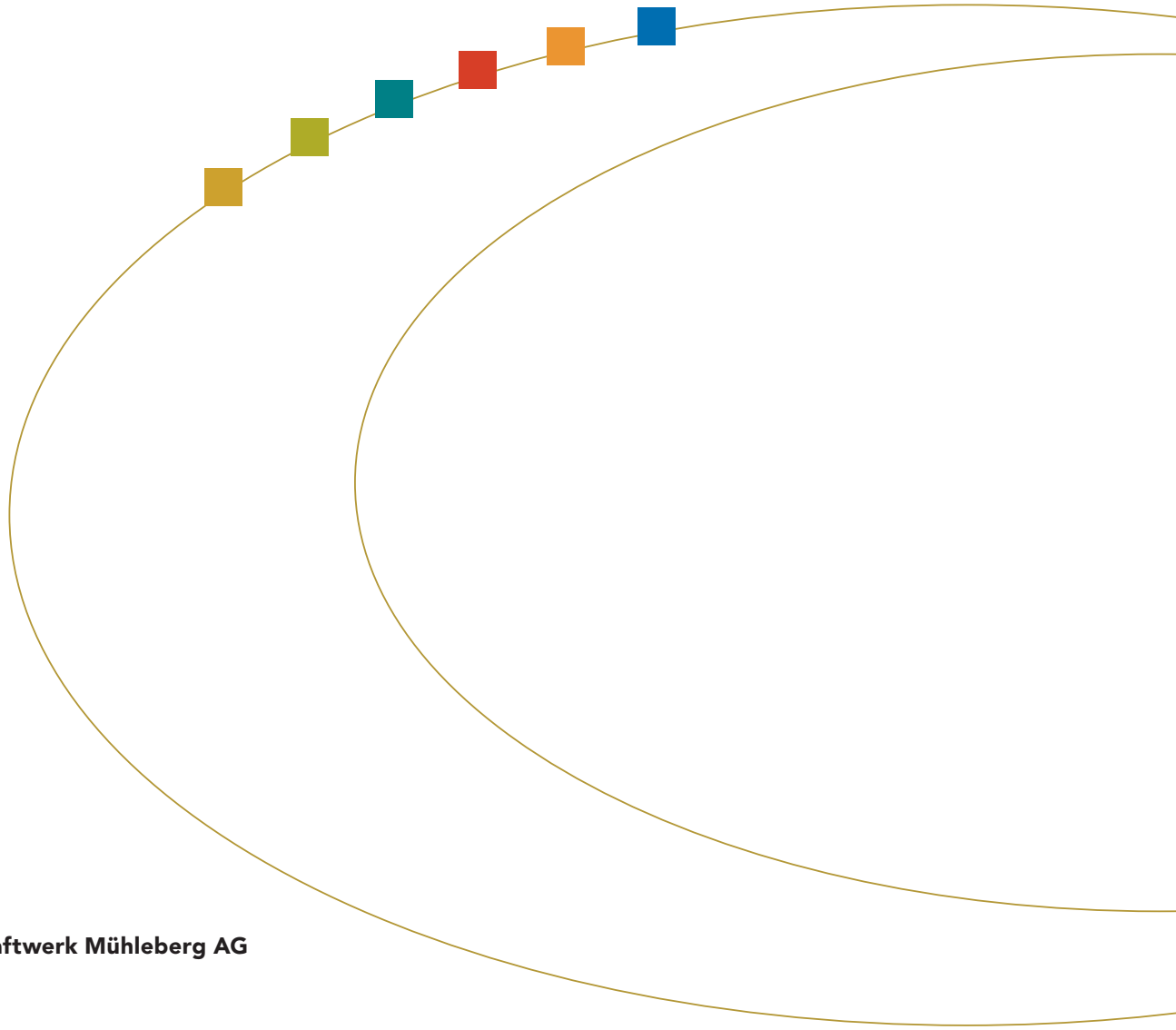
General License Application for the
Mühleberg Replacement Nuclear Power Plant

Summary of the Application Documents



Applicant:
Ersatz Kernkraftwerk Mühleberg AG

Issued by:
Resun AG, a joint planning company of
Axpo-Konzerngesellschaften Nordostschweizerische Kraftwerke AG,
Centralschweizerische Kraftwerke AG and BKW FMB Energie AG

The text in this brochure is consistent with the introductions of the individual reports of the application documents.

Only the complete application documents in German are valid for statements of position.

BKW FMB Energie AG

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Introduction

In order to be able to continue meeting their responsibilities for the energy supply of Switzerland and for climate protection, the Nordostschweizerische Kraftwerke AG (NOK) and the Centralschweizerische Kraftwerke AG (CKW) together with BKW FMB Energie AG (BKW), have entered into a partnership, whose goal is the timely planning and construction of the replacement nuclear power plants of Beznau (EKKB) and Mühleberg (EKKM).

The applicant, the plant construction and operation company "Ersatz Kernkraftwerk Mühleberg AG", headquartered in Mühleberg in the Canton of Berne, is a joint subsidiary of BKW, NOK and CKW.

The existing NPP Mühleberg (KKM) of the BKW FMB Energie AG (BKW) at the Mühleberg site in the Canton of Berne must be replaced in the long term. Additionally, a replacement must be provided for the expiring purchase contracts with nuclear power plants in France. In order to timely provide this replacement capacity for guaranteed security of national supply, it is proposed to build a new nuclear power plant on the Niederruntigen site, upstream of the existing NPP Mühleberg (KKM) on the bank of the river Aare in the municipality of Mühleberg. The planned nuclear power plant is named EKKM (Ersatz Kernkraftwerk Mühleberg).

The transfer of electrical energy from the EKKM takes place at the 380 kV power grid level. The grid connection is established at the site in Mühleberg. It is one of the most important nodal points in the Swiss high voltage grid.

The investigations conducted and the documents prepared in support of the General License Application (Rahmenbewilligungesuch, RBG) were carried out by a team of highly-qualified specialists, supported by external, acknowledged experts and commissioned by the above-named applicant. The RBG documents were verified by means of thorough quality assurance.

Purpose and Main Features of the Nuclear Power Plant

The purpose of the plant is the use of nuclear energy to generate electricity, including the handling of nuclear materials and the conditioning and interim storage of radioactive waste from the plant itself or from other Swiss nuclear power plants. An optional goal is the provision of process or district heating.

A light water reactor is planned for EKKM with an electrical output of 1450 MW with a tolerance of around plus/minus 20%. Various reactor types, which correspond to the current state of the art, were taken into account for the RBG investigations; the choice of the reactor type and of the plant supplier will take place later in the course of the preparation of the construction license application. A plant design extensively covering the investigated reactor types was taken as a basis for the safety studies; for this design, the layout and the approximate dimensions of the major site buildings were determined. In order to minimise the transportation of radioactive substances, facilities for the conditioning and interim storage of radioactive materials are planned on the site, in addition to the nuclear power plant.

A hybrid cooling tower acts as the main cooling system: its function is based on forced air flow and on the combined wet-dry cooling principle. This makes it possible to largely avoid a visible plume and substantially reduce the height of the cooling tower.

The electrical grid is capable of accommodating the projected power generated by EKKM. The site can be readily made accessible by road.

The scientific and technical state of the art and national and international experience feedback will be taken into account for the conceptual and detailed design of EKKM.

Safety Analysis Report

Subject of the Report

As part of the general license application, nuclear safety data must be provided; these data, defined in the Nuclear Energy Ordinance, are contained in the Safety Analysis Report. The primary goal of this report is to evaluate the site from the standpoint of its suitability for the construction and operation of a nuclear power plant.

Site Characteristics

Site Geographical Features
The biogeographical conditions, population distribution and land use in the site environs show no specific features which could endanger the plant. The preparation and the implementation of emergency response measures in accordance with the applicable ordinances are feasible.

There are no industrial or military installations in the vicinity of the site, which could present a hazard for the safety of the nuclear power plant. The same applies to traffic on roads or railway lines. Both gas pipelines in the vicinity are located too far away from the site to create a hazard.

The site is not located in the immediate vicinity of large airports, though there are some regional airports and airfields within a radius of 50 km. Therefore, the risk of an accidental crash of large (commercial) and smaller aeroplanes as well as of military aeroplanes has been calculated. As a whole, it is low and in no way affects site suitability. EKKM design requirements will cover both the impact and the consequences of a plane crash, such as kerosene fire and wreckage missiles.

Meteorology
The site meteorological conditions are well documented and evaluated. The climate corresponds to the typical European Atlantic conditions and is generally suitable for the construction and operation of a nuclear power plant.

Any possible meteorologically induced hazards, such as lightning, wind gusts and tornadoes, were also investigated; they do not call the suitability of the site into question. The possible effects of such external events will be taken into account in the EKKM design.

Hydrology
The fluctuations of the river water temperatures and levels lie within the standard range for mid-European conditions. Lower water level conditions may occur, especially in winter. However, the design of the EKKM cooling system can ensure that the cooling of the plant will be unaffected.

The possible hazard of flooding both as a result of dam breaks and as a consequence of a 10 000-year flood was analysed. The water levels of a flood event are clearly exceeded by the levels caused by dam break events. By means of appropriate terrace sizing, the plant design

will ensure that all safety-relevant hydrological events are mitigated. Safe reactor shutdown will be guaranteed at all times.

Geology and Seismology
Geology, building ground and seismic hazards could be reliably assessed by means of a well founded geological and geotechnical database and the PEGASOS seismic hazard study. Favourable ground properties and load bearing capacity together with a low seismic hazard substantiate the site's suitability.

All EKKM safety-related buildings and equipment will be designed to withstand the possible effects of an earthquake event and its possible resulting events, so that the corresponding accidents can be mitigated.

Other External Events
The hazard potential of all possible externally generated events was reviewed. In addition to the above-mentioned hazards, events such as drought, ice, lightning, forest fires, biological events were investigated. Also, possible hazard combinations such as extraordinary summer and winter conditions (combination of high or low temperatures with, for example, drought or icing) were investigated. The investigations show that, through a suitable plant design, adequate protective measures can be taken against the site-related events.

Overall Assessment of Site Suitability
Site suitability is demonstrated by the following favourable site characteristics:
- stable weather conditions
- sufficient water quantities for cooling purposes
- good accessibility
- good connection to the Swiss high voltage grid
- stable geological formations and favourable building ground
- zone of low seismicity
- sparsely populated environs with mainly agricultural land use
- no industrial plants in the environs, ruling out corresponding hazards.

Hazards from external events do not call the suitability of the site into question. In accordance with state of the art science and technology, these hazards can be mitigated by provisions in plant design and construction, as well as organisational or other measures.

Internally generated events, which are design-specific, will be closely investigated in the process of the choice of reactor type and will be presented during the construction license process.

Radiation Protection

The selection of the nuclear power plant will consider, among other aspects, the minimising or optimising of radiation doses. The safety analysis report exclusively addresses exposure by ionising radiation.

Radiation protection measures and the anticipated radiation exposure in the plant environs during normal and abnormal operation will fulfil the requirements of the Nuclear Energy Ordinance. Suitable passive and active protective measures will be taken in order to keep radiation exposure of the population within the legally defined limits during accidents originating in or outside the plant.

As EKKM will be erected in the direct vicinity of the existing plant KKM, both plants can be radiologically considered together as one radiation source on one site with one single source-related recommended dose value. Should there be various plant utilities on the site, then these must come to a contractual arrangement. The limits stipulated by the regulatory authority will be observed.

As part of the construction license application, the radiological accident analyses required in the Radiation Protection Ordinance will be conducted in order to demonstrate compliance with all relevant radiological limits for accident conditions.

Staffing and Organisational Information

The important staffing and organisational principles and the planned organisational development in the EKKM project were investigated for the various project phases. Adequate, comprehensive and complete safety considerations are foreseen from the conceptual design until the decommissioning phases; nuclear engineering, human and organisational factors (HOF) and quality management will play a central role in this process.

Nuclear engineering and HOF engineering will be integrally considered from the outset. The new nuclear power plant will be assessed as a socio-technical system. Human, technical and organisational interaction will be integrated so that the project and operation processes advance smoothly and on schedule and the regulatory requirements for nuclear safety are met. Workforce training and deployment will ensure that the project can be implemented with technical and methodological proficiency.

Conclusion

The safety analysis report shows that a nuclear power plant can be safely built and operated on the Niederruntigen site and that compliance with the relevant legal requirements can be assured.

Security Report

Subject of the Report

Nuclear security data must be provided as part of the general license application; this data, which is defined in the Nuclear Energy Ordinance, is contained in the security report. The primary goal of security is to prevent interference with nuclear power plant safety and nuclear materials as well as theft of nuclear materials.

Plant Security Measures

The protection of nuclear power plants and nuclear materials against sabotage, violent interference or theft is based on a multi-layered security concept. This protection concept encompasses building, technical, organisational, staffing and administrative measures on the basis of threat perceptions, in accordance with the requirements of the Nuclear Energy Ordinance. Thereby, security measures will be established for the purpose of guaranteeing the control of persons, vehicles and material flow in safety-relevant zones and the deterrence of potential perpetrators from unauthorised actions. This is made possible by setting up security zones with security barriers as boundaries between them.

Measures will also be taken during the construction of the nuclear power plant, in order to avoid negative impacts on the security of the operational nuclear power plant.

Staffing, Organisational and Administrative Information

The different aspects of security will be structured and optimally coordinated using organisational and administrative measures. Rules and policies will also be defined for controlling pedestrian, motor vehicle and material access to and from the plant. Necessary agreements will be made with the authorities and also exercises to be conducted will be defined.

Important components of the organisation are the company guard force and the security officer.

Conclusion

The security report shows that, at the Niederruntigen site, the statutory requirements relative to the security measures necessary for a nuclear power plant can be implemented in full.

Environmental Impact Assessment (EIA) Report

Subject of the Report

In the first step of the EIA main investigation, the foreseeable construction and operational impacts of the Mühleberg replacement nuclear power plant (EKKM) project on the environment were investigated and evaluated.

The environmental impact assessment report in the application documents also deals with diverse land use planning aspects. In this summary, the common aspects are only mentioned in one of the two chapters, Environmental Impact Assessment or Land Use Planning respectively, for the sake of simplification.

Air Pollution Control and Climate Protection

The existing atmospheric pollution in the region, and on the approach routes into the perimeter under investigation, is comparatively low and lies significantly below the limit values of the Swiss Air Pollution Control Ordinance.

Heavy transport that can be expected during the peak-period of the construction phase will result in considerable surplus atmospheric burden on the approach roads to the plant. Measures such as the construction of a separate access road outside the residential areas are expected to reduce this additional burden at least for the residential areas.

Unlike the existing plant, the main cooling of the plant will be carried out by means of a cooling tower. The use of a hybrid cooling system is planned. As a result, noticeable shadowing can be excluded. Unlike the systems previously deployed in nuclear power plants, the system proposed here possesses a constructional height of merely approximately 60 m. Additional increase in humidity in the environs of the plant is not to be expected, thanks to the high climbing height of the (normally invisible) humid air from the cooling tower. For this reason, the occurrence of "industrial snow" is not expected either.

During operation traffic to/from the plant should be roughly 30 % higher as compared to that of the existing plant. However, the resultant additional air contamination on the access roads will not change significantly.

Possible parallel operation[1] of the existing plant and the new plant would result in noticeably higher atmospheric loads due to the traffic, since a doubling of the plant traffic would then be expected. The additional NO_2 atmospheric burden to be expected on the access road in this case, amounts to around 1 µg/m^3 (annual average value) in the vicinity of the road. Similar results can be expected for PM10 burden. Though these additions do not result in any exceedence of the Swiss Air Pollution Control Ordinance limit values, they do necessitate precautionary measures in accordance with the enforcement code of practice of the Canton of Berne. The construction site traffic in the residential areas is to be directed onto a separate construction road for this reason.

[1] BKW is endeavouring to take the existing KKM plant out of operation as early as possible after EKKM plant commissioning. However, as things presently stand, parallel output operation of both plants may be necessary in order to be able to continue to guarantee security of supply for BKW and the partners with a stake in EKKM during the first phase after EKKM plant commissioning.

The greenhouse gas emissions associated with the electricity from a nuclear power plant occur due to uranium production, processing, enrichment and due to the materials needed for the construction of the nuclear power plant as well as due to decommissioning and dismantling of the plant, most of which is emitted indirectly in the form of "grey" energy. These amounts were determined for the time of proposed commissioning of the plant, within the framework of an extensive lifecycle analysis by the Paul Scherrer Institute (PSI, part of the ETH domain). The result is greenhouse gas emissions of approx. 5 g CO_2 equivalents per produced kilowatt hour.

Noise Control and Vibrations

No data can be provided at the "General License" stage owing to the current low level of details about the future noise emissions caused by operation of EKKM. The relevant noise sources are presumably the hybrid cooling tower, the turbine building and the access routes for the approx. 400 employees. In the EIA main investigation Level 2, the task will be to assess the noise emissions as a result of operation at the relevant monitoring locations. Measures and proposals to ensure compliance with statutory requirement values will be developed where required.

During the 7 to 8-year-long construction phase, the noise and vibration burden on the neighbouring land and property will be of relevance. Special attention must be paid to the roadways for the construction site transport. The S1D variant (bypassing of Buttenried on largely new road sections) proves to be the best variant from the point of view of noise and vibration protection, since the emission loads on the concerned land and property will be altogether lower and therefore preferable. Specific measures and proposals for the reduction of construction noise emissions must be developed in the EIA main investigation Level 2.

Protection against Non-Ionising Radiation (NIR)

The transfer of electrical energy to the 380 kV grid level will be optimised with regard to NIR load. An underground route is foreseen for the EKKM project using either a gas-insulated line or high voltage cables (2 cable harnesses) to the East substation in Mühleberg. Since an increase in non-ionising radiation in the transmission lines leading out of the plant can be expected, owing to the greater output of the new plant, the design of the 380 kV feed cable (cable pipe conduit) takes into consideration a low emission arrangement of the phase conductor.

In the course of further planning and with the availability of detailed and constructional drawings the emissions of non-ionizing radiation will be calculated and evaluated in the EIA Level 2. The statutory requirements will be implemented and complied with by means of appropriate measures.

Ground Water

The planned buildings are located in Water Protection Zone B. Since June 2008, ground water levels at different piezo meter sites have been measured and evaluated; however, the test series is too short for conclusions to be drawn at the time of the present report. Hydrogeological investigations have shown that ground water is fed by slope water influx and river water infiltrates into ground water only in the case of high water level of the Aare River. The use of ground water, or water from existing or new catchment basins, for cooling purposes is not planned for normal operation. Construction and operation of the plant implies an non-critical impact on the "Ground Water".

Detailed clarifications with regard to drainage of the foundation excavation and a drainage plan for the construction site, with the necessary permit applications, can only be developed in the EIA Level 2 using the relevant detailed project and construction drawings.

Surface Water, Aqueous and River Bank Habitat

The Aare between the Wehr Mühleberg and Lake Biel is characterised by the use of water for several run-of-the-river hydraulic power plants and by the exit flow regulation of the Lake Thun. Further down from the proposed EKKM site, the Saane River flows into the Aare River, which is significantly affected by the water use at the Schiffenen hydraulic power plant.

The hydro-biological conditions in the Aare River are currently affected by the discharge of waste heat from the existing KKM (max. 728 MW). The thermal plume resulting from slow mixing processes is detectable as far as the Niederried weir and impacts the composition, density of species and biomass of the aquatic invertebrate fauna. The fish fauna in the concerned section of river Aare is species-rich. While the catch yield between Wehr, Mühleberg and the Saane confluence is relatively high, it is in contrast very low in the water catchment areas of the power plants. The yield of individual species, such the greyling, has declined in the last few years. Detailed surveys on fauna and flora of the concerned section of the Aare River are still underway and will be continued in 2009.

Temporary encroachments on the banks of river Aare will be necessary during the EKKM construction phase, which will last 7 to 8 years. 30 m wide strips of riverbank on both sides of the river will be kept free of any non site-specific installations in order to reduce these encroachments as much as possible. Further measures for reducing environmental impacts during the construction phase will be developed in the EIA Level 2. Any residual adverse effects must be compensated using appropriate measures.

During normal EKKM operation, with a possible electrical output of 1 450 MW with a tolerance of roughly plus/minus 20 percent, the flow of the Aare River will be only marginally influenced by water extraction. The maximal diversion will be roughly 14 % of the historical

lowest water flow rate (a plant with an electrical output of approx. 1600 MW was taken as the basis for the calculations for the cooling and the water requirements as an example of a large plant). During normal operation of the plant, including discharge from the hybrid cooling tower, an average of 12 MW, with a maximum of 30–40 MW, of waste heat will be discharged into the Aare. From the service water system, without main cooling water discharge, there will be approximately an additional 100 MW (for short periods up to 180 MW). This results in an increase of the temperature of the river Aare, below the plant water discharge point, of around 0.2–0.3 °C during normal operation of the plant, and up to maximal 0.6 °C during full deployment of the auxiliary cooling in the short term (quicker cooling of the plant after the reactor is shut down). In both cases, it was assumed that auxiliary cooling takes place with direct flow cooling, since this represents the alternative solution that has a maximum effect on water temperatures. Consequently, the total waste heat discharge into the Aare will be much lower than is the case at present with the existing KKM. The discharge conditions in accordance with the Water Protection Ordinance (WPO) can be complied with in every operational state of EKKM.

The salt concentrations of the Aare River will be increased by the water return from the hybrid cooling tower, but within an ecologically viable range, so that no ecological damage is to be expected. The limits for discharge of other substances (possibly biocides) must be defined in the construction license.

In the event of parallel operation[2] of the existing KKM and of the proposed new EKKM, the waste heat discharge will be somewhat higher than at present. However, the discharge conditions of the WPO can be complied with at all times, since output of the existing KKM is reduced in conditions of extremely low Aare stream flow or extremely high Aare temperatures.

Measures will be proposed which, on the one hand, reduce impacts of temporary encroachments on the banks of Aare River (bridge, water catchments and water return during the construction phase) and, on the other hand, compensate for the permanent impacts on the aquatic environment (water catchment and return, waste heat discharge).

Waste Water

Construction site waste water will be treated in a central plant and reused as process water on the construction site for cleaning purposes or as concrete mixing water. The aim is to have an autonomous supply of water on the construction site. In the operational phase, the waste water will be discharged into the communal waste water network via existing pipeline and pumping systems. Drinking water will be drawn from the existing KKM network or from the communal network both in the construction and operational phases. The installation and storage areas outside the construction site will be supplied and drained separately.

As part of the EIA Level 2, the necessary technical installations will be sized and adjusted to the existing systems.

[2] BKW shall endeavour to take the existing KKM plant out of operation as early as possible after EKKM plant commissioning. However, as things presently stand, parallel output operation of both plants may be necessary in order to be able to further guarantee security of supply for BKW and the partners with a stake in EKKM during the first phase after EKKM plant commissioning.

Soil Protection

At the Niederruntigen site an area of 15 to 20 ha, which today is still for the most part in a natural condition and being used for agricultural purposes, will be used for permanent buildings and installations. Additional natural land areas in the vicinity of the construction site will be lost due to the planned extension of the power plant site access and the levelling of the land (excavation and fill). According to current state of knowledge, only a part of the topsoil removed during the construction of the planned buildings and plants can be reused on site. The rest of the excavated topsoil and also the excavated subsoil must be transported from the site. Clarification of which recycling and/or landfill possibilities exist in the region will be made in the framework of the EIA Level 2.

During the construction phase, another approx. 40 ha land area will be needed temporarily for intermediate landfill, storage areas, installation areas, construction barracks and offices, site access as well as concrete works and other auxiliary works. Such areas are planned in the Niederruntigen, Talmatt, Mühleberg regions and optionally also in Riedbach. The temporarily affected areas are presently almost completely natural and are being used for agricultural purposes. In the EIA Level 2, measures for the protection and, if required, for restoration of the temporarily stressed soils will be determined.

Contaminated Areas

According to the current state of knowledge, 54 contaminated areas lie within the investigation perimeter for the planned plant and for the additional areas required to be temporarily occupied by installations and site access. Most of these sites are debris sites (total 31); another 16 are operational sites and also 7 shooting ranges.

In the EIA Level 1, these sites were compiled and evaluated in cooperation with the responsible Cantonal authorities. All of the site parameters available in the given time frame were compiled and the historical data were acquired and evaluated. An attempt was made to limit the number of the sites for the next evaluation steps using categorisation. It can be assumed, using current planning and the categorisation, that more precise clarification of 10 sites will be necessary. The purpose of further evaluation is first of all to achieve a legally binding categorisation of the sites (determination of requirements for monitoring and/or redevelopment) as well as the legal consequences for waste disposal (type, quantity and distribution of stressed material) as the basis of determining further steps. Likewise, input for project optimisation is intended to be developed on the basis of the available site information.

The investigation perimeter for contaminated sites can be adjusted and the sites to be further processed can be defined as soon as the proposed surface area occupation by the planned plant and by the associated facilities and access routes are defined in detail. It can be assumed that there will be a significant reduction in the number of relevant sites after surface use is defined. According to the current project engineering status, it can be assumed that, in all probability, for 44 of the 54 compiled sites no further processing will be needed at later stages.

Wastes and Environmentally Hazardous Materials

A separate material management concept for excavation and landfill materials will be prepared in the EIA Level 2. In the course of construction supervision, special attention should be paid to handling of chemicals and other wastes on the large construction site with the many storage and transfer points.

During operation, the chemicals list of EKKM will include many substances, with also environmentally hazardous substances (primarily acids and bases). Additionally, diverse wastes will be created, including special wastes. The chemicals and wastes will be stored and managed according to state-of-the-art technology. An appropriate storage and monitoring system will be set up for this purpose. This forms an integral component of the EIA Level 2 which will also include applicable guidelines concerning the prevention of major accidents.

Prevention of Major Accidents

This chapter deals with conventional, i.e. non-nuclear, major accidents. A major accident (in terms of the Ordinance on Major Accidents) is any extraordinary event in a plant, due to which significant impacts outside the operating area occur. The major accident risk is derived from the magnitude of the possible damage to the population or the environment and the probability with which these major accidents can occur.

The probability that a major accident will occur, is derived from various sub-probabilities, among other things, collision probability, the probability of technical failure and the probability of human failure. The magnitude of the damage depends upon the type and quantity of the released materials as well as where these substances are released.

The evaluation of the risk thus requires, among other things, information about the type and quantity of the stored chemicals, about the storage concept and the drainage of the operational area. Since these are not yet known in detail at the current state of project engineering, the risk determination in the EIA Level 2 will be prepared with the construction license application. A brief report will initially be prepared in accordance with the Ordinance on Major Accidents for said purpose. This is also applicable to the construction phase, in the event that quantity thresholds given in the Ordinance on Major Accidents are exceeded.

It can be assumed that EKKM will be able to fully comply with the requirements of the Ordinance on Major Accidents.

Forest Conservation

The typical woodruff beech forest is widespread owing to the prevailing site conditions. In gullies and individual areas at the bottom of slopes, the humidity increases and fresher variants of this species can be found. A narrow band of ash leaf maple forest was also mapped in the gully in Fuchsenried. Given the species composition of the woods – with a clearly overwhelming predominance of coniferous trees– the ash leaf maple must be regarded here as an alien species.

From a forestry standpoint, the woods must basically be regarded as having good growth potential and are interesting from the point of view of forest management. The forest is managed using a system of cutting small groups of trees (the Swiss Femelschlagverfahren).

According to the Regional Forestry Plan (RWP) of Frienisberg-Laupenamt, the forests at Runtigerain do not fulfil any priority function.

Around 42000 m^2 will be cleared due to the access road to be prepared as well as the plant itself. Of these, 36000 m^2 are counted as permanent and 6000 m^2 as temporary forest clearance. Depending upon routing of the new access road, the area to be temporarily cleared in the slope area can vary. Whereas the temporary clearances will be re-forested after completion of the on site construction work, two afforestation zones (Marfeldingen and Kallnach) are foreseen to compensate for the permanent clearance.

The requirements of Art. 7 of the Forestry Act with regard to adequate replacement for cleared forests are met with these measures.

Nature Conservation and Wild Mammals

Wild Mammals
The wider area of Mühleberg provides primarily a habitat for deer, fox and badger. The hare is also found in the open agricultural areas in particular. Wild boar and beaver are also to be found.

The temporary, relevant loss of habitat cannot be compensated for. By means of a buffer strip along the forest, the riverside woods, as well as early execution of improvement measures in the agricultural region of Niederruntigen, the negative impacts of the project are minimised.

No relevant additional burden exists during normal operation. This presupposes the provision of a lighting concept that restricts undesired light emissions.

Only the area loss due to the fenced-off plant has a negative effect for the wild mammals. Complete on-site compensation is not possible.

Amphibians, reptiles, grasshoppers, butterflies, bats and birds: These groups are also represented by numerous species. From the reptile, bird, butterfly and grasshopper groups, only sporadic, special species could be verified. The frequent occurrence of bats in the Niederruntigen / Talmatt region was noted.

Flora
Nature conservation assets – in accordance with Art. 18 Para 1 of the Nature and Heritage Conservation Act (Natur- und Heimatschutzgesetz, NHG) – occur in all the affected areas; their frequency however varies. Within the temporarily used zones, these assets are either encountered on the edges or they are rare. In the area of the future plant and in the region of Talmatt they occur with greater frequency and over larger areas. In particular are found

ruderal sites, dry sites, river bank vegetation, species-rich fertilised meadows (incl. margins of fields or paths), field or waterside groves, orchards and individual trees. Species that are listed in the red list are rare.

During construction of the plant extensive neighbouring areas will be utilised. As long as these are only temporarily influenced the impacts, for the most part, can be reversed by means of preservation and restoration in accordance with the requirements of Art. 18 Para 1 of the NHG.

However this is not possible for the plant site. In order to ensure that the requirements of Art. 18 Para 1 NHG are fully complied with, extensive restoration measures will be implemented in the area of Brättele.

Water extraction during construction and the normal plant operation do not represent any relevant additional burden on the flora or on amphibians, reptiles, grasshoppers, butterflies, bats and birds; exceptions are the loss of natural area and the separation of areas by the plant and the new access road. In this respect the above mentioned lighting concept is especially relevant.

In order to avoid indirect consequential damages arising from the construction activity, the development of invasive plants will be monitored in all areas affected by the project in the first three years following termination of construction work and, if necessary, appropriate steps will be taken for their elimination.

Landscape and Townscape Conservation (Leisure and Tourism)

The rural area within the investigated perimeter is marked by dispersed settlements and villages (medium development density) and represents a still largely unspoilt cultivated landscape, with forest and mostly agricultural areas. Beside the existing power plants, the high voltage lines that are distributed across the region can be mentioned as characteristic landscape features.

The proposed EKKM lies at the bottom of the Aare valley and is clearly visible only from a relatively few nearby locations, with the corresponding relevance in terms of landscape characteristics. Outside the valley, the EKKM buildings are hardly perceptible, since they are largely hidden by the topography and consequently have subordinate significance even from an agricultural standpoint. There is equally no visual impact of the proposed EKKM on the areas downstream of the existing plant which are protected at a national level. These positive features are also supported by the fact that the proposed hybrid cooling system practically does not generate any visible vapour plume that would allow the plant to be identified from a distance.

This implies that, apart from the immediate environs of the plant, where, as expected, a distinct impairment of the aesthetic value of the landscape is recognisable, if the extended environs of the plant and/or the region are considered, practically no change in landscape quality can be determined, and EKKM can consequently be evaluated as landscape-compatible.

Once the detailed building and construction plans are available the plant integration into the landscape of the region will be verified in the EIA Level 2 and where necessary optimised. Likewise, site access and the corresponding infrastructure will be assessed and optimised taking into account the temporary nature of these effects.

Conclusion

Replacement of the existing KKM with the construction of a new nuclear power plant in Niederruntigen (Municipality of Mühleberg) was investigated with respect to the environmental impacts both for the construction phase as well as the operational phase. It should be borne in mind that the respective project engineering status and the degree of detailing corresponds to the requirements of the general license application in accordance with the Nuclear Energy Act, and that, in certain areas, the necessary project background that would permit a conclusive evaluation will only be available in the context of the EIA Level 2.

According to the experts, the results may however be interpreted within the scope of this EIA Level 1, to mean that considering the defined measures, including ecological replacement, the statutory requirements can be met completely.

The required activities in the EIA Level 2 are primarily seen for the construction phase, for which verification and optimisation of building logistics and the transport systems with the resulting impacts on different environmental areas are a primary concern. This requires the completion of the civil design and planning documentation.

Report on Compatibility with Land Use Planning

Subject of the Report

The report on compatibility with the land use planning is a part of the General License Application for the replacement of the Mühleberg nuclear power plant (EKKM). It investigates the impacts of the project on the local and regional development as well as its compatibility with applicable regional planning. Pursuant to Art. 13 (b) of the Nuclear Energy Act (KEG), the General License can be issued when no other requirements foreseen by federal legislation, namely those relative to environmental protection, nature and heritage conservation and land use planning, are in conflict with the application.

Any possible conflict of EKKM with local and regional development should be pointed out at an early stage in the land use planning report and appropriate measures for conflict avoidance or minimisation should be stipulated. Potential, insurmountable hurdles in the construction license process should thereby be excluded.

Investigation Perimeter

The perimeters R05 and R15 were defined as the field of investigation, in consultation with the responsible Federal and Cantonal authorities. R05 denotes the region within a 5 km radius of EKKM, and R15 denotes that within a 15 km radius.

Site and Environs

The site for the planned EKKM lies in Niederruntigen in the municipality of Mühleberg (Canton of Berne), directly to the east of the existing nuclear power plant. At present, the plot for the planned EKKM is assigned in part to the communal industrial zone, and the other part is in the agricultural zone. The planned EKKM operational site exhibits the following site qualities: acceptance of the existing NPP by the site community, existing national grid integration, central location for the energy supply of Western Switzerland, sparse settlement in the vicinity, experienced and qualified employees in Mühleberg and the region, good space availability, available land reserves owned by BKW, existing access infrastructure, good topographical prerequisites for the integration of the plant into the landscape, availability of cooling water and good building ground on solid rock.

Access and Construction Logistics

The construction phase will last roughly 7 to 8 years, from the start of construction up to the commercial operation of the plant, i.e. inclusive of testing, and commissioning of the plant. Around 900 000 m^3 of material must be excavated for EKKM construction. Cement, aggregate materials, steel and power plant components to be delivered and construction waste to be removed further contribute to traffic volume during the construction period.

The traffic volume during the construction phase primarily results from the large volume of excavation material. Both temporary (construction) as well as permanent (operation) variants

were investigated in detail for the site access to EKKM. The variant which circumvents existing settlements and does not use any existing roads (called S1D), was preferred. It calls for the construction of a separate road from external logistics points to the construction site. The existing traffic routes will be intersected at separate levels, so that no road connections are interrupted. Moreover, an optional combined solution with rail transport and transfer in Riedbach is possible, as a complement to the exclusively road access variant. In this option, because of the topography, the last section of the construction site access is by road and is identical to the above mentioned S1D variant.

In order to reduce the volume of traffic on the road, alternative access possibilities such as cable transport systems or conveyor belts will be investigated in detail in the EIA Level 2 report.

Impact on Land Use

The impacts on land use are evaluated as being substantial in the construction phase. EKKM construction requires a considerable temporary land use of around 40 ha land. Around 33 ha of this land fall under the category of high-quality agricultural land (crop rotation areas). EKKM construction will result at least in the temporary suspension of military operations at the Mühleberg crossing point. The impacts of a potential district heat transport line are to be evaluated independently of the proposed EKKM at a later date.

The overall impacts on land use in the operational state can be described as low. It is planned that the plant boundary be 30 m from the Aare River with inward-sloping terrain at certain areas. The military crossing point will at least partially lie in the inward-sloping area. Possible conflicts and solutions are to be discussed between the participants.

No detailed data about the future noise emission caused by operation of EKKM can be provided at the "General License" stage. The relevant noise sources are presumably the hybrid cooling tower, the turbine building and the access routes for the approx. 400 employees. During the construction phase, the noise and vibration load on the surrounding land and property is of relevance. The S1D variant proves to be the best variant from the point of view of noise protection and vibration, since the emission loads on the affected land and properties are in general lower and thus preferable.

Impact on the Landscape

The protection objectives of national importance prescribed for the BLN zone and the wetlands zone will not be impaired by the proposed EKKM and remain completely fulfilled. EKKM is not visible from either of the zones that lie upriver of the existing plant.

The rural area within the investigation perimeter is marked by villages and dispersed settlements (medium density of development) and represents a still largely unspoilt cultivated landscape, with forest and mostly agricultural areas. The existing power plants and the high voltage lines are characteristic features, which are distributed across the landscape. The proposed EKKM lies in the bottom of the Aare valley and is clearly visible from only a few, nearby locations. The planned plant is hardly perceptible outside of the Aare valley. The selected hybrid cooling system produces practically no plume that could be visible from afar or would make localisation of the plant possible.

The construction phase will result in adverse effects on the landscape. The impact on the landscape during operation is evaluated as relatively low. This evaluation takes into consideration the existing visual burden from power generation and distribution plants.

Cultural Asset Conservation and Archaeology

Given the topographical situation, archaeological finds can be expected in all areas that are affected by the project during the construction phase and during operation. The Cantonal archaeological service therefore requests sampling of all of the areas affected by construction, the provisional installations and the landfills. According to the evaluation in the EIA Level 1, exploratory work can be dispensed within places where the subsoil will remain intact. In those places where deep excavations are foreseen, the corresponding exploration is to be planned.

Four cultural assets are affected by the EKKM project within the investigation perimeter:

Object Name	ISOS	Cantonal Building Group	Cantonal Building Inventory, Hydro Plant Mühleberg
Mühleberg Hydraulic Power Plant	Buildings worthy of protection and of national importance. Neighbourhood protection zone specified by the planning authority	Buildings worthy of protection	Worthy of protection
Workers' housing settlement in Krähenfeld			Worthy of preservation
Workers' housing settlement in Buttenried		Buildings worthy of protection	
Riedbach (Hamlet)	Buildings worthy of protection and of national importance	Buildings worthy of protection	Objects worthy of protection and preservation

The buildings and the infrastructure of the hydraulic power plant and those of the workers' housing settlement in Krähenfeld will not be directly affected either in the construction phase or during operation. EKKM as a site-bound plant is in conflict with the ISOS protection goal "a" pertaining to Environmental Protection Zones (U-Zo II, U-Zo III). Resolution of the conflict between the energy and supply objectives of electricity production and the protection goals of asset preservation (ISOS goals for the respective areas) will have to occur within the framework of an assessment of conflicting interests and assets.

With respect to noise emissions and landscape aesthetics however, the burden on cultural objects is especially significant during the construction phase (for all cultural objects) and also during operation for the workers' housing settlement Krähenfeld.

A conflict analysis and evaluation of the affected objects from the inventory of historical traffic routes of Switzerland (Inventar historischer Verkehrswege der Schweiz, IVS) was carried out, together with the evaluation of the hiking and bicycle routes.

Impact on Residential Areas

The land use planning report investigates the development of the residential and worker populations as well as the impacts on land requirements for residential use for the year 2050 with respect to the two scenarios "with EKKM" and "without EKKM". In both the scenarios, no impacts are noticeable on demographic development and the zoning demands for residential use. The employment impact within a perimeter of 5 km is identifiable in percentage terms in relation to the selected scenarios, but is relatively small in absolute terms. Relative to the total number of employees the impact is low within a 15 km perimeter. The evaluation of the impact on the attractiveness of the locality shows a reduction in the area of environment during the construction phase and positive impacts in the area of economy.

Impact on the Local and Regional Economy

Investigations show that the economic effects are stronger with increased proximity to the site. Although the gross domestic production and employment effects within a 15 km radius of the plant are higher in absolute terms than in the R05 perimeter, the significance for long-term macroeconomic development in R15 is disproportionately lower compared to R05. The real gross domestic product (GDP) in the year 2050 in the "with EKKM" scenario within the R15 perimeter is 1.1 percent higher than in the "without EKKM" scenario (shutdown of KKM without replacement), whereby employment is 0.3 percent higher. This corresponds to around 1 000 jobs. In contrast, the impacts for the region within the radius of 5 km (R05) are very high. Investigations show that in the "with EKKM" scenario within a 5 km radius, a GDP difference of over 50 percent and an employment difference of around 5 percent as compared to the "without EKKM" scenario are to be expected.

Compatibility with Planning Instruments

The investigations show that there are certain conflicts during the construction phase between the proposed EKKM and the protection and planning goals formulated in the various planning instruments (impairment or loss of natural assets and quality of landscape and local recreation). There are minor conflicts with planning instruments during operation.

There are no conflicts with federal inventories in the area of nature and landscape.

The EKKM operational site lies in the Environmental Protection Zone (ISOS) of the Mühleberg hydraulic power plant. There is a conflict with the protection goals defined in ISOS during the EKKM operational phase that concerns the neighbourhood protection zones. An appropriate level of assessment of interests and assets must be performed within the framework of the general license application procedure.

The EKKM project is consistent with the energy strategy of the Federal Council of Switzerland. In accordance with the 2006 energy strategy, the Cantonal government of Berne is striving for a nuclear free electricity supply in the long term.

Optional Use of District Heat

Climate change, environmental problems, excessive dependency on foreign countries for fossil fuels and their high prices require alternatives that are able to reduce CO_2 emission, enhance the efficiency of the energy system, improve the quality of air and lower overseas dependency, especially concerning heating oil and natural gas. District heat from local energy sources, such as the waste energy from a nuclear power plant, can fulfil these requirements. The feasibility studies conducted for EKKM are based on a plant with an electrical output of 1 450 MW with a tolerance of plus / minus approx. 20 percent. The corresponding heat to be removed is accordingly 2 200 to 3 000 MW. Potential markets for district heat with comfort heat requirements for heating and warm water can be found in the western part of the city of Berne with its high-rise settlements as well as the residential settlements in Bethlehem, Bümpliz, Kappelenring, Hinterkappelen and Brünnen. Synergies may occur upon implementation of EKKM, in view of the city of Berne's intention to develop the western Berne region as an additional urban quarter with 4 000 residential homes in the long term (potential sales area).

The achievement of reasonable cost effectiveness of district heating systems in spite of high fossil fuel prices is becoming increasingly more difficult with the current attempts for the reasonable reduction of the comfort heat demand in buildings (e.g. Minergie standard). A funding body with participation of interested local communities and other partners would have to be found for the transport, distribution and operation of the district heating system and for its maintenance. The Ersatz Kernkraftwerk Mühleberg AG could make energy for district heating available from the power plant to one or several investors.

Cooperation and Status of Information

In 2008, BKW informed the authorities and the public at the Federal, Cantonal, regional and municipality levels in an appropriate manner about the project intentions and the planning status, and will continue to inform the appointed project groups of the site municipalities and the region on a regular basis.

Decommissioning Concept

The concept for decommissioning is an integral part of the application documents for obtaining the general license.

Based on a description of the demands placed on those responsible for decommissioning according to Swiss law, the content of the decommissioning concept was outlined, and differentiated from the decommissioning plan, which must be submitted later with the construction license application and periodically updated during the course of operation. The decommissioning project, necessary at some time in the future for the dismantling of the plant, is also described. Furthermore, the differentiation of the decommissioning concept from the verification of disposal of incidental radioactive wastes is presented.

It is explained that – although alternatives cannot to be excluded in principle – decommissioning options that come into consideration in Switzerland for statutory reasons are primarily immediate dismantling or perhaps dismantling later following a period of safe enclosure.

The basic work to be performed in the decommissioning phase subsequent to a post-operational phase is presented, and the possibility of a stepwise decommissioning is considered; the goal here being the continued operation of waste disposal systems beyond the power plant's decommissioning. Upon completion of decommissioning, it will be demonstrated that the plant no longer represents a radiological hazard source and that the site can be further used without restrictions imposed by legislation governing nuclear energy.

Basic principles are presented, which will be applied at the time of future execution of decommissioning. On the one hand, these concern the organisation and personnel and, on the other hand, work optimisation, both with respect to quality and with regard to legislation concerning radiation protection, as well as securing funding.

Finally, the criteria are given for selection of the decommissioning option which will be provided later as part of the decommissioning plan. It is mentioned that customary international standards for the protection of human beings and the environment, which favour immediate dismantling as the decommissioning variant, will be taken into consideration at the time of selection.

It is thus shown that all of the statutory decommissioning-related requirements for the application for a general license for a nuclear power plant at the Mühleberg site are met.

Verification of Radioactive Waste Disposal

Verification of the capability of disposal of incidental radioactive waste is an integral part of the application documents for obtaining a general license.

Based on a description of the legal requirements, the work already performed in Switzerland by the parties responsible for waste disposal is presented and it is mentioned that mandatory proof of radioactive waste disposal is deemed to have been provided by acknowledgement of this work by the Swiss Federal Council. Additionally, it is shown that the financing of the disposal is secured by means of statutory regulations.

The disposal steps envisaged in the disposal concept for radioactive waste in Switzerland, i.e. conditioning, intermediate storage and deep geological repository, as well as the transport connected with these disposal steps, are explained with the corresponding statutory regulations and/or legal requirements. Furthermore, categorisation of radioactive waste and assignment of waste categories to the deep geological repository are dealt with. Likewise, the radioactive waste potentially caused by the planned replacement power plant is assigned to these waste categories. It is further mentioned that this waste is taken into consideration in the Swiss disposal programme. By means of the legally required periodic adjustment, changes in quantity or activity of radioactive wastes resulting from the detailed plant design are guaranteed to be taken into consideration early enough in the disposal concept.

It is demonstrated that with respect to their disposal-relevant properties, operational waste, spent fuel to be stored, possible additional reprocessing waste and decommissioning waste are not significantly different from those created by nuclear power plants currently being operated in Switzerland, and, therefore, the same applicable disposal steps can be used.

Therefore, all of the statutory decommissioning-related requirements for the application for a general license for a nuclear power plant at the Mühleberg site (EKKM) are met.