Study of Environmental Impact Assessment for Mochovce NPP Units 3&4

Executive Summary

September 2007

Golder Associates

SLOVENSKÉ ELEKTRÁRNE

Enel

Executive Summary

SE/ENEL, on a voluntary basis, has prepared a new EIA Study for the completion of Units 3&4 of Mochovce Nuclear Power Plant (MO34 NPP) according to International current practices and European Directives.

The results of the analysis, according to SE/ENEL Environment and Corporate Social Responsibility policies, will be provided to local Communities and Public Authorities. The Environmental Impact Assessment is performed:

- in compliance with appendix 11 of Slovak Act. No. 24/2006 **"On the assessment of the effects on the environment and on the modification and enlargement of some laws"**;
- meeting the requirements of the Exhibit II **"Illustrative list of potential social and environmental issues to be addressed in the Social and Environmental Assessment documentation"** as reported in the document "Equator Principles" of 2006 July developed by the International Finance Corporation (IFC).

The area of Mochovce NPP is situated in Central Europe in the south-western region of the Slovak Republic (SR) at the western border of the Levice district. The area lies in the south-western part of the Kozmálovské hills mainly in the Hron highlands.

From the point of view of the terrestrial and administrative organization of the SR, Mochovce NPP is situated in the eastern part of the Nitra region, in the north-western part of the Levice district, close to the border with the Nitra and Zlaté Moravce districts. Mochovce NPP is approx. 12 km from the district capital Levice, which is the largest town within a 20 km distance from the power plant.

Initial site preparation began in August 1983. In April 1998 the first fuel was loaded into Unit 1 of Mochovce NPP. The operation started in August 1998. Unit 2 started operation in January 2000.

The original Construction Permit No. Výst. 2010/86 for MO 34 was issued by the District National Committee in Levice on the basis of the Land Planning Decisions on 12 November 1986. This Permit has been renewed firstly in 5 May 1997 by letter of the Regional Authority in Nitra No. 97/02276-004 and further by Decision of the Regional Construction Authority in Nitra No. 2004/00402-007 dated 15 July 2004 (the current Construction Permit for Completion of MO34).

Construction work on Units 3 and 4 was halted in 1992 and since that time attention has been paid to preservation and protection of components so that they will be immediately ready for further work when a decision was taken about the completion.

On the basis of the valid construction permit and according to current legislation there is no legal obligation to follow an Environmental Impact Assessment (EIA) procedure for the completion of Units 3&4 of Mochovce NPP.

The project consists of the completion of two units, Units 3 and 4, of an the existing nuclear power plant whose operation started in 1998 and 2000 for Unit 1 and Unit 2 respectively.

In particular the Project includes the completion and the operation of Units 3 and 4 and the operations of all four units (4×440 MW) to generate overall 1,760 MW of electricity for distribution to the Slovak Republic grid. The Project includes management of used fuel and radioactive waste produced through the operating life of the power station. After 40 years of operation the power station would be decommissioned.

Since the Mochovce NPP is an existing plant, previous EIA and environmental studies were carried out in order to assess the effects of the construction phase of the 4 units and related facilities. At the moment Units 3 and 4 are completed about 70% in civil part and about 40% in mechanical part. Therefore the present study focuses on likely additional environmental effects of an existing facility, as a result of the completion and operation of Units 3 and 4.

The Environmental Impact Assessment has been divided into several basis sections (see Table E-1 below), each comprising a number of chapters of the overall report.

Table E-1 – Basis sections of EIA Report

EIA Report Organization	
1	INTRODUCTION
2	ASSESSMENT METHODOLOGY
3	THE ALTERNATIVES FOR THE COMPLETION OF MOCHOVCE NPP
4	PROGRAMMATIC FRAMEWORK
5	DESIGN FRAMEWORK
6	ENVIRONMENTAL FRAMEWORK

Assessment Methodology

The methodology used for this EIA is based on systematic consideration of the system, works and activities mentioned above and presented in Section 5 "Design Framework", which comprises the Project.

Table E-2 – List of Project works and activities

CONSTRUCTION PHASE	Completion of civil construction
	Installation of equipment
	Construction waste management
	Construction workforce
	Commissioning of units 3&4
OPERATIONS PHASE	Operation of nuclear systems
	Operation of non-nuclear systems
	Radioactive waste management
	Non-radioactive waste management
	Spent fuel management
	Workforce

Each of the identified project works and activities is first screened in the context of several environmental components to determine its potential for interaction with the environment. A focused description of existing environmental conditions is then prepared. Where Project-environment interactions are identified, each interaction is systematically screened to determine if measurable changes to the existing environmental conditions are likely. Changes could be either beneficial or adverse. Where measurable changes are identified, a detailed assessment is conducted to characterize the effect.

Where adverse effects are identified, mitigation measures are presented to reduce, control or eliminate the effects. Following an evaluation of these mitigation measures, the residual effects are determined. Finally, a follow up program is recommended to confirm the results of the EIA and to allow the adequacy of mitigation measures to be verified.

For the purpose of this EIA, the environment is comprised of the following environmental components, including the biophysical and social features:

- **Radiation and radioactivity**: represents environmental radiation and radioactivity, including radionuclide emissions (to air and water) and doses to humans and effects to non-human biota and to environment;
- **Atmospheric environment**: represents air quality, with respect to non-radiological parameters, including noise, and considers meteorological and climatic conditions;

- **Geology and seismicity:** represents geological, hydrogeological and seismic conditions;
- **Hydrology and groundwater:** represents conditions and quality, with respect to non-radiological parameters of surface waters and groundwater; it also includes the aquatic environment;
- **Terrestrial environment:** represents land-based biota and habitat (vegetation, fauna and ecosystem);
- **Land use and cultural and historical heritage:** including transportation network;
- **Socio-economic conditions:** represents population, economic base, infrastructure and services, recreation and communities, resource use.

These environmental components were used as the basis for determining the likely environmental effects of the project within appropriate study areas and time frames as set out in the Scope of the Environmental Assessment.

For the present study the following study areas were suggested in the scope of assessment:

- **Site study area:** this area, centred on the plant site with a radius of about 3 km, includes facilities, buildings and infrastructure at the Mochovce site, including the licensed buffer zone (Protection zone) for the site on the land. This zone, where it is forbidden to reside permanently, has been set by Decree of Region Health Officer No. H-IV-2370/79 from 15.10.1979);
- **Local study area**: this area is defined as that area existing outside the site study area boundary, where there is a potential for impacts in the unlikely events of abnormal operating conditions. The Local Study Area generally corresponds with the 10 km emergency planning zone (centred on the Mochovce site), as identified by Emergency Measures;
- **Regional study area:** this area is defined as that area within which there is the potential for cumulative and social-economic effects and it approximately corresponds with a 50 km radius area around the site, limited to National borders. The size and configuration of the applied study areas varies by environmental component. Each is described, including the rationale for its determination, in the appropriate subsections.

The temporal boundaries for the assessment define the time periods for which likely environmental effects of the Project are considered. For purposes of this EIA, the Project life-cycle extends from 2007 to about 2050. Construction works for the Completion of MO34 will take place between 2000 and 2011. The commissioning activities are scheduled for 2011. Commercial operations of Unit 3 are scheduled to begin in 2012 and for Unit 4 in 2013. The operation life of MO34 is expected to be 40 years.

The baseline conditions of the existing environment are generally considered to be those existing in 2006-2007 within the study areas. Where appropriate, relevant historical data have been used to supplement current data.

The EIA guidelines require that a preliminary decommissioning plan has to be included in the assessment. The preliminary plan will document the preferred decommissioning strategy, including a justification of why this is the preferred strategy. It will also include end-state objectives; the major decontamination, disassembly and remediation steps; the approximate quantities and types of waste generated; and an overview of the principal hazard and protection strategies envisioned for decommissioning.

The alternatives for the completion of Mochovce NPP

The alternative analysis comprises the following issues:

- Economic aspects of the nuclear energy;
- Excluded alternatives, i.e. the alternatives that have been excluded from the study, as they are not realistic alternatives for the Completion of MO34 (Energy saving, Wind power and Additional hydropower);
- Feasible alternatives to MO34.

The feasible alternative to assure a production of electric energy corresponding to the production of MO34, based on the technology and facility of the Slovenské Elektrárne generation park, consists of,

- a 450 MW of Combined Cycle Gas Turbines (CCGT) power plant at the Vojany site;
- a 450 MW Fluidized bed combustion (CFB) lignite power plant at the Novaky site.

The assessment presented has necessarily been undertaken without a detailed specification for such plants and, indeed, in the absence of a well-defined potential location.

In performing the analysis, attention is first paid to basic assumptions regarding the likely environmental effects of the new plant that might be built in the Slovak Republic.

An assessment is then made of the potential environmental impacts, both in terms of resource requirements and routine waste arising and effluent discharges. Finally, specific issues related to project construction and operation and associated impacts are considered.

Programmatic framework

Section 4 provides a description of the:

- Slovak electricity market and foreseen development of power;
- EIA Law framework;
- Land use planning, Construction and Operation Permits ; and
- International Treaties and obligations.

The section also provides the coherence of the project with regional planning and the estimated costs for completion of MO34.

Design framework

Based on forecasted development of installed capacity in the Slovak Republic, starting from 2007 Slovakia ceases to be an exporter and becomes an importer until putting appropriate substitution into operation.

Taking into account current status and viability of new potential investments, MO34 will be probably the only equivalent substitution for closed power plants. Based on current schedule of MO34 construction, Slovakia will be dependent on electricity import at least until 2013.

The Project consists of the completion and the operation of Units 3 and 4 and the operations of all four units to generate overall 1,760 MW of electricity for distribution to the Slovak Republic grid. The Project includes management of used fuel and radioactive waste produced through the operating life of the power station. After 40 years of operation the power station would be decommissioned.

Section 5 of the EIA Study provides a detailed description of the project.

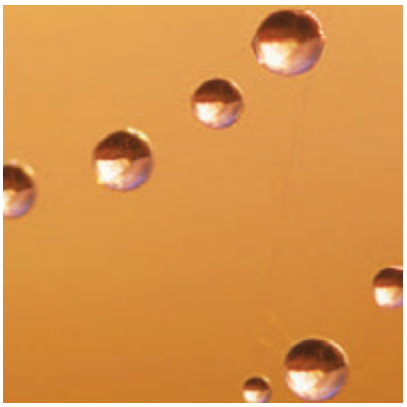
Environmental framework

Section 6 of the EIA Study describes the existing, or baseline, environmental conditions relating to Mochovce NPP. The conditions described represent those during 2006 and 2007. In some cases, historical information (i.e. pre-2006) may be included in order to provide the necessary broad and complete description of the existing environment.

The purpose of the description of the existing environment is to provide a foundation upon which to predict and assess changes and likely environment effects associated with the Project.

The existing environmental conditions are described individually for each environmental component in the subsections.

As a result of the focusing process, the baseline descriptions address only those features of the environment that are relevant and useful for predicting changes as a result of the Project.



The assessment of environmental effects involves four steps that progressively refine the focus of the assessment on the project's physical works and activities that may affect the environment, and the features of the environment that may be affected.

For the purpose of this Study the environment comprises the seven environmental components described in the Assessment Methodology.

The end point for assessment for each of the environmental components was a set of Valued Ecosystem Components shown in the table E-3 below.

Table E-3 – Selected valued ecosystem components

Environmental component	Valued ecosystem components
Radiation and radioactivity	• Human health workers and member of the public
Atmospheric environment	• Local atmosphere • Human health
Geology and seismicity (1)	No direct effects between project activities and component
Hydrology and groundwater	• Human health • Hron river and other water sources quality • Aquatic species
Terrestrial environment	• Vegetation communities and species • Wildlife habitat
Land use and cultural and historical heritage	No direct effects between project activities and component
Socio-economic conditions	• Socio-economy • Population and employment • Economic activity

(1) While the project does not have any direct effects on geology and seismicity, the effects of potential seismic events are fully assessed in Section 6.4.6.

Environmental likely effects, mitigation and residual effects

Section 6.9 of the Study describes the likely environmental effects associated with the project; the mitigation measures that have been identified to eliminate, reduce or control any adverse effects; and the likely residual effects that remain after mitigation.

Consistent with accepted practice, quantitative as well as qualitative methods, including professional expertise and judgement, are used to predict and describe the likely effects. Specific assessment criteria are applied to assess the importance of each effect in each environmental component.

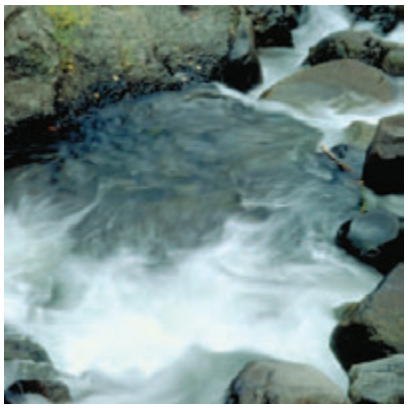
Each interaction is considered individually and associated effects described. Likely effects have been identified for the following environmental components:

- **Radiation and radioactivity;**
- **Atmospheric environment;**
- **Hydrology and groundwater.**

Based on the identified criteria, a determination is made as to whether an effect is likely, and if so, the nature of the effect is described. If effects are unlikely or negligible, no further assessment is conducted.

Otherwise, the effects are advanced for further consideration of mitigation and residual effects.

The criteria applied for the individual environmental components and the assessment of likely effects is presented individually for each environmental component.



Assessment of significance of Effects

Determination of the significance of the residual effects of the project is the fourth step in the assessment of effects process.

The significance of each residual effect was established within a framework of criteria and effect levels. To ensure a consistent and reproducible evaluation, the common criteria are used for all residual effects within all environmental components (Table E-4).

The definition of the level of effect within each criterion varies by environmental component to recognize that the units and range of measurement are distinct for each component.

Table E-4 – Effects criteria and significance levels

Effects Criteria	Effects Level Definition		
	Low	Moderate	High
Magnitude (of effect)	Effect is evident only at, or nominally above, baseline (existing) conditions	Effect exceeds baseline (existing) conditions, however, is less than regulatory criteria or published guideline values	Effect exceeds regulatory criteria or published guideline values
Geographic Extent (of effect)	Effect is limited to the Site Study Area as defined for the environmental component (3 km radius)	Effect extends into the Local Study Area as defined for the environmental component (10 km radius)	Effect extends into the Regional Study Area as defined for the environmental component (~50 km radius)
Timing and Duration (of effect)	Effect is not evident	Effect is evident during the operational period	Effect extends beyond operational period
Frequency (of conditions causing effect)	Conditions or phenomena causing the effect occur very infrequently; or are effectively a one-time event (several times per year)	Conditions or phenomena causing the effect occur at regular although infrequent intervals (several times per month)	Conditions or phenomena causing the effect occur at regular, frequent or continuous intervals (daily)
Degree of Reversibility (of effect)	Effect is readily reversible during the completion phase	Effect is reversible during operational phase	Effect is not reversible and remains after the operational phase

Environmental effects associated with the project have been described and their significance evaluated in the preceding sections. The evaluation was conducted individually for each residual effect within each environmental component.
A summary of the likely environmental effects and their significance is presented in Table E-5.

Table E-5 – Summary of likely effects and significance

Environmental component	Significance
Radiation and radioactivity	
• members of the public Maximum annual effective dose for inhabitants calculated by model for normal operation of 4 reactors (0.215 μSv/year) is negligible compared with maximum annual effective dose to inhabitants from critical group (250 μSv/year)	minor adverse effect
• workers On average, workers doses are much below the regulatory limits of 20 mSv/year and 100 mSv over a five year period	minor adverse effect
Atmospheric environment	no adverse effect
Geology and seismicity	No interactions between the Project and component were identified during the operations phase and consequently no likely effect occurs.
Hydrology and groundwater	no adverse effect
Terrestrial environment	no adverse effect
Land use and cultural and historical heritage	No interactions between the Project and component were identified during the operations phase and consequently no likely effect occurs.
Socio-economic conditions:	
• Increase economic activity trough process expenditures and pay-roll	Beneficial effect
• Increase community stability trough existent of a long term power plant with employment opportunities	Beneficial effect

Residual environmental effects are those that remain after the preceding assessment process, including the application of mitigation to eliminate, reduce or control the adverse effects of the project where appropriate. It was determined through the assessment of effects of the project that some residual effects are likely. These residual effects are summarized in table E-6.

Table E-6 – Summary of adverse and beneficial effects

Adverse/ beneficial environmental effect	Identified mitigation	Residual adverse/ beneficial effect
Radiation and radioactivity		
Increase in the average individual radiation doses to workers and to members of the public as a result of the Completion of MO34	• Policies and operational procedures • Adoption of burnable gadolinium fuel elements	Radiation doses to worker and member of the public are low or not detectable
Increase of background tritium concentration in surface water and groundwater	• Adoption of burnable gadolinium fuel elements • Development of a radioecological analysis	Radiation doses to worker and member of the public are low or not detectable, therefore the expected doses to aquatic biota will be as well low or not detectable
Atmospheric environment		
None	No mitigation measure required	None
Geology and seismicity		
None	No mitigation measure required	None
Hydrology and groundwater including aquatic environment		
None	No mitigation measure required	None
Terrestrial environment		
None	No mitigation measure required	None
Land use and cultural and historical heritage		
None	No mitigation measure required	None
Socio-economic condition		
Increase economic activity trough process expenditures and pay-roll		Beneficial effect
Increase community stability trough existent of a long term power plant with employment opportunities		Beneficial effect

Social analysis

The Social Impact Assessment and community involvement is as central to project success as any other factor and involves the proper management of the relationships with local community people.

Basically, Social Impact Assessment contains an analysis of:

- social and socio-economic aspects;
- social perception;
- media reports.

The Mochovce NPP is an existing facility in an established and stable community. All necessary construction permits have been granted. Accordingly a detailed socio-economic assessment is not required.
Notwithstanding this, the company will consult with the public on the results of this study. This consultation may include presentation, news letters, and briefing of governmental officials.

Section 7 focuses on the public communication policy adopted by SE, a. s. and ÚJD, in order to ascertain the level of knowledge and the perception of the project by local communities, as the first step of the social perception analysis.

Follow-up and monitoring program

Section 8 provides a preliminary plan for the design and implementation of a follow-up program.

The Scope of the plan is to assist in determining if the identified environmental effects of the project are as predicted in the assessment. A further objective of the follow-up program is to confirm whether the mitigation measures identified in this report are effective and whether new mitigation strategies may be required. The follow-up program would incorporate current Mochovce monitoring programs and other environmental studies, as appropriate.

Conclusions

Taking into account the findings of the present EIA Study, including the identified mitigation measures, it is a SE conclusion that the project is not likely to have any significant adverse effect on the environment. Indeed, the project will result in a number of positive effects through reducing greenhouse gases emissions and providing economic benefits to the immediate and surrounding communities.

Study developed by:
Golder (Europe) EEIG
Clyde House, Reform Road
Maidenhead
Berkshire SL6 8B
ENGLAND

Published by:
Slovenské elektrárne, a.s.
Hraničná 12, 827 36 Bratislava 212, Slovakia
www.seas.sk