

# **RADIATION PROTECTION REQUIREMENTS FOR NEW NPP IN SWITZERLAND DURING LICENSING PROCEDURE**

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## **Abstract and Introduction**

In 2007 the Swiss Federal Council made a resolution that the construction of new NPP is necessary in order to replace the old NPP. The Swiss Federal Nuclear Safety Inspectorate (called HSK until 2008, ENSI as from 2009) was informed that applications for two or three licenses for new NPP in Switzerland will be filed in 2008. Since this announcement HSK/ENSI founded a project team to prepare a catalogue of requirements to be fulfilled in the preliminary design stage of NPP as a first step in the licensing procedure. In this paper we describe the licensing procedure as well as the basic requirements about radiation protection.

## **Procedure Steps toward the Licensing of new NPP in Switzerland**

Because Switzerland is a basic democratical federation the new Law on Nuclear Energy established in 2005 (Kernenergiegesetz, KEG) regulates the different steps toward the operation of a new NPP in Switzerland. Three different licenses are necessary up to the start of operation to produce electricity: a general license, a construction permit and an operation permit.

### A. General License

1. After the application of a general license for a new NPP the HSK/ENSI has to furnish an expert opinion on the safety analysis report (9 months). Additionally the commission on nuclear safety has to prepare an independent statement on the report (3 months).
2. Consultations and hearings of neighbour states, regional and local governments (canton and municipal administration) and other official authorities have to be performed. The application including the safety analysis report as well as the expert reports have to be made public (5 months).
3. The proposal for a license has to deal with the objections from single persons of the public or from associations (3 months).
4. Preparation of the license report in cooperation with inspectorate, neighbour canton and states (8 months).
5. The Swiss Federal Council has to decide on the proposal (3 months).
6. The Swiss Federal Parliaments have to decide on the proposal (9 months).
7. A facultative plebiscite/referendum could be performed (9 months).

The duration between the application and the granting of the general license may be about 3 to 4 years.

## B. Construction Permit

1. After the application for construction permit the ENSI has to furnish an expert opinion on the detailed technical documents (24 months).
2. The application including several technical reports as well as the expert reports have to be made public (3 months).
3. The Swiss Federal Department on Traffic, Energy and Communication has to prepare and decide on the construction permit after a consultation of cantonal and municipal administration (12 months).
4. If objections have been raised by single persons of the public or by associations the Swiss Administrative Court has to adjudicate on them (12 months).
5. The court order could be pushed to the Swiss Federal Court, which has to adjudicate definitively on the objections from single persons of the public or from associations (12 months).

The duration between the application of the construction permit and the effective permission for construction could be between 3 and 5 years, whereas the application may be filed after the expert opinion of the ENSI on the general license is finished and published. Thus the construction permit could be available after 1 to 3 years after the granting of the general license. During the construction there are several steps, which need to be approved by the ENSI.

## C. Operation Permit

1. After the application for operation permit the ENSI has to furnish an expert opinion on the detailed documents necessary for the operation such as operating regulations, technical specifications and organisational description (at least 24 months).
2. The application documents as well as the expert report have to be made public (3 months).
3. The Swiss Federal Department on Traffic, Energy and Communication has to prepare and decide on the operating permit after a consultation of other authority bodies (12 months).
4. If objections have been raised by single persons of the public or by associations, the Swiss Administrative Court has to adjudicate on them (12 months).
5. The court order could be pushed to the Swiss Federal Court, which has to adjudicate definitively on the objections from single persons of the public or from associations have to be (12 months).

The application for operation can be filed when the general license has been granted. The operation could start earliest 5 years after the application for the operation. Before the operation up to maximum power (i.e. 100 %) could be reached, several approvals have to be given by the ENSI.

The entire license procedure should require about 13 to 16 years (theoretically this period can be reduced to appr. 9 years) from the first application of a general license until the first electrical power production of 100 %.

## **Basic Requirements about Radiation Protection**

In the application documents for the general license the basic concept on measures, which ensures the commitment to the requirements about radiation protection related to the environment and NPP staff, has to be considered during the design state of the NPP and has to be shown in the application documents. These requirements are:

### Impact on most exposed group of people in the neighbourhood during normal operation:

The licensee applicant has to show

- that the release of activity and the direct exposure to the environment during normal operation, including power operation and outages, is justified,
- that the effective dose from activity released by air and water additionally to the direct exposure has to be surely below 0,3 mSv/year considering a 50 year operation duration and all sources from one site (one site could include several NPP units and other nuclear facilities)

during normal operation including perturbations with an occurrence of  $> 1/10$  per year, whereby 0,1 mSv/year could be caused in maximum by direct exposure (e.g. sky shine),

- and that the release and also the direct exposure is optimized by state of the art for technical measures if the expected dose lies above 0,01 mSv/year.

#### Impact on NPP staff during normal operation:

The licensee applicant has to show

- that the actions giving rise to the exposure are justified,
- that the individual dose of each person of the operational staff is well below 20 mSv/year,
- that all measures are optimized as long as the individual dose of the operational staff exceeds 0,1 mSv/year,
- that the five-years-averaged collective dose of the NPP staff from normal operation, including power operation and outages with all necessary maintenance jobs, lies below the actual value of those NPP with the best performances worldwide (estimated from the ISOE statistics: PWR 150 man mSv/year, 250 man mSv/year BWR) considering that the technical possibilities will improve in the next decade furthermore.

#### Impact on most exposed group of people in the neighbourhood during incidents and accidents:

The licensee applicant has to show

- that the dose caused by release of activity and direct exposure is restricted to 0,3 mSv/year for each single incident with an occurrence between 1/10 and 1/100 per year,
- that the dose caused by release of activity and direct exposure to the environment is restricted to 1,0 mSv/year for an accident with an occurrence between 1/100 to 1/10000 per year ( $1.0E-4/y$ ),
- that the dose caused by release of activity and direct exposure to the environment is restricted to 100 mSv/year for each accident with an occurrence between of 1/10000 and 1/1000000 per year ( $< 1.0E-4/y$  and  $> 1.0E-6/y$ ),
- that there are only few causes for accidents possible which have an occurrence  $< 1/100$  per year,
- that there are emergency preparedness measures at hand in case of an accident may cause more than 1 mSv/year

#### Impact on NPP staff during incidents and accidents:

The licensee applicant has to show

- that the maximum individual dose for actions necessary to control accidents is 50 mSv (to rescue lives 250 mSv).

#### Other fundamental requirements on RP

Beside these basic requirements the licensee applicant has to ensure e.g.

- the generation of radioactive waste is minimized and separated from not radioactive material during construction, operation and decommissioning as well as the fixation of volatile radioactive waste,
- the immission (the contamination outside of the supervised area of an NPP) is monitored and kept well below the limits in the RP Ordinance,
- the released activity concentration and release rate is below the granted maximum values
- a concept of controlled areas as well as of shielding and embedding of radioactive sources (several barriers depending on radio toxicity) is available to minimize the carryover of contamination inside and outside the NPP,
- the staff is educated and trained with respect to the radiological risk, which could be caused by possible mistakes,
- a monitoring program on personal dosimetry and locally on the work sides,
- a quality assurance program is at hand for planning, preparing, performing, monitoring and control of radiation protection measures (radiation protection program).