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NON – TECHNICAL SUMMARY

ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR CONSTRUCTION OF A NEW 2 x 400 KV OVERHEAD TRANSMISSION LINE CIRKOVCE – PINCE

Ljubljana, August 2015

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1 INTRODUCTION

The public company ELES, Ltd., Electricity Transmission System Operator (ELES) has the exclusive right to perform the public service of the transmission network system operator in Slovenia. The founder and the sole owner of the company is the Republic of Slovenia.

The State has legally obliged ELES for reliable and sufficient operation of electricity transmission system and covering the needs of its users. To ensure this task, ELES should maintain or upgrade existing transmissions lines and build the transmission network through new transmission lines and substations.

The purpose of the project is to build a new 400 kV double transmission line from Cirkovce to Pince, which is approximately 80 km long. The planned transmission line would stabilize the existing network and enable electricity trading with Hungary, as well as other countries.

Under the provisions of the Decree on the categories of activities for which an environmental impact assessment is mandatory (Official Gazette of RS, Nr. 51/2014, 57/2015), the estimated intervention is recognized as an intervention for which environmental impacts should be evaluated and development consent should be obtained.

This document is a Non-Technical Summary of the Environmental Impact Assessment (EIA) report for the »2 x 400 kV overhead transmission line Cirkovce – Pince« (OHTL). EIA report deals with all the expected impacts on all environmental components. Acceptance of the project (rate) is evaluated, taking into account all the suggested mitigation measures.

1.1 Purpose of the document

The purpose of this document is to present the Environmental Impact Assessment report (EIA Report) to interested wider public.

EIA report is a document, prepared in accordance with the Environmental Protection Act (EPA).

Legislation provides detailed content of the report and prescribes the procedure of Environmental Impact Assessment (EIA), where environmental impacts are identified and evaluated and where proposals for project improvement are given. Environmental Agency of the Republic of Slovenia then examines whether the effects of the project on the environment are acceptable and issues a developing consent accordingly.

Non technical summary gives useful information that is relevant for assessing the acceptability of the planned activity on the environment and its components in a concise manner. The EIA is an assessment of physical, natural, cultural and social impacts of the project, taking into account the differences between construction and operation phases.

The project includes a construction of a new 400 kV double circuit transmission line from Cirkovce to Pince with the conclusion of lines in front of Cirkovce substation and rearrangement of Cirkovce substation.

For the assessment and evaluation of the effects six - value scale is used:

Impact degree	Descriptive evaluation	The importance of Impact level
+	positive impact	Impact is positive.
0	no impact	The project does not adversely affect the environmental component. Qualitative or physical change of the environmental component is small.
1	impact is small	Qualitative or physical change of the environmental component is small, but perceived.
2	impact is moderate	Qualitative or physical change of the environmental component is perceived, and moderate.
3	impact is large	Qualitative or physical change of the environmental component is large, but within the permissible limits.
4	the impact is very large and inadmissible	Qualitative or physical change of the environmental component is too large, and exceeds limit values.

Table 1: The scale for the Environmental Impact Assessment

2 PROJECT DESCRIPTION

The project includes construction of a new 2 x 400 kV Overhead Transmission Line from Cirkovce to Pince and thereon the connection to the transmission line network of the Republic of Hungary. The project includes the following spatial arrangements:

- Reconstruction and upgrading of Cirkovce substation, which includes a construction of a new switching station on the east side of the existing substation and the construction of a control building;
- Construction of the transmission line 2 x 400 kV Cirkovce – Pince, which includes building of towers, placing of overhead transmission conductors, installation of the lighting, warning balls for air traffic, labels in order to prevent bird collision, grounding and optical telecommunications;
- Construction of overhead and underground power line turn in front of Cirkovce substation. That includes removal of parts of the existing overhead transmission lines: 2 x 400 kV Maribor - Mihovce, 220 kV Cirkovce - Žerjavinec, 110 kV Cirkovce - Kidričevo I, 110 kV Cirkovce - Kidričevo II , 110 kV Cirkovce - Kidričevo III , 110 kV Formin - Cirkovce , 2 x 110 kV Zlatoličje - Cirkovce and 110 kV Cirkovce - Rogaška Slatina as well as construction of substitute underground and overhead power lines;
- construction of access roads to power lines;
- reconstruction of existing infrastructure, intersected with transmission lines;
- landscaping in the forest crossings and nature protection sites;
- Implementation of mitigation measures – creation of alternative habitats.

The planned transmission line will mainly be built along the existing 110 kV transmission line, in the ownership of Elektro Maribor. In Pince, it will be connected to the existing Hungarian 2 x 400 kV Pince – Heviz line.

ELES is going to construct 80 km of new double circuit 400 kV overhead transmission line. 264 towers will be installed along the transmission line route that will vary in height according to local conditions, but will be stay within 29 and 68 metres.

Preparation of the Detailed plan of national importance for the project started in the year 2000. Project optimisations were prepared until the Government of Republic of Slovenia approved the most appropriate course of the OHTL in 2006. Governmental Decree on the detailed plan of national importance for 2 × 400 kV Cirkovce - Pince was adopted in 2012 (Official Gazette of RS, no. 55/2012) and represents the legal basis for the project implementation.

2.1 Why is the realization of the project required?

Due to the incompatibility of electricity systems, construction of transmission line connections with Hungary was not feasible. An agreement on cooperation of Slovenian and Hungarian Electricity Transmission System Operators was signed in 1995 for improved energy exchange and mutual assistance during major outages of electricity facilities. The implementation of major joint facilities, like the planned transmission line, was also included in the agreement. In the wider European context, this connection means a net increase in transmission capacity on South East – South West European route.

This project was recognized by the European Commission as a Project of common interest (PCI).

The planned transmission line and the new substation Cirkovce represent the first cross-border connection to the Hungarian transmission network. One system will be connected with substation Heviz in Hungary while the other one will connect the substation Žerjavinec in Croatia.

The project aims to increase the reliability of the Slovenian electric power system. On one hand, the import transmission capacity and the reliability of the transmission network will increase in the South-East part of Slovenia. On the other hand, the new connection with Hungarian transmission network will allow additional supply of energy for the entire country. That will improve the reliability of power supply for Slovenia in case of outages of larger production facilities and operational difficulties.

With the realization of the project, Slovenia would become integrated into the regional electricity market with facilitated access to Eastern European electricity markets, which would bring long-term benefits in terms of lower electricity prices for Slovenian consumers.

2.2 The basic technical characteristics of the project

OHTL 2 x 400 kV Cirkovce – Pince:

- Double circuit overhead transmission line with nominal voltage of 400 kV, approximately 50 km long. Corridor width: 50 m (2 × 25 m, the left and right of the axis of the transmission line), in the areas of human settlement and forest land, the corridor will be extended up to 80 m (40 m × 2, left and right of the axis of the transmission line).
- Steel double circuit towers (electricity pylons), with the head shape »tons«, in which the conductors are distributed in three heights, and with the head shape »Danube«, with the conductors in two levels with one or two spikes.

OHTL 220 kV Cirkovce - Žerjavinec :

- Single circuit overhead transmission line, nominal voltage 220 kV.
- The existing line is moved (before Cirkovce substation, in a length of about 6 km), south of OTHL 2 x 400 kV Cirkovce – Pince. Both lines are placed in a mutual distance of about 45 m. New single circuit tower with the shape of the head »fir tree« will be built.
- Underground cables are placed in a ground tunnel individually or grouped.

The table below provides basic technical data of the planned transmission line.

Voltage:	400 kV
Length of route:	app. 80 km
Conductors:	2 x 3 x 3x 490-AL1/64-A20SA (490/65 Al/Fe) three- conductor bundle
Safety rope	OPGW with 108 integrated optic fiber and 1 x 122-AL3/71-ST1A
Maximum conductor tension	80 N/mm^2
Max tightening of OPGW	160 N/mm^2
Max tightening of protective ropes	137.5 N/mm^2
Insulation (basic rate)	insulator chain, that consists of composite insulators, level of 1425 kV
Tower/Plyon type	Double circuit, steel construction, anti corrosion protection by hot dip galvanizing and extra painted in factory, with the shape of the head "tons" and "Danube", with one or two spikes.
Tower/Plyon Number:	264 pieces
Foundation	concrete - knuckled, MB 20 , foundation partly on piles
Load capacity (estimate)	0,1 MPa + groundwater up to 0,3 MPa
Grounding	Zinc rolling stock of 25 x 4 mm, four legs in the form of stars
Wind pressure	600 N/m^2 – I. zone up to 40 m, 750 N/m^2 – II. zone over 40 m
Additional load	1,6 x 0,18 √ d (daN/m)
Terrain	mostly flat
Land use	forests , wetlands, meadows, fields

Table 2: Technical data of the planned transmission line

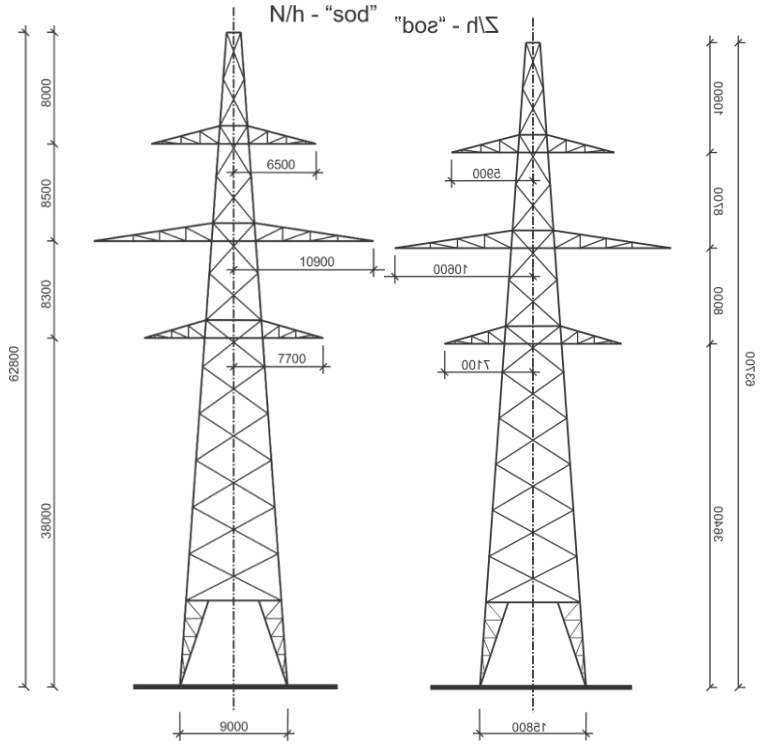


Figure 1: Suspension tower (left) and tension tower (right) with the shape of the head »tons«

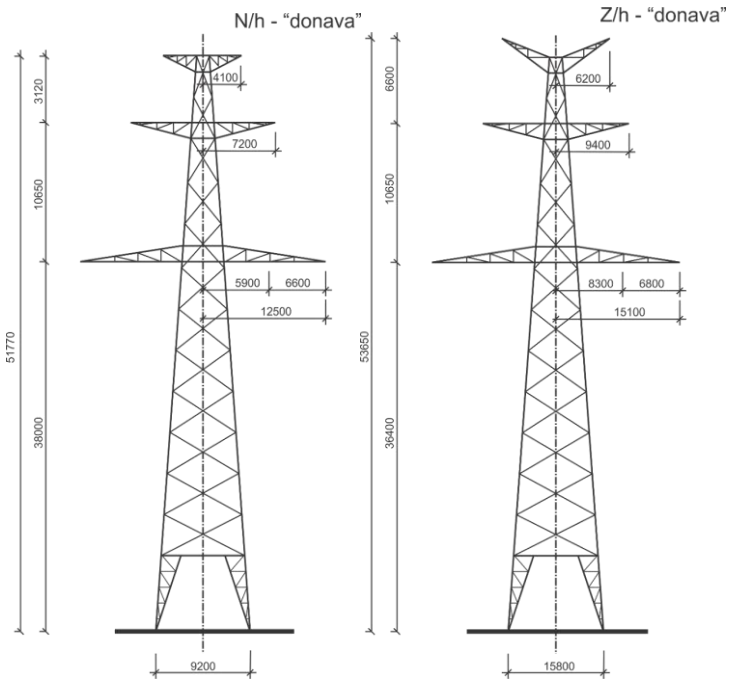


Figure 2: Suspension tower (left) and tension tower (right) with the shape of the head »Danube«

2.3 The location of the project

GRAPHICAL DISPLAY OF LINE ROUTE

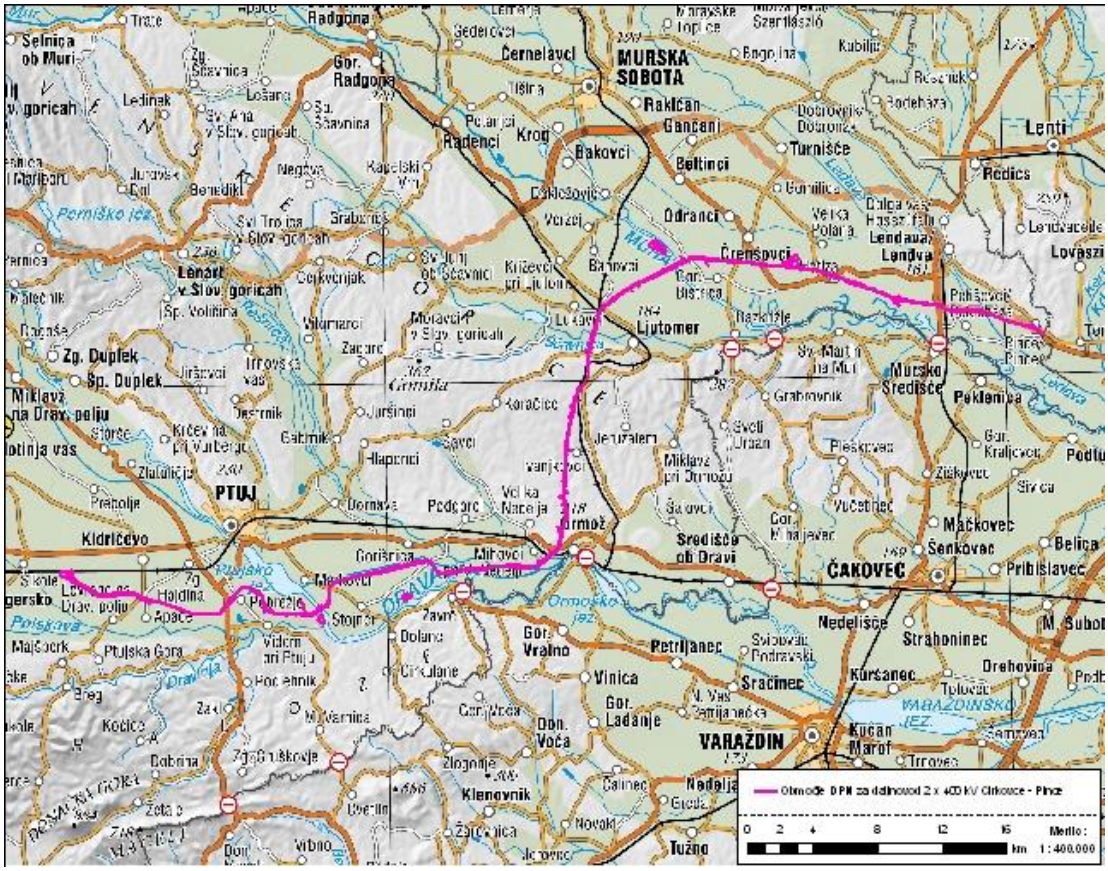


Figure 3: The route of the planned 2 x 400 kV Cirkovce – Pince OTHL

The transmission line route is located between rural settlement of Cirkovce and the border with the Republic of Hungary. Geographically it can be divided into three sections:

- Predominantly planar section from Cirkovce to Ormož , which runs in direction East - West close to Croatian border,

- Predominantly hilly section from Ormož to Ljutomer, which runs in direction Southwest - Northeast,

- Predominantly planar section from Ljutomer to Pince, which runs in direction East - West.

The route is characterized by dispersed settlements; the only agglomeration in the immediate vicinity of the route is Placerovci, a village in the Gorišnica municipality. The whole area is dominated by fields and meadows, while vineyards and larger patches of forest characterize the section from Ormož to Ljutomer.. Importantly, there are some areas of floodplain forests in the two predominantly planar sections.

2.3.1 Sensitive areas of special interest

NATURE: The transmission line route crosses more watercourses, i.e. water protection area »Dravsko – Ptujsko polje« and some reservoirs of drinking water.

The transmission line route crosses the following Natura 2000 sites: SCI Mura (SI3000215) SPA Mura (SI5000010), SCI Drava (SI3000220), SPA Drava (SI5000011), pSCI Mura (HR2000364). Moreover, it intersects the nature protection areas Nature Park Šturmovec, Nature Park Ljutomerski ribniki in Jeruzalemske gorice and Nature Park Jeruzalemsko - Ormoške gorice and three ecologically important areas: Mura - Radmožanci (42100) Drava - Spodnja (41500) and Dravsko polje (42500).

The project area is characterized by high species diversity, particularly ornitofauna. In total, 90 species of birds occupy the area with the lake Ptuj in the vicinity of the route representing one of the most important bird localities in Slovenia.

CULTURAL HERITAGE: The route intersects some areas of cultural heritage; Lancova vas - Rimski grob (Roman tomb) (EŠD 6506); Mihovci pri Veliki Nedelji - Rimska naselbina (Roman settlement) (EŠD 640496); Hajndl - Arheološko najdišče (Archeological site) (EŠD 6033); Dobrava pri Ormožu - Rimski gomili Hajndl (Roman mound Hajndl) (EŠD 15303); Lešnica pri Ormožu – Domačija Habjanič (Homestead Habjanič) (EŠD 24964); Lancova vas - Prazgodovinska naselbina Srednje polje (Prehistoric settlement Srednje polje) (EŠD 27971); Lešnica pri Ormožu - Prazgodovinska naselbina (Prehistoric settlement) (EŠD 23584); Pince - Prazgodovinska naselbina Pod Grunti (Prehistoric settlement Pod Grunti) (EŠD 23610).

RESIDENTIAL AREAS: The area of the planned intervention is sparsely populated. The main focus of the planning process was to avoid the settlements and the residential buildings. Settlement is primarily dispersed in the region, meaning there are many individual facilities on the edges or outside the agglomerations. There are 17 residential facilities in the 80 m corridor of the transmission line axis (40 m on each side of the axis).

The closest to the thansmission line corridor is the village of Placerovci. An alternative route was not possible in that case due to the existing or planned infrastructure. i.e. (hydroelectric power plant Formin with its supply channel and the highway from Markovci to Ormož, respectively). The corridor also approaches the villages Apaški Križ, Apače, Videm pri Ptuju and Spodnji Kamenščak. Those could also not be avoided, either because of the dense settlements in the vicinity, the other infrastructure in the wider area or the possible effects on the Natura 2000 qualification species.

2.4 Selection of line route and alternatives to the project

The planning of the transmission line started in 1996. During the pre-investment and the planning phase, the investor prepared many technical studies for the project.
Preparation of Detailed Plan of National Importance started in 2000. In 2006, the Government of Republic of Slovenia approved the most appropriate course of OHTL. Governmental Decree on Detailed Plan of National Importance for 2 × 400 kV Cirkovce - Pince was adopted in 2012 (Official Gazette of RS, no. 55/2012) which represents the legal basis for placement intervention.

To select the most suitable route, a comparative study evaluating two alternative routes was carried out. The assessment took into account the following aspects:

- energetic and technical adequacy
- regional and urban development
- natural and cultural components of the environment along with residential areas
- economic aspects
- social acceptability (development of residential areas, avoiding settlements).

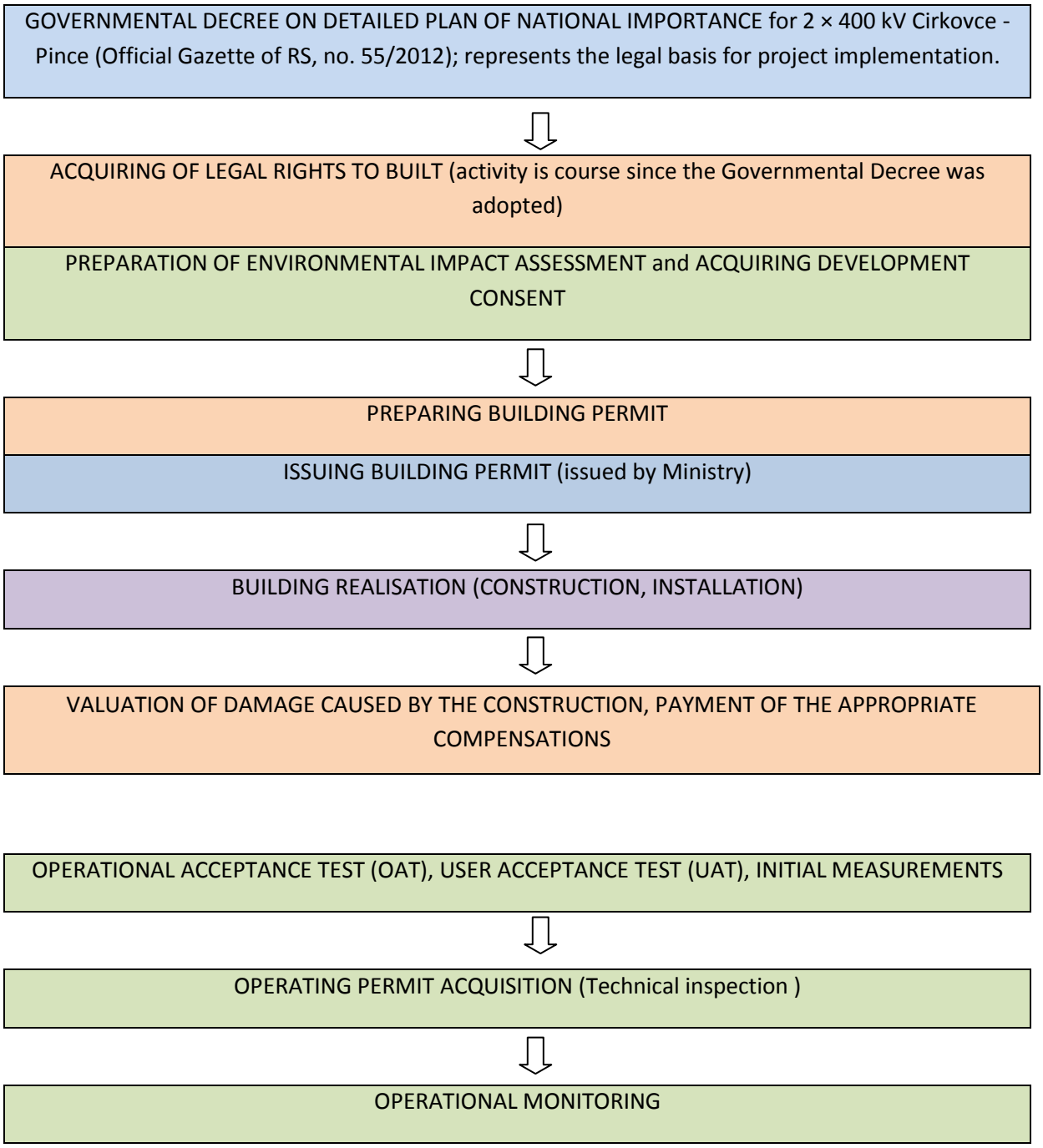
Over the course of the project, the route was optimized especially in the following sections:
1. Next to Pobrežje and Videm (pole legs 37 to 43): In addition to the basic proposal from the comparative study, two additional alternatives were proposed by the residents of Pobrežje:
• first proposal: the corridor should cross the road from Pobrežje to Tržec and the the village of Podbrežje at its northern part, then it should turn south and connect to the original route when it approaches the existing 110 kV transmission line,
• second proposal: the corridor should cross the road from Podbrežje to Tržec and avoid the village of Podbrežje, then enter Ptuj municipaly and turn South where it connects to the original route next to the existing 110 kV transmission line
The first optimization was chosen.

2. Passing Kapca (pole legs from 217 to 232): The original route turns North of the village Kapca, then eastwards so that it bypasses Kapca on the Southern side.
The route along the existing 110 kV transmission line, where a short section passes a meander of the Mura river was chosen.

3. Crossing the supply channel of the hydroelectric power plant of Formin (pole legs 88 to 98)
Because of the settlements and the technical constraints, the suggested optimization of the route was not possible.

During the preparation phase of the project, many initiatives to change the route were collected from the local communities. The route was optimized to the greatest extent possible, meaning that some pylon locations were changed, including avoidance of the existing gasline, and crossing of a Croatian cadastre. At the same time renumbering of the pylons was made.

2.5 The scheme of the project preparation



3 HOW WILL THE PROJECT AFFECT THE ECONOMIC DEVELOPMENT OF THE COUNTRY AND THE REGION?

New transport and energy infrastructure projects in general create better possibilities for upgrading the national infrastructure and thus improving the integration of Slovenia both with neighbouring countries and the European Union as well as its effective internal grid system.

Investment in the energy sector is of a great importance for Slovenia, because the lack of the adequate energy transmission and production systems jeopardizes the functioning and growth of economic entities. Energetic projects are urgently needed for national economic efficiency and international competitiveness. They bring many direct and indirect positive effects for the long-term economic growth and international economic integration.

Investment in electricity transmission infrastructure affects the whole economy. Besides business aspect, macroeconomic effects are also important. Increasing investment in the energy sector particularly increases the dynamics in the construction sector, industry, employment and taxation, which all result in higher inflow into legal tender.

The regional impact of the project is ensuring a stable and reliable supply of electricity, which enables further development of the region.

4 WASTE MANAGEMENT

No by products are expected. The majority of the waste will be created during the construction phase, i.e. waste generated during ground works (for placing the foundations, creating access roads).

A small amount of waste will be created at the reconstruction of Cirkovce substation.

The type of waste that is expected to appear during construction phase is shown in Table 3.

Class. No. of waste material	Name of waste material
02 01 07	forestry waste
15 01 06	mixed packaging
15 01 10*	packaging, that contains remains of dangerous substances or is polluted with dangerous substances
15 02 02*	absorbents, filtering agents (also oil filters, that aren't listed elsewhere), cleaning dusters, protective clothing, polluted with dangerous substances
17 01 01	concrete
17 02 03	plastic
17 01 07	mix of concrete, brick, wall tiles and ceramics, that are not listed under 17 01 06
17 02 01	wood
17 04 05	iron and steel
17 05 04	ground waste and stones, that are not listed under 17 05 03
17 06 04	insulation materials other than those mentioned in 17 06 01 and 17 06 03
20 03 01	mixed communal waste

Table 3: Expected types of waste during construction phase

During the operational phase, the power line right-of-phase will be regularly cleared of the vegetation, creating biomass waste. Waste will be produced also during maintenance works, including conductors, insulator sets and strings, earth wires, suspension clamps, and grounding material. In case of tower maintenance waste packaging of paint and solvents for washing, both classified as hazardous waste, could occur.

Class. No. of waste material	Name of waste material

Class. No. of waste material	Name of waste material
08 01 11*	waste paint and polishers that contain organic solvents or other dangerous substances
15 01 06	mixed packaging
15 01 10*	packaging that contains remains of dangerous substances or is polluted with dangerous substances
16 01 17	iron metals
16 01 18	non-ferrous metals
16 01 19	plastic
16 01 99	Other such waste
20 02 01	biodegradable waste
20 03 01	mixed communal waste

Table 4: Expected types of waste during operation phase

The type of waste that can be expected at eventual termination of power line operating, abandonment of its use or in case of removal of towers and conductors is shown in Table 5.

Class. No. of waste material	Name of waste material
02 01 07	forestry waste
15 01 06	mixed packaging
15 01 10*	packaging, that contains remains of dangerous substances or is polluted with dangerous substances
15 02 02*	absorbents, filtering agents (also oil filters, that aren't listed elsewhere), cleaning dusters, protective clothing, polluted with dangerous substances
17 01 01	concrete
17 02 03	plastic
17 04 05	iron and steel
20 03 01	mixed communal waste

Table 5: The types of waste that can be expected at eventual termination of power line operating

5 POTENTIAL ENVIRONMENTAL IMPACTS OF THE PROJECT

The potential environmental impacts of the project along with the key mitigation measures are presented.

AIR: Air quality will be impacted during construction phase only at the construction site:

- exhaust gases from construction machinery and transport vehicles,
- dusting during construction works,
- other working operations (e.g. forest clearance).

The project will not influence the air quality significantly. A minor amount of exhaust gases will be released during the construction phase due to the construction machinery and the amount of dust particles in the air can increase in the occasions of dry and windy weather. Limit values will not be exceeded at any phase of the project.

SURFACE WATER AND GROUNDWATER: Construction of the overhead transmission line can potentially have an impact on:

- the morphological condition and quality (in terms of chemical characteristics) of watercourses,
- groundwater.

No direct impacts on groundwater are expected. However, the ground and consequently groundwater might be polluted in case of an accidental spillage of hazardous substances. By taking mitigation measures into consideration, the possibility of such stressing will be considerably reduced.

During the operational phase, traffic associated with occasional maintenance works under the transmission line (vegetation clearance) might influence the ecological characteristics of the watercourses crossed by access roads.

- **GEOLOGY AND LAND:** Constructing the transmission line will potentially have the following impacts:smaller physical destruction of soil layer at locations of towers and access roads (removal of the humus layer, adding indigenous unconsolidated bulk material, soil compression),
- risk for ground pollution with fuels, oils and other materials used for transport and construction mechanisation,
- forest clearance in the 50 m corridor along the line route.

The project will not increase the present rate of flood hazard in the local and regional area.

NATURAL VALUES, PROTECTED AREAS, ENVIRONMENTALLY IMPORTANT AREAS AND AREAS OF NATURA 2000: During the construction and tower assembly phases, the rate of motor vehicles will increase, which might negatively affect the surroundings due to exhaust gas emissions and increased dusting. Production of various type of waste will require temporary disposal sites that should not be located in the vicinity of natural heritage areas.

Land use within the project area might impact the local biodiversity. Overhead transmission line could cause causalities of bird collision and electrocution or influence the bird migratory paths and animal movement in general. However, mitigation measures will be carefully implemented to reduce this risk level.

During the construction phase, the project will potentially have the following impacts:

- temporary or permanent change of species richness and composition and the structure and quality of habitat types as a consequence of vegetation clearing and periodical maintenance of the corridor in terms of removing the woody plants in the corridor and on the access roads,
- permanent destruction of present flora and the less mobile animal species on sites of foundation excavation and newly established access roads,
- temporary destruction of vegetation layer in areas of wood piling and construction machinery,
- altered abiotic conditions (amount of light at the forest edge due to clearance, wind exposure , lower moisture levels etc.), which cause habitat alteration,
- reduced fitness and resistance of certain plant species because of the increased dusting in the impact area of a building site,
- changes in ground pH levels due to the inflow of carbonate into the acid soil,
- influence on animal behaviour – some timid species might avoid the area during the building process,
- effects on habitat types and species of Natura 2000 sites due to the negative effects of the project on the size and quality of the habitats or/and ecological requirements of the protected species
- changes in the area appearance of and subsequently the perception of the natural values or ecologically important areas by visitors.

The construction phase will have the largest impact in the area where the overhead transmission line crosses rivers Drava and Mura.

Appropriate Aseesment (AA) for protected areas was made in accordance with Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas (Official Gazette of RS, Nos. 130/04, 53/06, 38/10 and 3/11).

The presence and maintenance of a new power line will potentially bring consequences for native fauna due to forest fragmentation. During the operational phase, vegetation will be regularly cleared in the transmission line corridor, which will influence animal ecology. Fragmentation and forest habitat degradation brings negative consequences for forest specialists (certain groups of birds, bats, beetles and large mammals) but at the same time creates new habitat for edge species (such as roe deer, some bird species and butterflies). The impact on certain species of beetles will be mitigated by preserving older tree stumps and markers will be placed on the protection wire to decrease the number of bird collisions. The project will impact on the migratory and residential bird species that use the air space in the area during long distance seasonal migration (migratory species) or during daily movements between nesting and feeding grounds (residential species).

CULTURAL HERITAGE: During establishment of foundations, construction and assembly phases, the cultural heritage objects in the vicinity might be exposed to indirect impacts mostly caused by the construction and transportation mechanisation.

VISUAL IMPACT: The installation of the OHTL and reconstruction of Cirkovce substation represents an additional feature in the landscape with a visual impact.

The negative construction impacts are mostly temporary or permanent removal or damage to the vegetation, presence of the construction mechanisation on the construction site and temporary enlightening of the construction site, organization of temporary waste deposition sites and temporary storage of the construction material.

The transmission line will be most visible from the hilly areas of Slovenske gorice and Lendavske gorice.

The majority of the transmission line route is located on flat areas, where the impacts on the visual environment tend to be smaller.

Due to the temporary or permanent vegetation clearing, a greater impact on the visual environment is expected by the Mura river and its flood groves area, in the area of Žižkovsko joušje and between Hotiza and Kapca.

There is smaller visual impact expected where the transmission line route runs through intensive cultivated flatland, along the existing infrastructure (power lines, hydroelectric power plant of Formin and its supply channel) and in the area of future infrastructure projects (highway between Markovci and Placerovci).

NOISE: The construction ground will act as a temporary time-changeable noise source. An important factor in environmental stress assessment are the working hours on the construction site itself as well as the operational times of the individual noisy construction machines and equipment. Transport will add to the noise pollution.

Decree on limit values for environment noise indicators (Official Gazette of RS, Nos. 105/05, 34/08, 109/09, 62/10) sets maximum and critical noise levels in different periods of the day in relation to noise-sensitive area classification.

- In the vicinity of the transmission line corridor, the following classes of noise sensitive areas appear: level IV: farmland, forest and transport infrastructure,
- level III: general residential areas, farmland, mixed areas, water bodies.

Area	Limit indicators			
	L_{day}	$L_{evening}$	L_{night}	L_{DEN}
Maximum values of noise				
area III	-	-	50	60
area IV	-	-	65	75
Critical values of noise				
area III	-	-	59	69
area IV	-	-	80	80
Levels of noise caused by the use of equipment or construction machinery				
area III	58	53	48	58
area IV	73	68	63	73

Table 6: Maximum and critical values of noise indicators for III. and IV. level of noise protection area in dB (A)

With the model-based calculation, it was found out that due to the construction in the case of the use of machinery, noise value are between 54 and 58 dB(A) at a distance of 20 meters from the location of the construction; where there is no housing. It follows that the noise levels from the construction of transmission line will not exceed the limits prescribed for level III. of protection against noise.

The additional noise from the transportation routes is also not expected to exceed the limit values.

In bad weather conditions, operation of high-voltage lines generates noise of varying intensity caused by the so-called corona. The emergence of the corona is more expressed when air humidity is very high, especially at the time of precipitation.

Weather conditions that cause the maximum noise level occur exceptionally (once, twice a year over a period of 2-4 hours). Therefore, specific technical measures (such as larger number of wires, increased tower height) are not eligible and not used in this case.

ELECTROMAGNETIC RADIATION:

Electromagnetic radiation (EMR) is widely present in the environment. Effects of EMR differ in accordance with a number of physical characters, particularly the frequency and intensity of EMR. There are two main types of electromagnetic radiation; the non-ionizing and the ionizing radiations.

The main sources of low frequency EMR in the environment are transmission and distribution electric power lines, transformer substations and distribution transformer stations. The main source of high-frequency EMR are radio and television transmitters, radars, base stations and other telecommunications transmitters.

Regulation on Electromagnetic Radiation in the Natural and Living Environment (Official Gazette of RS, Nos. 70/1996) defines limit values of electric field - electric field strength (E) [V/m] and magnetic field - effective density values of the magnetic flux (B) [T].

Regulation applies to all sources of electromagnetic radiation in the natural and living environment and divides them into two main categories (based on official land use criteria), namely:

- I. level of EMR protection: hospitals, spas, recovery facilities, tourist facilities, residential and recreation areas, clean residential areas, educational facilities, health care facilities, playground area and public parks, public green and recreational areas, commercial - business-residential area, which is also intended for residences or craft or similar productive activities, public centres (administrative, commercial, service areas), and those parts of agricultural areas that are at the same time indented for residence.

- area of II. level of EMR protection: areas without housing, intended for industrial, craft and other similar production activities, transport, storage or service activities. Any other areas that are not defined in the previous paragraph as area of I. degree of EMR protection, as well as surfaces designed for public road or rail transport within area of I. degree of EMR protection.

The Regulation sets limit values for electric and magnetic fields that depend on whether it is a new, reconstructed or existing source of radiation.

Maximum values for	**area of I. level of EMR protection**	**area of II. level of EMR protection**
electric field (**E**)	500 V/m	10.000 V/m
magnetic field (**B**)	10 μT	100 μT

Table 7: Limit values for electric and magnetic fields for new sources of radiation

Maximum values for	**area of I. level of EMR protection**	**area of II. level of EMR protection**
electric field (**E**)	1.800 V/m	10.000 V/m
magnetic field (**B**)	15 μT	100 μT

Table 8: Limit values for electric and magnetic fields for reconstructed sources of radiation

Maximum values for	**area of I. level of EMR protection**	**area of II. level of EMR protection**
electric field (**E**)	10.000 V/m	10.000 V/m
magnetic field (**B**)	100 μT	100 μT

Table 9: Maximum values for electric and magnetic fields for existing sources of radiation

RESULTS OF MEASUREMENTS OF ELECTROMAGNETIC RADIATION:

Overhead transmission line 2 x 400 kV Cirkovce – Pince is in section from substation Cirkovce to Apače placed in the axis of the existing 220 kV Cirkovce – Žerjavinec transmission line and therefore classified as reconstructed radiation source.

In section from Apače to Pince OHTL is recognized as new radiation source.

As he most vulnerable area for EMR, the areas of dispersed settlement and some individual parts of villages Apače and Placerovci were detected.

Governmental Decree on Detailed Plan of National Importance for 2 × 400 kV Cirkovce - Pince (Official Gazette of RS, no. 55/2012) established re-categorization of certain parcels of land from I. to II. area of radiation protection as a mitigation measure.

Based on the available data about deviations from general calculations and considering the re-categorization of certain parcels listed in Governmental Decree, II. level of EMR protection is applied also in areas where possible exceeding of limit values for I. level of EMR protection is expected. Yet, the II. level of EMR will not exceed any maximum values.

Accounting for the provisions of Governmental Decree on Detailed Plan of National Importance for 2 × 400 kV Cirkovce - Pince (Official Gazette of RS, no. 55/2012) and implementing additional technical measure for the reduction of value of electromagnetic field within span between pole legs no. 86 and 87[1], it the EIA report concludes that the expected impact of electromagnetic radiation will not exceed the set limits.

[1] The lower conductors on the towers with head shape »Danube« are shifted: lower/internal suspension is shifted 0,5 m towards tower body and lower/external suspension is shifted 2 m towards tower body.

5.1 Overview of potential environmental impacts and mitigation measures

Segment	Source	Potential impacts	Mitigation measures and legal frame
AIR QUALITY	Construction phase: work and transport on/ to a building site	Air pollution emissions because of the transport and use of machinery (exhaust gases, dusting)	➢ Regulation on the prevention and reduction of particulate emissions from construction sites (Official Gazette of RS, no. no. 21/11) • moisturizing the material, unprotected surfaces and transport roads in windy and dry weather, preventing the dispersal of material from building site; • general surveillance of dust levels and applying mitigation measures if issues appear; • cleaning the vehicles, leaving construction site and entering public roads, regular cleaning of access roads; • maintenance of construction machinery, use of the vehicles which meet technical standards; • switching off the engines of working machinery and mechanization in case of longer breaks; • minimising open excavation areas; • re-cultivation of degraded land.
	Operation phase: occasional maintenance works	Occasional pollution during maintenance	• use of existing access roads to the largest possible extent

Segment	Source	Potential impacts	Mitigation measures and legal frame
SURFACE WATER	Construction phase: spillage of oils, fuels or other substances from construction machinery and transport vehicles, elution near placement of towers	Possible spot pollution, possible pollution of surface waters	Mitigation measures, deriving from Governmental Decree (Official Gazette of RS, no. 55/2012) • The lowest height of conductor crossing the water course should be at least 9 m. Towers must be at least 15 m away from the border of offshore land of continental waters of 1st order in areas of settlements and 40 m away from the border of offshore land of other watercourses. • Hardening of surface water should be prevented. Building operations with heavy machinery and all excavation work must be carried out in dry weather. • By interventions in watercourses fishing organisation and the operator of these watercourses should be informed. • Protecting of temporary storage and transfer systems of fuel and other hazardous substances from possible spillage in soil and watercourses, compulsory use of oil traps. • Preventing or minimizing damage of vegetation near water courses. No working in water courses with construction machinery is allowed. • Use of the vehicles which meet technical standards. The construction site should be organised so that the possibility of accidents (spillage) will be minimal or that in case of an accident fast and efficient emergency actions can be taken. • Ensuring safe transport and safe use of hazardous substances and petroleum products.
	Operation phase: traffic on access roads, crossing watercourses due to temporary maintenance works	Impact on ecological characteristics of watercourses	Are not foreseen.

Segment	Source	Potential impacts	Mitigation measures and legal frame
UNDERGROUND WATER	Construction phase: spillage of oils, fuels or other substances from construction machinery and transport vehicles, elution near placement of towers	Possible pollution of underground water	➢ Rules on criteria for the designation of a water protection zone (Official Gazette of RS, no. 64/04, 5/06, 58/11) ➢ Ordinance establishing water protection areas and measures for the protection of drinking water for pumping station Ormož (Official Gazette Ormož, 5-23/2000) ➢ Ordinance establishing protection zones and measures to secure water coverage of Mota (Official publications of Pomurje municipalities, 30/83) <u>Key mitigation measures:</u> (all mitigation measures are listed in EIA Report): • Use of the vehicles which meet technical standards. • Proper organization of construction sites that affects minimum size areas, especially in areas of priority habitat types. • The upper humus layer of soil is suspended separately from the rest of dredged material and is used for the renewal of the land. • Disposal of the material in the flow profile of watercourses or on flood plains is prohibited. • Preventing or minimizing damage of vegetation near water courses. • Protecting of temporary storage and transfer systems of fuel and other hazardous substances from possible spillage in soil and watercourses, compulsory use of oil traps. • Ensuring safe transport and safe use of hazardous substances and petroleum products.
	Operation phase: spillage of oils, fuels or other substances from construction machinery and transport vehicles, elution near placement of towers	Possible pollution of underground water	Measures for construction phase should be considered reasonably.

Segment	Source	Potential impacts	Mitigation measures and legal frame
FLOOD SAFETY	Construction and operation phase: pole legs located in flood land area	No impact on flood hazard of the area.	➢ Decree on conditions and limitations for constructions and activities on flood risk areas (Official Gazette of RS, no. 89/08) Key mitigation measures: (all mitigation measures are listed in EIA Report for every pole leg located in flood land area): • Realisation of suitable deep foundation. • Additional protection against erosion that prevents undermining of towers. • Cleaning of floating material on towers. • Additional concreting of individual towers. • Protection of steel part of construction (quoins, diagonals, joints), that are to be flooded, with additional protection against corrosion. • Regular inspection after annual high waters.

Segment	Source	Potential impacts	Mitigation measures and legal frame
FLORA, FAUNA AND HABITAT TYPES	Construction phase: vegetation and humus layer removal, terrestrial excavations because of construction of towers, access and manipulative surfaces	Impact on ecosystems, flora and fauna and their habitats, the spread of invasive species	➢ Regulation on Habitat Types (Official Gazette of RS, no. 112/2003) • Using existing access roads to the largest possible extent. • Depositing excavated soil outside the areas of habitat types important for conservation and habitats of protected species, especially away from the water edges, floodplains and wet meadows. • Construction should take place during arid summer periods or in the winter to avoid damaging the wet ground that underlies most of the route. The technological abilities of the machinery should also be considered. • Restoration of natural forest edges. • Wetting unfortified roads and other terrain in dry and windy weather. • Restoration of steep slopes in Slovenske gorice with grasses. • Preventing oil and fuel spillage. • Allowing sub-canopy and scrub layer to develop where line corridor cuts the forest. • Preventing partial or complete destruction of Natura 2000 habitat types. Minimizing interventions at riverbanks and river gravel habitats with herbaceous or suffrutescent plants. Limitation of clear cutting in the areas of acidophilus beech forests. <u>Key mitigation measures for birds:</u> (all mitigation measures are listed in EIA Report): • concealing the power line with existing or new woody vegetation, • formation of substitute habitats.

Segment	Source	Potential impacts	Mitigation measures and legal frame
	Operation phase: transmission line as an obstacle in open space, vegetation clearing in the line corridor	Birds collisions, invasive species	• wire marking (highlighters, colouring of conductors), • construction should take place during arid summer periods or in winter; • preventing colonization and spread of invasive species along the line corridor and other areas of bare ground • minimizing clear-cutting where transmission line crosses floodplain forest, preserving shrub layer • restoration of riverside shrubs in case of any damage caused.
NATURAL VALUES, PROTECTED AREAS, ENVIRONMENTALLY IMPORTANT AREAS AND AREAS OF NATURA 2000	Construction phase: vegetation clearing, dusting, noise	Changes in species composition and modification of habitat types; negative impact on size and quality of habitat types and the status of protected species in the Natura 2000 network; permanent destruction of present flora and some animal species; changes in abiotic conditions in the corridor area ; influence on animal movement; changes in visitor's experience of areas important for conservation	The same mitigation measures as for segments »Flora, fauna and habitat types«

Segment	Source	Potential impacts	Mitigation measures and legal frame
	Operation phase: transmission line presence of the transmission line and its corridor	Habitat fragmentation and changed species composition, obstacle on the migration paths of residential and migratory birds causing collisions. Possible positive impact – line corridor can represent suitable habitat for edge species.	The same mitigation measures as for segments »Flora, fauna and habitat types«
CULTURAL HERITAGE	Construction phase: access roads, pole legs	Destruction of cultural heritage	➢ Cultural Heritage Protection Act (Official Gazette of RS, no. 16/2008, 123/2008), other Ordinance on the Protection of the individual units of cultural heritage • implementation of previous archaeological research and implementation of the excavations of discovered archaeological sites; • permanent archaeological supervision over earthworks; • construction site should be reduced to the minimum area which allows the construction; • registration of the cultural heritage condition before and after completed construction.
	Operation phase: transmission line and accessed roads placed in physical space	Visual perception of units of cultural heritage	Are not foreseen.

Segment	Source	Potential impacts	Mitigation measures and legal frame
LANDSCAPE	Construction phase: preparatory and assembly works, building of access roads	Visual environment is affected.	• Proper organization of construction sites, that affect minimum size areas: - Depositing of dredged material to visually less exposed locations.; - restoration of natural forest edges; - restoration of steep slopes in Slovenske gorice with grasses.
	Operation phase: transmission line as landscape element	Changes in visual quality and landscape patterns	- preservation of shrub vegetation where the height of conductors allows it; - allowing sub-canopy and scrub layer to develop where line corridor cuts the forest; - adjusting the height of towers to landscape picture; - final checking of views within minimal radio of 1 km after completed construction. Where towers are more emphasised because of a background, impact is reduced with vegetation or painting.
NOISE	Construction phase: construction machinery, transport, transport material (location of pole legs, excavation for foundation, building of access roads)	Noise from construction will not exceed the set limits for III. noise protection area	➢ Decree on limit values for environment noise indicators (Official Gazette of RS, no. 105/05, 34/08, 109/09, 62/10) • use of the vehicles which meet technical standards; • use of personal protective equipment; • general measures for reduction of equipment noise (e.g. silences on pneumatic tools/acoustic enclosures on compressors etc.); • slow driving in construction site area and speed limit on access roads (30 km/h); • switching off the engines of working machinery and mechanization in case of longer breaks;

Segment	Source	Potential impacts	Mitigation measures and legal frame
	Operation phase: transport by occasional maintenance works, crackling of conductors		Are not foreseen.
ELECTROMAGNETIC RADIATION	Construction phase: no source of radiation	No impact.	Not needed.
	Operation phase: new source of radiation	Human health impact, impact on residential and business function	➢ Regulation on Electromagnetic Radiation in the Natural and Living Environment (Official Gazette of RS, No. 70/1996) ➢ Rules on initial measurements and operational monitoring of sources of electromagnetic radiation and the conditions for its implementation (Official Gazette of RS, No. 70/1996) • Governmental Decree on Detailed Plan of National Importance for 2 × 400 kV Cirkovce - Pince (Official Gazette of RS, no. 55/2012) established re-categorization of certain parcels of land from I. to II. area of radiation protection. • Within span between pole legs no. 86 and 87 implementing of additional technical measure for the reduction of value of electromagnetic field is needed. The lower conductors on the towers with head shape »Danube« are shifted: lower/internal suspension is shifted 0,5 m towards tower body and lower/external suspension is shifted 2 m towards tower body.

6 MONITORING THE STATE OF THE ENVIRONMENT DURING CONSTRUCTION AND OPERATION OF TRANSMISSION LINE

FLORA, FAUNA AND HABITAT TYPES: Construction works and forest clearance must be monitored and therefore insured that the extent of degradation and forest cuts is minimised. Forest clearing must follow the guidelines of Slovenia Forest Service (ZGS).
In operation phase the presence of invasive alien species in the line corridor must be inspected. If the invasive species occupy more than 35% of each habitat type, they should be removed. Inspection must be done 5 years after the project implementation.

FAUNA: During the construction phase, monitoring wetland habitat preservation must be ensured, especially in the area of transmission towers. The type and quantity of dead biomass, deliberately left in an area should also be examined.
In the operation phase, the suitability of replacement habitats must be monitored in terms of bird surveys. In case of bush encroachment in the meadows, mowing frequency will be adjusted. Monitoring of saproxylic beetles, living in dead wood is also needed. It is required on a yearly basis for 5 years after the project implementation.

CULTURAL HERITAGE: During construction phase, permanent archaeological supervision over earthworks must be ensured. Monitoring after the final registration of the cultural heritage condition will no longer be needed.

ELECTROMAGNETIC RADIATION: No monitoring is needed during the construction phase.
According to specifications of the Ordinance on electromagnetic radiation in the natural and living environment (Official Gazette of RS, no. 70/1996), the investor should assure the first measurements of the electromagnetic radiation.

NOISE: No monitoring is needed during construction phase. According to specifications of the Ordinance on limit values for noise indicators in the environment (Official Gazette of RS no. 105/2005, 34/2008, 109/2009) and Regulatory on the first assessment and operational monitoring for noise sources and on terms for its implementation (Official Gazette of the RS no. 105/2008), the Owner or the Operator should assure the first measurements of noise and afterwards continue with periodical operational monitoring.

7 FURTHER STEPS OF THE PROJECT

When Governmental Decree on Detailed plan of national importance for 2 × 400 kV Cirkovce – Pince is adopted, activities related to land acquisition begin.

Then, the building permit, which represents the base for construction and assembly work, is issued by the Ministry. When construction is finished, damage caused by construction is validated and appropriate compensations are paid.

Operational and functional traits are tested next and initial measurements are performed.

Finally, based on project and other technical documentation, operating permit is acquired and the project is listed in the Cadastre of public infrastructure.

8 FURTHER INFORMATION

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