Functions important to nuclear power plant safety, and training and qualification of personnel

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Authorisation

By virtue of section 55, second paragraph, point 3 of the Nuclear Energy Act (990/87) and section 29 of the Council of State Decision (395/91) on General Regulations for the Safety of Nuclear Power Plants, the Finnish Centre for Radiation and Nuclear Safety (STUK) issues detailed regulations concerning the safety of nuclear power plants.

YVL Guides are rules an individual licensee or any other organisation concerned shall comply with, unless STUK has been presented with some other acceptable procedure or solution by which the safety level set forth in the YVL Guides is achieved.

Translation. Original text in Finnish.

1 General

One essential prerequisite for the safe operation of a nuclear power plant is that the personnel have the professional qualifications appropriate to their duties and are aware of the administrative and technical requirements relating to safety. In carrying out their duties, the personnel shall always aim at a high level of safety in the operation of the nuclear power plant.

The following regulations concerning nuclear power plant personnel are enacted in the Nuclear Energy Act and Decree and also in the Council of State Decision (395/91):

According to section 19 of the Nuclear Energy Act, one prerequisite for granting a construction permit for a nuclear facility is that the applicant has available the necessary expertise. The conditions for granting an operating licence are given in section 20 of the Act which states that the applicant must have available sufficient expertise and, in particular, that the competence of the operating personnel and the operating organisation of the nuclear facility must be appropriate.

According to section 55 of the Nuclear Energy Act, the Finnish Centre for Radiation and Nuclear Safety shall set qualification requirements for persons involved in the use of nuclear energy and shall ensure that these requirements are met. Under section 119 of the Nuclear Energy Act, the Centre sees to it that the licence-holder's organisation is appropriate and adequate and that those involved in the use of nuclear energy meet the qualification requirements set and have been given training as appropriate.

According to section 25 of the Council of State Decision (395/91), nuclear power plant personnel shall be well suited for their duties, they shall be competent and have sufficient basic education. The personnel shall be given initial, complementary and refresher training. A sufficient number of competent personnel shall be available to ensure safety in all situations.

Under section 4 of the Council of State Decision (395/91), during the design, construction and operation of a nuclear plant, an advanced safety culture shall be maintained which is based on the safety-oriented attitude of the topmost management of the organisations concerned and on a personnel motivated to work in a responsible manner. These require well organised working conditions and an open working atmosphere as well as the encouragement of alertness and initiative to observe and eliminate factors which may endanger safety.

Qualification requirements for the responsible manager of a nuclear facility and for his deputy and the approval procedure are enacted in section 79 of the Nuclear Energy Act and in sections 122–127 of the Nuclear Energy Decree. According to section 128 of the Decree, the main control room operators must have an approval for the job granted by the Finnish Centre for Radiation and Nuclear Safety. According to section 129 of the Decree, the licence-holder shall appoint persons responsible for emergency planning, physical protection and nuclear materials control at the nuclear facility who are to be separately approved for each job by the Centre. The organisational position of the aforementioned persons is enacted in section 130 of the Decree.

According to section 113 of the Nuclear Energy Decree, inspections and tests of nuclear facility systems, structures and components may only be performed by the licence-holder or, in his place, an inspector or an inspection agency specifically approved for this purpose by the Finnish Centre for Radiation and Nuclear Safety. Only persons approved by the Centre may be appointed as supervisors of pressure vessel manufacture and operation whose qualification requirements are given in sections 9, 10, 25 and 26 of the Pressure Vessel Decree.

2 Scope

This Guide defines the functions required for the safe operation of an organisation and for which position-specific qualification requirements shall be established. Each function's description is the basis for the qualification requirements.

In this Guide, the operating organisation means the organisation attending to direct operational functions, the plant's maintenance functions and the technical support functions defined in chapter 3 of this Guide. The way technical support functions are organised differs by operating organisation. In the licence-holder's organisation, part of the technical support functions referred to in chapter 3 may be performed on-site or in a technical support organisation off-site which is not subordinate to the nuclear power plant's responsible manager. The job-specific qualification requirements mentioned in this Guide shall also be applied to persons referred to in this Guide who are employed by an outside support organisation.

This Guide presents the basic education, work experience and medical fitness for the job required during recruitment, the requirements relating to the initial training arranged by the licence-holder to qualify a person for his job and certain job-specific approvals granted separately. General requirements for the training function and for the refresher and continuing training arranged by the licence-holder are also set out in this Guide.

In addition to this Guide, instructions relating to the personnel are given in the following guides:

— licensing of nuclear power plant operators; the procedure is described in Guide YVL 1.6
— companies and individuals performing fabrication, inspection and expert tasks subject to licensing and which relate to mechanical components and concrete and steel structures of nuclear power plants; licensing and other prerequisites for operation can be found in Guides YVL 1.3, YVL 3.4, YVL 4.1 and YVL 4.2.

3 Functions important to safety

3.1 Functions of the organisation

In this chapter, a general description of functions important for the safe operation of a nuclear power plant is given. The authority, responsibilities and lines of communication relating to these functions shall be clearly defined. The organisation shall maintain its capability to function under all circumstances, including operational transients and accident conditions.

The safe operation of an organisation requires goals for the operation. These goals shall be set by the organisation's management who also shall monitor their realisation. Planning and the personnel's commitment are required to achieve these goals.

The organisation's structure, job descriptions, the qualification requirements, authority and responsibility of the personnel, and the lines of management shall be described in the administrative rules or in the organisation's manual. Also the arrangement of on-call and replacement duties and the principles to be observed in having work done overtime shall be defined in the administrative rules. Requirements concerning the administrative rules are presented in Guide YVL 1.1.

The organisation's structure, functions and the number of personnel required, their qualification requirements and recruitment shall be planned in sufficient detail during the plant's construction phase already.

Below is an exemplary list of plant operational functions which was used when setting the requirements of this Guide:

— responsible manager
— operation
— maintenance
— technical support:
    — reactor physics and core management
    — chemistry
    — radiation protection

  - — testing and surveillance
  - — planning of operations
  - — plant engineering and operational experience feedback
  - — nuclear safety
  - — emergency preparedness
  - — document administration
- — quality assurance
- — fire protection
- — physical protection
- — nuclear material safeguards
- — training
- — other functions.

The groups and names of functions may differ from the above, depending on the licensee's existing organisation, but the same functions relating to plant operation shall be covered, however.

A separate supervisory safety committee issues recommendations and addresses safety-significant issues relating to the plant's nuclear safety. The committee is subordinate to the license-holder's management.

3.2 Responsible manager

Section 79 of the Nuclear Energy Act prescribes that an operation for which a licence referred to in section 20 has been granted cannot be carried out if a responsible manager has not been appointed for the operation. Under section 124 of the Nuclear Energy Decree, the responsible manager has a duty to see to it that the provisions of the Nuclear Energy Act on the safe use of nuclear energy, on the arrangements for physical protection and emergency preparedness, and on the (nuclear material) safeguards provisions of the Act referred to in section 118 of the aforementioned Decree, and the rules and regulations issued by virtue of the Decree, plus the licence conditions are complied with.

The responsible manager has responsibility for the safe and reliable operation of the nuclear power plant. He directs activities relating to plant operation and maintenance and to the technical support function at the plant. He is responsible for the training and qualification of the plant's personnel.

Directly subordinate to the responsible manager are those in charge of plant operation, maintenance and technical support.

3.3 Operation

Direct operational functions are headed by the operations manager. The plant is operated in shifts by "shift teams". The number of a plant unit's shift teams shall enable continuous manning of the plant unit, taking into account working time requirements and the time spent in training. Shift teams are headed by approved shift supervisors. Besides the shift supervisor, a shift team shall include at least two approved operators and a sufficient number of field operators.

The shift supervisor heads his own shift team and is responsible for ensuring that direct operations are performed according to the Technical Specifications and plant procedures. The operators operate the reactor controls and equipment in the plant's main control room. Field operators perform operations outside the main control room.

In multi-unit plants, each unit has an operations engineer in charge of operational functions and who is subordinate to the operations manager and is head of shift supervisors.

In the event of emergencies and transients, the shift supervisor in the main control room is assisted by the safety engineer who has at least a shift supervisor's qualifications. The safety engineer's duty is to independently monitor nuclear safety.

3.4 Maintenance

The maintenance function covers activities relating to plant preventive maintenance and repair. Those in maintenance also participate in the implementation of modifications. Maintenance is headed by the maintenance manager who ensures that the function is discharged in compliance with the Technical Specifications, approved procedures and instructions.

Maintenance is divided into engineering-specific sub-areas such as mechanical, building, electrical and instrumentation plus preparation of maintenance measures and work planning. Those holding supervisory positions in these sub-areas are directly subordinate to the maintenance manager, and work supervisors operate under the authority of the heads of these sub-areas. Under the authority of the work supervisors, the maintenance crew perform maintenance and repair work assigned to them.

During outages in particular, a large number of contract workers are employed at the nuclear power plant, mostly in maintenance. Sub-contractor personnel and work supervisors work under the authority of the license-holder's work supervisors.

3.5 Technical support

The technical support functions contributing to the safe operation of the nuclear power plant can be named as follows: reactor physics and core management, chemistry, radiation protection, testing and surveillance, planning of operations, nuclear plant engineering, nuclear safety, emergency preparedness and document administration. The requirements set for these functions are addressed below.

Each of the above functions can be performed by a separate unit or several functions can be combined. To define their special features, however, each function is presented here separately. Some of the technical support functions mentioned may be contained in either the operations or maintenance units, or, the utility's organisational units off-site are responsible for their implementation. Also, there may be a separate unit for nuclear safety. The nuclear power plant's technical support function on-site is directed by the technical support manager.

3.5.1 Reactor physics and core management

The reactor physics and core management functions include monitoring of the reactor core in support of control room operations, monitoring of fuel operation, assessment of fuel behaviour during the fuel cycle, loading plans, and planning and monitoring of measures relating to fuel handling and storage.

Job titles are e.g. Reactor Engineer and Fuel Engineer.

3.5.2 Chemistry

The chemistry function covers activities which are used to control and monitor the process chemistry and to monitor radiation levels inside the plant and along exposure pathways out from the plant. The function comprises tasks typical of laboratories, sampling and analyses, chemistry management and expert tasks relating to process and materials technology.

Job titles are i.a. Chemist, Radiochemist, Technician and Laboratory Assistant.

3.5.3 Radiation protection

The radiation protection function covers the radiation safety of nuclear power plant personnel and of the surrounding population. It encompasses technical and administrative radiation protection, occupational dosimetry, radioactive releases and monitoring of discharges and radiation level measurements on-site and in the plant's vicinity.

Job titles are i.a. Radiation Protection Manager, Radiation Protection Technician and Radiation Protection Assistant. The radiation protection personnel discharge their duties under the supervision of the Radiation Protection Manager who reports direct to the responsible manager.

3.5.4 Testing and surveillance

Testing and surveillance comprises all tests required in the Technical Specifications and other tests, inservice inspections and assessment of the results.

Job titles are i.a. Reliability Engineer and Pressure Vessel Operation Supervisor.

3.5.5 Planning of operations

Operational planning comprises daily and long term planning, including i.a. daily operation, co-ordination of testing and maintenance measures, and also planning of annual maintenance outages.

Job titles are i.a. Operations Planning Engineer.

3.5.6 Plant engineering and operational experience feedback

The plant engineering function ensures that all systems and components continue to meet the design requirements for safe and reliable operation. The function includes:

— monitoring of the operability of systems and components and investigation into the causes of any deficiencies detected
— monitoring and operational experience feedback gained at own and other plants
— assessment of the applicability of the results of safety analyses and of advancements in technology
— proposal of plant modifications, evaluation and planning of the proposed modifications.

Nuclear engineering can be divided into sub-groups according to responsibity, e.g. process, mechanical, electrical and instrumentation, or, according to systems; an operational feedback group shall also be set up.

Job titles are i.a. Planning Manager, Process, Mechanical, Electrical, Instrumentation and Design Engineers and Operational Experience Engineer.

3.5.7 Nuclear safety

Nuclear safety comprises:

— making of safety assessments and analyses
— evaluation of plant operational safety
— assessment of defects, malfunctions and plant transients detected
— proposals to prevent transients and improve safety
— assessment of the safety of the plant modifications proposed
— nucler safety review of reports to be submitted to authorities.

Job titles are i.a. Safety Engineer and Reliability Engineer.

3.5.8 Emergency preparedness

The emergency preparedness function comprises provision made against potential nuclear accidents. Therefore, plans are made describing the lines of management and measures taken during accidents. To achieve the planned preparedness, appropriate training is given to the personnel and the necessary equipment is acquired. Preparedness is assessed, maintained and developed by regular excercises.

Job titles are i.a Emergency Preparedness Expert.

3.5.9 Document administration

Document administration comprises the updating of documents in daily use and the filing of design documents, commissioning documents and documents related to operational history.

3.6 Quality assurance

Quality assurance comprises monitoring of the implementation of the quality assurance programme. The quality assurance unit reports directly to the responsible manager and the unit is independent of the organisational units over which its quality assurance activities are exerted.

Job titles are i.a. Quality Assurance Manager and Quality Assurance Engineer.

3.7 Fire protection

Fire protection comprises preventive fire protection, operative fire extinguishing and maintenance of structural fire protection. For the conduct of the fire protection function, the plant has a chief fire officer who has received training relative to his position and under whose authority the rest of the trained fire protection organisation operates.

3.8 Physical protection

Physical protection means the prevention of any illegitimate action that could endanger nuclear or radiation safety or nuclear material immunity.

Job titles are i.a. Security Expert, Security Chief and Guard.

3.9 Nuclear material safeguards

Nuclear material safeguards mean the necessary control to prevent the proliferation of nuclear weapons relating to the procurement, transport, use, handling and storage of nuclear materials, and the fulfillment of the obligations of Finland's international treaties relating to this control.

Job titles are i.a. Safeguards Expert.

3.10 Training

Training includes:
— familiarisation training given to the plant's own personnel and to suppliers' newly recruited personnel before work is started
— initial, refresher and continuing training for the plant's own personnel
— monitoring of the contents and quality of training
— maintenance of a training register
— planning and development of the training function.

Job titles are i.a. Training Manager, Instructor and Simulator Instructor.

3.11 Other functions

Other functions include e.g. industrial safety and expert tasks not mentioned above. At nuclear power plants, the principles underlying these tasks are equal to those at conventional industrial plants.

4 Recruitment of personnel and qualification requirements

4.1 Recruitment

A nuclear power plant must have a personnel recruitment plan in which the personnel required, qualification requirements, initial training programmes and times of recruitment are indicated.

Recruitment shall take place early enough during the construction phase and before the plant's commissioning to allow for familiarisation with and training for duties. The time required for this depends on how demanding each task is. Familiarisation is best achieved by performing duties relating to the construction and commissioning of the plant unit. When considering the time of recruitment, it should be taken into account that a person may be used e.g. to
— recruit and train other personnel
— draw up commissioning tests, operation and maintenance instructions, chemistry and radiation protection instructions, inservice inspection instructions and other equivalent instructions
— make operable, operate and maintain systems
— select equipment and replacement parts for the maintenance, chemistry and radiation protection laboratories and workshops.

When new staff is recruited to an operating nuclear power plant, the recruits shall receive training and familiarisation relevant to the task-specific qualification requirements and each person's professional qualifications and work experience shall be taken into account.

4.2 Qualification requirements

Personnel qualification requirements apply to the following entities:
— basic education and work experience
— suitability for a job (medical examination, aptitude tests and personnel security)
— initial, refresher and continuing training given by the licensee.
— any specific approvals required.

4.3 Basic education and work experience

Table I sets out the basic education and work experience requirements for persons referred to in chapter 3. Since the assignment of duties varies from plant to plant, the requirements shall be confirmed in the plant's administrative rules or in the organisation manual to ensure compliance with requirements which are in conformity with those presented in Table I.

In Table I, the basic education requirements are indicated by the abbreviations M.Sc, E, T, VT, or –, which stand for

M.Sc	Master of Science in Technology or equivalent academic degree,
E	Engineer or equivalent technical training,
T	Technician or equivalent technical training,
VT	Vocational training relating to the field,
–	no (specific) vocational training.

Work experience requirements corresponding to the alternatives indicated in the basic education column of Table I are given in respective order.

Work experience means experience gained after the completion of basic education.

Work experience shall provide the employee with the knowledge and skills required in the performance of the task in question at the nuclear power plant.

Depending on the task, some part of a person's work experience shall be in the nuclear power field. Such experience is obtained by participating in the design, construction, trial run or operation of a nuclear power plant. Work with a research reactor or in a research laboratory and inspection of, or research relating to, nuclear power plants is also considered such work experience. Furthermore, the period a person is employed by a utility and receives training in preparation for his future position also counts as experience in the field of nuclear energy.

At new nuclear power plant units, the personnel shall have attained the required experience by the time fuel loading is started. At operating nuclear power plant units this experience shall be attained before a person assumes full responsibility of a task. The person in charge of a task may have subordinates who do not fulfill the work experience requirement and for whose work results he is thus responsible.

4.4 Suitability for a job

The medical fitness of those employed in functions important for nuclear power plant safety to work at the plant shall be ascertained during recruitment and, thereafter, at regular intervals during the employment relationship. All personnel engaged in radiation work shall undergo medical examination as appropriate.

The use of psychologial aptitude tests is recommended when hiring persons to positions most important to safety and which relate to direct conduct of plant operations.

4.5 Recruitment of temporary personnel and qualification requirements

When recruiting temporary personnel to a nuclear power plant, e.g. for the duration of outages, the meeting of task-specific qualification requirements shall be ensured.

Table I. *Basic education and work experience requirements.*

Position	Basic Education	Work Experience Total (years)	Nuclear Field (years)
Responsible Manager and his deputy	M.Sc	10	5
Operations Manager	M.Sc, E	7, 10	3, 5
Maintenance Manager	M.Sc, E	7, 10	3, 5
Technical Manager	M.Sc	7	3
Operations Engineer	E	7	3
Safety Engineer (Operations)	E	5	3
Shift Supervisor	E, T	5, 7	3, 5
Operator	T	3	1
Field Operator	VT,–	1, 3	0.5, 1
Mechanical Maintenance Manager	E, T	5, 7	1, 3
Electrical Maintenance Manager	E, T	5, 7	1, 3
Instrumentation Maintenance Manager	E	5	1
Building Maintenance Manager	E, T	3, 5	–, 1
Work Planning Manager	E	5	3
Work Planner	T, VT	3, 5	1, 3
Work Supervisor	T, VT	3, 7	1, 3
Mechanic	VT, –	1, 3	0.5, 1
Reactor Engineer	M.Sc, E	3, 5	3, 5
Fuel Engineer	M.Sc	3	1
Chemist	M.Sc, E	3, 5	1, 3
Radiochemist	M.Sc, E	3	1
Radiation Protection Manager	M.Sc	5	3
Radiation Protection Technician	T	3	1
Radiation Protection Assistant	T, –	1, 3	1, 3
Safety Engineer (technical support)	M.Sc, E	3, 5	3, 3
Testing Engineer	M.Sc, E	3, 3	1, 1
Operations Planning Engineer	M.Sc, E	3, 5	1, 3
Quality Assurance Manager	M.Sc	5	3
Quality Assurance Engineer	M.Sc, E	3, 5	1, 1
Quality Control Engineer	M.Sc, E	3, 5	3, 3
Planning Manager	M.Sc, E	5, 5	1, 1
Process Engineer	M.Sc, E	3, 3	1, 1
Electrical Engineer	M.Sc, E	3, 3	1, 1
Instrumentation Engineer	M.Sc, E	3, 3	1, 1
Reliability Engineer	M.Sc, E	3, 3	1, 1
Operational Experience Engineer	M.Sc, E	3, 3	1, 1
Training Manager	M.Sc, E	3, 5	1, 3
Instructor	E, T	3, 5	1, 3
Simulator Instructor	E, T	3, 5	3, 3
Emergency Preparedness Expert	M.Sc, E	3, 5	1, 3
Security Expert	M.Sc, E	3, 3	1, 3
Safeguards Expert	M.Sc, E	3, 3	1, 3

Familiarisation training shall be given, taking into account each person's previous work experience and training.

Each recruit's basic education, work experience and, in particular, the experience gained at a nuclear power plant shall be known. When ordering a piece of work from a subcontractor it shall be ensured that an appropriately qualified team is appointed to carry out the assignment.

To ensure that teams with sufficient professional skills are used, qualification requirements shall be set for the teams of workers repairing and maintaining systems and components important to the safe operation of the nuclear power plant. Where necessary, the licensee shall arrange subcontractor personnel complementary vocational training.

Familiarisation training given before outages shall include i.a. access arrangements, industrial safety and radiation protection, fire protection, emergency response arrangements and work permit procedures. The importance of high quality work shall be emphasised. The safety classification system and its impact on work supervision, the necessary maintenance instructions and the importance of complying with them, and factors contributing to the successful accomplishment of work and the experience gained during previous outages in each work supervisor's sub-area shall be described to the work supervisors of subcontractors.

Requirements set out in sub-sections 4.2–4.4 and 6.3 apply, for applicable parts, to temporary personnel employed e.g. for the duration of outages.

5 Training

5.1 General training arrangements

The training function shall be so arranged that it ensures acquirement and maintenance of the competence required in the performance of tasks important to safety. It shall include the initial training given before a person assumes full responsibility of a task and also the refresher ja continuing training to be given later.

As regards each safety-significant position, the following matters shall be taken care of:
— qualification requirements for the position are defined
— it is analysed what training is required to meet the qualification requirements, and the training programmes are developed
— trainee proficiency at the various stages of training is assessed and the results are recorded
— the effectiveness of training is assessed
— refresher and continuing training is given at regular intervals.

Anyone in a supervisory position in the line organisation is responsible to ensure that his subordinates are appropriately trained and professionally qualified for their positions. Managers shall identify the training needs of their subordinates and ensure that these are met. The responsibility and authority of the training staff in providing training for the plant personnel shall be clearly defined.

A job-specific initial, refresher and continuing training programme shall be drawn up for every position mentioned in this Guide. The training given shall impart the knowledge and skills necessary to perform the tasks of each position under all circumstances. Also, the safety awareness of the trainees shall be promoted.

Training may be arranged in a training organisation within or outside the operating organisation. The instructors shall be technically competent within their spheres of responsibility, and sufficiently competent as instructors, and they shall be given sufficient time to maintain their competence e.g. by working at the plant and by participating in refresher and continuing training.

The training function shall be well organised. The training programmes shall contain an appropriate combination of classroom instruction and practical training in the actual

work environment. The following factors shall be taken into account when arranging training programmes for each position:

— Training material to support classroom instruction shall be provided, such as course-specific written material aimed at the trainee and instructions and teaching material aimed at the instructor.

— On-the-job training shall be systematic and conducted by the help of an incumbent who shall be familiarised with his or her tasks. The progress made by the trainee shall be monitored and the results assessed.

— Simulator training shall be part of the initial and refresher training given to operators who manipulate the reactor controls in the control room. The simulator facility must be as representative of the plant main control room as possible. The simulator's behaviour during transient and accident conditions shall adequately well correspond to the plant's behaviour and the range simulated shall cover plant normal operation, operational transients and accidents in the extent appropriate.

— To teach safe working practices, laboratory and workshop training shall be arranged for those who need these skills. Training mock-ups and models are to be provided for practising tasks which have to be carried out quickly and skilfully and cannot be practised with the actual facility equipment.

— A designated expert shall assist the trainee in self-study training, offering support and guidance as required. Specifically prepared training material shall be provided for self-study topics and the process itself shall be supported by introductory lectures.

— Computer-based systems facilitating operator self-study training can be installed in the nuclear power plant's control room. Their use for training purposes shall clearly be separated from the equipment used for the control room work.

During the training, it shall be ensured by examinations that the trainees digest well enough the information imparted. For this purpose, written tests, oral examinations and performance tests can be used. After the basic training, a persons's readiness to work independently shall be assessed. Assessment of the work skills of main control room operators shall contain tests at the training simulator carried out towards the end of the initial training period and at regular intervals during refresher training.

The necessary changes to the training programmes and equipment and materials shall be made every time the plant systems or instructions change and new operating experience or feedback on them is received. The appropriateness and effectiveness of the training programmes shall be regularly assessed.

A training register shall be kept of all individuals whose tasks fall within the spheres of competence presented in this Guide. The register shall contain the qualification requirements for each position, a person's basic education and work experience, the training he or she has participated in and the approvals granted concerning his or her competence to independently handle a task.

A set of instructions shall be drawn up for the training function which contains the general principles of the training activities, the procedures, job-specific qualification requirements and training programmes.

5.2 Training programmes

5.2.1 General

Nuclear power plant recruits shall be systematically familiarised with their work environment. The familiarisation programme shall present the responsibilities and obligations of the personnel plus safe work practices and the emergency preparedness function.

All personnel likely to be (occupationally) exposed to ionizing radiation shall receive suitable training in radiation risks and in the technical and administrative means to limit and prevent exposure.

The training programmes for the personnel referred to in this Guide, i.e. staff who work in technical management and expert assignments, main control room operators and technicians in responsible positions, shall contain a sufficiently extensive review of the basic principles of nuclear technology, nuclear safety, nuclear power plant design and operating principles, and on-the-job training. Other technicians, field operators, maintenance staff and staff with vocational training referred to in this Guide shall be given a more practically oriented initial training which includes theory as deemed necessary.

A nuclear power plant's personnel shall receive training in provision against accident conditions. Those of the personnel who perform tasks during accident conditions shall be given the specific training required.

5.2.2 Training for operating personnel

Operators shall be thoroughly trained in the structure, functioning and operation of the plant and its systems. The obligation to operate the plant according to the Technical Specifications and plant procedures shall be emphasised.

Control room operators shall have sufficiently extensive experience of the plant's behaviour under various operational conditions and of making observations relating to the various operational conditions, performing operating procedures, working in a team and performing administrative tasks. In addition, shift supervisors shall be given training in managerial and communication skills and their training shall be more extensive than that of other operators.

Training given at a representative, full-scope simulator facility is essential for shift supervisors and main control room operators for practising operations during infrequent normal operational conditions and transient and accident conditions. Diagnostic skills shall also be developed during the training. To promote effective cooperation, every shift must practise as an individual team.

Severe accident conditions with the related instructions shall be included in the training programme and shall be practised at a simulator facility, or otherwise, to the extent practicable.

Field operators shall be given training commensurate with their duties and obligations.They shall also in practice rehearse the performance of the measures.

5.2.3 Training for maintenance personnel

Training for the maintenance personnel shall include features of facility design, general features and functions of at least plant systems within each persons's sphere of responsibility, quality assurance and quality control, maintenance instructions and practices, surveillance, and the specific knowledge and skills required in the performance of their duties.

The safety hazards associated with potential maintenance errors and the operating experience relating to the maintenance function shall be emphasised in training.

Foremen shall ensure that their subordinates are sufficiently qualified for their duties and familiar with the work items and the equipment assigned to them. Competence may be based on training given by the component manufacturer, training on training mock-ups and on-the-job training under the supervision of an experienced individual.

5.2.4 Training for technical support personnel

The training given to technical support personnel shall include the features of facility design, the structure and functioning of systems in broad outline and general principles of operation. The training shall provide the personnel with sufficient knowledge and skills for performing their tasks and responsibilities reliably and safely. Task-specific training programmes shall be planned on the basis of the knowledge and skills required in each task, and on-the-job training shall be included in the programme.

5.2.5 Continuing training

Systematic continuing training shall be arranged for groups of employees whose duties are essential for plant safety. Annual training courses are recommended. The specific needs of various personnel groups shall be taken into account in the refresher and continuing training programmes.

The training programme shall cover changes made to plant systems, components, instructions and procedures, the operating experience gained at own and other plants and experience relating to the work of the personnel group in question. Shift supervisors and operators shall also rehearse the features of facility design, the Technical Specifications, the set of instructions, infrequent operations and other issues relating to their sphere of activity in so far as these do not occur during normal operation.

A programme shall be drawn up for refresher training to bring matters to mind at regular intervals. Items important to nuclear power plant safety shall be reviewed at least once in every three years. Training at a simulator shall be included in refresher training every year. The maintenance personnel shall go through infrequent maintenance functions important to safety and which are topical for example in a forthcoming outage. Quality assurance and control, administrative procedures, radiation protection and industrial safety shall be included in the programme.

Personnel in the emergency preparedness, fire protection and physical protection organisations shall be arranged yearly refresher training which, in addition to theory, also contains drills.

Refresher and continuing training in radiation protection, industrial safety and emergency preparedness shall be arranged for all personnel referred to in this Guide, in so far as required by their tasks.

6 Specific approvals

6.1 Responsible manager of a nuclear power plant and his deputy

The qualification requirements for and approval of a responsible manager and his deputy are enacted in sections 123–127 and 130 of the Nuclear Energy Decree.

STUK assesses the competence of those applying for the positions of responsible manager or his deputy on the basis of the licensee's application, oral examination where necessary and other information received.

6.2 Nuclear power plant operators

The qualification requirements and approval procedure for nuclear power plant operators are presented in Guide YVL 1.6.

6.3 Individuals performing inspections of and expert tasks relating to nuclear power plant systems, structures or components

The procedure of granting approval for individuals performing inspections of and expert tasks relating to nuclear power plant systems, structures and components is presented in Guides YVL 1.3, YVL 3.4, YVL 4.1 and YVL 4.2.

6.4 Individual responsible for emergency response arrangements

STUK's approval shall be obtained for the individual in charge of emergency response arrangements. The qualification requirements are as follows:

— appropriate graduate degree from a university or a technical college
— knowledge of and work experience in nuclear power plant emergency response arrangements and rescue operations and in the nuclear safety and radiation protection fields
— technical knowledge of and work experience in the nuclear energy field
— special training concerning the nuclear facility in question
— adequate mastery of legislation relating to nuclear energy, radiation protection and rescue operations
— suitability for the job also in other respects.

STUK assesses the competence of applicants on the basis of the licensee's application, oral examination where necessary and other information received.

6.5 Individual responsible for physical protection

STUK's approval shall be obtained for the individual in charge of physical protection. The qualification requirements for the position are:

— appropriate graduate degree from a university or a technical college
— knowledge of and work experience in the security field
— knowledge of the nuclear safety and radiation protection fields and work experience in the nuclear energy field
— special training concerning the nuclear facility in question
— sufficient mastery of legislation in the fields of nuclear energy and safety
— suitability for the job also in other respects.

STUK assesses the competence of applicants on the basis of the licensee's application, oral examination where necessary and other information received.

6.6 Individual responsible for nuclear material safeguards

STUK's approval shall be obtained for the individual in charge of nuclear material safeguards. The qualification requirements are as follows:

— appropriate graduate degree from a university or a technical college
— technical knowledge of and work experience in the field of nuclear energy
— sufficient knowledge of nuclear energy legislation and international contractual arrangements, in particular as regards nuclear material safeguards
— suitability for the job also in other respects.

STUK assesses the competence of applicants on the basis of the licensee's application, oral examination where necessary and other information received.

7 Regulatory control of personnel training

During the construction and commissioning of the nuclear power plant, the Finnish Centre for Radiation and Nuclear Safety oversees personnel training as follows:

— reviews information about the organisation and personnel presented in the nuclear power plant's preliminary and final safety analysis reports and attached to the application for an operating licence
— reviews the plant's personnel recruitment plan referred to in sub-section 4.1
— reviews the plant's administrative rule and organisation manual
— arranges follow-up visits to training courses to see how initial training is arranged
— regularly checks the training register
— reviews the applications for approval referred to in chapter 6.

The following information shall be given in the preliminary safety analysis report:

— organisational chart specifying the job titles planned for the facility
— a brief description of the sphere of activity equivalent to each job title

— the basic education and work experience requirements attached to each job title
— the preliminary initial training plan specifying for each job title the courses or equivalent training to be completed and also the on-the-job training required, the duration and contents of the courses in broad outline, the duration of initial training and the organisations in charge of the training.

Corresponding information shall be further specified in the final safety analysis report which shall also present the refresher and continuing training plan.

In accordance with GuideYVL 1.1, the Finnish Centre for Radiation and Nuclear Safety ensures in reviewing the applications for reactor loading that the organisation operating the nuclear power plant is appropriate and sufficient and that plant personnel meet the competence requirements set.

The Centre oversees the personnel training function of a commissioned nuclear power plant as follows:

— reviews changes in the organisation or personnel
— inspects that newly recruited personnel meet the qualification requirements and monitors their initial training
— reviews the applications for approval referred to in chapter 6
— reviews the nuclear power plant's yearly personnel training plans and their implementation
— oversees refresher and continuing training i.a. by making follow-up visits to training courses
— conducts inspections of the training function contained in STUK's periodic inspection programme.

The Centre shall be informed of training courses in a manner enabling regular monitoring of the training function.

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The YVL-guides without any language marking are available both in English and Finnish.