence selected. The second column shows the tasks under the position that require these competences, identified through an analysis based on operating experience. The third column, divided into three sub-columns, gives the competence level (high, medium or basic) required for each element (knowledge, skills and attitudes) to ensure adequate job performance.

The graphic representation of competence profiles has the advantage of providing a quick overview thereof, which helps in staff recruitment and training.

Figure 5 shows the construction of the competence profile for a given position, highlighting the direct relationship between each main task and the competences needed for its execution.

These competences are displayed in a pie chart whose four main sections replicate the four quadrants of the IAEA model. The slices of each quadrant represent the core competences therein and the radius of each slice is proportional to the level of the secondary competences derived from each core competence. The pie chart depicts what the CReAN project calls a 'competence chart' for a given position.

Figure 6 offers a comparative view of the three competence charts for the three representative positions of a regulatory body identified in the CReAN project.

Therefore, the description of the position (its objective and main tasks) and the corresponding competence chart represent the competence profile for the regulatory position, which serves as the basis for devising a training plan that ensures the acquisition, development and maintenance of these competences at the level required for effective and efficient job performance.

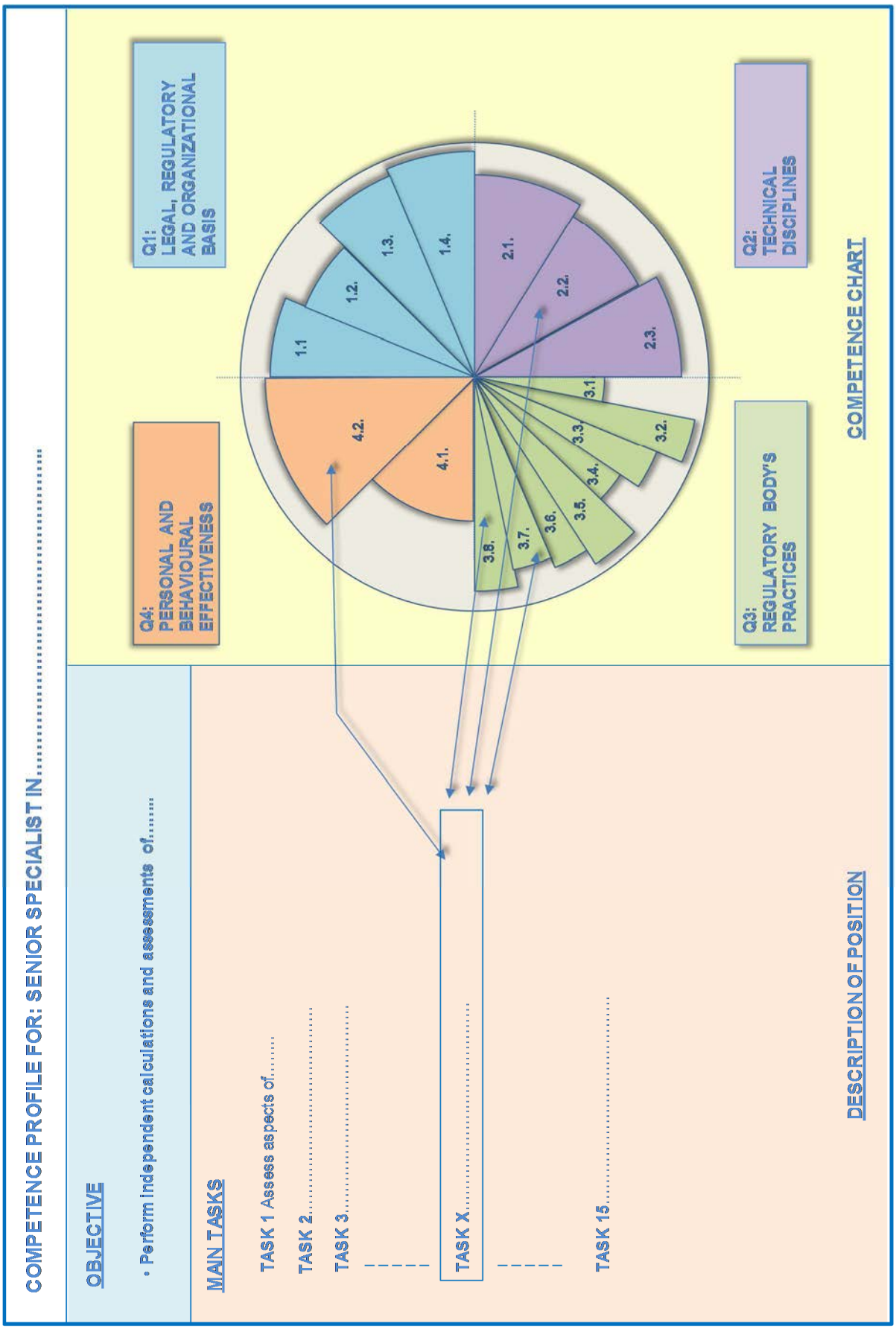

FIG. 5. Construction of the competence profile for a given position

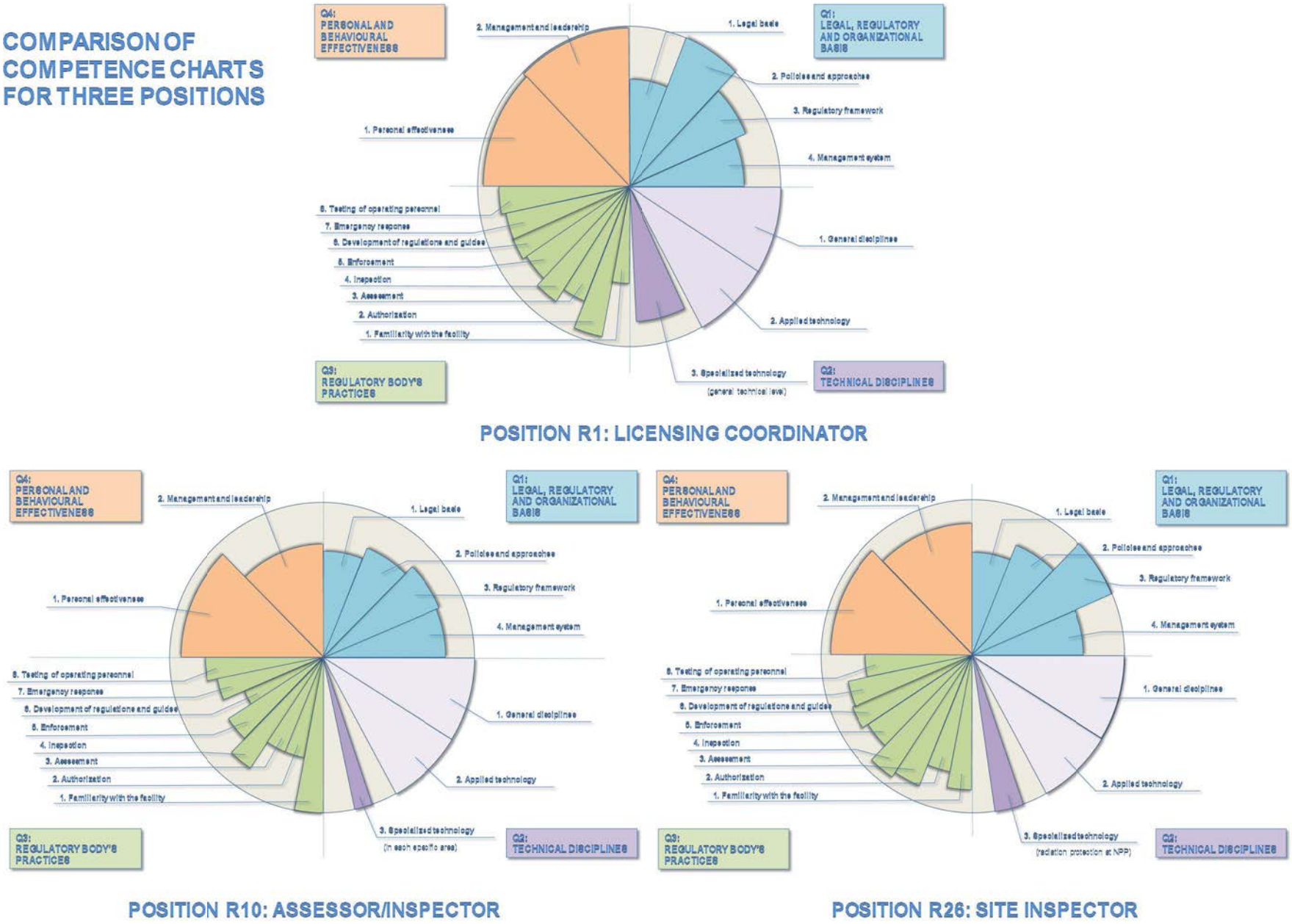

FIG. 6. Comparative view of three competence charts

*In **Annex VII,** the methodology is applied in detail to three key positions in the core workforce, chosen for their distinctive characteristics and because they form the nucleus of all the positions needed in a nuclear regulatory body. They are: licensing coordinator, site inspector and specialist (assessor and inspector) in mechanical system safety. The first two positions stand alone, while the third is representative of a group of assessors and inspectors (obviously, a set of positions is needed for specialists in the various technical disciplines, but the general characteristics of these positions are very similar).*

This exercise has demonstrated that the model adopted by CReAN is fit for practical application.

5.2. IN-HOUSE STAFF TRAINING

Once the core workforce for nuclear reactor licensing and control has been decided, and the competence profile defined for each position, the challenge is to guarantee the acquisition, development and maintenance of these competences through an adequate forward-looking vision for the organization, in the context of each country's nuclear programme.

This requires strategic planning of staff training and development activities, taking into account the following elements as a minimum:

- A formal programme (as part of the regulatory body's management system) with a systematic approach to identifying needs and managing training;
- Job-specific training (using in-house or external human resources);
- On-the-job training (OJT) through formal programmes;
- Continuing education through formal programmes aimed at developing and maintaining specific competences at each stage of the career. Possibility to self-manage continuing education at the expert level;
- An institutional system for recording training activities with the possibility of follow-up by the individual;
- Training activities linked directly to promotion or career advancement.

This institutional training and development plan will need to be linked to the regulatory body's knowledge management policies, which will address the maintenance of the organization's competences more specifically. Knowledge management strategies and mechanisms are not covered by these Guidelines.

5.2.1. On-the-job training

One aspect of this stage that deserves special attention, for two reasons, is on-the-job training. Firstly, this type of training is important because it is considered to be the best, and sometimes the only, means of acquiring the highly specialized knowledge and skills required for certain regulatory competences, for example advanced safety analysis tools and methodologies or innovative inspection and assessment techniques. Secondly, there are substantial difficulties in establishing a formal programme to cover this kind of training, which may involve work not only at the regulatory body's headquarters, but also at the facilities regulated and at other organizations, on a national and international scale.

Discussions held under the CReAN project led to the conclusion that, for such a network to be possible and to function efficiently, a number of elements need to be incorporated. These elements are presented and discussed below, with a view to their being taken into account if such a network were to be designed in the future.

(a) *A list of possible topics for on-the-job training (OJT) placements should be drawn up. Generally speaking, it should include specific, highly specialized topics such as new issues, methodologies or tools related to licensing and supervision. Another topic of clear relevance to an OJT programme is exchange among site inspectors.*

(b) *A regional catalogue should be put together of reference centres for possible OJT placements. The catalogue should include the following:*
- *headquarters of regulatory bodies;*
- *nuclear power plants;*
- *research reactors;*
- *nuclear fuel cycle facilities;*
- *TSOs, technology or research centres;*
- *construction and/or engineering companies;*
- *service providers;*
- *equipment manufacturers.*

(c) *Terms of references and basic standards should be drawn up to define and regulate the placement programme. One option is to establish a minimum commitment from each country (e.g. agreement to host a minimum number of OJT placements), but it seems more appropriate not to be prescriptive in this regard, so that placements might be arranged between the visiting and host organizations as the need or opportunity arises. It does, however, appear necessary to establish general criteria with respect to costs and logistics, to avoid disparities and the need to agree these details case by case. The criteria should promote equality and efficiency to facilitate exchanges (e.g. it would make sense for the visiting country to cover travel and accommodation expenses, while the host country covers costs and arrangements relating to the work itself.)*

(d) *In order to regulate the aspects mentioned above, in particular in (c), interested countries would need to sign up to a framework agreement supporting the activities of the OJT network.*

(e) *Consideration should be given to the possibility of integrating some OJT activities into the cooperation programmes of international organizations that offer competence development opportunities to regulators.*

(f) *OJT activities should not be seen as a tutorial intended for junior regulators; rather, as an exchange between experienced regulators.*

(g) *This kind of training must be completely formal in nature, and integrated into each organization's strategic training plan.*

5.2.2. International training opportunities

In relation to job-specific training and continuing training, once the national and regional capacities have been identified, it is highly likely that gaps will be identified in knowledge and experience of specialized or new technologies. In such cases, opportunities available internationally should be explored as a means of supporting nuclear regulator training and thus promoting nuclear safety in all countries. This includes the technical cooperation programmes offered by the IAEA and EU, and courses, tutorials and other training activities at regulatory bodies or technical support organizations (TSOs) in other countries, through bilateral and multilateral agreements.

The CReAN project looked into several alternatives for training in specialized technology and continuing education for senior regulatory officers through international reference institutions. As a result, contact was made with high-level representatives of the European Nuclear Safety Training and Tutoring Institute (ENSTTI), the Spanish Technological Platform for Nuclear Fission (CEIDEN) and the Tecnatom engineering company and service provider. All these entities offer or arrange a wide range of training in nuclear safety and technology, including specific training for regulators. This contact revealed a great willingness on the part of these organizations to complement national or regional programmes to build the competences of staff at regulatory bodies, and the feasibility of realizing these activities under the existing cooperation programmes.

6. CAREER PROGRESSION

For the training, development and learning element, some guiding principles are: (g) Ensure that training and development strategies enable staff, in particular expert staff and managers, to have equitable access to personal development opportunities (taken from [4] (2.1.3)).

Stage 4 objective:

6.1 Establish a career model that focuses on the individual and promotes competence accreditation, development and maintenance.

6.1. CAREER MODEL

The post-Fukushima IAEA Action Plan on Nuclear Safety [2] has established capacity building in Member States as one of its 12 actions. The IAEA devised an integrated capacity building approach that includes human resource development as one of its four pillars.

Few publications elaborate on the strategies and mechanisms for achieving adequate human resource development within the regulatory body, beyond training and development. That is why career progression is covered here, and certain aspects are discussed that may serve as a starting point for addressing this topic in the future.

Strategies for achieving the objective:

- Career outline for staff at the regulatory body, based on the competence levels to be attained;
- Competence-based performance appraisal;
- Mobility and promotion linked to acquisition and development of the required competences;
- Accreditation for competences.

Human resource development and knowledge management policies should promote a competence-based approach to career progression.

*The countries participating in the project have identified two good practices in relation to the aforementioned aspects; they are presented in **Annex VIII** and may provide assistance or guidance in achieving the objective for this stage. The first relates to the use of performance indicators, which are crucial in the context of a career progression model based on performance appraisal. The second, concerning the certification of competences, relates to the categorization of inspectors.*

Figure 7 is a schematic representation of the training process and competence-based career progression of a senior officer in nuclear reactor regulation, as defined in this document. The chart includes some of the elements discussed in the preceding sections.

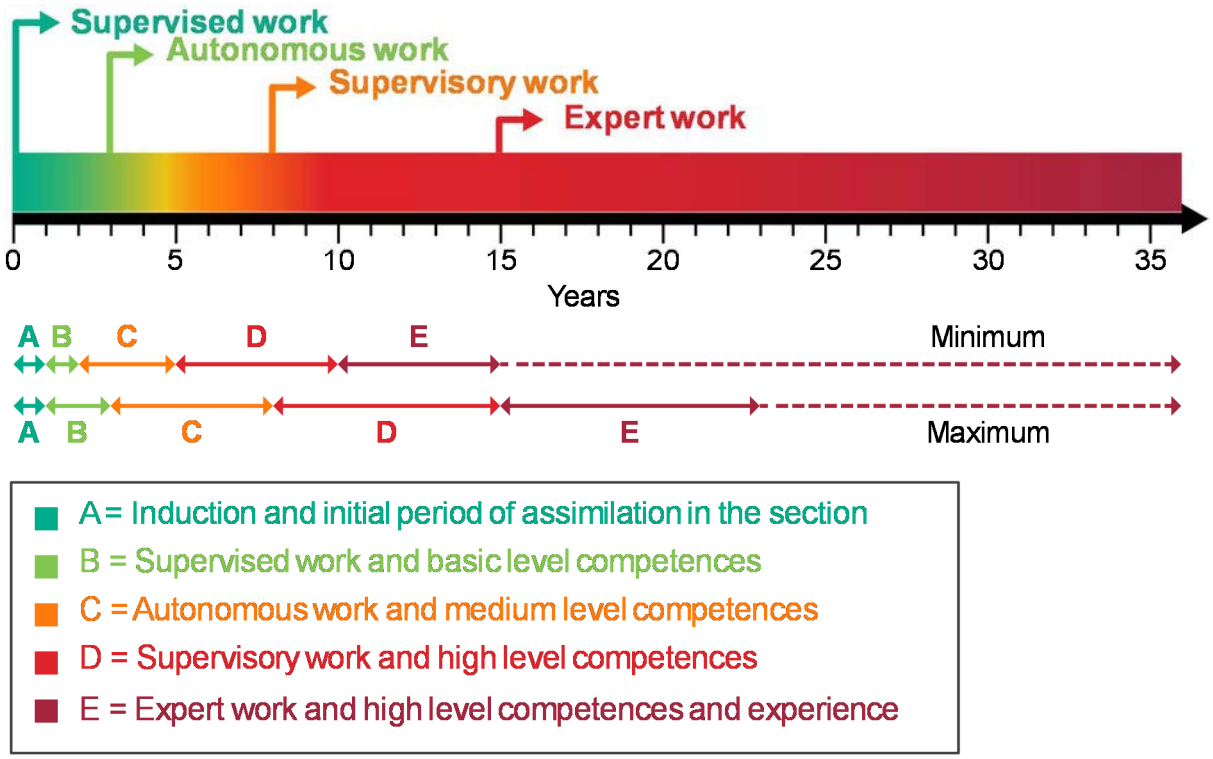

FIG. 7. Timeline of competence acquisition for a senior professional

Table 3 on the next page, which refers to some of the infrastructure available in the region and some of the good practices identified, provides an example that outlines the programme for competence acquisition and development (ProgCAD) proposed in these Guidelines.

TABLE 3. EXAMPLE OUTLINING THE PROGRAMME FOR COMPETENCE ACQUISITION AND DEVELOPMENT (PROGCAD) PROPOSED IN THESE GUIDELINES

STAGE	WORK	MAIN TRAINING ELEMENTS OF STAGE
Recruitment	Candidates in selection process	COMPETENCE-BASED JOB PROFILES Regulatory body proactive in promoting the basic disciplines of interest for its candidates (example of good practice in Spain: link between the regulatory body and universities). Test for the position with specific technical content.
Joining the regulatory body	Induction + initial period of assimilation in the section	INDUCTION COURSE On-boarding of new staff in the regulatory body (example of good practice in Spain). Initial period of assimilation in the section • guided reading • short placements at nuclear power plants • consolidation of knowledge of the regulatory framework, management system, etc. 6 months to 1 year
Training in applied technologies	Supervised work + basic level competences	POSTGRADUATE STUDIES IN RADIATION PROTECTION AND NUCLEAR SAFETY (based on the IAEA syllabus) Example of good practice in Argentina (regional training centre in Spanish). Example of good practice in Brazil (regional training centre in Portuguese). Start of first stage of on-the-job training with formal plans and records. Training under an appointed mentor. 1 to 2 years.

TABLE 3. EXAMPLE OUTLINING THE PROGRAMME FOR COMPETENCE ACQUISITION AND DEVELOPMENT (PROGCAD) PROPOSED IN THESE GUIDELINES (cont.)

STAGE	WORK	MAIN TRAINING ELEMENTS OF STAGE
Training in specialized technologies + start of professional career	Transition from supervised to autonomous work + basic/medium level competences	Continuing on-the-job training. NPP systems and facilities familiarization courses (given by the operator). Familiarization with the regulatory body's assessment/inspection procedures. Participation in regulatory inspections. Use of measuring equipment; IT tools; English language.
	Autonomous work + medium level competences	Building of autonomous experience in the field. External training (internships) at regional or international reference organizations. Use of technical cooperation mechanisms (IAEA, EU, bilateral agreements between regulatory bodies, etc.). Use of specific calculation codes. Training in basic management and leadership skills. Retraining. Beginning of competence certification. 3 to 5 years.
Career progression	Supervisory work + high level competences	Continuing education through formal programmes. Use of technical cooperation mechanisms (IAEA, EU, bilateral agreements between regulatory bodies, etc.). Scientific visits. Training in project management, planning and organization of work. Development of leadership, communication and negotiation competences. Teacher training (for the training of new staff). Ongoing certification of competences. Establishment of hierarchy. Example of good practice in Brazil (process of certifying and establishing the hierarchy of inspectors). 5 to 7 years.
	Expert work + high level competences + experience	Continuing education through a personalized and self-managed programme. Teaching experience: training of trainers. Participation in technical peer exchange forums. Knowledge management: preservation and transfer of expert knowledge. 5 to 8 years.

REFERENCES

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Governmental, Legal and Regulatory Framework for Safety, IAEA Safety Standards Series No. GSR Part 1 (Rev.1), IAEA, Vienna (2016).

[2] INTERNATIONAL ATOMIC ENERGY AGENCY, IAEA Action Plan on Nuclear Safety, Report by the Director General, GOV/2011/59-GC(55)/14, IAEA, Vienna (2011).

[3] INTERNATIONAL ATOMIC ENERGY AGENCY, NOTE BY THE SECRETARIAT, Strategic Approach to Education and Training in Nuclear Safety 2013–2020, IAEA, Vienna (2013).

[4] INTERNATIONAL ATOMIC ENERGY AGENCY, Managing Regulatory Body Competence, Safety Reports Series No. 79, IAEA, Vienna (2013).

[5] INTERNATIONAL ATOMIC ENERGY AGENCY, Methodology for the Systematic Assessment of the Regulatory Competence Needs (SARCoN) for Regulatory Bodies of Nuclear Installations, IAEA-TECDOC-1757, IAEA, Vienna (2014).

[6] INTERNATIONAL ATOMIC ENERGY AGENCY, Integrated Regulatory Review Service (IRRS) Guidelines for the Preparation and Conduct of IRRS Missions, IAEA Services Series 23, IAEA, Vienna (2013).

[7] INTERNATIONAL ATOMIC ENERGY AGENCY, Establishing the Safety Infrastructure for a Nuclear Power Programme, IAEA Safety Standards Series No. SSG-16, IAEA, Vienna (2012).

ANNEX I

ACADEMIC COURSES IN APPLIED NUCLEAR TECHNOLOGY OFFERED IN FORO COUNTRIES

COURSES ON OFFER	UNDERGRADUATE AND PRE-UNIVERSITY	POSTGRADUATE
ARGENTINA	DAN BENINSON INSTITUTE OF NUCLEAR TECHNOLOGY • Undergraduate degree in nuclear applications • Introductory course to nuclear technology (additional training for nuclear power reactor staff). JORGE SÁBATO INSTITUTE OF TECHNOLOGY • Materials engineering BALSEIRO INSTITUTE • Nuclear engineering NUCLEAR REGULATORY AUTHORITY (ARN) with backing from the IAEA Technical course in radiation protection	JORGE SÁBATO INSTITUTE OF TECHNOLOGY • Specialization in non-destructive testing • Masters and PhD in materials science and technology DAN BENINSON INSTITUTE OF NUCLEAR TECHNOLOGY • PhD in nuclear technology • Specialization in nuclear reactors and their fuel cycle • Postgraduate training course in nuclear reactors and their fuel cycle (in English, for foreign students) BALSEIRO INSTITUTE • Masters and PhD in nuclear engineering (Spanish/English) UNIVERSITY OF BUENOS AIRES (UBA) — FACULTY OF ENGINEERING AND ARN with backing from the IAEA • Specialization in radiation protection and safety of radiation sources • Specialization in nuclear safety UNIVERSITY OF BUENOS AIRES (UBA) — FACULTY OF ENGINEERING, NATIONAL UNIVERSITY OF CUYO (UNCUYO), BALSEIRO INSTITUTE, NATIONAL ATOMIC ENERGY COMMISSION (CNEA) • Specialization in technological applications of nuclear energy

COURSES ON OFFER	UNDERGRADUATE AND PRE-UNIVERSITY	POSTGRADUATE
BRAZIL	NUCLEAR AND ENERGY RESEARCH INSTITUTE (IPEN) in collaboration with various universities in the country and the FEDERAL UNIVERSITY OF RIO DE JANEIRO (UFRJ) • Nuclear engineering	NUCLEAR ENGINEERING INSTITUTE (IEN) with NATIONAL NUCLEAR ENERGY COMMISSION (CNEN) • Masters in nuclear science and technology In collaboration with the Military Institute of Engineering • Masters in nuclear engineering NUCLEAR TECHNOLOGY DEVELOPMENT CENTRE (CDTN) • Masters and PhD theses related to the IPR-R1 research reactor • Postgraduate course in radiation, minerals and materials science and technology • Postgraduate course in nuclear science and technology NUCLEAR AND ENERGY RESEARCH INSTITUTE (IPEN) • Postgraduate studies in nuclear technology (IPEN/University of São Paulo (USP)) • Postgraduate studies in nuclear engineering (IPEN/RJ) FEDERAL UNIVERSITY OF MINAS GERAIS (UFMG) • Various postgraduate studies in the nuclear field • Masters and PhDs in nuclear engineering and energy planning, and in radiation sciences UFRJ/ALBERTO LUIZ COIMBRA INSTITUTE FOR GRADUATE STUDIES AND RESEARCH IN ENGINEERING (COPPE) • Masters and PhDs in the nuclear field The Nuclear Engineering Programme cooperates at a national level with the CNEN, IEN, the Institute of Radiation Protection and Dosimetry (IRD), the UFRJ Physics Institute, the Brazilian Center for Research in Physics (CBPF), the University of Campinas (Unicamp), the Federal University of Pernambuco (UFPE), the Federal Technical University of Paraná (UFTPR), the Federal University of Paraná (UFPR) and USP, among others.
CUBA	HIGHER INSTITUTE OF TECHNOLOGIES AND APPLIED SCIENCES (InSTEC) • Engineering in energy and nuclear technology • Nuclear physics degree	HIGHER INSTITUTE OF TECHNOLOGIES AND APPLIED SCIENCES (InSTEC) • Relevant postgraduate courses • Masters and PhD programmes in the nuclear field

COURSES ON OFFER	UNDERGRADUATE AND PRE-UNIVERSITY	POSTGRADUATE
	• Radiochemistry degree	
CHILE	In Chile, there are currently no national undergraduate or postgraduate courses available offering basic and specialized training in nuclear reactor safety. The undergraduate courses offered in technological or scientific subjects, which provide the foundations for further postgraduate studies in nuclear safety, are too numerous to be included here. Information on the courses available at some 60 Chilean higher education facilities can be accessed via the website http://www.universia.cl/.	PONTIFICAL CATHOLIC UNIVERSITY (PUC) • Masters in energy engineering Specialized non-degree courses: • Diploma in nuclear power (PUC) • Courses in radiation protection (various universities)
SPAIN	With regard to undergraduate training, Spain has a variety of specialized university courses in engineering that cover the fundamentals of nuclear reactor safety and technology. It is unclear whether there is a catalogue of all these courses. It would be useful to have such information available; this activity could be undertaken by the CEIDEN training group (CEIDEN F+). CEIDEN is the Spanish technological platform for research in nuclear fission.	There is also a wide range of postgraduate training offered in Spain, with three Masters courses providing basic and specialized training in nuclear reactor safety and technology, two of which are dedicated exclusively to nuclear energy, while the third focuses on power generation. Moreover, there are other courses and Masters degrees which include, to varying extents, basic and specialized training in different areas. CEIDEN F+ has produced a catalogue of postgraduate nuclear training, which is currently being updated and improved.

COURSES ON OFFER	UNDERGRADUATE AND PRE-UNIVERSITY	POSTGRADUATE
MEXICO	NATIONAL POLYTECHNIC INSTITUTE Physics degree. Elective in nuclear engineering.	NATIONAL AUTONOMOUS UNIVERSITY OF MEXICO (UNAM). NUCLEAR SCIENCE INSTITUTE Masters and PhDs in: • Atomic and molecular physics • Nuclear physics • Radiation chemistry • Radiochemistry UNAM FACULTY OF ENGINEERING Masters and PhDs in: • Energy engineering AUTONOMOUS UNIVERSITY OF ZACATECAS • Masters in nuclear sciences
URUGUAY	Uruguay has a wide range of undergraduate courses in science and engineering, mainly at the University of the Republic of Uruguay. The university's Nuclear Research Centre also offers a number of short courses on radioactive source applications and handling, such as a three-month course on radioisotope methodology. However, to date, there is no complete undergraduate or postgraduate training in radiation protection, nuclear engineering or nuclear safety.	

ANNEX II

GOOD PRACTICES THAT ESTABLISH A LINK BETWEEN THE REGULATORY BODY AND UNIVERSITIES

II-1. SPAIN — ESTABLISHMENT OF UNIVERSITY CHAIRS

A noteworthy area of activity related to capacity building is the involvement of the organizations generating demand — the regulatory bodies in this case — in promoting supply.

One good practice identified in this area is the establishment of university chairs by the regulatory body, primarily to promote and support the development of professional interest in the activities of nuclear regulators. In Spain, the Nuclear Safety Council (CSN) has been implementing this practice since 2005, to positive effect. This section provides a summary of this approach as an example of good practice.

In 2005, the CSN signed agreements with two public universities (the ones that were most prominent in the fields of nuclear safety and technology and radiation protection) for the establishment of three chairs. A fourth chair was established in 2015. The budgetary allocation is €70 000 per chair.

The chief objectives, as set out in the agreements, are to:

- complement the training of undergraduate and postgraduate students and CSN technical staff (newly recruited or otherwise) in subjects related to nuclear engineering and nuclear safety[1];
- undertake work for end-of-degree and PhD theses and participate in PhD courses related to nuclear engineering and nuclear safety[2];
- coordinate and support research projects related to nuclear engineering and nuclear safety;
- promote the creation and development of, and participation in, university and research networks at the national and international level.

This helps to build the capacities of the regulatory body by:

1) steering students towards nuclear safety and technology → the vast majority of those receiving assistance from the chairs go on to join the nuclear sector;
2) incorporating material related to nuclear safety and technology into taught programmes at the universities;
3) bolstering technology and safety training → development of new courses and teaching material, more training of students and professionals from the regulatory body and the sector in general;
4) supporting knowledge networks;
5) integrating the results and knowledge obtained through R&D into the training of students and professionals.

For each chair, there is a CSN–university joint commission that monitors the chair's activities, devises and approves the annual action plans, approves expenditure and discusses

[1] In practice, the chair's activities also serve to complete the training of staff at organizations in the nuclear sector.

[2] In addition to receiving grants for undergraduate, Masters and PhD theses, students can also obtain funding, through the chairs, to attend international courses and meetings of interest.

the possible improvement or expansion of activities. Both parties are represented on these commissions at a high institutional and technical level (a member of the CSN Plenary presides over the commission).

II-1.1. Activities of Chair: Juan Manuel Kindelán

By way of example, summarized below is a paper that was presented to an annual meeting of the Spanish Nuclear Society on the activities of one of the CSN's chairs: Juan Manuel Kindelán, chair at the Higher Technical School for Mining and Energy Engineering (ETSIME) of the Technical University of Madrid.

The objectives of the chair are to:

- complement the students' training with specific instruction related to nuclear technology and safety;
- complement postgraduate training in nuclear engineering with subjects of particular interest to the CSN and engineering companies in the sector;
- award grants for PhDs and end-of-degree theses in relevant subjects;
- foster cooperation with foreign research centres and universities to complement the training of students and lecturers.

The following activities are anticipated:

- implementation of specific undergraduate and postgraduate courses, with the collaboration of technical staff from the CSN and other companies and institutions with ties to the nuclear sector;
- awarding of grants for end-of-degree theses related to nuclear safety and radiation protection;
- awarding of grants for PhD theses;
- awarding of grants and provision of assistance for training lecturers and postgraduate students at centres in Spain and other countries;
- coordination of R&D projects and fostering of cooperation with foreign research centres and universities.

During his ten years in the position, Mr Kindelán has organized the following courses for ETSIME's engineering students and graduates:

- "Analysis of nuclear facility safety" (30 hours), held eight times, with an average of 40 students enrolled each time;
- "Industrial applications of radiation and radiation protection" (30 hours), held eight times, with an average of 40 students enrolled;
- "Analysis of NPP accident sequences" (30 hours), held twice, with an average of 25 students enrolled.

Since these courses have been held, there has been a 30% increase in the number of ETSIME students pursuing subjects related to nuclear engineering.

In addition, a postgraduate course has been organized every year. The courses are one off, and a new one is organized each year. The courses organized so far are as follows:

- 2005 — Integrated methodologies for safety analysis;
- 2006 — Thermal hydraulic codes: use and applications of the TRACE code;

- 2007 — Operation and risk analysis in shutdown;
- 2008 — Changes to technical operating specifications based on risk-informed analysis;
- 2009 — Monitoring, inspection and maintenance at NPPs;
- 2010 — Safety analysis methodologies using uncertainty calculations;
- 2011 — TRACE code applications (basic and intermediate level);
- 2012 — Lessons learned from the TEPCO Fukushima Daiichi accident: analysis and management of the radiological impact of nuclear accidents;
- 2013 — Human and organizational factors in systems with high safety requirements.

In addition, a lot of grants have been awarded for PhD and end-of-degree theses. Two or three doctoral grants and two or three grants for end-of-degree theses are awarded each year, depending on the proposals received. An analysis of all the graduates who received grants shows that 75% are currently working in the nuclear sector.

Lastly, it should be noted that the chair has also paid for PhD students and trainee lecturers to attend courses and congresses in Spain and other countries.

ANNEX III

DEFINING A CORE WORKFORCE OF NUCLEAR REGULATORS

III-1. INTRODUCTION

In fulfilment of objective 4.1 of the stage 'Recruitment of technical staff to the regulatory body', a basic set of positions has been defined, comprising the regulators required at the various stages in the nuclear reactor licensing and control process, in order to ensure effective and autonomous control at all stages in the reactor's life cycle. They have been denominated as the 'core workforce'. The number of regulators needed for each position in the core workforce will depend on the regulatory body's size and structure, which are defined as the country's nuclear programme develops.

The core workforce comprises 28 nuclear regulator positions, each with its own objective and main tasks. Each position in the core workforce has a code comprising the letter 'R' for regulator and an assigned number 'i'. The table below shows the 28 positions defined.

CODE	POSITION
R1	NPP licensing coordinator
R2	Senior specialist in thermohydraulic assessment
R3	Senior specialist in neutronic assessment
R4	Senior specialist in natural and human-induced event analysis
R5	Senior specialist in nuclear safety
R6	Senior specialist in radiation protection
R7	Senior specialist in physical protection
R8	Assessor/auditor of the licensee's quality management system
R9	Assessor/inspector of civil and mechanical structure safety
R10	Assessor/inspector of mechanical system safety
R11	Assessor/inspector of electrical system safety
R12	Assessor/inspector of reactor instrumentation and control safety
R13	Assessor/inspector of safety systems
R14	Assessor/inspector for internal flooding and fires
R15	Site coordinator for engineering inspections and assessments
R16	Inspector of mechanical system construction, assembly and commissioning
R17	Inspector of electrical system construction, assembly and commissioning
R18	Inspector of instrumentation and control system construction, assembly and commissioning
R19	Inspector of the main contractor's quality management system
R20	Senior specialist in probabilistic safety assessment
R21	Senior specialist in human factors engineering
R22	Senior specialist in organizational aspects and safety culture
R23	Senior specialist in severe accident analysis
R24	Senior specialist in the assessment of operators in nuclear and radiation safety
R25	Senior specialist in emergency plan assessment
R26	Site inspector
R27	Senior specialist in operating experience
R28	Senior specialist in radioactive waste management

The regulatory process used to define the core workforce should be seen as a typical model of nuclear reactor authorization and control, based on the experience of FORO countries. It does not represent the licensing system of a particular country, and the intention is not to create a

standard process. This model can serve as a guide both for countries with nuclear capacities seeking to enhance their regulatory programmes, and for those embarking on a nuclear programme.

Nuclear reactor licensing and control is carried out in stages, each one subject to review and assessment, taking into account the outcomes of the previous stages. In general, the licensing and control processes in the region have five stages: siting, construction, commissioning, operation and decommissioning. Each stage has specific activities that need to be carried out by the regulator, and specific competences required of the regulatory staff involved.

The licensing process begins when the would-be operating organization (OO) notifies the regulatory body (RB) of its intent to construct a nuclear reactor. The RB establishes the regulatory framework for licensing the reactor, which includes the reference standards and details of the documents to be submitted by the OO. The stage-by-stage licensing of a nuclear power reactor is, therefore, a formal interactive process between the RB and the OO.

III-2. STAGES IN LICENSING A NUCLEAR REACTOR

The typical stages in the licensing process are described briefly below, with a view to highlighting the competences that the RB needs at its disposal to perform the licensing and control tasks that will ensure compliance with the safety standards established for the new NPP. A list of regulator positions considered necessary for each stage is also included, along with justification for their inclusion.

III-2.1. Siting stage

The site authorization process includes carrying out an appropriate site assessment and defining the design bases for the nuclear reactor, and how the reactor will interact with the site in both normal and accident conditions.

The OO assesses the safety of the proposed site with respect to the frequency and severity of natural and human-induced phenomena and external events that could affect the reactor. Where this is a possibility, the OO evaluates the risk and formulates the design bases for addressing these events and phenomena, based on a time period that covers the projected lifetime of the nuclear reactor.

The OO also looks into features of the region's natural environment that may be affected by the radiological impact in all operating modes and in accident conditions, and considers the total nuclear power that can be installed at the site. In addition, it verifies that the site allows for emergency response and that a physical protection system can be installed.

The assessments resulting from these studies are compiled in a document generically referred to as a site study, in which the OO demonstrates the viability of the site for NPP construction and presents the design bases for phenomena and external events, along with possible equipment or installations that could be used to compensate for any unacceptable impact that the reactor might have on the region.

Furthermore, the OO carries out an environmental impact assessment (EIA), the scope of which is defined by the respective competent authorities. The RB only establishes the scope and content of the radiological environmental impact assessment. The radiological environmental impact assessment must be approved by the RB, and the EIA must be approved by the relevant control authority before the RB can issue a siting licence.

In order to assess the site study (which includes the radiological environmental impact assessment) and to perform measurement and assessment tasks (carried out by the RB or consultants) at the site, the following regulator positions are considered necessary at this stage:

R_i	REGULATOR POSITION	MAIN TASKS DURING THIS STAGE
R1	NPP licensing coordinator	Plan, organize, direct and supervise the regulatory body's activities related to NPP site assessment; represent the RB before the OO.
R4	Senior specialist in natural and human-induced event analysis	Represent the RB before institutions specializing in natural and human-induced event analysis; coordinate the work of RB specialists and/or external consultants in this area.
R5	Senior specialist in nuclear safety	Check site safety aspects such as heat dissipation capacity, external supply of electricity and viability of emergency response.
R6	Senior specialist in radiation protection	Evaluate the radiological environmental impact assessment and advise on related regulatory actions.
R7	Senior specialist in physical protection	Check the viability of the site for installing a physical protection system.
R8	Assessor/auditor of the licensee's quality management system	Assess the OO's quality management system and audit its application in all site assessments and measurements carried out.

When assessing the site study — and any other document submitted to the RB by the OO at the various stages of NPP licensing — the team maintains open communication with OO representatives to exchange technical information in an interactive process that includes the provision of additional information. To the extent possible, any issues are resolved informally. Depending on the safety significance, however, a formal action may need to be taken by means of a request for information, a recommendation or a requirement.

III-2.2. Construction stage

Once the siting licence has been obtained, the OO submits an application for a construction licence along with the preliminary version of the safety analysis report (SAR) and other documents that the RB needs to review and assess. A typical SAR, as set out in the IAEA Safety Guide No. GS-G-4.1[3], covers all the topics to be considered in the RB's analysis and, consequently, the competences required of the staff involved in the task.

The review and assessment are completed when the RB is satisfied that the applicant is in a position to establish and maintain a level of nuclear and radiation safety that meets the standards set for NPP construction. The RB then issues the construction licence, which authorizes the OO, under specific conditions, to begin construction of the NPP.

The RB monitors compliance with the construction licence and with the requirements of safety and engineering standards applicable to the construction and assembly of reactor components. To this end, a team of inspectors is sent to the site to cover daily tasks and perform inspections of the construction work, together with other representatives of the RB and external consultants. The team also carries out nuclear and radiation safety assessments in

[3] IAEA Safety Guide No. GS-G-4.1 Format and Content of the Safety Analysis Report for Nuclear Power Plants.

support of periodic audits and inspections of various safety aspects related to NPP construction and assembly. These assessments require specialists in various technical disciplines, possibly including highly specialized topics, for which external experts are generally used.

The RB needs a team of specialist regulators to assess the preliminary version of the SAR and other documents, perform inspection tasks to corroborate the assessments made, and verify that the civil construction and assembly of components are in compliance with engineering standards. The following positions are considered necessary for this stage:

R_i	REGULATOR POSITION	MAIN TASKS DURING THIS STAGE
R1	NPP licensing coordinator	As for the siting stage, with a focus on activities related to regulatory control of NPP construction.
R2	Senior specialist in thermohydraulic assessment	Perform independent calculations and conceptual assessments of thermohydraulics related to the preliminary version of the SAR; perform assessments in support of inspections, participating as necessary.
R3	Senior specialist in neutronic assessment	Perform independent calculations and conceptual assessments of neutronics related to the preliminary version of the SAR; perform assessments in support of inspections, participating as necessary.
R4	Senior specialist in natural and human-induced event analysis	Participate in inspections during the implementation of technical solutions to protect against natural or human-induced phenomena at the site.
R5	Senior specialist in nuclear safety	Coordinate the assessment of the preliminary SAR and supervise safety inspections and/or assessments carried out by R9–R14; act in place of R1 when he/she is absent.
R6	Senior specialist in radiation protection	Participate in the assessment of the preliminary SAR by performing independent calculations and conceptual assessments of the radiation protection of workers and the public; perform assessments in support of inspections, participating as necessary.
R7	Senior specialist in physical protection	Analyse intrusion scenarios and develop technical solutions for their prevention; conduct regulatory inspections in his/her area of technical expertise.
R8	Assessor/auditor of the licensee's quality management system	As for the siting stage, with a focus on quality assurance/quality control (QA/QC) of all aspects of construction, including the manufacture of safety-related components.
R9	Assessor/inspector of civil and mechanical structure safety	Perform independent calculations and conceptual assessments of civil and mechanical structure safety; perform regulatory inspections and audits in his/her area of technical expertise.
R10	Assessor/inspector of mechanical system safety	Perform independent calculations and conceptual assessments of mechanical system safety; perform regulatory inspections and audits in his/her area of technical expertise.
R11	Assessor/inspector of electrical system safety	Perform independent calculations and conceptual assessments of electrical system safety; perform regulatory inspections and audits in his/her area of technical expertise.
R12	Assessor/inspector of reactor instrumentation and control safety	Perform independent calculations and conceptual assessments of instrumentation and control safety; perform regulatory inspections and audits in his/her area of technical expertise.

R_i	REGULATOR POSITION	MAIN TASKS DURING THIS STAGE
R13	Assessor/inspector of safety systems	Perform independent calculations and conceptual assessments of safety systems from a functional and integrated point of view; perform regulatory inspections and audits in his/her area of technical expertise.
R14	Assessor/inspector for internal flooding and fires	Perform independent calculations and conceptual assessments of the internal fire and flooding risk and develop technical solutions for its prevention; perform regulatory inspections and audits in his/her area of technical expertise.
R15	Site coordinator for engineering inspections and assessments	Organize and coordinate regulatory inspections and assessments to confirm that the civil construction and assembly of equipment, components and systems comply with applicable engineering standards; determine what needs to be inspected, and when, to verify compliance with the current licence.
R16	Inspector of mechanical system construction, assembly and commissioning	Analyse documentation and industrial standards applicable to the construction, assembly and commissioning of mechanical systems; perform regulatory inspections and audits in his/her area of technical expertise.
R17	Inspector of electrical system construction, assembly and commissioning	Analyse documentation and industrial standards applicable to the construction, assembly and commissioning of electrical systems; perform regulatory inspections and audits in his/her area of technical expertise.
R18	Inspector of instrumentation and control system construction, assembly and commissioning	Analyse documentation and industrial standards applicable to the construction, assembly and commissioning of instrumentation and control systems; perform regulatory inspections and audits in his/her area of technical expertise.
R19	Inspector of the main contractor's quality management system	Assess the quality management system of the main contractor and audit its application at the site.

While the NPP is being built, the OO drafts the documents that demonstrate its operational safety, in particular the final version of the SAR and the Level 1 probabilistic safety assessment (PSA). The RB maintains fluid communication with the OO, exchanging technical information on safety aspects, which includes the provision of advance draft chapters of these documents or other safety assessments performed by the OO.

Consequently, the OO specialists and the RB analysts participate in a technical information exchange whereby all parties express their views freely without the need for formal communication from the OO or a regulatory decision. Upon beginning the PSA information exchange, a new regulator position needs to be created:

R_i	REGULATOR POSITION	MAIN TASKS DURING THIS STAGE
R20	Senior specialist in probabilistic safety assessment	Perform conceptual assessments of the PSA, taking into consideration the anticipated operation, maintenance management and periodic testing of safety systems; carry out regulatory studies and audits in his/her area of technical expertise.

The documentation drawn up by the OO for nuclear reactor commissioning and operation includes an analysis of the incidence of human factors in reactor operation, which should show, inter alia, that the necessary measures have been taken to establish a safety culture

whereby the workers and management of the OO are individually and collectively committed to safety. Likewise, even if the PSA shows the probability of core meltdown to be acceptably low, the OO still needs to devise a severe accident management programme for assessment and approval by the RB.

The specialized nature of these new topics necessitates the creation of the following regulator positions:

R_i	REGULATOR POSITION	MAIN TASKS DURING THIS STAGE
R21	Senior specialist in human factors engineering	Assess human factors in NPP operational safety; perform regulatory inspections and audits in his/her area of technical expertise.
R22	Senior specialist in organizational aspects and safety culture	Assess organizational aspects related to NPP operation and the safety culture of the OO and its contractors and consultants; perform regulatory inspections and audits in his/her area of technical expertise.
R23	Senior specialist in severe accident analysis	Assess all actions planned in the event of a beyond design basis accident in order to prevent the event escalating into a severe accident, mitigate the consequences in case it does, and establish safe and stable conditions in the long term; perform regulatory inspections and audits in his/her area of technical expertise.

III-2.3. Commissioning stage

At the appropriate time, the OO prepares to begin NPP commissioning, which includes loading the fuel and moderator into the reactor. For this purpose, and sufficiently in advance, the OO devises a commissioning programme and establishes a body responsible for its implementation. This body generally takes the form of an ad hoc committee made up of qualified people with experience in the design, construction, commissioning and operation of nuclear reactors.

When the OO applies for a commissioning licence, the RB must form a team of regulators to assess the commissioning programme and the proposed body responsible for implementation. This team, either by itself or with the assistance of external experts unaffiliated with the OO, reviews the various stages of the commissioning programme, such as: loading of fuel and moderator; precriticality testing; initial criticality testing; power ramp testing; and full power testing. In addition, senior staff at the RB analyse the composition of the ad hoc committee with a view to providing a recommendation to senior management regarding its approval.

Having completed its review of the commissioning programme and approved the composition of the ad hoc committee, the RB issues the commissioning licence, which sets forth the conditions for loading the fuel and moderator, establishes the conditions for power ramping to nominal capacity, and specifies what verification and testing is required to confirm that the components, equipment and systems are in compliance with the design bases and objectives.

The regulatory activities carried out during commissioning are undertaken in the main by staff that are already involved in overseeing the construction and assembly of components and in preliminary testing.

R_i	REGULATOR POSITION	MAIN TASKS DURING THIS STAGE
R1	NPP licensing coordinator	As for the siting stage, with a focus on activities related to regulatory control of NPP commissioning.
R2	Senior specialist in thermohydraulic assessment	Assess the commissioning programme with regard to his/her area of technical expertise; perform independent calculations and assessments in support of the commissioning inspections, participating as required.
R3	Senior specialist in neutronic assessment	Assess the commissioning programme with regard to his/her area of technical expertise; perform independent calculations and assessments in support of the commissioning inspections, participating as required; perform criticality analysis.
R4	Senior specialist in natural and human-induced event analysis	Keep the analysis and control of external events up to date.
R5	Senior specialist in nuclear safety	Devise and coordinate the nuclear and radiation safety inspection and assessment programme for the commissioning stage.
R6	Senior specialist in radiation protection	As for the construction stage, with a focus on commissioning.
R7	Senior specialist in physical protection	Perform regulatory inspections in his/her area of technical expertise.
R8	Assessor/auditor of the licensee's quality management system	As for the construction stage, with a focus on commissioning.
R9	Assessor/inspector of civil and mechanical structure safety	As for the construction stage, with a focus on commissioning.
R10	Assessor/inspector of mechanical system safety	As for the construction stage, with a focus on commissioning.
R11	Assessor/inspector of electrical system safety	As for the construction stage, with a focus on commissioning.
R12	Assessor/inspector of reactor instrumentation and control safety	As for the construction stage, with a focus on commissioning.
R13	Assessor/inspector of safety systems	As for the construction stage, with a focus on commissioning.
R14	Assessor/inspector for internal flooding and fires	As for the construction stage, with a focus on commissioning.
R15	Site coordinator for engineering inspections and assessments	As for the construction stage, with a focus on commissioning.
R16	Inspector of mechanical system construction, assembly and commissioning	As for the construction stage, with a focus on commissioning.
R17	Inspector of electrical system construction, assembly and commissioning	As for the construction stage, with a focus on commissioning.
R18	Inspector of I&C system construction, assembly and commissioning	As for the construction stage, with a focus on commissioning.
R19	Inspector of the main contractor's quality management system	As for the construction stage, with a focus on commissioning.
R20	Senior specialist in probabilistic safety assessment	As for the construction stage.
R21	Senior specialist in human factors engineering	As for the construction stage, with a focus on commissioning.
R22	Senior specialist in organizational aspects and safety culture	As for the construction stage, with a focus on commissioning.
R23	Senior specialist in severe accident analysis	As for the construction stage.

The OO must complete the training of future operating personnel, as the RB requires that certain safety significant operating tasks be performed by licensed staff. In order to issue the relevant licences, the RB must be able to verify the suitability of operating personnel, hence the creation of a specialist regulator position in the assessment of operator training and development in nuclear and radiation safety.

R_i	REGULATOR POSITION	MAIN TASKS DURING THIS STAGE
R24	Senior specialist in the assessment of operators in nuclear and radiation safety	Assess proposed plans for the training and development of operators; organize the teams tasked with assessing the licences of operating personnel.

Although appropriate measures are introduced during the commissioning process, with the supervision of the RB, to ensure that the risk of accidental exposure of workers and the public is acceptably low, the possibility of accidents or incidents needs to be recognized and contingency plans established. The documentation drafted by the OO for the commissioning and operation of the reactor therefore includes an internal emergency plan, necessitating another regulator position.

R_i	REGULATOR POSITION	MAIN TASKS DURING THIS STAGE
R25	Senior specialist in emergency plan assessment	Assess the internal emergency plan; perform regulatory inspections and audits in his/her area of technical expertise.

Beginning with the commissioning of the reactor and during all subsequent stages, at least one RB representative is present on the site to oversee, monitor and directly observe the tasks and the operation of installations related to NPP safety. This position is normally filled by someone with in-depth knowledge of the facility, who has been performing inspection activities during construction (R16/R17/R18).

R_i	REGULATOR POSITION	MAIN TASKS DURING THIS STAGE
R26	Site inspector	Perform and coordinate on site the regulatory control tasks related to nuclear and radiation safety.

III-2.4. Operation stage

Giving the notice prescribed in the regulatory framework, the OO informs the RB of its intent to begin the commercial operation of the NPP and submits the relevant documents, including the final version of the SAR and the Level 1 PSA. The RB will already be familiar with these documents and will have partially assessed them during the informal exchange of technical information.

Through the final SAR, the OO demonstrates its effective fulfilment of the safety criteria laid down in specific standards and requirements, and presents a deterministic analysis of accidents at the nuclear reactor, which is adjusted during commissioning and used to determine the technical specifications that set the operating conditions and limits.

Through the Level 1 PSA, the OO demonstrates that it has achieved the safety objectives established for the nuclear reactor design and that the operating procedures are sufficient to prevent core damage, based on criteria such as an annual core damage probability of 10^{-5} or less, which is the internationally accepted value for new reactors.

The team of regulators involved in the licensing of the nuclear reactor must assess, either by itself or with the assistance of external experts unaffiliated with the OO, the SAR, the Level 1 PSA and any other documentation accompanying the licence application. The operating licence is issued when the RB can conclude, having assessed the documents submitted and performed inspections during construction and commissioning, that the operation of the nuclear reactor will be safe.

The licence is issued for a set period, usually 10 years, after which it must be renewed based on an exhaustive review of operational safety during the period covered by the expiring licence, and verification that the reactor safety is in line with modern standards. In addition, throughout the operation stage, an NPP is subject to various modifications to its design or operating specifications (e.g. a power uprate). Some of these, in particular the ones that have a major impact on safety, will need to be authorized by the RB. This generates specific licensing processes in addition to, and independent of, subsequent renewals of the operating licence.

The RB monitors compliance with the licence conditions through inspections, safety assessments and audits. To this end, it establishes a systematic programme of inspections by the site inspectors and other RB representatives. It also develops and implements a programme to assess the radiation safety of staff, the environment and the public, and periodically audits safety aspects related to nuclear reactor operation.

In order to assess the documentation accompanying a licence application, perform inspection activities in support of assessments and analyse commissioning results, the RB needs to have a team of specialist regulators. Once the operating licence has been issued and throughout the operation stage, most of these regulators will form a team that oversees reactor operation continuously or part time. The following positions are considered necessary for the issuance of operating licences and subsequent monitoring of compliance therewith.

R_i	REGULATOR POSITION	MAIN TASKS DURING THIS STAGE
R1	NPP licensing coordinator	As for the siting stage, with a focus on activities related to regulatory control of NPP operation.
R2	Senior specialist in thermohydraulic assessment	As for the construction stage, with a focus on the final version of the SAR.
R3	Senior specialist in neutronic assessment	As for the construction stage, with a focus on the final version of the SAR; perform criticality analysis.
R4	Senior specialist in natural and human-induced event analysis	Keep the analysis and control of external events up to date; study significant changes in land use, the expansion of human activities or the construction of high-risk facilities.
R5	Senior specialist in nuclear safety	As for the construction stage, with a focus on the final version of the SAR; coordinate the programme of nuclear and radiation safety inspections and assessments during operation.
R6	Senior specialist in radiation protection	As for the construction stage, with a focus on the final version of the SAR; perform independent calculations and assessments of radiation protection in support of inspections during operation; perform regulatory inspections and audits in his/her area of technical expertise.
R7	Senior specialist in physical protection	As for the construction stage, with a focus on whether the technical solutions implemented are functioning adequately; perform regulatory inspections in his/her area of technical expertise.

R_i	REGULATOR POSITION	MAIN TASKS DURING THIS STAGE
R8	Assessor/auditor of the licensee's quality management system	As for the construction stage with a focus on operation.
R9	Assessor/inspector of civil and mechanical structure safety	As for the construction stage, with a focus on the operation of these structures, including aspects of ageing and maintenance management.
R10	Assessor/inspector of mechanical system safety	As for the construction stage, with a focus on the operation of these systems, including aspects of ageing and maintenance management.
R11	Assessor/inspector of electrical system safety	As for the construction stage, with a focus on the operation of these systems, including aspects of ageing and maintenance management.
R12	Assessor/inspector of reactor instrumentation and control safety	As for the construction stage, with a focus on the operation of these systems, including aspects of ageing and maintenance management.
R13	Assessor/inspector of safety systems	As for the construction stage, with a focus on the operation of these systems, including aspects of ageing and maintenance management.
R14	Assessor/inspector for internal flooding and fires	As for the construction stage, with a focus on the operation of internal flooding and fire prevention systems, including aspects of ageing and maintenance management.
R20	Senior specialist in probabilistic safety assessment	As for the construction stage, with a focus on the final version of the PSA; update the PSA based on operating experience, changes in procedure, improvements to the design of safety-related systems and equipment; possible extension of the PSA's original scope to cover other risks: other operating modes, internal fire, external events, etc.
R21	Senior specialist in human factors engineering	As for the construction stage with a focus on operation.
R22	Senior specialist in organizational aspects and safety culture	As for the construction stage with a focus on operation.
R23	Senior specialist in severe accident analysis	As for the construction stage; assess and monitor whether severe accident management guidelines are kept up to date.
R24	Senior specialist in the assessment of operators in nuclear and radiation safety	As for the commissioning stage, with a focus on operation.
R25	Senior specialist in emergency plan assessment	Assess the emergency plan; coordinate regulatory activities related to periodic exercises under the plan, and provide support to the regulatory body in responding to real emergencies; perform regulatory inspections and audits in his/her area of technical expertise.
R26	Site inspector	As for the commissioning stage, with a focus on operation.

An important aspect of operational safety is the continual improvement of operation based on the results of the licensee's programme for analysing operating experience. It is also important for radioactive waste to be managed in such a way as to ensure adequate radiation protection of workers, the public and the environment. The RB's control of these particular aspects necessitates the creation of the following regulator positions.

R_i	REGULATOR POSITION	MAIN TASKS DURING THIS STAGE
R27	Senior specialist in operating experience	Assess and monitor the licensee's programme for analysing operating experience; assess operating events reported to the RB; perform regulatory inspections and audits in his/her area of technical expertise.
R28	Senior specialist in radioactive waste management	Assess and monitor technological systems and processes for radioactive waste management; perform regulatory inspections in his/her area of technical expertise.

III-2.5. Decommissioning stage

At the end of the NPP's commercial operation, a process is launched to manage the final closure of the facility and undertake activities to allow the site to be used for its planned purpose. To this end, the OO devises a decommissioning and dismantling programme which includes the necessary institutional arrangements and all the steps required to ensure adequate nuclear safety (while there is nuclear fuel at the site) and radiation protection at each stage in the process.

The OO informs the RB, with due notice, of its intent to end commercial operation of the NPP and then keeps the reactor in safe shutdown until it obtains a decommissioning licence. For the latter, it submits the decommissioning and dismantling programme and provides information on arrangements made with other institutions, in particular the entity responsible for radioactive waste management.

The assessment of the decommissioning and dismantling programme and other documentation that accompanies the licence application, in addition to inspection activities in support of assessments, carried out by the RB itself or with the assistance of external experts unaffiliated with the OO, requires some specialist regulators with substantial prior experience in the regulation of NPP operation, to acquire a new set of competences linked fundamentally to the radiation protection of workers and the environment.

Once the decommissioning licence has been issued, and during the dismantling of the nuclear reactor, these regulators are at the site full or part time. The following positions are considered necessary for the issuing of decommissioning licences and subsequent monitoring of compliance therewith.

R_i	REGULATOR POSITION	MAIN TASKS DURING THIS STAGE
R1	NPP licensing coordinator	As for the siting stage, with a focus on activities related to regulatory control of NPP decommissioning.
R3	Senior specialist in neutronic assessment	Perform independent calculations and assessments of criticality prevention in the handling of spent fuel assemblies.[4]
R6	Senior specialist in radiation protection	Perform independent calculations and assessments of radiation protection of workers, the public and the environment, both when assessing the decommissioning and dismantling programme, and during on-site regulatory activities.
R7	Senior specialist in physical	Analyse intrusion scenarios and develop technical solutions

[4] Only required when there is fuel at the site.

R_i	REGULATOR POSITION	MAIN TASKS DURING THIS STAGE
	protection	for their prevention during dismantling; perform regulatory inspections in his/her area of technical expertise.
R8	Assessor/auditor of the licensee's quality management system	As for the construction stage, with a focus on the decommissioning of the NPP.
R22	Senior specialist in organizational aspects and safety culture	As for the construction stage, with a focus on the decommissioning of the NPP.
R25	Senior specialist in emergency plan assessment	As for the construction stage, with a focus on the decommissioning of the NPP.
R26	Site inspector	As for the commissioning stage, with a focus on the decommissioning of the NPP.
R28	Senior specialist in radioactive waste management	Assess the technological processes and systems used to manage radioactive waste generated during reactor dismantling, and assess the licensee's institutional arrangements for radioactive waste management; perform regulatory inspections and audits in his/her area of technical expertise.

The physical protection measures and the presence of regulatory staff on site continue until adequate radiation protection conditions are achieved, when monitoring and control of access to the site can be reduced to a minimum.

III-3. POSITIONS IN THE CORE WORKFORCE AND STAGES IN WHICH THEY ARE INVOLVED

The previous section defined and justified which regulator positions are involved at each stage in the nuclear power reactor licensing and control process, which are considered integral to the regulatory body in ensuring effective and independent control at all stages in the reactor's life cycle. These positions, known as the 'core workforce', reflect which regulators should be involved at each stage in the licensing process, but do not state how many are required for each position, which will depend on the size and structure of each regulatory body.

In total, 28 nuclear regulator positions have been identified for the various stages in the NPP licensing and control process. The project has defined the objective and main tasks of each position. These are given in Annex VI — "Objectives and main tasks of the 28 positions in the core workforce".

Table III-1 below lists the regulator positions (core workforce) which the project considers to be integral to the regulatory body in order to ensure effective and autonomous control at all stages in a reactor's life cycle. It gives the objective of each position and indicates the stages of the licensing process in which the incumbent is involved.

TABLE III-1. CORE WORKFORCE OF REGULATORS FOR NPP LICENSING AND CONTROL

POST		OBJECTIVE	STAGE				
			S	Con	Com	O	D
R1	NPP licensing coordinator	Plan, organize, direct and supervise the regulatory body's activities, such as authorization, assessment, inspection and enforcement, related to the NPP; represent the RB before the OO.	√	√	√	√	√
R2	Senior specialist in thermohydraulic assessment	Perform or supervise independent calculations and conceptual assessments of heat transfer processes at the NPP; analyse thermohydraulic/neutronic coupling with fuel, coolant and moderator; perform regulatory inspections and audits in his/her area of technical expertise.	—	√	√	√	—
R3	Senior specialist in neutronic assessment	Perform or supervise independent calculations and conceptual assessments of core physics; analyse thermohydraulic/neutronic coupling with fuel, and criticality; perform regulatory inspections and audits in his/her area of technical expertise.	—	√	√	√	√(*)
R4	Senior specialist in natural and human-induced event analysis	Represent the RB before institutions specializing in natural and human-induced event analysis; coordinate the work of RB specialists and/or external consultants in this area.	√	√	√	√	—
R5	Senior specialist in nuclear safety	Check safety aspects of the NPP site; coordinate the assessment of the preliminary and final versions of the SAR and supervise the assessment of chapters by safety system inspectors and assessors in his/her area of technical expertise; coordinate regulatory inspections and audits; act in place of R1 when he/she is absent.	√	√	√	√	—
R6	Senior specialist in radiation protection	Perform independent calculations and conceptual assessments of the radiation protection of workers and the public; perform regulatory inspections and audits in his/her area of technical expertise.	√	√	√	√	√
R7	Senior specialist in physical protection	Analyse intrusion scenarios and develop technical solutions for their prevention; perform regulatory inspections and audits in his/her area of technical expertise.	√	√	√	√	√
R8	Assessor/auditor of the licensee's quality management system	Assess the licensee's quality management system and audit its application at all stages in the life cycle of the NPP.	√	√	√	√	√
R9	Assessor/inspector of civil and mechanical structure safety	Perform independent calculations and conceptual assessments of civil and mechanical structure safety; perform regulatory inspections and audits in his/her area of technical expertise.	—	√	√	√	—

(*) The need for these specialists depends on whether there is fuel present at the site

TABLE III-1. CORE WORKFORCE OF REGULATORS FOR NPP LICENSING AND CONTROL (cont.)

POST		OBJECTIVE	STAGE				
			S	Con	Com	O	D
R10	Assessor/inspector of mechanical system safety	Perform independent calculations and conceptual assessments of mechanical system safety; perform regulatory inspections and audits in his/her area of technical expertise.	—	√	√	√	—
R11	Assessor/inspector of electrical system safety	Perform independent calculations and conceptual assessments of electrical system safety; perform regulatory inspections and audits in his/her area of technical expertise.	—	√	√	√	—
R12	Assessor/inspector of reactor instrumentation and control safety	Perform independent calculations and conceptual assessments of instrumentation and control system safety; perform regulatory inspections and audits in his/her area of technical expertise.	—	√	√	√	—
R13	Assessor/inspector of safety systems	Perform independent calculations and conceptual assessments of safety systems from a functional and integrated point of view; perform regulatory inspections and audits in his/her area of technical expertise.	—	√	√	√	—
R14	Assessor/inspector for internal flooding and fires	Perform independent calculations and conceptual assessments of the internal flooding and fire risk and develop technical solutions for its prevention; perform regulatory inspections and audits in his/her area of technical expertise.	—	√	√	√	—
R15	Site coordinator for engineering inspections and assessments	Organize and coordinate regulatory inspections and assessments to confirm that the civil construction and assembly of equipment, components and systems comply with applicable industrial standards; determine what needs to be inspected, and when, to verify compliance with the current licence.	—	√	√	—	—
R16	Inspector of mechanical system construction, assembly and commissioning	Analyse documentation and industrial standards applicable to the construction, assembly and commissioning of mechanical systems; perform regulatory inspections and audits in his/her area of technical expertise.	—	√	√	—	—
R17	Inspector of electrical system construction, assembly and commissioning	Analyse documentation and industrial standards applicable to the construction, assembly and commissioning of electrical systems; perform regulatory inspections and audits in his/her area of technical expertise.	—	√	√	—	—
R18	Inspector of instrumentation and control system construction, assembly and commissioning	Analyse documentation and industrial standards applicable to the construction, assembly and commissioning of instrumentation and control systems; perform regulatory inspections and audits in his/her area of technical expertise.	—	√	√	—	—

TABLE III-1. CORE WORKFORCE OF REGULATORS FOR NPP LICENSING AND CONTROL (cont.)

POST		OBJECTIVE	STAGE				
			S	Con	Com	O	D
R19	Inspector of the main contractor's quality management system	Assess the quality management system of the main contractor; inspect and audit its application at the site.	—	√	√	—	—
R20	Senior specialist in probabilistic safety assessment	Perform or supervise probabilistic safety assessments, taking into consideration aspects related to the operation, maintenance management and periodic testing of safety systems; perform regulatory inspections and audits in his/her area of technical expertise.	—	√	√	√	—
R21	Senior specialist in human factors engineering	Assess human factors in NPP operational safety; perform regulatory inspections and audits in his/her area of technical expertise.	—	—	√	√	—
R22	Senior specialist in organizational aspects and safety culture	Assess organizational aspects related to NPP operation and the safety culture of the OO and its contractors and consultants at all stages from NPP commissioning onwards; perform regulatory inspections and audits in his/her area of technical expertise.	—	—	√	√	√
R23	Senior specialist in severe accident analysis	Assess all actions planned in the event of a beyond design basis accident in order to prevent the event escalating into a severe accident, mitigate its consequences, and establish safe and stable conditions in the long term; perform regulatory inspections and audits in his/her area of technical expertise.	—	—	√	√	—
R24	Senior specialist in the assessment of operators in nuclear and radiation safety	Assess training and development programmes proposed by the licensee; organize the teams tasked with assessing the licences of operating personnel.	—	—	√	√	—
R25	Senior specialist in emergency plan assessment	Assess the NPP's emergency plan; coordinate regulatory activities related to the periodic exercises under the plan, and provide support to the regulatory body in responding to real emergencies; perform regulatory inspections and audits in his/her area of technical expertise.	—	—	√	√	√
R26	Site inspector	Perform and coordinate regulatory control tasks related to nuclear and radiation safety directly at the NPP site.	—	—	√	√	√
R27	Senior specialist in operating experience	Assess and monitor the licensee's operating experience analysis programme; analyse events that are subject to notification, in line with the RB's requirements; perform regulatory inspections and audits in his/her area of technical expertise.	—	—	—	√	—
R28	Senior specialist in radioactive waste management	Assess and monitor technological systems and processes for radioactive waste management; perform regulatory inspections and audits in his/her area of technical expertise.	—	—	—	√	√

ANNEX IV

GENERAL LIST OF COMPETENCES FOR NUCLEAR REGULATORS

For the proper management of regulatory staff recruitment and training, the nuclear regulatory body's competence needs (i.e. the knowledge, skills and attitudes needed to do a given job) should be analysed in advance. These competences should allow the regulatory body to carry out its main NPP licensing and control functions effectively.

In order to identify the competences required for each regulator position, the quadrant model recommended by the IAEA in Safety Reports Series No. 79 was adopted for the project, and a new version of the list of NPP regulatory staff competences was drafted, using the set of competences presented in the SARCoN Guidelines as a starting point.

When the FORO experts were translating and analysing these lists of competences, carefully considered changes were made in an iterative process; several versions were produced before a final consensus was reached.

In light of post-Fukushima discussions in international forums regarding the role of the regulatory body in the event of an emergency, all the experts agreed to include a general competence related to emergency response in the list of core competences for Quadrant 3 on the regulatory body's practices. Although governments already have responsibilities in this regard[5], it was deemed necessary to make clear the regulatory body's role in a nuclear emergency.

The decision was also taken to add two more core competences to Quadrant 3: one concerning the authorization of NPP operating personnel, since they often undertake complex processes requiring specific competences; and the other related to familiarity with the facility, which is considered particularly important for NPP regulators.

The analysis of Quadrant 4 on personal and behavioural effectiveness gave rise to substantial changes: the core competences were reorganized and new ones were introduced. The result was a simplified Quadrant 4 with respect to the SARCoN model. Minor changes were made to Quadrants 1 and 2.

For this new set of competences, the three competence levels (basic, medium, and high) have also been redefined, based on the concepts of 'supervised work', 'autonomous work' and 'supervisory or expert work'.

The end result is the set of core competences for nuclear regulators shown in Table IV-1.

[5] IAEA, Governmental, Legal and Regulatory Framework for Safety, IAEA Safety Standards Series No. GSR Part 1 (Rev.1), IAEA, Vienna (2016).

TABLE IV-1. QUADRANT MODEL OF COMPETENCES

4. Personal and behavioural competences 4.1. Personal effectiveness and self-management 4.2. Management and leadership	**1. Competences related to the legal, regulatory and organizational basis** 1.1. Legal basis 1.2. Regulatory policies and approaches 1.3. Regulatory framework 1.4. Management system
3. Competences related to the regulatory body's practices 3.1. Familiarity with facility 3.2. Authorization 3.3. Assessment 3.4. Inspection 3.5. Enforcement 3.6. Development of regulations and guides 3.7. Emergency response 3.8. Testing of operating personnel	**2. Technical disciplines competences** 2.1. General disciplines 2.2. Applied technology 2.3. Specialized technology

The following 'General list of competences for nuclear regulators' is, essentially, a new document in respect of the list presented by the IAEA in the SARCoN Guidelines. It takes what the CReAN project experts consider to be the right approach with regard to the competences of nuclear regulators.

GENERAL LIST OF COMPETENCES FOR NUCLEAR REGULATORS

QUADRANT 1 COMPETENCES

Quadrant 1: Competences related to the legal, regulatory and organizational basis	
1.1. Legal basis: Ability to comprehend, interpret, use and/or modify relevant documents (e.g. laws, acts, decrees, international treaties and conventions, etc.) that establish the legal framework for the regulatory body's activities. **Basic:** Basic knowledge of the documents that establish the legal framework for the regulatory body, and ability to apply them, under supervision. **Medium:** Thorough knowledge of the documents that establish the legal framework for the regulatory body, and ability to apply them autonomously. **High:** Expert knowledge of the documents that establish the legal framework for the regulatory body, and ability to supervise those applying them.	
COMPETENCE	**KSAs**
Legal basis	**1.1.1** Comprehension of the hierarchy and interrelationship of the documents that establish the legal framework for regulating nuclear activities, as well as the powers and authority conferred upon the regulatory body by these instruments.
	1.1.2 Comprehension of the national legal instruments and local jurisdiction relevant to the performance of regulatory functions.
	1.1.3 Comprehension of the Convention on Nuclear Safety.
	1.1.4 Comprehension of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.
	1.1.5 Comprehension of binding regional and international instruments on safety and security.
1.2 Regulatory policies and approaches: Ability to comprehend, interpret, use and/or modify relevant policies and approaches (mission, functions, vision, procedures, guidelines, etc.) of the regulatory body. **Basic:** Basic knowledge of the policies and approaches of the regulatory body, and ability to apply them, under supervision. **Medium:** Thorough knowledge of the policies and approaches of the regulatory body, and ability to apply them autonomously. **High:** Expert knowledge of the policies and approaches of the regulatory body, and ability to apply them in complex situations, supervise others applying them, and help to improve them.	
COMPETENCE	**KSAs**
Regulatory policies and approaches	**1.2.1** Comprehension of the mission, vision and strategic objectives of the regulatory body.
	1.2.2 Comprehension of, and commitment to, the values of the regulatory body and the principles of good regulation, such as independence, openness, efficiency, transparency and objectivity.

Quadrant 1: Competences related to the legal, regulatory and organizational basis	
	1.2.3 Comprehension of the regulatory body's policies, and the principles upon which the regulation processes are based, such as the graded approach to safety, stakeholder involvement, information on unsafe situations, enforcement or the performance of additional functions (research and development and international cooperation).
1.3 Regulatory framework: Ability to comprehend, interpret, use and/or modify relevant documents (regulations, standards, regulatory requirements, guidelines, procedures, etc.) that establish the regulatory framework. **Basic:** Basic knowledge of the documents that establish the regulatory framework, and ability to use them, under supervision. **Medium:** Thorough knowledge of the documents that establish the regulatory framework, and ability to apply them autonomously. **High:** Expert knowledge of the documents that establish the regulatory framework, and ability to supervise their application and help to develop or modify them.	
COMPETENCE	**KSAs**
Regulatory framework	**1.3.1** Comprehension of the basic requirements or national regulations on radiation safety, and of the country's nuclear and radiation safety requirements and guidelines.
	1.3.2 Comprehension of the IAEA safety standards applicable to NPPs.
	1.3.3 Comprehension of the regulatory requirements of the country supplying the nuclear reactor.
	1.3.4 Comprehension of industry codes and international standards such as ASME codes, DIN standards, etc.
1.4 Regulatory body's management system: Ability to comprehend, apply and develop the regulatory body's management system. **Basic:** Basic knowledge of the regulatory body's management system, and ability to apply it under supervision. **Medium:** Thorough knowledge of the regulatory body's management system, and ability to work autonomously under it. **High:** Expert knowledge of the regulatory body's management system, and ability to supervise its application and help to improve it.	
COMPETENCE	**KSAs**
Management system	**1.4.1** Comprehension of the policies and overall structure of the regulatory body's management system.
	1.4.2 Comprehension of the policy for building and maintaining staff competences in order to achieve the strategic goals of the regulatory body.
	1.4.3 Comprehension of the regulatory body's management processes, the interfaces between them and the procedures deriving therefrom.
	1.4.4 Comprehension of the allocation of responsibilities defined in the regulatory body's management system.
	1.4.5 Comprehension of the graded approach to implementing the management system.
	1.4.6 Comprehension of the regulatory body's system for the control of information, documentation and records.
	1.4.7 Comprehension of the regulatory body's mechanisms for measuring, assessing and improving the effectiveness of the management system to achieve the objectives.

QUADRANT 2 COMPETENCES

Quadrant 2: Technical disciplines competences	
2.1. General disciplines: Comprehension of basic science and engineering applicable to the nuclear field, equivalent to a university degree or higher. **Basic:** Basic knowledge of, and ability to work under supervision in, one of the general disciplines. **Medium:** Thorough knowledge of, and ability to work autonomously in, one of the general disciplines. **High:** Expert knowledge of, and ability to supervise and teach, one of the general disciplines.	
COMPETENCE	**KSAs**
General disciplines	**2.1.1** General knowledge of mathematics and its possible applications in the nuclear field.
	2.1.2 General knowledge of physics and its possible applications in the nuclear field.
	2.1.3 General knowledge of chemistry and its possible applications in the nuclear field.
	2.1.4 General knowledge of earth sciences and its possible applications in the nuclear field.
	2.1.5 General knowledge of geology and its possible applications in the nuclear field.
	2.1.6 General knowledge of meteorology and its possible applications in the nuclear field.
	2.1.7 General knowledge of computer science and its possible applications in the nuclear field.
	2.1.8 General knowledge of nuclear engineering.
	2.1.9 General knowledge of chemical engineering and its possible applications in the nuclear field.
	2.1.10 General knowledge of electrical engineering and its possible applications in the nuclear field.
	2.1.11 General knowledge of civil engineering and its possible applications in the nuclear field.
	2.1.12 General knowledge of environmental engineering and its possible applications in the nuclear field.
	2.1.13 General knowledge of mechanical engineering and its possible applications in the nuclear field.
	2.1.14 General knowledge of materials engineering and its possible applications in the nuclear field.
	2.1.15 General knowledge of systems engineering and its possible applications in the nuclear field.
	2.1.16 General knowledge of electronic engineering and its possible applications in the nuclear field.
	2.1.17 General knowledge of industrial engineering and its possible applications in the nuclear field.

Quadrant 2: Technical disciplines competences	
2.2. Applied technology: Comprehension of engineering and science concepts and skill to apply them in the field of nuclear reactors. **Basic:** Basic knowledge of, and ability to work under supervision in, one of the applied technology areas. **Medium:** Thorough knowledge of, and ability to work under supervision in, one of the applied technology areas. **High:** Expert knowledge of, and ability to supervise and teach, one of the applied technology areas.	
COMPETENCE	**KSAs**
Applied technology	**2.2.1** Comprehension of nuclear reactor technology concepts and skill to apply them.
	2.2.2 Comprehension of fuel cycle technology concepts and skill to apply them in the field of nuclear reactors.
	2.2.3 Comprehension of radiation protection technology concepts and skill to apply them in the field of nuclear reactors.
	2.2.4 Comprehension of nuclear safety technology concepts, including risk and safety analysis, and skill to apply them.
2.3. Specialized technology: Comprehension of engineering and science concepts in specialized areas related to nuclear reactor safety, and skill to apply them. Equivalent to specialized postgraduate level and specific training. **Basic:** Specialized knowledge without practical experience. Must work under supervision. **Medium:** Specialized knowledge and sufficient experience to work autonomously to tackle specific problems. **High:** Specialized expert knowledge to solve specific problems. Ability to supervise and teach.	
COMPETENCE	**KSAs**
Specialized technology	**2.3.1** Comprehension of digital and analogue instrumentation and control system concepts, and skill to apply them to nuclear reactor safety.
	2.3.2 Comprehension of electrical, electronic and communication system concepts, and skill to apply them to nuclear reactor safety.
	2.3.3 Comprehension of computer-based system concepts, including software reliability, and skill to apply them to nuclear reactor safety.
	2.3.4 Comprehension of human and organizational factor and human performance concepts, and skill to apply them to nuclear reactor safety.
	2.3.5 Comprehension of reliability analysis concepts, and skill to apply them to nuclear reactor safety.
	2.3.6 Comprehension of deterministic accident analysis concepts, and skill to apply them to nuclear reactor safety.
	2.3.7 Comprehension of probabilistic safety assessment concepts, and skill to apply them to nuclear reactor safety.
	2.3.8 Comprehension of severe accident analysis concepts , and skill to apply them to nuclear reactor safety.
	2.3.9 Comprehension of passive system analysis concepts, and skill to apply them to nuclear reactor safety.
	2.3.10 Comprehension of thermohydraulic concepts, including computational fluid dynamics and two-phase flow, and skill to apply them to nuclear reactor safety.
	2.3.11 Comprehension of geophysical site assessment concepts, and skill to apply them to nuclear reactor safety.
	2.3.12 Comprehension of external (natural and human-induced) event analysis concepts, and skill to apply them to nuclear reactor safety.

Quadrant 2: Technical disciplines competences	
	2.3.13 Comprehension of mechanical analysis concepts, including finite element methods, fracture mechanics and seismic resistance, and skill to apply them to nuclear reactor safety.
	2.3.14 Comprehension of confinement system and radioactive release concepts, and skill to apply them to nuclear reactor safety.
	2.3.15 Comprehension of fire analysis and protection system concepts, and skill to apply them to nuclear reactor safety.
	2.3.16 Comprehension of security, nuclear materials protection, control and accountability concepts, and skill to apply them to nuclear reactor safety.
	2.3.17 Comprehension of transport safety concepts, and skill to apply them to nuclear reactor safety.
	2.3.18 Comprehension of spent fuel and radioactive waste management concepts, and skill to apply them to nuclear reactor safety.
	2.3.19 Comprehension of criticality safety concepts, and skill to apply them to nuclear reactor safety.
	2.3.20 Comprehension of ageing management concepts, including radiation effects on materials, corrosion, and corrosion chemistry, and skill to apply them to nuclear reactor safety.
	2.3.21 Comprehension of nuclear reactor dismantling concepts, and skill to apply them to nuclear reactor safety.
	2.3.22 Comprehension of industrial safety concepts, and skill to apply them to nuclear reactor safety.
	2.3.23 Comprehension of nuclear reactor radiation protection technology concepts, and skill to apply them to a specific nuclear facility.

QUADRANT 3 COMPETENCES

Quadrant 3: Competences related to the regulatory body's practices	
3.1. Familiarity with facility: Ability to draw supportable regulatory conclusions based on knowledge of the facility and analysis of the safety information thereon. **Basic:** Basic knowledge of the facility and ability to identify information relevant to taking regulatory decisions, while working under supervision. **Medium:** Thorough knowledge and practical experience of the facility, so as to integrate information into a supportable regulatory conclusion, while working autonomously. **High:** Expert knowledge and extensive practical experience of the facility, so as to synthesize information from many sources into complex regulatory decisions and perform supervisory functions.	
COMPETENCE	**KSAs**
Familiarity with facility	**3.1.1** Knowledge of the relevant technological bases and technical features of the facility, the operating procedures and other nuclear safety significant aspects.
	3.1.2 Ability to make judgements on the safety of the facility.
	3.1.3 Knowledge of the facility and ability to get around the site.
	3.1.4 Specific knowledge of, and familiarity with, the control room and the associated documentation and resources.
	3.1.5 Knowledge and handling of the technical documentation generated and archived by the facility.
	3.1.6 Comprehension of the facility's operational limits and conditions.
3.2. Authorization: Ability to ensure that the licence and associated licensing documents comply in form and content with the regulatory requirements. **Basic:** Basic ability to gather information and determine its acceptability in the framework of the licensing process, while working under supervision. **Medium:** Extensive ability and practical experience, in order to gather information and determine autonomously whether the associated licensing documents comply with the regulations. **High:** Expert ability and extensive practical experience, in order to determine whether the associated licensing documents comply with the regulations. Ability to supervise authorization tasks.	
COMPETENCE	**KSAs**
Authorization	**3.2.1** Comprehension of requirements for the issuance of licences.
	3.2.2 Comprehension of the authorization processes and procedures.
	3.2.3 Ability to interact with the applicant to facilitate the authorization process.
	3.2.4 Ability to identify and synthesize information relevant to processing a licence (such as applicant's submission, past performance and enforcement and inspection history, if any).
	3.2.5 Ability to take decisions with respect to compliance with regulatory requirements for authorization.

Quadrant 3: Competences related to the regulatory body's practices	
	3.2.6 Ability to take the outcomes of other regulatory processes into consideration in the authorization process.
	3.2.7 Ability to take decisions on the issuance of a licence.
	3.2.8 Ability to draft the technical terms of the licence issued.
	3.2.9 Ability to determine the impact on the facility of possible restrictions or conditions that may be imposed in an authorization.
3.3. Assessment: Ability to examine studies, analyses and calculations submitted by the applicant in support of the licence application, and form judgements on the adequacy of the submissions in relation to regulatory requirements. **Basic:** Basic knowledge of how to make technical judgements on the safety of the facility using the information available, while working under supervision. **Medium:** Extensive knowledge and experience of how to make autonomous technical judgements on the safety of the facility using the information available. **High:** Expert knowledge and extensive experience of how to assess the safety of the facility and make technical judgements on complex safety issues. Ability to supervise assessments.	
COMPETENCE	**KSAs**
Assessment	**3.3.1** Comprehension of the regulatory body's assessment processes and procedures.
	3.3.2 Ability to identify and synthesize information relevant to the safety of the facility.
	3.3.3 Ability to identify the need for greater detail or further information in relation to assessment.
	3.3.4 Ability to take the outcomes of other regulatory processes into consideration in the assessment process.
	3.3.5 Ability to select and use specific technological tools (software, simulators, etc.) in the assessment process.
	3.3.6 Ability to interact with external technical consultants who may participate in the assessment process (specify the scope of the consultation, choose from among possible technical consultants, monitor the work of the consultant and interpret the outcomes of the consultation).
3.4. Inspection: Ability to review and examine the facility's safety conditions in situ, in order to establish whether they correspond to the technical information in the authorization documents, licence conditions or requirements imposed during previous inspections, as appropriate. **Basic:** Basic ability to review and examine the facility's safety conditions in situ, while working under supervision. **Medium:** Extensive ability to review and examine the facility's safety conditions in situ, while working autonomously. **High:** Expert ability and extensive experience, in order to review and examine the facility's safety conditions in situ, to devise inspection plans, and to form and lead inspection teams.	
COMPETENCE	**KSAs**
Inspection	**3.4.1** Comprehension of the regulatory body's inspection processes and procedures.
	3.4.2 Ability to determine the objective and scope of the inspection, taking into consideration the outcomes of other regulatory processes.
	3.4.3 Ability to recognize non-compliance of safety conditions through observation, measurements, interviews and examination of the facility's documentation and records.

Quadrant 3: Competences related to the regulatory body's practices	
	3.4.4 Ability to determine the effective application of the safety culture concept at all stages in the nuclear reactor's life cycle, checking that all safety significant tasks are performed correctly, alertly, with due consideration and full knowledge of the facts.
	3.4.5 Ability to prepare an inspection report properly, in accordance with the inspection procedure.
	3.4.6 Ability to recognize when immediate actions are required to rectify non-compliance if there is an imminent likelihood of a safety significant event.
	3.4.7 Ability to initiate other regulatory processes when needed (such as review and assessment of enforcement measures or re-assessment of safety).
	3.4.8 Ability to devise a periodic inspection programme for the facility.
	3.4.9 Ability to interact with external technical consultants who may participate in the assessment process (specify the scope of the consultation, choose from among possible technical consultants, monitor the work of the consultant and interpret the outcomes of the consultation).
	3.4.10 Ability to confirm the effective implementation of corrective measures, such as those resulting from enforcement.
3.5. Enforcement: Ability to apply the regulatory body's enforcement procedures. **Basic:** Basic knowledge of the enforcement procedures and ability to assess non-compliance and its impact on safety, while working under supervision. **Medium:** Extensive knowledge and experience of the enforcement procedures, in order to assess non-compliance and its impact on safety. **High:** Expert knowledge extensive experience of the enforcement procedures, in order to assess non-compliance and its impact on safety. Ability to supervise enforcement actions and to propose improvements to procedures.	
COMPETENCE	**KSAs**
Enforcement	**3.5.1** Comprehension of the regulatory body's enforcement processes and procedures.
	3.5.2 Ability to initiate enforcement actions because of non-compliance at the facility.
	3.5.3 Ability to investigate matters related to non-compliance.
	3.5.4 Ability to assess the safety impact of non-compliance.
	3.5.5 Ability to assess or propose corrective measures.
	3.5.6 Ability to draft the proposal for regulatory sanctions.
3.6. Development of regulations and guides: Ability to produce regulations and guides that shape the regulatory framework for nuclear reactors. **Basic:** Basic knowledge of the processes involved in the development of regulations and guides. Ability to gather useful information for this process. **Medium:** Extensive understanding of the processes involved in the development of regulations and guides. Ability to form part of a technical team dedicated to the production of regulations and guides. **High:** Expert knowledge and extensive experience of the processes involved in the development of regulations and guides. Ability to lead teams dedicated to the production of regulations and guides.	

Quadrant 3: Competences related to the regulatory body's practices	
COMPETENCE	**KSAs**
Development of regulations and guides	**3.6.1** Comprehension of the regulatory body's processes and procedures for the development of regulations and guides.
	3.6.2 Ability to analyse and identify the need for new regulations or guides, or the amendment of existing ones.
	3.6.3 Ability to identify and synthesize relevant information which could be considered in the drafting or amendment of regulations and guides.
	3.6.4 Ability to identify and appropriately address interfaces with other laws, regulations and guides.
	3.6.5 Ability to draft regulations and guides so as to meet technical and legal requirements.
	3.6.6 Ability to assess comments from interested parties on draft regulations, and incorporate them as applicable.
3.7. Emergency response: Ability to analyse, in real time, the evolution of an accident at an NPP, and to advise the relevant organizations and institutions thereon. **Basic:** Ability to provide information to the analysis team. **Medium:** Ability to participate in a team in analysing the evolution of an accident at an NPP. **High:** Ability to lead an analysis team and advise senior management on the emergency.	
COMPETENCE	**KSAs**
Emergency response	**3.7.1** Comprehension of the processes and procedures under the national nuclear emergency response system.
	3.7.2 Comprehension of the regulatory body's emergency response processes and procedures.
	3.7.3 Ability to use the resources and tools of the regulatory body's emergency response system to analyse the evolution of an emergency in real time.
	3.7.4 Ability to establish and maintain communication internally and externally.
	3.7.5 Ability to advise on short- and long-term public protection measures.
3.8. Testing of operating personnel: Ability to assess the aptitude of an NPP's operating personnel and to grant licences accordingly. **Basic:** Ability to be part of a team to assess operating personnel for the issuance of licences. **Medium:** Ability to be part of a team to assess operating personnel for the issuance of licences, and be responsible for a specific area of assessment. **High:** Ability to lead a team to assess operating personnel for the issuance of licences.	
COMPETENCE	**KSAs**
Testing of operating personnel	**3.8.1** Knowledge of the standards and guidelines applicable to the licensing of operating personnel.
	3.8.2 Comprehension of the processes and procedures involved in issuing licences to operating personnel.
	3.8.3 Knowledge of the mechanisms and techniques that can be used to test operating personnel.
	3.8.4 Ability to verify the knowledge, skills and attitudes required by operating personnel to obtain an operator's licence.

QUADRANT 4 COMPETENCES

Quadrant 4: Personal and behavioural competences	
4.1 Personal effectiveness and self-management: Ability to perform a task and achieve the set goals effectively. **Basic:** Ability to achieve goals, working under supervision. **Medium:** Ability to achieve goals effectively, working autonomously. **High:** Expert ability to achieve goals effectively and produce results that help to improve the organization of work.	
COMPETENCE	**KSAs**
Personal effectiveness and self-management	**4.1.1** Ability to integrate and analyse information for objective problem solving.
	4.1.2 Ability and willingness to acquire new knowledge and experience. Commitment to continuing education.
	4.1.3 Inquisitiveness and willingness to ascertain the causes of any problems before they occur.
	4.1.4 Ability to plan and organize work to achieve a desired objective.
	4.1.5 Ability to perform duties independently and flexibly.
	4.1.6 Ability to convey messages clearly in very diverse groups.
	4.1.7 Ability to communicate promptly and at the appropriate hierarchical levels.
	4.1.8 Ability to produce clear and concise written reports that meet the reader's needs.
	4.1.9 Ability to listen to others, without interrupting, before giving an opinion.
	4.1.10 Ability to build working relationships within a team to achieve shared objectives.
	4.1.11 Ability to use IT resources as a work tool.
	4.1.12 Ability to understand and communicate in English orally and in writing.
4.2. Management and leadership: Ability to head a team with efficiency, effectiveness, leadership and strategic vision. Ability to negotiate. **Basic:** Ability to guide and lead small groups in simple tasks. **Medium:** Ability to direct working groups and conduct negotiations. **High:** Ability and extensive experience, in order to lead groups and conduct negotiations in complex situations.	
COMPETENCE	**KSAs**
Management and leadership	**4.2.1** Ability to participate proactively in a working group.
	4.2.2 Ability to lead a group, assign tasks and delegate authority.
	4.2.3 Ability to coordinate multiple tasks for a specific purpose.

Quadrant 4: Personal and behavioural competences	
	4.2.4 Ability to lead, inspire and engage others to take on and achieve the set goals without needing to exert authority.
	4.2.5 Ability and willingness to share and impart knowledge.
	4.2.6 Ability to understand the organization from a strategic point of view, and to identify clearly the power relations and factors at play in decision making.
	4.2.7 Ability to devise and implement articulate and complex negotiation plans geared towards the attainment of an objective.
	4.2.8 Ability to reconcile differing opinions and interests and to persuade others to accept solutions that fit in with the organization's objectives.
	4.2.9 Ability to resolve conflicts by facilitating an open debate and proposing mutually beneficial solutions.
	4.2.10 Ability to devise projects that will facilitate the effective and efficient performance of complex tasks.
	4.2.11 Ability to review and assess the outcomes of a project against expectations.
	4.2.12 Ability to use project management tools.
	4.2.13 Ability to analyse the risks and benefits of various options.
	4.2.14 Ability to prioritize according to impact and urgency.
	4.2.15 Ability to analyse immediate factors affecting decision making.
	4.2.16 Ability to ensure that the consequences of a decision are understood by everyone.
	4.2.17 Ability to make decisions in changeable situations and under stress.

ANNEX V

GOOD PRACTICES IN THE RECRUITMENT AND ON-BOARDING OF NEW STAFF TO THE REGULATORY BODY

V-1. MEXICO — GOOD PRACTICE: RECRUITMENT AND ON-BOARDING AT THE NATIONAL COMMISSION FOR NUCLEAR SAFETY AND SAFEGUARDS

V-1.1. Recruitment

The National Commission for Nuclear Safety and Safeguards (CNSNS) recruits technical staff in accordance with the provisions of the law on the professional career service of the Federal Public Administration, and in line with the following:

(a) The selection process is guided by the principles of equal opportunities, transparency and achievement recognition;
(b) The job is advertised nationally in three different places: the CNSNS website, the Official Gazette of the Federation and the website www.trabajaen.gob.mx, where professional career service jobs are posted, and it is possible to register and follow the process;
(c) Anybody meeting the minimum requirements may enter the competitive process;
(d) The entry requirements are based on the job description and profile;
(e) Having supplied the requested documentation, applicants are assessed in their technical knowledge related to the job, and take a written examination on two of the five managerial competences in Quadrant 4 of the IAEA model, namely strategic vision, leadership, results orientation, teamwork and negotiation;
(f) Experience and achievements are also assessed according to set criteria;
(g) Anyone that achieves the minimum score stated in the job advertisement is invited to interview;
(h) A number of points are awarded to candidates at each stage, with 100 available in total. The successful applicant is the one with the highest point score.

The immediate supervisor to the position's incumbent sits on the selection committee throughout the process, from the posting of the job advertisement to the selection of the successful candidate. (The committee also comprises the head of human resources and a representative of the public administration, in this case the internal comptroller.)

Reference: Regulations of the law on the professional career service of the Federal Public Administration.

V-1.2. On-boarding

On-boarding or induction, as it is known in the professional career service system, is supported by training activities that last a total of 20 to 30 hours and cover the following aspects:

1) Induction into the Federal Public Administration:
   (a) organizational structure;
   (b) administrative responsibilities of public servants pursuant to the provisions of the Political Constitution of the United Mexican States and the relevant laws;
   (c) transparency and access to public governmental information, pursuant to the legislation in force;
   (d) gender equality;

(e) human rights;
(f) productivity.

2) Induction into the institution:
   (a) legal status of the institution;
   (b) organizational structure;
   (c) mission, vision, objectives, goals and functions;
   (d) rights and obligations of staff.

3) Induction into the position:
   (a) organizational structure of the section, and of the other sections with which the incumbent has most interaction;
   (b) general objective and goals of the position;
   (c) functions of the incumbent's administrative unit or section, and the corresponding duties;
   (d) place or places where the incumbent's duties are performed;
   (e) equipment, furniture and other tools or resources used to do the job.

The induction into the Federal Public Administration and the institution is coordinated by the General Directorate for Human Resources in collaboration with the relevant administrative units; it is given within the first three months of the public servant's entry into the position.

The induction into the position is given by the immediate supervisor, with the assistance of the General Directorate for Human Resources, within 15 working days of the public servant's arrival or change of position.

Reference: General administrative manual for human resources and organization; professional career service manual.

V-2. SPAIN — GOOD PRACTICE: ON-BOARDING PROGRAMME FOR NEW TECHNICAL STAFF

A noteworthy area of activity for capacity building, related to the recruitment of staff to the regulatory body, is the useful practice of having an on-boarding (or induction) programme for new technical recruits which provides them with the information and knowledge needed for their professional development at the organization, in an orderly, systematic and efficient manner.

In this regard, the on-boarding programme for new members of the Nuclear Safety and Radiation Protection Corps (the technical workforce at the Nuclear Safety Council (CSN)) has been identified as a good practice. The programme is described briefly here.

The training programme for new members of the CSN's Nuclear Safety and Radiation Protection Corps is part of the general process for recruiting new technical staff to the regulatory body.

This process comprises the following stages:

1) Recruitment by competitive examination: the tests that comprise the examination ensure a minimum scientific and technical basis and a certain homogeneity in the knowledge of staff joining the organization, as passing them requires knowledge and skills in the following areas:
   - administration and legislation (general and nuclear- and radiation-specific);
   - nuclear physics, technology and safety fundamentals;

- radiation physics and radiation protection fundamentals;
- specialist knowledge of nuclear safety or radiation protection;
- passing a practical test;
- English language;

2) Probationary period: in accordance with the standards of Spain's General Administration, candidates who pass the competitive examination are appointed as trainees and must pass a probationary period before being appointed as professional staff. The maximum probationary period is six months. The CSN uses this period to give the training programme for new members of the Nuclear Safety and Radiation Protection Corps, which lasts three to four months. This is a generic programme used for all new recruits, irrespective of the position subsequently assigned to them within the CSN. It must be complemented with initial training specific to the position, which is the responsibility of the supervisor and is not governed by regulations;
3) Actual recruitment to the position as a professional officer.

The CSN has always conducted training activities for new recruits during the probationary period; it is only in recent years, however, that it has developed a systematic on-boarding programme. This programme is constantly being updated and improved, but the main features remain the same and are summarized below.

The programme has not been run in the last few years because there have been no new recruits. Therefore, any new features will be introduced when it next runs.

The programme comprises nine modules, given in the following order:

1) Basic information → familiarization with the organization's work;
2) Structure of the CSN → presentation by the heads of the various organizational units;
3) Regulated and unregulated facilities and activities → nuclear facilities; radiation facilities; transport; other unregulated facilities, activities, etc.;
4) Core activities and practices of the regulatory body → assessment; inspection; emergency response;
5) Basic training in specific aspects of radiation protection and nuclear security → set of courses selected on the grounds of specific interest or fortuity;
6) Basic training in specific aspects of nuclear technology and nuclear safety → set of courses selected on the grounds of specific interest or fortuity;
7) Technical visits to facilities of interest (in groups);
8) Two-week placement at an operating NPP (individually or in pairs) → under the supervision of the site inspector;
9) Assessment and conclusions.

The bulk of the training is given by CSN staff, but modules 5 and 6 are mostly taught by external specialist companies.

The 2010 programme syllabus is included by way of example. This programme cost approximately €72 000 to run.

MODULE 1 — BASIC INFORMATION

Objective → to provide the best possible welcome to CSN trainees, helping them to become quickly familiar with the new setting.

SUBJECT	CONTENT	COMMENTS	ESTIMATED DURATION
Practical work-related information from the Subdirectorate for Personnel and Administration (SPA)	• Presentation of the basic organizational structure • Acronyms commonly used at the CSN • Building plan and layout • Access to IT support • Telephone directory • Working arrangements (working hours, holidays, paid/unpaid leave, etc.) • Remuneration scale, target-based productivity • In-house progression, career development, competitive application processes, etc. • Trade union branches • Social action • Requesting materials • Library • Secondments/travel office • Training • Medical service, occupational health The relevant application will be presented for each topic.	***Objectives:*** *Provide practical information and its location on the intranet* *Present the Subdirectorate* *Ensure that each new recruit is registered as a user* ***Trainers***: *Staff from the various areas of the SPA* ***Resources***: *Classroom with computers and a projector*	6 hours
Legal and regulatory framework Presentation of the Subdirectorate	• Presentation of the Subdirectorate and the Technical Standards Office (OFNT) • Regulatory framework of the CSN • Where to find information	***Objectives:*** *Assign trainees to suitable position within the CSN's regulatory framework* *Present the Subdirectorate and the OFNT* ***Trainers***: *Staff from the Legal Counselling Service (SAJ) and the OFNT* ***Resources***: *Classroom with computers and a projector*	1 hour

SUBJECT	CONTENT	COMMENTS	ESTIMATED DURATION
Institutional and procedural framework	• Mission and vision • Strategic plan • Management system • Annual work plan • CSN organizational and operational manual • Structure of CSN procedures • Brief comments on the most important procedures (inspection, assessment, emergency response, etc.) • Inputs • Guidance and support programme • Where to find all the information	***Objectives:*** *Provide an overview* *Present the Subdirectorate* ***Trainers****:* *Staff from the various areas of the General Subdirectorate for Planning, Information Systems and Quality (SIC)* ***Resources***: *Classroom with computers and a projector*	3 hours
Basic IT and documentation tools	• Brief 'tour' of the CSN website, identifying useful sources of information • Detailed 'tour' of the CSN intranet, identifying useful applications and sources of information • Other commonly used websites (CIEMAT/IAEA/NEA/NRC etc.) *In the intranet segment, the following should be covered as a minimum:* • *Publication of official inspection records* • *Press review* • *Integrated System for NPP Supervision (SISC)* • *PSA Information System (SIAPS)* • *Operating Incidents Database (FIO)*	***Objectives:*** *Provide an overview* ***Trainers****: Training coordinator* ***Resources***: *Classroom with computers and a projector*	3 hours

SUBJECT	CONTENT	COMMENTS	ESTIMATED DURATION
Style manual	• Good and bad drafting practices for technical staff • Demonstrations and exercises • Web-based grammar aids	***Objective:*** *Emphasize the need to draft clear and grammatically correct documents* *Adapt to the CSN manual* ***Trainers***: *Chief adviser for publications and information* ***Resources***: *Classroom with computers and a projector*	3 hours
Review of applications presented in module 1	• Presentation of the Department of Information Systems • Review the general applications presented in the module	*Trainees should now:* • *know the building layout* • *have contact points in the subdirectorates introduced* • *have been introduced to the applications listed in this module, as a minimum* *The trainees should be able to locate the applications and use them at an introductory level.*	2 hours
		TOTAL DURATION →	**18 hours**

MODULE 2 — PRESENTATION OF CSN ORGANIZATIONAL UNITS

Objective → to explain how the CSN is organized, and its functions, activities and operational framework, in order to see where the trainees fit within the organization, allow them to get to know the heads of each unit and give them sufficient information to choose a position.

NOTE: The content of this module is not included because it is specific to the CSN and must be adapted for each regulatory body.

MODULE 3 — NUCLEAR AND RADIATION FACILITIES; OTHER REGULATED ACTIVITIES; UNREGULATED ACTIVITIES

Objective → to understand the basics of the regulatory framework and licensing documentation.

SUBJECT	CONTENT	ESTIMATED DURATION
Nuclear facilities	• Regulatory framework (*Regulations on nuclear and radiation facilities, authorization regime, monitoring/inspection regime*) • Official operating documents • Facility types	3 hours
Radiation facilities	• Regulatory framework (*Regulations on nuclear and radiation facilities, authorization regime, monitoring/inspection regime*) • Facility types • Specific technical characteristics of note	2 hours
Other regulated activities	• Regulatory framework (*Regulations on nuclear and radiation facilities, authorization regime, monitoring/inspection regime*) • Types of activities • Transport and acceptance of packages	2 hours
Unregulated activities	• Applicable legal and regulatory framework • Types of activities/examples	1 hour
	TOTAL DURATION →	**1 day**

MODULE 4 — CORE ACTIVITIES OF THE CSN: ASSESSMENT, INSPECTION AND EMERGENCY RESPONSE

Objectives → to understand the core principles and procedures underpinning the CSN's activities in its two core functions, namely assessment and inspection; to understand the legal and regulatory framework and the core principles and procedures underpinning the CSN's emergency response.

SUBJECT	CONTENT	COMMENTS	ESTIMATED DURATION
Assessment	• Core principles • Applicable procedures • Drafting of reports		6 hours
Inspection	• Core principles • Applicable procedures • Drafting of official inspection records • Inspection plans • SISC monitoring programme • Inspections of radiation facilities and related activities • Scope of the activities of site inspectors at NPPs	*Radiation facility inspectors* *Site inspectors*	12 hours
Inspection	Non-scientific/technical or soft skills of inspection staff	*Course at CSN headquarters, led by an external company to be determined*	22 hours
Emergencies	• Emergency response organization course → Level 1	*The course is given in the CSN Emergency Room*	3 hours
		TOTAL DURATION →	**6 days**

MODULE 5 — BASIC TRAINING IN ASPECTS OF RADIATION PROTECTION

Objective → to provide the basic and practical radiation protection training required by all CSN technical staff.

SUBJECT	CONTENT	ESTIMATED DURATION
Radiation protection	• Radiation protection course at CIEMAT (*bespoke course*)	2 weeks
Basic training for workers exposed to radiation	• As included in procedure PA.X.02	1 day
Nuclear security	• Introduction to nuclear security	1 day
Specific aspects of radiation protection	• Waste routes and Manual for calculating dose outside nuclear facilities (MACADE) • Collaboration agreement on the radiation monitoring of metals • Natural radiation • Radiological accidents • Shielding • Industrial and medical applications of ionizing radiation • Description and use of the CSN's equipment for detecting and measuring radiation and contamination • Dosimetry and National Dosimetry Bank	3 days
	TOTAL DURATION →	**3 weeks**

MODULE 6 — BASIC TRAINING IN NUCLEAR SAFETY AND TECHNOLOGY

Objective → to provide the basic nuclear safety and technology training required by all CSN technical staff.

SUBJECT	CONTENT	COMMENTS	ESTIMATED DURATION
Basic nuclear technology	• Basic system technology, description of mechanical, electrical and I&C equipment and components	*~ 5 days*	3 weeks
	• Interpretation of cabling, control and flow diagrams and plans	*~ 2 days*	
	• Introduction to basic PWR and BWR technology	*~ 3 days + ~ 3 days*	
	• Practical operating training/demonstration in an interactive graphic simulator and visit to a full scope training simulator	*2 days*	
PSA and applications	• Integrated PSA programme in Spain: current status / PSAs required • Applications • Link to deterministic process		1.5 days
Seminars on specific aspects of nuclear safety	• Introduction to the technical operating specifications: o characteristics and licensing o technical operating specifications for BWRs (improved) and PWRs o anomalous conditions and exemptions from technical operating specifications o case studies		2 days
	• Design basis, licensing basis and accident analysis. Consideration of these subjects in the SAR and technical operating specifications		1.5 days
		TOTAL DURATION →	**4 weeks**

MODULE 7 — FACILITY VISITS

Objective → to see some of the country's most important and representative facilities close up, as an introduction to the technological and safety aspects, and as a means of making initial contact with the operators.

SUBJECT	CONTENT	COMMENTS	ESTIMATED DURATION
Nuclear facilities	• Juzbado • El Cabril • Zorita	*The estimated duration of this section allows time to visit the three nuclear facilities, Ensa and the National Accelerator Centre in Seville.*	1 week
Radiation facilities	• Medical and industrial facilities • National Accelerator Centre (Seville) • IONMED irradiation facility (Tarancón, Cuenca)	*The estimated duration of this section allows time to visit a hospital, an industrial facility and the IONMED irradiation facility.*	3 days
Other facilities	• Ensa (Santander)		
Other activities		*Allow for one or two days between trips to be spent at the CSN resolving any issues, providing training in outstanding topics and/or writing any reports that might be required.*	2 days
		TOTAL DURATION →	**2 weeks**

MODULE 8 — PLACEMENT AT AN OPERATING NPP

Objectives → to become familiar with the facilities; to see first hand the work and working methods of site inspectors; to establish initial contact with the operators.

- *The trainees will be distributed among the sites with operating NPPs.*
- *The proposed programme involves the participation of the licensees in the training, offering insight into the organizational structure of the licensee, and an introduction to the main tasks of each unit.*

SUBJECT	CONTENT	COMMENTS	ESTIMATED DURATION
Familiarization with the facility	• Tours of the plant • Familiarization with working documents	*Responsibility:* site inspectors	
Work practices of resident inspectors	• Continuous observation of the routine and special activities of the site inspectors, with particular attention to the SISC inspection procedures	*Responsibility:* site inspectors	
Familiarization with the structure of the licensee	• Presentations on the NPP • Presentation of the organizational structure for operations, and of each unit head and their responsibilities • Technical meetings on specific areas of interest	*Responsibility:* designated by the licensee	
		TOTAL DURATION →	**2 weeks**

ANNEX VI

OBJECTIVES AND MAIN TASKS OF THE 28 POSITIONS IN THE CORE WORKFORCE

Determining the competence profile for each position defined in the core workforce requires a detailed analysis of the tasks to be carried out by its incumbent.

The workforce, as set out in Annex III with a view to the technical autonomy of the regulatory body, comprises 28 positions, for each of which an objective has been defined and its relationship to each stage in the nuclear reactor's life cycle established. The main tasks of each position have also been identified, based on the operating experience of the countries participating in the project.

MAIN TASKS OF REGULATOR POSITION R1

NPP LICENSING COORDINATOR	
OBJECTIVE: Plan, organize, direct and supervise regulatory activities, such as authorization, assessment, inspection and enforcement, related to the NPP; represent the RB before the OO.	
TASK	**DESCRIPTION**
T1	Draw up proposals for regulatory activities related to authorization, assessment, inspection and enforcement at the NPP based on technical reports by specialists.
T2	Ensure constant monitoring of compliance with regulations and regulatory requirements imposed on the NPP.
T3	Approve and supervise the NPP inspection plan, participating in inspections as appropriate.
T4	Collaborate in the introduction of new inspection methods, processes or areas.
T5	Help to define regulatory processes and to devise authorization procedures for complex tasks at the NPP.
T6	Coordinate communication between the NPP and the other units of the RB, and manage the information and documentation that the OO submits to the RB.
T7	Maintain smooth interaction with the NPP counterpart to facilitate the exchange of technical information. Coordinate and manage relevant technical meetings between the regulator and NPP operator.
T8	Keep the management system up to date with regard to regulatory activities at the NPP, and propose possible improvements.
T9	Maintain systematic and fluid communication with the NPP site inspectors to remain abreast of activities and incidents there, and inform the site inspectors of regulatory activities that might affect them directly.
T10	Keep the RB's senior management constantly informed of processes under way, outlining needs as they arise.
T11	Coordinate with specific sections of the RB regarding their participation in resolving particular situations that might arise, such as legal matters, communication with the public, drafting of reports in light of international commitments, etc.
T12	Help to organize the RB's emergency response, as the person within the body who knows the NPP best.
T13	Help to draft technical standards, as an expert in regulatory processes.
T14	Train senior regulatory staff in tasks specific to licensing coordination. Manage his/her own continuing education.
T15	Interact with external technical consultants who are assisting in the NPP licensing and control process.
T16	Participate in teams tasked with assessing the licences of senior operators at the NPP.

MAIN TASKS OF REGULATOR POSITION R2

SENIOR SPECIALIST IN THERMOHYDRAULIC ASSESSMENT	
OBJECTIVE: Perform or supervise independent calculations and conceptual assessments of heat transfer processes at the NPP; analyse thermohydraulic/neutronic coupling with fuel, coolant and moderator; perform regulatory inspections and audits in his/her area of technical expertise.	
TASK	**DESCRIPTION**
T1	Use thermohydraulic calculation codes and model the nuclear reactor in order to predict the behaviour of physical variables during normal operation, abnormal events and accident situations.
T2	Perform or coordinate deterministic safety analyses of the NPP during design, construction, commissioning and operation, in order to verify compliance with the applicable regulations, based on the state of the art in that area.
T3	Perform or coordinate the independent review of documents submitted by the OO on safety significant thermohydraulic aspects, to check that they are complete and appropriate in content, and that they comply with the acceptance criteria established through quantitative studies.
T4	Help to assess the preliminary and final versions of the SAR by checking that the parts related to thermohydraulics demonstrate that the NPP's protection and safety systems are sufficient to keep in check any initiating events, including verification of the final status of fission product barriers.
T5	Perform or participate in analyses of beyond design basis accidents, verifying that all the plant's design capacities were taken into account, including the possible use of safety and non-safety systems beyond their original purpose to return the plant to a controlled state and/or mitigate the consequences of a severe accident.
T6	Participate as appropriate in any assessments of procedures for the commissioning and testing of safety relevant systems.
T7	Participate as appropriate in any inspections and audits that fall under regulatory activities related to thermohydraulic assessment.
T8	Perform, participate in, or supervise any independent thermohydraulic assessments in the field of probabilistic safety assessment, deterministic analysis of operational and accident transients and studies of severe accidents at the NPP, using validated calculation codes.
T9	Perform or supervise thermohydraulic assessments for relevant incidents, significant deviations from the reference operating conditions and requests for changes to safety-related documentation.
T10	Help to draft regulatory standards pertaining to thermohydraulics.

MAIN TASKS OF REGULATOR POSITION R3

SENIOR SPECIALIST IN NEUTRONIC ASSESSMENT
OBJECTIVE: Perform or supervise independent calculations and conceptual assessments of core physics; analyse thermohydraulic/neutronic coupling with fuel, and criticality; perform regulatory inspections and audits in his/her area of technical expertise.

TASK	DESCRIPTION
T1	Understand and use neutronic calculation codes and model the core for use in the code, in order to simulate the behaviour of physical variables in the reactor core.
T2	With the help of RB specialists and/or external consultants, assess safety significant aspects of core physics during the design, construction, commissioning and operation stages, in order to verify compliance with the applicable regulations, based on the state of the art in that area.
T3	Perform or coordinate the independent review of documents submitted by the OO on safety significant aspects of core physics, to check that they are complete and appropriate in content, and that they comply with the established acceptance criteria.
T4	Help to assess the preliminary and final versions of the SAR by checking that the parts related to core physics demonstrate reasonably that the NPP can be operated safely.
T5	Assess the core physics-related procedures established by the OO for the commissioning and operation of the NPP.
T6	Perform any inspections and audits that fall under regulatory activities related to NPP core physics assessment.
T7	Perform or supervise any neutronic assessments in the field of probabilistic safety assessment, deterministic analysis of operational and accident transients and studies of severe accidents at the NPP.
T8	Perform or supervise neutronic assessments for relevant incidents, significant deviations from the reference operating conditions and requests for changes to core physics-related documentation, collaborating as necessary with sections responsible for communication with international organizations.
T9	Perform or supervise independent calculations and/or conceptual assessments to verify that the fuel stores at the NPP are adequately subcritical.
T10	Perform or supervise independent calculations and/or conceptual assessments to assess the radioactive inventory of the core and spent fuel ponds at the NPP.
T11	Help to draft technical standards, as an expert in core physics.
T12	Train new regulatory body staff who will participate in NPP core physics assessments.

MAIN TASKS OF REGULATOR POSITION R4

SENIOR SPECIALIST IN NATURAL AND HUMAN-INDUCED EVENT ANALYSIS	
OBJECTIVE: Represent the RB before institutions specializing in natural and human-induced event analysis and control. Coordinate the work of RB specialists and/or external consultants in this area.	
TASK	**DESCRIPTION**
T1	With the help of RB specialists and/or external consultants, coordinate the assessment of the site study on features of the site that might be significant to NPP safety in relation to natural and human-induced external events.
T2	Verify the assessment of extremes in meteorological variables and exceptional meteorological phenomena at the site, along with meteorological and climatic characteristics of the surrounding region, including the likelihood of lightning at the site, and of tornadoes in the region.
T3	Verify the probability assessment of flooding in the region owing to one or more natural causes, such as precipitation run-off or melting of snow, high tide, high water levels following storms, wind waves, waves generated by earthquakes and other geological phenomena, as well as flooding and waves caused by the failure of water control structures.
T4	Coordinate the assessment of the region's seismotectonic characteristics and the conditions specific to the site, and the selection of seismic levels SL-1 and SL-2 to ensure that: the safety level of the NPP would not deteriorate significantly in the event of an SL-1 earthquake and normal operation could be resumed following a proper inspection; and, in the event of an SL-2 earthquake, the key safety structures, systems and components would ensure that the reactor was shut down and the residual heat removed in the required time frame.
T5	Coordinate the assessment of the geotechnical characteristics of the subsoil and the site's soil profile. Check the assessment of foundation material stability under static and seismic loads.
T6	Coordinate the probability assessment of surface faults at the site and, if there are surface or capable faults, whether they might cause significant relative displacement at the ground surface or near it.
T7	Coordinate the probability assessment of slope instability, and of subsidence or uplift of the site and its surrounding area. Verify the probability assessment of subsoil liquefaction at the site, using site-specific ground motion values and parameters.
T8	Verify the probability assessment of an aviation accident at the site, including the effects of the impact, and of possible fires and explosions, taking into account present and future features of air traffic and aircraft.
T9	Perform inspections of NPP construction when technical solutions are being implemented to protect against natural and human-induced events.
T10	Keep the analysis and control of natural and human-induced events up to date. Investigate significant changes in land use and the expansion of human activities in the region throughout the NPP's lifetime.
T11	Help to draft technical standards, as an expert in the analysis of external events that might affect NPP safety.
T12	Train senior regulatory staff in tasks specific to the assessment of natural and human-induced events.

MAIN TASKS OF REGULATOR POSITION R5

SENIOR SPECIALIST IN NUCLEAR SAFETY	
OBJECTIVE: Check safety aspects of the NPP site; coordinate the assessment of the preliminary and final versions of the SAR and supervise the assessment of chapters by safety system inspectors and assessors in his/her area of technical expertise; coordinate regulatory inspections and audits; act in place of R1 when he/she is absent.	
TASK	**DESCRIPTION**
T1	Check site safety aspects such as heat dissipation capacity, external supply of electricity and viability of intervention in an emergency.
T2	Organize and coordinate the performance of inspections of regulatory relevance during the construction and assembly or commissioning of systems and equipment, participating in the scheduling of inspections and planning the availability of suitable staff, whether in-house or external.
T3	Establish an appropriate classification system for documents produced during engineering assessments and inspections, and any other relevant documents produced by the facility, so that they might be traceable and available as a resource in making regulatory decisions, but the confidentiality of classified information is maintained.
T4	Coordinate the review and assessment of the SAR at each stage, by checking that it reasonably demonstrates the sufficiency of the reactor's structures, systems and components to protect staff, the public and the environment against ionizing radiation in all reactor operating modes and in accident conditions. The team will perform the task itself or with the assistance of external experts unaffiliated with the OO.
T5	Identify and evaluate the safety impact of anything detected during assessments and inspections, and issue the relevant reports.
T6	Help to organize the RB's emergency response, as a specialist in his/her area of expertise.
T7	Act as a qualified representative of the RB in exchanges with external technical consultants involved in the assessment process.
T8	Investigate, or collaborate in the investigation of, events with a safety impact in his/her specific technical area.
T9	Investigate, or collaborate in the investigation of, events at the facility which are considered to have a safety impact and, if there is indication of a violation, document the investigation, identifying and assessing any findings and violations that could give rise to enforcement actions.
T10	Coordinate or lead technical assessment teams in his/her area of technical expertise.
T11	Act in place of the NPP licensing coordinator in his/her absence.
T12	Help to draft technical standards, as an expert in engineering assessments and inspections.
T13	Train senior regulatory staff in tasks specific to the coordination of engineering inspections.

MAIN TASKS OF REGULATOR POSITION R6

SENIOR SPECIALIST IN RADIATION PROTECTION	
OBJECTIVE: Perform independent calculations and conceptual assessments of the radiation protection of workers and the public; perform regulatory inspections and audits in his/her area of technical expertise.	
TASK	**DESCRIPTION**
T1	With the help of RB specialists and/or external consultants, assess radiation protection at the NPP during the design, construction, commissioning, operation and decommissioning stages, in order to verify compliance with the applicable regulations, based on the state of the art in that area.
T2	Perform or coordinate the independent review of documents submitted by the licensee on radiation protection at the NPP, to check that they are complete and appropriate in content, and that they comply with established acceptance criteria.
T3	Help to assess the preliminary and final versions of the SAR, by checking that it reasonably demonstrates the sufficiency of the NPP's structures, systems and components to protect staff, the public and the environment against ionizing radiation in all reactor operating modes and in accident conditions.
T4	Perform any inspections and audits that fall under regulatory activities to assess radiation protection at the NPP.
T5	Assess the NPP's radiation protection programme, checking that in all operating situations, the doses caused by exposure to ionizing radiation or radioactive emissions from the nuclear reactor are kept below the prescribed limits and as low as reasonably achievable (ALARA).
T6	Assess the licensee's occupational radiation protection procedures during nuclear reactor commissioning, operation and decommissioning.
T7	Assess the programme for monitoring the environment immediately surrounding the NPP, which the OO follows to ensure compliance with the limits established for radioactive releases into the environment. Assess procedures for the monitoring and control of liquid and gaseous radioactive effluent discharge.
T8	Set the scope and content of the radiological environmental impact assessment for the region in all reactor operating modes and in accident conditions, as part of the environmental impact assessment undertaken in collaboration with other competent authorities.
T9	Evaluate the radiological environmental impact assessment and advise on related regulatory actions.
T10	Take the evaluation outcomes of any relevant internal events, performance indicators and operating experience, and use them to improve radiation protection at the NPP.
T11	Help to draft technical standards and guidance documents, as a radiation protection expert.
T12	Train new RB staff who will participate in public and occupational radiation protection assessments.

MAIN TASKS OF REGULATOR POSITION R7

SENIOR SPECIALIST IN PHYSICAL PROTECTION	
OBJECTIVE: Analyse intrusion scenarios and develop technical solutions for their prevention; perform regulatory inspections and audits in his/her area of technical expertise.	
TASK	**DESCRIPTION**
T1	Coordinate activities to be carried out in collaboration with national intelligence gathering institutions to define the design basis threat for the NPP.
T2	Check the viability of the site for installing a physical protection system, and the assessment of site characteristics used to establish the design basis threat.
T3	Check the assessment of the facility's characteristics used to design the physical protection system, ensuring that no measures are detrimental to nuclear and radiation safety.
T4	Check that the passive components of the physical protection system include deterrents, obstructions of access and means of delaying the entry and escape of intruders.
T5	Check that the active components of the physical protection system include perimeter surveillance, devices for the early detection and warning of attempted intrusion, activation of barriers impeding entry to places of interest, and means of prompt communication with response forces.
T6	Check that the information contained in the physical protection system, including its specifications, is covered by an appropriate classification system, and ensure that this is respected by the OO and the RB.
T7	Assess the physical protection measures envisaged for the domestic transport, import and export of fresh or spent nuclear fuel.
T8	Implement a regular inspection programme to verify compliance with the physical protection conditions established in the licence in force, throughout the NPP's lifetime.
T9	Check the periodic updates to the NPP's design basis threat and any revisions to the physical protection system that are deemed necessary.
T10	Assess the physical protection measures envisaged in the facility's decommissioning and dismantling programme, ensuring that no physical protection measure is detrimental to radiation safety.
T11	Coordinate and participate in the drafting of physical protection standards, as an expert in the field.
T12	Train senior regulatory staff in tasks specific to the assessment of the physical protection of the NPP.

MAIN TASKS OF REGULATOR POSITION R8

ASSESSOR/AUDITOR OF THE LICENSEE'S QUALITY MANAGEMENT SYSTEM	
OBJECTIVE: Assess the licensee's quality management system and audit its application at all stages in the NPP's life cycle.	
TASK	**DESCRIPTION**
T1	Assess the quality management system proposed by the licensee for the various stages in the NPP's life cycle, and interact with the licensee until all the criteria established in the applicable standards have been met.
T2	Convene specialists in the required technical disciplines to audit the effective application of the quality management system to specific areas of the site assessment, construction and assembly, commissioning, operation and decommissioning of the NPP.
T3	Participate in audits of the licensee's quality management system as part of the regulatory control and assessment of the NPP and its technical support organizations.
T4	Identify and assess the safety impact of anything detected during audits of the licensee's quality management system, and issue the relevant reports. Monitor the actions taken by the licensee in the event of non-compliance, and any corrective and preventive actions.
T5	Check that the licensee is monitoring the main contractor's proper application of the NPP's quality management system during construction and commissioning.
T6	Contribute to the quality management of the NPP licensing process (planning, implementation, control and improvement), thus allowing all stakeholders to help achieve the objectives in terms of safety, quality and continuous improvement.
T7	Contribute to the drafting and periodic review of the quality management system documents used in the licensing process to facilitate its implementation and management.
T8	Promote safety culture among stakeholders in the licensing process, so that all safety-related tasks are performed in accordance with the state of the art, with due consideration, full knowledge of the facts, good judgement and a sense of responsibility.
T9	Plan and conduct training activities to develop regulatory competences in the assessment of integrated quality management systems.
T10	Train new RB personnel who will participate in the assessment/audit of the licensee's quality management system.

MAIN TASKS OF REGULATOR POSITION R9

ASSESSOR/INSPECTOR OF CIVIL AND MECHANICAL STRUCTURE SAFETY	
OBJECTIVE: Perform independent calculations and conceptual assessments of civil and mechanical structure safety; perform regulatory inspections and audits in his/her area of technical expertise.	
TASK	**DESCRIPTION**
T1	Verify, or supervise the verification of, assessments of civil and mechanical structure safety at the various stages in the NPP's life cycle, including the ageing and maintenance management of such systems during operation.
T2	Help to assess the preliminary and final versions of the SAR by checking that the parts related to civil and mechanical structures demonstrate reasonably the safety of the NPP.
T3	Assess the OO's procedures for the manufacture and assembly of safety-related civil and mechanical structures during NPP construction.
T4	Coordinate or lead technical assessment teams in his/her area of technical expertise.
T5	Perform inspections and audits of the NPP's civil and mechanical structures, as part of both the assessment and the monitoring and control of the NPP or its support organizations.
T6	Identify and evaluate the safety impact of anything detected during assessments and inspections, and issue the relevant reports.
T7	Investigate, or collaborate in the investigation of, events with a safety impact, and help to assess and follow up on proposals to modify or change safety significant civil and mechanical structures, or to modify the associated documentation.
T8	Act as a qualified representative of the RB in exchanges with external technical consultants involved in the assessment of civil and mechanical structure safety.
T9	Help to organize the RB's emergency response, as a specialist in his/her area of expertise.
T10	Help to draft technical standards, as a specialist in his/her area of expertise.
T11	Train new RB staff who will participate in the assessment of the NPP's civil and mechanical structure safety. Manage his/her own continuing education.
T12	Represent the RB at technical events in his/her area of expertise.
T13	Participate in teams tasked with assessing the licences of the NPP's operating personnel.

MAIN TASKS OF REGULATOR POSITION R10

ASSESSOR/INSPECTOR OF MECHANICAL SYSTEM SAFETY	
OBJECTIVE: Perform independent calculations and conceptual assessments of mechanical system safety; perform regulatory inspections and audits in his/her area of technical expertise.	
TASK	**DESCRIPTION**
T1	Verify, or supervise the verification of, assessments of mechanical system safety at the various stages in the NPP's life cycle, including the reliability analyses of mechanical systems and the ageing and maintenance management of such systems during operation.
T2	Help to assess the preliminary and final versions of the SAR by checking that the parts related to mechanical systems demonstrate reasonably the safety of the NPP.
T3	Assess the OO's procedures for the manufacture, assembly and operation of safety-related mechanical systems during NPP construction, commissioning and operation.
T4	Coordinate or lead technical assessment teams in his/her area of technical expertise.
T5	Perform regulatory inspections and audits of the NPP's mechanical systems, as part of both the assessment and the monitoring and control of the NPP or its support organizations.
T6	Identify and evaluate the safety impact of anything detected during assessments and inspections, and issue the relevant reports.
T7	Investigate, or collaborate in the investigation of, events with a safety impact, and help to assess and follow up on proposals to modify or change components of safety significant mechanical systems, or to modify the associated documentation.
T8	Act as a qualified representative of the RB in exchanges with external technical consultants involved in the assessment of mechanical system safety.
T9	Help to organize the RB's emergency response, as a specialist in his/her area of expertise.
T10	Help to draft technical standards, as a specialist in his/her area of expertise.
T11	Train new RB staff who will participate in the assessment of the NPP's mechanical system safety. Manage his/her own continuing education.
T12	Represent the RB at technical events in his/her area of expertise.
T13	Participate in teams tasked with assessing the licences of the NPP's operating personnel.

MAIN TASKS OF REGULATOR POSITION R11

ASSESSOR/INSPECTOR OF ELECTRICAL SYSTEM SAFETY	
OBJECTIVE: Perform independent calculations and conceptual assessments of electrical system safety; perform regulatory inspections and audits in his/her area of technical expertise.	
TASK	**DESCRIPTION**
T1	Perform or supervise assessments of electrical system safety at the various stages in an NPP's life cycle, including reliability analyses of electrical systems and the ageing and maintenance management of such systems during operation.
T2	Help to assess the preliminary and final drafts of the SAR by checking that the parts related to electrical systems demonstrate reasonably the safety of the NPP.
T3	Assess the OO's procedures for the manufacture, assembly and operation of safety-related electrical systems during NPP construction, commissioning and operation.
T4	Coordinate or lead technical assessment teams in his/her area of technical expertise.
T5	Perform inspections and audits of the NPP's electrical systems, as part of both the assessment and the monitoring and control of the NPP or its support organizations.
T6	Identify and evaluate the safety impact of anything detected during assessments and inspections, and issue the relevant reports.
T7	Investigate, or collaborate in the investigation of, events with a safety impact, and help to assess and follow up on proposals to modify or change safety significant electrical system components, or to modify the associated documentation.
T8	Act as a qualified representative of the RB in exchanges with external technical consultants involved in the assessment of electrical system safety.
T9	Help to organize the RB's emergency response, as a specialist in his/her area of expertise.
T10	Help to draft technical standards, as a specialist in his/her area of expertise.
T11	Train new RB staff who will participate in the assessment of the NPP's electrical system safety. Manage his/her own continuing education.
T12	Represent the RB at technical events in his/her area of expertise.
T13	Participate in teams tasked with assessing the licences of the NPP's operating personnel.

MAIN TASKS OF REGULATOR POSITION R12

ASSESSOR/INSPECTOR OF REACTOR INSTRUMENTATION AND CONTROL SAFETY	
OBJECTIVE: Perform independent calculations and conceptual assessments of instrumentation and control system safety; perform regulatory inspections and audits in his/her area of technical expertise.	
TASK	**DESCRIPTION**
T1	Perform or supervise assessments of reactor instrumentation and control safety at the various stages in the NPP's life cycle, including reliability analyses of the reactor protection system and the ageing and maintenance management of electronic systems during operation.
T2	Help to assess the preliminary and final versions of the SAR by checking that the parts related to reactor instrumentation and control demonstrate reasonably the safety of the NPP.
T3	Assess the OO's procedures for the manufacture, assembly and operation of reactor instrumentation and control during NPP construction, commissioning and operation.
T4	Coordinate or lead technical assessment teams in his/her area of technical expertise.
T5	Perform regulatory inspections and audits of reactor instrumentation and control, as part of both the assessment and the monitoring and control of the NPP or its support organizations.
T6	Identify and evaluate the safety impact of anything detected during assessments and inspections, and issue the relevant reports.
T7	Investigate, or collaborate in the investigation of, events with a safety impact, and help to assess and follow up on proposals to modify or change reactor instrumentation and control, or to modify the associated documentation.
T8	Act as a qualified representative of the RB in exchanges with external technical consultants involved in the assessment of reactor instrumentation and control safety.
T9	Help to organize the RB's emergency response, as a specialist in his/her area of expertise.
T10	Help to draft technical standards, as a specialist in his/her area of expertise.
T11	Train new RB staff who will participate in the assessment of reactor instrumentation and control safety. Manage his/her own continuing education.
T12	Represent the RB at technical events in his/her area of expertise.
T13	Participate in teams tasked with assessing the licences of the NPP's operating personnel.

MAIN TASKS OF REGULATOR POSITION R13

ASSESSOR/INSPECTOR OF SAFETY SYSTEMS	
OBJECTIVE: Perform independent calculations and conceptual safety assessments of safety systems from a functional and integrated point of view; perform regulatory inspections and audits in his/her area of technical expertise.	
TASK	**DESCRIPTION**
T1	Verify, or supervise the verification of, safety assessments of safety systems at the various stages in an NPP's life cycle, including reliability analyses of safety systems and the ageing and maintenance management of such systems during operation.
T2	Help to assess the preliminary and final versions of the SAR by checking that the parts related to safety systems demonstrate reasonably the safety of the NPP.
T3	Assess the licensee's procedures for the manufacture, assembly and operation of safety systems during the construction, commissioning and operation of the NPP.
T4	Assess the aspects of plant operation that have a safety impact, including the operating procedures under normal and abnormal conditions and in emergency situations.
T5	Coordinate or lead technical assessment teams in his/her area of technical expertise.
T6	Perform inspections and audits of the NPP's safety systems, as part of both the assessment and the monitoring and control of the NPP or its support organizations.
T7	Identify and evaluate the safety impact of anything detected during assessments and inspections, and issue the relevant reports.
T8	Investigate, or collaborate in the investigation of, events with a safety impact, and help to assess and follow up on proposals to modify or change safety systems, or to modify the associated documentation.
T9	Act as a qualified representative of the RB in exchanges with external technical consultants involved in the assessment of safety systems.
T10	Help to organize the RB's emergency response, as a specialist in his/her area of expertise.
T11	Help to draft technical standards, as a specialist in his/her area of expertise.
T12	Train new RB staff who will participate in the assessment of the NPP's safety systems. Manage his/her own continuing education.
T12	Represent the RB at technical events in his/her area of expertise.
T13	Participate in teams tasked with assessing the licences of the NPP's operating personnel.

MAIN TASKS OF REGULATOR POSITION R14

ASSESSOR/INSPECTOR FOR INTERNAL FLOODING AND FIRES	
OBJECTIVE: Perform independent calculations and conceptual assessments of the internal flooding and fire risk and develop technical solutions for its prevention; perform regulatory inspections and audits in his/her area of technical expertise.	
TASK	**DESCRIPTION**
T1	Verify, or supervise the verification, that the NPP's fire protection programme demonstrates that the fire safety objectives have been met, the designs of active and passive fire protection systems are appropriate, and the administrative controls are properly implemented.
T2	Help to assess the preliminary and final versions of the SAR by checking that the parts related to active and passive fire protection systems demonstrate reasonably the safety of the NPP.
T3	Assess the licensee's maintenance, inspection and testing procedures under the NPP's fire protection system, and the compensatory measures in case the protection system is degraded or unavailable, including contingency plans.
T4	Verify, or supervise the verification, that the NPP's internal flooding protection manual demonstrates that the safety objectives related to internal flooding have been met, that the elements constituting a barrier or impediment to the onset or exacerbation of flooding adequately serve their purpose, and that the administrative controls are properly implemented.
T5	Help to assess the preliminary and final versions of the SAR by checking that the parts related to internal flooding protection demonstrate reasonably the safety of the NPP.
T6	Assess the licensee's maintenance, inspection and testing procedures contained in the NPP's internal flooding protection manual, the compensatory measures in case the protection system is degraded or unavailable, and the contingency plans.
T7	Coordinate or lead technical assessment teams in his/her area of technical expertise.
T8	Perform inspections of zones that may be at high risk of fire, in order to check the licensee's control over fixed and mobile fire sources and combustible materials, and over the maintenance of installed passive protection systems, fire barriers and fire protection systems.
T9	Perform inspections of internal flooding protection measures, in order to check that the procedures and equipment used for the detection and mitigation of possible internal flooding are consistent with the flooding risk analysis and design requirements.
T10	Identify and evaluate the safety impact of anything detected during assessments and inspections, and issue the relevant reports.
T11	Investigate, or collaborate in the investigation of, events with a safety impact, and help to assess and follow up on proposals to modify or change fire protection systems or components of flooding protection systems, or to modify the associated documentation.
T12	Act as a qualified representative of the RB in exchanges with external technical consultants involved in the fire or internal flooding risk assessment process.
T13	Help to organize the RB's emergency response, as a specialist in his/her area of expertise.
T14	Help to draft technical standards, as a specialist in his/her area of expertise.
T15	Train new RB staff who will participate in the risk assessment of fire or internal flooding at the NPP. Manage his/her own continuing education.
T16	Represent the RB at technical events in his/her area of expertise.
T17	Participate in teams tasked with assessing the licences of the NPP's operating personnel.

MAIN TASKS OF REGULATOR POSITION R15

SITE COORDINATOR FOR ENGINEERING INSPECTIONS AND ASSESSMENTS	
OBJECTIVE: Organize and coordinate regulatory inspections and assessments to confirm that the civil construction and assembly of equipment, components and systems comply with applicable industrial standards; determine what needs to be inspected, and when, to verify compliance with the current licence.	
TASK	**DESCRIPTION**
T1	Organize and coordinate any regulatory inspections that need to be carried out during construction and assembly work or system and equipment commissioning, participating in the scheduling of inspections and planning the availability of suitable staff, whether in-house or external.
T2	With the help of RB specialists and/or external consultants, analyse and assess safety significant aspects of civil, mechanical, materials, chemical, electrical and I&C engineering during NPP construction and commissioning, in order to verify compliance with the applicable regulations and with the state of the art in that area.
T3	Check that the industrial standards are being correctly applied to the construction and assembly of NPP equipment and systems.
T4	Ensure continuous monitoring of compliance with the respective licence during construction and commissioning, managing any necessary enforcement actions in the event of non-compliance.
T5	Maintain smooth interaction with the OO counterpart to facilitate the exchange of technical information. Coordinate and manage relevant technical meetings between the regulator and the entity being regulated.
T6	Keep the management system up to date with regard to regulatory activities at the NPP, and propose possible improvements.
T7	Keep the RB's management constantly informed of processes under way, outlining needs as they arise.
T8	Coordinate communication between the OO and the other organizational units of the RB, and manage the information and documentation that the OO sends to the RB.
T9	Coordinate with specific sections of the RB regarding their participation in resolving particular situations that might arise, such as legal matters, communication with the public, etc.
T10	Manage the issuance of regulatory requirements that might arise as a result of inspections.
T11	Coordinate the RB's review and acceptance of preliminary testing and commissioning programmes, and of the organization tasked with implementing these programmes.
T12	Once the preliminary testing and commissioning programmes and the organization proposed to implement them have been accepted, recommend the issuance of a commissioning licence stipulating the conditions for loading the nuclear fuel and moderator and for power ramping to nominal capacity.
T13	Establish an appropriate classification system for documents produced during engineering assessments and inspections, and any other relevant documents produced by the facility, so that they might be traceable and available as a resource in making regulatory decisions, but the confidentiality of classified information is maintained.
T14	In agreement with other sections of the RB, recommend the issuance of the operating licence once the conclusion has been drawn, based on construction and commissioning inspections and commissioning results, that the NPP will operate safely.
T15	Help to draft technical standards, as an expert in engineering inspections and assessments.
T16	Train senior regulatory staff in tasks specific to the coordination of engineering inspections.

MAIN TASKS OF REGULATOR POSITION R16

INSPECTOR OF MECHANICAL SYSTEM CONSTRUCTION, ASSEMBLY AND COMMISSIONING	
OBJECTIVE: Analyse documentation and industrial standards applicable to the construction, assembly and commissioning of mechanical systems; perform regulatory inspections and audits in his/her area of technical expertise.	
TASK	**DESCRIPTION**
T1	During NPP construction and commissioning, analyse and assess the mechanical engineering aspects in safety-related systems, in order to verify compliance with the applicable regulations and with the state of the art in that area.
T2	Analyse the industrial standards applied by the OO to the construction, assembly and commissioning of the NPP's safety-related mechanical systems.
T3	Continuously monitor compliance with the respective licence during construction and commissioning, recommending any necessary enforcement actions in the event of non-compliance.
T4	Perform inspections during the construction and assembly of mechanical systems, equipment and components, checking that the as-built isometric drawings correspond to what is actually built or assembled.
T5	Analyse the OO's procedures for the construction, assembly and commissioning of mechanical systems, equipment and components, with a view to planning inspections to check that the procedures are being properly followed.
T6	Check the mechanical aspects of fluid transport system lines, reviewing their layout in the plant, supports, fastenings, engineering changes, etc.
T7	Check the structural integrity of the main safety-related pipelines and components (pressure vessel, main coolant line, steam generators, etc.)
T8	Compile and keep a record of documentation on the reactor pressure vessel manufacturing process.
T9	Act as a qualified representative of the RB in exchanges with external technical consultants involved in the construction, assembly and commissioning of the NPP's safety-related mechanical systems.
T10	Maintain a system of recording assessments and inspections, in line with the NPP's regulatory activity management system.
T11	Train junior staff in tasks specific to the assessment and inspection of mechanical systems. Manage his/her own continuing education.

MAIN TASKS OF REGULATOR POSITION R17

INSPECTOR OF ELECTRICAL SYSTEM CONSTRUCTION, ASSEMBLY AND COMMISSIONING	
OBJECTIVE: Analyse documentation and industrial standards applicable to the construction, assembly and commissioning of electrical systems; perform regulatory inspections and audits in his/her area of technical expertise.	
TASK	**DESCRIPTION**
T1	During NPP construction and commissioning, analyse and assess the electrical engineering aspects in safety-related systems, in order to verify compliance with the applicable regulations and with the state of the art in that area.
T2	Analyse the industrial standards applied by the OO during the construction, assembly and commissioning of the NPP's safety-related electrical systems.
T3	Continuously monitor compliance with the respective licence during construction and commissioning, recommending any necessary enforcement actions in the event of non-compliance.
T4	Perform inspections during the construction and assembly of electrical systems, equipment and components, checking that the as-built isometric drawings correspond to what is actually built or assembled.
T5	Analyse the OO's procedures for the construction, assembly and commissioning of electrical systems, equipment and components, with a view to planning inspections to check that the procedures are being properly followed.
T6	Act as a qualified representative of the RB in exchanges with external technical consultants involved in the construction, assembly and commissioning of the NPP's safety-related electrical systems.
T7	Maintain a system of recording assessments and inspections, in line with the NPP's regulatory activity management system.
T8	Train junior staff in tasks specific to the assessment and inspection of electrical systems. Manage his/her own continuing education.

MAIN TASKS OF REGULATOR POSITION R18

INSPECTOR OF INSTRUMENTATION AND CONTROL SYSTEM CONSTRUCTION, ASSEMBLY AND COMMISSIONING	
OBJECTIVE: Analyse documentation and industrial standards applicable to the construction, assembly and commissioning of instrumentation and control systems; perform regulatory inspections and audits in his/her area of technical expertise.	
TASK	**DESCRIPTION**
T1	During NPP construction and commissioning, analyse and assess the electronic engineering aspects in safety-related systems, in order to verify compliance with the applicable regulations and with the state of the art in that area.
T2	Analyse the industrial standards applied by the OO during the construction, assembly and commissioning of the NPP's safety-related instrumentation and control systems.
T3	Continuously monitor compliance with the respective licence during construction and commissioning, recommending any necessary enforcement actions in the event of non-compliance.
T4	Perform inspections during the construction and assembly of instrumentation and control systems, equipment and components, checking that the as-built isometric drawings correspond to what is actually built or assembled.
T5	Analyse the OO's procedures for the construction, assembly and commissioning of instrumentation and control systems, equipment and components, with a view to planning inspections to check that the procedures are being properly followed.
T6	Act as a qualified representative of the RB in exchanges with external technical consultants involved in the construction, assembly and commissioning of the NPP's safety-related instrumentation and control systems.
T7	Maintain a system of recording assessments and inspections, in line with the NPP's regulatory activity management system.
T8	Train junior staff in tasks specific to the assessment and inspection of instrumentation and control systems. Manage his/her own continuing education.

MAIN TASKS OF REGULATOR POSITION R19

INSPECTOR OF THE MAIN CONTRACTOR'S QUALITY MANAGEMENT SYSTEM	
OBJECTIVE: Assess the quality management system of the main contractor; inspect and audit its application on site.	
TASK	**DESCRIPTION**
T1	Assess the quality systems of the main contractor and subcontractors for NPP construction and commissioning, in order to check that they are consistent with the licensee's quality system accepted by the RB, and with the commitment to continuous quality improvement.
T2	Inspect the effective application of the main contractor's quality management system, checking that all processes are subject to control using procedures, instructions, plans or other appropriate means to assure quality outcomes, and that these processes are implemented by trained and qualified staff that clearly understand the safety consequences of their activities.
T3	Monitor any safety-related item, service or process that does not comply with the established requirements. Check that the causes of actual and potential non-compliance are determined, and that the appropriate corrective and preventive actions are taken.
T4	Convene specialists in the required technical disciplines to check that the main contractor's quality management system is being applied effectively to specific areas of NPP construction, assembly and commissioning.
T5	Perform audits of the main contractor's quality management system. Participate in the NPP regulatory control and assessment processes.
T6	Identify and assess the safety impact of anything detected during audits of the main contractor's quality management system, and issue the relevant reports. Follow up on actions taken by the main contractor in the event of non-compliance, and on preventive and corrective actions.
T7	Check that the licensee is monitoring the main contractor with regard to the proper application of the NPP's quality management system during construction and commissioning.
T8	Establish and maintain a system for archiving documents produced in relation to the assessment and inspection of the main contractor's quality management system, ensuring the traceability of the documents so that they can be used to support regulatory documentation.
T9	Train new RB staff who will participate in the assessment and inspection of the main contractor's quality management system. Manage his/her own continuing education.

MAIN TASKS OF REGULATOR POSITION R20

SENIOR SPECIALIST IN PROBABILISTIC SAFETY ASSESSMENT	
OBJECTIVE: Perform or supervise probabilistic safety assessments, taking into consideration aspects related to the operation, maintenance management and periodic testing of safety systems; perform regulatory inspections and audits in his/her area of technical expertise.	
TASK	**DESCRIPTION**
T1	Assess the documents produced by the OO in relation to Level 1, 2 and 3 probabilistic safety assessment (PSA).
T2	Review the Level 1 PSA and the interface between levels 1 and 2, checking the modelling of accident sequences that lead to core damage and were caused by an initiating event, and also checking the faults taken into consideration in safety systems, the combinations of such faults and the human errors anticipated in the operating procedures.
T3	Review the Level 2 PSA and the interface between levels 2 and 3, in order to assess the possible accident sequences anticipated by the interface between levels 1 and 2, analysing the modelling of physical and chemical processes inside the containment, the progression of accident sequences, taking into account possible faults in mitigation systems, and the composition and conditions of the resulting source term.
T4	Review the Level 3 PSA, checking the magnitude and frequency of the radiological environmental impact produced by the source term determined in Level 2 and, where appropriate, perform further assessments, such as the economic impact of a radioactive release into the environment.
T5	Check that human activities have been incorporated into the PSAs, assessing the human reliability and operating procedure analyses foreseen for maintenance activities and periodic system testing, and for emergencies and accident management.
T6	Check that a balanced design has been achieved so that no particular feature or postulated initiating event makes a disproportionately large or significantly uncertain contribution to global risk, and that the first two levels of defence in depth are primarily responsible for guaranteeing nuclear safety.
T7	Identify systems for which design improvements or modifications to operating procedures could reduce the frequency of accident sequences leading to core damage.
T8	Review the assessment of the probability of core damage state, and the risk assessment of major off-site releases requiring immediate response, particularly those associated with early containment failure.
T9	Verify the probability assessment and consequences of natural and human-induced external hazards related to the features of the NPP site.
T10	Assess the adequacy of the NPP's emergency procedures.
T11	Verify compliance with safety objectives established or recommended for the various PSA levels, such as the core damage frequency value for Level 1, taking into account hazards considered during the study.
T12	Assess the nuclear safety impact of any changes to preventive routine testing and the in-service inspection programme.
T13	Assess the nuclear safety impact of temporary changes to safety systems, such as the temporary unavailability of redundant trains during operation due to corrective maintenance.
T14	Train new RB staff who will participate in probabilistic safety assessment. Manage his/her own continuing education.

MAIN TASKS OF REGULATOR POSITION R21

SENIOR SPECIALIST IN HUMAN FACTORS ENGINEERING	
OBJECTIVE: Assess human factors in the operational safety of the NPP; perform regulatory inspections and audits in his/her area of technical expertise.	
TASK	**DESCRIPTION**
T1	Verify, or supervise the verification of, the human factors engineering programme to identify, monitor and correct human factors before they can negatively affect NPP safety.
T2	Assess the human factors engineering of the primary and secondary control rooms in relation to the man–machine interface and its verification and validation in specific simulators at the NPP.
T3	Assess and inspect human reliability factors in the development, maintenance and update of the NPP's PSA (in conjunction with the senior specialist in probabilistic safety assessment).
T4	Perform inspections and audits of the implementation of the human factors engineering programme implemented by the licensee to improve human factor-related aspects.
T5	Investigate, or collaborate in the investigation of, events with a safety impact, and help to assess and follow up on proposals to modify or change operating procedures for human factor techniques.
T6	Assess and inspect the licensee's training plans in the area of human factors engineering.
T7	Assess and inspect the use of field simulators to represent the working environment and conditions, to teach error prevention skills and techniques.
T8	Coordinate and participate in the drafting of guidance documents and standards on human factors, human reliability and human performance in NPP safety.
T9	Train new RB staff who will participate in the assessment of the NPP's human factors engineering programme.
T10	Represent the RB at technical events in his/her area of expertise.
T11	Participate in teams tasked with assessing the licences of the NPP's operating personnel.

MAIN TASKS OF REGULATOR POSITION R22

SENIOR SPECIALIST IN ORGANIZATIONAL ASPECTS AND SAFETY CULTURE	
OBJECTIVE: Assess organizational aspects related to NPP operation and the safety culture of the OO, its contractors and consultants at all stages, beginning with the commissioning of the NPP; perform regulatory inspections and audits in his/her area of technical expertise.	
TASK	**DESCRIPTION**
T1	Perform or supervise the assessment of the NPP's management system in terms of organizational factors (organization, planning, implementation, assessment and feedback) and the NPP's safety culture.
T2	Assess and inspect safety assessment and improvement programmes related to organizational aspects.
T3	Assess and inspect changes in the operator's structure from a point of view of organizational factors and change management (justification, assessment and classification of the change according to its safety significance and safety assurance upon execution).
T4	Assess and inspect the programmes to assess and improve the safety culture of staff of the RB and the service providers, in order to track their progress and identify areas where improvements should be planned.
T5	Inspect and audit the effective application of safety culture at all stages in the NPP's life cycle, checking that safety significant tasks are performed correctly, with due consideration and full knowledge of the facts.
T6	Check that the licensee's management promotes a commitment to safety at both the organizational and individual level, and that it encourages actions and policies that embody the safety culture.
T7	Check that the management promotes the continuous improvement of workers through initial training, periodic retraining, experience exchange, professional recognition and opportunities for career development.
T8	Help to draft technical standards and guidance documents, as an expert in organizational matters and safety culture.
T9	Train new RB staff who will participate in the evaluation of programmes to assess and improve safety in organizational aspects and safety culture.
T10	Represent the RB at technical events in his/her area of expertise.
T11	Participate in teams tasked with assessing the licences of the NPP's operating personnel.

MAIN TASKS OF REGULATOR POSITION R23

SENIOR SPECIALIST IN SEVERE ACCIDENT ANALYSIS	
OBJECTIVE: Assess all actions planned in the event of a beyond design basis accident to prevent the event escalating into a severe accident, mitigate its consequences and establish safe and stable conditions in the long term; perform regulatory inspections and audits in his/her area of technical expertise.	
TASK	**DESCRIPTION**
T1	Perform or supervise the assessment of the NPP's severe accident management programme. Check that uncertainties associated with accident progression have been taken into account in the application of the defence in depth concept.
T2	Be able to perform independent assessments using specific calculation codes. Check the justification and applicability of the codes selected for analysis.
T3	Assess and monitor the updating of severe accident management guidelines.
T4	Review and assess the completeness and quality of the Level 2 PSA studies and check that, in the event that the probability of significant core damage and the magnitude of a radioactive release following a severe accident do not comply with the regulations in force, severe accident management measures are identified and implemented.
T5	Check the justification and applicability of using a combination of probabilistic methods, deterministic methods and proven engineering judgements in the selection and categorization of severe accident sequences.
T6	Check that all the plant's design capacities, including the possible use of safety systems and non-safety systems beyond their original purpose, were taken into account to return the plant to a controlled state and/or to mitigate the consequences of a severe accident, provided that the ability of these systems to operate in the anticipated environmental conditions can be demonstrated.
T7	Check that possible design or procedural changes that could reduce the probability of severe accidents or mitigate their consequences, while ensuring the integrity of containment for the most likely accidents, have been assessed and implemented.
T8	Check that accident management guidelines have been laid down, taking into account representative and dominant severe accident scenarios.
T9	Check that the operating personnel and the team that will apply the severe accident management guidelines receive specific training to ensure they are familiar with beyond design basis accident phenomenology and with accident management guidelines.
T10	Train new RB staff who will participate in severe accident analysis. Manage his/her own continuing education.

MAIN TASKS OF REGULATOR POSITION R24

SENIOR SPECIALIST IN THE ASSESSMENT OF OPERATORS IN NUCLEAR AND RADIATION SAFETY	
OBJECTIVE: Assess training and development programmes proposed by the licensee; organize the teams tasked with assessing the licences of operating personnel.	
TASK	**DESCRIPTION**
T1	Analyse the organizational structure of NPP operations and determine, in collaboration with the licensee, which specific functions could have a bearing on the safety of the facility and thus require a personnel licence.
T2	In collaboration with the licensee, determine the competences required for each specific function, i.e. the knowledge, skills and attitudes needed for the effective performance of the functions associated with the position.
T3	In collaboration with the licensee, analyse the operator training, development and retraining programmes proposed by the NPP for each specific function, and ensure that they meet the RB's criteria.
T4	In collaboration with the licensee, determine the on-the-job training corresponding to each specific function, to be given at the NPP under the supervision and authority of licensed staff.
T5	Assess and process licence applications. Review licence renewal applications and any available information on the applicant's conduct, and transmit the information to the team tasked with assessing operating personnel.
T6	Convene the operating personnel assessment teams to decide upon the granting or renewal of licences for NPP operating personnel.
T7	Develop testing techniques and mechanisms to assess whether the licence applicants fulfil the readiness and experience requirements and conditions needed to perform the functions associated with their positions.
T8	Inform the RB's management of the results of the technical assessment and whether applicants meet the medical fitness requirements, recommending the issuance/renewal of the personnel licence.
T9	Inform the RB's management of any violations that could give rise to enforcement actions.
T10	Update the archive and database with the status of NPP operating personnel licences.
T11	Coordinate and participate in the drafting of guidance documents and standards on the licensing of NPP operating personnel.
T12	Train senior regulatory staff in tasks specific to the assessment of operators in nuclear and radiation safety.

MAIN TASKS OF REGULATOR POSITION R25

SENIOR SPECIALIST IN EMERGENCY PLAN ASSESSMENT	
OBJECTIVE: Assess the NPP's emergency plan; coordinate regulatory activities related to periodic exercises under the plan and provide support to the regulatory body in responding to real emergencies; perform regulatory inspections and audits in his/her area of technical expertise.	
TASK	**DESCRIPTION**
T1	Perform or coordinate the independent review of documentation on the NPP's internal emergency plan to check that it is complete and appropriate in content, and that it complies with the established acceptance criteria, and verify the OO's anticipated role in assisting with external protection activities, as set out in the applicable nuclear emergency plan.
T2	Perform any inspections and audits that fall under regulatory activities to assess the NPP's internal emergency plan.
T3	Help to prepare national, provincial and municipal nuclear emergency plans, recommending their acceptance by the RB's management. Help to uphold agreements with the organizations involved in radiological and nuclear emergency response.
T4	Perform or supervise the review of procedures for carrying out emergency drills at the NPP.
T5	Participate in the operational maintenance of emergency preparedness and response infrastructure, including communications, the emergency control centre, consequence prediction software, the geographic information system and real-time measurement systems.
T6	Coordinate the training and development activities of organizations involved in radiological and nuclear emergency response and RB staff participating in emergency drills at the NPP.
T7	Help to develop and improve the technological tools used in nuclear and radiological emergency preparedness and response, including the prediction and mitigation of consequences.
T8	With the various environmental monitoring groups, coordinate the strategy to be followed in an emergency.
T9	Help to define the criteria for providing information to the public and mass media during a nuclear emergency.
T10	Follow up on a public information programme on measures to be taken in an emergency.
T11	Help to draft technical standards and guidance documents, as an expert in emergency plan assessment.
T12	Train new RB staff who will participate in emergency plan assessment and in the emergency preparedness and response structure.

MAIN TASKS OF REGULATOR POSITION R26

SITE INSPECTOR	
OBJECTIVE: Perform and coordinate regulatory control tasks related to nuclear and radiation safety directly at the NPP site.	
TASK	**DESCRIPTION**
T1	Perform on-site monitoring and inspections to check for compliance with the applicable nuclear and radiation safety regulations and the conditions set forth in the licence and associated documentation.
T2	Perform in situ checks and the assessments required by the NPP licensing coordinator.
T3	Prepare periodic reports in order to document and communicate outcomes of in situ inspection activities.
T4	Act as the RB's primary representative before the NPP authorities and the local authorities.
T5	Act as facilitator for RB staff assigned to inspection, audit, assessment and analysis tasks.
T6	Keep the RB's headquarters informed of the site inspectors' activities and of any incidents or changes at the facility, making a preliminary assessment of their safety impact. Take informative notes on any safety significant event.
T7	Keep informed of the RB's activities and decisions in relation to the NPP.
T8	Investigate, or collaborate in the investigation of, events at the facility that are considered to have a safety impact or any indication of violation, documenting the investigation, and identifying and assessing any findings and violations that could give rise to enforcement actions.
T9	Take regulatory decisions in cases where the gravity of a deviation may be assessed in situ and immediate regulatory intervention is urgently required.
T10	Help to organize emergency response, both for drills and for real emergencies.
T11	Assess on site any actions taken by the facility staff in response to incidents or accidents, and inform headquarters thereof.
T12	Support technicians at the headquarters in preparing and conducting tests for operating personnel licences, and in testing activities held at the NPP.
T13	Help to draft technical standards, as a specialist in his/her field of work.
T14	Act as the RB's representative, along with other competent authorities and the NPP operator, in providing the general public and interested sectors with information on the NPP.
T15	Provide in situ training to RB staff who will be assigned to the regulatory control of the NPP. Manage his/her own continuing education.

MAIN TASKS OF REGULATOR POSITION R27

SENIOR SPECIALIST IN OPERATING EXPERIENCE	
OBJECTIVE: Assess and monitor the licensee's operating experience analysis programme; analyse events that are subject to notification, in line with the RB's requirements; perform regulatory inspections and audits in his/her area of technical expertise.	
TASK	**DESCRIPTION**
T1	Perform or supervise the assessment of the NPP's operating experience analysis programme with a view to avoiding the recurrence of events that may affect nuclear safety, and disseminate the lessons learned to prevent such occurrences at other NPPs.
T2	Assess, or collaborate in the assessment of, events reported to the RB in the manner and time frame established in the applicable regulations, ensuring that the direct and root causes of the event are identified along with any corrective actions resulting from the event analysis.
T3	Perform inspections and audits of activities under the internal operating experience analysis programme, checking that it covers the analysis of all relevant events, as well as incidents which do not need to be reported to the RB but which cause significant transients or other situations of interest to the nuclear community.
T4	Perform inspections and audits of activities under the external operating experience analysis programme, checking that it includes an analysis of the applicability of events reported to the RB by other NPPs, as well as international operating experience and reports from the supplier about problems encountered in the equipment provided.
T5	Check that event analyses identify the root causes using internationally accepted root cause analysis methodologies, such as the IAEA's Assessment of Safety Significant Events Team (ASSET) service methodology.
T6	Check the definition and use of performance indicators for the trend analysis of event causes, and their classification as administrative, errors of licensed staff, errors of other staff, due to maintenance or design, etc.
T7	Coordinate national participation in the IAEA's Incident Reporting System (IRS). Monitor and analyse international operating experience and propose the analysis of events that have occurred at other NPPs around the world that are considered relevant to the NPP in question.
T8	In collaboration with the licensee, classify events that need to be reported using the International Nuclear Event Scale (INES), and recommend any necessary action to the RB management.
T9	Participate in international forums on operating experience and the analysis of operating events.
T10	Help to draft technical standards and guidance documents, as an expert in operating experience.
T11	Train new RB staff who will participate in the assessment of the operating experience analysis programme.
T12	Represent the RB at technical events in his/her area of expertise.
T13	Participate in teams tasked with assessing the licences of the NPP's operating personnel.

MAIN TASKS OF REGULATOR POSITION R28

SENIOR SPECIALIST IN RADIOACTIVE WASTE MANAGEMENT	
OBJECTIVE: Assess and monitor technological systems and processes for radioactive waste management; perform regulatory inspections and audits in his/her area of technical expertise.	
TASK	**DESCRIPTION**
T1	Perform or supervise radiation safety assessments of spent fuel and radioactive waste management, to ensure the radiation protection of workers, the public and the environment.
T2	Assess the OO's procedures for operating technological systems for spent fuel and radioactive waste management at the NPP.
T3	Maintain smooth interaction with the NPP counterpart to facilitate the exchange of technical information in his/her area of expertise. Maintain systematic communication with the site inspectors to keep abreast of activities and incidents related to spent fuel and radioactive waste management.
T4	Perform inspections and audits of the technological systems for spent fuel and radioactive waste management at the NPP. Assess the safety impact of anything detected, and issue the relevant reports.
T5	Confirm that the OO records, characterizes, segregates, treats, conditions, stores and transports radioactive waste properly.
T6	Confirm that the OO keeps inventories of the radioactive waste generated and any stored at, or transferred to, a radioactive waste management facility.
T7	Confirm that the OO keeps up-to-date inventories of fuel removed from the core and temporarily stored in ponds, and fuel transferred to dry storage systems.
T8	Verify that the OO is checking the traceability of radioactive waste generated at the NPP, and of spent fuel.
T9	With the assistance of RB specialists and/or external consultants, assess the NPP's decommissioning and dismantling programme, and advise the RB's senior management on its acceptance.
T10	Perform or supervise assessments of the technological systems and processes for managing the radioactive waste generated during the dismantling of the reactor, and assess the licensee's institutional arrangements for radioactive waste management.
T11	Organize and coordinate any regulatory inspections that need to be carried out during the dismantling of the NPP, helping to schedule inspections and plan the availability of suitable staff, whether in-house or external.
T12	Help to draft technical standards and guidance documents, as an expert in radioactive waste management.
T13	Train new RB staff who will participate in radiation safety assessments of spent fuel and radioactive waste management.

ANNEX VII

CONSTRUCTION OF COMPETENCE PROFILES FOR NUCLEAR REGULATOR POSITIONS

VII-1. INTRODUCTION

Each regulator position involved in NPP licensing and control has its own characteristics and should be occupied by someone with a certain level of knowledge, skills and attitudes (KSAs). The attributes that characterize a given position constitute the profile for that regulator position.

The competence profile for a given position, as defined under the project, is constructed based on two factors: the job description including the objective and main tasks of the position, and the set of competences required, along with their respective levels. The set of competences required for a given task is selected from the general list of competences for nuclear reactor regulators (Annex IV).

The competence profiles are fundamental to devising a strategic training plan for regulators, as they explicitly establish which competences are required, and at what level, for effective and efficient performance in each position. In other words, the profile defines the knowledge, skills and attitudes required for the position, and the corresponding competence level — high, medium or basic.

The biggest challenge in constructing competence profiles lies in the large number of hypotheses needed to define each profile. Some of these assumptions can be left to the discretion of whoever is developing the profile, but they will be linked to the operational procedures imposed by the regulatory body's functional structure, and to the vision established based on the body's technical and scientific nature.

VII-2. COMPETENCE PROFILES FOR POSITIONS

To demonstrate the viability of the method used to construct competence profiles for the positions in the core workforce, three positions were selected that are characteristic of NPP licensing and control. These are:

- NPP licensing coordinator (R1);
- Assessor/inspector of mechanical system safety (R10);
- Site inspector (R26).

These three positions, taken together, are considered to be representative of practically the whole core workforce because R1 and R26 are examples of stand-alone cases, while R10 is largely representative of any assessor/inspection position, whatever the technical expertise of its incumbent.

At least five years' working at the institution is deemed to be a prerequisite for the three positions selected, to ensure a full understanding of the way it operates. In addition, their competence profiles have been constructed on the assumption that they are 'supervisory' or 'expert' regulators, thus representing those at the peak of their career, where the required competence levels tend to be 'high' (expert) or 'medium' (autonomous).

This is intrinsic to the R1 position, which cannot by filled by someone with no supervisory or expert qualifications. In the case of R10, this level would equate to a senior assessor/inspector. As for R26, it corresponds to the chief site inspector if, as is commonly the

case, there is more than one inspector at the site. Consequently, any training plans devised to achieve such competence levels should cover all the necessary stages.

Assigning the 'expert' level also means that, for the technical disciplines competences (Quadrant 2), only those at a specialist level are considered, because competences in general disciplines and applied technologies are only meaningful in the recruitment and initial technical training processes.

VII-3. GRAPHICAL REPRESENTATION OF THE COMPETENCE PROFILE

The graphical representation of competence profiles has the advantage of providing a quick overview thereof, which can help in staff recruitment and training. Figure VII-1 shows the generic construction of the competence profile for a given nuclear regulator position, showing the direct relationship between each main task and the competences needed for its execution.

These competences are displayed in a pie chart whose four main sections replicate the four quadrants of the IAEA model. The slices of each quadrant represent the core competences therein and the radius of each slice is proportional to the level of the secondary competences derived from each core competence. The pie chart depicts what the CReAN project calls a 'competence chart' for a given position.

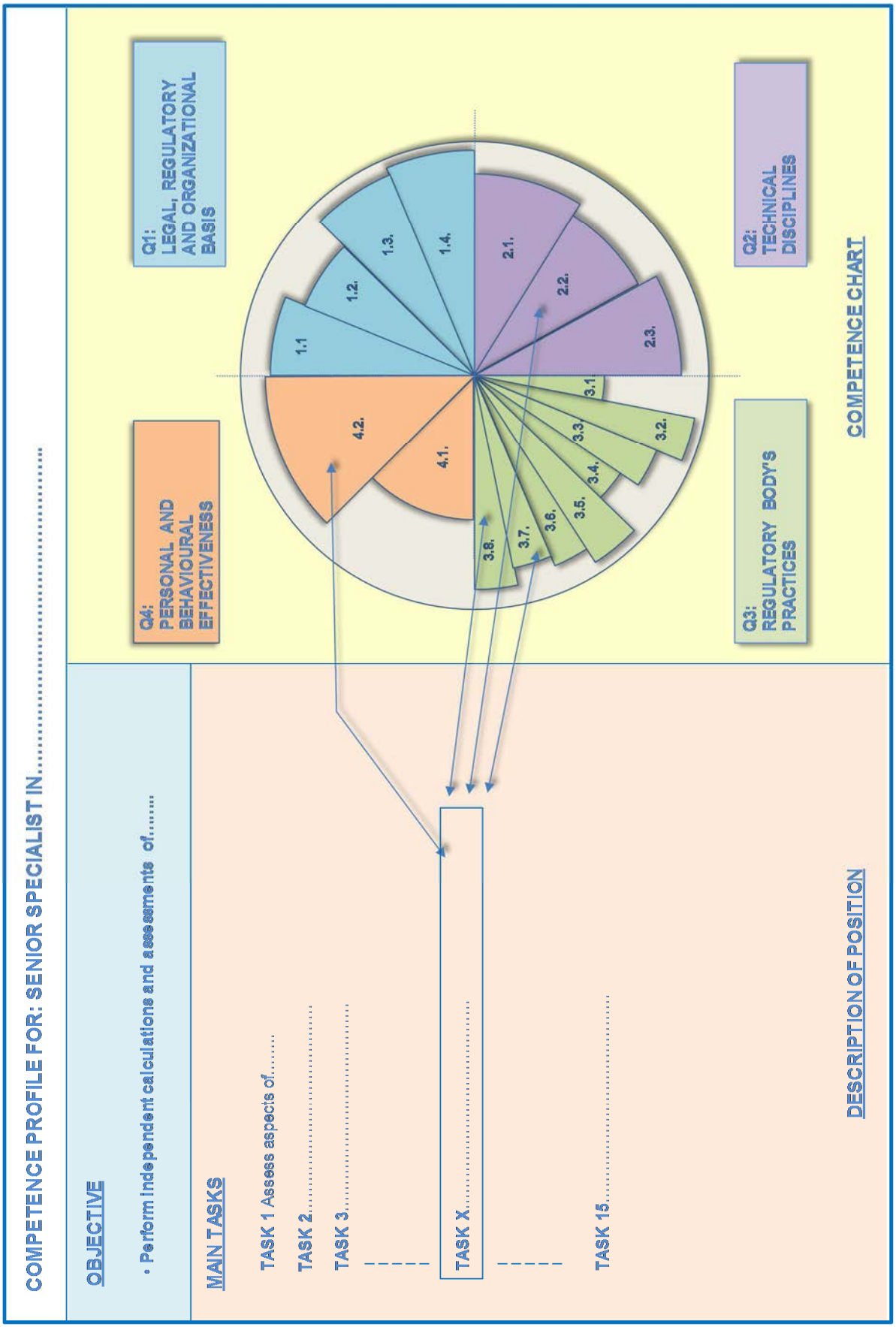

FIG. VII-1. Construction of the competence profile for a given position

The following pages show matrices for the three selected positions: licensing coordinator (R1), assessor/inspector (R10) and site inspector (R26). Each one is followed by a competence chart, as defined in the main body of the Guidelines. The charts give a simplified view of the competence profiles for the respective positions (Figures VII-2, VII-3 and VII-4).

In each matrix, the nuclear regulator's competences are linked to the main tasks of the position. There are, however, competences which, although not directly related to any task, should form part of a regulator's profile and be at a level consistent with his/her professional development within the regulatory body. In this connection, the attribute 'N/A' for a given competence means that it is not applicable to a particular task of that position, but that it may form part of prior training.

Finally, Figure VII-5 is a bar chart comparing the three profiles as regards Quadrant 3 'Regulatory body's practices'. Of particular note in this figure are the high level of familiarity with the facility required for the site inspector position, and the high competence level required in authorization for the licensing coordinator.

Each national regulatory body can use this methodology to construct NPP regulator profiles for its own workforce.

CONSTRUCTION OF COMPETENCE PROFILE FOR POSITION R1

POSITION: NPP LICENSING COORDINATOR

Objective: Plan, organize, direct and supervise regulatory activities, such as authorization, assessment, inspection and enforcement, related to the NPP; act as the RB's spokesperson before the OO.

The competence profile was constructed based on a general technician with advanced leadership skills, at least ten years' experience, preferably in assessment/inspection tasks, within the organization, and prior experience in coordinating groups and management tasks.

The NPP licensing coordinator will manage regulators specializing in one or more areas, since the NPP licensing and control process involves many functions and specializations which are not always interrelated.

For each secondary competence related to a given core competence, the required knowledge (K), skills (S) and attitudes (A) are analysed along with their levels, which are indicated by a letter (H = high; M = medium; B = basic) or a dash when none of the KSA components are considered applicable. The three levels are defined in the general list of competences for nuclear regulators for the core competence in question. The specific definitions are based on the general criteria: H = supervisor or expert; M = works autonomously; B = works under supervision.

Competence	Related tasks	Level required			Comments
		K	S	A	
Quadrant 1: Competences related to the legal, regulatory and organizational basis					
1.1. Legal basis					
1.1.1	T1	**M**	—	—	A senior regulator who should be able to understand and apply the legal basis autonomously in any area of work.
1.1.2	T1	**M**	—	—	
1.1.3	T11	**M**	—	—	Can participate in the drafting of the periodic national safety report under the Convention on Nuclear Safety.
1.1.4	T1; T11	**M**	—	—	—
1.1.5	T1; T11	**M**	—	—	—
1.2 Regulatory policies and approaches					
1.2.1	T1	**H**	—	—	—
1.2.2	T1	**H**	—	**H**	In terms of attitudes, the senior regulator should demonstrate a high level of commitment to the values of the RB.
1.2.3	T1	**H**	—	—	—
1.3 Regulatory framework					
1.3.1	T1	**H**	—	—	—
1.3.2	T1	**H**	—	—	—
1.3.3	T1; T15	**M**	—	—	The 'high' level would correspond to the assessor/inspector in his/her area of technical expertise.
1.3.4	T1	**M**	—	—	
1.4 Regulatory body's management system					
1.4.1	T1; T4	**H**	—	—	—
1.4.2	T14	**H**	—	—	—
1.4.3	T1; T4; T5; T8	**M**	—	—	—
1.4.4	T1; T6; T11	**M**	—	—	—
1.4.5	T8	**M**	—	—	—
1.4.6	T1; T6	**M**	—	—	—
1.4.7	T8	**M**	—	—	—

Competence	Related tasks	Level required			Comments
		K	S	A	
Quadrant 2: Technical disciplines competences					
2.1. General disciplines					
2.1.1 to 2.1.17	—	—	—	—	Since the coordinator has been assigned the 'expert' level, when it comes to technical disciplines, only specialized competences are taken into consideration; competences in general disciplines are only meaningful during recruitment and the initial technical training of staff.
2.2. Applied technology					
2.2.1 to 2.2.4	—	—	—	—	Since the coordinator has been assigned the 'expert' level, when it comes to technical disciplines, only specialized competences are taken into consideration; competences in applied technology are only meaningful during the initial technical training of staff.
2.3. Specialized technology					
2.3.1 to 2.3.23	T1	**M**	**H**	—	The coordinator's knowledge of, and skills in, applying science and engineering concepts to nuclear reactor safety must be sufficient to interact with assessors/inspectors and with other in-house or external specialists.
Quadrant 3: Competences related to a regulatory body's practices					
3.1. Familiarity with the facility					
3.1.1.	T1; T4	**M**	—	—	—
3.1.2	T1	**M**	—	—	This competence will be assigned the 'high' level for assessors/inspectors in their areas of technical expertise.
3.1.3	T1; T3; T4; T9	**B**	—	—	The coordinator will be accompanied around the site by the site inspector.
3.1.4	T1; T3	**B**	—	—	
3.1.5	T1; T2	**M**	—	—	—
3.1.6	T1; T2	**H**	—	—	—
3.2. Authorization					
3.2.1	T1; T5	**H**	—	—	—
3.2.2	T1; T5	**H**	—	—	—
3.2.3	T6; T7	**H**	**H**	—	—
3.2.4	T1; T2	**H**	—	—	—
3.2.5	T1; T2	**H**	**H**	—	—
3.2.6	T1; T5	**H**	**H**	—	—
3.2.7	T1; T5	**H**	**H**	—	—
3.2.8	T1	**M**	**M**	—	This competence will be assigned the 'high' level for assessors/inspectors in their areas of technical expertise.
3.2.9	T1; T5	**H**	**H**	—	—
3.3. Assessment					
3.3.1	T1; T2	**H**	—	—	—
3.3.2	T1; T2	**M**	**H**	—	—
3.3.3	T1; T2; T7	**M**	—	—	—
3.3.4	T1; T2	**M**	**M**	—	—
3.3.5	T1; T2; T5	**B**	**B**	—	Decisions resulting from this competence will be taken in agreement with the assessor/inspector for the relevant technical area.
3.3.6	T15	**H**	**H**	—	—
3.4. Inspection					
3.4.1	T1; T3; T4	**H**	—	—	—
3.4.2	T2; T3; T4	**H**	**H**	—	—
3.4.3	T2; T3	**M**	**M**	—	—

Competence	Related tasks	Level required			Comments
		K	S	A	
3.4.4	T1; T2	**M**	**M**	—	—
3.4.5	N/A	—	—	—	Does not correspond to main tasks.
3.4.6	T2	**H**	**H**	—	—
3.4.7	T5; T6	**H**	**M**	—	—
3.4.8	T3	**H**	**H**	—	—
3.4.9	T15	**H**	**H**	—	—
3.4.10	N/A	—	—	—	Does not correspond to main tasks.
3.5. Enforcement					
3.5.1	T1; T2	**H**	—	—	—
3.5.2	T1; T2; T5; T7	**M**	**M**	**H**	Attitudes are included because this is a decision-making process that may have complex implications.
3.5.3	T2; T5; T7	**M**	**M**	—	—
3.5.4.	T2; T5; T6; T7	**M**	**H**	—	—
3.5.5	T2; T5; T7	**M**	**H**	—	—
3.5.6	T1; T5; T7	**M**	**M**	**H**	—
3.6. Development of regulations and guides					
3.6.1	T13	**M**	—	—	—
3.6.2	T13	**H**	—	—	—
3.6.3	T13	**H**	**H**	—	—
3.6.4	T13	**M**	**M**	—	—
3.6.5	T13	**H**	**M**	—	—
3.6.6	T13	**M**	—	**H**	—
3.7. Emergency response					
3.7.1	T12	**M**	—	—	Able to integrate the national emergency response system.
3.7.2	T12	**H**	—	—	—
3.7.3	T12	**M**	**M**	—	—
3.7.4	T10; T12	**H**	**H**	—	—
3.7.5	T11; T12	**H**	**M**	**H**	—
3.8. Testing of operating personnel					
3.8.1	T16	**H**	—	—	—
3.8.2	T16	**H**	—	—	—
3.8.3	T16	**M**	—	—	—
3.8.4	T16	**M**	**H**	—	—
Quadrant 4: Personal and behavioural competences					
4.1. Personal effectiveness and self-management					
4.1.1	All	—	**H**	—	The personal effectiveness and self-management competences for a senior regulatory officer in the role of coordinator must be at the 'high' level and applicable to all of the tasks associated with this position; therefore, specific tasks are not singled out for each competence.
4.1.2		—	**H**	**H**	
4.1.3		—	**H**	**H**	
4.1.4		—	**H**	—	
4.1.5		—	**H**	—	
4.1.6		—	**H**	—	
4.1.7		—	**H**	—	
4.1.8		—	**H**	—	
4.1.9		—	—	**H**	
4.1.10		—	**H**	**H**	
4.1.11		—	**M**	—	
4.1.12		**H**	**H**	—	
4.2. Management and leadership					
4.2.1	All	—	**H**	—	The management and leadership competences for a senior regulatory officer in the role of coordinator must be at the 'high' level and applicable to all of the tasks associated with this position; specific tasks are therefore not singled out for each competence.
4.2.2		—	**H**	**H**	
4.2.3		—	**H**	—	
4.2.4		—	**H**	**H**	
4.2.5		—	—	**H**	
4.2.6		—	**H**	**H**	

Competence	Related tasks	Level required			Comments
		K	S	A	
4.2.7		—	**H**	**H**	
4.2.8		—	**H**	**H**	
4.2.9		—	**H**	**H**	
4.2.10		**H**	**H**	—	
4.2.11		**H**	**H**	—	
4.2.12		**M**	—	—	
4.2.13		—	**H**	—	
4.2.14		—	**H**	—	
4.2.15		—	**H**	—	
4.2.16		—	**H**	—	
4.2.17.		—	**H**	**H**	

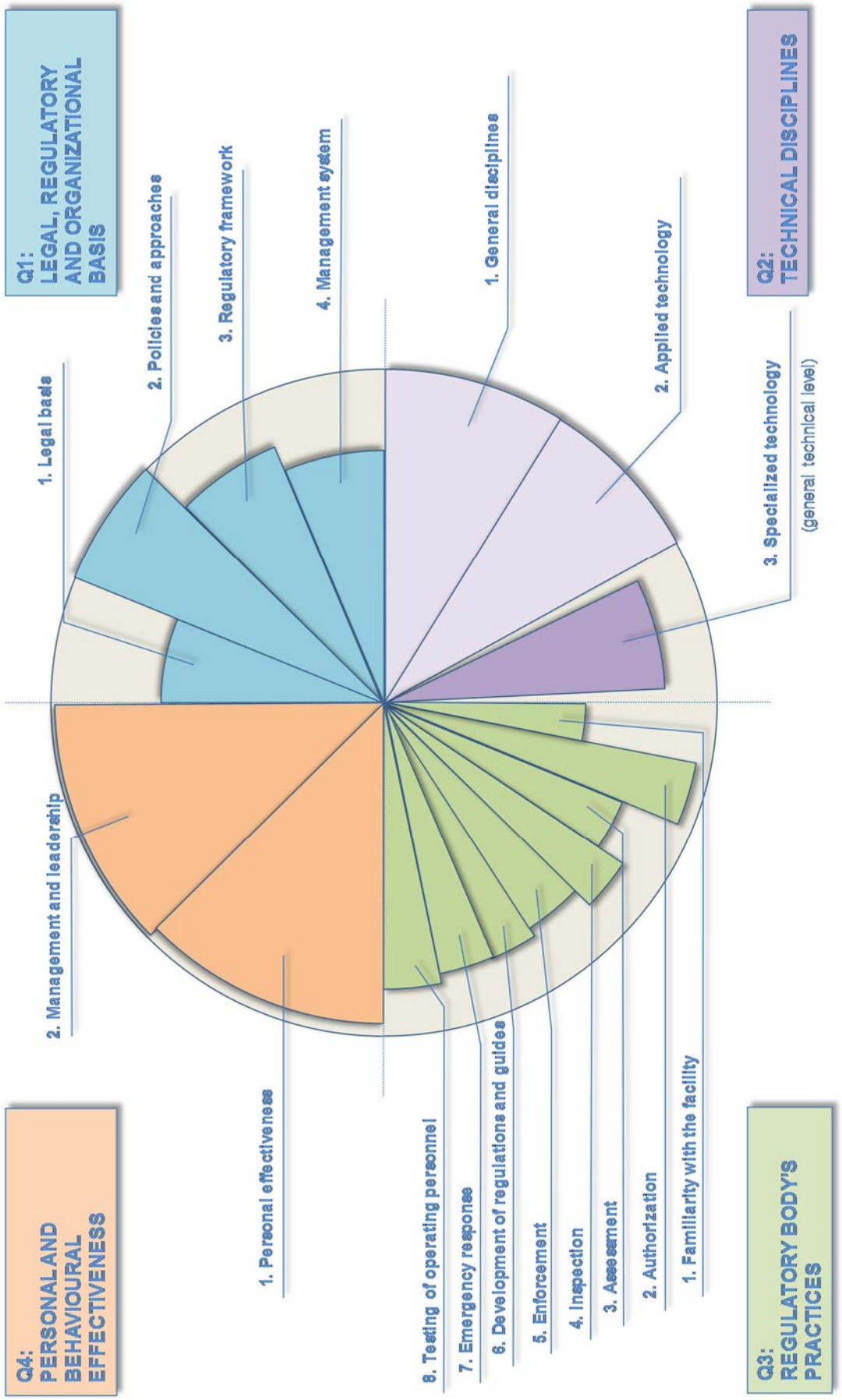

FIG. VII-2. Competence chart for position R1: Licensing coordinator

CONSTRUCTION OF COMPETENCE PROFILE FOR POSITION R10

POSITION: ASSESSOR/INSPECTOR OF MECHANICAL SYSTEM SAFETY

Objective: Perform independent calculations and conceptual assessments of mechanical system safety; perform regulatory inspections and audits in his/her area of technical expertise.

This competence profile was constructed based on a senior regulator with at least seven years' experience, a university degree in mechanical engineering or similar, and postgraduate training in applied technology; he/she should have received high-level training in applied technology and have reached the level of specialist in one or more specific technologies (e.g. fractal mechanics, non-destructive testing) through Masters courses and internships at regulatory bodies in countries with advanced nuclear programmes.

For each secondary competence related to a core competence, the required knowledge (K), skills (S) and attitudes (A) are analysed along with their levels, which are indicated by a letter (H = high; M = medium; B = basic) or a dash when none of the KSA components are considered applicable. The three levels are defined in the general list of competences for nuclear regulators for the core competence in question. The specific definitions are based on the general criteria: H = supervisor or expert; M = works autonomously; B = works under supervision.

Competence	Related tasks	Level required			Comments
		K	S	A	
Quadrant 1: Competences related to the legal, regulatory and organizational basis					
1.1. Legal basis					
1.1.1	All	**M**	—	—	A senior regulatory official who should be able to understand and apply the legal basis autonomously in any area of work.
1.1.2	N/A	—	—	—	—
1.1.3	T12	**M**	—	—	Can participate in the drafting of the periodic national safety report under the Convention on Nuclear Safety, in his/her specific technical area.
1.1.4	N/A	—	—	—	—
1.1.5	N/A	—	—	—	—
1.2 Regulatory policies and approaches					
1.2.1	All	**M**	—	—	A senior regulatory official who should have a clear understanding of the RB's mission, vision and policies in any field of activity.
1.2.2	All	**H**	—	**H**	A senior regulatory official who is expected to be highly committed to the RB's values and to act accordingly.
1.2.3	All	**M**	—	—	A senior regulatory official who should have a clear understanding of the RB's mission, vision and policies in any field of activity.
1.3 Regulatory framework					
1.3.1	T1; T2; T4; T5; T8; T10	**H**	—	—	The knowledge of regulations must be at a 'high' level in his/her area of expertise and may be 'medium' (autonomous application) in other areas.
1.3.2	T1; T2; T4; T5; T8; T10	**H**	—	—	
1.3.3	T1; T2; T4; T5; T8; T10	**B**	—	—	
1.3.4	T1; T2; T4; T5; T8; T10	**M**	—	—	
1.4 Regulatory body's management system					
1.4.1	All	**M**	—	—	A senior regulatory official who should be able to understand the RB's management system in any field of activity and work autonomously within it.
1.4.2	T11	**H**	—	—	—

Competence	Related tasks	Level required			Comments
		K	S	A	
1.4.3	All	**M**	—	—	A senior regulatory official who should be able to understand the RB's management system in any field of activity and work autonomously within it.
1.4.4	All	**M**	—	—	
1.4.5	N/A		—	—	—
1.4.6	T1; T2; T3; T5; T7	**M**	—	—	—
1.4.7	N/A	—	—	—	—
Quadrant 2: Technical disciplines competences					
2.1. General disciplines					
2.1.1 to 2.1.17	—	—	—	—	Since the assessor/inspector of mechanical system safety has been assigned the 'expert' level, when it comes to technical disciplines, only specialized competences are taken into consideration; competences in general disciplines are only meaningful during recruitment and the initial technical training of staff.
2.2. Applied technology					
2.2.1 to 2.2.4	—	—	—	—	Since the assessor/inspector of mechanical system safety has been assigned the 'expert' level, when it comes to technical disciplines, only specialized competences are taken into consideration; competences in applied technology are only meaningful during the initial technical training of staff.
2.3. Specialized technology					
2.3.1 to 2.3.23	T1; T2; T3; T5; T6; T7; T8; T10; T11; T12	**H**	—	—	The 'high' level refers to his/her specific technical area, in relation to competence 2.3.13.
Quadrant 3: Competences related to a regulatory body's practices					
3.1. Familiarity with the facility					
3.1.1	T1; T2; T3; T5	**H**	—	—	The 'high' level refers to his/her specific technical area.
3.1.2	T5; T6; T7; T9	**H**	**H**	—	
3.1.3	T5	**M**	**M**	—	—
3.1.4	T5	**M**	**M**	—	—
3.1.5	N/A	—	—	—	Considered to be a competence of the site inspector and, to a lesser extent, the coordinator.
3.1.6	T1; T2; T3; T5; T6; T7	**H**	—	—	The 'high' level refers to his/her specific technical area.
3.2. Authorization					
3.2.1	T1; T2; T3; T4	**M**	—	—	—
3.2.2	T1; T2; T3; T4	**M**	—	—	—
3.2.3	T1; T2; T3; T4	**M**	**M**	—	—
3.2.4	N/A	—	—	—	Considered to be competences specific to the coordinator.
3.2.5	N/A	—	—	—	
3.2.6	N/A	—	—	—	
3.2.7	N/A	—	—	—	
3.2.8	N/A	—	—	—	
3.2.9	T6	**H**	—	—	The 'high' level refers to his/her specific technical area.
3.3. Assessment					
3.3.1	T1; T2; T3; T4	**H**	—	—	—
3.3.2	T1; T2; T3; T7	**H**	**H**	—	The 'high' level refers to his/her specific technical area.
3.3.3	T1; T2; T3	**H**	**H**	—	

Competence	Related tasks	Level required			Comments
		K	S	A	
3.3.4	T1; T2; T3; T4	**M**	**M**	—	The 'high' level is assigned to the coordinator as the person with an overview of the whole assessment process.
3.3.5	T1; T2; T3	**H**	**H**	—	The 'high' level refers to his/her specific technical area.
3.3.6	T8	**H**	**M**	**M**	
3.4. Inspection					
3.4.1	T5	**H**	—	—	—
3.4.2	T5	**H**	—	—	The 'high' level refers to his/her specific technical area.
3.4.3	T5	**H**	**H**	**H**	—
3.4.4	T5	**M**	**M**	—	The 'high' level is assigned to the senior specialist in organizational aspects and safety culture.
3.4.5	T5	**H**	**H**	—	The 'high' level refers to his/her specific technical area.
3.4.6	T5; T6	**H**	**H**	—	
3.4.7	T5; T6	**H**	**M**	—	
3.4.8	T5; T6	**H**	—	—	
3.4.9	T5; T8	**H**	**H**	—	
3.4.10	T5	**H**	**H**	—	
3.5. Enforcement					
3.5.1	T5; T7	**M**	—	—	—
3.5.2	T5; T7	**M**	**M**	**M**	Attitudes are included because this is a decision-making process with potentially complex implications.
3.5.3	T7	**H**	**M**	—	In aspects related to his/her specific technical area, serving as a technical expert.
3.5.4	T6	**H**	**H**	—	
3.5.5	T6; T7	**H**	**H**	—	
3.5.6	T7	**M**	**M**	**M**	
3.6. Development of regulations and guides					
3.6.1	T10	**M**	—	—	—
3.6.2	T10	**H**	—	—	In aspects related to his/her specific technical area.
3.6.3	T10	**H**	**H**	—	
3.6.4	T10	**M**	**M**	—	—
3.6.5	T10	**H**	**M**	—	In aspects related to his/her specific technical area, acting as a member of the regulation and guide drafting committee.
3.6.6	T10	**H**	—	**H**	
3.7. Emergency response					
3.7.1	T9	**M**	—	—	Able to integrate the emergency response system.
3.7.2	T9	**H**	—	—	
3.7.3	T9	**H**	**H**	—	In aspects related to his/her specific technical area.
3.7.4	T9	**M**	**M**	—	—
3.7.5	T9	**H**	**M**	**M**	In aspects related to his/her specific technical area.
3.8. Testing of operating personnel					
3.8.1	T13	**M**	—	—	—
3.8.2	T13	**M**	—	—	—
3.8.3	T13	**M**	—	—	—
3.8.4	T13	**H**	**M**	—	In aspects related to his/her specific technical area.
Quadrant 4: Personal and behavioural competences					
4.1. Personal effectiveness and self-management					
4.1.1	T1; T2; T3; T5; T7; T10	—	**H**	—	—
4.1.2	T11	—	**H**	**H**	—
4.1.3	T1; T2; T3; T5; T6; T7; T9	—	**H**	**H**	—

Competence	Related tasks	Level required			Comments
		K	S	A	
4.1.4	T1; T2; T3; T4; T5; T11	—	**H**	—	—
4.1.5	T1; T2; T3; T5; T7; T8; T12	—	**H**	—	—
4.1.6	T4; T5; T7; T8; T9; T11; T12	—	**M**	—	—
4.1.7	T6; T7; T8; T9; T12	—	**M**	**M**	—
4.1.8	T1; T2; T3; T5; T6; T7; T12	—	**H**	—	—
4.1.9	T4; T8; T9; T12	—	—	**H**	—
4.1.10	T4; T5; T10	—	**M**	**M**	—
4.1.11	T1; T2; T3; T5	**H**	**H**	—	—
4.1.12	T1; T2; T3; T8; T10; T12	**H**	**M**	—	—
4.2. Management and leadership					
4.2.1	T4; T9; T10	—	**H**	**H**	—
4.2.2	T4	—	**H**	**H**	—
4.2.3	T4	—	**M**	—	—
4.2.4	T4; T11	—	**M**	**M**	—
4.2.5	T4; T11	—	**M**	**H**	—
4.2.6	N/A	—	—	—	—
4.2.7	N/A	—	—	—	These competences are considered to be purely managerial in nature.
4.2.8	N/A	—	—	—	
4.2.9	N/A	—	—	—	
4.2.10	N/A	—	—	—	
4.2.11	N/A	—	—	—	
4.2.12	N/A	—	—	—	
4.2.13	N/A	—	—	—	
4.2.14	N/A	—	—	—	
4.2.15	N/A	—	—	—	
4.2.16	N/A	—	—	—	
4.2.17	N/A	—	—	—	

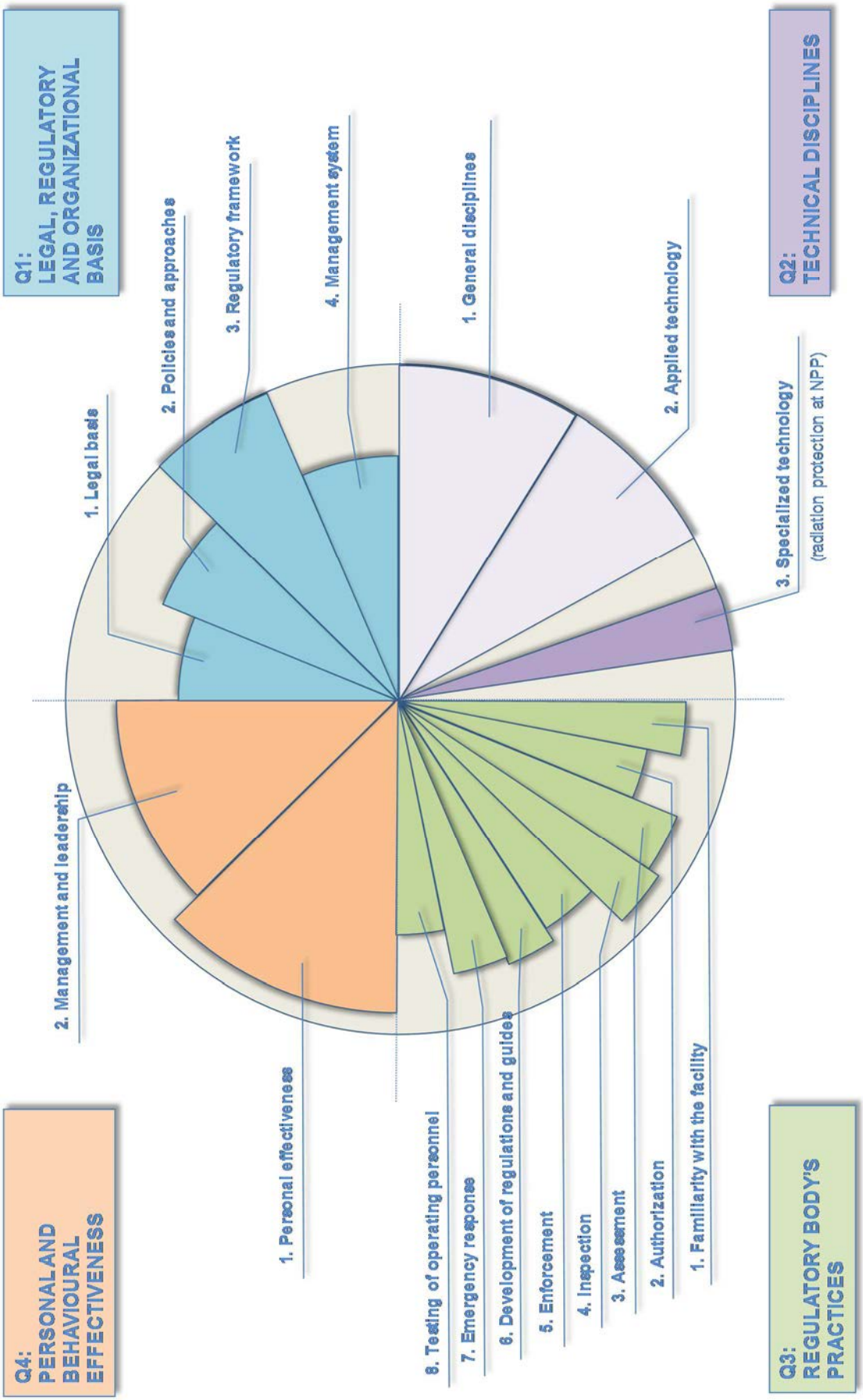

FIG. VII-3. Competence chart for position R10: Assessor/inspector

CONSTRUCTION OF COMPETENCE PROFILE FOR POSITION R26

POSITION: SITE INSPECTOR

Objective: Perform and coordinate regulatory control tasks related to nuclear and radiation safety directly at the NPP site.

This profile was constructed based on a senior regulatory officer with at least seven years' experience, a university degree in a technical or scientific field, and postgraduate training in applied technology; he/she should have also received specific training at the NPP until becoming very familiar with the plant, and have done internships at regulatory bodies in countries with a developed nuclear programme, in particular related to site inspection of foreign NPPs.

For each secondary competence related to a given core competence, the required knowledge (K), skills (S) and attitudes (A) are analysed along with their levels, which are indicated by a letter (H = high; M = medium; B = basic) or a dash when none of the KSA components are considered applicable. The three levels are defined in the general list of competences for nuclear regulators for the core competence in question. The specific definitions are based on the general criteria: H = supervisor or expert; M = works autonomously; B = works under supervision.

Competence	Related tasks	Level required			Comments
		K	S	A	
Quadrant 1: Competences related to the legal, regulatory and organizational basis					
1.1. Legal basis					
1.1.1	All	**M**	—	—	A senior regulatory official who should be able to understand and apply the legal basis autonomously in any area of work.
1.1.2	N/A	—	—	—	—
1.1.3	N/A	—	—	—	—
1.1.4	N/A	—	—	—	—
1.1.5	N/A	—	—	—	—
1.2 Regulatory policies and approaches					
1.2.1	All	**M**	—	—	A senior regulatory official who should be able to understand and apply the legal basis autonomously in any area of work.
1.2.2	All	**H**	—	**H**	A senior regulatory official who is expected to be highly committed to the RB's values and to act accordingly.
1.2.3	All	**M**	—	—	—
1.3 Regulatory framework					
1.3.1	T1; T8; T9; T13	**H**	—	—	—
1.3.2	T1; T2	**H**	—	—	—
1.3.3	T1; T2	**B**	—	—	—
1.3.4	T1; T2	**M**	—	—	—
1.4 Regulatory body's management system					
1.4.1	T1	**M**	—	—	—
1.4.2	T15	**M**	—	—	—
1.4.3	All	**H**	—	—	In the processes and procedures associated with the

Competence	Related tasks	Level required			Comments
		K	S	A	
1.4.4	All	**H**	—	—	position.
1.4.5	N/A	—	—	—	—
1.4.6	T3; T6; T8; T11	**M**	—	—	—
1.4.7	N/A	—	—	—	—
Quadrant 2: Technical disciplines competences					
2.1. General disciplines					
2.1.1 to 2.1.17	—	—	—	—	Since the site inspector has been assigned the 'expert' level, when it comes to technical disciplines, only specialized competences are taken into consideration; competences in general disciplines are only meaningful during recruitment and the initial technical training of staff.
2.2. Applied technology					
2.2.1 to 2.2.4	—	—	—	—	Since the site inspector has been assigned the 'expert' level, when it comes to technical disciplines, only specialized competences are taken into consideration; competences in applied technology are only meaningful during the initial technical training of staff.
2.3. Specialized technology					
2.3.1 to 2.3.22	T1; T2; T3; T4; T5; T6; T8; T10; T11; T13	**B**	—	—	The 'basic' level in these specific technologies refers to the fact that this job involves constant contact with many specialists.
2.3.23	T1; T2; T3; T4; T5; T6; T8; T10; T11; T13	**H**	—	—	The 'high' level refers fundamentally to radiation protection at the NPP site.
Quadrant 3: Competences related to a regulatory body's practices					
3.1. Familiarity with the facility					
3.1.1	T1; T2; T3; T5; T8; T11	**H**	—	—	—
3.1.2	T8; T9	**H**	**H**	—	—
3.1.3	T1; T2; T5	**H**	**H**	—	—
3.1.4	T2; T5; T11	**H**	**H**	—	—
3.1.5	T1; T3; T5; T11	**H**	—	—	—
3.1.6	T1; T2; T4; T6; T8; T9; T11	**H**	—	—	—
3.2. Authorization					
3.2.1	T1; T2; T3; T6	**M**	—	—	These competences are associated with the attributes of a senior regulatory official.
3.2.2	T1; T2; T3; T6	**M**	—	—	
3.2.3	N/A	—	—	—	—
3.2.4	N/A	—	—	—	—
3.2.5	N/A	—	—	—	—

Competence	Related tasks	Level required			Comments
		K	S	A	
3.2.6	N/A	—	—	—	—
3.2.7	N/A	—	—	—	—
3.2.8	N/A	—	—	—	—
3.2.9	T1; T2	**M**	—	—	Ability resulting from his/her in situ assessments.
3.3. Assessment					
3.3.1	T1; T5	**M**	—	—	—
3.3.2	T1; T2; T8; T9; T11	**H**	**H**	—	—
3.3.3	N/A	—	—	—	Considered to be competences of the assessor/inspector.
3.3.4	N/A	—	—	—	
3.3.5	N/A	—	—	—	
3.3.6	N/A	—	—	—	
3.4. Inspection					
3.4.1	T1; T2; T5; T11	**H**	—	—	—
3.4.2	T1; T2; T6; T9; T11	**H**	**H**	—	—
3.4.3	T1; T2; T11	**H**	**H**	—	—
3.4.4	T1; T2; T11	**M**	**M**	—	The 'high' level is assigned to the senior specialist in organizational aspects and safety culture.
3.4.5	T3; T6; T8; T11	**H**	**H**	—	—
3.4.6	T9	**H**	**H**	—	—
3.4.7	T1; T2; T9	**H**	**M**	—	—
3.4.8	T1; T2	**H**	**H**	—	—
3.4.9	T5	**M**	**M**	—	—
3.4.10	T1; T2; T8; T11	**H**	—	—	May require the assistance of a specialist assessor/inspector.
3.5. Enforcement					
3.5.1	T1; T2; T3; T8; T9	**H**	—	—	—
3.5.2	T8; T9	**M**	**M**	**M**	Attitudes are included because this is a decision-making process with potentially complex implications.
3.5.3	T8; T9	**M**	**M**	—	—
3.5.4	T8; T9	**H**	**H**	—	—
3.5.5	T8; T9	**M**	**M**	—	—
3.5.6	T8; T9	**B**	**B**	**M**	—
3.6. Development of regulations and guides					
3.6.1	T13	**M**	—	—	—
3.6.2	T13	**M**	—	—	—
3.6.3	T13	**M**	**M**	—	—
3.6.4	T13	**B**	—	—	—

Competence	Related tasks	Level required			Comments
		K	S	A	
3.6.5	T13	**B**	—	—	—
3.6.6	T13	**M**	—	**M**	—
3.7. Emergency response					
3.7.1	T10	**M**	—	—	Able to integrate the emergency response system.
3.7.2	T10	**H**	—	—	
3.7.3	T10	**M**	—	—	—
3.7.4	T10	**H**	**H**	**H**	—
3.7.5	T10	**M**	—	—	—
3.8. Testing of operating personnel					
3.8.1	T12	**H**	—	—	—
3.8.2	T12	**M**	—	—	—
3.8.3	T12	**M**	—	—	—
3.8.4	T12	**M**	**M**	—	—
Quadrant 4: Personal and behavioural competences					
4.1. Personal effectiveness and self-management					
4.1.1	T1; T3; T8; T9	—	**H**	—	—
4.1.2	T15	—	**H**	**H**	—
4.1.3	T1; T2; T8; T11	—	**H**	**H**	—
4.1.4	T1; T2; T3; T4; T5; T6; T7; T11	—	**H**	—	—
4.1.5	T4; T5; T6; T8; T9; T11; T14	—	**H**	—	—
4.1.6	T4; T5; T6; T10; T14	—	**H**	—	—
4.1.7	T4; T6; T10; T14	—	**H**	**M**	—
4.1.8	T3; T6; T8	—	**H**	—	—
4.1.9	T4; T5; T7; T10; T14	—	—	**H**	—
4.1.10	T4; T5	—	**H**	**H**	—
4.1.11	T1; T2	**M**	**M**	—	—
4.1.12	T4; T13; T14	**M**	**M**	—	—
4.2. Management and leadership					
4.2.1	T4; T5; T8; T13	—	**H**	**H**	—
4.2.2	N/A	—	—	—	Not expected to lead groups in this job.
4.2.3	T1; T2; T3; T4; T5; T6	—	**M**	—	—
4.2.4	N/A	—	—	—	—
4.2.5	T4; T5; T15	—	**M**	**H**	—
4.2.6	T4	—	**M**	—	—

Competence	Related tasks	Level required			Comments
		K	S	A	
4.2.7	N/A	—	—	—	Considered to be competences of the coordinator.
4.2.8	N/A	—	—	—	
4.2.9	N/A	—	—	—	
4.2.10	N/A	—	—	—	
4.2.11	N/A	—	—	—	
4.2.12	N/A	—	—	—	
4.2.13	T9; T10	—	**M**	—	—
4.2.14	T9	—	**M**	—	—
4.2.15	N/A	—	—	—	—
4.2.16	N/A	—	—	—	—
4.2.17	T9; T10	—	**M**	—	—

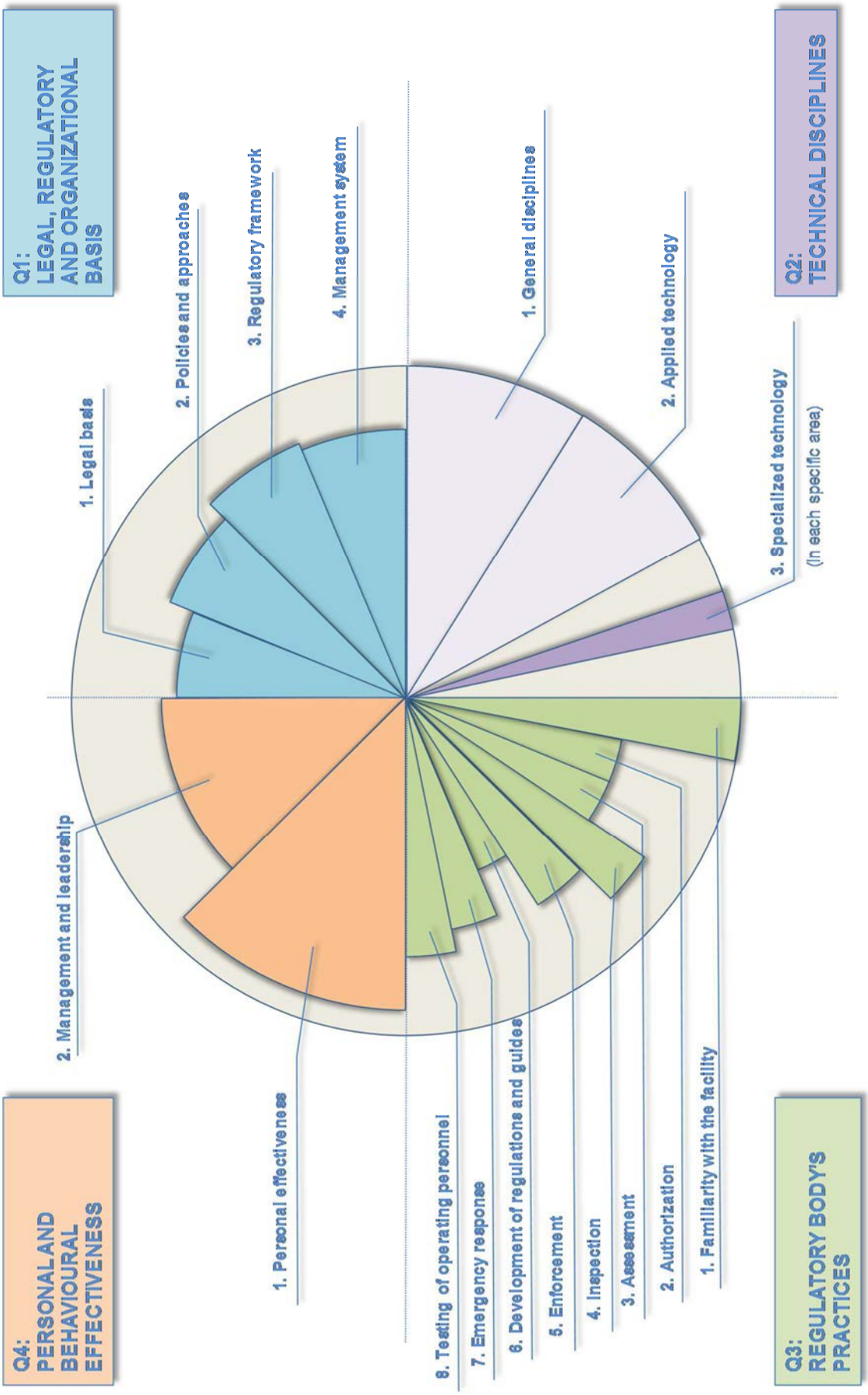

FIG. VII-4. Competence chart for position R26: Site inspector

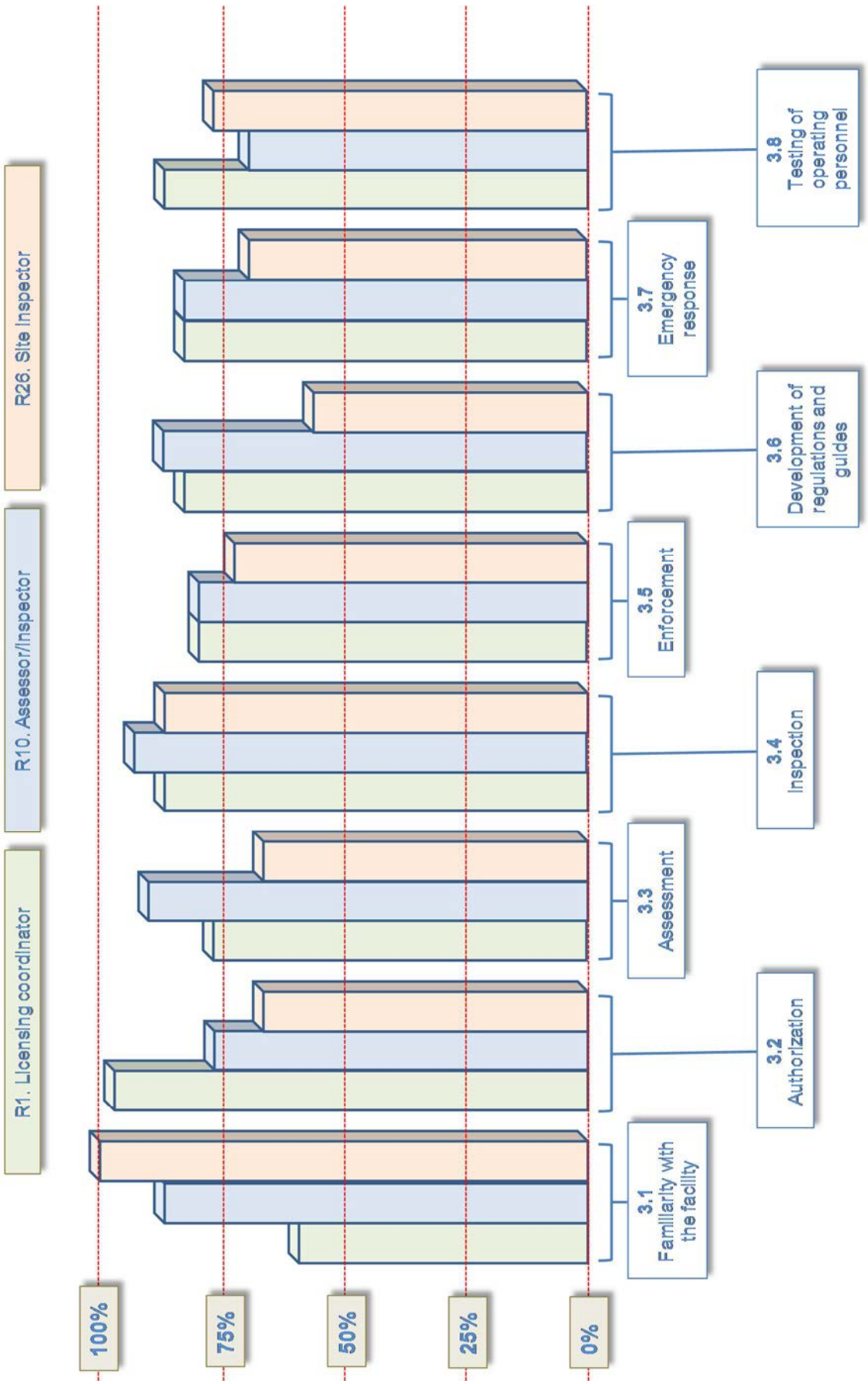

FIG. VII-5. Comparison of the competence charts for key positions. Quadrant 3: regulatory body's practices

ANNEX VIII

GOOD PRACTICES IN PERFORMANCE APPRAISAL AND COMPETENCE CERTIFICATION

VIII-1. MEXICO: GOOD PRACTICE IN PERFORMANCE APPRAISAL

At the National Commission for Nuclear Safety and Safeguards (CNSNS), public servants undergo an annual performance appraisal.

The appraisal relates to whether each public servant has achieved the goals set, in agreement with his/her immediate supervisor, at the start of the year.

The appraisal focuses primarily on the following aspects:

(a) The public servant's conduct in relation to the five managerial competences, which have different weighting depending on the type of position:
- teamwork
- results orientation
- leadership
- strategic vision
- negotiation

(b) Achievement of the personal goals set for the year;
(c) Achievement of the collective objectives of the organizational unit, based on its functions;
(d) Results achieved in training activities.

Each public servant carries out a self-appraisal, which is repeated by his/her immediate supervisor and a third evaluator (the supervisor's supervisor). The results are weighted to obtain a unique result of 0–100.

VIII-2. BRAZIL: GOOD PRACTICE IN INSPECTOR COMPETENCE CERTIFICATION

Brazil has instructions (IN-DRS-0002 Rev. 1, December 1994) on the qualification and certification of inspectors. They provide for two levels of inspector qualification: Level I and Level II.

Persons wishing to qualify as a Level I or Level II inspector must be qualified as an engineer or assessor at the National Nuclear Energy Commission (CNEN) workforce.

As least two years' professional experience in the relevant area of expertise is required to qualify as a Level I inspector.

As least five years' professional experience in the relevant area of expertise, including three years working in the nuclear field, is required to qualify as a Level II inspector; he/she should also have participated in at least five regulatory inspections, at least one of which in the preceding three years.

VIII-2.1. Training

A public servant hoping to qualify as a Level I or Level II inspector must fulfil the following training requirements:

- Pass a specific course for the facility to be inspected and retrain every three years, in accordance with the programme proposed by the regulatory body and approved by the Directorate for Radiation Protection and Nuclear Safety (DRS);
- Pass the course on basic quality assurance principles, perform regulatory inspections and retrain every three years, in accordance with the programme approved by the DRS;
- Successfully complete, and retake every year, a course on radiation protection, emergency procedures and physical protection in the controlled areas of nuclear facilities, in accordance with the programme approved by the DRS.

VIII-2.2. Physical aptitude

A public servant hoping to qualify as a Level I or Level II inspector must meet the physical aptitude requirements, which include an annual medical examination to confirm that he/she is physically able to perform inspection tasks in controlled areas, and annual whole-body monitoring.

VIII-2.3. Competence

A certified Level I inspector is authorized to participate in inspections as a team member.

A certified Level II inspector is authorized to participate in inspections as a team leader.

VIII-2.4. Validity and revalidation

The certification referred to above remains valid for three years.

Its revalidation will be conditional on meeting the initial requirements.

VIII-2.5. Records

The DRS keeps individual files on the certified inspectors, containing all the documents corroborating that the requirements have been met.

GLOSSARY

The terms used in this document are taken from the IAEA Safety Glossary 2007 Edition[6], except for the following terms that have been coined for these Guidelines:

BASIC TRAINING: Pre-university or undergraduate academic training before joining the regulatory body.

APPLIED TRAINING: Postgraduate training serving as an introduction to nuclear reactor safety.

SPECIALIZED TRAINING: Specific training in a technical discipline applicable to nuclear reactor licensing and control.

COMPETENCE CHART (for a position): Pie chart depicting the core competences of the four quadrants and their required level for a given position.

LIST OF COMPETENCES FOR NUCLEAR REACTOR REGULATORS: Adaptation of the general compilation of competences proposed in the IAEA's SARCoN Guidelines, so that it could be applied to nuclear regulators in the Ibero-American region; this led to the introduction of new core competences, the modification and regrouping of certain competences from the IAEA model, and the redefining of the three levels for each core competence, based on the concepts of 'supervised work', 'autonomous work' and 'supervisory or expert work'.

COMPETENCE PROFILE (for a position): Objectives and tasks of a position, and the competences needed to fulfil them.

CORE WORKFORCE: Basic set of regulators involved in the various stages of the licensing and control process, who are considered a fundamental part of the regulatory body staff in order to ensure effective independent control at all stages in the life cycle of a nuclear power reactor.

[6] http://www-pub.iaea.org/books/IAEABooks/7897/IAEA-Safety-Glossary

LIST OF ABBREVIATIONS

ARN	Nuclear Regulatory Authority (Argentina)
CEIDEN	Technological Platform for Nuclear Fission
CIEMAT	Research Centre for Energy, Environment and Technology (Spain)
CNEN	National Nuclear Energy Commission (Brazil)
CReAN	Competences of Regulators in the Area of Nuclear Safety
CSN	Nuclear Safety Council (Spain)
EduTA	Education and Training Appraisal
EIA	environmental impact assessment
ETRES	Education and Training Review Service
ETSIME	Higher Technical School for Mining and Energy Engineering (Spain)
EU	European Union
FORO	Ibero-American Forum of Radiological and Nuclear Regulatory Agencies
I&C	instrumentation and control
IAEA	International Atomic Energy Agency
IEN	Nuclear Engineering Institute (Brazil)
IPEN	Nuclear and Energy Research Institute
IRRS	Integrated Regulatory Review Service
KSAs	knowledge, skills and attitudes
NPP	nuclear power plant
OFNT	Technical Standards Office (CSN)
OJT	on-the-job training
OO	operating organization
ProgCAD	programme for competence acquisition and development
PSA	probabilistic safety assessment
RB	regulatory body
SAR	safety analysis report
SARCoN	Systematic Assessment of Regulatory Competence Needs
SISC	Integrated System for NPP Supervision (CSN)
SWOT	strengths, weaknesses, opportunities, threats
TSO	technical support organization
UFRJ	Federal University of Rio de Janeiro
USP	University of São Paulo

CONTRIBUTORS TO DRAFTING AND REVIEW

Alfonso Pallares, C.	Office for Environmental Regulation and Nuclear Safety (ORASEN), Cuba
Encinas Cerezo, D.	Nuclear Safety Council (CSN), Spain
Esquivel, J.L.	National Commission for Nuclear Safety and Safeguards (CNSNS), Mexico
Gromann, A.	National Nuclear Energy Commission (CNEN), Brazil
Kay, J.M.	Nuclear Regulatory Authority (ARN), Argentina
Larcher, A.	Nuclear Regulatory Authority (ARN), Argentina
Moracho Ramírez, M.	Department of Nuclear Safety and Security, IAEA
Morales, E.F.	National Regulatory Authority for Radiation Protection (ARNR), Ministry of Industry, Energy and Mining, Uruguay
Riesle Wetherby, J.	Chilean Nuclear Energy Commission (CCHEN), Chile

Expert meetings

Buenos Aires, Argentina: 23–27 April 2012

Cuernavaca, Mexico: 24–28 September 2012

Rio de Janeiro, Brazil: 8–12 April 2013

Vienna, Austria: 4–8 November 2013

Madrid, Spain: 5–9 May 2014

IAEA
International Atomic Energy Agency

No. 24

ORDERING LOCALLY

In the following countries, IAEA priced publications may be purchased from the sources listed below or from major local booksellers.

Orders for unpriced publications should be made directly to the IAEA. The contact details are given at the end of this list.

BELGIUM
Jean de Lannoy
Avenue du Roi 202, 1190 Brussels, BELGIUM
Telephone: +32 2 5384 308 • Fax: +32 2 5380 841
Email: jean.de.lannoy@euronet.be • Web site: http://www.jean-de-lannoy.be

CANADA
Renouf Publishing Co. Ltd.
22-1010 Polytek Street, Ottawa, ON K1J 9J1, CANADA
Telephone: +1 613 745 2665 • Fax: +1 643 745 7660
Email: order@renoufbooks.com • Web site: http://www.renoufbooks.com

Bernan Associates
4501 Forbes Blvd., Suite 200, Lanham, MD 20706-4391, USA
Telephone: +1 800 865 3457 • Fax: +1 800 865 3450
Email: orders@bernan.com • Web site: http://www.bernan.com

CZECH REPUBLIC
Suweco CZ, s.r.o.
SESTUPNÁ 153/11, 162 00 Prague 6, CZECH REPUBLIC
Telephone: +420 242 459 205 • Fax: +420 284 821 646
Email: nakup@suweco.cz • Web site: http://www.suweco.cz

FRANCE
Form-Edit
5 rue Janssen, PO Box 25, 75921 Paris CEDEX, FRANCE
Telephone: +33 1 42 01 49 49 • Fax: +33 1 42 01 90 90
Email: fabien.boucard@formedit.fr • Web site: http://www.formedit.fr

Lavoisier SAS
14 rue de Provigny, 94236 Cachan CEDEX, FRANCE
Telephone: +33 1 47 40 67 00 • Fax: +33 1 47 40 67 02
Email: livres@lavoisier.fr • Web site: http://www.lavoisier.fr

L'Appel du livre
99 rue de Charonne, 75011 Paris, FRANCE
Telephone: +33 1 43 07 43 43 • Fax: +33 1 43 07 50 80
Email: livres@appeldulivre.fr • Web site: http://www.appeldulivre.fr

GERMANY
Goethe Buchhandlung Teubig GmbH
Schweitzer Fachinformationen
Willstätterstrasse 15, 40549 Düsseldorf, GERMANY
Telephone: +49 (0) 211 49 874 015 • Fax: +49 (0) 211 49 874 28
Email: kundenbetreuung.goethe@schweitzer-online.de • Web site: http://www.goethebuch.de

HUNGARY
Librotrade Ltd., Book Import
Pesti ut 237. 1173 Budapest, HUNGARY
Telephone: +36 1 254-0-269 • Fax: +36 1 254-0-274
Email: books@librotrade.hu • Web site: http://www.librotrade.hu

INDIA
Allied Publishers
1st Floor, Dubash House, 15, J.N. Heredi Marg, Ballard Estate, Mumbai 400001, INDIA
Telephone: +91 22 4212 6930/31/69 • Fax: +91 22 2261 7928
Email: alliedpl@vsnl.com • Web site: http://www.alliedpublishers.com

Bookwell
3/79 Nirankari, Delhi 110009, INDIA
Telephone: +91 11 2760 1283/4536
Email: bkwell@nde.vsnl.net.in • Web site: http://www.bookwellindia.com

ITALY
Libreria Scientifica "AEIOU"
Via Vincenzo Maria Coronelli 6, 20146 Milan, ITALY
Telephone: +39 02 48 95 45 52 • Fax: +39 02 48 95 45 48
Email: info@libreriaaeiou.eu • Web site: http://www.libreriaaeiou.eu

JAPAN
Maruzen-Yushodo Co., Ltd.
10-10, Yotsuyasakamachi, Shinjuku-ku, Tokyo 160-0002, JAPAN
Telephone: +81 3 4335 9312 • Fax: +81 3 4335 9364
Email: bookimport@maruzen.co.jp • Web site: http://maruzen.co.jp

RUSSIAN FEDERATION
Scientific and Engineering Centre for Nuclear and Radiation Safety
107140, Moscow, Malaya Krasnoselskaya st. 2/8, bld. 5, RUSSIAN FEDERATION
Telephone: +7 499 264 00 03 • Fax: +7 499 264 28 59
Email: secnrs@secnrs.ru • Web site: http://www.secnrs.ru

UNITED STATES OF AMERICA
Bernan Associates
4501 Forbes Blvd., Suite 200, Lanham, MD 20706-4391, USA
Telephone: +1 800 865 3457 • Fax: +1 800 865 3450
Email: orders@bernan.com • Web site: http://www.bernan.com

Renouf Publishing Co. Ltd.
812 Proctor Avenue, Ogdensburg, NY 13669-2205, USA
Telephone: +1 888 551 7470 • Fax: +1 888 551 7471
Email: orders@renoufbooks.com • Web site: http://www.renoufbooks.com

Orders for both priced and unpriced publications may be addressed directly to:

IAEA Publishing Section, Marketing and Sales Unit
International Atomic Energy Agency
Vienna International Centre, PO Box 100, 1400 Vienna, Austria
Telephone: +43 1 2600 22529 or 22530 • Fax: +43 1 2600 29302
Email: sales.publications@iaea.org • Web site: http://www.iaea.org/books