

Application documents for modifications to nuclear installations requiring a permit

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Guideline for Swiss nuclear installations

ENSI-A04/e

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Contents

Guideline for Swiss nuclear installations

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1	Introduction	1
2	Subject matter and scope of application	1
3	Legal basis	1
4	Implementing provisions	1
	4.1 Modifications	2
	4.2 Requirement to obtain a permit (obligation for permits)	2
5	Type of application documents to be submitted	3
	5.1 Modifications according to Article 40 paragraph 1 letter a NEO	4
	5.2 Modifications to the reactor core	8
	5.3 Modification of the contents of documents	9
	5.4 Modification of the contents of application documents	9
6	Content of the application documents	9
	6.1 Modifications according to Article 40 paragraph 1 letter a NEO	10
	6.2 Modifications to the reactor core	30
7	Presentation	33
	7.1 Structure of the permit application	34
	7.2 Documents pertaining to the permit application	35
	7.3 Construction plans	35
8	Number of copies	35
9	Form of the documents	36
10	Language	36
11	Processing times	37
	11.1 Principles	37
	11.2 Refuelling	37

1 Introduction

The Swiss Federal Nuclear Safety Inspectorate (ENSI) is the regulatory authority for nuclear safety and security of the nuclear installations in Switzerland. ENSI issues guidelines either in its capacity as regulatory authority or based on a mandate in an ordinance. Guidelines are support documents that formalise the implementation of legal requirements and facilitate uniformity of implementation practices. They further concretise the state-of-the-art in science and technology. ENSI may allow deviations from the guidelines in individual cases, provided that the suggested solution ensures at least an equivalent level of nuclear safety or security.

2 Subject matter and scope of application

Based on Annex 4 of the Nuclear Energy Ordinance NEO (*Kernenergieverordnung - KEV*), this guideline regulates the type, content, presentation and number of required application documents for modifications to be carried out on nuclear installations and requiring a permit according to Article 40 NEO (*KEV*), excluding the area of security. It specifies more closely the term 'modification' in the context of the obligation to obtain a permit. It furthermore regulates the submission of documents that according to Article 75 paragraph 2 NEO (*KEV*) are transmitted by ENSI to the specialist departments of the Confederation as well as of documents that are transmitted by ENSI to cantonal and municipal authorities for commenting. The material requirements for these documents are not the subject of this guideline but are the responsibility of the authorities mentioned. This guideline applies to all Swiss nuclear installations.

3 Legal basis

This guideline implements the following legal provision:

Article 40 paragraph 5 of the Nuclear Energy Ordinance NEO of 10 December 2004 (*KEV*, SR 732.11)

4 Implementing provisions

The listed implementing provisions (definitions) specify more closely the requirements of the Nuclear Energy Act NEA (*KEG*, SR 732.1) and the NEO (*KEV*).

4.1 Modifications

Modifications in terms of Article 40 paragraph 1 letter a NEO (*KEV*) are all measures that alter the function or the properties of components, systems and structures in such a way that they deviate from the valid design basis.

For the area of electrical engineering, the following subject-specific additions apply:

Modifications are measures that effect deviations from specification values that have been valid so far as well as the alterations of systems and components. Any planned systematic replacement of components with spare parts that have the same function but are not true to the original has to be regarded as a modification if no qualification approved by ENSI is available for the spare parts to be newly used. A technology change in connection with the replacement of electrical and I&C (instrumentation and control) systems is always considered as a modification.

4.2 Requirement to obtain a permit (obligation for permits)

A distinction has to be made between modifications requiring a permit according to Article 65 paragraph 3 NEA (*KEG*) and reportable modifications according to Article 65 paragraph 4 NEA.

Temporary and permanent modifications are treated in the same way.

Modifications that do not require a permit have to be reported according to Article 65 paragraph 4 NEA and Article 38 paragraph 2 NEO (*KEV*). Details are regulated in the guideline ENSI-B03.

4.2.1 Modifications that require a permit

Modifications that always require a permit are modifications:

- a. to mechanical equipment of Safety Classes SC 1, SC 2 and SC 3;
- b. to electrical equipment classified as 1E;
- c. to buildings of the nuclear building classes BC I and BC II;
- d. in the areas of fire protection and lightning protection.

Modifications to mechanical equipment of Safety Class SC 4 and to electrical equipment classified as 0E require a permit if at least one of the following criteria is fulfilled:

- a. components which are safety-relevant from the PSA point of view (according to guideline ENSI-A06);
- b. significant modifications to electrical systems and electrical equipment;
- c. equipment actually or potentially containing an activity inventory greater than 10 000 licensing limits according to RPO (*StSV* SR 814.501);

- d. radiation protection measuring devices for which guideline ENSI-G13 demands a permit in their suitability demonstration (Ch. 6).

Modifications to mechanical equipment that is not classified and to electrical equipment that is not classified require a permit if they are safety-relevant from the PSA point of view (according to guideline ENSI-A06).

Significant modifications to electrical systems and electrical equipment are in particular design modifications or modifications to which one of the aspects to be examined for the safety review according to Chapter 6.1.3.1 applies.

Modifications to buildings that are not classified require a permit if they have an influence on buildings that are classified as important to safety.

The safety classification is defined in Annex 4 number 3 NEO (*KEV*) and the relevant guideline (*REMARK, not included in the german version: ENSI-G01*).

4.2.2 Beginning of permit obligation for repairs

4.2.2.1 Fuel elements

The obligation to obtain a permit for repairs on fuel elements according to Article 40 paragraph 1 letter b number 2 NEO (*KEV*) starts with the point in time at which the fuel elements leave the manufacturer's plant when being shipped to the nuclear installation.

4.2.2.2 Control rods

The obligation to obtain a permit for repairs on control rods according to Article 40 paragraph 1 letter b number 2 NEO (*KEV*) starts as soon as the licence holder has accepted them from the supplier. A control rod is considered to have been accepted if the licence holder has either explicitly or implicitly accepted it as usable. Acceptance may be in several steps, with not all of the steps having to be carried out within the installation. Correspondingly, for step-wise acceptance, the obligation to obtain a permit begins step by step for the different acceptance criteria as soon as the licence holder has checked the corresponding criterion for the last time prior to use.

5 Type of application documents to be submitted

For modifications according to Article 40 paragraph 1 letters a and b, a systematic safety assessment according to Article 33 paragraph 1 letter a NEO (*KEV*) is required. To assess the influence of risk, the requirements according to guideline ENSI-A06 have to be taken into account. The systematic safety assessment has to be submitted together with the permit application; in the case of modifications that require several permit applications, the systematic safety assessment has to be submitted together with the first permit application.

5.1 Modifications according to Article 40 paragraph 1 letter a NEO

The designations of the different areas, the associated abbreviations and the structuring into the four steps of the permit procedure are defined in Annex 4 NEO (KEV). Chapter 5.1 regulates which of the types of documents listed in Annex 4 number 2 NEO (KEV) have to be submitted for modifications according to Article 40 paragraph 1 letter a NEO (KEV).

In the case of major modifications, the licence holder shall inform ENSI in time about the purpose, intent, scope and kind of the project as well as about the rough schedule. One important aspect in this context is the novel character of a project with regard to Swiss nuclear installations. The early clarifications serve ENSI for planning the necessary internal and, if need be, external resources for the supervisory procedure. Examples of such modifications are new buildings, the larger reconstruction of existing buildings, new systems, the replacement of systems, and backfittings of a larger extent.

Documents on the overall plant (G1 to G4) are not required for modifications according to Article 40 paragraph 1 letter a NEO (KEV). If a modification necessitates a modification of the safety analysis report, the reporting obligation according to Article 38 paragraph 2 letter b NEO and the applicable guideline has to be observed.

For new buildings or the extension of existing buildings, the construction and layout plans (G2 according to Annex 4 number 2 NEO) have to be submitted as part of the B2 documents).

5.1.1 Civil engineering (B)

5.1.1.1 Civil engineering hierarchies

The application documents to be submitted depend on the type and extent of the modification. The extent of modifications to buildings may differ strongly. This spans from the installation of a new fastening to the construction of a new building within the existing plant. The documents are classified according to the graded planning and construction process into the building hierarchies B1 to B4.

- a. Civil engineering (*geman: Bautechnik*) hierarchy B1, design bases;
- b. Civil engineering hierarchy B2, building design;
- c. Civil engineering hierarchy B3, design and construction of components;
- d. Civil engineering hierarchy B4, building documentation (following executed modification).

The documents required for the assessment of the application have to be compiled case-by-case. They have to document issues that are closed in substance according to Chapter 6.1.2. They have to be submitted in examinable form as a set of project engineering

documents that is closed in substance, such as specifications, calculations, building plans, but may be handed in in stages. Each set to be examined shall contain a list of documents.

As for contents of civil engineering hierarchy B1 that are regulated for the overall plant, the safety analysis report may be referred to.

5.1.1.2 Decision criteria for the type and scope of the application documents

The table given below summarises the decision criteria for the type and extent of the application documents to be submitted, additional to the overall safety classification, in dependence of the building classification (BC I or BC II), and the type of structural modification (first column).

Type of structural modification	Type of application documents for building class BC I	Type of application documents for building class BC II
New building	B1, B2, B3, B4	B1, B2 and B3 together, B4
Reconstruction or extension <i>with effects on existing supporting structures or effects on other areas (mechanical engineering, electrical engineering, radiation protection, fire protection, lightning protection, protection against flooding, etc.)</i>	B1, B2, B3, B4	simplified permit procedure: B2 and B3 together, B4
Reconstruction or extension <i>without any relevant effects on existing supporting structures and no effects on other areas</i>	simplified permit procedure: B2 and B3 together, B4	simplified permit procedure: B2 and B3 together, B4
Fastenings, engagements <i>with effects on structures with relevant load-bearing function or with effects on other areas</i>	simplified permit procedure: B2 and B3 together, B4	simplified permit procedure: B2 and B3 together, B4
Fastenings, engagements <i>without any effects on structures with relevant load-bearing function and without effects on other areas</i>	These modifications are not considered as modifications that require a permit as defined by the NEO (KEV).	These modifications are not considered as modifications that require a permit as defined by the NEO (KEV).

In the case of major modifications, such as new buildings or restructuring measures involving changes to supporting structures, all four civil engineering hierarchies have to be covered as a matter of principle. Additional to the overall safety assessment, one or several Technical Reports with plans enclosed have to be submitted for each civil engineering hierarchy.

Minor structural modifications that only affect individual components and only the area of civil engineering may be covered in one step by way of a simplified permit procedure. In such cases, a Technical Report has to be submitted, containing the following documentation:

- a. overall safety assessment;
- b. design specification and verifications belonging to civil engineering hierarchy B2 that are relevant in connection with the project;
- c. verifications belonging to civil engineering hierarchy B3 and construction plans;
- d. quality testing programme;
- e. building programme.

During construction, applications for concreting or installation permits have to be submitted for each structural modification per building stage, making reference to the relevant construction plans and including the material testing records.

After construction, the documentation of civil engineering hierarchy B4 has to be submitted. If the simplified permit procedure is applied, a declaration that the building work was carried out in conformity with the requirements of the quality testing programme may be submitted in lieu of a detailed documentation.

As regards modifications to buildings that are not classified, the documents required by the competent cantonal authorities have to be submitted to ENSI prior to construction. In assessing these documents, ENSI will consult the relevant competent authorities. No documents need generally to be submitted if the modifications only concern the interior of the building.

5.1.2 Systems engineering (S)

Extensive modifications require a procedure involving four hierarchies (S1 to S4). Hierarchies may be summarised for less extensive modifications.

5.1.3 Mechanical engineering (M)

Extensive modifications to mechanical equipment require a procedure involving four hierarchies (M1 to M4), with the possibility of summarising hierarchies M1 and M2 depending on the extent of the modification.

In the case of minor modifications, standardised forms are permissible as application documents, dealing with the permit process in one single step.

This simplified form of granting a permit for modifications is permissible if:

- a. the modification only affects the area of mechanical engineering;
- b. the modification affects only one mechanical component, but no overall system;
- c. there is no change to the design.

5.1.4 Electrical engineering (E)

Regarding modifications to electrical and I&C functions, systems and equipment classified as important to safety, the following criteria have to be observed:

- a. Upon the replacement of systems as well as in the case of modifications and backfittings of a larger extent for systems and components classified as 1E, a procedure involving four hierarchies is required, with S and E documents having to be submitted, respectively.
- b. For Class 0E (safety related) systems and equipment, the documents of hierarchies 2 and 3 have to be submitted together to obtain an installation permit.
- c. Modifications of a lesser extent, i.e. modifications that only affect individual parts or which are easy to grasp, may be covered in one single permit process step. However, modifications of a lesser extent still require the submission of all documents affected by the modification, applying to all hierarchies. It is permissible to submit for this purpose only the sections that are affected by the modification if the connection with the description of the modification is clearly evident.

5.1.5 Radiation protection, waste management and emergency preparedness (U)

For modifications relevant in connection with radiation protection, hierarchies U1 and U2 are to be covered in one joint document as the individual concepts and specifications are factually interrelated. Hierarchies U3 and U4 require separate documents.

As for measuring systems, the requirements of Chapter 5.1.4 are to be applied analogously.

5.1.6 Security (D)

The documents in the area of security (D) are not subject of the present guideline.

5.1.7 Plant organisation and personnel (P)

A training programme for commissioning (P2 document) has to be submitted if the commissioning of the modified plant components requires special knowledge or skills that are not covered by the qualifications of the personnel in charge.

As regards modifications that have an influence on the training and in-service training programmes for the operation of the plant under normal operating conditions, during anticipated operational occurrences or accidents, the modifications of these programmes have to be submitted as P4 documents.

5.1.8 Deep geological repository

Modifications to a deep geological repository or its installations also have to involve an assessment of their relevance to the long-term safety of the repository.

5.1.9 Transport and storage casks

Modifications are understood to be modifications to already existing transport and storage casks (T/L casks) as well as modifications of the properties of cask types with regard to the manufacture of new casks.

For modifications to transport and storage casks, the M documents required for the assessment have to be submitted. For new T/L cask types, the requirements for these documents in respect of content are contained in guideline ENSI-G05. For modifications to T/L casks, the documents that are amended as regards content have to be submitted. The systematic safety assessment shall be done by adaptation of the safety analysis report in accordance with guideline ENSI-G05. In case a modification does not require an adaptation of the safety analysis report, the systematic safety assessment has to be provided in a suitable form in the application documents.

Minor modifications without conceptual character may be described in one single document (combined M2/M3 document).

5.2 Modifications to the reactor core

For modifications according to Article 40 paragraph 1 letter b numbers 1 to 6 NEO (*KEV*), the following documents on the following issues have to be submitted according to Annex 4 number 2 NEO (*KEV*):

- a. fuel element design (R1);
- b. core design (R1/R3);
- c. definition of the safety limits (R1).

The assessment of the commissioning tests and the results (R4) following modifications to the reactor core load within the framework of refuelling (Article 40 paragraph 1 letter b number 1 NEO) shall be done in the outage report 'physics' in accordance with Annex 5 NEO.

5.3 Modification of the contents of documents

Regarding the modification of the contents of documents according to Article 40 paragraph 1 letter c numbers 1 to 4 NEO (*KEV*), the document to be modified is to be submitted with the intended modifications and the justification of the modifications has to be presented according to Article 40 paragraph 3 NEO. The modifications for which an application for a permit is made have to be marked. Following the granting of the permit and the fulfilment of any possible additional requirements, the modified document has to be submitted in its definitive form as it will be applied in the nuclear installation.

In the case of technical specifications it is sufficient to submit the chapters that are affected by the modification together with the systematic safety assessment.

For the explanation required according to Article 40 paragraph 4 NEO (*KEV*) for modifications of technical specifications, the requirements of guideline ENSI-A06 have to be observed in the area of the PSA.

5.4 Modification of the contents of application documents

If application documents for modifications according to Article 40 paragraph 1 letters a and b NEO (*KEV*) are modified as regards content after they have been submitted to ENSI, the modified documents have as a matter of principle to be resubmitted with a corresponding justification. If the modifications affect other, already existing application documents, these have to be adapted and resubmitted, too.

The modified documents do not have to be resubmitted if they have been modified to meet a requirement by ENSI and if ENSI explicitly forgoes resubmission in the wording of the requirement.

6 Content of the application documents

Chapter 6 of the present guideline specifies the requirements of Annex 4 number 2 NEO (*KEV*). To facilitate application of the guideline, the requirements of the NEO are repeated in italics before the requirements of the present guideline. Excluded are documents on the overall plant (G), on security (D) and on plant organisation and personnel (P), for which the present guideline makes no requirements as regards content. Requirements listed in the NEO without any supplementation are marked with the comment "no specific requirements". Requirements of the present guideline that are not directly allocated to a provision of the NEO are listed at the end of each subchapter.

When preparing the application documents for modifications that require a permit, it has to be checked which of the requirements in Annex 4 number 2 NEO and Chapter 6 of the present guideline are relevant in the concrete case.

As concerns the PSA, the content of the systematic safety assessment according to Article 33 paragraph 1 letter a NEO (KEV) for permits according to Article 40 paragraph 1 letters a and b is regulated in guideline ENSI-A06. This also applies to the explanation according to Article 40 paragraph 4 NEO for modifications of technical specifications.

6.1 Modifications according to Article 40 paragraph 1 letter a NEO

In the area of the vessels and piping classified as important to safety as well as of the core internals, the requirements of guideline ENSI-G11 have to be observed additional to Chapter 6.1 of the present guideline.

6.1.1 Overall plant (G)

For the adaptation of the safety analysis report, Article 41 NEO (KEV) and the applicable guideline are relevant.

6.1.2 Civil engineering (B)

6.1.2.1 Design bases (B1)

Classification of buildings

no specific requirements

Conversion of hazard specifications into engineering parameters

The following items have to be considered in particular in the conversion of hazard specifications into engineering parameters (impacts on buildings / structures):

- a. earthquake (acceleration levels, design spectra);
- b. aircraft crash (impact area, load function, debris);
- c. explosions (pressure distribution, debris);
- d. flooding (flooding level, water pressure).

Information relating to aircraft crash shall be confidential if it concerns the fulfilment of confidential requirements.

Foundation properties

The foundation properties have to be presented statically as well as dynamically.

Groundwater protection concept

no specific requirements

Layout concepts

The layout concepts have to comprise in particular the following items:

- a. standards;
- b. building regulations;
- c. loads and load combinations;
- d. material exploitation or safety coefficients;
- e. design guidelines;
- f. design principles;
- g. minimum reinforcement.

Requirements on shielding walls

no specific requirements

Additional requirements for B1:

The concept of structural quality assurance is part of the B1 documents.

6.1.2.2 Building layout (B2)

Layout specifications/Design criteria

The layout specifications and design criteria include in particular the choice and design criteria of special materials and products (special components).

Assumed loads

no specific requirements

Supporting framework models/Preliminary calculations

Modelling of the supporting framework has to be done for static and dynamic calculations.

Preliminary calculations have to take the following aspects into account:

- a. verification of the main dimensions;
- b. overall stability for design impacts;
- c. geotechnical verifications;
- d. excavation bracings.

Main dimensions

no specific requirements

Floor response spectra

no specific requirements

Requirements on impermeability, groundwater protection, drainage, lightning protection, fire prevention

The requirements for lightning protection have to be specified in a lightning protection specification.

In the area of structural fire protection, doors, intervention and escape routes as well as fire sections have to be considered. Aspects of security have to be considered.

Fastening concept

no specific requirements

Additional requirements for B2:

The following issues are also subject of the B2 documents:

- a. mutual influence of buildings, for example during earthquakes or settlements;
- b. layout of building cranes including protection against load crash;
- c. quality management programme (QM manual).

6.1.2.3 Component arrangement and installation (B3)

Detailed static measurements and tension tests (evidences), load-bearing capacity and suitability tests (evidences)

no specific requirements

Structural design

For the structural design, not only formwork and shielding plans but also steel construction and lightning protection plans are required.

For the fastenings, the following items have to be observed:

- a. design of the installed fastening elements;
- b. fastening plans including type designations of the fastenings according to the fastening concept.

Formwork and shielding plans

no specific requirements

Procedure test

no specific requirements

Special manufacturing requirements

Special manufacturing requirements to be considered are the shielding effect with regard to gamma and neutron radiation, possible activation as well as the optimisation of the dismantling of activated and contaminated components.

Quality testing plans

no specific requirements

Additional requirements for B3:

The following items also have to be considered:

- a. verifications and procedure testing for special components;
- b. definition of the component areas with restrictions regarding engagements and additional fastenings;
- c. stability analysis for building cranes;
- d. building programme.

Applications for concreting or installation permits, including designation of the relevant construction plans and the material testing records, belong to the B3 documents.

6.1.2.4 Building documentation (B4)

Documentation relating to construction work (building file)

For fastenings and engagements in the building / structure, the documentation relating to construction work has to include a confirmation of the design on the basis of the defined loads as well as load balance plans for the fastenings (verification that the actual loads acting on the components are covered by the assumptions of the design).

Reporting on quality assurance

no specific requirements

Monitoring report

no specific requirements

Maintenance programmes

The profile on ageing monitoring with the assessed basic inspection and maintenance programme is part of the B4 documents.

6.1.3 Systems engineering (S)

6.1.3.1 System concepts (S1)

System classification/System concepts

The requirement specification pertaining to the system concept specifies the requirements that the system has to fulfil and defines the boundary conditions under which it has to fulfil its function. Also defined are the safety relevance and the requirements for qualification. The following items have to be considered:

- a. process-related description of the functions;

- b. system classification (Annex 4 NEO): determination of the classification of the overall system;
- c. compilation and explanation of the requirements and the boundary conditions from the plant;
- d. requirements for the IT security of the I&C installation, description of the measures to be taken within the framework of the IT security concept.

The following analyses have to be performed regarding the system concept:

- a. categorisation analysis of the I&C functions according to IEC 61226, and indication of the requirement classes of the subsystems according to IEC 61513;
- b. diversity analysis for functions of category A;
- c. independence of the I&C defence in depth levels for systems with functions of categories A and B.

The functional categories are defined in the relevant guideline.

Additionally, any provisional layout plans also belong to the system concept.

Provisional system specifications

The provisional system specification specifies in detailed form the structure (topology) characteristics and behaviour of the system on the basis of the requirement specification and the information on the I&C system to be used. In the area of I&C, this includes the provisional system specification of the I&C installation with general logics as well as the specifications of the systems to be controlled if this is necessary for the definition of the electrical and I&C functions, and a provisional documentation of the I&C system to be used.

System circuit diagrams

no specific requirements

Function diagrams

The provisional functions diagrams contain a symbolic representation of the governing and control functions including the complete formulation of tasks, but are not hardware-specific. If necessary for reasons of clarity, the representation is to be added by a brief description.

Lists of mechanical and electrical components

no specific requirements

Safety assessment following plant modifications

For the safety assessment, it has to be examined and, if applicable, to be evaluated what possible influence the planned modification may have on:

- a. the frequency of occurrence of accidents considered in the safety analysis report or on the associated assumptions;

- b. the effects of accidents considered in the safety analysis report;
- c. the reliability of systems important to safety (safety-relevant systems, including auxiliary and operational systems if those are affected);
- d. the effect of a failure of systems important to safety ;
- e. the occurrence of an accident not covered by the safety analysis report;
- f. the occurrence of a failure of systems important to safety not covered by the safety analysis report;
- g. the safety margins that were defined as a basis for the technical specification;
- h. the effects on the plant during the execution of the modification;
- i. the degree of compliance with design criteria and guidelines;
- j. the technical specification (if applicable: separate permit according to Article 40 paragraph 1 letter c number 4 NEO).

Additional requirements for S1:

The applicant's and supplier's quality assurance concepts belong to the S1 documents. They show the organisation and areas of responsibility, the kinds of work and the documentary process for the classified electrical equipment during the phases of design, manufacture, testing, installation and commissioning.

6.1.3.2 System design (S2)

Definitive system specifications, including technical data

In the area of mechanical engineering, the definitive system specification including technical data has to comprise the following data:

- a. fulfilment of the relevant regulatory requirements from the S1 permit;
- b. design bases and design data;
- c. definitive data including the characteristic operational process data;
- d. working medium (including any special aspects to be considered);
- e. description of the main components including their design data;
- f. requirements for the reaction times of the pumps, valve closing/opening times, admissible delay of challenge in emergency power conditions, admissible transducer tolerances;
- g. description of all operating modes, including system function testing;
- h. planned pre-operational tests;

- i. planned protection measures against disturbances in the system, against other internal events and against external impacts;
- j. I&C including instrumentation for the system concerned (requirements and conceptual execution);
- k. interconnection and interaction with other systems;
- l. component cooling (requirements and construction);
- m. ventilation and cooling of rooms (requirements and construction);
- n. isolation of rooms, protection against escape of activity;
- o. leakage monitoring;
- p. layout of the system in buildings, including civil engineering requirements;
- q. accessibility, operability, testability, space available, radiation protection;
- r. lightning protection measures;
- s. fire protection measures;
- t. ergonomics, protection against incorrect operation;
- u. shielding and containment of contaminations.

In the area of electrical and I&C engineering, the definitive system specification also has to contain in particular the following information:

- a. system specification of the I&C installation with general logics;
- b. technical data of electrical and I&C systems as well as of the controlled mechanical systems;
- c. documentation relating to the I&C system to be used;
- d. list of mechanical components (Annex 4 NEO) of the components operated or monitored by electrical or I&C systems (definitive);
- e. network diagrams of the I&C installations (presentation of the communication links between the subsystems);
- f. wiring concept for systems with functions of categories A and B;
- g. specifications on physical separation, electricity supply, wiring, EMC and lightning protection measures, IT security, inspection and self-monitoring installations for systems with functions of categories A and B;
- h. concept of periodic testing (surveillance testing) for the I&C installation for systems with functions of category A with a description of the technical measures that allow periodic testing.

The following analyses have to be performed with respect to the system specification:

- a. FMEA (failure mode and effects analysis) for systems with functions of category A;
- b. explanation of possible failures and of the behaviour upon failure (failure tolerance) and the measures to be taken for systems with functions of categories B and C;
- c. verification of the diversity analysis;
- d. independence of the defence in depth levels of the I&C.

The following quality assessments have to be performed with respect to the system specification:

- a. verifications regarding generic qualification for systems with functions of category A;
- b. design records (e.g. EMC, ambient conditions) for systems with functions of categories B and C;
- c. verifications regarding application-specific qualification for systems with functions of category A;
- d. verifications regarding application-specific qualification for systems with functions of category B.

Layout plans

no specific requirements

System circuit diagrams

no specific requirements

Function diagrams

The definitive function diagrams contain a symbolic representation of the governing and control function including a complete formulation of tasks, but are not hardware-specific. If necessary for reasons of clarity, the representation is to be added by a brief description.

List of mechanical components

The contents of the list of mechanical components (S2) and electrical components (S3) are specified in the relevant guideline. The data contained in the lists of components serve solely for information purposes, for example for establishing the acceptance obligation. The values of the technical data that are binding for construction are contained in the specifications of the components. If modifications according to Article 40 paragraph 1 letter a NEO (KEV) are carried out, the lists of components have to be amended accordingly.

Additional requirements for S2:

The quality management programmes of the main suppliers belong to the S2 documents.

The following supplementary planning documents are required for computer-based I&C systems important to safety:

- a. quality assurance plan including verification plan and configuration management plan;
- b. system integration plan;
- c. validation plan;
- d. installation and commissioning plan;
- e. maintenance plan.

6.1.3.3 System implementation (S3)

System descriptions, including analysis of interactions

In the system descriptions and the associated diagrams the information of the system specifications (S2) has to be completed in such a way that they describe the solution specified for construction including the components chosen and designed in detail.

The additional information concerns in particular:

- a. control-related logics and possible interactions with other systems, including any analyses in this regard;
- b. update of the description of the system and its structure (topology);
- c. accessibility, operability, testability, and space available;
- d. description of the system components and their proven reliability in service;
- e. valve opening/closing times, pump reaction times (if relevant);
- f. system commissioning test programmes (pre-operational tests);
- g. periodic / in-service system function tests;
- h. maintenance plan;
- i. statement on whether and how the regulatory requirements of the S2 permit have been fulfilled;
- j. documentation on system integration;
- k. documentation of the results of system validation;
- l. statement on the modifications that have been realised since the start of the project.

The following items have to be covered with respect to electrical and I&C functions and systems:

- a. detailed function plans for the functions of categories A and B realised on the software side;

- b. signal flow charts (representations of the signal flow, e.g. from the terminal clamps of the transducer, the control console or the switching board via the jumper connection up to the connections to the electronic modules in the cabinet), details regarding equipment type and functional unit used;
- c. detailed plans (e.g. list of cables, cable connection plans, cable routing drawings, cabinet layout plans, circuit wiring diagrams) for systems with functions of categories A and B;
- d. configuration identification documentation for systems with functions of categories A and B.

In addition, the following analyses, qualifications and tests are to be documented:

- a. verification of the correctness of the detailed design when compared with the requirements specification regarding functionality and performance;
- b. certificates of post-qualification (if applicable) for systems with functions of category A;
- c. documentation of the review and analysis of the compatibility of the modified systems and plant components with the existing plant components.

Logic diagrams

The logic diagrams have to show a detailed, hardware-specific symbolic representation of the hard-wired functions for functions of categories A and B.

List of electrical components

no specific requirements

6.1.3.4 System start-up (S4)

Test procedures for preliminary operation tests

The test procedures for preliminary operation tests also include the test procedures for system start-up.

Results of systems tests

no specific requirements

Procedures for periodical function tests of systems and components

no specific requirements

Definitive system circuit diagrams and function diagrams

The definitive system circuit diagrams and function diagrams are to be understood to be the documents updated after commissioning.

Additional requirements for S4:

As regards computer-based I&C important to safety, the following supplementary documents are required:

- a. detailed installation plan, information on how the nuclear safety of the plant is ensured, detailed commissioning plans (or experiment programmes) and test procedures;
- b. instruction to carry out modifications (Configuration Management).

6.1.4 Mechanical engineering (M)

6.1.4.1 Layout concepts (M1)

Applicable regulations and rules for construction

no specific requirements

Constructive implementation

Aspects of constructive implementation, especially:

- a. use of forged or cast parts;
- b. requirements regarding testability;
- c. minimisation of the number of weld seams.

Choice of material for main components

Requirements for materials, especially:

- a. restriction of admissible materials;
- b. toughness;
- c. weldability;
- d. erosion and corrosion behaviour;
- e. limitation of trace elements.

Measures to limit activation and contamination, especially the limitation of the cobalt content.

Additional requirements for M1:

The layout concepts furthermore have to contain information on the application of special concepts and verifications, especially:

- a. measures to reduce the probability of pipe ruptures;
- b. verification of the operability in case of earthquakes;
- c. verifications of resistance to fracture;
- d. verification of the accident behaviour of pumps and valves.

6.1.4.2 Layout (M2)

Design specifications

The content and structure of the specifications for vessels and piping classified as important to safety as well as for core internals classified as important to safety are regulated in guideline ENSI-G11. These requirements shall apply analogously to other mechanical components.

Overview drawings of safety-relevant components (components important to safety)

no specific requirements

Programmes for special certificates or qualifications

no specific requirements

Additional requirements for M2:

In the documents on the layout of components, the following further items have to be considered:

- a. hazard analysis according to guideline ENSI-G11;
- b. specifications for qualification tests;
- c. documents on type-tested equipment.

The documents relating to the layout furthermore have to contain the information necessary for the ergonomic assessment of the modifications. This also includes the mechanical components used for the communication of information as well as those needed for control.

The following items have to be considered:

- a. location of the indicating instruments;
- b. size of the indicating instruments and of the information elements displayed in the context of the reading distance;
- c. brightness, intensity of illumination, colours, contrasts of indications;
- d. types of control elements;
- e. ambient conditions for intended applications, especially with regard to dose rate, temperature and humidity;
- f. effort and time required for operating control elements;
- g. accessibility, including time needed for access and distances to be covered.

6.1.4.3 Implementation (M3)

M3 documents will generally be reviewed on behalf of ENSI by the authorised inspector designated by it for this purpose.

Documents for design approval coming from the manufacturer of components important to safety for construction and manufacture

The content and structure of the documents for design approval relating to vessels and piping classified as important to safety (VPN/BRK) as well as for core internals are regulated in guideline ENSI-G11. These requirements shall apply analogously to other mechanical components.

Basic test programme

The content and structure of the basic test programme are defined in regulation NE-14 of the SVTI.

6.1.4.4 Start-up and documentation (M4)

Results of special type and qualification tests

no specific requirements

Final documentation on component manufacture, basic tests, final assembly control and quality assurance

no specific requirements

Stress analyses

no specific requirements

In-service inspection programme

no specific requirements

Construction monitoring report

no specific requirements

Maintenance report

no specific requirements

Additional requirements for M4:

The M4 documents are divided into two sub-hierarchies (M4.1 and M4.2).

M4.1 documents shall generally be reviewed on behalf of ENSI by the authorised inspector designated by it for this purpose. M4.1 documents include:

- a. final documentation on component manufacture;
- b. results of assembly controls;
- c. results of stress analyses;
- d. results of basic tests;
- e. in-service inspection programme;

- f. construction monitoring report of the applicant.

The M4.2 documents that will be reviewed by ENSI include:

- a. results of type and qualification tests as well as special certificates;
- b. results of function tests;
- c. construction monitoring report of the applicant for mechanical equipment that is not monitored by the authorised inspector designated by ENSI for this purpose;
- d. procedures for periodic function testing during operation and any possible further tests;
- e. maintenance programmes.

6.1.4.5 Form for the simplified permit procedure

The form used for the simplified permit procedure (cf. Chapter 5.1.3) has to contain the following information:

- a. legal basis of the permit application;
- b. identification of the components to be modified;
- c. system/equipment identifications;
- d. safety class;
- e. seismic class;
- f. layout data;
- g. rules for construction (basis for the graded quality requirements, *german: sicherheitstechnische Kriterien*);
- h. layout/standard specification;
- i. detailed specification;
- j. construction monitoring by the authorised inspector designated by ENSI for this purpose (yes/no);
- k. design approval by the authorised inspector designated by ENSI for this purpose initiated (yes/no);
- l. component parts affected;
- m. description of the planned modification work and explanation of the safety-relevance of the modification (basis for the graded quality requirements and explanation of how the graded quality requirements are fulfilled);
- n. justification of the planned modification work;
- o. date of the actual performance of the modification;

- p. plant state during the modification;
- q. supplements.

The performance of the modification has to be entered on the form with the release note of ENSI, and a copy has to be forwarded to ENSI.

6.1.5 Electrical engineering and instrumentation & control (E)

6.1.5.1 Principles of electrical equipment (E1)

Applicable technology for main components and instrumentation & control

Information on the applicable technology means the intended type of design. Examples are: uninterruptible power supply in converter technology, hard-wired or computer-based instrumentation & control (I&C), instrumentation & control connection on fibre-optics basis or voltage transformation by means of dry-type transformer.

Train assignment scheme

no specific requirements

Layout principles of 1E components

As regards their qualification, the following information has to be provided:

- a. binding procedures and standards for the components affected;
- b. electrical layout conditions regarding voltage and frequency variations (including emergency power conditions), overvoltage (lightning strike, external voltage impact), interference resistance (electromagnetic compatibility), fire behaviour, short-circuit strength, service lifetime, reliability, etc.;
- c. ambient conditions for normal operation and accidents.

Applicable regulations

no specific requirements

Qualification procedures for single and series-production parts

The qualification procedures for single and series-production parts classified as 1E have to be defined in principle, with reference to the standards to be applied.

Additional requirements for E1:

Unless this has already been covered by S1 documents, the quality assurance concepts of the applicant and the suppliers also belong to the E1 documents.

6.1.5.2 Layout (E2)

Specifications and data sheets

The specification also has to include the information necessary for the ergonomic assessment of modifications. This also includes the analogue and digital electrical components used for the communication of information as well as those needed for control. The following items have to be considered:

- a. arrangement of indicating instruments within the framework of the plant modification and in the context of the control room;
- b. size of the indicating instruments and of the information elements displayed;
- c. brightness, intensity of illumination, colours, contrasts of indications;
- d. kind of access to information in the case of multifunctional indicating instruments, especially concerning computer-based indications;
- e. types of control elements;
- f. arrangement of control elements within the framework of the plant modification and in the context of the control room respectively the control panel;
- g. selection of switching actions to be performed in the case of multifunctional control elements, especially concerning computer-based systems;
- h. accessibility, including time needed for access and distances to be covered;
- i. ambient conditions for the intended applications, especially regarding dose rate, temperature and humidity.

For components classified as 1E, the specification is to be supplemented by the design calculations.

Qualification criteria

The qualification criteria have to be supplemented by the component test programmes for components classified as 1E and by the audit reports on quality assurance procedures.

6.1.5.3 Implementation certificates (E3)

Results of qualification procedures

no specific requirements

Test programmes for start-up of special components

no specific requirements

6.1.5.4 Start-up and documentation (E4)

Test results

no specific requirements

Technical documentation

no specific requirements

Report on quality assurance

For the modifications carried out during the refuelling and overall maintenance inspection outage, the report on quality assurance may be integrated in the outage report "engineering" according to Annex 5 NEO (KEV).

Maintenance programmes

no specific requirements

6.1.6 Radiation protection, waste management, emergency preparedness (U)

6.1.6.1 Layout criteria and concepts (U1)

Concepts for radiological zones, shielding, monitoring of surroundings, surveillance of rooms, systems, monitoring of emissions, emergency preparedness, waste water

The radiation protection concept (concept for radiological zones and shieldings) has to contain the following information:

- a. radiological condition (activity inventories with information about the radiotoxicity and form of the activity, contamination levels and dose rates before, during and after the new construction, reconstruction or dismantling of plant components according to measurements, calculations or estimates);
- b. protection objectives of radiation protection (limits to be observed, reference levels derived, planning targets according to guideline HSK-R-11 and the principle of optimisation in the Radiological Protection Ordinance);
- c. radiological barriers and zones concept (zone plans with information on zone types, area types and working area types, zone boundaries, step over between zones, air locks, hot cells, temporary cells, storages for radioactive substances, negative pressure staggering, protection against flooding together with drainage and groundwater protection, escape and intervention routes);
- d. concept of further protection measures for the personnel (shieldings, radiation protection compartmentalisation, reduction of the radioactive substances by means of decontamination, cleaning especially of cooling

circuits and separation, optimised processes and aids, mock-up training, special administrative measures);

- e. concept of further protection measures for the environment (ventilation systems with filter and exhaust gas decay systems, waste water collection, waste water treatment, waste water purification plants including fire water, testability of the air-tightness of the ventilation systems and the leak-tightness of the waste water system, low-radiation area for clearance and storing of materials).

The monitoring concept (concept for the monitoring of systems, workplaces, rooms, installations, individuals, emission and the environment) has to contain the following information:

- a. system monitoring concept (radiation and activity monitoring, monitoring of water chemistry);
- b. concept for monitoring of workplaces, rooms and installations within the controlled area (stationary and temporary air contamination monitoring, surface contamination monitoring programme, stationary and temporary dose rate and dose monitoring);
- c. concept for monitoring individuals (health physics, personal contamination monitoring, incorporation monitoring);
- d. concept for emission monitoring (monitoring and detailed assessment of the exhaust air and waste water, verification methods for the clearance of material from the contaminated zone);
- e. concept for immission monitoring (measuring programme for the determination of the local dose outside the controlled area, on the premises, at the perimeter fence and in the environment, measuring programme for the determination of the activity in the air, measuring programme for the monitoring of the river water upstream of the cooling water intake and downstream of the cooling water outlet).

As regards the individual measuring systems, the following information has to be provided according to guideline ENSI-G13:

- a. function of the measuring system;
- b. safety-relevance (safety classification) of the measuring system and of the modification, justification of the classification;
- c. monitoring or measuring method, structure of the measuring instruments, in the case of emission monitoring additionally also the methods and processes applied for the detailed assessment of the radioactive substances in the exhaust air and in the waste water of the nuclear installation;

- d. measuring, indicating, alarming and registration locations;
- e. periodicity of the measurements and sampling;
- f. energy and media supply of the measuring system;
- g. derivation of alarm set points from the protection objectives.

Waste conditioning procedure

no specific requirements

Interim storage of waste

no specific requirements

6.1.6.2 Layout of radiological installations (U2)

Layout specifications

The layout documents for the shieldings have to contain the following information:

- a. specifications of shieldings (incl. radiation protection compartmentisation) with quantitative details on the choice of material, geometry, achieved shielding factor;
- b. specifications of cleaning systems and decontamination methods, with details on the expected decontamination factor and the expected activity retention;
- c. specifications of the tightness of barriers, negative pressure staggering, ventilation rates.

The layout documents for the measuring systems have to contain the following information according to guideline ENSI-G13:

- a. measuring range, detection limit, calibration nuclide;
- b. traceability to measurement standards;
- c. ambient conditions, measuring medium conditions, comparison with the layout of the system to be monitored;
- d. quality of the power supply;
- e. layout criteria for sampling, verifications within the framework of start-up, such as e.g. determination of the total transmission rates;
- f. tests with certified sources.

Estimate of collective dose for operation, in-service inspections and revisions (planned refuelling and/or maintenance outages)

The estimate of the collective dose must contain the following information:

- a. estimated man-hours and dose rates at the locations during operation incl. in-service inspections and revisions per year as well as during the time the modifications are implemented;
- b. resulting collective dose (for work with collective doses above 50 pers.-mSv);
- c. estimated maximum individual dose and extremity dose.

6.1.6.3 Implementation certificate (U3)

Test and acceptance records

The test and acceptance records and results of special tests have to cover the following items:

- a. radiation-protection-related acceptance of modifications to zones, areas and working areas regarding decontaminability of walls and floors, the leak-tightness of the floor, the equipment with protective agent;
- b. leak-tightness tests on cooling water, waste water, waste gas systems, checking of the air exchange rate and the ventilation direction;
- c. shielding effect especially with regard to penetrations;
- d. results of inactive tests, mockup training, decontamination tests;
- e. dose rate and activity mapping upon start-up.

Results of special tests

no specific requirements

Training and in-service training of monitoring personnel

Regarding the training and in-service training of monitoring personnel, the following information is necessary:

- a. analysis of responsibility and competence requirements;
- b. planning and execution of the requisite training and in-service training;
- c. special radiation protection instructions for the personnel during the modification phase.

Additional requirements for U3:

For measuring systems, the following verifications have to be submitted:

- a. detailed description of the measuring systems, based on the manufacturer's documentation;
- b. conformity certificates, calibration certificates.

6.1.6.4 Start-up and documentation (U4)

Operating, testing and maintenance programmes

For measuring systems, the following items have to be covered:

- a. start-up procedures;
- b. result of the determination of the total transmission rates and density of sampling systems;
- c. alarm set points;
- d. procedures for the periodic testing of measuring systems according to guideline ENSI-G13;
- e. adaptation of periodic reports.

Additional requirements for U4:

Valid programmes, check lists and records on chemical, activity, dose rate, contamination and leaktightness monitoring of the plant have to be submitted for those plant modifications that affect the radiological monitoring programmes.

Operating regulations (with definitions of responsibilities) and operating instructions have to be submitted.

6.2 Modifications to the reactor core

Regarding modifications to the reactor core, this chapter implements the requirements of Annex 4 number 2 NEO (*KEV*) for the reactor engineering (R) documents. The structure is based on Article 40 paragraph 1 letter b NEO.

6.2.1 Modifications to the reactor core load

Permits for modifications to the reactor core load with its fuel elements (FE) as part of the refuelling procedure (Article 40 paragraph 1 letter b number 1 NEO) are granted in two stages.

For the first stage, the applicant has to submit the following documents:

- a. provisional fuel-loading plan;
- b. certificate of the quality-assured manufacture of the newly loaded fuel elements;
- c. verifications that the fundamental protection objectives (so called fundamental safety functions of nuclear safety) will be met during refuelling;
- d. safety assessment of the new reactor core (verifications of adherence to operational and safety limits).

For the second stage, the applicant has to submit the following documents:

- a. approved fuel-loading plan;
- b. results of the reactor-physical measurements at less than 5% reactor power;
- c. safety assessment of the new reactor core (verifications of adherence to operational and safety limits).

6.2.2 Modifications to fuel elements and control rods

For modifications to fuel elements and control rods (Article 40 paragraph 1 letter b number 2 NEO), the applicant has to submit documents that contain the assessment bases and safety criteria for normal operation, accidents and waste management, together with the associated verifications. In particular, the issues listed in the following have to be covered.

For fuel elements:

- a. thermomechanical fuel rod design
- b. fuel element structure design;
- c. nuclear and thermal-hydraulic design;
- d. compatibility (geometrical, nuclear, thermal-hydraulic) with the other fuel elements used;
- e. correlations for the critical heat generation rate;
- f. effects on core monitoring;
- g. stability behaviour (for boiling water reactors);
- h. accident behaviour;
- i. subcriticality and cooling in the fuel pools;
- j. operating experience in other plants;
- k. testability and reparability;
- l. inspection programme (for forerunner fuel elements);
- m. influence on the operational radioactive waste (only for reloaded fuel elements);
- n. evidence that fuel elements can be disposed of after use (only for reloaded fuel elements).
- o. evidence that transport and storage casks for the maximum possible FE burn-up are available.

For control rods:

- a. mechanical design;

- b. nuclear and thermal-hydraulic design;
- c. compatibility (geometrical, nuclear, thermal-hydraulic) with the core internals;
- d. testability;
- e. operating experience in other plants;
- f. inspection programme (for forerunner fuel elements);
- g. influence on the operational radioactive waste.

For repairs on fuel elements and control rods (Article 40 paragraph 1 letter b number 2 NEO), the applicant has to submit documents on the following items:

- a. re-establishment of the as-specified condition or of a condition that is unobjectionable from a safety point of view;
- b. fulfilment of all safety criteria upon use in the reactor core;
- c. working plan indicating all important steps and the radiation protection measures.

The use of repaired fuel elements or control rods in the reactor core has to be taken into consideration in the safety assessment of the modified reactor core.

6.2.3 Increase of permissible burn-up

For an increase of permissible burn-up (Article 40 paragraph 1 letter b number 3 NEO), the following documents have to be submitted:

- a. thermomechanical fuel rod design;
- b. fuel element structure design;
- c. safety assessment of a reference reactor core (verifications of adherence to operational and safety limits);
- d. accident behaviour;
- e. subcriticality and cooling in the storage pools;
- f. radioactive inventory in the core, in the reactor coolant and in the stored fuel elements;
- g. radiological analysis of accidents involving the release of radioactive substances;
- h. operating experience with forerunner fuel elements up to the increased burn-up applied for;
- i. evidence that the higher burnt-up fuel elements can be disposed of after use;

- j. evidence that transport and storage casks for the maximum possible FE burn-up are available.

6.2.4 Modification of safety assessment methods

In the event of the modification or use of new safety assessment methods (Article 40 paragraph 1 letter b number 4 NEO), documents have to be submitted to verify the modified or new physical models and their validation for the intended area of application.

6.2.5 Modification of safety criteria

Modifications of safety criteria (Article 40 paragraph 1 letter b number 5 NEO) have to correspond to the state of the art in science and technology.

The applicant has to justify the modification of safety criteria and has to show that the fundamental protection objectives (control of the reactivity, cooling of the fuel elements, containment of radioactive substances, limitation of radiation exposure) continue to be fulfilled.

6.2.6 Increase of the proportion of MOX fuel elements

For an increase of the proportion of MOX fuel elements (Article 40 paragraph 1 letter b number 6 NEO), the following documents have to be submitted:

- a. compatibility (nuclear) with the uranium oxide fuel elements used;
- b. safety assessment of a reference reactor core with the applied-for proportion of MOX fuel elements (verifications of adherence to operational and safety limits);
- c. accident behaviour of the fuel elements and the plant;
- d. subcriticality and cooling in the storage pools;
- e. radioactive inventory in the core, in the reactor coolant and in the stored fuel elements;
- f. analysis of the radiological consequences of accidents involving the release of radioactive substances into the environment.

7 Presentation

The application documents shall consist of a permit application and the documents necessary for the assessment of the application.

The application documents have to be submitted in an examinable form. They have to be structured such that they are logically comprehensible.

7.1 Structure of the permit application

The permit application has to be structured as follows:

- a. date of the application;
- b. applicant;
- c. explanation of the intent;
- d. formal application indicating the legal bases;
- e. material description of the modification that is the subject of the permit application;
- f. explanation of the safety-relevance of the modification;
- g. for modifications according to Article 40 paragraph 1 letters a and b NEO (*KEV*), summary of the results of the systematic safety assessment according to Article 33 paragraph 1 letter a;
- h. planned date of execution;
- i. list of documents submitted with the application.

If the application documents are submitted in several stages, the applicant shall provide at least an accompanying letter for each part of the application documents, explaining the significance of the documents submitted in the context of the overall modification.

For comprehensive modifications, the permit application has to be split. In this respect, specific permit applications are required in particular for the following activities:

- a. the construction of components of buildings including concrete-embedded mounting elements and the laying of the armouring or installation of steel components as well as the methodology in connection with interventions in the structural work and in the case of additionally installed mounting hardware;
- b. the manufacture of major mechanical components;
- c. the installation of mechanical and electrical systems including their instrumentation and control systems.

When submitting the first application pertaining to a modification project, it is necessary that this be accompanied by an overview of all planned permit applications in the context of this project. Here, it has to be indicated clearly which modification applications (hierarchies and areas according to Annex 4 NEO) are planned for which point in time.

7.2 Documents pertaining to the permit application

The documents submitted with the permit application that are necessary for assessing the application have to contain the following elements in addition to the description of the facts:

- a. author of the document;
- b. date;
- c. revision index;
- d. initials of at least one of the licence holder's representatives responsible.

7.3 Construction plans

Overview plans of hierarchy B2 have to be submitted on a scale of 1:100.

Construction plans of hierarchy B3 and the associated plans of hierarchy B4 have to be submitted on a scale of 1:50.

Details have to be shown on an appropriate larger scale.

8 Number of copies

Permit applications have to be submitted in single copy.

Documents for plant modifications according to Article 40 paragraph 1 letter a NEO (*KEV*) and modifications to the reactor core according to Article 40 paragraph 1 letter b NEO are on principle to be submitted in single copy. In the following cases, several copies have to be submitted:

- a. To be submitted in duplicate are documents the size of which exceeds DIN-A3 in one or two dimensions.
- b. Regarding documents that are submitted by ENSI according to Article 75 paragraph 2 NEO to specialist departments of the Confederation as well as documents that are to be submitted by ENSI to cantonal and municipal authorities for commenting, an additional copy has to be provided for each authority involved.

As regards a permit for modifications of the content of documents according to Article 40 paragraph 1 letter c numbers 1-4 NEO, the document including the justification has to be submitted in single copy. The definitive version of the document after the permit has been granted has to be submitted in single copy unless ENSI explicitly demands a different number of copies.

As regards modifications of the technical specifications, the pertaining documents according to Article 40 paragraph 4 NEO have to be submitted in single copy.

9 Form of the documents

Permit applications have to be submitted on paper. They have to carry the legally valid signature of at least one representative of the applying nuclear installation.

Documents for plant modifications according to Article 40 paragraph 1 letter a and modifications to the reactor core according to Article 40 paragraph 1 letter b NEO on principle have to be submitted on paper. Any technical reports as well as results of calculations may be submitted as PDF files on a data carrier under the following conditions:

- a. number of pages above 100 according to DIN-A4;
- b. format of the individual pages in both dimensions according to DIN-A4 at the most. Relevant here is the size at a zoom factor of 100%;
- c. the data carrier must exclusively contain PDF files.

Other data formats are possible after prior consultation with ENSI.

As regards a permit for modifications of the content of documents according to Article 40 paragraph 1 letter c numbers 1-4 NEO (*KEV*), the document including the justification has to be submitted on paper. The content modifications in the document have to be marked. After the permit has been granted and any possible requirements have been met, the modified document has to be submitted on paper in the version in which it is applied at the nuclear installation. If the modification concerns only a part of the document, it is permissible to submit only the pages concerned provided that the other parts of the document are not modified in any other way.

As regards modifications of the technical specifications, the pertaining documents according to Article 40 paragraph 4 NEO have to be submitted on paper.

10 Language

Permit applications have to be written in an official Swiss language; for technical documents, English is also permissible.

The application documents have to be phrased unambiguously and without any room for linguistic interpretation. Terms and designations have to be uniformly applied in all the application documents submitted with respect to a modification.

11 Processing times

11.1 Principles

Permit applications may be made at any time. Regarding permits that do not require any special examination effort nor any consultation of external experts by ENSI, the following processing times can be expected:

- a. one month for documents that have to be assessed only by ENSI;
- b. three months for documents that are submitted by ENSI according to Article 75 paragraph 2 NEO to specialist departments of the Confederation as well as documents that are to be submitted by ENSI to cantonal and municipal authorities for commenting.

If the application documents have to be sent back to the applying nuclear installation for revision, the processing time will be prolonged correspondingly.

As for modifications that require a multi-stage permit procedure, it is recommended that an overall schedule should be submitted beforehand.

11.2 Refuelling

Permits for modifications to the reactor core load with fuel elements (FE) within the framework of refuelling (Article 40 paragraph 1 letter b number 1 NEO) are granted in two stages (cf. chapter 6.2.1). The documents pertaining to the first stage (provisional fuel-loading plan) have to be submitted at least four weeks prior to the plant shutdown. In case it is necessary to deviate slightly from the provisional fuel-loading plan, ENSI expects a corresponding written notice prior to the start of loading, containing an assessment demonstrating that with the such modified load, all safety criteria remain fulfilled during fuel loading as well as in the course of the following cycle. The documents pertaining to the second stage (final loading of the reactor core) have to be submitted immediately after loading of the core. The results of the reactor-physical measurements at less than 5% reactor power have to be submitted immediately.

This guideline was approved on 1 July 2008.