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*** This designation is without prejudice to positions on status and is in line with UNSCR 1244/199 and the ICJ opinion on the Kosovo declaration of independence.**

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North Macedonia, Strengthening the Transmission Network in the South-east Region of North Macedonia - Component 1

ESIA Scoping Report

January 2022

HILL INTERNATIONAL
IPF 7 CONSORTIUM

The Western Balkans Investment Framework (WBIF) is a financing facility launched in December 2009 by the European Commission, together with the Council of Europe Development Bank (CEB), the European Bank for Reconstruction and Development (EBRD), the European Investment Bank (EIB), Bilateral Donors, and Western Balkans countries with the purpose to deliver funding for strategic investment projects in beneficiary countries. Eligible sectors include infrastructure development in the environment, energy, transport, social and digital sectors as well as private sector development. KfW and the World Bank subsequently joined the Framework. In July 2017, the KfW became a partner organisation.

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Checked By	Sinisha Stanchevski / Božidar Radović	Sinisha Stanchevski / Božidar Radović	Sinisha Stanchevski / Božidar Radović	
Approved By				

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Abbreviations

Abbreviation	Meaning
CH	Critical Habitat
CORINE LC or CLC	COoRdinate INformation on the Environment (land data base), provided by European Environmental Agency
EVP	Electric Traction Plant (in Macedonian '*Електровлечно построение*')
DLR	Dynamic Line Rate
E&S	Environmental and Social
EBRD	European Bank for Reconstruction and Development
EIB	European Investment Bank
EIA	Environmental Impact Assessment
EMF	Electric and Magnetic Fields
EN	European Standard(s) (European Norm(s))
ESP	Environmental and Social Policy of the European Bank for Reconstruction and Development
ENTSO – E	European Network Transmission System Operators – Electricity
ESIA	Environmental and Social Impact Assessment
EU	European Union
FS	Feasibility Study
HDV	Heavy Duty Vehicles
IBA	Important Bird Area
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IFI	International Financing Institution
IPA	Important Plant Area
IPF7	Infrastructure Project Facility, Technical Assistance 7
LSG	Local Self-Government Units
MEPP	(Macedonian) Ministry for Environment and Physical Planning
MEPSO	Transmission System Operator of North Macedonia
MKS	Macedonian Standard(s)
MN	Monument of Nature
NPV	Net Present Value
OG	Official Gazette
OHL	Overhead Line
PBF	Priority Biodiversity Features

PM10 / PM2.5	Particulate Matter (Suspended Particles)
Ref.	Reference
RES	Renewable Energy Sources
SEP	Stakeholder Engagement Plan
SEW	Social Economic Welfare
SS	Substation
TSO	Transmission System Operator
WB	Western Balkans
WBIF	Western Balkans Investment framework
WHO	World Health Organization

Executive Summary

Objective of the Proposed Project

The main objective of this project is the strengthening the transmission network in the Southeast Region of North Macedonia ('Project'). The Project consists of the following two components:

- Design, construction and operation of a new 400/110 kV substation Valandovo in the area of the village Miletkovo. This new substation will be connected with the existing 110 kV transmission network in the Project region and with the existing 400 kV transmission line Dubrovo – Thessalonica (GR), by in-out connection (Component 1 or Sub-project 1).
- Reconstruction of the existing 110 kV transmission line SS Valandovo – SS Strumica 2 – SS Strumica 1 by upgrading its transmission capacity and partial cabling in the urban zones of Strumica (Component 2 or Sub-project 2).

Project Developer

The project developer is the Macedonian Transmission System Operator (MEPSO). MEPSO is a Joint Stock company fully state-owned, established in 2005 after the transformation of the Electric Power Company of Macedonia ('Elektro-stopanstvo na Makedonija'). The core activity of MEPSO is a reliable electricity transmission via the national high voltage network, electric power system control and regular and duly electricity flow to its clients such as the large industrial consumers, and to the low voltage grid of the Macedonian electricity distribution system operator (EVN Macedonia). To perform its activity MEPSO has been granted the following relevant licenses from the national Energy Regulatory Commission:

- A license of doing the energy business and activity in terms of electricity transmission and activity transmission system control.
- A license of doing power business and activity, organization and electricity market control.

Need for the Proposed Project

In order to meet the goals of the European Union for the integration of energy from Renewable Energy Sources (RES), North Macedonia makes efforts to maximize the integration of these energy sources into the national power system. Due to the favourable climate conditions, the investments in the RES (wind power, solar power and hydropower) are most cost-effective in the south-eastern region of North Macedonia. Therefore, it is expected that the most significant investments in utilization of RES are/will be located mostly in this region (Figure below).

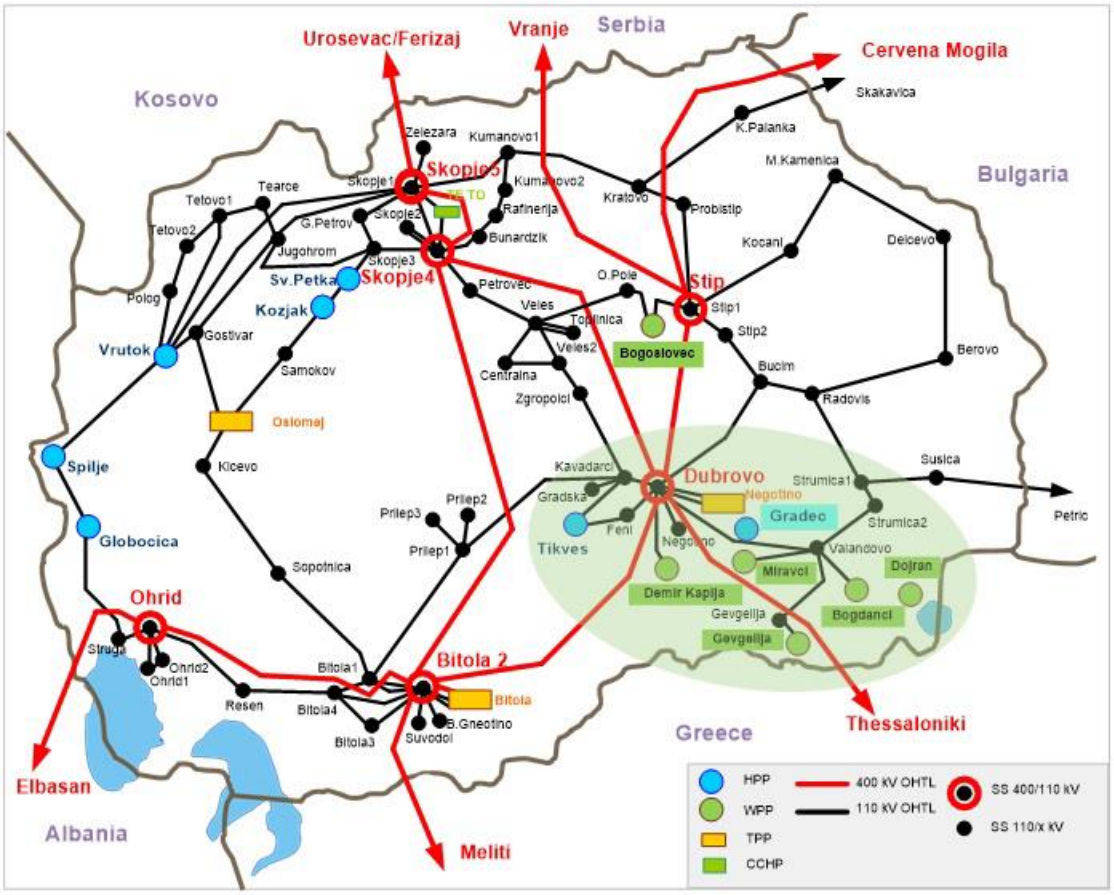


Figure 0.1: Macedonian grid and project area mid-term topology

Source: MEPSO

MEPSO already faces several requests for new connections of RES in the local transmission grid in the wider Project region. Newly installed capacities of RES – wind power plants (WPP), big and small hydro power plants (HPP) as well as solar power plants (SPP) - up to 350 MW, are expected in a mid-term horizon in this region. In addition, new WPP - 536 MW, HPP - 185 MW SPP - 250 MW are foreseen until year 2040, in a long-term horizon.

Transmission grid in the southeast region of Macedonia (110 kV transmission line Dubrovo – Valandovo – Strumica 2 – Strumica 1, approx 57.5 km long line) is approaching the end of the lifecycle and lacks capacity for connection of new renewable electricity sources to the network. As such, it is a candidate for reconstruction due to ageing process. In addition, in the midterm forecasted regimes, there are contingency cases with a higher risk to the security of supply.

Therefore, the main objective of the Project is to provide:

- Increased security of supply, and
- Secure and reliable integration of planned RES in the southeast region of the country, which consequently contribute towards reduction in CO_2 emissions.

In addition, the Project will contribute towards increase of the efficiency and capacity of the transmission grid with smart grid solutions (Dynamic Line Rate (DLR) & asset management).

Purpose of the Report

This document represents an Environmental and Social Impact Assessment (ESIA) Scoping Report for the aforementioned proposed sub-projects:

(1) Design, construction and operation of a new 400/110 kV substation (SS) Valandovo with connection to the existing 400 kV and 110 kV transmission network, and

(2) Reconstruction of the existing 110 kV overhead line (OHL) Valandovo – Strumica 2 – Strumica 1.

The Report has been prepared as part of the ESIA process in accordance with international requirements for project environmental and social scoping which is required by the potential Project lender – the European Bank for Reconstruction and Development (EBRD).

This Report is based on the emerging Technical Assessment (Conceptual Solution) for the proposed transmission development. The Project is to be developed further through reference design stages (i.e. preliminary design and detailed design) which will form the basis for the detailed environmental and social appraisal and application to the Macedonian competent authority for consenting purposes as well as for Project appraisal by EBRD.

The principle purpose of this Scoping Report is therefore to:

- Provide a summarized description of the proposed sub-projects, including their location and technical capacity;
- Provide a summary of the options / alternatives considered to date and the outcome of the process for selection of the preferred option for further development;
- Set out the proposed scope of work and methods to be applied in carrying out the ESIA.

It should be noted that this Report is not intended to provide detailed information regarding the environmental and social appraisal of the Project. Instead it is a preliminary overview of the Project that can inform the process of early engagement with the key relevant stakeholders and to help identify potential impacts.

Both developments (sub-projects), i.e. the proposed 400/110 SS Valandovo and the reconstruction of the existing 110 OHL Valandovo-Strumica are elements of the wider initiative for strengthening the regional transmission network in southeast Macedonia to integrate the electricity generation from planned renewable sources. However, these elements are separate transmission infrastructures whose construction may be executed independently and both developments may operate with no direct technological and functional interdependency. Due to this fact, two separate environmental and social appraisals are proposed and will be completed as part of this development stage of the Project. Consequently, where deemed necessary, this Report makes clear distinction between the sub-projects.

Project Design Status and Level of Details

In this stage, the Project will be developed to a feasibility level - to a detail considered sufficient to establish that the proposed developments are technically feasible and to allow initial assessment of their environmental and social integrity and effects, i.e. to a level of Technical Assessment (Conceptual Solution) that corresponds to a Feasibility Study. Therefore, the level of detail of the present ESIA will be compliant with that of the Project's Conceptual Solution whose content and scope

are not specifically regulated by the relevant Macedonian legislation[1]. As such, the Conceptual Solution is not considered as formalised design document and no administrative consenting process for its adoption by the competent authorities is required. According to the general practice, this Conceptual Solution (in Macedonian: 'Konceptualno reshenie') contains in particular data on: macro-location and general disposition of the facility / infrastructure; technical-technological conception of the facility / infrastructure; the manner of providing the supporting infrastructure; possible variants of spatial and technical solutions from the point of view of fitting into space; natural conditions; functionality and rationality of the project solution.' The Feasibility Stuidy and the Technical Assessment (Conceptual Solution) need to also comply with the respective EBRD requirements.

Further design, including precise location of towers and access roads will be undertaken once the more detailed technical design (Preliminary Design and Main Design) as required by the Macedonian relevant legislation are developed and prior to construction commencing. This change or refinement of the feasibility design (Conceptual Solution) will be within the limits of deviation defined as a 500 m wide corridor along the transmission lines where individual towers can be moved laterally or longitudinally and a 100 m buffer around proposed substation location. It is anticipated that the majority of the refinement of the current feasibility design will be within this corridor/buffer. Where technical details of the Project have still to be finalized, such as detailed construction methods, etc., standard practice assumptions will be made in the ESIA to allow potential impacts to be identified and appropriate mitigation formulated.

The Proposed Project

Project Location

The Project area is situated in Southeast Region of North Macedonia.

The Project as a whole crosses the territory of three Macedonian local self-government (LSG) units - the municipalities of Gevgelija, Strumica and Valandovo.

(1) New 400/110 kV SS Valandovo with connection to the existing 400 kV and 110 kV transmission network

The location of the proposed 400/110 kV SS Valandovo (is situated in the wider area of the settlement Miletkovo (at relative distance of approximately 1 km), in the municipality of Gevgelija, in immediate proximity to the A1 highway Skopje – Gevgelija (further to Thessalonica, Greece), at approx. 7.5 km from the existing 110/35/10 kV substation in Valandovo. There are no other existing structures or transmission or other infrastructure in proximity to the location of the new substation. This new substation would be connected with the existing 400 kV transmission network via 'in-out' connection with the existing 400 kV OHL from Dubrovo to Thessalonica (GR) which passes in the immediate proximity to the proposed substation location.

The new substation would be connected to the existing 110 kV transmission network by the following interventions:

[1] Law on Construction (Official Gazette of RM no. 130/09 and its amendments) and associated by-laws

- Reconstruction / upgrade of the existing 110 kV OHL from Valandovo to the existing 110/20 kV SS 'EVP'[2] Miletkovo utilizing the same route of the existing line and its extension to the new 400/110 kV SS Valandovo

  The alignment of this transmission line passes through the territory of two Macedonian LSGs: the municipalities of Valandovo and Gevgelija. The line has dominant west and west – southwest directions, passing through mainly agricultural land, as well as some shrubland and pastures. The alignment crosses the canalised river Anska Reka at two crossing points as well as the Vardar River. The nearest settlements along the line are the village Miletkovo, located at a relative distance of approx. 700 metres from the line as well as the villages Brajkovci, Balinci and Marvinci located at a relative distance of more than 1000 metres from the line. The line crosses several features of transport infrastructure in the Project region: two regional roads (R1105 and R1102), as well as the railway Skopje – Thessalonica (GR).

- Construction of a new 2x110 kV OHL from the new 400/110 kV SS Valandovo to the existing 110/20 kV SS 'EVP' Miletkovo

  The alignment of this transmission line is located within the territory of one Macedonian LSG: the municipality of Gevgelija. The alignment goes in general south-southwest towards the location of the new 400/110 kV substation Valandovo, in parallel with the extension of the 110 kV OHL SS Valandovo – SS 'EVP' Miletkovo, as described above.

(2) Reconstruction of the existing 110 kV OHL from Valandovo to Strumica (substations Strumica 2 and Strumica 1)

This existing transmission line passes through the territory of two Macedonian LSGs: the municipalities of Strumica and Valandovo. The line has dominant west and west – southwest directions, passing through mainly agricultural land, as well as some hilly forest and shrubland. In addition, mosaiced landscape, with dominating broadleaf forests with significant patches of shrubland, conifer plantations, orchards, abandoned fields, hilly pastures and pastures are found along the line. The alignment crosses several watercourses – Trkavalishte and Trkanja being most prominent. The nearest settlements along the OHL corridor are the villages Kosturino, Tri Vodi and Kuklish, all located at a relative distance of more than 500 metres. The line crossed the regional road R1401. On its way to SS Strumica 2, and further to SS Strumica 1, the line passes through sub-urban and urban zones of Strumica, in immediate vicinity or over residential and other properties

Project Elements

A brief overview of the key elements of the selected preferred Project option, subject to this ESIA Scoping Report, is provided below. The preferred Project option is Option 2, Alternative 2 (refer to next sub-section (Alternatives Considered and Selection of Preferred Option) for more details).

In wider context, the main elements of the Project and their inclusion in the environmental and social appraisal comprise the following components (sub-projects):

(1) Sub-project 1: New 400/110 kV SS Valandovo with connection to the existing 400 kV and 110 kV transmission network, including:

[2] EVP – Electric Traction Plant (in Macedonian '*Електровлечно построение*'). It is an electrical substation that converts the power to an appropriate voltage, current type and frequency to supply railway system(s) with traction current.

- A new 400/110 kV substation Valandovo, located in Miletkovo area (Gevgelija municipality), comprising of:
  - 400 kV Switchyard with a total of six bays of which one is a spare bay;
  - Two power transformers 400±8x1.25%/115/10.5kV, 300/300/70 MVA;
  - 110 kV Switchyard with a total of fifteen bays, of which eight are spare bays;
  - Control building, with approximate dimensions of 20 m x 40 m, and
  - Relay kiosks in 110 kV and 400 kV bays.

  The area required for construction of the substation is approximately 5 ha.
- The new 400/110 kV substation will be connected to the existing 400 kV and 110 kV transmission network via the following interventions:
  - In-out, approx. 0.5 km long, connection with the existing 400 kV line from SS Dubrovo to Thessalonica (GR)

    A typical 400 kV transmission line includes the following main technical elements:

    - Towers, designed as galvanised steel-lattice single circuit self-supporting towers with a horizontal configuration of conductors and two earth wires. The proposed in-out connection is designed with two steel-lattice angle (tension) towers with two conductors per phase, with a height range between 17 and 33 metres. The maximal footprint area for a tower is approximately up to 250 m^2. Each tower will have four legs and single reinforced concrete foundation per leg, i.e. four foundations for each tower.
    - Phase conductors, attached to the cross-arms at the towers by insulator strings. Characteristics of the conductors will be in compliance with national standards (MKS) and European standards (European Norms – EN).The insulators in the case of angle towers are attached in line with the conductors (tension strings).
    - Protective wires, strung in horizontal configuration above the top most conductors between the tower peaks for protection against lightning strikes.
  - Reconstruction / upgrade of the existing approx. 6.4 km long 2x110 kV transmission line from SS Valandovo to SS 'EVP' Miletkovo, by modification of the current double system line into three phase line with conductor 240/40 mm^2 on the existing route. Characteristics of the conductors will be in compliance with national standards (MKS) and European standards (European Norms – EN). Based on the further technical assessment - upcoming Project reference development stages (preliminary design and detailed design) - the reconstruction / upgrade will assess the need for possible rearrangements of the towers and their upgrade with appropriate elements to increase their height. Use of several new towers has to be foreseen to accommodate the changes imposed by the Project as a whole.
  - Construction of a new approx. 1.8 km long 2x110 kV OHL from the new 400/110 kV SS Valandovo to the existing SS 'EVP' Miletkovo, as a double-system line (2x110 kV) to provide reliable supply to the SS 'EVP' Miletkovo which is the main power supply of the railway transport system in the southeastern part of the country, comprising of the following main technical elements:
    - Towers, designed as galvanised steel-lattice single circuit self-supporting towers with four arms configuration of conductors and one earth wire at the

top of the towers. The number of towers and their type[3] as well as the proposed position of each individual tower within the proposed OHL corridor will be identified and confirmed during the upcoming Project reference development stages (preliminary design and detailed design) in line with the relevant Macedonian legislation.The typical tower height range is between 12 and 27 metres for the tension towers, and 12 to 30 metres for the suspension tower types. The maximal footprint area for a tower is approximately up to 100 m^2. Each tower will have four legs and single reinforced concrete foundation per leg, i.e. four foundations for each tower.

- Phase conductors, attached to the cross-arms at the towers by insulator strings, which, in the case of suspension towers, hang vertically below the cross-arms. Characteristics of the conductors will be in compliance with national standards (MKS) and European standards (European Norms – EN). At angle towers the conductors are again attached to the cross arms by insulators but in this case the insulators are in line with the conductors.
- Protective wires, strung in horizontal configuration above the top most conductors between the tower peaks for protection against lightning strikes.

(2) Sub-project 2: Reconstruction of the existing approx. 17.7 km long 110 kV OHL SS Valandovo - SS Strumica 2 – SS Strumica 1, including:

- Construction of a new 15.7 km long line from SS Valandovo to SS Strumica 2 by utilising the route of the existing one, comprising of the following main technical elements:
  - Towers, designed as galvanised steel-lattice single circuit self-supporting towers with three arms configuration of conductors and one earth wire at the top of the towers. The number of towers and their type would be equivalent as the number of towers of the existing 110 kV line: 6 tension and 42 suspension towers. They would be located at the same sites as the existing towers, as far as practicable. The typical tower height range is between 9 and 30 metres. The maximal footprint area for a tower is approximately up to 100 m^2. Each tower will have four legs and single reinforced concrete foundation per leg, i.e. four foundations for each tower.
  - Phase conductors, attached to the cross-arms at the towers by insulator strings, which, in the case of suspension towers, hang vertically below the cross-arms. Characteristics of the conductors will be in compliance with national standards (MKS) and European standards (European Norms – EN). At angle towers the conductors are again attached to the cross arms by insulators but in this case the insulators are in line with the conductors.
  - Protective wires, strung in horizontal configuration above the top most conductors between the tower peaks for protection against lightning strikes.
- Construction of a underground transmission cable in last section (approx. 500 metres) in front of SS Strumica 2 and between SS Strumica 2 an SS Strumica 1 (approx. 2.1 km), comprising of the following main technical elements:

[3] Depending on their position in the transmission line, the types of towers could be:
(i) Suspension towers,
(ii) Angle (tension) towers, used where the line changes direction or for special loading cases along the line,
(iii) Terminal towers, used when the line is connected to a substation.

- Transmission cable. The underground line will be designed with one conductor per phase. Characteristics of the conductor will be in compliance with national standards (MKS) and European standards (European Norms - EN). The cable system will be laid in a trench at a depth of 1.60 m, except at the sites of crossing of the cable with other underground installations (e.g. water supply or sewage network, communication infrastructure, etc.). In such cases, it is necessary to meet safety distances from these installations defined in the applicable technical regulations, but the minimum cable line depth must not be less than 1.5 metres. Therefore, at intersection points the cable line can be laid at a greater depth to meet the technical requirements.

Right of Way

The relevant Macedonian legislation[4] requires establishment of a protection zone (safety zone) or Right of Way (RoW) along the path of a transmission line and in proximity to a substation. This zone is prescribed by MEPSO's Grid Code[5], according to which – 'the safety zone is the area and the space, below, above and along the existing electric power transmission facilities, necessary for their spatial planning, protection and maintenance, in which the right of ownership is restricted or the possibility for performing construction actions and other activities without consent granted by MEPSO is limited'.

For an operational transmission line, the protection zone is prescribed by MEPSO's Grid Code and is determined by the voltage of the line:

- 15 m from the axis of an operational overhead line with nominal voltage of 400 kV (or 30 metres wide safety corridor (zone) along the path of the line).
- 10 m from the axis of an operational overhead line with nominal voltage of 110 kV (or 20 metres wide safety corridor (zone) along the path of the line).
- 1.5 m from the axis of an operational cable transmission line with nominal voltage of 110 kV (or 3 metres wide safety corridor (zone) along the path of the line).

For an operational substation with a nominal voltage of 400 kV and 110 kV, the required safety distance is 5 metres from the outer edge of the substation's fence or wall.

The regulation's objective is to facilitate the uninterrupted functioning of the power grid, to ensure safe operations, to meet the requirements of the sanitary and safety norms, and to prevent accidents. Within this protection zone buildings and facilities must not be constructed and certain activities are restricted to ensure the safe operation of the lines and for the safety of people. These mainly include agriculture activities within the RoW which include cultivated plants or trees which reach height that may pose safety operational risk for the line[6], or agricultural practices that use spraying equipment as well as fixed or mobile irrigation equipment.

It is also necessary to remove trees and vegetation from within the right of way for the safe operation of the transmission line. Therefore, in areas of forestry and woodland, clearance on either

[4] Rulebook for Construction of Overhead Lines with rated Voltage from 1 kV to 400 kV (Official Gazette of RM no.25, from 1.2.2019)

[5] MEPSO Grid Code (2021) [Ref.7]

[6] According to the applicable regulation, the minimum vertical clearance for an operational transmission line in regard vegetation, trees, etc. is set to 3.0 metres.

side of the transmission line within the safety zone is required according to the rules defined by the relevant Macedonian legislation[7].

Alternatives Considered and Selection of Preferred Option

No Project Option

The 'No Project' option ('Do Nothing') is an alternative involving no development of the proposed Project.

One of the main strategic pillars identified in the Macedonian Strategy for Energy Development until 2040 [Ref.12] (the Strategy) is achieving high level of integration of the national energy system with the international energy markets. In addition, the Strategy foresees a goal for decarbonisation of the Macedonian energy system, which is to be achieved by a number of strategic goals, including reduction of the greenhouse gas emissions associated with the energy production and increasing the penetration of the renewable energy sources in the overall energy consumption, in a sustainable manner.

The integration with the international markets is foreseen to be achieved by continuous investments in the transmission and distribution network in order to [Ref.12]:

- greater integration of renewable energy sources or electricity production, especially from wind and solar sources,
- enabling the producer-consumer mechanism ("prosumer"),
- greater penetration of electric vehicles, and
- satisfying the increased demand for electricity in the region.

According to the Strategy, the biggest challenge for achieving these goals, including the foreseen increased penetration of the of renewable energy sources, from the perspective of the national transmission system, will be the strengthening of the existing 110 kV voltage level grid by reconstruction/replacement of 110 kV transmission lines in particular regions. Given the long-term investment plan of MEPSO until 2040, 'the system needs an investment of 163 million. EUR, of which 87 mil. EUR for a new network and 76 mil. EUR for network revitalization. The largest investments in revitalization of ~ 70% are expected to be in the period 2025-2040, while ~ 98% of investments in a new transmission network should be made by 2030, based on the lowest costs.' [Ref.12].

Therefore, this Project for strengthening the transmission network in Southeast Region of Macedonia is seen as an important step towards fulfilment of the Strategy goals for integration of energy from renewable sources into the national power system, since the most significant investments in this regard are (will be) located mostly in this region of the country (see Figure 1.1, Section 1). Beside the key benefit from the Project – to secure reliable integration of the planned renewable sources in the southeast region of the country, which consequently contributes towards reduction in CO_2 emissions, the Project will increase the security of supply and will contribute towards increase of the efficiency and capacity of the transmission grid with smart grid solutions.

[7] Rulebook for Construction of Overhead Lines with rated Voltage from 1 kV to 400 kV (Official Gazette of RM no.25, from 1.2.2019)

In terms of fulfillment of the above Macedonian strategic goals, the 'No Project' option has no positive argument in its favour, because if the proposed Project is not build, then it would cause a serious problem in the planned national energy sector development and the regional integration of the Macedonian electricity system. Such scenario would also result in serious obstacle in regard to the country's efforts to meet the goals of the European Union for the integration of energy from renewable sources into the national power system.

'No Project' option does not involve capital investment costs. However, maintenance costs are higher than for lines within the expected life span because the equipment would become obsolete with an expired useful life. Consequently, the 'No Project' option will directly contribute to higher operational costs of the existing out-of-date transmission infrastructure in the Project region, as well as to higher technical losses. It will also decrease security and reliability of the power supply in the Project region.

In a wider context, the 'No Project' option would limit overall economic development and possibilities for the improvement in the social welfare of the citizens in the Project region and wider context – at country level.

Project Options

Based on the transmission network topologies defined in the Project-related studies, three Project options have been identified (including alternative corridors for each option) (Figure below), in order to make a clearer distinction between different network configurations. They are all built based on the network topology, representing the basic development of the local transmission networks for three referenced years - 2025, 2030 and 2040.

The key technical elements of the identified options are as follows:

(1) Project Option 1 - Double Circuit 110 kV OHL Dubrovo – Valandovo, which includes the following main components:
   a. Construction of a new double circuit 110 kV OHL between Valandovo and Dubrovo
   b. New 400/110 kV power transformer in the 400/110 kV SS Dubrovo, with respective 110 kV and 400 kV bays
   c. Reconstruction of the existing 110 kV OHL Valandovo – Strumica 2 – Strumica 1

(2) Project Option 2 - New 400/110 kV SS Valandovo and lead in-out of existing 400 kV OHL Dubrovo – Thessalonica (GR), which includes the following main components:
   a. Construction of a new 400/110 kV SS Valandovo
   b. Connection of the existing 400 kV OHL Dubrovo – Thessalonica (GR) into the new SS Valandovo
   c. Reconstruction of the existing 110 kV OHL Valandovo – Strumica 2 – Strumica 1

(3) Project Option 3 – New 400/110 kV SS Valandovo with interconnection (new 400 kV OHL Dubrovo – Valandovo – Thessalonica (GR)), which includes the following main components:
   a. Construction of a new 400/110 kV SS Valandovo
   b. Construction of a new 400 kV OHL Dubrovo – Valandovo – Thessalonica (GR)
   c. Reconstruction of existing 110 kV OHLs Valandovo – Strumica 2 – Strumica 1

The Project element – Reconstruction of the existing 110 kV OHL Valandovo – Strumica (Subproject 2) - is included in each of the identified Project options. The reconstructed line will replace the existing one by utilising the same route and any particular sensitivity on the existing route can

be mitigated as described in this Report. The existing line will be decomissioned. Wherever possible, the design principles to keep the same number of towers as of the existing line and to use locations of the existing towers for the new towers would be applied. Therefore, no alternatives on Project level have been considered for this Project element. As such, this element was not a comparative factor for the decision-making process for selection of the preferred Project option and was not taken into the comparative analysis of the identified Project options.

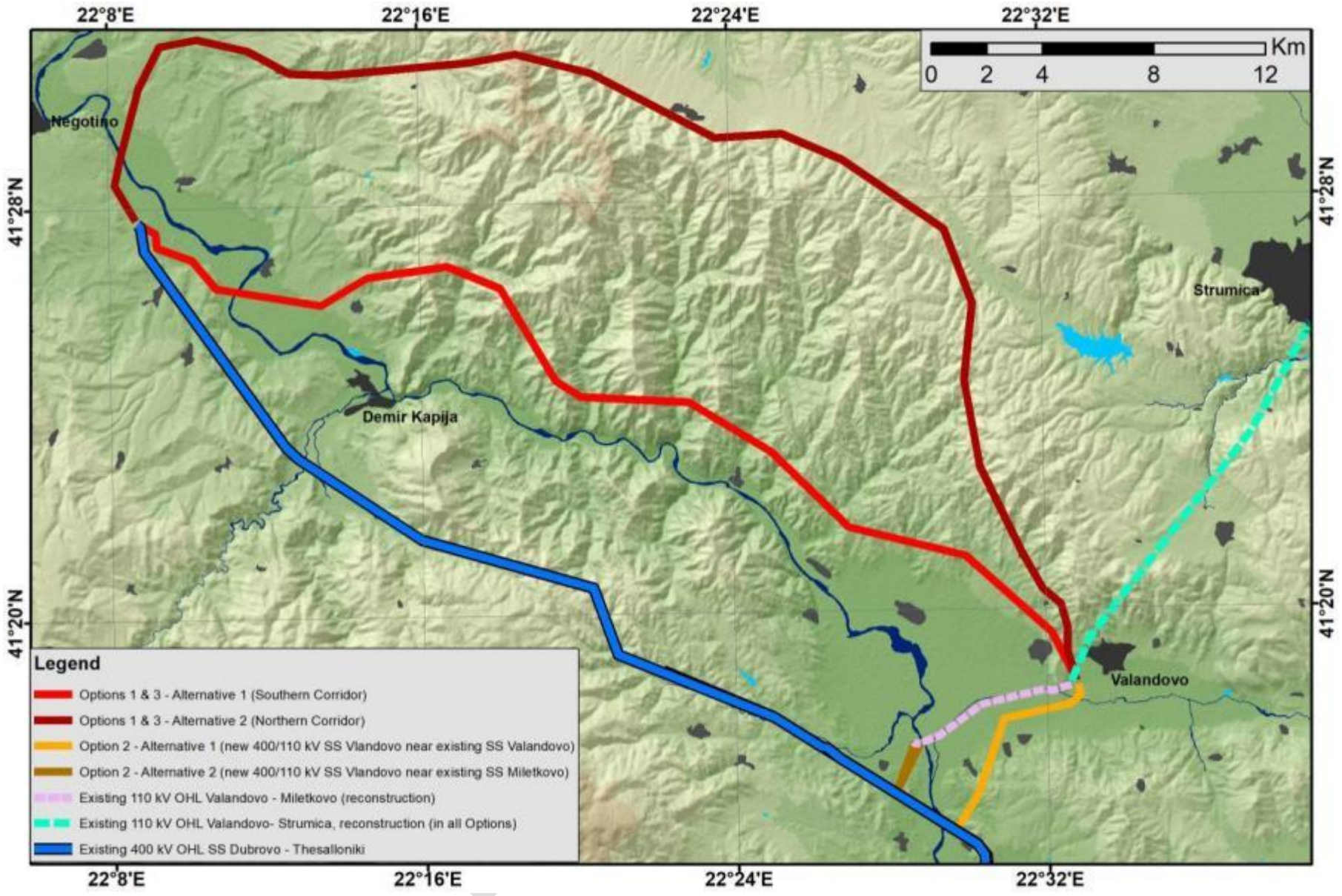


Figure 0.2: Project options and alternatives within Project options

Description of the Options

(1) Project Option 1 – Double-circuit 110 kV OHL Dubrovo – Valandovo (Figure below)

Due to the high-level environmental constraints identified in the Project region (see Annex 2), two routing alternative corridors of the 2x110 kV OHL alignment were identified and assessed for this Project option (Figure below):

- Alternative 1 – Southern Corridor. This corridor is generally routed in parallel with the existing 110 kV OHL Dubrovo- Valandovo, at relative distance of approx. 500 m from its centerline, with one particular deviation aiming to minimise the crossing section with the proposed protected area Demir Kapija Gorge[8]. The corridor is with an approximate length 41 km.
- Alternative 2 – Northern Corridor. From its starting point – SS Dubrovo – for approx. 9 km, this alternative corridor is routed in parallel with the 400 kV OHL SS Dubrovo – SS Stip at relative distance of approx. 500 m. From this point, the alignment turns to the east to hilly and mountainous terrain until it reaches the highest point of around 1,000 m a.s.l and then it descends towards the ending point – existing SS Valandovo. The corridor is with an approximate length of 55 km, 14 km longer than the Southern Corridor.

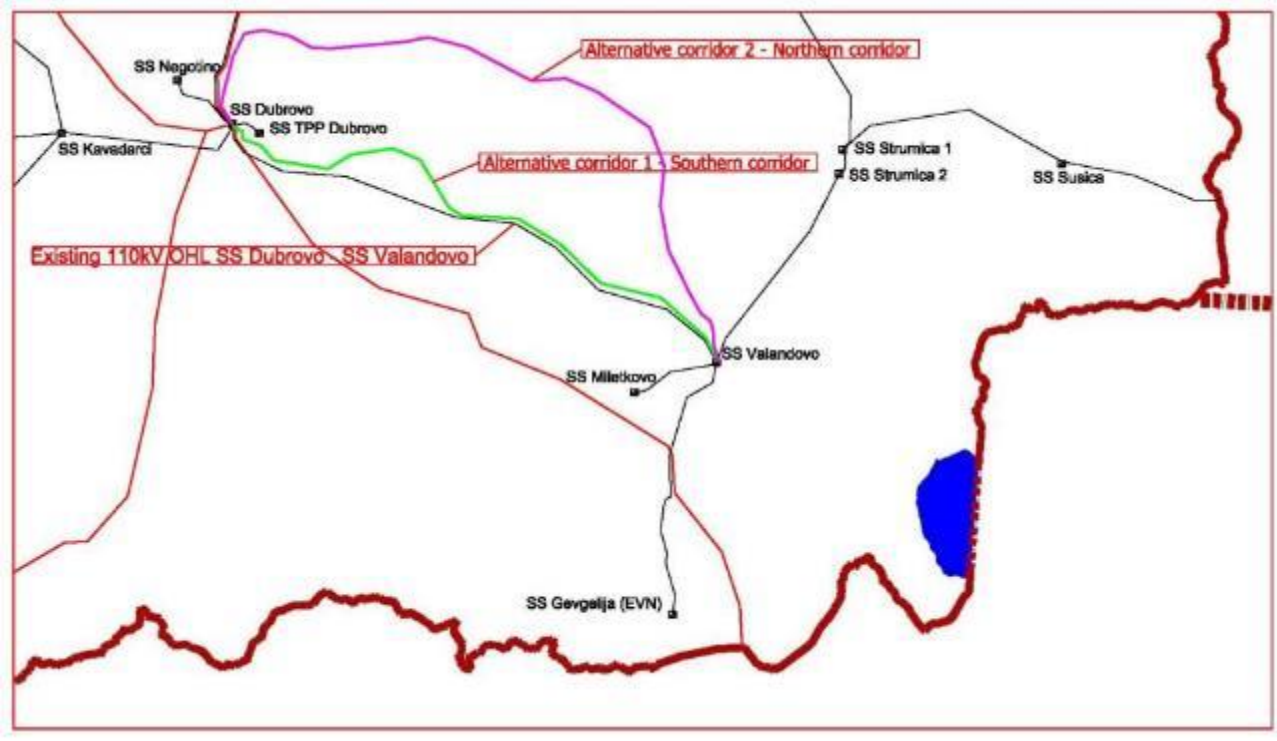


Figure 0.3: Project Option 1 – Double circuit 110 kV OHL Dubrovo – Valandovo, alternative corridors

Source: WB21-MKD-ENE-03 North Macedonia, Strengthening the Transmission Network in the Southeast Region of North Macedonia - Component 1; Selection of the preferred Option, September 2021 [Ref.4]

[8] The site proposed for protection - Demir Kapija Gorge (Demirkapiska Klisura) geographically includes the existing Monuments of Nature Demir Kapija and Iberliska Reka, as well as several other sites recognised for future protection: Klisurska Reka, Bela Voda cave, Goren Zmejovec cave, Krastovec, Shtuder and Mala Javorica.

This option also includes extension of the SS Dubrovo and SS Valandovo to accommodate the proposed new 2x110 kV line. In SS Dubrovo a new power transformer with respective new bays would be required. An extension of the existing SS Valandovo with new bays would be required to accommodate the connection with new renewable energy sources planned in the Project region.

(2) Project Option 2 - New 400/110 kV SS Valandovo and lead in-out of existing 400 kV OHL Dubrovo – Thessalonica (GR) (Figure below)

This option includes two alternatives of the location of the proposed new 400/110 kV substation, resulting in different layout of the OHL connectors:

- Alternative 1 – Location 1 - adjacent to existing 110/35/10 kV SS Valandovo

The alternative location 1 for the proposed 400/110 kV substation, located on the territory of the municipality of Valandovo, is adjacent to the existing SS Valandovo. The new substation would include construction of 400 kV and 110 kV switchyards with necessary bays and equipment to support the foreseen operation of the facility. This alternative also includes a new approx. 7.8 km long 400 kV line - in-out connection of the proposed substation with the existing 400 kV OHL Dubrovo – Thessalonica (GR). From its starting point - the new SS 400/110 kV Valandovo – the corridor of these lines is routed in the south – southwest direction, avoiding the settlements in the area (villages Brajkovci, Balinci and Marvinci) and connecting to the existing 400 kV OHL in proximity to the village Grchiste.

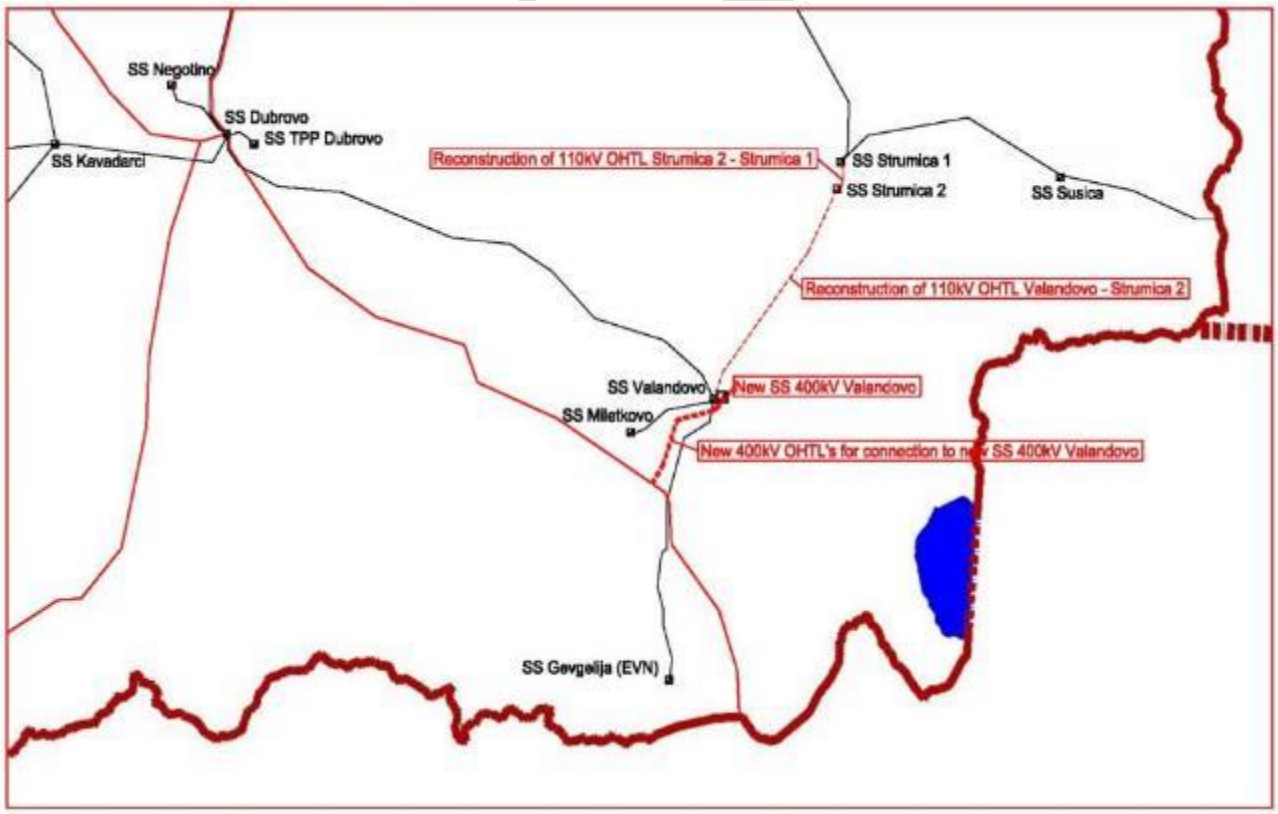


Figure 0.4: Project Option 2 – New 400/110 kV SS Valandovo and lead in-out of existing 400 kV OHL Dubrovo – Thessalonica (GR), Alternative 1

Source: WB21-MKD-ENE-03 North Macedonia, Strengthening the Transmission Network in the Southeast Region of North Macedonia - Component 1; Selection of the preferred Option, September 2021 [Ref.4]

- Alternative 2 – Location 2 - in vicinity to existing 110/25 kV SS 'EVP' Miletkovo in proximity of the A1 highway

The alternative location 2 of the proposed 400/110 kV substation, located on the territory of the municipality of Gevgelija, is in the vicinity of the 110/25 kV SS 'EVP' Miletkovo, right next to the A1 highway Demir Kapija Smokvica, at around 7.5 km from the existing SS Valandovo. The existing 400 kV OHL Dubrovo – Thessalonica (GR), would be connected to the new substation via approx. 0.5 km long in-out connector.

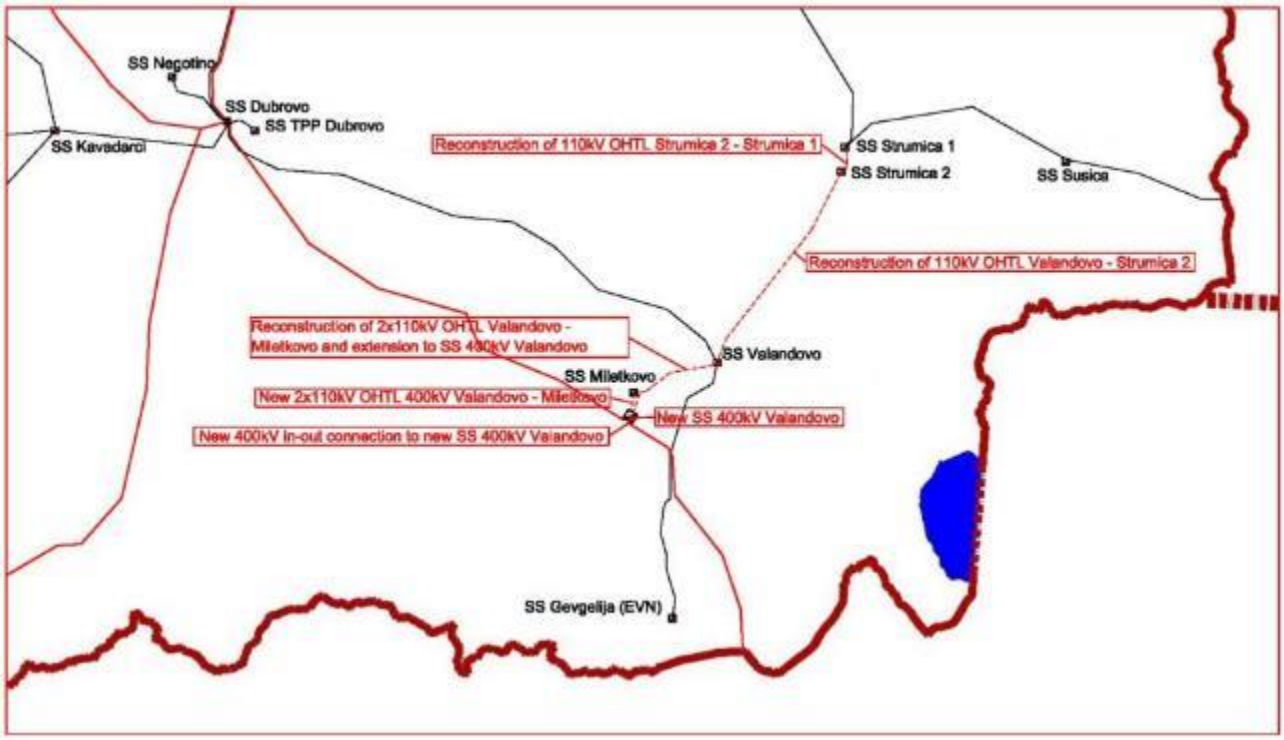


Figure 0.5: Project Option 2 – New 400/110 kV SS Valandovo and lead in-out of existing 400 kV OHL Dubrovo – Thessalonica (GR), Alternative 2

Source: WB21-MKD-ENE-03 North Macedonia, Strengthening the Transmission Network in the Southeast Region of North Macedonia - Component 1; Selection of the preferred Option, September 2021 [Ref.4]

The following interventions to provide connection of the new substation with the existing 110 kV transmission network in the Project region are constituent elements of this alternative:

- Reconstruction/upgrade of existing approx. 6.4 km long double-circuit 110 kV OHL from Valandovo to Miletkovo and extension to the new 400/110 kV SS Valandovo. This intervention would include new phase conductors with larger cross-section as well as possible rearrangements of the towers, upgrading the towers with appropriate elements to increase their height and use of a several new towers, where necessary.
- Construction of new double-circuit 110 kV from the new SS Valandovo to existing 'EVP' SS Miletkovo, from a point in proximity to the SS 'EVP' Miletkovo to the new 400/110 kV substation with an approximate length of 1.8 km, in order to complete the connection of new substation with the existing SS Valandovo.

(3) Project Option 3 – New 400/110 kV SS Valandovo with interconnection (new 400 kV OHL Dubrovo – Valandovo – Thessalonica (GR)) (Figure below)

This option includes construction of a new 400/110 kV SS Valandovo adjacent to the existing SS Valandovo, same as the respective element of the Project Option 2, Alternative 1 as previously described. In addition, it foresees construction of a new single-circuit 400 kV OHL Dubrovo – Valandovo – MK/GR border (further to Thessalonica (GR), composed of two separate sections:

(1) Section SS Dubrovo - SS Valandovo

Two alternative corridors were identified in this section. These are identical in geographic context to the OHL routing alternatives identified and assessed in the scope of the Project Option 1 Alternative 1 – Southern Corridor (approx. 41 km long corridor) and Alternative 2 – Northern Corridor (approx. 55 km long corridor).

(2) Section SS Valandovo - MK/GR border

This section would be approx. 24 km long, with the first segment of approx. 8 km to be built along the same alignment as described in Project Option 2, Alternative 1. The remaining 16 km would be built in parallel with the existing 400 kV OHL SS Dubrovo - MK/GR border.

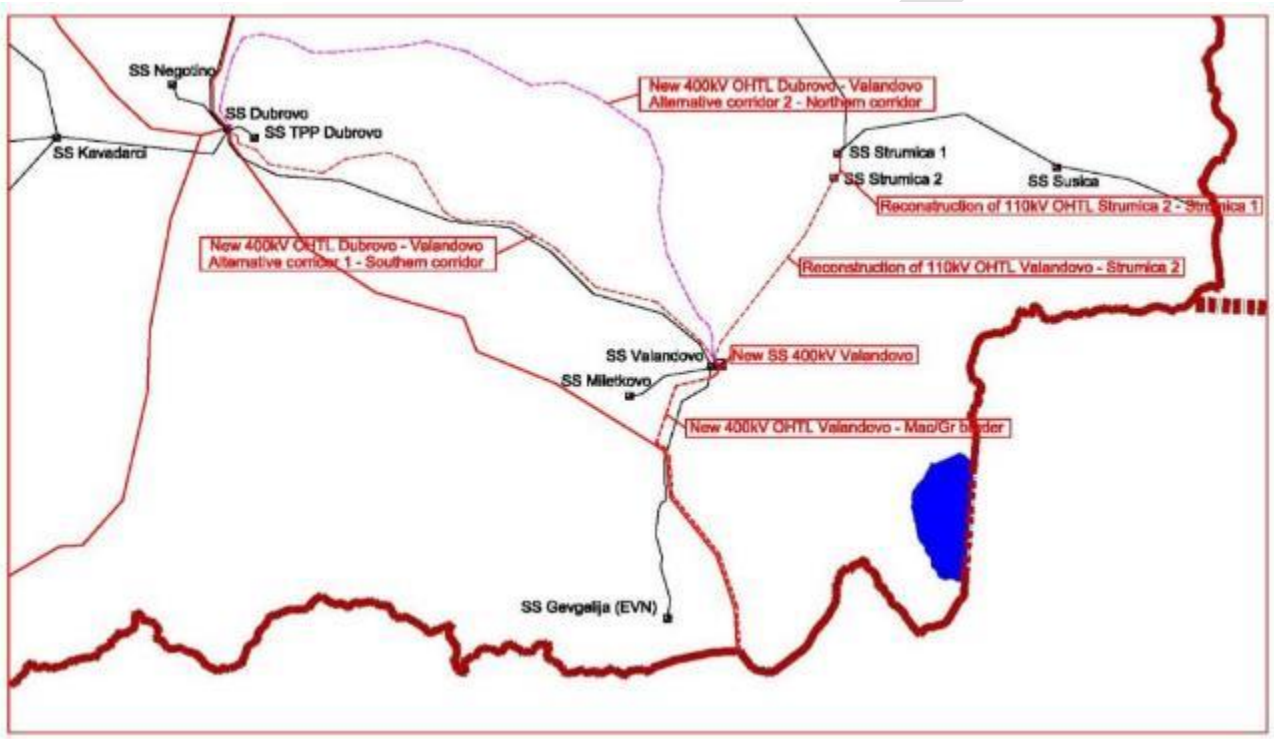


Figure 0.6: Project Option 3 – New 400/110 kV SS Valandovo with 400 kV interconnection (Dubrovo – Valandovo – Thessalonica (GR)), alternative corridors

Source: WB21-MKD-ENE-03 North Macedonia, Strengthening the Transmission Network in the Southeast Region of North Macedonia - Component 1; Selection of the preferred Option, September 2021 [Ref.4]

Evaluation of Options - Multi-Criteria Analysis

The Multi-Criteria Analysis procedure requires (i) the establishment of the set of criteria that should measure each option's / alternative's performance against the objectives, and (ii) the assessment of the options / alternatives. The assessment has included the following steps:

- Definition of the criteria "weights", in order to reflect and illustrate their relative importance;
- Scoring of each option against the criteria;
- Combination of weights and scores to calculate each option's overall score;
- Ranking the options according to their scores.

Three main criteria categories have been defined for the Project (Table below): (i) network and market based criteria, with two sub-categories – non monetised benefits and monetised benefits

and costs; (ii) engineering or technical criteria, and (iii) environmental and social criteria, with two sub-categories - environmental elements and social elements. Comparative assessment of these three categories and associated sub-categories has resulted in the category weights as presented in the Table below.

Each criteria category consists of different selected criteria, as documented in the respective report[9].

No.	Criteria category (group of indicators)	Weight (%)
	Network and market based	
1	Non-monetised benefit elements	20
2	Monetised benefit and cost elements	25
	Sub-total:	45
	Engineering / Technical	
3	Technical elements and location assessment	25
	Sub-total:	25
	Environmental and social	
4	Environmental elements	15
5	Social elements	15
	Sub-total:	30
	Total (1 to 5):	100

Table 0.1: Criteria categories for Multi-Criteria Analysis, with their weighting factors

Selection of Preferred Option

The selection process of the preferred Project option via the above MCA approach and methodology and based on the evaluation of each identified option and alternatives within the options against the selected criteria has indicated that preferred option would be the Option 2, Alternative 2 - New 400/110 kV SS Valandovo and lead in-out of existing 400 kV OHL Dubrovo – Thessalonica (GR).

The rationale behind this recommendation is as follows [Ref.4]:

- System studies and economic assessment

  According to the results of system studies, Option 2 is indicated as the best one from the reduction of energy curtailed from RES in the Project region, from the biggest losses reduction, and increase of additional capacity reserve.

  From economic assessment point of view, the Project brings sufficient monetised benefits to Macedonia and it is economically viable for the society and the national economy as a whole. The assessment has indicated the preferred option (Option 2, Alternative 2) is the most viable option / alternative from economic point of view.

- Technical assessment and E&S aspects

  From the technical as well as from the environmental and social perspective, the Option 2, Alternative 2 is superior in comparison to other identified Project options and respective alternatives, since:

[9] WB21-MKD-ENE-03 North Macedonia, Strengthening the Transmission Network in the Southeast Region of North Macedonia - Component 1; Selection of the preferred Option, September 2021 [Ref.4]

- It does not require construction of new long 110 kV or 400 kV overhead line and, therefore, it implies the least land-take needs and land cover / land use changes;
- It implies the least interventions (reconfiguration and extensions) in the existing transmission assets in the Project region and, therefore, the least impact on the existing operation of the power system;
- There are no settlements in proximity to the Project locations and no operational community safety risks (e.g. public exposure to electro-magnetic radiation or nuisance due to corona noise) are likely to occur;
- It implies the least potential impact magnitude to sensitive habitats in the Project region;
- It does not interact with any legally protected area or internationally recognised area in the Project region;
- It implies the least potential impact magnitude on agricultural land and, therefore, will likely result in the least compensation arrangements;
- There are no cultural heritages sites and resources in proximity to the Project locations.

The preferred Project option consists of the following components:

- Construction of a new 400/110 kV SS Valandovo, located in Miletkovo area (Gevgelija municipality), with its connection to the existing 400 kV and 110 kV transmission network (Sub-project 1) via the following interventions:
  - In-out, approx. 0.5 km long, connection with the existing 400 kV line from SS Dubrovo to Thessalonica (GR)
  - Reconstruction / upgrade of the existing approx. 6.4 km long 2x110 kV transmission line from SS Valandovo to SS 'EVP' Miletkovo and its extension to the new 400/110 kV SS Valandovo.
  - Construction of a new approx. 1.8 km long 110 kV OHL connector with the existing SS 'EVP' Miletkovo
- Reconstruction of the existing approx. 17.7 km long 110 kV OHL Valandovo – Strumica (Sub-project 2).

Based on the subsequent review and consultative process with key relevant statutory stakeholders[10] held during the assessment of the project options and during the ESIA scoping phase (including relevant institutional stakeholders - line ministries and agencies and concerned municipalities) this proposal was accepted by MEPSO in their capacity as Project Beneficiary and EBRD in their capacity as lead IFI in October 2021 and it will be further elaborated during the on-going project activities (Conceptual Solution and accompanied ESIA).

The preferred Project option is shown in Annex 1.

Project Categorisation

Both components of the Project as a whole - Sub-project 1 & Sub-project 2 - have been screened against the key applicable legal requirements and international standards:

[10] For more details see: WB21-MKD-ENE-03 North Macedonia, Strengthening the Transmission Network in the Southeast Region of North Macedonia - Component 1; Stakeholder Engagement Plan, September 2021 [Ref.5]

- Macedonian legal EIA screening requirements (Decree on determining of projects and criteria upon which the need for an environmental impact assessment (EIA) is established (Official Gazette of RM no.74/05, 109/09 & 164/12)); and
- The EBRD Environmental and Social Policy (2019) (Appendix 2: A list of Category A projects);
- The EU EIA requirements (EIA Directive, i.e. Annexes of the Directive which list the project that fall under its scope)

The following Table summarizes the results of the screening exercise against the relevant regulative requirements.

Project Component	Macedonian EIA regulations	EBRD ESP	EU EIA Directive
Sub-project 1	Annex II development Formalised EIA not mandatory / Formalised EIA may be required (case-by-case examination)	Category B development[11] (E&S Assessment report is required)	Annex II development EIA is not compulsory / EIA may be required (case-by-case examination)
Sub-project 2	Formalised EIA not mandatory / Formalised EIA may be required (case-by-case examination)	Category B development (E&S Assessment report is required)	Annex II development EIA is not compulsory / EIA may be required (case-by-case examination)

Table 0.2: Summary of the Project categorisation against the applicable standards

ESIA Scoping Summary

Different aspects of the Project are to be considered when assessing the impact of the proposed developments on the biophysical and societal environment. The Tables below show the main environmental and socio-economic aspects associated with construction and operation of the proposed transmission infrastructures that will be addressed in the subsequent ESIA. Each of these issues is further described in this Scoping Report.

Topic	Key issues / notes
Climate-related aspects	- Climate change assessment - key greenhouse gas emission sources during construction. Since the Project is in its initial development stage and relevant technical / design information for GHG calculation during construction stage of the Project is currently not available (e.g. number of towers, access roads, construction transport, etc.), the calculation of GHG emissions is scoped out from the present ESIA. - Climate resilience assessment – adaptation of the Project to extreme weather events by measures incorporated into the Project design.
Air Quality	- During construction - change of air quality due to fugitive dust (movement of vehicles; preparatory works; earthworks; construction of access roads, and substation and towers; surfacing works) and vehicle exhaust emissions. These are anticipated as not significant and, therefore scoped out from the present ESIA - During operation - not anticipated as significant and, therefore, scoped out from the present ESIA
Geology and soils	- During construction - disturbance of geological deposits due to construction of the Project; risks to the soils (loss of deposits; erosion; pollution risk)

[11] The new 400 kV OHL, considered as high-voltage line according to the EBRD ESP, is very short (approx. 500 metres) and no major environmental and social sensitivities will occur. Therefore, Category A criteria according to EBRD ESP is not triggered.

Topic	Key issues / notes
	- During operation - not anticipated as significant significant since the Project area is not susceptible to geological hazards (e.g. erosion, landslides, etc.) and, therefore, scoped out from the present ESIA
Water Environment	- During construction - risk to water environment (excavation, pollution risk, physical modification) - During the operation - pollution risk at substation (accidental spillage of transformer oils)
Noise and vibration	- During construction - noise and/or vibration from site clearance, earthworks, construction of access roads, and substation and towers, attachment of conductors as well as the related construction traffic - During operation – operational noise due to "corona discharge"
Land use / land conversion	- During construction - land use change, habitat loss, loss of agricultural land due to temporarily and permanent land take
	- During operation - land use restriction to ensure public safety and safe operation of the Project
Biodiversity and natural heritage	- During construction - impacts to biodiversity receptors (loss of habitats, flora and fauna, disturbance of species, risk of forest fires, pollution risk) - During operation – habitat conversion and fragmentation, potential risk to avian fauna (collision risk and electrocution of birds), pollution risk
Landscape	- During construction - temporary physical and visual change to the landscape of negligible significance and, therefore, scoped out from the present ESIA - During operation - changes in visual aspects for Project elements which include construction of new structures - not anticipated as significant and, therefore, scoped out from the present ESIA
Waste	- During construction - waste generation - During operation - not anticipated as significant since waste generation is expected to be very small during operational maintenance of the Project and no hazardous wastes (e.g. PCBs) will be generated during operational life of the Project. Therefore, this is scoped out from the present ESIA.
Socio-economic aspects	During Project life: - Positive impacts (improvement of the national / regional power system, employment opportunities during construction, local economy and supply chain opportunities during construction)
Community health and safety	- Construction traffic - Health and safety and security of people / local communities during operation of the Project
Land acquisition and livelihood	- Temporary or permanent acquisition of private assets - involuntary economic resettlement, as well as land-take (arable agricultural land)

Labour and Working conditions	- Impact to workers (labour standards and working conditions, including occupational health and safety)
	- Workers occupational hazards during construction, maintenance, and operation activities occur (e.g.):
	  - working at height
	  - electrocution hazard
	  - contact with live power lines

Cultural heritage	During construction - risk of partial or total removal of unknown heritage assets (undiscovered archaeological sites)
Cumulative effects	Main cumulative impacts - inter-project effects - the effects of a series of other developments of similar type and scale in the vicinity of the Project and effect interaction in the Project itself.
Transboundary effects	Project has no cross-border context and no transboundary impacts shall occur during the Project life and, therefore, scoped out from the present ESIA

Table 0.3: Summary of ESIA scoping

1. Introduction

1.1 Background and Project Objective

In order to meet the goals of the European Union for the integration of energy from Renewable Energy Sources (RES), North Macedonia makes efforts to maximize the integration of these energy sources into the national power system. Due to the favourable climate conditions, the investments in the RES (wind power, solar power and hydropower) are most cost-effective in the south-eastern region of North Macedonia. Therefore, it is expected that the most significant investments in utilization of RES are/will be located mostly in this region (Figure below).

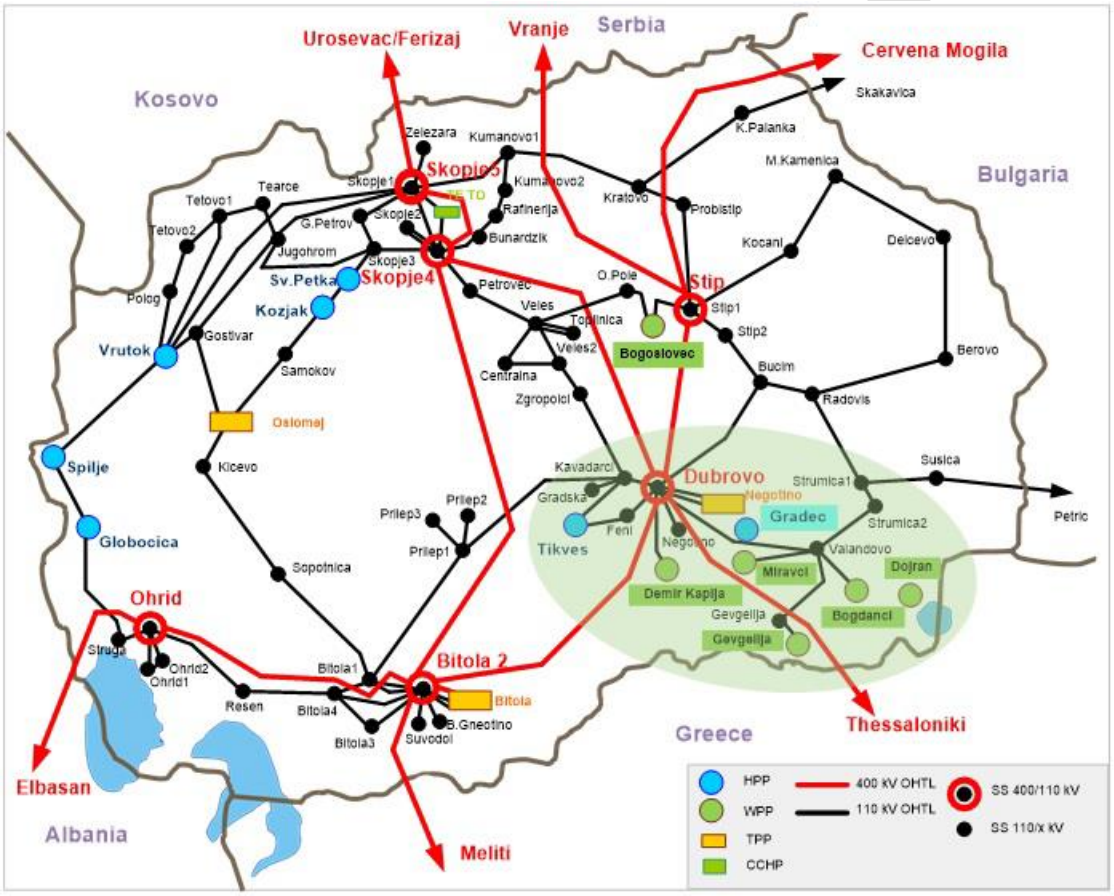


Figure 1.1: Macedonian grid and project area mid-term topology

Source: Macedonian Transmission System Operator

Note: The Project region is depicted in green pattern

The Macedonian Transmission System Operator (MEPSO) already faces several requests for new connections of RES in the local transmission grid in the wider Project region. Newly installed capacities of RES – wind power plants (WPP), big and small hydro power plants (HPP) as well as solar power plants (SPP) - up to 350 MW, are expected in a mid-term horizon in this region. In addition, new WPP - 536 MW, HPP - 185 MW SPP - 250 MW are foreseen until year 2040, in a long-term horizon.

Transmission grid in the southeast region of Macedonia (110 kV transmission line Dubrovo – Valandovo – Strumica 2 – Strumica 1, approx 57.5 km long line) is approaching the end of the lifecycle and lacks capacity for connection of new renewable electricity sources to the network. As such,

it is a candidate for reconstruction due to ageing process. In addition, in the midterm forecasted regimes, there are contingency cases with a higher risk to the security of supply.

The main objective of the Project is the strengthening the transmission network in the Southeast Region of North Macedonia. The Project consists of the following two components:

- Design, construction and operation of a new 400/110 kV substation Valandovo in the area of the village Miletkovo. This new substation will be connected with the existing 110 kV transmission network in the Project region and with the existing 400 kV transmission line Dubrovo – Thessalonica (GR), by in-out connection (Component 1 or Sub-project 1).
- Reconstruction of the existing 110 kV transmission line SS Valandovo – SS Strumica 2 – SS Strumica 1 by upgrading its transmission capacity and partial cabling in the urban zones of Strumica (Component 2 or Sub-project 2).

The Project is expected to provide:

- Increased security of supply, and
- Secure and reliable integration of planned RES in the southeast region of the country, which consequently contribute towards reduction in CO_2 emissions.

In addition, the Project will contribute towards increase of the efficiency and capacity of the transmission grid with smart grid solutions (Dynamic Line Rate (DLR) & asset management).

1.2 The Project Developer

The project developer is the Macedonian Transmission System Operator. MEPSO is a Joint Stock company fully state-owned, established in 2005 after the transformation of the Electric Power Company of Macedonia ('Elektro-stopanstvo na Makedonija'). The core activity of MEPSO is a reliable electricity transmission via the national high voltage network, electric power system control and regular and duly electricity flow to its clients such as the large industrial consumers, and to the low voltage grid of the Macedonian electricity distribution system operator (EVN Macedonia). To perform its activity MEPSO has been granted the following relevant licenses from the national Energy Regulatory Commission:

- A license of doing the energy business and activity in terms of electricity transmission and activity transmission system control.
- A license of doing power business and activity, organization and electricity market control.

1.3 Purpose and Structure of the Report

This document represents an Environmental and Social Impact Assessment (ESIA) Scoping Report for the aforementioned proposed sub-projects:

(1) Design, construction and operation of a new 400/110 kV substation (SS) Valandovo with connection to the existing 400 kV and 110 kV transmission network, and

(2) Reconstruction of the existing 110 kV overhead line (OHL) Valandovo – Strumica 2 – Strumica 1.

The Report has been prepared as part of the ESIA process in accordance with international requirements for project environmental and social scoping which is required by the potential Project lender – the European Bank for Reconstruction and Development (EBRD).

This Report is based on the emerging Technical Assessment (Conceptual Solution) for the proposed transmission development. The Project is to be developed further through reference design stages (i.e. preliminary design and detailed design) which will form the basis for the detailed environmental and social appraisal and application to the Macedonian competent authority for consenting purposes.

The principle purpose of this Scoping Report is therefore to:

- Provide a summarized description of the proposed sub-projects, including their location and technical capacity;
- Provide a summary of the options / alternatives considered to date and the outcome of the process for selection of the preferred option for further development;
- Set out the proposed scope of work and methods to be applied in carrying out the ESIA, and
- Provide a summary of the stakeholder consultation process carried out to date.

It should be noted that this Report is not intended to provide detailed information regarding the environmental and social appraisal of the Project. Instead it is a preliminary overview of the Project that can inform the process of early engagement with the key relevant stakeholders and to help identify potential impacts.

Due to the fact that both developments (sub-projects), i.e. the proposed 400/110 SS Valandovo and the reconstruction of the existing 110 OHL Valandovo-Strumica are separate transmission infrastructures with no direct technological and functional interdependency, two final separate environmental and social appraisals are proposed and will be completed as part of this development stage of the Project. Consequently, where deemed necessary, this Report makes clear distinction between the sub-projects.

2. The Proposed Project

2.1 Project Location

The Project area is situated in Southeast Region of North Macedonia.

The Project as a whole crosses the territory of three Macedonian local self-government (LSG) units - the municipalities of Gevgelija, Strumica and Valandovo.

(1) Sub-project 1 - New 400/110 kV substation Valandovo with connection to the existing 400 kV and 110 kV transmission network

The location of the proposed 400/110 kV SS Valandovo (Figure below) is situated in the wider area of the settlement Miletkovo (at relative distance of approximately 1 km), in the municipality of Gevgelija, in immediate proximity to the A1 highway Skopje – Gevgelija (further to Thessalonica, Greece), at approx. 7.5 km from the existing 110/35/10 kV substation in Valandovo. There are no other existing structures or transmission or other infrastructure in proximity to the location of the new substation.

Figure 2.1: Location of the new 400/110 kV substation Valandovo

This new substation would be connected with the existing 400 kV transmission network via 'in-out' connection with the existing 400 kV OHL from Dubrovo to Thessalonica (GR) which passes in the immediate proximity to the proposed substation location (Figure above).

The new substation would be connected to the existing 110 kV transmission network by the following interventions (Annex 1.1):

- Reconstruction / upgrade of the existing 110 kV OHL from Valandovo to the existing 110/20 kV SS 'EVP'[12] Miletkovo and its extension to the new 400/110 kV SS Valandovo

  The alignment of this transmission line passes through the territory of two Macedonian LSGs: the municipalities of Valandovo and Gevgelija.

  From its starting point - the existing SS Valandovo - the line goes to west through hilly forest and shrubland landscape. It crosses the regional road R1105 in vicinity to Valandovo and then it crosses the channelled river Anska Reka, approx. 600 metres from the substation. From this crossing point with the river Anska Reka, the route continues in general direction west – southwest, in parallel with Anska Reka (at relative distance from 50 to 200 metres), mainly through agricultural land. The nearest settlements along the OHL corridor are the villages Brajkovci, Balinci and Marvinci, at relative distance from 1 km to 1.5 km, situated to the south from the line. At approx. 1400 m north from the village Marvinci and 1800 m to the north-east from SS 'EVP' Miletkovo, the line crosses the regional road R1102. Approximately 1 km from this crossing point, the line again crosses river Anska Reka and further to west it crosses the Vardar River, approx. 300 m east from the SS 'EVP' Miletkovo. At immediate proximity to this substation, the line crosses the railway Skopje – Thessalonica (GR). The extension of the line towards the new 400/110 kV SS Valandovo has a general south-southwest direction. It crosses the regional road R29177 at approx. 1 km from SS 'EVP' Miletkovo, approx. 650 m on east from the village Miletkovo, which is the nearest settlement along this section of the alignment. The section of the line between SS 'EVP' Miletkovo and the new SS Valandovo mainly goes through agricultural area, with an exception of the last 500 metres where it passes through shrubland and grassland. It will cross the stream Dukavec and other three intermittent streams before its connection to the new 400/110 kV SS Valandovo.
- Construction of a new 2x110 kV OHL from the new 400/110 kV SS Valandovo to the existing 110/20 kV SS 'EVP' Miletkovo

  The alignment of this transmission line is located within the territory of one Macedonian LSG: the municipality of Gevgelija.

  The alignment starts from SS 'EVP' Miletkovo and goes in general south-southwest towards the location of the new 400/110 kV substation Valandovo, in parallel with the extension of the 110 kV OHL SS Valandovo – SS 'EVP' Miletkovo, as described above.

(2) Sub-project 2 - Reconstruction of the existing 110 kV OHL Valandovo - Strumica

The existing 110 kV OHL Valandovo – Strumica passes through the territory of two Macedonian LSGs: the municipalities of Strumica and Valandovo.

From its starting point – the existing SS Valandovo - the line continues in the north-northeast direction, through hilly forest and shrubland for approx. 450 m, passing a nearby poultry farm (at approx. 160 m). In the next 1 km, the line passes mainly through agricultural area and then continues uphill with approx. 1.1 km long section through mosaiced landscape, with dominating

[12] EVP – Electric Traction Plant (in Macedonian '*Електровлечно построение*'). It is a electrical substation that converts the power to an appropriate voltage, current type and frequency to supply railway system(s) with traction current.

broadleaf forests with significant patches of shrubland, conifer plantations, orchards, abandoned fields, hilly pastures. In this area, at approx. 1700 metres from the SS Valandovo, the alignment slightly changes the direction continuing to northeast for approx. 9.5 km. In this section, along first several kilometres, the line passes through dominating broadleaf forest, crossing only hiking trails and patches of shrubland, also crossing a few dirt roads and two intermittent streams. The alignment then continues through a mosaiced landscape dominated by agriculture, until it crosses river Trkavalishte, located approx. 8.75 km from the SS Valandovo. Right after the crossing point with the river Trkavalishte, the OHL crosses regional road R1401, towards the village Kosturino. Bypassing this village, the line crosses the river Zhabarnik. From this point onwards, the landscape changes to dominating broadleaf forest and shrubland for approx. 2.5 km. This section ends at the point where the alignment direction changes again to north-northeast, which remains for the rest of the line (approx. 4.3 km from Strumica). Broadleaf forests dominate the landscape in this area, with the exception of the first approx. 1.2 km, in the vicinity of the settlement Tri Vodi, where agricultural landscape dominates in certain areas. After the settlement Tri Vodi, passes through broadleaf forest and crossing the river Trkanja on its way to Strumica. Before reaching Strumica, the line crosses the regional road R1401 and passes in proximity to the village Kuklish, through mainly mosaiced human dominated landscape with grassland and sands dominating the wider area along the valley of the river Trkajna. On its way to SS Strumica 2, and further to SS Strumica 1, the line passes through sub-urban and urban zones of Strumica, in immediate vicinity or over residential and other properties (Annex 1.3 and Annex 1.4).

2.2 Project Description

2.2.1 Outline of the Project's Elements

In wider context, the main elements of the Project and their inclusion in the environmental and social appraisal comprise the following:

- To construct and operate a new 400/110 kV substation Valandovo, located in Miletkovo area (Gevgelija municipality), with its connection to the existing 400 kV and 110 kV transmission network (Sub-project 1) via the following interventions:
  - In-out, approx. 0.5 km long, connection with the existing 400 kV line from SS Dubrovo to Thessalonica (GR)
  - Reconstruction / upgrade of the existing approx. 6.4 km long 2x110 kV transmission line from SS Valandovo to SS 'EVP' Miletkovo and its extension, approx. 1.8 km long line to the new 400/110 kV SS Valandovo
  - Construction of a new approx. 1.8 km long 110 kV OHL connector with the existing SS 'EVP' Miletkovo.
- To reconstruct the existing approx. 17.7 km long 110 kV OHL SS Valandovo - SS Strumica 2 – SS Strumica 1 (Sub-project 2) by:
  - Construction of a new 15.7 km long line by utilising the route of the existing one;
  - Partial cabling of the last section (about 500 meters) in front of SS Strumica 2, and
  - Construction of a new approx. 2.1 km long 110 kV cable from SS Strumica 2 to SS Strumica 1.

2.2.2 Approach to Design

The technical requirements for design of the transmission infrastructure / elements proposed in the scope of the Project are defined in accordance with MEPSO's standard practice and design, and based on the operational consideration, which include reliability, construction and maintenance of the OHL.

According to these requirements, the proposed infrastructure will be designed in compliance with the current relevant Macedonian regulation[13] and MKS/EN standards[14].

A typical transmission project is made up of a number of elements, the design of which is approached in a logical sequence as follows:

- Location and design of a substation (civil construction and electro-mechanical elements).
- Selection of tower type for an OHL (lattice or other and approximate height and span which relates to voltage and conductor type).
- Selection of an OHL alignment / corridor as well as selection of a route of transmission cable (where applicable).
- Design of OHL towers.
- Design of a transmission cable (where applicable) – cable type and cross-section.
- Location and design of access tracks.
- Location and design of ancillary structures, and
- Design and management of a safety zone at the substation and a clearance corridor (through forest and woodland) along the transmission line(s).

2.2.3 Right of Way

The aforementioned Macedonian legislation[15] requires establishment of a protection zone (safety zone) or Right of Way (RoW) along the path of a transmission line and in proximity to a substation. This zone is prescribed by MEPSO's Grid Code[16], according to which – 'the safety zone is the area and the space, below, above and along the existing electric power transmission facilities, necessary for their spatial planning, protection and maintenance, in which the right of ownership is restricted or the possibility for performing construction actions and other activities without consent granted by MEPSO is limited'.

For an operational transmission line, the protection zone is prescribed by MEPSO's Grid Code and is determined by the voltage of the line:

- 15 m from the axis of an operational overhead line with nominal voltage of 400 kV (or 30 metres wide safety corridor (zone) along the path of the line).
- 10 m from the axis of an operational overhead line with nominal voltage of 110 kV (or 20 metres wide safety corridor (zone) along the path of the line).

[13] Rulebook for Construction of Overhead Lines with rated Voltage from 1 kV to 400 kV (Official Gazette of RM no.25, from 1.2.2019)

[14] MKS EN 50341 - Overhead electrical lines exceeding AC 1 kV

[15] Rulebook for Construction of Overhead Lines with rated Voltage from 1 kV to 400 kV (Official Gazette of RM no.25, from 1.2.2019)

[16] MEPSO Grid Code (2019) [Ref.7]

- 1.5 m from the axis of an operational cable transmission line with nominal voltage of 110 kV (or 3 metres wide safety corridor (zone) along the path of the line).

For an operational substation with a nominal voltage of 400 kV and 110 kV, the required safety distance is 5 metres from the outer edge of the substation's fence or wall.

The regulation's objective is to facilitate the uninterrupted functioning of the power grid, to ensure safe operations, to meet the requirements of the sanitary and safety norms, and to prevent accidents. Within this protection zone buildings and facilities must not be constructed and certain activities are restricted to ensure the safe operation of the lines and for the safety of people. These mainly include agriculture activities within the RoW which include cultivated plants or trees which reach height that may pose safety operational risk for the line[17], or agricultural practices that use spraying equipment as well as fixed or mobile irrigation equipment.

It is also necessary to remove trees and vegetation from within the right of way for the safe operation of the transmission line. Therefore, in areas of forestry and woodland, clearance on either side of the transmission line within the safety zone is required according to the rules defined by the relevant Macedonian legislation[18].

2.2.4 Sub-project 1 - New 400/110 kV Substation Valandovo with Connection to the existing Transmission Network

2.2.4.1 New 400/110 kV SS Valandovo with In-out Connection with the existing 400 kV Line from Dubrovo to Thessalonica (GR)

2.2.4.1.1 400/110 kV Substation Valandovo

The proposed 400/110 kV substation will comprise:

- 400 kV Switchyard with a total of six bays of which one is a spare bay;
- Two power transformers 400±8x1.25%/115/10.5kV, 300/300/70 MVA;
- 110 kV Switchyard with a total of fifteen bays, of which eight are spare bays;
- Control building, with approximate dimensions of 20 m x 40 m, and
- Relay kiosks in 110 kV and 400 kV bays.

The area required for construction of the substation is approximately 5 ha (250 m x 200 m). The entire substation will be constructed on an open space with equipment and safety distances for outdoor installation. The 400 kV and 110 kV switchyards will be designed with the following basic configuration:

- 400 kV Switchyard

  The proposed 400 kV switchyard would be air insulated, with double tubular busbar systems. It shall consist of six 400 kV bays - five fully equipped bays and one spare bay. Two equipped bays would be for connection to the 400 kV OHL from Dubrovo to MK/GR border

[17] According to the applicable regulation, the minimum vertical clearance for an operational transmission line in regard vegetation, trees, etc. is set to 3.0 metres.

[18] Rulebook for Construction of Overhead Lines with rated Voltage from 1 kV to 400 kV (Official Gazette of RM no.25, from 1.2.2019)

(further to Thessalonica (GR)), two would be 400 kV transformer bays and one would be coupling/metering bay.

Three relay kiosks are foreseen in this switchyard. Each relay kiosk should house the secondary equipment for two 400 kV bays (control, protection, metering, auxiliary supply).

- 110 kV Switchyard

The proposed 110 kV switchyard would be air insulated, with double tubular busbar systems. It shall consist of fifteen bays: seven fully equipped bays and eight spare bays. Four equipped bays would be for connection to the existing 110 kV substations Miletkovo and Valandovo (two bays for each), two would be 110 kV transformer bays and one would be coupling/metering bay.

Eight relay kiosks are foreseen in this switchyard. Each relay kiosk should house the secondary equipment for two 110 kV bays (control, protection, metering, auxiliary supply).

A typical layout of the substation is provided below.

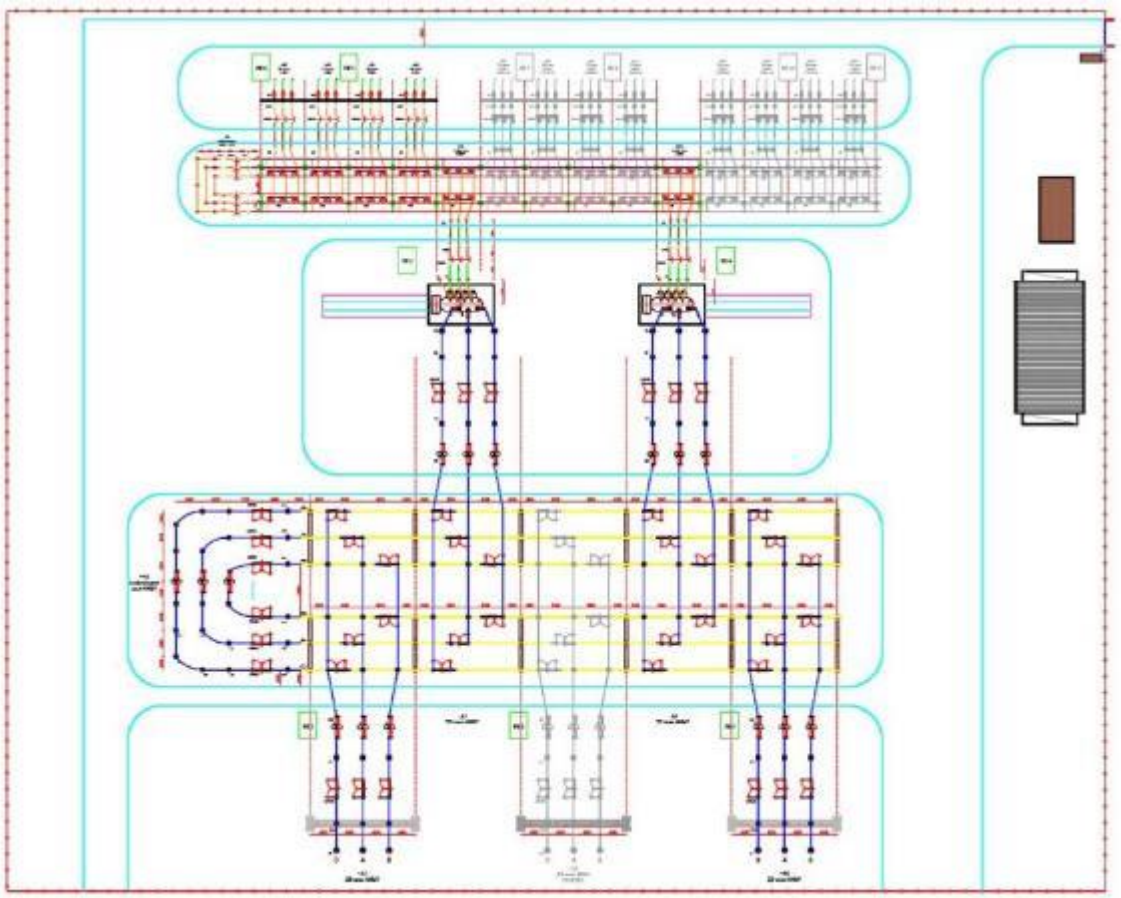


Figure 2.2: Layout of the new 400/110 kV substation Valandovo

2.2.4.1.1 In-out Connection with the existing 400 kV Line from Dubrovo to Thessalonica (GR)

- Technical Elements

The proposed 400 kV in-out connection in the new 400/110 kV SS Valandovo includes the following technical elements:

- Towers. The proposed in-out connection will be designed and will be constructed with galvanised steel-lattice single circuit self-supporting towers with a horizontal configuration of conductors and two earth wires.
- Foundations. The tower foundations will be designed and will be constructed of four separate reinforced concrete footings suitable for the specific bearing capacity of the terrain.
- Phase conductors and insulator strings. Two conductors per phase are foreseen. Characteristics of the conductors are in compliance with national standards (MKS) and European standards (European Norms - EN). The insulator strings will be tension strings.

    - Towers and foundations

The design of the towers will ensure safe operation in all working climate conditions, paying particular regard to the phase conductors, earth wires and insulator sets and for the designed wind and weight spans.

In general, depending on their position in a transmission line, the types of towers could be:

- Suspension towers,
- Angle (tension) towers, used where the line changes direction or for special loading cases along the line,
- Terminal towers, used when the line is connected to a substation.

The proposed in-out connection is designed with two steel-lattice angle (tension) towers with two conductors per phase and two earth wires (Figure below). The tower series selected for the connection are of Type "AZ-4" for changing the direction of the line in a range from 50° to 60°.

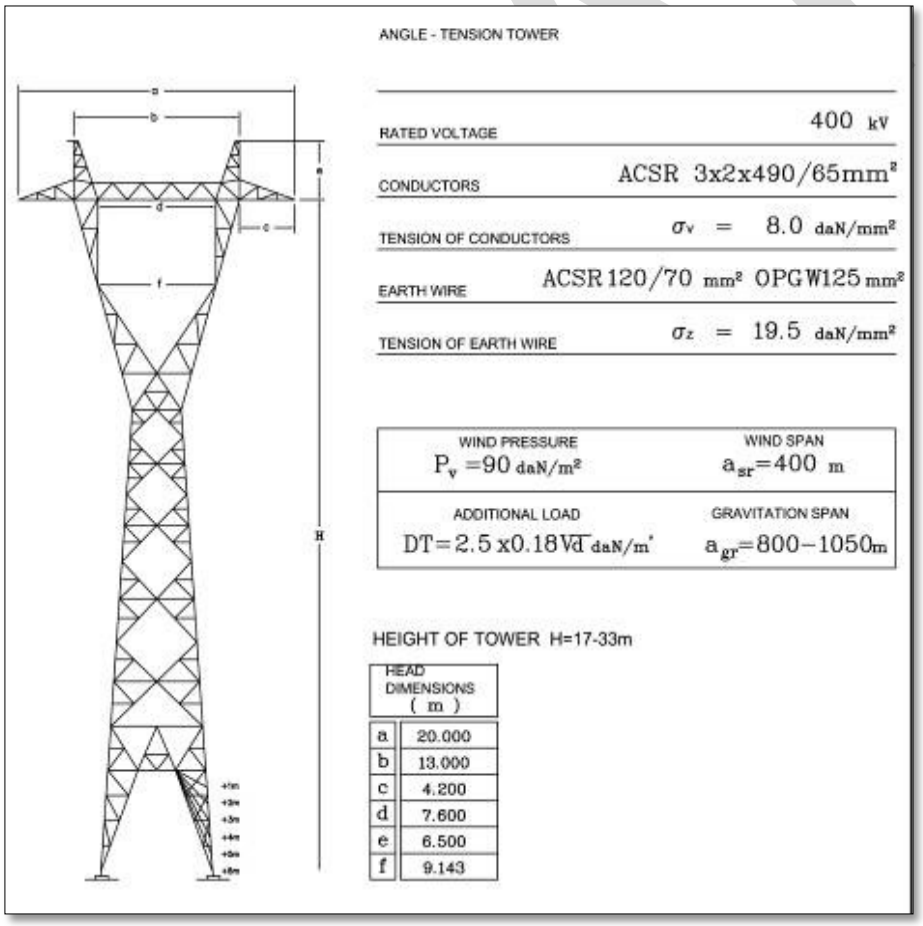


Figure 2.3: Typical tower for the in-out connection of the new 400/110 kV substation Valandovo with the existing 400 kV transmission line from Dubrovo to Thessalonica (GR)

The typical tower height range is between 17 and 33 metres.

The number of conductors and their disposition on the tower is three circuits with two conductors per phase and two protective wires in a horizontal direction.

The maximal footprint area for a tower is approximately up to 250 m^2. This land area will need to be permanently acquired in order ensure safe operations and maintenance of the in-out line.

Each tower will have four legs and single foundation per leg, i.e. four foundations for each tower. The foundations will be designed with reinforced concrete blocks with a type of concrete suitable to the specific bearing capacity of the soil, obtained from the respective site-specific geo-technical investigation.

- Phase conductors

For the phase conductors for this 400 kV in-out connection, pursuant to the current concept in Macedonia Aluminium Conductor Steel-Reinforced (ACSR) conductors will be used with a normal cross section of 490/65 mm^2. Two conductors per phase (a bundle) are designed at a mutual distance of 400 mm.

- Insulators

The in-out line will be connected to the grid with a directly grounded neutral point and and nominal lightning impulse withstand voltage of 1425 kV. The insulator that is to be used will be of a type approved for such lines and appropriate assembling procedures will be carried out for the various types of insulator chains. Insulators are typically made of toughened glass.

- Earthing

Earthing of the towers will be completed with one ring around each tower foundation and additional Fe wire ring is laid around the entire tower structure, roughly 1 metre away from existing rings and at depth of 0.8 to 1.0 metre, made from Fe wires of a nominal diameter (Ø) of 10mm. These rings are connected between them and to the tower steel structure. In cases where earthing needs to be reinforced (e.g. for types of soil with lower conductivity), reinforcement is done by adding two legs (extensions) from FeZn wires or FeZn tapes to existing rings on each tower foundation.

- Protective wires

Two ground wires will be strung above the top most conductors between the tower peaks for protection against lightning strikes.

2.2.4.2 New 2x110 kV OHL 400/110 kV SS Valandovo - SS 'EVP' Miletkovo

A new two-phase 2x110 kV line will be built to connect the existing SS 'EVP Miletkovo' to the new 400/110 kV SS Valandovo since the existing 2x110 kV OHL SS Valandovo – SS EVP Miletkovo will be reconstructed, extended and connected to the new SS 400/110 kV Valandovo thus enabling a connection between new 400/110 kV SS Valandovo and existing 110/35/10 kV SS Valandovo. This new line will be constructed as a double-system line (2x110 kV) to provide reliable supply to the SS 'EVP' Miletkovo which is the main power supply of the railway transport system in the southeastern part of the country.

2.2.4.2.1 Technical Elements

The proposed new 2x110 kV line includes the following technical elements:

- Towers. The proposed transmission line will be designed and constructed with galvanised steel-lattice towers with four arms configuration of conductors and one earth wire at the top of the towers.
- Foundations. The tower foundations will be designed and will be constructed of four separate reinforced concrete footings suitable for the specific bearing capacity of the terrain.
- Phase conductors and insulator strings. One conductor per phase is foreseen. Characteristics of the conductors will be in compliance with national standards (MKS) and European standards (European Norms - EN). The insulator strings will be tension strings.

    - Towers and foundations

The design of the towers will ensure safe operation in all working climate conditions, paying particular regard to the phase conductors, earth wires and insulator sets and for the designed wind and weight spans.

Depending on their position in the transmission line, the types of towers could be:

- Suspension towers,
- Angle (tension) towers, used where the line changes direction or for special loading cases along the line,
- Terminal towers, used when the line is connected to a substation.

The transmission line is designed with steel-lattice towers with four arms with one conductor per phase and one earth wire (Figure below).

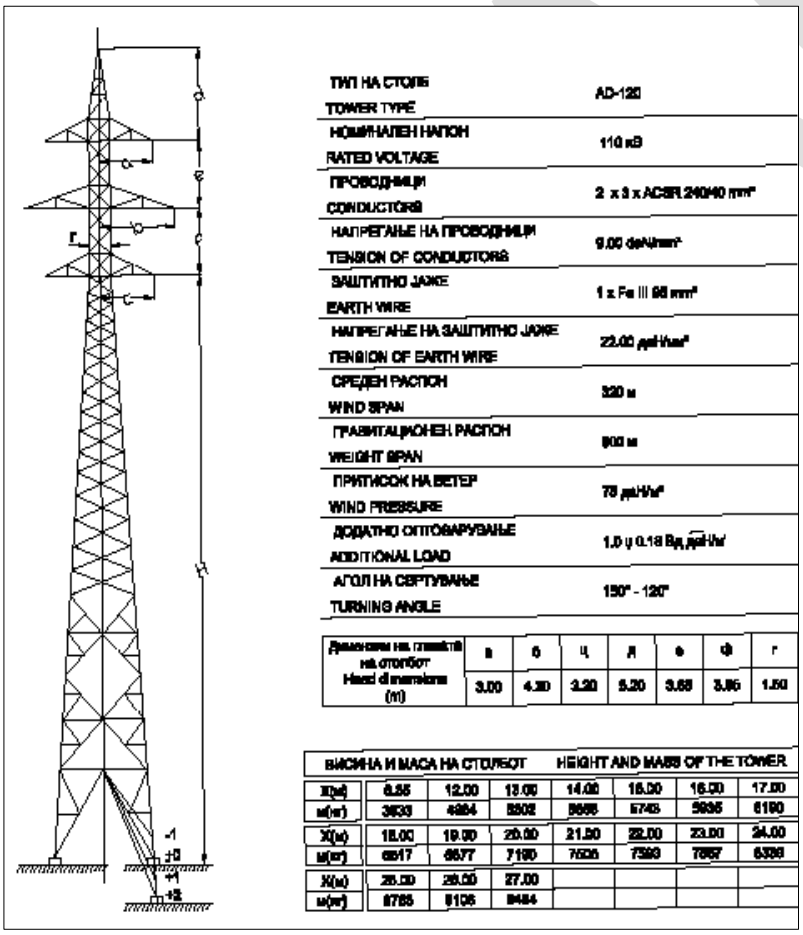


Figure 2.4: Typical tower for the new double-circuit transmission line from the new 400/110 kV substation Valandovo to substation 'EVP' Miletkovo

The typical tower height range is between 12 and 27 metres for the tension towers, and 12 to 30 metres for the suspension tower types. Towers are manufactured from galvanised steel and are therefore grey in colour - this finish is considered appropriate in order to minimise visual impact. Tower steelwork is painted grey at intervals throughout the life of the towers, to afford continued protection against corrosion.

The tower series selected for the transmission line are the following:

- Angle (tension) towers:
  - Type "AD-120" for changing the direction of the transmission line in a range from 30° to 60°
  - Type "AD-150" for changing the direction of the transmission line in a range from 1° to 30°
- Suspension towers
  - Type "SD" for towers used for different wind and weight spans depending on the terrain conditions.

The number of towers and their type as well as the proposed position of each individual tower within the proposed corridor will be identified and confirmed during the upcoming Project reference development stages (preliminary design and detailed design) in line with the relevant Macedonian legislation.

The number of conductors and their disposition on each tower type is two circuits with one conductor per phase and one protective wire at the top of the tower.

The maximal footprint area for a tower is approximately up to 100 m^2. This land area will need to be permanently acquired in order ensure safe operations and maintenance of the transmission line.

Each tower will have four legs and single foundation per leg, i.e. four foundations for each tower. The foundations will be designed with reinforced concrete blocks with a type of concrete suitable to the specific bearing capacity of the soil, obtained from the respective site-specific geo-technical investigation.

- Phase Conductors

The conductors are attached to the cross-arms at OHL towers by insulator strings, which, in the case of suspension towers, hang vertically below the cross-arms. At angle towers the conductors are again attached to the cross arms by insulators but in this case the insulators are in line with the conductors. Conductors for transmission lines are typically manufactured from aluminium with steel core. For the phase conductors for this 110 kV transmission line, pursuant to the current concept in Macedonia, Aluminium Conductor Steel-Reinforced (ACSR) conductors will be used with a normal cross section of 240/40 mm^2.

- Insulators

The transmission line will be connected to the grid with a directly grounded neutral point and nominal lightning impulse withstand voltage of 550 kV.

The insulator that is to be used will be of a type approved for such transmission lines and appropriate assembling procedures will be carried out for the various types of insulator chains. Insulators are typically made of toughened glass.

- Earthing

Earthing of the towers will be completed with one ring around each tower foundation and additional Fe wire ring is laid around the entire tower structure, roughly 1 metre away from existing rings and at depth of 0.8 to 1.0 metre, made from Fe wires of a nominal diameter (Ø) of 10mm. These rings are connected between them and to the tower steel structure. In cases where earthing needs to be reinforced (e.g. for types of soil with lower conductivity), reinforcement is done by adding two legs (extensions) from FeZn wires or FeZn tapes to existing rings on each tower foundation.

- Protective Wires

One ground wire will be strung above the towers arms at the tower peak for protection against lightning strikes.

2.2.4.3 Reconstruction / upgrade of the existing 2x110 kV OHL SS Valandovo – SS 'EVP' Miletkovo

The existing 2x110 kV OHL from SS Valandovo to SS 'EVP' Miletkovo will be reconstructed to connect the new 400/110 kV SS Valandovo with the existing 110/35 kV SS Valandovo.

2.2.4.3.1 Existing Line

This transmission line is approx. 6.4 km long, with 21 towers (14 angle-tension towers and 7 suspension towers). It was constructed and is in operation since 1986.

The towers are typical three phase double system 110 kV steel lattice towers, from which only the top two arms and middle tower arms are used for the line, i.e. for the purposes of the power supply for the railway SS 110/25 kV Miletkovo. The tower types are AD120, AD150 and SD. The height of the suspension towers ranges from 12.8 m to 21.8 m, while for the tension towers from 12 m to 25 m. The phase conductor is ACSR 150/25 mm^2.

The foundations are separate reinforced concrete footings for various bearing capacity of the ground. The earthing is performed with a copper wire (50 mm^2) around each foundation footing and one outer ring placed at a depth of 0.7 m.

2.2.4.3.2 Reconstruction

The reconstruction / upgrade of the existing 2x110 kV OHL from SS Valandovo to SS 'EVP' Miletkovo will include modification of the current double system line into three phase line with conductor 240/40 mm^2 on the existing route, using the same alignment. For the construction purposes of this new infrastructure, the existing line will be dismantled and removed.

In addition, based on the further technical assessment, the reconstruction / upgrade will assess the need for possible rearrangements of the towers and their upgrade with appropriate elements to increase their height. Use of several new towers has to be foreseen to accommodate the changes imposed by the Project as a whole. The detailed analysis in this respect would be performed in the upcoming Project reference development stages (preliminary design and detailed design) in line with the relevant Macedonian legislation as well as EU and EBRD standards.

2.2.5 Sub-project 2 - Reconstruction of the existing 110 kV Transmission Line from Valandovo to Strumica

2.2.5.1 110 kV Transmission Line from SS Valandovo to SS Strumica 2

2.2.5.1.1 Existing Line

The existing 110 kV OHL SS Valandovo – SS Strumica 2 has been in operation since 1971. The starting point of the line is the 110 kV gantry in 110/35/10 kV SS Valandovo. The OHL is 15.6 km long with a total number of 48 towers (6 angle-tension towers and 42 suspension towers).

The towers are typical 110 kV steel lattice towers, with three arms, for a 150 mm^2 conductor and with one protective ground wire of 50 mm^2. The towers types are N240-50 and AZ240-50. The height of the suspension towers ranges from 9.9 m to 25 m, while for the tension towers from 9.8 m to 16.4 m.

The foundations are separate reinforced concrete footings for various bearing capacity of the ground. The earthing is performed with a copper wire (50 mm^2) around each foundation footing and one outer ring placed at a depth of 0.7 m.

Along its route, the line crosses with other existing 35 kV and 10 kV transmission lines.

The route of the line, in its ending part towards the entry in SS Strumica 2, in approx. 0.5 km long section, passes through the inhabited and urbanized part of Strumica (Annex 1.3).

2.2.5.1.2 Reconstruction

Considering the year of the construction of the line and the fact that it has been in operation for around 50 years now, the reconstruction works will consist of construction of a completely new 110 kV OHL along the same corridor, by utilising the same existing route, as much as feasible. Wherever possible, the design principles to keep the same number of towers as of the existing line and to use locations of the existing towers for the new towers would be applied.

Since the existing OHL route in the last, approx. 0.5 km long, section before its connection to the SS Strumica 2 crosses urban area of Strumica (passing in vicinity and over various residential and other properties), underground cabling of the line in approx. 0.75 km long section is foreseen, until the gantry in SS Strumica 2. In the current development stage of the Project, one option for the cable route has been proposed (Annex 1.3). This option would be further evaluated during more advanced Project design stages (preliminary design and detailed design), from technical and financial aspect and taking into the consideration the social implications and urban constraints in the affected area. Adoption of the final route for the proposed transmission cable would need to be based on consultation with stakeholders and be formalised by the local authorities (Strumica municipality), including its inclusion in respective urban planning documentation. The potential impacts associated with the proposed cable route will be assessed and general E&S guidelines will be provided in the scope of the present ESIA.

Prior to construction of the new line, the existing obsolete 110 kV OHL from SS Valandovo to SS Strumica 2 will be dismantled and removed to allow new line to be built on the same route. During

the construction period, uninterrupted electricity supply to consumers will be provided by the transmission network according to the MEPSO's Grid Code[19].

2.2.5.1.3 Technical Elements

The proposed reconstruction of the 110 kV OHL SS Valandovo – SS Strumica 2 includes the following technical elements:

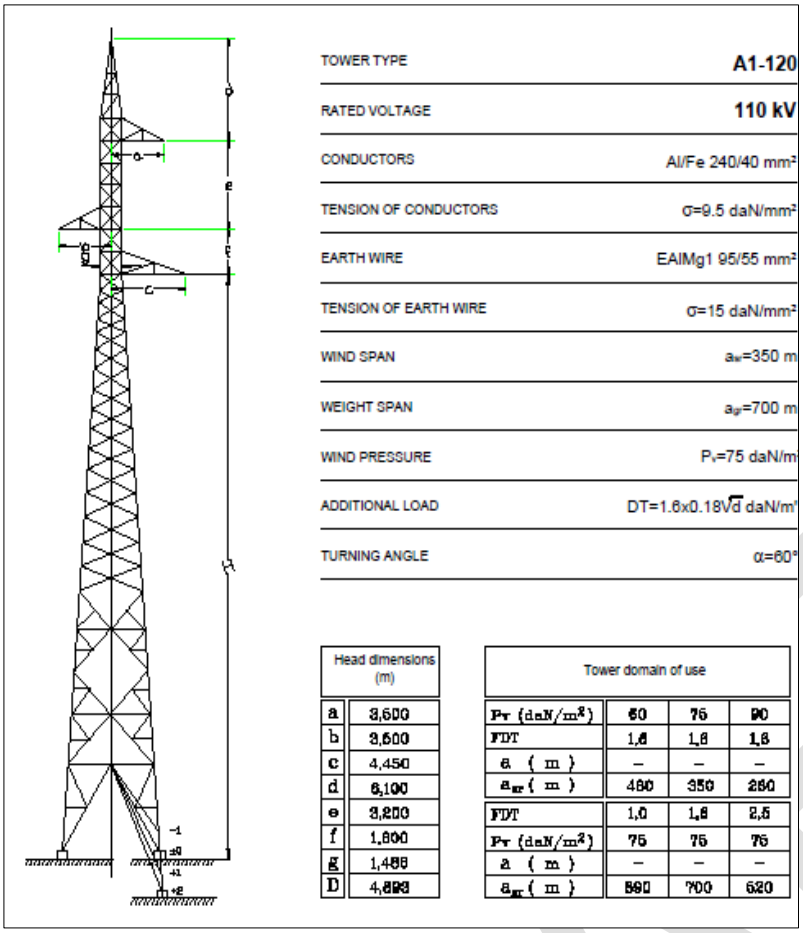
- Towers. The proposed transmission line will be designed and constructed with galvanised steel-lattice towers with three arms configuration of conductors and one earth wire at the top of the tower.
- Foundations. The tower foundations will be designed and will be constructed of four separate reinforced concrete footings suitable for the specific bearing capacity of the terrain.
- Phase conductors and insulator strings. One conductor per phase is foreseen. Characteristics of the conductors will be in compliance with national standards (MKS) and European standards (European Norms - EN). The insulator strings will be tension strings.
    - Towers and foundations

The design of the towers will ensure safe operation in all working climate conditions, paying particular regard to the phase conductors, earth wires and insulator sets and for the designed wind and weight spans. Depending on their position in the transmission line, the types of towers could be:

- Suspension towers,
- Angle (tension) towers, used where the line changes direction or for special loading cases along the line,
- Terminal towers, used when the line is connected to a substation.

The transmission line is designed with steel-lattice towers with three arms with one conductor per phase and one earth wire (Figure below).

[19] MEPSO Grid Code (2021) [Ref.7]



TOWER TYPE	A1-120
RATED VOLTAGE	110 kV
CONDUCTORS	Al/Fe 240/40 mm²
TENSION OF CONDUCTORS	σ=9.5 daN/mm²
EARTH WIRE	EAlMg1 95/55 mm²
TENSION OF EARTH WIRE	σ=15 daN/mm²
WIND SPAN	a_w=350 m
WEIGHT SPAN	a_g=700 m
WIND PRESSURE	P_v=75 daN/m²
ADDITIONAL LOAD	DT=1.6x0.18$\sqrt{d}$ daN/m'
TURNING ANGLE	α=60°

Head dimensions (m)	
a	3,600
b	3,600
c	4,450
d	6,100
e	3,200
f	1,800
g	1,488
D	4,823

Tower domain of use			
Pv (daN/m²)	60	75	90
FDT	1,6	1,6	1,6
a (m)	–	–	–
a_w (m)	480	350	280
FDT	1,0	1,6	2,5
Pv (daN/m²)	75	75	75
a (m)	–	–	–
a_g (m)	580	700	620

Figure 2.5: Typical tower for reconstruction of the existing transmission line from SS Valandovo to SS Strumica 2

The typical tower height range is between 9 and 30 metres. Towers are manufactured from galvanised steel and are therefore grey in colour - this finish is considered appropriate in order to minimise visual impact. Tower steelwork is painted grey at intervals throughout the life of the towers, to afford continued protection against corrosion.

The tower series selected for the transmission line are the following:

- Angle (tension) towers:
  - Type "A1-120" for changing the direction of the transmission line in a range from 30° to 60°
  - Type "A1-150" for changing the direction of the transmission line in a range from 1° to 30°
- Suspension towers
  - Type "S1", "S2" and "S3" for towers used for different wind and weight spans depending on the terrain conditions.

The number of towers and their type would be equivalent as the number of towers of the existing 110 kV line: 6 tension and 42 suspension towers. They would be located at the same sites as the existing towers, as far as practicable.

The number of conductors and their disposition on each tower type is three circuits with one conductor per phase and one protective wire at the top of the tower.

The maximal footprint area for a tower is approximately up to 100 m^2. Provided that the new towers will replace the exisiting ones at the same locations, it is very likely that no new land area would need to be permanently acquired.

Each tower will have four legs and single foundation per leg, i.e. four foundations for each tower. The foundations will be designed with reinforced concrete blocks with a type of concrete suitable to the specific bearing capacity of the soil, obtained from the respective site-specific geo-technical investigation.

- Phase Conductors

The conductors are attached to the cross-arms at OHL towers by insulator strings, which, in the case of suspension towers, hang vertically below the cross-arms. At angle towers the conductors are again attached to the cross arms by insulators but in this case the insulators are in line with the conductors. Conductors for transmission lines are typically manufactured from aluminium with steel core. For the phase conductors for this 110 kV transmission line, pursuant to the current concept in Macedonia, Aluminium Conductor Steel-Reinforced (ACSR) conductors will be used with a normal cross section of 240/40 mm^2.

- Insulators

The transmission line will be connected to the grid with a directly grounded neutral point and nominal lightning impulse withstand voltage of 550 kV.

The insulator that is to be used will be of a type approved for such transmission lines and appropriate assembling procedures will be carried out for the various types of insulator chains. Insulators are typically made of toughened glass.

- Earthing

Earthing of the towers will be completed with one ring around each tower foundation and additional Fe wire ring is laid around the entire tower structure, roughly 1 metre away from existing rings and at depth of 0.8 to 1.0 metre, made from Fe wires of a nominal diameter (Ø) of 10mm. These rings are connected between them and to the tower steel structure. In cases where earthing needs to be reinforced (e.g. for types of soil with lower conductivity), reinforcement is done by adding two legs (extensions) from FeZn wires or FeZn tapes to existing rings on each tower foundation.

- Protective Wires

One ground wire will be strung above the towers arms at the tower peak for protection against lightning strikes.

2.2.5.2 110 kV Transmission Line from SS Strumica 2 to SS Strumica 1

2.2.5.2.1 Existing Line

The existing 110 kV OHL SS Strumcia 2 – SS Strumica 2 has been in operation since 1971 and was partly reconstructed in 1988. The starting point of the line is the 110 kV gantry in SS Strumica 2. The OHL is 1.9 km long with a total number of 10 towers (6 angle-tension and 4 suspension towers).

The towers are typical 110 kV steel lattice towers, with three arms, for a 240/40 mm^2 conductor and with one protective ground wire of 50 mm^2. The towers types are N, S and A120 and A150.

The height of the suspension towers ranges from 14.8 to 24.8 m, while for the tension towers from 13 to 18 m.

The foundations are separate reinforced concrete footings for various bearing capacity of the ground. The earthing is performed with a copper wire (50 mm^2) around each foundation footing and one outer ring placed at a depth of 0.7 m.

Along its route, the line crosses with other existing 35 kV and 10 kV transmission lines.

The whole length of route of the line passes through the inhabited and urbanized part of Strumica (Annex 1.4).

2.2.5.2.2 Reconstruction

Considering the year of the construction of the line and the fact that it has been in operation for around 50 years now, and taking into the consideration that it passes through urban zones of Strumica, the reconstruction works will consist of its replacement with a 110 kV power underground cable along a new approx. 2.1 km long alignment along the existing street network in Strumica, in the section between the two terminate substations. As part of the Project, prior to construction of the new line, the existing obsolete 110 OHL would be dismantled and removed. During the construction period, uninterrupted electricity supply to consumers will be provided by the transmission network according to the MEPSO's Grid Code[20].

In the current development stage of the Project, two options for the cable route have been proposed (Annex 1.4). These options would be further evaluated during more advanced Project design stages (preliminary design and detailed design), from technical and financial aspect and taking into the consideration the social implications and urban constraints in the affected area. Adoption of the final route for the proposed transmission cable would need to be formalised by the local authorities (Strumica municipality), including its inclusion in respective urban planning documentation. The potential impacts associated with the proposed optional cable routes will be assessed and general E&S guidelines will be provided in the scope of the present ESIA.

2.2.5.2.3 Technical Elements

The proposed reconstruction of the 110 kV OHL SS Strumica 2 – SS Strumica 1 includes the following technical elements:

- Transmission cable. The underground line will be designed with one conductor per phase. Characteristics of the conductor will be in compliance with national standards (MKS) and European standards (European Norms - EN). The insulator strings are tension strings.

An overview of the main technical parameters of the transmission line is given in the following Table.

[20] MEPSO Grid Code (2021) [Ref.7]

Parameter	Characteristic
Nominal voltage	110 kV
Conductor material	Aluminium
Cross section	1000 mm
Insulation type	XLPW
Cable Sheet material	Copper
Cable Sheet cross section	95 mm^2

Table 2.1: Technical parameters of transmission underground cable for reconstruction of the existing transmission line from SS Strumica 2 to SS Strumica 1 (urban zones of Strumica)

A typical underground transmission cable construction is presented in the Figure below.

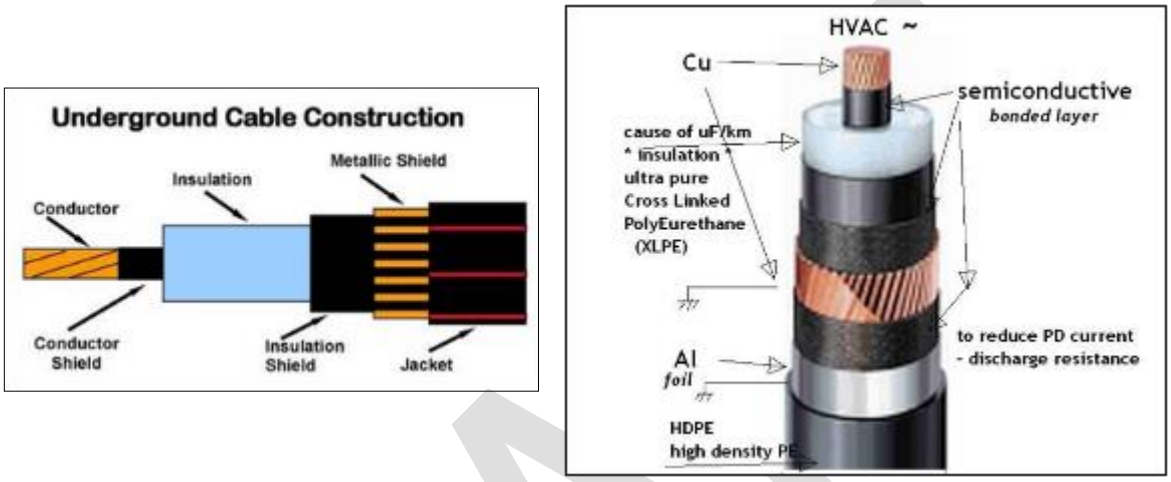


Figure 2.6: Typical underground transmission cable

2.2.5.2.4 Cable Trench

The cable system will be laid in a trench at a depth of 1.60 m, except at the sites of crossing of the cable with other underground installations (e.g. water supply or sewage network, communication infrastructure, etc.). In such cases, it is necessary to meet safety distances from these installations defined in the applicable technical regulations, but the minimum cable line depth must not be less than 1.5 metres. Therefore, at intersection points the cable line can be laid at a greater depth to meet the technical requirements.

The cable will be protected from any contact that may damage the outside protective layer. The cable will be laid in a cable bed made of a special thermal conductive material (or HDPE pipes placed in a cable bed – in some parts) and covered with concrete slabs for mechanical protection. Above the concrete slabs PVC warning stripes are placed at a distance of 0.5 m.

A typical cable trench for underground transmission cable is presented in the Figure below.

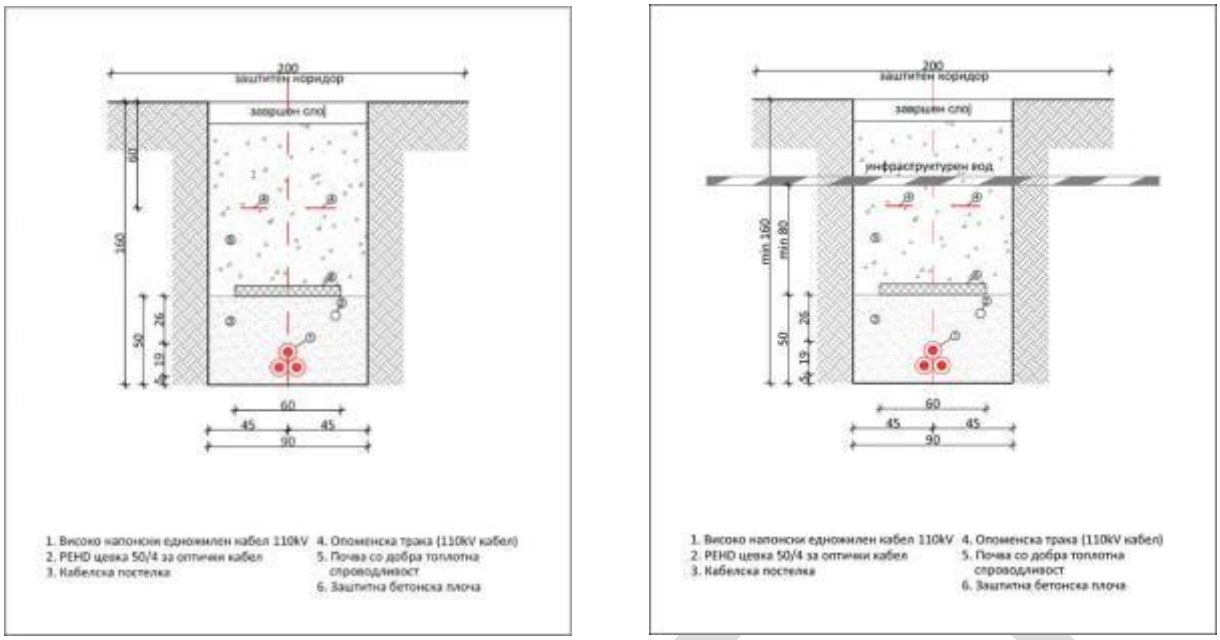


Figure 2.7: Typical trench for an underground transmission cable

3. Assessment of Project Options

3.1 Identification and Assessment of Options

3.1.1 Methodological Approach

The general approach for the identification of the development options and alternatives for the Project's Component 1 (Sub-project 1) was to identify and optimise the location of the new 400/110 kV SS Valandovo and to identify and elaborate the feasible alignments for the 400 kV OHL corridor from the new substation to the connection point in the SS Dubrovo in the municipality of Negotino, in order to proceed to a more detailed and updated comparison and scoring of the variants.

The Project's Component 2 (Sub-project 2) – reconstruction of the existing 110 kV OHL Valandovo – Strumica is included as a constituent element in all development options and, therefore, was not a comparative factor for the decision-making process for selection of the preferred Project option.

For the identification and development of the Project options and alternatives, the following key design aspects were considered:

- Broader country-specific integration and development policies, strategies and plans within the European, regional and national context;
- Spatial development and urban plans;
- Sectoral master plans and strategies in the electricity transmission sector;
- Previous studies and/or designs relevant for the Project history;
- Current technical standards and other legislative requirements.

In parallel, the identification and development exercise of the Project options and alternatives was supported by an environmental and social (E&S) assessment. The E&S process identified potential E&S effects of each of the identified alternatives which steered the selection of the preferred Project option from an E&S perspective.

In that respect, the approach was based on the following actions:

- Review of available planning and project related documentation (e.g. strategies and development plans and programmes, studies and reports, E&S monitoring data);
- Review of relevant national and EU environmental regulations as well as the Environmental and Social Policy (ESP) document (2019)[21] of the European Bank for Reconstruction and Development (EBRD);
- Identification and mapping of existing high-level E&S constraints – sensitive and/or "no go" zones in the area where the Project is to be implemented (see Annex 2);
- Focused site visits and field surveys carried out in May and August 2021 to obtain the key baseline environmental data for relevant topics and sensitivities (e.g. biodiversity and nature conservation, landscape character and visual context) as well as the key

[21] Environmental and Social Policy, EBRD, April 2019 [Ref.13]

baseline social data and sensitivities (e.g. settlements pattern, material assets, land use, cultural heritage);

- Description of the identified SS locations and OHL alignment variants and their E&S constraints and opportunities.

The ultimate objective of this exercise was to identify alternative SS locations and OHL variants and, through a process of holistic appraisal via a multi-criteria assessment (MCA) from various aspects – network/market, technical, environmental and social, and economic - to recommend and select the preferred Project option to be taken forward for further development (i.e. Conceptual Solution and environmental and social appraisal).

3.1.2 No Project Option

The 'No Project' option ('Do Nothing') is an alternative involving no development of the proposed Project.

One of the main strategic pillars identified in the Macedonian Strategy for Energy Development until 2040 [Ref.12] (the Strategy) is achieving high level of integration of the national energy system with the international energy markets. In addition, the Strategy foresees a goal for decarbonisation of the Macedonian energy system, which is to be achieved by a number of strategic goals, including reduction of the greenhouse gas emissions associated with the energy production and increasing the penetration of the renewable energy sources in the overall energy consumption, in a sustainable manner.

The integration with the international markets is foreseen to be achieved by continuous investments in the transmission and distribution network in order to [Ref.12]:

- greater integration of renewable energy sources or electricity production, especially from wind and solar sources,
- enabling the producer-consumer mechanism ("prosumer"),
- greater penetration of electric vehicles, and
- satisfying the increased demand for electricity in the region.

According to the Strategy, the biggest challenge for achieving these goals, including the foreseen increased penetration of the of renewable energy sources, from the perspective of the national transmission system, will be the strengthening of the existing 110 kV voltage level grid by reconstruction/replacement of 110 kV transmission lines in particular regions. Given the long-term investment plan of MEPSO until 2040, 'the system needs an investment of 163 million. EUR, of which 87 mil. EUR for a new network and 76 mil. EUR for network revitalization. The largest investments in revitalization of ~ 70% are expected to be in the period 2025-2040, while ~ 98% of investments in a new transmission network should be made by 2030, based on the lowest costs.' [Ref.12].

Therefore, this Project for strengthening the transmission network in Southeast Region of Macedonia is seen as an important step towards fulfilment of the Strategy goals for integration of energy from renewable sources into the national power system, since the most significant investments in this regard are (will be) located mostly in this region of the country (see Figure 1.1, Section 1). Beside the key benefit from the Project – to secure reliable integration of the planned renewable sources in the southeast region of the country, which consequently contributes towards reduction

in CO_2 emissions, the Project will increase the security of supply and will contribute towards increase of the efficiency and capacity of the transmission grid with smart grid solutions.

In terms of fulfillment of the above Macedonian strategic goals, the 'No Project' option has no positive argument in its favour, because if the proposed Project is not build, then it would cause a serious problem in the planned national energy sector development and the regional integration of the Macedonian electricity system. Such scenario would also result in serious obstacle in regard to the country's efforts to meet the goals of the European Union for the integration of energy from renewable sources into the national power system.

'No Project' option does not involve capital investment costs. However, maintenance costs are higher than for lines within the expected life span because the equipment would become obsolete with an expired useful life. Consequently, the 'No Project' option will directly contribute to higher operational costs of the existing out-of-date transmission infrastructure in the Project region, as well as to higher technical losses. It will also decrease security and reliability of the power supply in the Project region.

In a wider context, the 'No Project' option would limit overall economic development and possibilities for the improvement in the social welfare of the citizens in the Project region and wider context – at country level.

3.1.3 Identified Options

Based on the transmission network topologies defined in the Project-related studies, three Project options have been identified (including alternative corridors for each option) (Figure below), in order to make a clearer distinction between different network configurations. They are all built based on the network topology, representing the basic development of the local transmission networks for three referenced years - 2025, 2030 and 2040.

The key technical elements of the identified options are as follows:

1. Project Option 1 - Double Circuit 110 kV OHL Dubrovo – Valandovo, which includes the following main components:
    a. Construction of a new double circuit 110 kV OHL between Valandovo and Dubrovo
    b. New 400/110 kV power transformer in the 400/110 kV SS Dubrovo, with respective 110 kV and 400 kV bays
    c. Reconstruction of the existing 110 kV OHL Valandovo – Strumica 2 – Strumica 1
2. Project Option 2 - New 400/110 kV SS Valandovo and lead in-out of existing 400 kV OHL Dubrovo – Thessalonica (GR), which includes the following main components:
    a. Construction of a new 400/110 kV SS Valandovo
    b. Connection of the existing 400 kV OHL Dubrovo – Thessalonica (GR) into the new SS Valandovo
    c. Reconstruction of the existing 110 kV OHL Valandovo – Strumica 2 – Strumica 1
3. Project Option 3 – New 400/110 kV SS Valandovo with interconnection (new 400 kV OHL Dubrovo – Valandovo – Thessalonica (GR)), which includes the following main components:
    a. Construction of a new 400/110 kV SS Valandovo
    b. Construction of a new 400 kV OHL Dubrovo – Valandovo – Thessalonica (GR)
    c. Reconstruction of existing 110 kV OHLs Valandovo – Strumica 2 – Strumica 1

The Project element – Reconstruction of the existing 110 kV OHL Valandovo – Strumica (Sub-project 2) - is included in each of the identified Project options. The reconstructed line will replace the existing one by utilising the same route. The existing line will be decomissioned. Wherever possible, the design principles to keep the same number of towers as of the existing line and to use locations of the existing towers for the new towers would be applied. As such, this element was not a comparative factor for the decision-making process for selection of the preferred Project option and was not taken into the comparative analysis of the identified Project options.

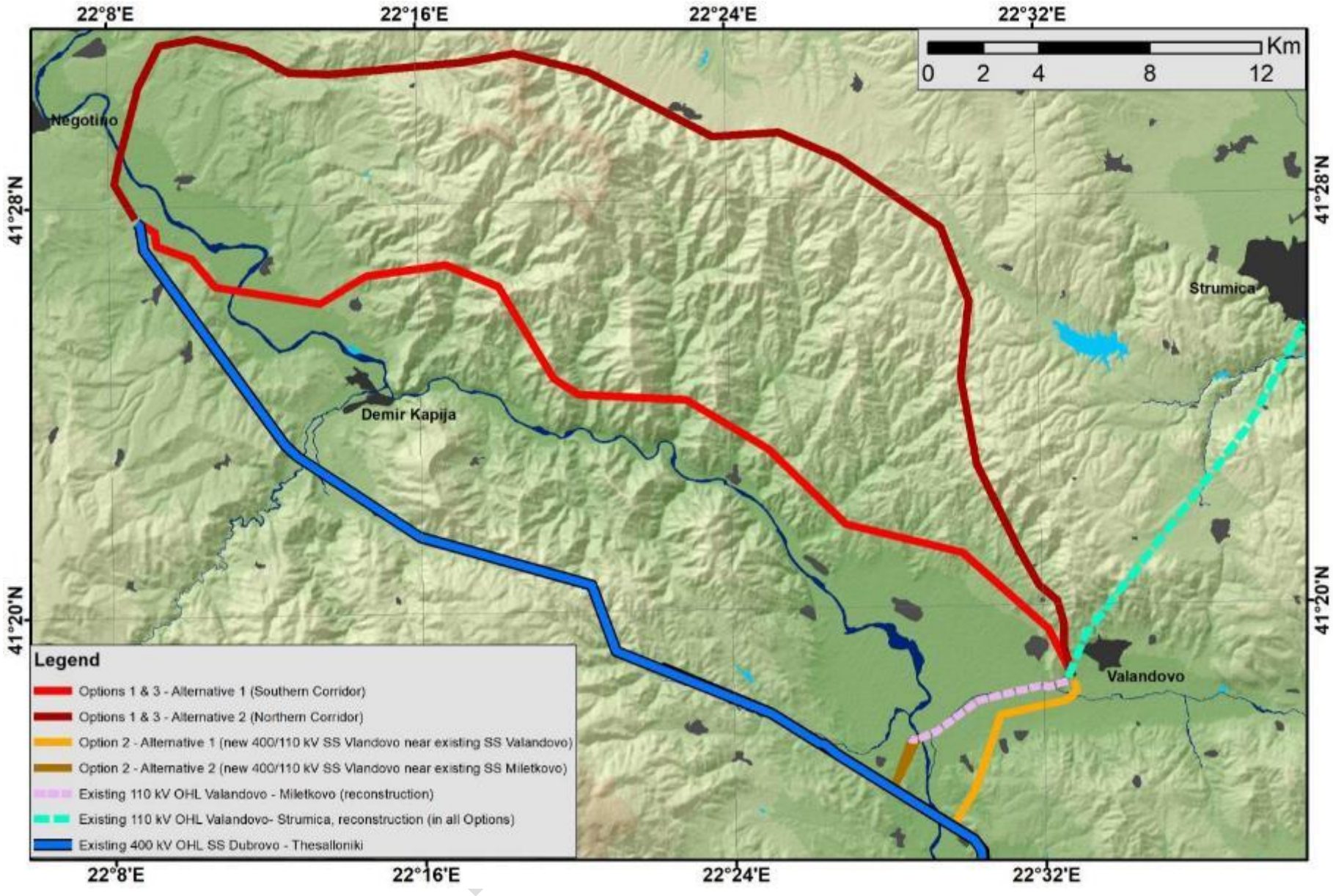


Figure 3.1: Project options and alternatives within Project options

3.1.4 Description of Options

(1) Project Option 1 – Double-circuit 110 kV OHL Dubrovo – Valandovo

Due to the high-level environmental constraints identified in the Project region (see Annex 2), two routing alternative corridors of the 2x110 kV OHL alignment were identified and assessed for this Project option (Figure below):

- Alternative 1 – Southern Corridor

  This corridor is generally routed in parallel with the existing 110 kV OHL Dubrovo- Valandovo, at relative distance of approx. 500 m from its centerline, with one particular deviation aiming to minimise the crossing section with the proposed protected area Demir Kapija Gorge[22]. From its starting point – SS Dubrovo – this alternative goes in parallel with the newly foreseen line for the proposed wind park Dren (Demir Kapija area) and after approx. 4 km it crosses the Vardar River, continuing to the west through a hilly and mountainous terrain, bypassing the settlements in the area. In this section, this alternative corridor runs in parallel with the existing 110 kV line to its ending point - the existing SS 110/35/10 kV Valandovo. The corridor is with an approximate length 41 km.

- Alternative 2 – Northern Corridor

  From its starting point – SS Dubrovo – for approx. 9 km, this alternative corridor is routed in parallel with the 400 kV OHL SS Dubrovo – SS Stip at relative distance of approx. 500 m. From this point, the alignment turns to the east to hilly and mountainous terrain until it reaches the highest point of around 1,000 m a.s.l and then it descends towards the ending point – existing SS Valandovo. At around 38 km from the SS Dubrovo, the corridor turns south reaching the SS Valandovo. The corridor is with an approximate length of 55 km, 14 km longer than the Southern Corridor.

[22] The site proposed for protection - Demir Kapija Gorge (Demirkapiska Klisura) geographically includes the existing Monuments of Nature Demir Kapija and Iberliska Reka, as well as several other sites recognised for future protection: Klisurska Reka, Bela Voda cave, Goren Zmejovec cave, Krastovec, Shtuder and Mala Javorica.

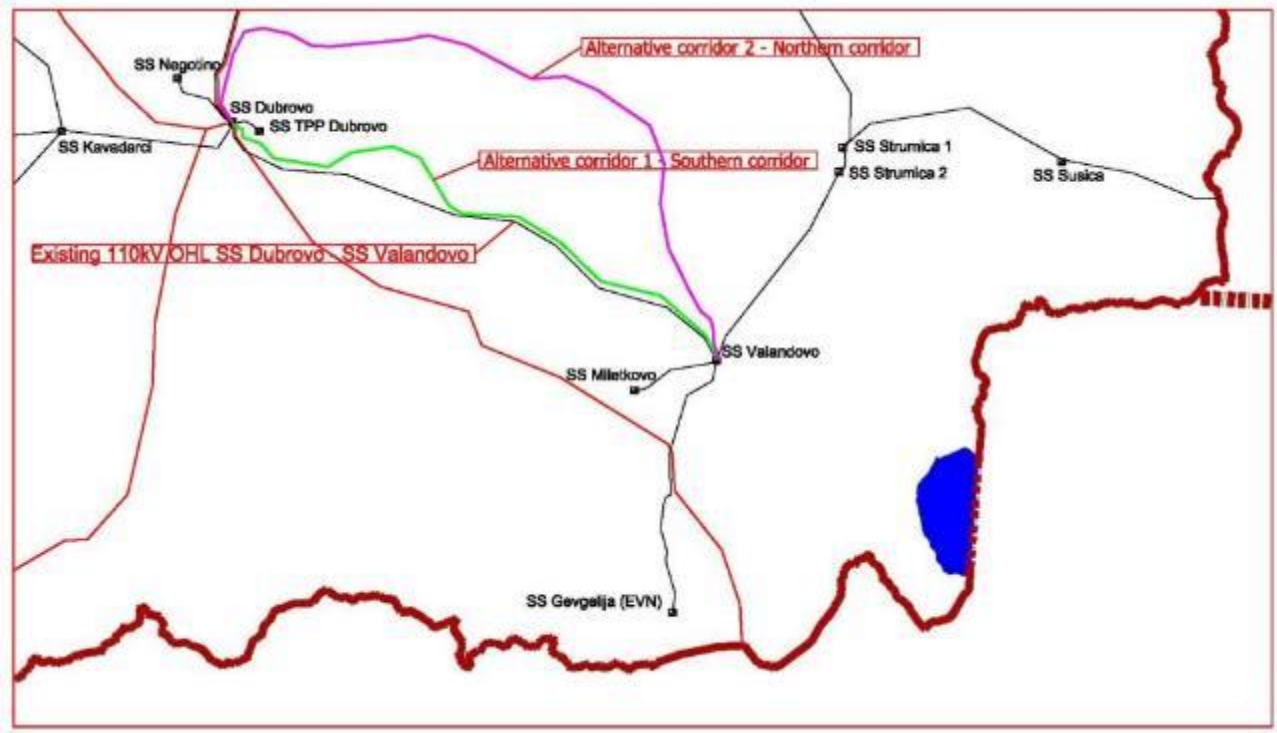


Figure 3.2: Project Option 1 – Double circuit 110 kV OHL Dubrovo – Valandovo, alternative corridors

Source: WB21-MKD-ENE-03 North Macedonia, Strengthening the Transmission Network in the Southeast Region of North Macedonia - Component 1; Selection of the preferred Option, September 2021 [Ref.4]

This option also includes extension of the SS Dubrovo to accommodate the proposed new 2x110 kV line, including a new 400/110 kV power transformer with respective new 400 kV and 110 kV transformer bays, as well as extension of the existing SS Valandovo with new 110 kV bays to accommodate the connection with the new 2x110 kV line and new renewable energy sources planned in the Project region.

(2) Project Option 2 - New 400/110 kV SS Valandovo and lead in-out of existing 400 kV OHL Dubrovo – Thessalonica (GR)

This option includes two alternatives of the location of the proposed new 400/110 kV substation, resulting in different layout of the OHL connectors:

- Alternative 1 – Location 1 - adjacent to existing 110/35/10 kV SS Valandovo

The alternative location 1 for the proposed 400/110 kV substation, located on the territory of the municipality of Valandovo (cadastral area (K.O.) "Valandovo – von grad"), is adjacent to the existing substation Valandovo. There are medium and low voltage lines in the immediate vicinity of the existing substation. The new substation would include construction of 400 kV and 110 kV switchyards with necessary bays and equipment to support the foreseen operation of the facility (see Section 2.2.4). Considering the spatial layout of the location there is space for further extension of both the 400 kV and the 110 kV switchyards in the future.

This alternative also includes a new approx. 7.8 km long 400 kV line - in-out connection of the proposed substation with the existing 400 kV OHL Dubrovo – Thessalonica (GR), which would be realized with two single circuit 400 kV lines (Figure below). From its starting point - the new SS 400/110 kV Valandovo – the corridor of these lines is routed in the south – southwest direction, avoiding the settlements in the area (villages Brajkovci, Balinci and Marvinci) and connecting to the existing 400 kV OHL in proximity to the village Grchiste.

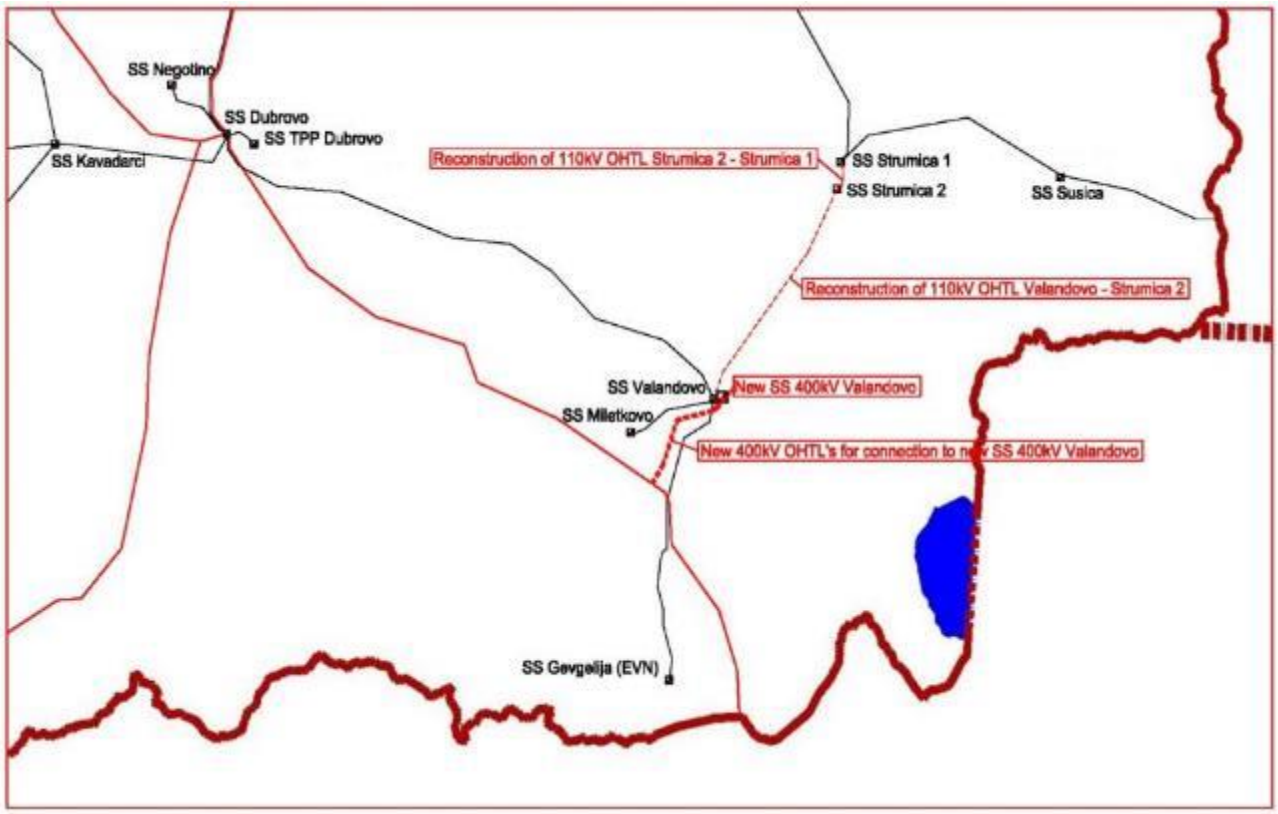


Figure 3.3: Project Option 2 – New 400/110 kV SS Valandovo and lead in-out of existing 400 kV OHL Dubrovo – Thessalonica (GR), Alternative 1

Source: WB21-MKD-ENE-03 North Macedonia, Strengthening the Transmission Network in the Southeast Region of North Macedonia - Component 1; Selection of the preferred Option, September 2021 [Ref.4]

- Alternative 2 – Location 2 - in vicinity to existing 110/25 kV SS 'EVP' Miletkovo in proximity of the A1 highway

The alternative location 2 of the proposed 400/110 kV substation, located on the territory of the municipality of Gevgelija (cadastral area "Smokvica"), is in the vicinity of the 110/25 kV SS 'EVP' Miletkovo, right next to the A1 highway Demir Kapija Smokvica, at around 7.5 km from the existing substation Valandovo. There are no existing surrounding structures or other transmission lines, with an exception of the existing 400 kV OHL Dubrovo – Thessalonica (GR), which is to be connected to the new substation via approx. 0.5 km long in-out connector. This connection would include only minor intervention for dislocation of several existing 400 kV towers to ensure the connection to the new SS Valandovo.

The conceptual technical solution of the substation is equivalent to the previously described solution with respective differences related to the 110 kV bays which would serve to connect the new 400/110 kV substation with the existing 110 kV network in the Project region.

The general overview of this alternative is given in the Figure below.

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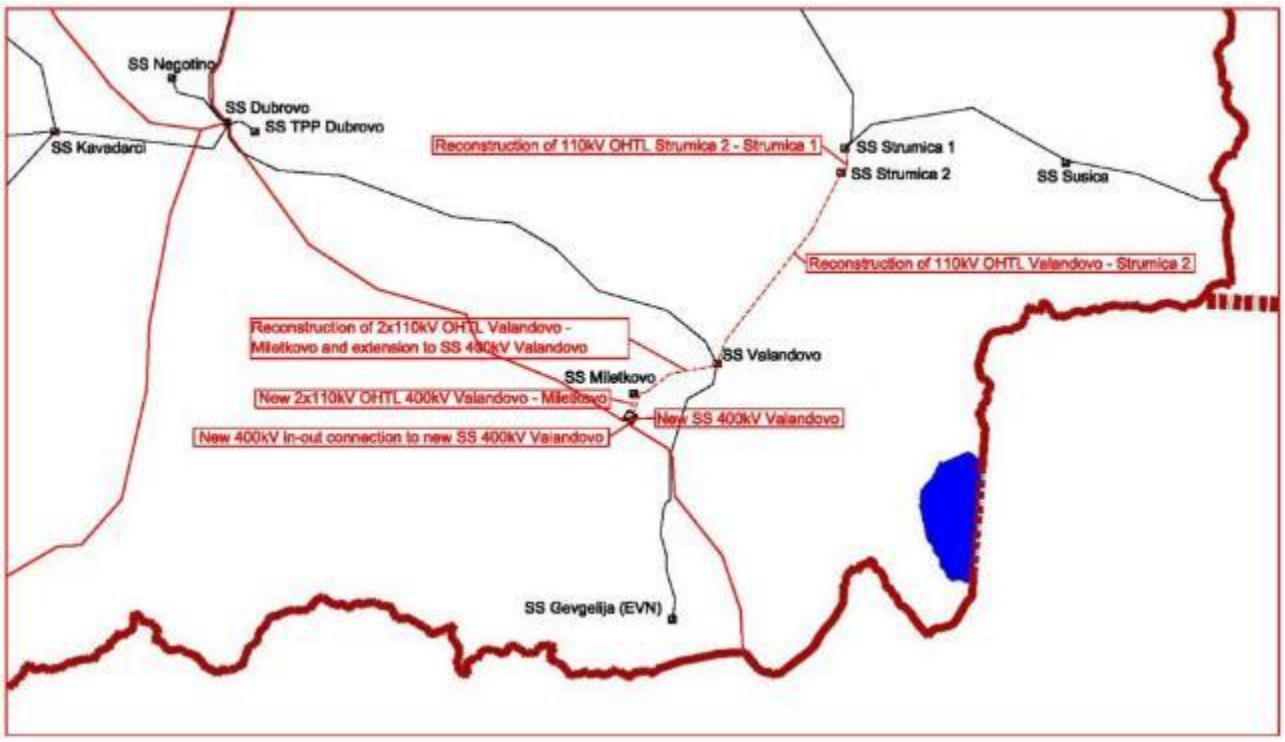

Figure 3.4: Project Option 2 – New 400/110 kV SS Valandovo and lead in-out of existing 400 kV OHL Dubrovo – Thessalonica (GR), Alternative 2

Source: WB21-MKD-ENE-03 North Macedonia, Strengthening the Transmission Network in the Southeast Region of North Macedonia - Component 1; Selection of the preferred Option, September 2021 [Ref.4]

The following interventions to provide connection of the new substation with the existing 110 kV transmission network in the Project region are constituent elements of this alternative:

- Reconstruction/upgrade of existing double-circuit 110 kV OHL from Valandovo to Miletkovo and extension to the new 400/110 kV SS Valandovo

This approx. 6.4 km long existing 110 kV line would be reconstructed and extended to connect the new 400/110 kV SS Valandovo with the existing 110/35 kV SS Valandovo. According to the existing technical data (engineering design, longitudinal profiles and the safety clearances of the line), the intervention would include new phase conductors with larger cross-section as well as possible rearrangements of the towers, upgrading the towers with appropriate elements to increase their height and use of a several new towers, where necessary.

- Construction of new double-circuit 110 kV from the new SS Valandovo to existing 'EVP' SS Miletkovo

In addition, a new 2x110 kV line would need to be built from a point in proximity to the SS 'EVP' Miletkovo to the new 400/110 kV substation with an approximate length of 1.8 km, in order to complete the connection of new substation with the existing SS Valandovo.

(3) Project Option 3 – New 400/110 kV SS Valandovo with interconnection (new 400 kV OHL Dubrovo – Valandovo – Thessalonica (GR))

This option (Figure below) includes construction of a new 400/110 kV SS Valandovo adjacent to the existing SS Valandovo, same as the respective element of the Project Option 2, Alternative 1 as described in the previous sub-section.

In addition, it foresees construction of a new single-circuit 400 kV OHL Dubrovo – Valandovo – MK/GR border (further to Thessalonica (GR)), designed with 'Y' towers, standardised in the Macedonian transmission system, and composed of two separate sections:

(1) Section SS Dubrovo - SS Valandovo

Two alternative corridors were identified in this section. These are identical in geographic context to the OHL routing alternatives identified and assessed in the scope of the Project Option 1 Alternative 1 – Southern Corridor (approx. 41 km long corridor) and Alternative 2 – Northern Corridor (approx. 55 km long corridor).

(2) Section SS Valandovo - MK/GR border

This section would be approx. 24 km long, with the first segment of approx. 8 km to be built along the same alignment as described in Project Option 2, Alternative 1. The remaining 16 km would be built in parallel with the existing 400 kV OHL SS Dubrovo - MK/GR border.

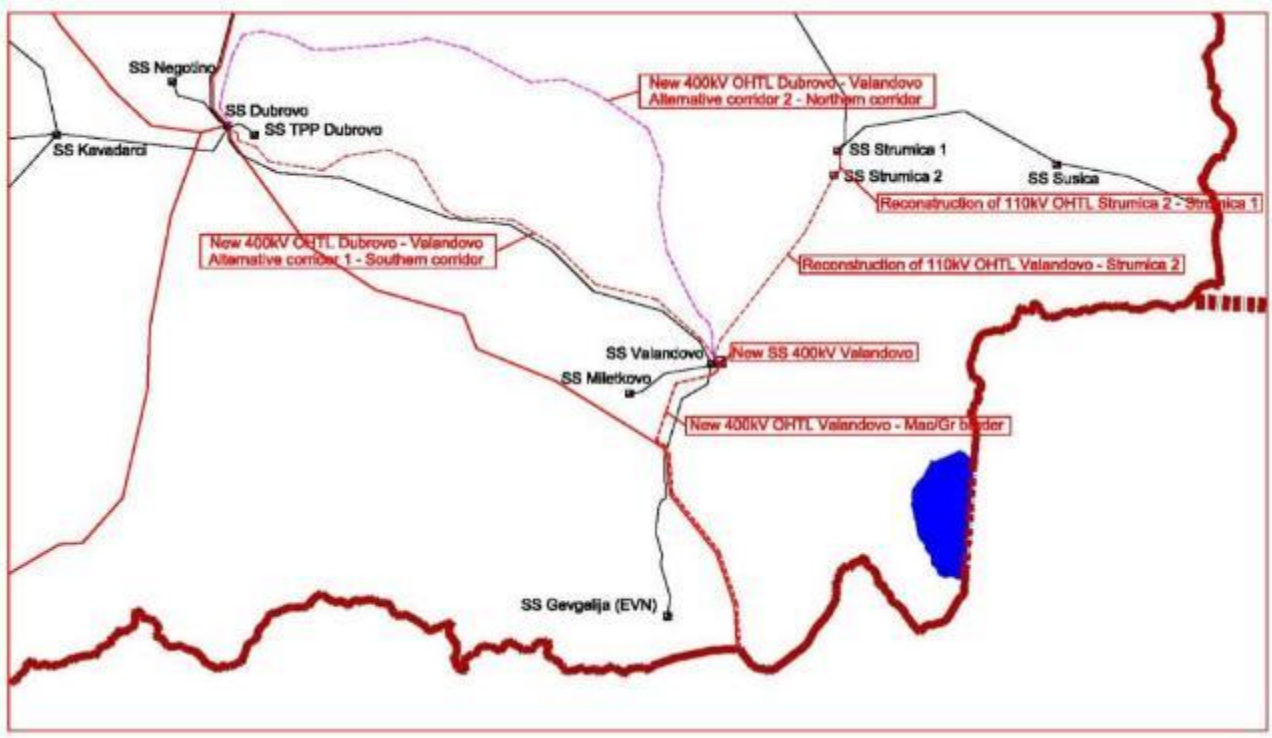

Figure 3.5: Project Option 3 – New 400/110 kV SS Valandovo with 400 kV interconnection (Dubrovo – Valandovo – Thessalonica (GR)), alternative corridors

Source: WB21-MKD-ENE-03 North Macedonia, Strengthening the Transmission Network in the Southeast Region of North Macedonia - Component 1; Selection of the preferred Option, September 2021 [Ref.4]

3.1.5 Assessment of Options

Each of the identified Project options and alternatives within the options has been preliminary evaluated from multi-criteria perspective, including strategic development aspects (network and marked based appraisal), technical and engineering criteria, environment and social aspects, as well as economics. The key conclusions of this exercise are given below.

Network and Market Based Assessment

Methodology

Network and market benefit study has included two set of elements and comprises the calculation of benefits according to ENTSO-E methodology (Figure below). The target years to calculate these benefits were 2025, 2030 and 2040.

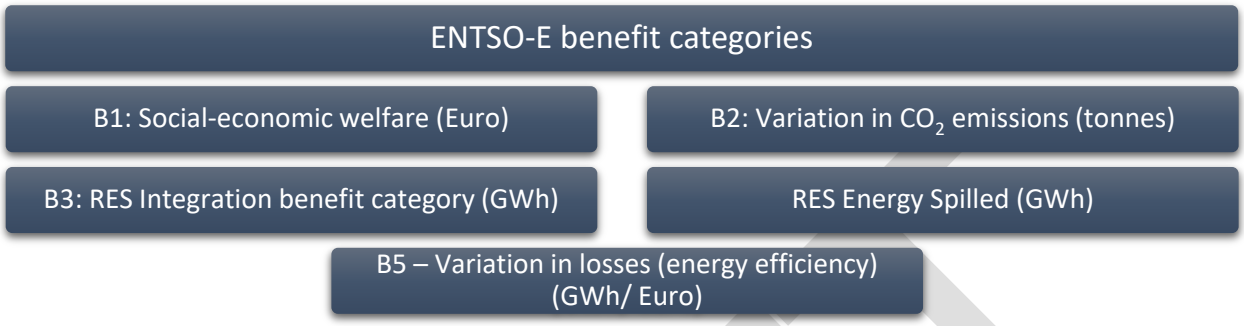

Figure 3.6: Key benefit categories investigated in the network and market based assessment

Source: WB21-MKD-ENE-03 North Macedonia, Strengthening the Transmission Network in the Southeast Region of North Macedonia - Component 1; Selection of the preferred Option, September 2021 [Ref.4]

In addition, based on the preliminary technical assessment of the Project's options and alternatives within the options, relevant project costs[23] (Figure below) have been provided and the respective economic benefit and cost element, i.e. the benefit/cost ratio (Net Present Value - NPV) for each identified Project option has been calculated.

Figure 3.7: Costs categories investigated in the economic assessment

Source: WB21-MKD-ENE-03 North Macedonia, Strengthening the Transmission Network in the Southeast Region of North Macedonia - Component 1; Selection of the preferred Option, September 2021 [Ref.4]

This economic assessment includes a comparison of costs and benefits that the Project would cause to the society, in order to assess its economic viability and the final effect on the economy of the country and the region as a whole.

Key Findings and Conclusions

The Project's network and market based assessment has indicated the following key conclusions [Ref.4]:

[23] Capital expenditure (CAPEX). This indicator reports the capital expenditure of a project, which includes elements such as the cost of obtaining permits, conducting studies, obtaining rights-of-way, ground, preparatory work, designing, dismantling, equipment purchase and installation.

Operational expenditure (OPEX). These expenses are based on project operating and maintenance costs.

- The results of the analyses have shown that in 2025 there are no particular benefits from any of the identified options. Social Economic Welfare (SEW)[24] is negative for all three options, while the losses are even decreased in Option 1.
- All identified options increase Change of Evacuation Capacity (GTC) and provide sufficient reserve for installation of additional production capacities in South-East region of Macedonian transmission system. Option 2 and Option 3 are in a favour to Option 1 related to GTC increase, which means those two options facilitate additional penetration of renewable energy sources in the Project region.
- The main benefits from realisation of the Project would start from 2030, so any of these three options is advised to be realised.
- Regarding the CO_2 emission reduction, Option 2 provides the best results, decreasing the emission up to 5,200 t in 2030 and 31,000 t in 2025, while in 2030 the Option 3 brings the maximum of CO2 emissions reduction, by 4,700 t. This calculation is based on RES integration (unlock of generation with lower carbon content), defined as the ability of the system to allow the connection of new RES plants and unlock existing and future "green" generation, while minimizing curtailments [Ref.7].

Based on these considerations, the assessment recommends the Option 2 as preferable one from the reduction of energy curtailed from renewable energy sources in the Project region, from the biggest losses reduction, and increase of additional capacity reserve in the region.

This assessment concludes that the upgrade of the existing network in the Project region is necessary to support integration of the renewable energy sources and increase of Macedonian social-economic welfare.

Technical Appraisal

Methodology

The identified Project options and alternatives within the options have been preliminary assessed against set of technical criteria, comprising a number of design and engineering factors relevant for comparison of the options:

- Terrain conditions and topography for the new 400/110 kV substation and the corridors for the new overhead lines;
- Availability of free OHL corridors for new connections of renewable energy sources
- Land availability for the new 400/110 kV substation;
- Required upgrade of existing transmission assets (line and substations)
- Climate parameters for the new transmission infrastructure;

Key Findings and Conclusions

The Project's technical assessment has indicated the following key conclusions [Ref.4]:

[24] Socio-economic welfare (SEW) is characterized by the ability of a power system to reduce congestion and thus provide an adequate Change of Evacuation Capacity (GTC) so that electricity markets can trade power in an economically efficient manner. The reduction of congestions is an indicator of social and economic welfare assuming equitable distribution of benefits under the goal of the European Union to develop an integrated market (perfect market assumption). [Ref.7]

- Project Option 1 requires construction of a new 2x110 kV line (either 41 km or 55 km), which from the previous experience with the construction of this type of facilities would require significant efforts. In addition, a larger reconstruction/expansion of the existing SS Valandovo is needed (due to the connection of new RES) which will cause continuous operational challenges at the substation.
- Project Option 2:
  - Alternative location 1 for the new 400/110 kV substation is near agricultural, industrial and small business facilities that reduces the possibility of access to new OHL corridors for connections of renewable energy sources. Also, the spatial constraints of the location reduce the possibility for future extensions.
  - Alternative location 2 for the new 400/110 kV substation is a completely new location without urban and land-use challenges. The short connection (approx. 500 m) of the substation at 400 kV voltage level is simple and cost effective.
- Project Option 3 requires construction of long 400 kV OHL which is certainly an extensive and demanding process.

Based on these considerations, the assessment recommends the Option 2, Alternative 2 as preferable one from the technical / construction point of view due to the following main benefits:

- Construction of long new transmission line(s) - 110 kV or 400 kV - is not required;
- The least interventions (reconfiguration and extensions) in the existing transmission assets in the Project region;
- The least impact on the existing operation of the power system;
- Available local and national roads and railway infrastructure near the proposed location of the substation;
- Possibility to connect sufficient number of new 110 kV lines for future renewable energy sources and expansion of the proposed 400/110 kV substation.

Environmental and Social Appraisal

Methodology

From E&S perspective, the methodology of the selection process for the preferred Project option / alternative has been based on a preventive approach giving preference to avoidance and prevention of likely impacts and by consideration of feasible locations of the proposed substation and feasible routeing variants of the transmission lines. The methodology includes a combination of environmental and social criteria which would allow for an optimized and sound selection process. The following key environmental and social criteria have been employed:

- Social aspects / settlements (community safety, proximity to people and communities): Avoid interaction with residential zones and properties, as much as practicable, in order to ensure compliance with public exposure limits to electro-magnetic radiation and operational noise and to avoid public health and safety risks, as well to minimize likelihood of any physical resettlement due to SS and OHL infrastructure and safety zones (right of way);
- Social aspects / land cover and land use forms: Avoid as much as practicable valued land cover forms as well as agricultural lands, woodlands and lands of high social and economic values, etc. to minimize land acquisition and involuntary resettlement needs;

- Biodiversity sensitive zones (nationally protected areas and/or internationally recognised areas; wetlands, flood plains, riparian areas, water resources): Avoid, as much as practicable, those areas rich in biodiversity and sensitive zones;
- Landscape / aesthetics: Avoid scenically important areas where the proposed transmission line may negatively affect the landscape values;
- Cultural / archaeological heritage: Avoid the sites or objects classified as historic or having an archaeological heritage;
- Water environment: Minimise adverse effects due to watercourse crossings.

Key Findings and Conclusions

<u>Project Option 1 (also applicable to Project Option 3)</u>

- The Southern Corridor crosses three Macedonian municipalities: Negotino, Demir Kapija and Valandovo, passing through the administrative territory of twelve rural settlements and outskirts of Valandovo, with a total of 9,571 inhabitants (including Valandovo as a whole).
- The Northern Corridor crosses three Macedonian municipalities: Negotino, Konche and Valandovo, passing through the administrative territory of eight rural settlements (four of them abandoned) and outskirts of Valandovo, with a total of 4,402 inhabitants (including Valandovo as a whole).
- The Southern Corridor crosses one legally protected area and one area proposed for legal protection which is considered as significant environmental constraint. These are:
  - Nature Park Iberliska Reka, crossed in very short section of approximate length of 100 metres.
  - Demir Kapija Gorge (Demirkapiska Klisura), proposed for protection, crossed in approx. 3.9 km long section.
- In addition, the Southern Corridor crosses three internationally recognized areas:
  - IBA Tikvesh Region and IBA Demir Kapija Gorge crossed in 11 km and 9.6 km long sections, respectively, as well as IPA Demir Kapija, crossed in 0.5 km long section.

  The crossings of both IBAs are considered as significant environmental constraint, although IBA Tikvesh Region cannot be avoided since the SS Dubrovo is situated within this site. If this Option/Alternative is selected as a preferred one and put forward for further development, special attention would need to be paid on the mitigation strategy for minimizing the risks to birds populations (vultures and birds of prey) in IPA Demir Kapija Gorge, including further routing modifications as an primary avoidance strategy.
- The Northern Corridor does not cross legally protected areas or areas proposed for legal protection. It crosses one internationally recognized area - IBA Tikvesh Region, crossed in 5.6 km long section.
- Both alternatives have very similar coverage within the study area (1,000 m wide OHL corridor) of forest and shrublands which are dominant sensitive land cover type - approx. 65% (Southern Corridor) and 60 % (Northern Corridor), as well as very similar coverage of agricultural land with mutual difference of less than 10%.

- Both identified OHL corridors have six crossings over permanent natural watercourses. The length of all these crossings would not require special technical design solutions.
- No major constraints were identified from the social aspect – proximity to properties - that would constitute significant project compliance risk. Several particular locations with social sensitivities within the study area (1,000 metres wide corridor) which require further avoidance actions are identified along both OHL corridors.
- Several cultural resources - eight and five archaeological sites are identified within study area (1,000 m wide corridor) along the identified corridors, respectively along the Southern Corridor and the Northern Corridor. None of these is directly crossed by the centerline of the OHL corridors.

Project Option 2

- Project Option 2, Alternative 1 is located in two Macedonian municipalities: Gevgelija and Valandovo, passing through the administrative territory of four rural settlements with a total of 1,386 inhabitants.
- No settlements are located in proximity to the proposed 400/110 kV substation - Alternative 2 of the Project Option 2.
- Both alternatives of the Project Option 2 are located in environmental area of low sensitivity and no legally protected areas or internationally recognized areas are to be affected by the Project implementation.
- No major constraints were identified from the social aspect – proximity to properties - that would constitute significant project compliance risk. Several particular locations with social sensitivities within the study area (1,000 metres wide corridor) along the Project Option 2, Alternative 1 which require further avoidance actions are identified.
- The Alternative 1 – the corridor In-Out 400 kV OHL Dubrovo – Valandovo – crosses the protected cultural heritage site Gradishor-Mramor, posing a constraint of particular concern. If this alternative is selected as preferred one and put forward for further development, eventual corridor routing constraints or restrictions in respect to this designated site (including eventual need for its full avoidance, if possible) need to be verified by the competent authorities for protection of the cultural heritage throughout the upcoming stakeholder engagement process.

Project Capital Costs

The capital costs (CAPEX) for each of the identified options and alternatives have been estimated by inclusion of the following elements:

- Costs of construction of new 2x110 kV OHL or 400 kV OHL
- Costs of construction of new 400/110kV SS Valandovo;
- Costs of construction of 400 kV and 110 kV lines to be lead-in into the new SS Valandovo;
- Land acquisition, right of way and compensations costs, based on recent implemented projects
- Project procedure costs (construction and other permits, design, project supervision and monitoring, etc.).

The overview of the calculated Project capital cost of each identified option and alternatives within the options is shown in the Table below.

Project Options / Alternatives within Options	Project Costs (000 €)
Option 0 (No Project)	
No Project	0
Option 1	
Option 1 - Alternative 1	16,890
Option 1 - Alternative 2	20,390
Option 2	
Option 2 – Alternative 1	21,530
Option 2 – Alternative 2	18,960
Option 3	
Option 3 - Alternative 1	36,000
Option 3 - Alternative 2	39,920

Table 3.1: Overview of Project costs per identified option

Note: The above costs include the costs related to the reconstruction of 110 kV OHLs Valandovo – Strumica 2 and Strumica 2 – Strumica 1 (Sub-project 2), although it does not affect the results of the selection process and the Multi-Criteria Assessment, due to the fact that this reconstruction will be done for each of the options.

Source: WB21-MKD-ENE-03 North Macedonia, Strengthening the Transmission Network in the Southeast Region of North Macedonia - Component 1; Selection of the preferred Option, September 2021 [Ref.4]

In this stage of the Project development, the capital costs are considered as indicative.

The assessment results summarised in the Table above clearly demonstrate that all options are competitive in sense of project costs.

However, there is a significant difference of approximately 90% between Option 2 and Option 3, Alternative 2 (the most expensive option) and 236 % between Option 1 (the cheapest option) and Option 3, Alternative 2, related to the overall price.

Preliminary Economic Analysis

The following is a comparative overview of the results of the economic analysis for the Project options and alternatives within the options. The results of this economic NPV calculation and economic indicators for Macedonia are summarised in the following Table.

Economic indicators	Option 1		Option 2		Option 3	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Investment cost (000 €)	16,890	20,390	21,530	18,960	36,000	39,920
NPV (000 €)	52,407	48,676	158,023	160,763	85,408	81,229

Table 3.2: Project economic indicators

Source: WB21-MKD-ENE-03 North Macedonia, Strengthening the Transmission Network in the Southeast Region of North Macedonia - Component 1; Selection of the preferred Option, September 2021 [Ref.4]

Observing the values of positive NPV, the total benefit that the construction brings to the Macedonia amounts from 48.68 million EURO in Option 1, Alternative 2 to 160.76 million EURO in Option 2, Alternative 2 (expressed in the present value of money).

On the basis of the presented economic indicators, it can be concluded that the Project brings significant benefits for Macedonia.

3.2 Selection of Preferred Option

3.2.1 Evaluation of Options - Multi-Criteria Analysis

The Multi-Criteria Analysis procedure requires (i) the establishment of the set of criteria that should measure each option's / alternative's performance against the objectives, and (ii) the assessment of the options / alternatives. The assessment has included the following steps:

- Definition of the criteria "weights", in order to reflect and illustrate their relative importance;
- Scoring of each option against the criteria;
- Combination of weights and scores to calculate each option's overall score;
- Ranking the options according to their scores.

Three main criteria categories have been defined for the Project (Table below): (i) network and market based criteria, with two sub-categories – non monetised benefits and monetised benefits and costs; (ii) engineering or technical criteria, and (iii) environmental and social criteria, with two sub-categories - environmental elements and social elements. Comparative assessment of these three categories and associated sub-categories has resulted in the category weights as presented in the Table below.

Each criteria category consists of different selected criteria, as documented in the respective report[25].

No.	Criteria category (group of indicators)	Weight (%)
	Network and market based	
1	Non-monetised benefit elements	20
2	Monetised benefit and cost elements	25
	Sub-total:	45
	Engineering / Technical	
3	Technical elements and location assessment	25
	Sub-total:	25
	Environmental and social	
4	Environmental elements	15
5	Social elements	15
	Sub-total:	30
	Total (1 to 5):	100

Table 3.3: Criteria categories for Multi-Criteria Analysis, with their weighting factors

3.2.2 Selection of Preferred Option

The selection process of the preferred Project option via the above MCA approach and methodology and based on the evaluation of each identified option against the selected criteria has indicated that preferred option would be the Option 2, Alternative 2 - New 400/110 kV SS Valandovo and lead in-out of existing 400 kV OHL Dubrovo – Thessalonica (GR).

[25] WB21-MKD-ENE-03 North Macedonia, Strengthening the Transmission Network in the Southeast Region of North Macedonia - Component 1; Selection of the preferred Option, September 2021 [Ref.4]

The rationale behind this recommendation is as follows [Ref.4]:

- System studies and economic assessment

  According to the results of system studies, Option 2 is indicated as the best one from the reduction of energy curtailed from RES in the Project region, from the biggest losses reduction, and increase of additional capacity reserve.

  From economic assessment point of view, the Project brings sufficient monetised benefits to Macedonia and it is economically viable for the society and the national economy as a whole. The assessment has indicated the preferred option (Option 2, Alternative 2) is the most viable option / alternative from economic point of view.

- Technical assessment and E&S aspects

  From the technical as well as from the environmental and social perspective, the Option 2, Alternative 2 is superior in comparison to other identified Project options and respective alternatives, since:

  - It does not require construction of new long 110 kV or 400 kV overhead line and, therefore, it implies the least land-take needs and land cover / land use changes;
  - It implies the least interventions (reconfiguration and extensions) in the existing transmission assets in the Project region and, therefore, the least impact on the existing operation of the power system;
  - There are no settlements in proximity to the Project locations and no operational community safety risks (e.g. public exposure to electro-magnetic radiation or nuisance due to corona noise) are likely to occur;
  - It implies the least potential impact magnitude to sensitive habitats in the Project region;
  - It does not interact with any legally protected area or internationally recognised area in the Project region;
  - It implies the least potential impact magnitude on agricultural land and, therefore, will likely result in the least compensation arrangements;
  - There are no cultural heritages sites and resources in proximity to the Project locations.

The preferred Project option consists of the following components:

- Construction of a new 400/110 kV SS Valandovo, located in Miletkovo area (Gevgelija municipality), with its connection to the existing 400 kV and 110 kV transmission network (Sub-project 1) via the following interventions:
  - In-out, approx. 0.5 km long, connection with the existing 400 kV line from SS Dubrovo to Thessalonica (GR)
  - Upgrade of the the existing approx. 6.4 km long 110 kV transmission line from SS Valandovo to SS 'EVP' Miletkovo and its extension to the new 400/110 kV SS Valandovo.
  - Construction of a new approx. 1.8 km long 110 kV OHL connector with the existing SS 'EVP' Miletkovo
- Reconstruction of the existing approx. 17.7 km long 110 kV OHL Valandovo – Strumica (Sub-project 2).

Based on the subsequent review and consultative process with key relevant stakeholders[26], this proposal was accepted by MEPSO in their capacity as Project Beneficiary and EBRD in their capacity as lead IFI in October 2021 and it will be further elaborated during the on-going project activities (Conceptual Solution and accompanied ESIA).

The preferred Project option is shown in Annex 1.

[26] For more details see: WB21-MKD-ENE-03 North Macedonia, Strengthening the Transmission Network in the Southeast Region of North Macedonia - Component 1; Stakeholder Engagement Plan, September 2021 [Ref.5]

4. Categorisation of the Project

4.1 National EIA Standards

4.1.1 Introduction

- EIA Projects

The Macedonian "Decree on determining of projects and criteria upon which the need for an environmental impact assessment (EIA) is established" (OG of RM no.74/05, 109/09 & 164/12) – the EIA Decree determines the projects that may require environmental impact assessment. This legal instrument transposes the requirements of the EU EIA Directive[27].

Under the EIA Decree, projects are classified in two groups: projects listed in Annex I are all subject to compulsory EIA while for projects in Annex II, the assessment contains and element of discretion, noting that an EIA procedure will, in any event, be required for projects with potentially significant environmental impacts. For the projects listed in Annex II, the national competent authority[28] should determine whether an EIA is required. This is to be done through a formalised and legally regulated EIA screening process based on a 'Notification of intent to implement a project'[29] submitted to the competent authority by the project proponent.

OHL developments fall within the scope of the EIA Decree in the:

(i) Annex I – Projects which are subject to compulsory EIA, Section 17 – "Overhead transmission lines of 110 kV voltage or higher, and longer than 15 km".

(ii) Annex II – Projects which may be subject to EIA (formalised screening is required), Section 3 - Energy, item 'b' – "Industrial installations for transmission and distribution of gas, steam and hot water and for transmission and distribution of electricity with overhead lines (projects not included in Annex I)."

In wider context, the EIA Decree foresees a possibility for existing projects listed in this regulation which are subject to change to be subject to EIA. These are listed in Annex II:

(iii) Annex II – Projects which may be subject to EIA (formalised screening is required), item 16 – "Any modification or extension of the projects listed in Annex I or Annex II, existing, approved, executed projects or projects in the process of implementation, which could have significant adverse effects on the environment."

[27] Council Directive on the assessment of the effects of certain public and private projects on the environment (Council Directive on the assessment of the effects of certain public and private projects on the environment)

[28] The Macedonian Ministry for Environment and Physical Planning (MEPP) is a national EIA competent authority.

[29] In Macedonian: "Известување за намерата за спроведување на проектот"

- Non EIA Projects

For projects which are not listed in the EIA Decree or are listed in Annex II of the Macedonian EIA Decree and for which the competent authority determines that an EIA is not required, the project proponent may be requested to prepare a Report ('Elaborate') for Environment Protection[30] in compliance with the requirements stipulated in the Macedonian Law on the Environment. The projects for which such 'Elaborate' is required are determined by a respective decree – "Decree on projects and activities for which preparation of an Elaborate for Environment Protection is compulsory" (OG of RM no.80/09 & 36/12). According to this decree, section V – Energy, item 7, an 'Elaborate' is to be prepared for:

(i) "Industrial installations for transmission and distribution of gas, steam and hot water and for transmission and distribution of electricity with overhead lines".

- Summary

An overview of the Macedonian regulatory context for an environmental assessment of projects is provided in the Figure below.

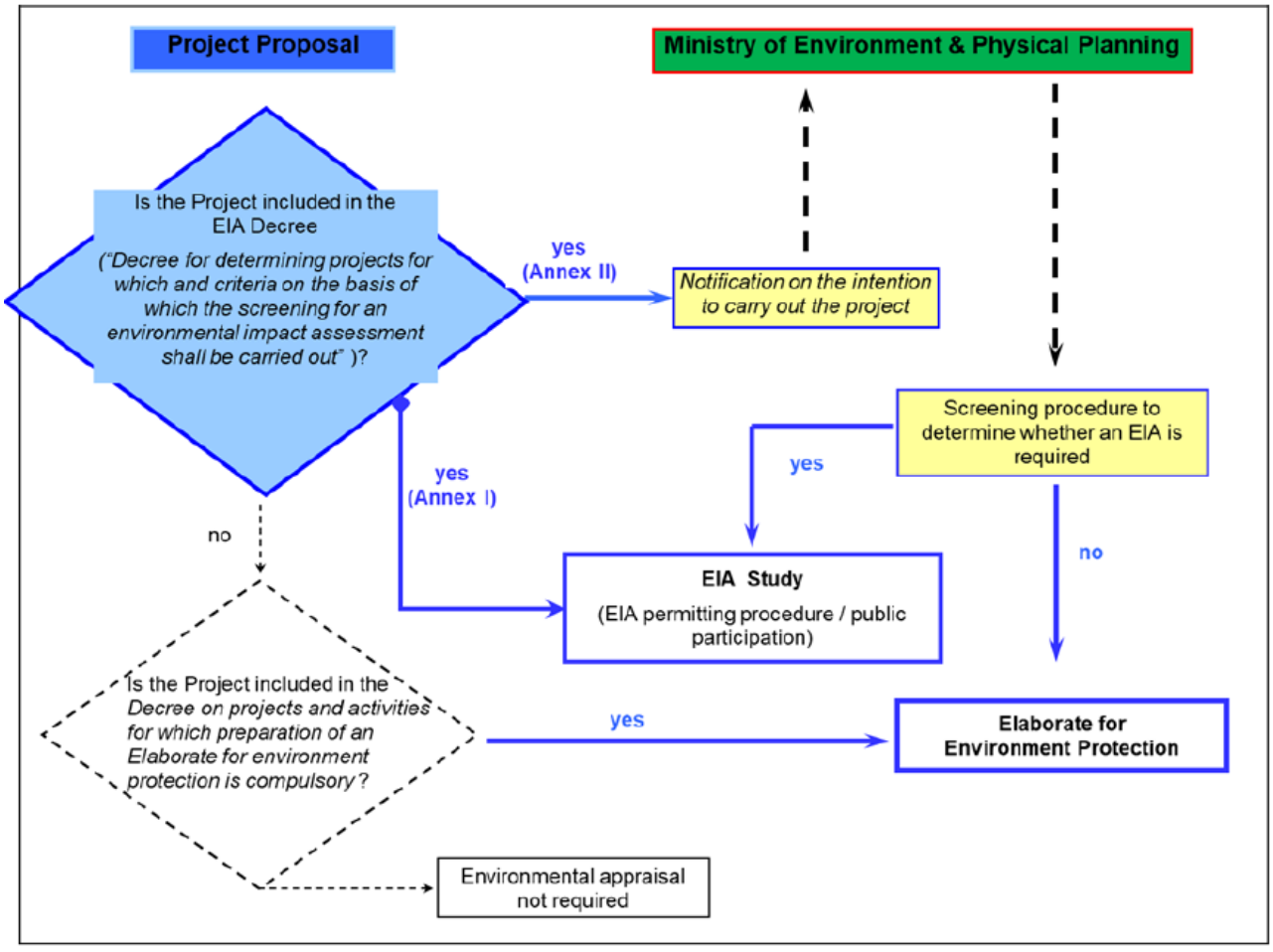

Figure 4.1: Brief summary of the Macedonian regulatory context for environmental assessment

[30] In Macedonian: 'Елаборат за заштита на животната средина'.

4.1.2 Categorisation

The Project components (Sub-project 1 and Sub-project 2) are screened against the aforementioned regulation as reported below.

(1) Sub-project 1 - New 400/110 kV SS Valandovo with connection to the existing 400 kV and 110 kV transmission network

This sub-project includes construction of a new high-voltage substation and approx 1.8 km long transmission line as well as modification of an existing approx. 6.4 km long transmission line. As such, according to the national EIA Decree, it is not a subject to compulsory EIA, since it does not meet the cumulative thresholds set under Annex I (Section 17)[31] of the EIA Decree.

The need for an EIA would be determined by the Macedonian EIA authority (MEPP) on case-by-case approach through a formalized administrative screening procedure based on an official application[32)] (request) for establishing the need for EIA. This application is to be submitted to MEPP by MEPSO, in a format prescribed by the relevant national legislation.

(2) Sub-project 2 - Reconstruction of the existing 110 kV OHL Valandovo - Strumica

This sub-project includes modification of existing approx. 17.7 km long transmission line. Therefore, the need for an EIA would need to be determined by the MEPP on case-by-case approach based on an official application for establishing the need for EIA submitted by MEPSO, in a format prescribed by the relevant national legislation.

4.2 EBRD Requirements

4.2.1 Introduction

The EBRD Environmental and Social Policy (2019) (ESP) categorises projects as A, B or C to determine the nature and level of environmental and social investigations, information disclosure and stakeholder engagement required. The categorisation corresponds to the nature, location, sensitivity, scale and likely significance of adverse effects of the project. The Policy also defines a categorisation tool for projects based on the potential environmental and social impact of proposed financing [Ref.13]:

1. Projects are classified as Category A when the project receiving EBRD funding could result in potentially significant adverse future environmental and/or social impacts which, at the time of screening, cannot readily be identified or assessed. A formalised and participatory environmental and social impact assessment (ESIA), in accordance with the Performance Requirements established under the EBRD E&S Policy (2019), is therefore required to identify and assess the future E&S impacts associated with the proposed project, identify potential environmental improvement opportunities, and recommend any measures needed to pre-

[31] Section 17 of the national EIA Decree's Annex I: 'Overhead transmission lines of 110 kV voltage or higher, and longer than 15 km'.

[32] 'Notification of intent to implement a project'. The scope of this document is legally determined by the 'Rulebook on the information contained in the notification of intent to undertake a project and the procedure for establishing the need for environmental impact assessment of a project' (2006).

vent, minimise and mitigate adverse impacts. A list of Category A projects is presented in the Policy (refer to EBRD E&S Policy, Appendix 2: 'Category A Projects'[33]).

2. Projects are classified as Category B when the project receiving EBRD funding could result in future environmental impacts which are less adverse than those of Category A projects. These impacts are typically site-specific, and/or readily identified and addressed through effective mitigation measures and therefore no formalised and participatory ESIA is required. Typically, an Environmental and Social Assessment is required, commensurate with, and proportional to, the potential impacts and issues of the Project.
3. A project is categorised C when the project receiving EBRD funding is likely to have minimal or no potential adverse environmental and/or social impacts and therefore requires neither an ESIA nor an E&S Assessment.

4.2.2 Categorisation

The transmission projects are generally included in the list of Appendix 2 of the EBRD E&S Policy document (2019), item 24: 'Construction of high voltage overhead electrical power lines'. No specific technical or other thresholds for overhead lines that would explicitly categorise the OHL projects are set under this list. Since the EBRD ESP is aligned with the EU EIA Directive (see next section), a power line of a voltage level over 220 kV is considered as a high voltage power line.

Since this list is of indicative nature, in order to assess environmental and social category of the Project components, a typical screening matrix tailored to the Project specifics was used to assess their likely E&S aspects. It is based on specific environmental and social criteria that reflect the nature, location, sensitivity and scale of the Project components with an aim to support their categorisation. This screening exercise is summarized in the Table below.

[33] The list of Category A Project given in the EBRD ESP (2019) 'applies to "greenfield" or major extension or transformation-conversion projects in the categories listed below. The types of projects listed below are examples of projects that could result in potentially significant environmental and/or social impacts that are additional and new and therefore require an environmental and social impact assessment. The categorisation of each project will depend on the nature and significance of any actual or potential environmental or social impacts that are additional and new, as determined by the specifics of nature, location, sensitivity and scale of the project.' [Ref.13]

Screening item	Project Component (Sub-project)							
	Sub-project 1				Sub-project 2			
	Project phase				Project phase			
	Construction		Operation		Construction		Operation	
	Yes	No	Yes	No	Yes	No	Yes	No
1. Location:								
Is the project site adjacent to or within any of the following sensitive areas?								
- Proximity of people and settlements		X		X	X (Strumica urban zone)		X (Strumica urban zone)	
- Legally protected area or area proposed of legal protection (e.g. National Park, Monument of Nature, etc.)		X		X		X		X
- Internationally designated area (UNESCO World Heritage site, Ramsar site, etc.) or internationally recognised area (Emerald site, Important Plant Area (IPA), Important Bird Area (IBA), Priority Butterfly Area (PBA), etc.)		X		X	X (IPA Belas-cica)		X (IPA Belas-cica)	
- Legally protected area or area proposed of legal protection (e.g. National Park, Monument of Nature, etc.)		X		X	X (MN Cham Chiflik)		X (MN Cham Chiflik)	
- Other areas of conservation interest		X		X		X		X
- Cultural heritage site		X		X		X		X
- Significant land occupation		X		X		X		X
Is the project location susceptible to extreme natural hazards (earthquakes, landslides, erosion, flooding or extreme or adverse climatic conditions)?		X		X		X		X
2. Potential environmental & social impacts								
Will the project use natural resources which are non-renewable or in short supply?		X		X		X		X
Will the project cause significant impact on air quality (increase the dust level or level of air pollutants)?		X		X		X		X
Will the project lead to significant risks of contamination of land or water from releases of pollutants onto the ground or into surface waters or groundwater?		X		X		X		X
Will the project cause change of surface water bodies, increase water turbidity due to run-off and erosion?		X		X		X		X
Will the project lead to risks to any other areas on or around the location which are important or sensitive for reasons of their ecology e.g. priority / critical habitats, wet-lands, watercourses, coastal zone, mountains, forests or woodlands?		X		X		X		X
Will the project lead to significant loss of vegetation and/or habitat fragmentation?		X		X		X		X
Will the project cause significance visual changes to a valued landscape?		X		X		X		X
Will the project cause generation of significant waste quantities?		X		X		X		X
Will the project generate significant quantities of hazardous wastes (including PCBs from		X		X		X		X

Screening item	Project Component (Sub-project)							
	Sub-project 1				Sub-project 2			
	Project phase				Project phase			
	Construction		Operation		Construction		Operation	
	Yes	No	Yes	No	Yes	No	Yes	No
transformers)?								
Will the project cause noise and/or vibration?	X		X (newly constructed elements		X			X (no new or additional risks)
Will the project cause release of electromagnetic radiation?		X	X (newly constructed elements			X		X (no new or additional risks)
Will the project involve use, storage, transport, handling or production of hazardous substances or explosives?		X		X		X		X
Will the project cause any permanent and/or temporary land acquisition?	X (newly constructed elements			X		X		X
Will the project cause any physical resettlement?		X		X		X		X
Will the project result in social changes (in demography, traditional lifestyles, employment, etc.)?		X		X		X		X
Will the project require new access road(s)?	X			X		X		X
Will the project cause disturbance to the existing traffic / transportation in the affected area?	X			X	X			X
Will the project cause occupational and/or community health and safety risks?	X		X (newly constructed elements		X			X (no new or additional risks)
Will the project cause improvement in regard to the current community health and safety risks?							X (Strumica urban zone)	

Table 4.1: Environmental and social screening of the Project components

(1) Sub-project 1 - New 400/110 kV SS Valandovo with connection to the existing 400 kV and 110 kV transmission network

This sub-project would imply limited land-take for the new substation and for construction of the associated new (short) transmission connectors. No physical displacement of people will occur. In addition, no new land-take is expected for the elements of this sub-project which are subject to reconstruction / upgrade activities, since their footprint will remain as it is due to the fact that the reconstructed line will be of same 110 kV voltage level as the existing infrastructure Therefore, no significant involuntary resettlement or economic displacement would occur. The construction of the sub-project would cause typical E&S impacts - localised dust generation and air emissions, construction noise emission and waste generation as well as disturbance of the local traffic in the Project area. All these impacts are temporary, reversible and of localized nature and therefore are considered as of minor significance. They can be mitigated with standardized mitigation measures of good construction practice and E&S management. No significant impacts on natural habitats, forests or biodiversity as well as to the valued landscapes are expected, since no additional vegetation clearance would be required as there is already established clearance corridor along the existing line which would be replaced. This sub-project would not cause impact to any legally protected area or internationally designated area. Occupational health and safety (OHS) risks (e.g. working on height, electrocution, etc.) may arise but would be prevented and controlled by necessary technical standards and OHS planning.

The operation of the new substation and associated new transmission connectors would generate community health and safety risks - electric and magnetic fields and audible noise from the operational transmission equipment. These impacts could be mitigated by employing the necessary technical standards and since this Project component is distant from the settlements, these impacts are considered as of very low significance. The occupational health and safety risks during the operational maintenance of the transmission infrastructure would be controlled according to the management system of MEPSO.

Based on the above, this Project component is assessed as B Category according to the EBRD Environmental and Social Policy, requiring an Environmental and Social Assessment Report with an E&S Management Plan as an impact mitigation instrument.

(2) Sub-project 2 - Reconstruction of the existing 110 kV OHL Valandovo - Strumica

The intention of this sub-project is to decommission the obsolete existing 110 kV OHL from the existing SS Valandovo to Strumica substations (Strumica 1 and Strumica 2), which is commissioned 50 years ago, in 1971, and replace it with a new line by utilising the same existing route. As such, this sub-project is a 'brown-field' development that would technically upgrade the existing line. Wherever possible, the design principles to keep the same number of towers as of the existing line and to use locations of the existing towers for the new towers would be applied. The construction works would not imply new land-take or establishment of a new safety corridor along the line. These construction works will imply typical E&S impacts of similar nature and magnitude, or lower magnitude as in the case of the Sub-project 1.

The existing OHL route passes through two important areas for biodiversity, one internationally recognised area (Important Plant Area Belasica) and one legally protected area (Cham Chiflik). Due to the geographical spread of IPA Belasica it is not possible to avoid this designated area. However, most of the identified values of IPA Belasica are characteristic for the higher parts of Belasica mountain which are distant from the Project and would not be affected by the implemen-

tation of the Project (see Section 6.7). There may be some minor change/deviation of the existing route if some particular site conditions impose such needs, but that would be of very low magnitude and negligible significance. Therefore, no additional impact will occur in this respect and there is no potential to impact qualifying features of this designated site. In regard to the protected area Cham Chiflik, further primary mitigation measure to fully avoid this site by deviation from the existing alignment is being currently under consideration as part of the on-going optimisation of the Project's technical assessment (Conceptual Solution). This change of the alignment that avoids this protected area will be elaborated and addressed in the upcoming E&S assessment.

Threfore, the operation of the reconstructed / rehabilitated 110 kV overhead line would not imply additional impacts to the environment and social surroundings as is the case with the existing line.

The Project involves decommissioning, dismantle and removal of the overhead line segments currently passing through the suburban and urban areas of Strumica in proximity and over residential and commercial properties and their replacement with underground option – underground transmission cable, buried in a cable trench below streets in Strumica, along the selected route. As such, this option would imply positive community benefit of major significance in regard to the health and safety aspects.

Based on the above, this Project component is assessed as B Category according to the EBRD Environmental and Social Policy, requiring an Environmental and Social Assessment Report with an E&S Management Plan as an impact mitigation instrument.

4.3 EU EIA Requirements

4.3.1 Introduction

The objective of EU Directive on the assessment of the effects of certain public and private projects on the environment (the EIA Directive) is to ensure that projects that are likely to have a significant effect on the environment are adequately assessed before they are approved. Before any decision is taken to allow such a project to proceed, the possible impacts it may have on the environment (either from its construction or operation) are to be identified and assessed. The Directive also ensures the participation of environmental authorities and the public in environmental decision making procedures. Annex I and II to the Directive list the projects that fall under its scope. Projects listed in Annex I are those that have significant effects on the environment and which, as a rule, should be subject to a systematic assessment. Projects listed in Annex II do not necessarily have significant effects on the environment in every case; they should be assessed if they are likely to have significant effects on the environment.

Under the EIA Directive, projects are classified in two groups: projects listed in Annex I are all subject to compulsory EIA while for projects in Annex II, the assessment contains and element of discretion, noting that an EIA procedure will, in any event, be required for projects with potentially significant environmental impacts. These Annexes are transposed into legislation of Macedonia via the Macedonian EIA Decree.

4.3.2 EIA Screening

Both Project components (Sub-project 1 and Sub-project 2) fall under the scope of the EU EIA Directive. Since they do not meet the cumulative thresholds set under Annex I (Section 20)[34], they are listed in Annex II of the Directive – 'Projects of classes which case by case examination would determine whether the project shall be made subject to EIA', under the following category: Section 3 – "Energy industry", item b - "Industrial installations for carrying gas, steam and hot water; transmission of electrical energy by overhead cables (projects not included in Annex I)". Therefore, both sub-projects are not subject to compulsory EIA and the assessment contains an element of discretion, noting that an EIA procedure will, in any event, be required if the Macedonian competent authority decides that they are projects with potentially significant environmental impacts.

4.4 Summary

The following Table summarizes the results of the screening exercise against the relevant regulative requirements.

Project Component	Macedonian EIA regulations	EBRD ESP	EU EIA Directive
Sub-project 1	Annex II development Formalised EIA not mandatory / Formalised EIA may be required (case-by-case examination)	Category B development[35] (E&S Assessment report is required)	Annex II development EIA is not compulsory EIA may be required (case-by-case examination)
Sub-project 2	Formalised EIA not mandatory / Formalised EIA may be required (case-by-case examination)	Category B development (E&S Assessment report is required)	Annex II development EIA is not compulsory EIA may be required (case-by-case examination)

Table 4.2: Summary of the Project categorisation against the applicable standards

[34] Section 20 of the EU EIA Directive's Annex I: 'Construction of overhead electrical power lines with a voltage of 220 kV or more and a length of more than 15 km.'

[35] The new 400 kV OHL, considered as high-voltage line according to the EBRD ESP, is very short (approx. 500 metres) and no major environmental and social sensitivities will occur. Therefore, Category A criteria according to EBRD ESP is not triggered.

5. Approach to Assessment

5.1 Source of Information

The following sources of information will be used in collating the ESIA documentation:

- Information from the Project Developer (MEPSO);
- Information from the Project engineering team;
- Information from statutory stakeholders and other interested parties;
- Published information, including relevant national / regional / local plans;
- Unpublished records made available by stakeholders;
- Relevant topographic and thematic maps; and
- Field visits and surveys carried out during the E&S assessment process.

5.2 Project Design Status and Level of Details of the Assessment

In this stage, the Project will be developed to a feasibility level - to a detail considered sufficient to establish that the proposed developments are technically feasible and to allow initial assessment of their environmental and social integrity and effects, i.e. to a level of Technical Assessment (Conceptual Solution) that corresponds to a Feasibility Study. Therefore, the level of detail of the ESIA will be compliant with that of the Project's Conceptual Solution whose content and scope are not specifically regulated by the relevant Macedonian legislation[36]. As such, the Conceptual Solution is not considered as formalised design document and no administrative consenting process for its adoption by the competent authorities is required. According to the general practice, this Conceptual Solution (in Macedonian: 'Konceptualno reshenie') contains in particular data on: macro-location and general disposition of the facility / infrastructure; technical-technological conception of the facility / infrastructure; the manner of providing the supporting infrastructure; possible variants of spatial and technical solutions from the point of view of fitting into space; natural conditions; functionality and rationality of the project solution.' The Feasibility Stuidy and the Technical Assessment (Conceptual Solution) need to also comply with the respective EBRD requirements.

Further design, including precise location of towers and access roads will be undertaken once the more detailed technical design (Preliminary Design and Main Design) as required by the Macedonian relevant legislation are developed and prior to construction commencing. This change or refinement of the feasibility design (Conceptual Solution) will be within the limits of deviation defined as a 500 m wide corridor along the transmission lines where individual towers can be moved laterally or longitudinally and a 100 m buffer around proposed substation location. It is anticipated that the majority of the refinement of the current feasibility design will be within this corridor/buffer. Where technical details of the Project have still to be finalized, such as detailed construction methods, etc., standard practice assumptions will be made in the ESIA to allow potential impacts to be identified and appropriate mitigation formulated.

[36] Law on Construction (Official Gazette of RM no. 130/09 and its amendments) and associated by-laws

5.3 Approach to the Assessment

A common approach to the assessment of each E&S topic will be followed and reporting the assessment of each relevant topic in the E&S appraisal will be structured using a similar format as far as possible. This will include:

- establishing the key baseline conditions of the receiving environment through a combination of desk review and site visits;
- identifying and assessing the changes on that receiving environment (potential impacts) which the Project could have - adverse and beneficial – based on a set of assessment criteria;
- determining the significance of those changes (potential impacts) as a function of their predicted magnitude and the sensitivity/ value of the resource/ receptor being affected. This is considered as iterative process, whereby the E&S team will inform the engineering team about the potential for adverse effects from the Project and, consequently, the engineering team will be taking into account these issues in refining the Conceptual Solution in order to avoid, as much as possible, those effects; and
- prescribing key mitigation for those impacts which are likely to have, either by themselves or in combination with other impacts, a significant adverse environmental or social effect. This mitigation will be designed to prevent, reduce and, where possible, offset any significant adverse effects.

5.4 Interaction with the Technical Design

The E&S appraisal and Conceptual Solution processes interact with each other, with both being informed by two-way communication, combined with ongoing consultation and discussion with various relevant project stakeholders. The E&S appraisal will need to identify potential (negative) effects which would potentially lead to design refinements to reduce the significance of those effects.

This process of synergy, based on the views / inputs from the E&S appraisal, has interacted with the design process from the earliest Project development stage. Such approach has informed the design process with relevant early E&S-related proposals in the scope of the process for selection of the preferred Project option thus achieving 'mitigation through design' precautionary goal for impact avoidance. This approach will further continue throughout next stages in order to reduce the likelihood of the Project being designed on a basis that already has built-in negative E&S effects which could have been avoided.

The process of synergy will continue until the engineering design (Conceptual Solution) is optimised and sufficiently fixed for E&S appraisal to be finalised – so that those E&S assessments are based on the likely significant effects of the final optimised Conceptual Solution.

5.5 Study Area

Study areas are to be defined individually for each topic, according to the geographic scope of the potential impacts or of the information required to assess those impacts. They are based on the boundary of the SS location and the OHL corridor(s), i.e. the land anticipated to be potentially re-

quired temporarily and/or permanently for the construction, operation (including land subject to restrictions) and maintenance of the Project at the time of preparation of this ESIA Scoping Report and taking into consideration the specifics of the receptor / resource being assessed.

5.6 Existing Baseline

5.6.1 Introduction

A comprehensive understanding of existing environmental and societal baseline conditions in the Project region is essential prerequisite for sound identification and assessment of potential impacts from the proposed developments. Understanding the baseline allows the measurement of changes that would be caused by the Project. The process for collecting the baseline environmental and social data is based on:

- Desk studies (i.e. legally defined quality standards for environmental media and emission limit values; existing literature, strategic / planning documents, statistics, databases and reports from various relevant organizations; as well as available internet sources and other similar projects).
- Site visits and walkover observations to identify the area of influence (study area) and to collect required supplementary data at substation location and along the OHL corridor(s) (i.e. biodiversity survey; landscape assessment; land-use observation; etc.), as well as benefiting from various field surveys carried out for the purposes of the engineering design.

5.6.2 Baseline Surveys

In order to determine relevant baseline environmental and social conditions within the study areas detailed surveys outlined in the Table below were undertaken during the ESIA scoping exercise. The scope of these surveys was determined through desk study and an initial walkover survey, undertaken on 10 September 2020. The field surveys were undertaken from 25 and 28 May 2021 and from 18 and 20 August 2021. The findings obtained from these surveys for each relevant topic are reported in respective sections this Scoping Report.

Baseline survey	Goal and Scope
Air quality	Key sources of air emission within 200 m of the centreline of the alignments of the transmission lines and 200 m around the proposed location of the substation - were observed to gain indicative air quality baseline situation. There are no measurements of the ambient air quality within the study area or in wider region. Key air pollution source is the traffic network. . Other sources of seasonal air pollution in the environment are the air emissions during heating season and from agricultural activities. No significant industrial facilities are present in the area. The area is not densely populated and is predominantly rural in nature, with an exemption of the section of the existing 110 kV OHL from Valandovo to Strumica (Sub-project 2) through urban zones in Strumica where air quality likely exceeds ambient limit values in particular cases.
Geological and water environment	The geological environment within 500 m wide corridor along the transmission lines (within 250 m of the centreline of the alignments), including the proposed location of the substation was observed, with the expected characteristics of the rock masses, and any significant engineering-geological phenomena and processes. The terrain in the study area as a whole is considered as stable, without occurrence geological hazards (slips and landslides, erosion). Site specific issues may be possible but these were not taken into consideration in this Project development stage.

	Groundwater levels were registered within the expected range for periods of the year when the surveys were carried out. In addition, to the already known prominent water bodies that would be affected by the Project, smaller watercourses, with their character of flow (continuous or occasional) were registered.
Noise	Key sources of noise within 2,000 m wide corridor along the transmission lines (within 1,000 m of the centreline of the alignments), including the proposed location of the substation - were observed to gain indicative noise baseline situation. There are no measurements of the environmental noise neither within the study area nor in wider region. Key noise source is the traffic network, as well as agricultural activities. No significant industrial facilities are present in the area. The area is not densely populated and is predominantly rural in nature, with an exemption of the section of the existing 110 kV OHL from Valandovo to Strumica (Sub-project 2) through urban zones in Strumica where background urban noise likely exceeds ambient noise limit values in particular cases.
Land use / land cover	Land cover was assessed within 1,000 m wide corridor along the transmission lines (within 500 m of the centreline of the alignments), including the proposed location of the substation based on the Corine Land Cover (CLC 2018). The land cover was calculated in ArcGIS for both sub-projects, separately. A land cover map was also elaborated and presented in this scoping report. The land cover in Sub-project 1 is dominated by agricultural land (40%) and Sclerophyllous vegetation (29.5%). Again, the land cover in Sub-project 2 is dominated by agricultural land cover types (52.7%) as well as forests (29.3%) and s significant percentage of urban and industrial areas (9.6%).
Biodiversity and natural heritage	An area of 1,000 m wide corridor along the transmission lines (within 500 m of the centreline of the alignments), including the proposed location of the substation was used to present the biodiversity baseline in wider context, which is considered as representative and sufficient to identify the current biodiversity status in the broader area and to assess indirect impacts from the Project. The baseline is based on the desk-based information, map of ecosystems of Macedonia, and biodiversity field surveys. Most of the data on habitats and species presented in this scoping report are from the field observations. Only few data on habitats exist for the Important Plant Area Belasica and very scarce data for protected area Cham Chiflik (both these designated areas are relevant for the Sub-project 2). Both sub-projects and their components were separately analyzed from the aspect of their vegetation, flora and habitats as well as presence of protected and designated sites (with national or international importance). Habitats were identified according to different classification systems (trivial, EUNIS, Bern Convention, EU Habitats Directive). Valorization of habitats was performed based primarily on EU Habitats Directive and Bern Convention. Three important habitat types were recorded: 9530 * (Sub-Mediterranean pine forests with endemic black pines, 92C0 *Platanus orientalis* and *Liquidambar orientalis* woods (Plantanion orientalis) and 92A0 Salix alba and Populus alba galleries. Valorization of flora was also performed on the basis of national and international criteria as well as expert assessment. Only *Osyris alba* from Cham Chiflik is considered as relatively rare plant species. Valorization of fauna (Bern convention, EU Habitats Directive, EU Birds Directive, Global, European and national red lists, Law on hunting, Law on Nature Protection) showed presence of a number of important species. Assessment of Critical Habitat (CH) and Priority Biodiversity Features (PBF) was performed according to the PR6 guidelines. The habitat 9530 *(Sub-Mediterranean pine forests with endemic black pines qualifies for CH, while 92C0 *Platanus orientalis* and *Liquidambar orientalis* woods *(Plantanion orientalis*) and 92A0 *Salix alba* and *Populus alba* galleries for PBF.
Landscape	Five landscape types were identified within the study area - 1,000 m wide corridor along the transmission lines (within 500 m of the centreline of the alignments), including the proposed location of the substation. These are classified according to the Macedonian Strategy for Nature Protection as follows: 1) Rolling submediterranean landscape (pseudo-maquis). 2) Thermophilous degraded forests landscape. 3) Flatland sub-Mediterranean agricultural landscape. 4) Rolling rural landscape and 5) Urban landscape (Strumica). These landscape types are described in terms of their appearance, matrix and patches, their connectivity as well as according to their presence in sub-projects and components.
Social-economic context: Settlements	All potentially affected settlements within the study area - 2,000 m wide corridor

	along the transmission lines (within 1,000 m of the centreline of the alignments), including the proposed location of the substation - were visited and on-site observation was performed in order to determine the general way of life of the inhabitants, their way of livelihood provision, dwelling, state of the communal infrastructure, road connections, presence of social facilities and its use, administrative facilities and other features that will successfully ease in proper understanding of the local life and needs/aspirations of these people. Each of the rural settlements that are within the study area was examined, and in all potentially affected settlements local residents (1-3 people) unstructured interview was performed. Urban settlements are much complex entities, but these techniques were also applied, separately, but to multiple locations of the affected parts of the cities (Valandovo, and particularly Strumica).
Social-economic context: Residenital and other properties	No residential or other properties were identified in proximity to proposed location of the new substation (Sub-project 1) that would pose constraints for its further development. Field surveys along the existing transmission lines, proposed for reconstruction, indicated that there are no residential properties that will be directly affected from the Project. All nearby dwelling and other objects are at a reasonable distance of at least 150 m from the lines. Clearly, an exception is the section of the 110 kV OHL Valandovo-Strumica (Sub-project 2), in the urban zone of Strumica, where the line passes over, or in immediate vicinity, to residential or industrial properties. Alternative technical design to replace this section with underground transmission cable to fully eliminate potential impacts to people has been considered as further described in this scoping report.
Social-economic context: Vulnerable groups	Roma population is identified as vulnerable group along the route of the existing 110 kV OHL Valandovo –Strumica (in the urban zone of Strumica, Sub-project 2). The newly proposed underground transmission cable routing options within this zone will completely avoid Roma population (e.g. operating car-recycling businesses that are set beneath the conductors of the existing line and some towers (between SS Strumica 1 SS Strumica 2). The existing line will be decommissioned and all its elements - conductors, towers and concrete foundations - will be dismantled and removed for this part of the line, resulting in beneficial effects to the vulnerable groups currently potentially affected by the existing line. In addition, all concerned settlements, as well as the complete OHL alignments were visually checked in order to determine whether there are vulnerable groups that dwell within the safety corridors, or perform livelihood provision activities.
Cultural heritage	Both field surveys included detail inspection of the terrain against visible elements of presence of certain cultural heritage. Additionally, relevant information for two potential archeological sites, were provided from the responsible institutions for protection of cultural heritage, as reported in this scoping report.

Table 5.1: Baseline surveys overtaken to date

These surveys provided detailed information on the existing environmental and social baseline conditions within study areas. This information is considered as sufficient for the Project's E&S assessment in the current Project development stage – feasibility design (Conceptual Solution). Therefore, no supplementary field surveys are considered necessary throughout the present ESIA. However, if during the impact assessment process particular data gaps are identified, additional field surveys will be undertaken to supplement the findings of the baseline surveys undertaken to date.

5.7 Potential Significant Effects and Mitigation

5.7.1 Significance of Impacts – Generic Approach

The significance of an environmental and social effect is typically a function of the "value" or "sensitivity" of the receptor and the "magnitude" or "scale" of the impact.

Receptor Sensitivity of Value

The sensitivity of a receptor refers to its importance i.e. its environmental value / attributes. The sensitivity is generally site specific and is a function of receptor's capacity to accommodate change. It reflects its ability to recover if it is affected, and is defined by the following factors:

- Adaptability – the degree to which a receptor can avoid, adapt to or recover from an effect.
- Tolerance – the ability of a receptor to accommodate temporary or permanent change.
- Recoverability – the temporal scale over and extent to which a receptor will recover following an effect.

Generic criteria guidelines for assigning receptor sensitivity for the purpose of the assessment for the Project are given in Table below. In principle, the assessment of receptor's sensitivity is a matter of judgment applied by professional experts based on case by case approach within the relevant area affected by the proposed development.

Receptor sensitivity / value	Description - typical descriptors
Very high	Receptor has very limited or no capacity to accommodate changes (impacts) - very high importance and rarity, international scale and very limited potential for substitution/ replacement.
High	Receptor has a limited capacity to accommodate changes (impacts) - high importance and rarity, national scale and limited potential for substitution/replacement.
Medium	Receptor has a limited capacity to accommodate changes (impacts) - high or medium importance and rarity, regional scale, limited potential for substitution/ replacement.
Low	Receptor has a moderate capacity to accommodate changes (impacts) - low or medium importance and rarity, local scale and potentially can be substituted / replaced.
Very low	Receptor is generally tolerant of and can accommodate changes or influences - very low importance and rarity, local scale and are not designated, and are easily substituted / replaced.

Table 5.2: Generic criteria and typical descriptors for assigning receptor sensitivity / value

Impact Magnitude or Scale

The magnitude of an effect is typically defined by number of factors including, but not limited to:

- Spatial extent – the area over which an effect occurs.
- Duration – the time for which the effect occurs.
- Likelihood – probability of occurrence.
- Reversibility – ability to return to the original state.
- Intensity – the degree of change relative to existing environmental conditions.

A typical impact appraisal matrix for different elements of the environment is prepared to guide the impact assessment exercise for the Project and presented in Table below.

Impact magnitude factor	Description - typical descriptors	
Spatial Extent (Area of influence)	Limited (on SS location or along OHL corridor)	Area on, and around the construction and operational location of the Project
	Local	In the range of municipality / neighbouring municipalities
	Regional	Macedonia and neighbouring countries

	Global	Continent and wider
Duration	Very short	Few minutes to few hours
	Short	Few hours to few weeks
	Average duration	Few weeks to few months
	Long	Few months to few years
	Very long	Decades / centuries
Probability of occur-rence (Likelihood)	No probability	Should not occur during normal operation and conditions
	Low probability	Possible, but unlikely
	Average probability	May happen sometimes
	High probability	Likely to occur during the life cycle of the project
	Reliable probability	Will certainly appear
Reversibility	Reversible (impact)	Reversible impact on the resource / receptor, i.e. impact upon which the environment will be able to return to the original state
	Irreversible (impact)	Irreversible impact on the resource / receptor, i.e. impact upon which the environment will not be able to return to its original state
Intensity	A (very low / negligible)	No change or negligible weak impact without damaging the resource / receptor
	B (low to medium)	Measurable impact, but with proper planning does not cause damage to the resource / receptor
	C (medium to high)	Significant impact, but can be controlled by implementing the appropriate measures
	D (very high)	Impact that would be harmful to the resource / receptor
	E (compensation)	Impact that requires compensatory measures

Table 5.3: Typical impact appraisal matrix

Typical criteria descriptors for defining impact magnitude for the purpose of the assessment are given in Table below. While this Table provides guidelines of a generic nature, it should be noted that specific guidelines in relation to impact magnitude may be required for the particular topics, where considered necessary.

Impact magnitude	Description - typical descriptors
High	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse)
	Large scale or major improvement of resource; extensive restoration or enhance-ment, major improvement of attribute quality (Beneficial)
Medium	Loss of resource, but not affecting integrity, partial loss of/damage to key character-istics, features or elements (Adverse)
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial)
Low	Some measurable change in attributes, quality or vulnerability, minor loss of or alter-ation to one (possibly more) key characteristics, features or elements (Adverse)
	Minor benefit to, or addition of, one (possibly more) key characteristics, features or elements, some beneficial impact on attribute or a reduced risk of a negative impact occurring (Beneficial)
Very low	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse)
	Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial)
None / no change	No loss or alteration of characteristics, features or elements, no observable impact in either direction

Table 5.4: Generic criteria and typical descriptors for determining impact magnitude / scale

Impact Significance

The assessment of effects on the environment arising from the Project will consider their signifi-cance during both construction and operational phases. Impacts are likely to be significant if they:

- Are extensive over space or time and are intensive in relation to assimilative capacity of the environment.
- Exceed environmental or health standards or thresholds.
- Do not comply with environmental and social policies / land use plans.
- Adversely affect ecological sensitive / important areas or natural heritage resources.
- Adversely affect community lifestyle, traditional land uses and values.

The significance (or the level) of a potential effect is a function of its predicted magnitude and the sensitivity / value of the resource / receptor being affected. The greater the receptor sensitivity and the greater the impact magnitude, the impact is more significant. The impact significance has to be set in a context and could be relativistic and to a certain degree - subjective.

In general, an impact could be categorized into following significance categories (Table below):

- Negligible (or neutral): no detectable change to the environment;
- Minor: a detectable but non-material change to the environment;
- Moderate: a material but non-fundamental change to the environment;
- Major: a fundamental change to the environment.

Receptor sensitivity	Impact magnitude				
	High	Medium	Low	Very low	None
Very high	Major	Major	Moderate	Moderate	Negligible
High	Major	Moderate	Moderate	Minor	Negligible
Medium	Moderate	Moderate	Minor	Minor	Negligible
Low	Minor	Minor	Minor	Negligible	Negligible
Very low	Minor	Negligible	Negligible	Negligible	Negligible

Table 5.5: Typical impact significance matrix

The Table above demonstrates how combining the sensitivity / value of the resource or receptor with the magnitude of change produces a significance of effect category.

For some topics, such as air or water quality, noise, elector-magnetic radiation - quantifiable (measurable) thresholds or legally defined criteria could be used to determine the significance of an impact. However, for other topics, such as biodiversity or landscape, it is necessary to use combination of quantitative and qualitative criteria – professional judgment on case by case basis.

Assigning impact significance relies on reasoned argument, professional judgment and consideration of the views and guidance of competent organisations. Assigning each impact to one of four significance categories enables different topic issues to be placed within the same scale to allow a direct comparison. The four significance categories are described in Table below. In arriving at the significance of effect, the assessor will also consider whether they are direct or indirect; short, medium or long-term; permanent or temporary, positive or negative, cumulative.

Impact significance category	Typical criteria	Description - typical descriptors
Major	A fundamental change to the environment	Only adverse impacts are normally assigned this level of significance, and represents key factors in decision-making process. These impacts are generally but not exclusively associated with sites or features of International, National or Regional importance that are likely to suffer a most damaging impact and loss of integrity. However, a major change in a site or feature of local importance may also enter this category.
Moderate	A material but non-	These beneficial or adverse impacts may be important, but are

	fundamental change to the environment	not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse impact on a particular resource or receptor.
Minor	A detectable but non-material change to the Environment	These beneficial or adverse impacts may be raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
Negligible (or neutral)	No detectable change to the environment	No impacts or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

Table 5.6: Typical impact significance categories and their decision-making aspects

Impacts determined to be minor or negligible (neutral) are not deemed to be significant, and as such will not be reported in detail in the assessment's document package and will not require specific mitigation. The exception to this is where the combination of multiple minor effects has the potential to lead to a significant (i.e. moderate or above) cumulative effect.

It should be noted that, although the above describes overall generic approach proposed for the E&S appraisal for the Project – using sensitivity and magnitude to determine the significance of impact – some particular topics may imply different approach which reflects topic's specifics in more appropriate way or variations in terms to the sensitivity or magnitude categories.

5.7.2 Impact Mitigation Measures, Enhancement and Residual Effects

Mitigation measures are to be proposed, where they are available and practical, in those cases where significant adverse impacts are identified. These measures need to be consistent with the requirements of the relevant legislation and policies as well as with best international practice and should be proportional to the level of the impact predicted.

During the past Project stage, 'mitigation through design' was employed as an important factor in ensuring that the environmental and social impacts of the Project are avoided as much as possible and minimized throughout alternative sound selection of the Project's preferred development option. Therefore, through the development of the Project so far and the iterative approach used by engineering and E&S teams, mitigation has been built into the technical design (embedded mitigation measures to avoid adverse E&S effects). Where significant impacts potentially remain, further specific mitigation measures will be proposed in the assessment.

The principles of mitigation, including its hierarchical manner are as follows (Figure below):

- Avoidance and prevention measures - incorporate measures to avoid the effect (e.g. alternative design options or modifying the proposed project construction programme to avoid environmentally sensitive periods).
- Reduction - incorporate measures to lessen the effect (e.g. fencing off sensitive areas during construction and implementing a Construction Environmental and Social Management Plan (CESMP) to reduce the potential impacts from construction activities).
- Compensation / remediation as last resort – where it is not possible to avoid or reduce a significant effect then offsetting measures should be considered (e.g. provision of replacement of habitat to replace that lost to the proposed project or remediation such as the clean-up of contaminated soils). It should be noted that compensation or remediation does not automatically make an impact 'acceptable' or excuse the need to consider other forms of mitigation as discussed in the hierarchy.

- Enhancement of eventual positive project effects.

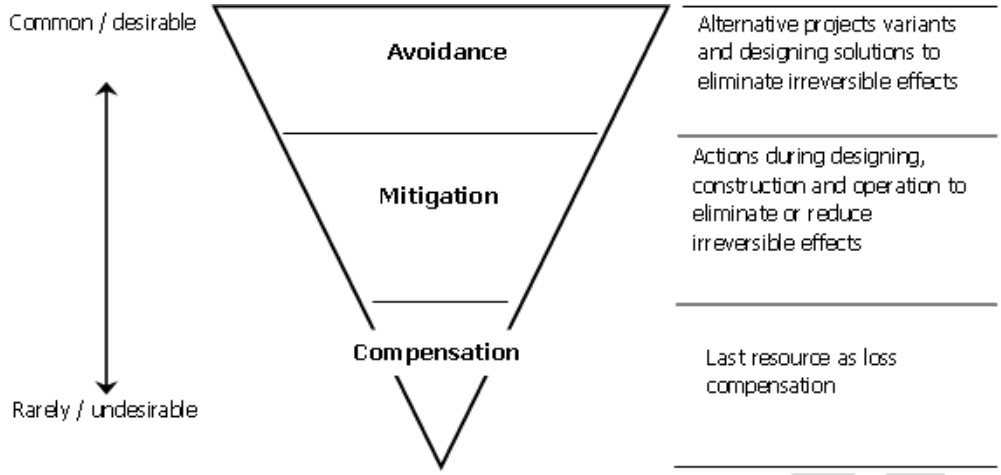

Figure 5.1: Impact mitigation hierarchy

5.8 Proposed Scope of Assessment

The topic areas to be considered and the extent of the assessment work proposed are referred to as the scope of assessment. The typical standards of the good international (ESIA) practice and EIA regulations require the process to describe the likely significant effects of the proposed Project to the biophysical and social environment resulting from:

- the construction and existence / operation of the development, including, where relevant, demolition works;
- the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources;
- the emission of pollutants, noise (as well as vibration, light, heat and radiation) and the creation of nuisances;
- the generation and management (including recovery and disposal) of waste;
- the impact of the project on climate (e.g. the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change (climate resilience);
- the risks to human health, cultural heritage or the social environment;
- the accumulation of effects with other existing and/or approved projects.

The environmental and social topic areas proposed for inclusion in the environmental and social appraisal of the proposed Project are as follows:

i. Climate;
ii. Air Quality;
iii. Geology and soils;
iv. Water environment;
v. Noise and vibration;
vi. Land use
vii. Biodiversity and natural heritage, landscape;
viii. Waste;
ix. Social aspects, including health and safety

x. Cultural heritage

xi. Combined and cumulative effects

5.9 Assumptions and Limitations

Throughout this scoping exercise the following generic assumptions have been made:

- This ESIA Scoping Report has been prepared based on the selected SS location and OHL corridor(s) (as presented in Annex 1), the environmental and social baseline information available at the time of writing and the current available technical (engineering) design (Conceptual Solution). Further information will become available as the iterative technical (engineering) design and E&S assessment process proceed through preliminary and detailed design and, subsequently, the scope of ESIA will need to be reviewed and updated as process evolves, if necessary.
- Number and locations of the towers for the new transmission line and for the line(s) that would be subject to reconstruction are unknown at present stage of the Project development. These would be identified during upcoming design stages of the Project.
- Details in regard to the construction methodologies are unknown at present stage of the Project development.
- Locations and details of auxiliary works (e.g. access roads for construction purposes, site compounds, workers camps and materials storage) are unknown at present stage of the Project development. The assumption is that the compounds would be located outside of designated areas for natural heritage as well as areas of known cultural heritage.
- The current situation with the outbreak of the pandemic COVID-19 disease imposed mandatory restrictions and social distancing measures thus changing the familiar and widely used methods for information disclosure and stakeholder engagement. As a result, non-statutory consultation to inform the stakeholders and concerned communities throughout the scoping stage of the Project's E&S appraisal has not taken place. The inclusion of these stakeholders in the further stakeholder engagement process as part of the upcoming Project's development stages (e.g. preliminary design and detailed design) will be carried out according to the respective international and national recommendations and would need to be set out in the Project's SEP.
- Baseline measurements of electric and magnetic fields as well as ambient noise and calculation of EMF and noise from an operational SS and OHL were not performed at present stage of the Project development. If deemed necessary, these would need to be scoped in the further Project design and the accompanied supplementary environmental and social appraisal to further determine the potential compliance risks with the applicable standards.

6. Assessment of Impacts

6.1 Climate-related Aspects

In principle, the climate topic includes two separate assessments:

- Greenhouse gas (GHG) impact assessment – the effects on the climate from GHG emissions arising from the Project.
- Climate resilience assessment – the resilience of the Project to adapt to the impacts resulting from a changing climate, including how the Project design would take into the account the projected impacts of climate change.

This section provides an overview of the climate-related impacts of the Project and sets out why the assessment of these has been scoped out of the assessment.

6.1.1 Greenhouse Gas Impact Assessment

Study Area

The study area for GHG impact assessment would need to cover all direct GHG emissions arising from activities undertaken within the Project boundary during the construction, operation and maintenance of the Project. It would need to include emissions based on a lifecycle approach.

Potential Impacts and Principle Mitigation

The key identified contributing GHG emission sources and/or activities associated with the Project, based on a lifecycle approach, are presented in the Table below.

Lifecycle stage	Project activity	Key GHG emission sources
Pre-construction stage	Construction site preparatory works	Fuel use - for vehicles, generators on site, etc.
	Clearance works (vegetation clearance; land use change)	Losses of carbon sink - removal of a natural environment that has the ability to absorb GHG emissions (e.g. woodlands)
Production stage	Use of products and/or materials required to build the Project (e.g. concrete, steel, conductors, other metallic materials, insulators, etc)	Embodied GHG emissions within the construction materials - emissions resulting from the manufacturing/processing of materials into secondary/final products for use and the transportation of those materials
Construction stage	On-site construction activity, e.g.: - Transport of materials and equipment to the construction site; - Transportation of construction work force to the construction site; - Use of construction vehicles and plant at the construction site; - Disposal of any waste generated by the construction processes.	- GHG emissions from vehicle and plant use - GHG emissions from disposal of waste
Operational & maintenance stage	- Operation of substation, including lighting - Maintenance operations, including vehicle journeys, replacement of SS and OHL equipment	- GHG emissions from energy and fuel use. - Embodied emissions associated with replacement of equipment / materials (e.g. OHL tower elements, conductors, insulators, SS equipment) These missions are expected to be minimal

Table 6.1: Key anticipated greenhouse gas emissions sources associated with the Project

The principle mitigation measures to reduce GHG emissions across the lifecycle of the Project would include:

- Specification of alternative materials with lower embodied GHG emissions such as locally sourced products and materials with a higher recycled content.
- Low carbon design specifications such as energy-efficient lighting (at the substation) and durable construction materials to reduce energy consumption and maintenance and decrease replacement cycles.
- A Construction Environmental and Social Management Plan (CESMP) prepared and implemented by the selected construction Contractor to include a range of best construction practice measures with an aim to reduce GHG emissions.

Since the Project is in its initial development stage and the relevant technical / design information for GHG calculation during construction stage of the Project is currently not available (e.g. construction transport, etc.), the calculation of GHG emissions associated with the construction of the Project has been scoped out from the present ESIA and is to be considered as part of the climate impact assessment in the further ESIA during next development stages of the Project (e.g. feasibility study with preliminary design or detailed design), which is expected to provide the necessary information for GHG calculation.

GHG emissions during operation and maintenance of the Project are expected to be very small over time during its operational life. Therefore, these have been scoped out from the present ESIA.

6.1.2 Climate Resilience Assessment

Study Area

The study area for the climate resilience assessment covers all elements (assets and infrastructure) which constitute the Project.

Potential Impacts and Principle Mitigation

The project area is likely to be vulnerable to a range of climate change risks – extreme events (e.g. an increased frequency and severity of prolonged and/or heavy precipitation events and lightning, heat waves, an increased risk of storms with high wind speed, etc.).

These extreme weather events associated with the expected climate changes may result in the following principle impacts:

- Material deterioration due to high temperatures and also from periods of heavy rainfall.
- Flood risk at the substation location, and damage to drainage systems and equipment.
- Erosion and subsidence undermining structures.
- Storm damage to OHL tower structures and substation equipment and other project's assets.
- Asset deterioration from exposure to heat.

A number of general mitigation and adaptation measures would need to be considered to address these risks. These measures would need to be identified and incorporated into the Project design and documented in the ESIA , so to achieve that the Project is designed to be resilient to impacts

arising from current and future weather events and climatic conditions, and designed in accordance with current planning, design and engineering practice and codes.

6.2 Air Quality

This section provides an overview of the impacts of the Project on air quality and sets out why the assessment of these has been scoped out of the assessment.

6.2.1 Study Area

The assessment of the effects on the local air quality uses a study area of 200 m around the SS location and the OHL corridors likely to be affected by the Project activities. This is due to the effect of air pollutants from the Project activities reducing with distance from the point of release, and beyond 200 m these are likely to have reduced to a concentration equivalent to background concentrations.

6.2.2 Baseline Conditions

The monitoring of the ambient air quality in Macedonia is organised in urban areas of twelve local self-governments[37] (municipalities) at 19 automatic measuring stations (18 stationary stations and one mobile station). There are no measurements neither within the study area nor in the rural areas in the wider Project area. There is one station in the wider Project region, in urban area of Strumica.

The study area is predominantly rural in nature, passing through not densely populated zones. Key source of air pollutants is the traffic network. Other sources of seasonal air pollution in the environment are the air emissions during heating season and from agricultural activities. Therefore, it is generally assumed that the ambient air pollutants at the proximity of the location of the new substation and along the OHL corridors are below the legally determined limit values for particular polluting substances set out in the relevant Macedonian legislation[38]. An exception is the urban zone of Strumica, along the existing 110 kV OHL Valandovo – Strumica (Sub-project 2), where exceedance of the mean annual concentration of suspended particles (particulate matter - PM10) is reported in 2020[39]. No exceedances are reported in Strumica in regard to the concentrations of other key air pollutants (e.g. carbon monoxide, sulphur dioxide, nitrogen oxides, benzene) [Ref.15].

6.2.3 Construction

The key pollutants of concern that may give rise to significant air quality effects during the construction phase are:

[37] These are: City of Skopje (five stations), Bitola (two stations) and Veles, Kumanovo, Kicevo, Tetovo, Gostivar, Kocani, Strumica Kavadarci, Ilinden and Mavrovo-Rostuse with one monitoring station.

[38] Decree on limit values and types of polluting substance in the ambient air (OG no. 50/05, 4/13 and 183/17)

[39] Annual Report for Environmental Data for 2020; Ministry of Environment and Physical Planning, 2021 [Ref.15]

- Fugitive dust from construction related activities, including the following main sources of dust:
  - construction vehicle movements and other project related traffic on unpaved roads
  - earthworks - soil stripping and excavation, handling, storage, stockpiling, ground levelling
  - site preparation and restoration after completion
  - construction of access roads
  - construction of the new substation (Sub-project 1)
  - construction / reconstruction of towers for the transmission lines
  - construction of transmission cable (Sub-project 2).

  The majority of the dust emissions are likely to occur during the working hours of construction activity.
- Vehicle exhaust emissions of oxides of nitrogen (NOx) and fine particulate matter (PM) from construction traffic, particularly heavy duty vehicles (HDV).
- Vehicle exhaust emissions from non-road mobile machinery (impacting human and ecological receptors).

The risk of dust impacts associated with each construction activity would be considered by the Contractor to define the required dust control levels for each activity to ensure that no significant impact would occur as a result of construction activities which have the potential to generate dust. Mitigation, to be set out in a Project's CESMP would be employed to ensure no significant impacts occur.

While the anticipated traffic numbers associated with the construction of the Project are unknown at present stage of the Project development, the majority of the construction works would be undertaken in areas where existing road traffic levels are low to moderate and air quality is generally currently good. In addition, the construction / reconstruction of the transmission lines will be transitory with work in any one place being of short duration considering the favourable flat topography in the Project region, with work at each location along the along the OHL corridors being intermittent within the construction time period. Therefore, construction effects on the air quality along the OHL corridors will be temporary and would be limited to dust nuisance problems.

Peak traffic numbers will be associated with the construction of the substation where construction staff will be based to site. However, in busiest construction period, the maximum traffic movements would be expected to be less than 100 vehicles per day. It is therefore considered that, with the use of mitigation, that impacts on both short and long term levels of fine particulate matter and nitrogen oxides due to substation construction traffic are unlikely to result in exceedances of the air quality limit values set out in the relevant Macedonian legislation[40].

Project construction impacts on air quality would be managed by a number of mitigation actions and measures of good construction practice and would be set in a Project's CESMP, prepared and subsequently implemented by the selected construction Contractor. These include GIP measures that are typically adopted on construction projects, which are designed to prevent the occurrence

[40] Decree on limit values and types of polluting substance in the ambient air (Official Gazette of Macedonia no. 50/05, 4/13 and 183/17). This regulation is based on EU legislation and on recommendations made by the WHO. Legally binding limit values for Macedonia to achieve have been set for key pollutants (i.e. SO_2, NOx, particulate matter, ozone, CO, lead and benzene (C_6H_6)).

of significant impacts. Consequently, it is considered that the use of GIP will ensure that no significant permanent or residual air quality impacts would occur due to the construction of the Project. Therefore, the assessment of air quality is scoped out of the present ESIA. However, an ESMP will be prepared as part of the present ESIA to describe the mitigation strategy during the construction of the Project.

6.2.4 Operation

During the operation phase of the Project it is not anticipated that there would be any significant emissions to air and no significant air quality impacts would occur. The assessment of air quality impacts during the operational phase is, therefore, scoped out of the ESIA, as justified below:

- Once constructed, operational traffic would consist of not more than monthly inspections in light vehicles.
- The proposed substation may include gas insulated equipment, which use sulphur hexafluoride (SF_6) gas as an electrical insulator. This is a greenhouse gas rather than a local air quality pollutant. However, manufacturers now produce such equipment that is guaranteed to have no or minimal leakage and there would be no resulting local air quality or greenhouse gas impacts.
- Substation auxiliary plant would most likely include standby diesel generators. Standby generators are usually run several hours per month to prove reliability and for control and maintenance purposes. As such, standby generators are considered unlikely to have significant impacts on local air quality.

6.3 Geological Environment

The Project has the potential to affect the geological environment and soils during the construction and operational phases. This section provides an overview of the current baseline and potential impacts of the Project on the geological environment and describes the principle mitigation approach.

6.3.1 Study Area

The assessment of the effects on the geological environment and soils uses a wider study area around the proposed substation site and respective OHL corridor(s) and the adjacent areas likely to be affected by the Project activities. The study area is extended to 100 metres buffer zone around the substation site and 500 metres wide corridor along transmission lines.

6.3.2 Baseline Conditions

(1) Sub-project 1 - New 400/110 kV SS Valandovo with connection to the existing 400 kV and 110 kV transmission network

From a geological point of view, the study area is build by Quaternary alluvial sediments (clay, sand and gravel) developed in valleys of the Vardar River and the river Anska Reka. The estimated depth of these sediments varies between 15 m and 30 m. Near Miletkovo village (from the right side of Vardar River), the groundwater level follows the water level of Vardar River, but starting from the left side of Vardar River and the inflow of Anska Reka into Vardar River, due to the high

degree of collimation of the Anska Reka riverbed, the groundwater level does not correspond to the water level in Anska Reka.

No mining activities or mineral extraction facilities exist within the study area.

(2) Sub-project 2 - Reconstruction of the existing 110 kV OHL Valandovo - Strumica

From a geological point of view, the study area is build by Old Palaeozoic metamorphic rocks, Plaush's granites, granodiorytes, gabrro and diabase and Belasica's metarhyolite rocks, and Tertiary Upper Pilocene sedimentary rocks (gravel, sand and clay) developed in Kosturino village's valley. From an engineering-geological point of view, the terrain along the line is stable, without the occurrence of slips and landslides, except the registered landslide uphill of the clay mine, above the brickyard at the entrance to Strumica, which is distant from the Project, at approx. 2,800 metres.

No mining activities or mineral extraction facilities exist within the study area.

6.3.3 Construction

The potential impacts of the Project on the geological structures and soils during construction will mainly be in the form of soil degradation due to:

- Loss of deposits / soils through construction of access roads and excavation for construction of foundations for substation and towers of the transmission lines.
- Potential physical damage to soil, including soil compaction as a result of heavy construction vehicle movements.
- Pollution risk due to spillage of oils and fuels from vehicles.
- Soil pollution due inadequate waste management.

The risks of soil erosion and landslides during construction of the Project are likely to be very limited and site-specific since the study area as a whole is not susceptible to these geological hazards - the Project region as a whole is characterised with flat and well consolidated soils, with exception at particular areas with medium sloping grounds within the study area along the Sub-project 2.

The potential impacts would be mitigated by undertaking of construction works in accordance with a Project's CESMP, prepared and subsequently implemented by the selected construction Contractor. The CESMP will set out the mitigation requirements related to geological environment and soils. It would contain GIP measures to ensure compliance with relevant standards and legislation. These measures will be designed to reduce the possibility for dispersal and accidental releases of potential contaminants to soils and uncontrolled run-off to occur during construction. It would also set out how material is to be excavated, segregated and stockpiled to minimise the possibility for run-off and soil quality degradation and would establish procedures for dealing with unexpected soil or groundwater contamination.

6.3.4 Operation

During its operational phase, the Project will not directly discharge pollutants to the land.

The operational Project may result in minor potential impacts on the land, especially due to maintenance activities and the control of the infrastructure and equipment:

- Along the transmission lines:
  - Risk of pollution from fuel / oils

- Local effects on soils from compaction

- Risk of pollution due to spillage of transformer oil during substation operation.

It is anticipated that these potential impacts will be of negligible to minor significance. The assessment of the impacts to the geological environment during the operational phase is, therefore, scoped out of the ESIA, as justified below:

- To eliminate or mitigate the potential operational risks to geological resources, good operational and maintenance practice measures would be employed including preparation and implementation of spill response and clean-up plans, a part of the Integrated Management System (IMS)[41] of MEPSO, which, inter alia, includes a certified management system for environment (ISO 14001:2004).
- In addition, primary mitigation would need to be incorporated into the Project design for the substation to prevent accidental spillages of transformer oils by instalment of protection measures against spills in line with design standards. These include oil / storm water tank, placed bellow energy transformers with suitable capacity designed to accept accident oil spillage. Regular inspection throughout substation operation period would be performed to ensure the containment is secure.

An ESMP will be prepared as part of the present ESIA to describe the mitigation strategy during the impelemntation of the Project.

6.4 Water Environment

The Project has the potential to affect the water environment during the construction and operational phases. This section provides an overview of the current baseline and potential impacts of the Project on the water environment and describes the principle mitigation approach.

6.4.1 Study Area

For the purposes of the assessment, the spatial scope of the assessment includes features of the water environment in vicinity to the SS location or that are crossed by the 500 metres wide OHL corridor (250 metres on both sides from the longitudinal axis of the transmission line). These features are likely to be affected by the Project activities.

[41] MEPSO has an IMS, incorporating quality, environment and health & safety, certified under respective international standards - ISO 9001 (quality management), ISO 14001 (environmental management) and ISO 45001 (health and safety management)

6.4.2 Baseline Conditions

In wider context, from a hydrographical point of view, the Project region as a whole belongs to the catchment areas of the Vardar River and the river Strumica, both part of the Aegean Sea Basin (Figure below).

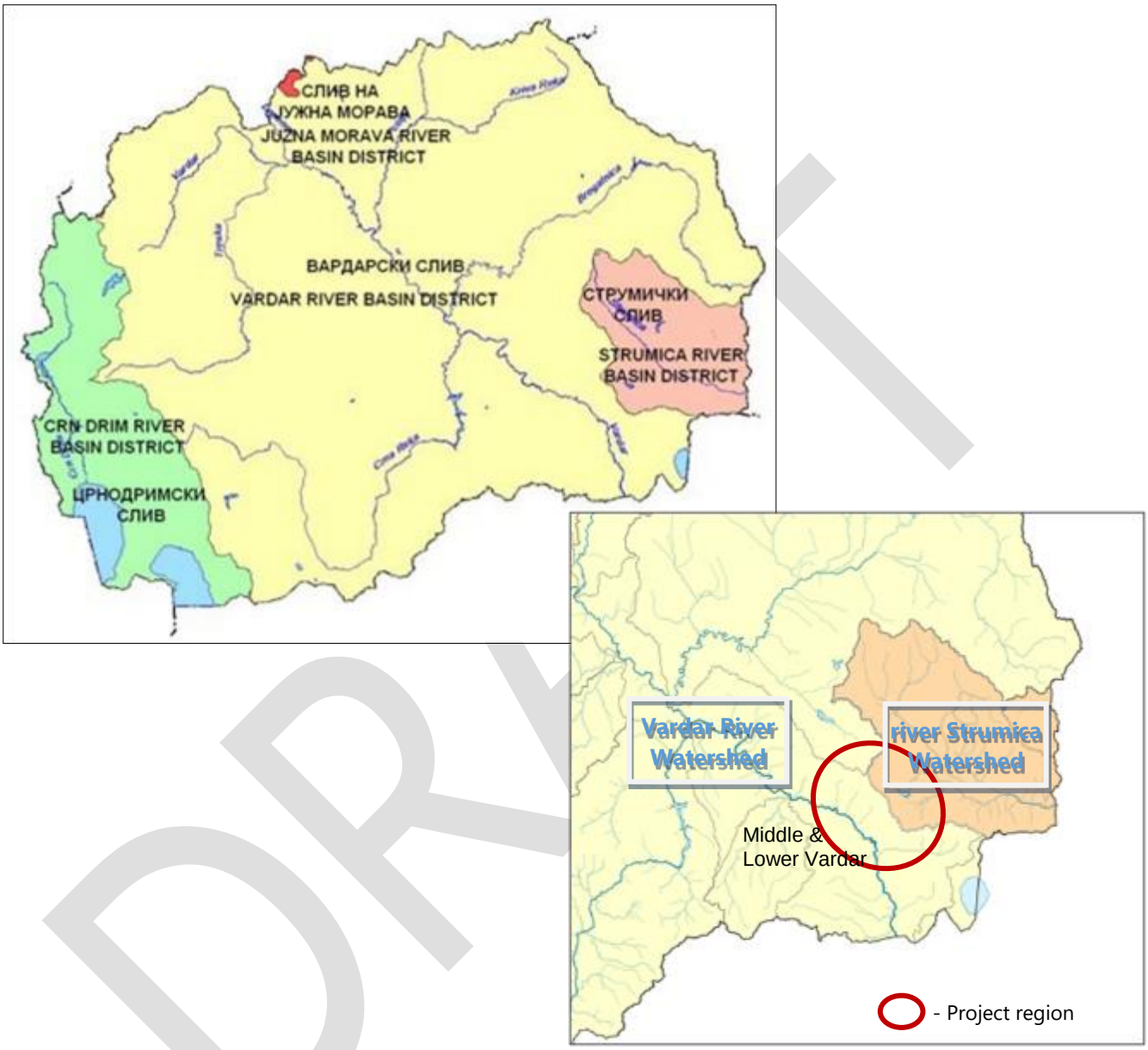

Figure 6.1: Hydrological catchment area in the Project region

The spatial scope of the assessment includes regional features of the natural water environment crossed by the Project elements.

(1) Sub-project 1 - New 400/110 kV SS Valandovo with connection to the existing 400 kV and 110 kV transmission network

No natural water bodies are located in proximity to the proposed location for the new 400/110 kV SS Valandovo. The Vardar River is at relative distance of approx 1 km from the substation location and, therefore, no interaction with the Project is likely.

The natural water bodies crossed by the respective 110 kV OHL corridor(s) are presented in the Table below.

Natural features of water environment - Sub-project 1 -	
Existing 110 kV OHL from SS Valandovo to SS 'EVP' Miletkovo	
Watercourse	Character
Anska Reka	Continuous
Vardar	Continuous
New 110 kV OHL connector with SS 'EVP' Miletkovo	
Watercourse	Character
Dukavec	Continuous
Three streams	Intermittent

Table 6.2: Features of water environment within the study area of the proposed new 400/110 kV SS Valandovo and 110 kV connectors

(2) Sub-project 2 - Reconstruction of the existing 110 kV OHL Valandovo - Strumica

The natural water bodies crossed by this Project element are presented in Table below.

Natural features of water environment - Sub-project 2 -	
Watercourse	Character
Velichka River	Continuous
Trkavilishte	Continuous
Zhabarnik	Continuous
Trkanja	Continuous
Kriva River	Continuous

Table 6.3: Features of water environment within the study area of the proposed reconstruction of the existing 110 kV OHL Valandovo – Strumica

6.4.3 Construction

Potential impacts on the water environment during the construction phase of the Project include:

- Risks to the water environment due to:
  - excavation, and the subsequent deposition of soils, sediment, or other construction materials causing pollution;
  - spillage of fuels or other contaminating liquids causing pollution;
  - temporary physical modifications interrupting the natural passage of surface and subsurface flow.

The potential impacts for the above activities would be mitigated by undertaking of construction works in accordance with a Project's CESMP which will include, at a minimum:

- no direct discharges to groundwater or surface waters;
- sanitary water discharged to self-contained units and further processed with treatment facilities;
- minimizing construction works in floodplains;
- no work in watercourses and no vehicles entering watercourses;
- crossings constructed to minimise sediments;
- temporary land-take would include adequate areas of land set away from surface waters and groundwater areas.

In addition, close communications with the competent authorities in relation to water environment and flood risk would be established during the construction phase of the Project in order to mini-

mise the potential for negative effects of the construction works to water resources in the study area.

6.4.4 Operation

The operational phase of the Project may result in potential impacts on water quality, especially due to maintenance activities and the control of infrastructure and equipment:

- Accidental spillage of oils and fuels from vehicles, leading to risk of pollution these hazardous substances;
- Compaction of land around the Project elements, leading to local effects on hydrology from compaction;
- Accidental spillage of transformer oils at the substation, which is a potential risk of groundwater pollution from hazardous substances.

It is anticipated that these potential impacts will be of negligible to minor significance. The assessment of the impacts to the water environment during the operational phase is, therefore, scoped out of the ESIA, as justified below:

- To eliminate or mitigate the potential operational risks to water resources, good operational and maintenance practice measures would be employed including preparation and implementation of spill response and clean-up plans, a part of the Integrated Management System (IMS)[42] of MEPSO, which, inter alia, includes a certified management system for environment (ISO 14001:2004).
- In addition, primary mitigation would need to be incorporated into the Project design for the substation to prevent accidental spillages of transformer oils by instalment of protection measures against spills in line with design standards. These include oil / storm water tank, placed bellow energy transformers with suitable capacity designed to accept accident oil spillage. Regular inspection throughout substation operation period would be performed to ensure the containment is secure.

An ESMP will be prepared as part of the present ESIA to describe the mitigation strategy during the impelemntation of the Project.

6.5 Noise

The Project has the potential to result in temporary noise impacts at the closest receptors to the works during the construction phase as well as in permanent impacts during operational phase. This section provides an overview of the current baseline and potential noise impacts of the Project and describes the principle mitigation approach.

6.5.1 Study Area

The assessment of effects from the construction noise uses a study area of 1,000 m from the SS location and 2,000 m wide OHL corridors (1,000 metres on both sides from the longitudinal axis of

[42] MEPSO has an IMS, incorporating quality, environment and health & safety, certified under respective international standards - ISO 9001 (quality management), ISO 14001 (environmental management) and ISO 45001 (health and safety management)

the transmission lines) likely to be affected by the Project activities. This is due to the effect of noise from construction reducing with distance from the point of release, and beyond 1,000 m these are likely to have reduced to a level equivalent to background levels.

6.5.2 Baseline Conditions

Environmental noise monitoring in Macedonia is organised in urban areas of four local self-governments[43] (municipalities) at 39 measuring stations [Ref.15]. There are no measurements of the environmental noise neither within the study area nor in the rural or urban areas in the Project region.

The study area is predominantly rural in nature, passing through not densely populated zones. Key noise source is the traffic network. Other sources of seasonal noise in the environment are the agricultural activities. Therefore, it is generally assumed that the ambient noise levels at the proximity of the location of the new substation and along the OHL corridors are below the legally determined limit values for the particular types of zones set out in the relevant Macedonian legislation[44]. An exemption is the section of the existing 110 kV OHL from Valandovo to Strumica through urban zones in Strumica where background urban noise likely exceeds ambient noise limit values in particular cases.

6.5.3 Construction

In a general context, construction of the Project elements can be divided into a number of distinct processes. They may be described as follows:

- construction of substation
- dismantling of obsolete transmission line
- construction of tower foundations
- tower assembly and erection
- attachment of conductors
- access roads (including general road improvements) and other off-site construction works.

The potential impacts for the above activities would be mitigated by undertaking of construction works in accordance with a Project's CESMP which will include, at a minimum:

- establish working hours and rules based on the needs to minimise noise disturbance;
- selection of quiet and low noise equipment, i.e. use outdoor machinery that complies with the noise emissions standards as required by the relevant Macedonian legislation and the EU's Outdoor Equipment Directive[45]
- review of construction programme and methodology to consider low noise/ low vibration methods;

[43] These are: City of Skopje (fourteen stations), Bitola (eight stations), Kumanovo (ten stations) and Kicevo (seven stations).

[44] Rulebook on environmental noise level limit values (Official Gazette of Macedonia no. 147/08)

[45] DIRECTIVE 2000/14/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 May 2000 on the approximation of the laws of the Member States relating to the noise emission in the environment by equipment for use outdoors

- optimal location of equipment on site and careful unloading of vehicles to minimise noise disturbance;
- proper maintenance and operation of machinery to minimise noise disturbance;
- provision of acoustic enclosures to compressors and static plant, where necessary;
- implementation of a Traffic Management Plan to mitigate traffic impacts during construction, for example, through the choice of routes, the varying of routes and timing of construction traffic.

In addition, regular liaison with the local authorities to discuss activities and the progress of the Project construction would be undertaken in order to minimise the potential for negative effects of the construction works due to noise nuisance.

6.5.4 Operation

Once operational, the Project would be a source of noise due to the phenomenon known as "corona discharge" (a limited electrical insulation breakdown of the air) which can also occur naturally during storms when highly charged clouds induce high electric fields around tall objects.

In principle, to minimise this operational impact, primary mitigation ('mitigation through design') would be incorporated into the Project. The transmission infrastructure and equipment would need to be inherently designed to avoid the public exposure to operational noise from its future use. Therefore, potential impacts on human health as a result of the operational noise would be mitigated through the design of the Project, mainly through incorporation of respective design parameters into the Project design (e.g. set out minimum required conductor vertical clearance and application of noise reducing coatings for conductors in vicinity to residential zones and other properties).

In addition, primary mitigation to avoid public exposure to the operational noise would be incorporated into the Project through the legal requirement for MEPSO to establish a Right of Way as a safety corridor along the path of the transmission lines and safety zone around the substation perimeter. Within this corridor buildings and facilities must not be constructed and certain activities are restricted to ensure, *inter alia*, protection of human health against long-term exposure to noise.

During the pre-construction and construction phases, correct manufacturing and installation methods and procedures are considered as an essential prerequisite measure that would allow reduction of eventual audible nuisance due to operations of the transmission infrastructure and equipment. Particular attention should be paid to:

- Appropriate corona testing of conductor fittings in the line configuration.
- Manufacture of conductor consistent with technical specifications.
- Appropriate requirements for storage, transport and handling of the conductors to minimise surface damage and contamination.

6.6 Land Cover and Land Use Change

The Project will affect the current land cover forms and use pattern during the construction and operational phases, with significant difference between the elements that will be reconstructed / upgraded and newly constructed elements. This section provides an overview of the current base-

line and potential impacts of the Project on the land cover and describes the principle mitigation approach.

6.6.1 Study Area

An area of 1,000 metres wide OHL corridor (500 metres on both sides from the longitudinal axis of the transmission line), including the SS location (Sub-project 1), is used for this ESIA scoping phase to present the baseline in wider context, which is considered as representative and sufficient to identify the current land use and structure in the broader area and to assess indirect impacts for the Project.

For the purposes of the ESIA Report, the study area within the infrastructure corridor (defined for the purpose of this appraisal as 100 metres wide corridor) will be used for consideration of the direct effects and changes on the current key land use forms (e.g. agricultural land, woodland, urban land, etc.). This zone is based on the land anticipated to be directly affected by the Project, i.e. potentially required temporarily and/or permanently for the construction, operation and maintenance of the transmission line and where specific land use rules would be established to ensure technical safety of the OHL and protection of people and environment during its operation.

6.6.2 Baseline Conditions

Comparative land cover assessment within the study area of the Project's components is made based on CORINE Land Cover (CLC)[46] 2018 data and is presented below.

(1) Sub-project 1 - New 400/110 kV SS Valandovo with connection to the existing 400 kV and 110 kV transmission network

The baseline land cover conditions for each of the elements of this sub-project are provided below.

- The new 400/110 kV substation Valandovo and 'in-out' connection with the existing 400 kV line from SS Dubrovo to Thessalonica (GR)

Due to the relatively small affected area, there are only three land cover classes: 211: Non-irrigated arable land, 321: Natural grasslands and 323 Sclerophyllous vegetation. The Non-irrigated arable land occupies small surface while Natural grasslands and Sclerophyllous vegetation are dominant (Figure below).

[46] The CORINE Land Cover (CLC) inventory was initiated in 1985 (reference year 1990) to standardize data collection on land in Europe to support environmental policy development.

Figure 6.2: Wider area of the new 400/110 kV substation Valandovo and 'in-out' connection with the existing 400 kV line

Note: The existing 400 KV OHL can be seen within the 323 Sclerophyllous vegetation

- Upgrade the existing 110 kV transmission line from SS Valandovo to SS 'EVP' Miletkovo.

The land cover within the study area along this existing line (Table below) is dominated by agricultural land (approx. 40% in total): 242 Complex cultivation patterns (37.0%) and 211 Non-irrigated arable land (3%). Significant portion is also occupied by 323 Sclerophyllous vegetation (29.51%) which in fact the vegetation of pseudomaquis.

The line crosses the valley of the Vardar River which contributes to higher percentage of CLC class 511 Water courses (29.1%).

CORINE Land Cover class (broader study area of 1,000 metres wide corridor)	Area [hectares]	Percentage [%]
112 Discontinuous urban fabric	/	/
121 Industrial or commercial units	/	/
211 Non-irrigated arable land	36.83	2.99
221 Vineyards	0.60	0.05
231 Pastures	0.00	0.00
242 Complex cultivation patterns	455.74	37.00
243 Land principally occupied by agriculture with significant areas of natural vegetation	3.57	0.29
311 Broad-leaved forest	5.71	0.46
313 Mixed forest	0.00	0.00
321 Natural grasslands	2.94	0.24
323 Sclerophyllous vegetation	363.52	29.51
324 Transitional woodland-shrub	3.93	0.32
511 Water courses	358.91	29.14
Total:	1,231.76	100.00

Table 6.4: Land cover according to CORINE Land Cover types within the study area of the proposed reconstruction / upgrade of the existing 110 kV OHL from SS Valandovo to SS 'EVP' Miletkovo

- Construction of a new 110 kV OHL connector with the existing SS 'EVP' Miletkovo

The land cover patterns within the study area along the proposed corridor of this new transmission line (Table below) is characterized by the presence of highly degraded Sclerophyllous vegetation

(CLC code 323) and small patches of Natural grasslands (CLC code 321). The surrounding area also contains significant portion of Non-irrigated arable land (CLC code 211) Complex cultivation patterns (38.72%).

CORINE Land Cover classes (broader study area of 1,000 metres wide corridor)	Area [hectares]	Percentage [%]
211-Non-irrigated arable land	71.71	24.85
242-Complex cultivation patterns	111.76	38.72
243-Land principally occupied by agriculture, with significant areas of natural vegetation	21.51	7.45
323-Sclerophyllous vegetation	51.63	17.89
324-Transitional woodland-shrub	0.04	0.02
321-Natural grasslands	21.06	7.30
511-Water courses	10.89	3.77
Total:	288.60	100.00

Table 6.5: Land cover according to CORINE Land Cover types within the study area of the proposed construction of a new 110 kV OHL connector of the new 400/110 kV SS Valandovo with the existing SS 'EVP' Miletkovo

(2) Sub-project 2 - Reconstruction of the existing 110 kV OHL Valandovo - Strumica

The land cover within the study area of this Project component (Table and Figure below) is dominated by agricultural land cover types (52.7%). It is also characterised with high percentage of forests (29.31%) as well as significant percentage of urban and industrial areas (9.6%).

CORINE Land Cover class (broader study area of 1,000 metres wide corridor)	Area [hectares]	Percentage (%)
112 Discontinuous urban fabric	98.64	5.38
121 Industrial or commercial units	76.94	4.19
211 Non-irrigated arable land	101.06	5.51
221 Vineyards	/	/
231 Pastures	154.75	8.44
242 Complex cultivation patterns	495.47	27.01
243 Land principally occupied by agriculture with significant areas of natural vegetation	215.43	11.74
311 Broad-leaved forest	537.56	29.31
313 Mixed forest	/	/
321 Natural grasslands	/	/
323 Sclerophyllous vegetation	47.29	2.58
324 Transitional woodland-shrub	107.19	5.84
511 Water courses	/	/
Total:	1,834.33	100.00

Table 6.6: Land cover according to CORINE Land Cover types within the study area of the proposed reconstruction of the existing 110 kV OHL Valandovo – Strumica

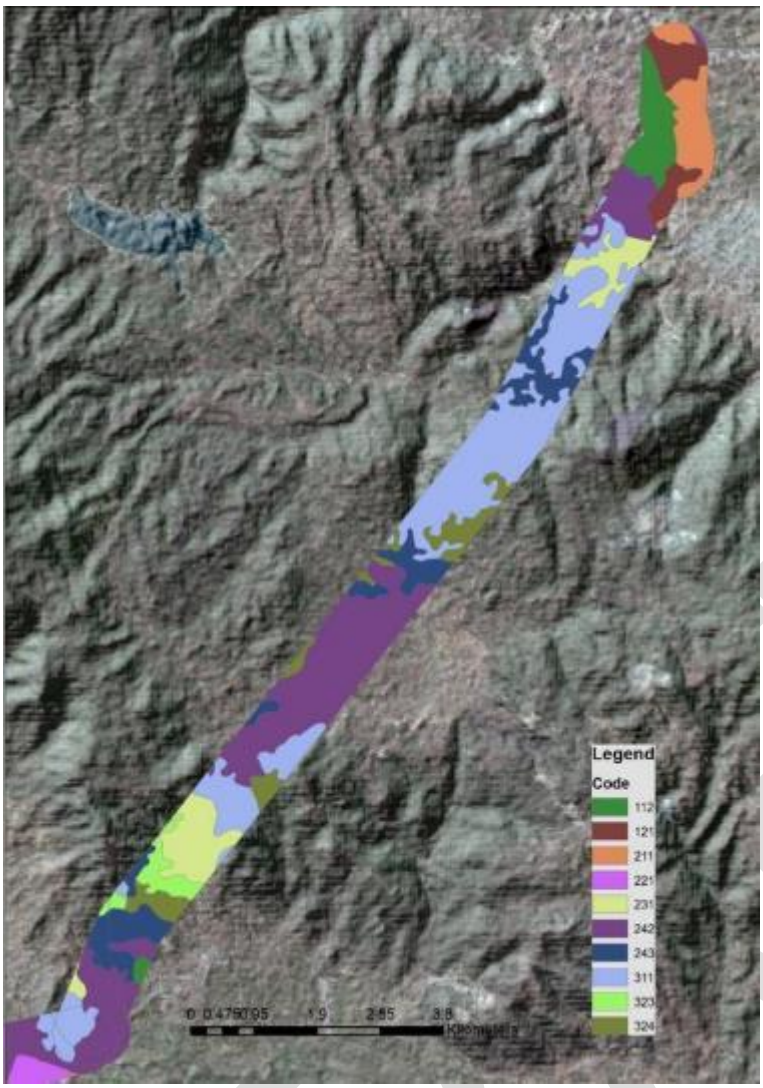

Figure 6.3: Land cover map within the study area of the proposed reconstruction of the existing 110 kV OHL from Valandovo to Strumica

6.6.3 Potential Impacts and Principle Mitigation

In general, the construction and operation of the Project will have certain, but limited, land use effects which will be relevant in the case of newly constructed project elements – the new 400/110 kV substation and newly proposed transmission lines. However, the land transformation in these cases is considered as of very low magnitude and significance of these effects is likely to be negligible. In principle, both public and privately owned land will likely be affected by the implementation of the Project activities. The land use changes from the Project development would imply environmental as well as social element and in principle would typically include the following topics:

- Habitat loss. The Project will require removal of vegetation for construction activities (including access roads) and for creation of the OHL clearance corridor thus leading to temporary and permanent habitat losses, including woodland habitats. The construction of new access roads (where necessary) and rehabilitation of the existing ones may contribute to increased illegal logging, hunting and collection of non-timber forest products. However due to the current wide accessibility of the Project locations, this risk is considered as of low magnitude.

- Land conversion due to land take, including agricultural land as dominant land use form in the study area, in the case the new 400/110 kV substation with the connectors to the existing 400 kV and 110 kV transmission network (Sub-project 1). No such effect is likely to occur in the case of the proposed reconstruction of the existing 110 kV OHL from Valandovo to Strumica (Sub-project 2). Construction of the Project will require conversion of land due the temporary use of agricultural land and land use forms for construction activities (including access roads where they do not exist) and thus potential short-term effects may be experienced by agricultural operations in the Project area. Dust may affect arable land and construction noise and traffic may disturb livestock. In addition, permanent acquisition of agricultural land (land take) will be required within the footprint of the Project components, mainly land needed for the construction of the new substation and new OHL towers, that would permanently disrupt agricultural activities, resulting in long-term operational impacts. In addition, this may result in severance of land parcels.

There are no universally applicable measures available to mitigate the direct permanent change / loss of land resulting from land take required for the Project. Measures to mitigate the land take will need to be incorporated into the further designing process of the Project (i.e. fine-tuning of the new OHL corridor(s) as a key design principle to sought to achieve avoidance of take of agricultural or forest land as well as to minimise the involuntary economical resettlement of people, as far as practicable. According to the relevant Macedonian regulation[47], the minimum vertical clearance for 110 kV transmission line above the ground is 5.0 metres and 6.0 metres in areas not accesible for vehicles/people and accessible for vehicles/people, respectively, including forests. The minimum clearance in regard to forests and trees is set to 3.0 metres. Therefore, certain biodiversity which does not reach height of approx. 2 metres and 3 metres, respectively, would not be necessary removed since it does not pose operational risk for the lines. Other typical mitigation for land use change will relate to the reinstatement of land used temporarily during the construction period.

6.7 Biodiversity and Natural Heritage

The Project has the potential to affect the biodiversity (habitats and species of flora, fauna and fungia) and natural heritage sites. Special attention will need to be paid to the designated areas, important species and habitats with global, European or national importance (according to the international documents and Macedonian legislation). The following text summarizes the study area, identified baseline as well as potential impacts and principle mitigation concerning biodiversity.

6.7.1 Study Area

An area of 1,000 metres wide OHL corridor(s) (500 metres on both sides from the longitudinal axis of the transmission line), including the SS location, is used for this ESIA scoping phase to present the baseline in wider context, which is considered as representative and sufficient to identify the

[47] Rulebook for Construction of Overhead Lines with rated Voltage from 1 kV to 400 kV (Official Gazette of RM no.25, from 1.2.2019)

current biodiversity status in the broader area and to assess indirect impacts from the Project. For Prime Biodiversity Features and critical Habitats an Ecologically Appropriate Assesment Area (EAAA) will be designed. The baseline area is based on the desk-based information, map of ecosystems of North Macedonia, and biodiversity surveys undertaken from 25 and 28 May 2021 and from 18 and 20 August 2021. Most of the data on habitats and species are from the observations during the executed surveys. Only few data on habitats exist for the affected internationally recognised area Important Plant Area Belasica and very scarce data for the legally protected area Cham Chiflik.

The description of habitats and species composition provided in this Scoping Report was based solely on fieldwork observations. Habitats were identified during the field work based on the present plant associations, dominant (edifier) plant species, preservation status and composition of plant species in all layer of the habitat (trees, shrubs and herbs layers). All of these data were taken with OruxMaps free software for Android (https://www.oruxmaps.com/cs/en/). The records of individual species (plants, animals) were recorded with Memento Database for Android (https://mementodatabase.com/).

For the purposes of the ESIA Report, the study area within the infrastructure corridor (defined for the purpose of this appraisal as 100 metres wide corridor) will be used for consideration of the direct effects on the key biodiversity components affected by the Project – especially habitats. This area is generally considered as zone of influence encompassing the main likely significant ecological effects of the Project, including those which would occur by habitat loss or degradation. However, the study area may be extended to a broader context for important habitats (patches of larger size), disturbance of species, etc.

For the purposes of the ESIA, each site designated for nature conservation interest or proposed for designation (legally protected area and/or internationally recognised area), likely to be affected by the Project, is considered as a study area as a whole in terms to the potential of the project to impact its conservation objective and integrity.

6.7.2 Baseline Conditions

(1) Sub-project 1 - New 400/110 kV SS Valandovo with connection to the existing 400 kV and 110 kV transmission network

The baseline biodiversity conditions for each of the elements of this sub-project are provided below.

- The new 400/110 kV substation Valandovo and 'in-out' connection with the existing 400 kV line from SS Dubrovo to Thessalonica (GR)

Vegetation and Habitats

Most of the study area passes through an agricultural land with low biodiversity values. The area is characterized by very degraded pseudomaquis with dominance of Christ's thorn (*Paliurus spina-christi*) and small patches of Kermes oak woodlands (*Coccifero-Carpinetum orientalis*).

Flora

There are no literature data which are specific for the study area. However, the field surveys carried out to date showed presence of common species for the area of pseudomaquis. The dominant tree/shrub species are *Quercus coccifera, Paliurus spina-christi, Fraxinus ornus, Phyllirea media,*

Platanus orientalis, Salix alba, *Rubus sanguineus*, etc. There are no rare, threatened or otherwise important plant species that were recorded.

Fauna

There are no literature data which are specific for the fauna of the study area, as well. During the field surveys the following species were registered: *Lanius collurio, Merops apiaster, Buteo buteo, Ciconia ciconia* (birds), *Podarcis muralis, Lacerta trilineata, Testudo graeca* (reptiles), *Iphiclides podalirius, Maniola jurtina, Pararge aegeria, Lybithea celtis, Polyommatus icarus* (butterflies). Attention should be paid to the fauna of birds and reptiles where particular important species are likely present.

Natural Heritage Sites

There are no nationally natural heritage sites (legally protected areas or internationally recognized areas) within the study area of the proposed new 400/110 kV SS Valandovo, including the proposed 'in-out' connection with the existing 400 kV OHL from SS Dubrovo to Thessalonica (GR).

- Reconstruction / upgrade the existing 110 kV transmission line from SS Valandovo to SS 'EVP' Miletkovo.

Vegetation and Habitats

The existing line passes through environmental area of low sensitivity with dominance of agricultural land. The first approx. 600 m long section of the corridor, starting from the SS Valandovo passes through Kermes oak shrubland (Pseudomaquis). The rest of the route passes through agricultural land. In this part the line crosses river Anska Reka at two points (22.533219E, 41.307299N and 22.485034E, 41.292345N). Anska Reka is canalized and its riparian vegetation is degraded and represented by willow shrubs (*Salix alba*), *Tamarix* spp, *Rubus* spp. and some herb species. The transmission line also crosses the Vardar River (22.480452E, 41.290926N) – the vegetation in this part is represented by Willow belt (Salicetum albae-fragilis) which is very narrow and adjacent to the river as well as degraded sandy habitats. Out of the natural habitats, only Floating Duckweed covers (EUNIS code C1.221) should be mentioned, noticed on Anska Reka.

Flora

The flora in the study area is poor in species. The most diverse floristic composition was noticed at the crossings of rivers Anska Reka and Vardar: *Salix alba, Tamarix* spp*., Lythrum salicaria, Rubus sanguineus, R. discolour, Phragmites australis, Populus alba, Sambucus ebulus, Humulus lupulus, Convolvulus arvensis, Typha latifolia, Urtica dioica*, etc. None of the species is threatened or rare.

Fauna

The fauna in the study area is not documented in the literature. The most common species are *Lanius collurio, Buteo buteo, Pernis apivorus, Passer domesticus, P. hispanioliensis, Ciconia ciconia, Ardea cinerea, A. alba, Egretta garzetta, Luscinia megarhynchos,* etc. Amphibians (*Pelophylax ridibundus, Bufo viridis, Rana graeca*) are present along the Vardar River.

Natural Heritage Sites

There are no nationally natural heritage sites (legally protected areas or internationally recognized areas) within the study area of the proposed upgrade of the existing 110 kV OHL from SS Valandovo to SS 'EVP' Miletkovo.

- Construction of a new 110 kV OHL connector with the existing SS 'EVP' Miletkovo

Vegetation and Habitats

The corridor of the proposed transmission line passes through an agricultural area with low biodiversity values. Some remains of natural communities are scattered within the agricultural matrix, but these are of very limited extent. At the periphery of the study area there are the riparian communities along the Vardar River.

Flora

The flora in the study area is consisted mainly of widespread and ruderal species. No important or endemic species were recorded during the field surveys.

Fauna

The fauna in the study area is not documented in the literature. During the field visits the following species were registered: *Lanius collurio, Merops apiaster, Buteo buteo, Ciconia ciconia* (birds), *Podarcis muralis,* (reptiles), *Iphiclides podalirius, Maniola jurtina, Pararge aegeria, Lybithea celtis, Polyommatus icarus* (butterflies).

Natural Heritage Sites

There are no nationally natural heritage sites (legally protected areas or internationally recognized areas) within the study area of the proposed construction of a new 110 kV OHL connector of the new 400/110 kV SS Valandovo with the existing SS 'EVP' Miletkovo.

(2) Sub-project 2 - Reconstruction of the existing 110 kV OHL Valandovo - Strumica

Vegetation and Habitats

The natural and semi-natural vegetation in the wider area along this transmission line is dominantly represented by forest associations as well as small parts of rivers, riparian habitats and meadows. Kermes oak pseudomaquis (Coccifero-Carpinetum orientalis) occupies largest area around Valandovo and Kosturino and gradually changes to Italian oak (*Quercus frainetto*) forest (Quercetum frainetto-cerris) with some elements of Pubescent oak community (Querco-Carpinetum orientalis) in the area between Kosturino and Strumica. Kermes oak pseudomaquis (shrubland) is represented by different degradation stadiums of which the last one is marked by the presence Christ's thorn (*paliuretosum*). Oriental plant belts are present in the ravines in the Kermes oak shrubland in the area of Valandovo. Crimean pine community (subass. *pinetosum nigrae*) develops in the valleys of streams in the area close to Strumica, including the hill Cham Chiflik (which is proclaimed as a legally protected area).

The valley of Kosturino is dominated by abandoned agricultural land with only degraded oak forests on the slopes of the surrounding hills.

Meadows are present in the vicinity of village Tri Vodi. The line also crosses river Trkajna (at two points) where riparian vegetation develops. The crossing of river Trkajna close to Strumica (22.639845E, 41.412155N) is marked by intensive quarrying, unsanitary solid waste disposal and highly degraded riparian habitats, including two artificial ponds.

Flora

The flora in the Kermes oak shrubland is composed of plant species which are specific, but common for this type of habitats: *Quercus coccifera, Q. pubescens, Carpinus orientalis, Paliurus spina-christi, Lonicera etrusca, Cistus villosus,, Clematis flammula, Fraxius ornus*, etc. The floristic composition of Pubescent oak forests is similar with lower presence of thermophilous species. It seems

that the most interesting plant species are present in the Crimean pine forests: *Pinus nigra* ssp. *pallasiana, Osyris alba, Comandra elegans, Gagea saxatilis, Limodorum abortivum, Cistus villosus, Genista januensis, Anthericum liliago, Loranthus europaeus, Quercus coccifera, Q. pubescens, Q. frainetto, Q. cerris,* etc. However, none of the species can be considered as important from conservation point of view.

Fauna

According to the database of protected areas there are several important species of amphibians, reptiles and birds present on Cham Chiflik: *Bombina variegata, Bufo bufo, Hyla arborea, Lissotriton vulgaris, Pelophylax ridibundus, Bufo viridis, Rana dalmatina, Rana graeca, Salamandra salamandra* (amphibians), *Elaphe quatuorlineata, Vipera ammodytes* (reptiles), *Ciconia nigra, Circaetus gallicus* (birds) and *Isophya tosevski, Saga campbelli campbelli* (insects). One species of termite *Reticulitermes lucifugus* was also recorded on Cham Chiflik.

Valorization of Habitats and Species of Flora and Fauna

The following Table presents the list of identified habitats in all project components and subcomponents. They are listed according to their trivial name which describes the community and its degradation status or other important aspects of its physiognomy. All of the habitats were also identified according to the EUNIS classification system of habitats[48] which a comprehensive system of all habitats on the European continents. Important habitats were selected according to the Annex I of the Habitats Directive[49]. Bern Convention (Resolution No. 4, updated version of Annex I, https://eunis.eea.europa.eu/references/2442) was also used to identify important habitats. One should bear in mind that both Bern Convention (Resolution 4 - Annex I) and EU Habitats Directive (Annex I) are not comprehensive classification systems and they focus on important habitats.

According to the EU Habitats Directive there are three important habitats: 9530* (Sub)Mediterranean pine forests with endemic black pines, 92C0 Platanus orientalis and Liquidambar orientalis woods (Plantanion orientalis) and 92A0 Salix alba and Populus alba galleries. The habitat 9530 is considered as priority habitat (*) – it corresponds to the Black pine forest in Cham Chiflik protected area. The habitat 92C0 is specific for the riparian belt of river Trkajna (Trkavalishte stream). The habitat 92A0 represents the riparian habitat consisted of willows and poplars along the Vardar River.

Habitats (trivial name)	Habitats (EUNIS)	Habitats (Bern Convention) ! – selected habitats	Habitats (EU Habitats Directive) * - priority habitats	Key Project components			
				1a	1b	1c	2
Very degraded pseudomaquis	F5.31: Helleno-Balkanic pseudomaquis	/	/	√			
Pseudomaquis		/	/		√		√
Patches of Kermes oak woodlands		/	/	√			
Italian oak (*Quercus frainetto*) forest	G1.762 Helleno-Moesian [*Quercus frainetto*] forests	G1.7C Mixed thermophilous woodland	/				√

[48] European Nature Information System (https://eunis.eea.europa.eu/habitats-code-browser.jsp)

[49] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A31992L0043)

Crimean pine community	G3.5617 - Pelagonide Pallas' pine forests	G3.5 [*Pinus nigra*] wood-land	9530 * (Sub-)Mediterranean pine for-ests with endemic black pines				√
Oriental plant belts	G1.381 : Helleno-Balkanic riparian plane forests	! G1.38 [*Platanus orientalis*] woods	92C0 *Platanus orientalis* and *Liquidambar orental-is* woods (*Plantanion orientalis*)				√
Willow belt	G1.3 - Mediterranean riparian woodland	G1.1 Riparian and gallery woodland, with dominant [*Alnus*], [*Betula*], [*Populus*] or [*Salix*]	92A0 Salix alba and Populus alba galleries		√	√	
Willow and Poplar belt						√	
Floating Duckweed covers	C1.221 - Duckweed covers	/	/			√	
Canalized river	C2.3 : Permanent non-tidal, smooth-flowing watercourses	/	/		√		
Lowland rivers	C2.31 : Epipotamal streams	/	/				
Agricultural land	I1 : Arable land and market gardens	/	/		√		

Table 6.7: Habitats within study area, their valorization and distribution per Project elements

Note: 1a - Sub-project 1 (new 400/110 kV SS and 400 kV in-out connector); 1b - Sub-project 1 (new 110 kV connector to SS 'EVP' Miletkovo); 1c - Sub-project 1 (upgrade of 110 kV OHL from Valandovo to Miletkovo); 2 - Sub-project 2 (reconstruction of 110 kV OHL from Valandovo to Strumica)

The valorization of species was based on both national and international criteria. National criteria included the List (bylaw) of Strictly protected and protected species[50] (Official Gazette of Republic of Macedonia, 139/2011) as well as assessment of the endemism and their rarity (expert as-sessment).

Since no reliable records of plant species are known for the area it is very difficult to compile a complete list of plant species. Based on the previous field work and personal databases in the wider area a list of all plant species will be elaborated and presented in the ESIA report. At the moment, this list contains more than 550 species.

The following Table presents the list of plant species which were recorded during the field work. None of the species has certain conservation status. Only *Osyris alba* may be regarded as rela-tively rare species in North Macedonia (it lives in Black pine forest of Cham Chiflik).

Species	National importance	International importance	Key Project components			
			1a	1b	1c	2
Anthericum liliago	/	/				√#
Carpinus orientalis	/	/	√	√	√	√
Cistus villosus	/	/			√	√#
Clematis flammula	/	/	√	√	√	√
Clematis vitalba	/	/				√
Comandra elegans	/	/				√
Convolvulus arvensis	/	/	√	√	√	√
Fraxinus ornus	/	/	√	√	√	√

[50] https://www.moepp.gov.mk/wp-content/uploads/2014/09/Listi%20za%20utvrduvanje%20na%20strogo%20 zas-titeni%20i%20zastiteni%20divi%20vidovi.pdf

Species	National	International	Key Project components			
Gagea saxatilis	/	/				√#
Genista januensis	/	/				√
Humulus lupulus	/	/		√	√	√
Limodorum abortivum	/	/				√#
Lonicera etrusca	/	/			√	√
Loranthus europaeus	/	/				√
Lythrum salicaria	/	/		√	√	√
Malva sylvestris			√	√	√	√
Malus sylvestris						√
Ostrya carpinifolia						√
Osyris alba	Rare (10 localities in MK)	/				√
Paliurus spina-christi	/	/	√	√	√	√
Phragmites australis	/	/		√	√	√
Phyllirea media	/	/	√	√	√	√
Pinus nigra ssp. *pallasiana*	/	/				√
Pinus nigra ssp. nigra (planted)	/	/				√
Platanus orientalis	/	/	√			√
Populus alba	/	/		√	√	√
Prunus cerasifera			√	√	√	√
Quercus pubescens	/	/	√	√	√	√
Quercus coccifera	/	/	√	√	√	√
Quercus frainetto	/	/				√
Quercus cerris	/	/				√
Rubus discolor	/	/		√	√	√
Rubus sanguineus	/	/	√	√	√	√
Salix alba	/	/	√	√	√	√
Salix elaeagnos	/	/		√		√
Salix fragilis	/	/		√		√
Sambucus ebulus	/	/		√		√
Tamarix parviflora	/	/		√		
Tamarix tetrandra	/	/		√		
Typha latifolia,	/	/		√	√	√
Urtica dioica	/	/	√	√	√	√
Lemna minor	/	/		√		
Prunus cerasifera	/	/	√	√	√	√
Ficus carica	/	/	√	√	√	√

Table 6.8: Flora within study area, valorization and distribution per Project elements

Note: 1a - Sub-project 1 (new 400/110 kV SS and 400 kV in-out connector); 1b - Sub-project 1 (new 110 kV connector to SS 'EVP' Miletkovo); 1c - Sub-project 1 (upgrade of 110 kV OHL from Valandovo to Miletkovo); 2 - Sub-project 2 (reconstruction of 110 kV OHL from Valandovo to Strumica)]. Records marked with # are from the Report on the Representative network of protected areas. All of the other records are from the field work conducted in 2021.

The following Table presents the distribution of bird species in the study area. Most of the records are from field research conducted in 2021 with the exception of records marked with # (species from Cham Chiflik). There are 14 species which are considered as strictly protected according to the Law on Nature: *Ardea alba, Buteo Buteo, Chroicocephalus ridibundus, Ciconia nigra, Circaetus gallicus, Corvus corax, Egretta garzetta, Falco subbuteo, Falco tinnunculus, Gallinula chloropus, Garrulus glandarius, Oriolus oriolus, Otus scops* and *Pernis apivorus*. Ten species are listed in Annex I of the EU Birds Direcive: *Alcedo atthis, Ardea alba, Caprimulgus europaeus, Ciconia nigra, Circaetus gallicus, Egretta garzetta, Lanius collurio, Lanius minor, Lullula arborea* and *Pernis apivorus*. *Streptopelia turtur* is considered as Vulnerable (VU) according to the IUCN

globar red list of threatened species. There are three species with threat status on the European red list of species: *Streptopelia turtur and Alcedo atthis* as Vulnerable (VU) and *Fulica atra* as Near Threatened (NT). All of the other species are of Least Concern (LC).

Species	IUCN GLR	IUCN ERL	Bird Directive	National list	Bern Convetion	Bonn Convention	CITES	Law of ature	HGunting law	Key Project components			
										1a	1b	1c	2
Aegithalos caudatus	LC	LC			III				tp	√	√	√	√
Alcedo atthis	LC	VU	I	I	II				tp	√	√	√	√
Anas platyrhynchos	LC	LC	IIA & IIIA		III	II		ps	hg	√	√	√	√
Ardea alba	LC	LC	I	I	II	II		sps	pp		√		
Buteo buteo	LC	LC			II	II	II	sps	pp	√	√	√	√
Caprimulgus europaeus	LC	LC	I	I	II				tp	√	√	√	√
Carduelis carduelis	LC	LC			II				tp	√	√	√	√
Cettia cetti	LC	LC			II	II			tp		√		√
Charadrius dubius	LC	LC		Ms	II	II			tp		√		
Chloris chloris	LC	LC			II				tp	√	√	√	√
Chroicocephalus ridibundus	LC	LC	IIB		III			sps	pp		√		√
Ciconia nigra	LC	LC	I		II	II		sps	pp				√#
Circaetus gallicus	LC	LC	I		II	II		sps	pp				√#
Coccothraustes coccothraustes	LC	LC			II				tp		√		
Columba livia	LC	LC	IIA		III			ps	hg	√	√	√	√
Columba palumbus	LC	LC	IIA & IIIA					ps	hg	√	√	√	√
Corvus corax	LC	LC			III			sps	pp	√	√	√	√
Corvus corone	LC	LC	IIB						ntp	√	√	√	√
Cuculus canorus	LC	LC			III				tp	√	√	√	√
Curruca communis	LC	LC			II	II			tp				√
Cyanistes caeruleus	LC	LC			II				tp	√	√	√	√
Delichon urbicum	LC	LC			II				tp	√	√	√	√
Dendrocopos major	LC	LC			II				tp	√	√	√	√
Egretta garzetta	LC	LC	I	I	II			sps	pp		√		√
Emberiza calandra	LC	LC			III				tp	√	√	√	√
Emberiza cirlus	LC	LC			II				tp	√	√	√	√
Erithacus rubecula	LC	LC			II	II			tp	√	√	√	√
Falco subbuteo	LC	LC			II	II	II	sps	pp	√	√	√	√
Falco tinnunculus	LC	LC			II	II	II	sps	pp	√	√	√	√
Fringilla coelebs	LC	LC			III				tp	√	√	√	√
Fulica atra	LC	NT	IIA & IIIB	Ms	III	II		ps	hg		√		√
Galerida cristata	LC	LC			III				tp	√	√	√	√
Gallinula chloropus	LC	LC	IIB		III			sps	pp		√		√
Garrulus glandarius	LC	LC	IIB					sps	pp				√
Granativora melanocephala	LC	LC		Ms	II				tp	√	√	√	√
Hirundo rustica	LC	LC			II				tp	√	√	√	√
Lanius collurio	LC	LC	I	I	II				tp	√	√	√	√
Lanius minor	LC	LC	I	I	II				tp	√	√	√	√
Lanius senator	LC	LC		Ms	II				tp	√	√	√	√
Lullula arborea	LC	LC	I	I	III				tp				√
Luscinia megarhynchos	LC	LC			II	II			tp	√	√	√	√
Merops apiaster	LC	LC			II	II			tp	√	√	√	√
Motacilla alba	LC	LC			II				tp		√		√
Motacilla flava	LC	LC			II				tp		√	√	√
Oenanthe hispanica	LC	LC		Ms	II	II			tp	√	√	√	
Oenanthe oenanthe	LC	LC			II	II			tp	√	√		√

Species	IUCN GLR	IUCN ERL	Bird Directive	National list	Bern Convetion	Bonn Convention	CITES	Law of ature	HGunting law	Key Project components			
										1a	1b	1c	2
Oriolus oriolus	LC	LC			II			sps	pp	√	√	√	√
Otus scops	LC	LC			II		II	sps	pp	√	√	√	√
Parus major	LC	LC			II				tp	√	√	√	√
Passer domesticus	LC	LC							tp	√	√	√	√
Passer hispanioliensis	LC	LC			III				tp		√		
Perdix perdix	LC	LC	IIA & IIIA		III			ps	hg	√	√	√	√
Pernis apivorus	LC	LC	I	I	II	II	II	sps	pp	√	√	√	√
Phalacrocorax carbo	LC	LC		sp	III				ntp		√		
Pica pica	LC	LC	IIB						ntp	√	√	√	√
Picus viridis	LC	LC			II				tp	√	√	√	√
Poecile lugubris	LC	LC			II				tp		√	√	√
Remiz pendulinus	LC	LC		Ms	III				tp	√	√	√	√
Sitta europaea	LC	LC			II				tp				√
Streptopelia decaocto	LC	LC	IIB		III			ps	hg	√	√	√	√
Streptopelia turtur	VU	VU	IIB	Ms	III	II		ps	hg	√	√	√	√
Sturnus vulgaris	LC	LC	IIB						ntp	√	√	√	√
Sylvia atricapilla	LC	LC			II	II			tp		√	√	√
Troglodytes troglodytes	LC	LC			II				tp				√
Turdus merula	LC	LC	IIB		III	II			tp	√	√	√	√
Upupa epops	LC	LC			II				tp	√	√	√	√

Table 6.9: Bird fauna within study area, valorization and distribution per project elements

Note: 1a - Sub-project 1 (new 400/110 kV SS and 400 kV in-out connector); 1b - Sub-project 1 (new 110 kV connector to SS 'EVP' Miletkovo); 1c - Sub-project 1 (upgrade of 110 kV OHL from Valandovo to Miletkovo); 2 - Sub-project 2 (reconstruction of 110 kV OHL from Valandovo to Strumica). Records marked with # are from the Report on the Representative network of protected areas. All of the other records are from the field work conducted in 2021. Law on hunting: permanent protection (pp); temporary protection (tp); no protection (np), hunting game (h). Law on Nature Protection: protected species (ps); strictly protected species (sps)

The valley of the Vardar River was considered as potential migratory route for birds. However, the monitoring conducted by Macedonian Ecological Society (Velevski, personal communication) in the last 10 years did not prove the importance of this area as a migratory route for birds, including the birds of prey.

The following Table presents the species of mammals, reptiles, amphibians and invertebrates which were recorded during the field observations or were mentions for the area of Cham Chiflik. There are four species (two mammals and two reptiles) on the Annex II of the EU Habitats Directive: *Canis lupus, Lutralutra, Elaphe quatuorlineata* and *Testudo graeca*.. Eight species have received certain threat status according to the national red list of species: *Canis lupus* (NT), *Lutra lutra* (VU), *Elaphe quatuorlineata* (NT), *Testudo graeca* (VU), *Hyla arborea* (NT), *Lissotriton vulgaris* (VU), *Rana dalmatina* (NT) *and Rana graeca* (NT). *Testudo graeca* is also Vulnerable according to the IUCN global list of threatened species.

Species	Law on Nature Protection	Law on Hunting	National Red List	IUCN European Red List	IUCN Global Red List	EU Habitats Directive	Bern Bonvention	Other importance	Key Project components

									1a	1b	1c	2
Mammals												
Erinaceus roumanicus				LC	LC				√	√	√	√
*Talpa europaea**				LC	LC				√	√		
Lepus europaeus		tp		LC	LC		III					√#
Sciurus vulgaris	ps	pp		LC	LC		III					√#
Apodemus sylvaticus				LC	LC				√	√	√	√
Rattus rattus				LC	LC				√	√	√	√
Mus musculus				LC	LC				√	√	√	√
Canis lupus		np	NT	LC	LC	II, IV & V	II		√	√	√	√
Vulpes vulpes		np		LC	LC				√	√	√	√
Mustela nivalis		np		LC	LC		III		√	√	√	√
Martes foina		np		LC	LC		III		√	√	√	√
Meles meles	ps	pp		LC	LC		III		√	√	√	√
Lutra lutra	sps	pp	VU	NT	NT	II & IV	II			?		?
Sus scrofa		tp		LC	LC							√#
Capreolus capreolus		tp		LC	LC		III					√#
Reptiles												
Podarcis muralis	ps	/	LC	LC	LC	IV	II		√	√	√	√
Lacerta trilineata	ps	/	LC	LC	LC	IV	II		√	√	√	√
Elaphe quatuorlineata	ps	/	NT	NT	NT	II, IV	II					√#
Vipera ammodytes	ps	/	LC	LC	LC	IV	II					√#
Testudo graeca	ps	/	VU	VU	VU	II, IV	II		√	√	√	√
Natrix natrix		/	LC	LC	LC		III		√	√	√	√
Podarcis muralis	ps	/	LC	LC	LC	IV	II					√
Amphibians												
Pelophylax ridibundus		/	LC	LC	LC	V	III			√	√	√
Bufo viridis	ps	/	LC	LC	LC	IV	II		√	√	√	√
Bufo bufo		/	LC	LC	LC	/	III					√#
Hyla arborea	ps	/	NT	LC	LC	IV	II					√#
Lissotriton vulgaris		/	VU	LC	LC		III					√#
Rana dalmatina	ps	/	NT	LC	LC	IV	II					√#
Salamandra salamandra		/	LC	LC	LC	/	III					√#
Rana graeca	ps	/	NT	LC	LC	IV	II			√	√	√
Butterflies												
Iphiclides podalirius									√	√	√	√
Maniola jurtina									√	√	√	√
Colias crocea											√	√
Anthocharis cardamines									√	√		
Gonepteryx rhami									√	√	√	√
Pieris brassicae									√	√		
Pieris mannii									√	√		√
Pararge aegeria									√	√	√	√
Lybithea celtis									√	√	√	√
Polyommatus icarus									√	√	√	√
Other insects												
Nemoptera sinuata											√	
Oecanthus pellucens									√	√	√	√
Isophya tosevski								Endemic				√#
Saga campbelli campbelli								Endemic				√#
Reticulitermes lucifugus												√#
Carabuc coriaceus emgei									√	√	√	√
Carabus graecus morio										√		
Elaphrus aureus										v		

Species	Law on Nature Protection	Law on Hunting	National Red List	IUCN European Red List	IUCN Global Red List	EU Habitats Directive	Bern Bonvention	Other importance	Key Project components			
									1a	1b	1c	2
Cicindela campestris									√	√	√	√#
Pachycarus cyaneus												√
Bembidion punctulatum										√		√
Xylotrechus rusticus												√
Prionus coriarius												√

Table 6.10: Bird fauna within study area, valorization and distribution per project elements

Note: 1a - Sub-project 1 (new 400/110 kV SS and 400 kV in-out connector); 1b - Sub-project 1 (new 110 kV connector to SS 'EVP' Miletkovo); 1c - Sub-project 1 (upgrade of 110 kV OHL from Valandovo to Miletkovo); 2 - Sub-project 2 (re-construction of 110 kV OHL from Valandovo to Strumica). Records marked with # are from the Report on the Representative network of protected areas. All of the other records are from the field work conducted in 2021. Law on hunting: permanent protection (pp); temporary protection (tp); no protection (np). Law on Nature Protection: protected species (ps); strictly protected species (sps)

Natural Heritage Sites

There is one legally protected area that is crossed by the existing transmission line - Monument of Nature Cham Chiflik (Figure below). It was proclaimed as protected area in 1969. The main motivation for protection was due to the presence of the community of Crimean pine in the Kermes oak pseudomaquis (Coccifero-Carpinetum orientalis pinetosum pallasianae) [51]. This community develops on both limestone and silicate bedrock. Unfortunately, there is no valorization study or any other document that describes its natural values (flora, fauna, geomorphology, etc.). During the field work it was noticed that the floristic composition is marked by the presence of many Mediterranean species (e.g. *Osyris alba, Jasminum fruticans, Quercus coccifera, Phyllirea media, Cistus villosus, Comandra elegans*, etc.).

[51] Spatial Plan of the Republic of Macedonia. Study for natural heritage, 2004

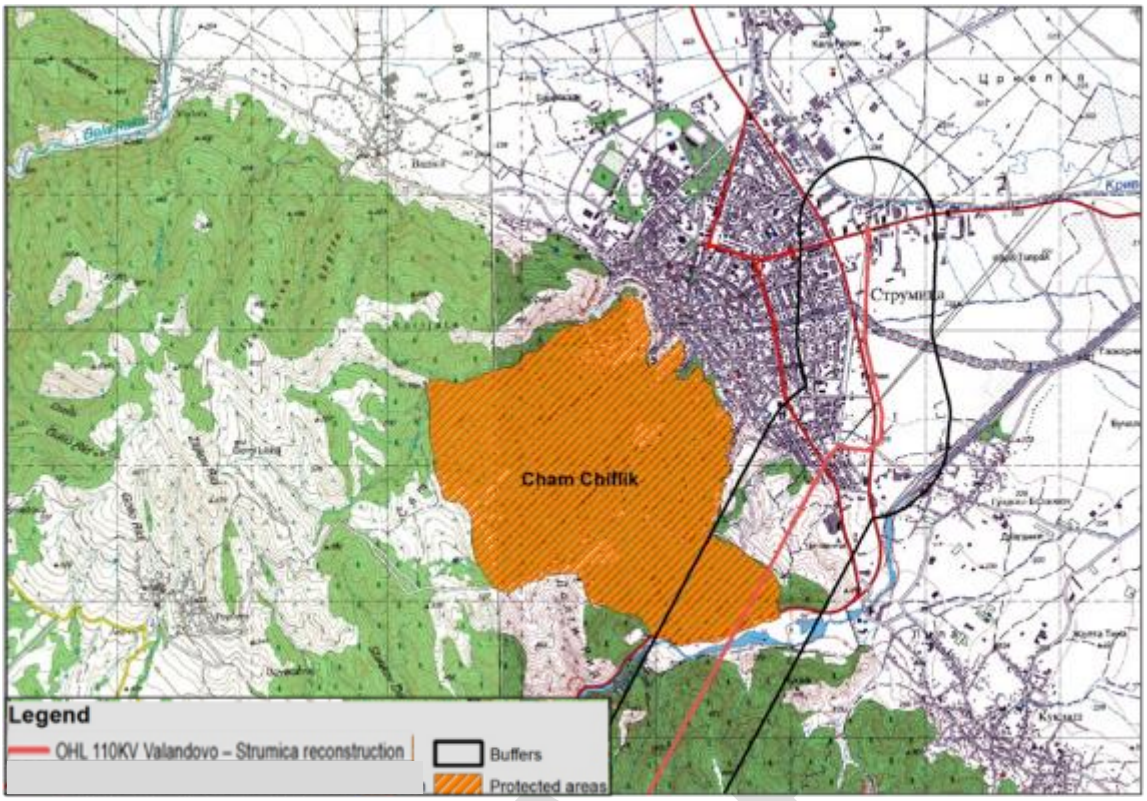

Figure 6.4: Nationally protected area – Monument of Nature Cham Chiflik relative to the existing 110 kV OHL from Valandovo to Strumica

The transmission line also crosses one internationally recognised area – Important Plant Area (IPA) Belasica (Figure below), in 2.8 km long section. It has been designated due to the presence of 3 plant/fungi species as well as 11 habitats. However, most of these species and habitats are confined to the highest parts of the IPA Belasica and are outside of the study area, which was verified by the field survey and published data on IPA Belasica[52]. Therefore, the Project will not interact with the key values of this site. The following habitats are of relevance for the Project: E1.33: East Mediterranean xeric grassland, G1.38: *Platanus orientalis* woods and G3.52: Western Balkanic *Pinus nigra* forests.

[52] Melovski, Lj., V. Matevski, M. Kostadinovski, M. Karadelev, N. Angelova & E.A. Radford (2010). Important Plant Areas in the Republic of Macedonia. Special issue of Macedonian Ecological Society, Vol. 9, Skopje, 128pp. (In Macedonian)

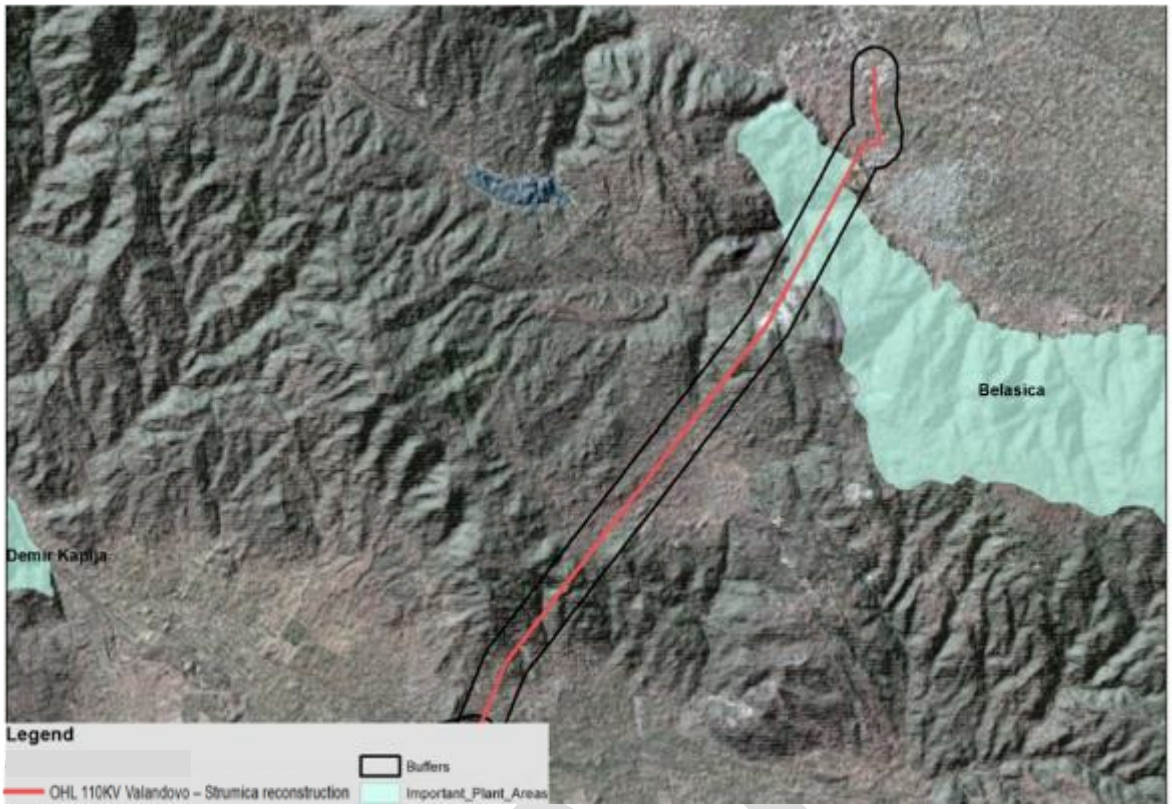

Figure 6.5: Internationally recognised area Important Plant Area Belasica relative to the existing 110 kV OHL from Valandovo to Strumica

Assessment of Key Biodiversity Features (Critical Habitat – CH and Priority Biodiversity Features - PBF)

Assessment of Critical Habitat and Priority Biodiversity Features was performed according to the PR6 guidelines[53]. The objectives of PR6 are to protect and conserve biodiversity; maintain core ecological functions of ecosystem services and biodiversity they support; adapt the mitigation hierarchy approach; and promote the sustainable management of living natural resources through the adoption of good international practices.

EBRD PR 6 defines critical habitats (CH) as:

(i) highly threatened or unique ecosystems;
(ii) habitats of significant importance to endangered or critically endangered species
(iii) habitats of significant importance to endemic or geographically restricted species;
(iv) habitats supporting globally significant migratory or congregatory species;
(v) areas associated with key evolutionary processes; or
(vi) ecological functions that are vital to maintaining the viability of biodiversity features described above.

Priority biodiversity features (PBF) are below critical habitat in terms of sensitivity, however, they still require careful consideration as part of the assessment and development of mitigation. They include four criteria: Criterion i - Threatened habitat, Criterion ii - Vulnerable species, Criterion iii - Significant biodiversity features identified by a broad set of stakeholders / governments and Criterion iv - Ecological functions vital to maintaining the viability of identified PBF.

[53] Guidance Note: EBRD Performance Requirement 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources. https://www.ebrd.com/environment/pdf-guidance-note-ebrd-performance-requirement-6.pdf

There are three important habitats according to the EU Habitats Directive (Table below): 92A0 Salix alba and Populus alba galleries, 9530 *(Sub-Mediterranean pine forests with endemic black pines and 92C0 Platanus orientalis and Liquidambar orientalis woods (*Plantanion orientalis*).

Habitats	Biodiversity feature	Distribution and estimates
92A0 *Salix alba* and *Populus alba galleries*	PBF (Criterion I) - This habitat is listed in Annex I of the EU Habitats Directive	This habitat is very common along the lowland rivers in the Republic of North Macedonia. It is also widespread riparian habitat on the European continent. In the area of interest it was recorded along the Vardar River.
9530 *(Sub-Mediterranean pine forests with endemic black pines	CH (Criterion I) – This habitat is considered as priority habitat (*) according to the EU Habitats Directive	Provisionally, we placed the Black pine forest of Cham Chiflik in this habitat type (=EUNIS: G3.5617 - Pelagonide Pallas' pine forests). The syntaxonomical status of "Crimean" pine forests in North Macedonia has not been studied, well. Thus, the distribution of this habitat cannot be estimated. Nevertheless, such Black pine forests in the submediterranean area of North Macedonia are very rare. The existing OHL crosses two patches of the Black pine forest – one of them situated in Cham Chiflik protected area and one more on the right side of river Trkajna. This habitat in Cham Chiflik protected area should be avoided during the reconstruction of the new OHL line in Sub-project 2.
92C0 *Platanus orientalis* and *Liquidambar orientalis* woods (*Plantanion orientalis*)	PBF (Criterion I) - This habitat is listed in Annex I of the EU Habitats Directive	The riparian belts of Oriental plane are common in the area, especially along tributaries of river Vardar, from Gevgelija to Veles (and Skopje). In the studied area we recorded one riparian Oriental plane belt in Sub-project 2, along river Trkajna (its main tributary Trkavalishte). This is not a typical community since White willow is mixed with Oriental plan and may be dominant in some of the stands along the river. The wires of the existing OHL are close to the Oriental plane belt, but they have no direct impact on the plant community.

Table 6.11: Habitats that trigger critical habitats or priority biodiversity features

Figure 6.6: Riparian Willow and Poplar belts along the Vardar River at the river crosing section of Sub-project 1

Figure 6.7: Oriental plane belt in the vicinity of village Kosturino

Figure 6.8: Black pine forest in the vicinity of Strumica (Cham Chiflik and river Trkajna-next to the road R1401)

As already presented there are a number of vertebrate species which are considered to be threatened, but none of them is considered as endangered (EN) or critically endangered (CR). Species that have other threat status (vulnerable, near threatened) or belong to Annex II of the EU Habitats Directive or have other conservation importance may fulfil criteria for triggering critical habitat or priority biodiversity feature. Such species are presented in the tables of the previous chapter (Valorization of habitats and species of flora and fauna). These species will be analysed in the course of the upcoming ESIA if specific impacts from the construction/operation of the Project are detected, their EAAA will be determined and specific mitigation measures will be designed in order to safeguard the principle of no net biodiversity loss.

6.7.3 Potential Impacts and Principle Mitigation

Primary mitigation measures are embedded within the Project design to date. Based on the principles of the mitigation hierarchy (by implementing the preventive approach of 'mitigation through

design) the designing process to date has achieved to fully avoid designated areas in the case of Sub-project 1. This was done by integrating the impact avoidance strategy into the previous project stage – Project options identification and analysis, and selection of the preferred option for further development[54] which resulted in selection of the Project option which is away from the designated areas in the Project Region.

In the case of the Sub-Project 2 – the reconstruction of the existing 110 kV OHL from Valandovo to Strumica – the existing OHL route passes through two important areas for biodiversity, one internationally recognised area (Important Plant Area Belasica) and one legally protected area (Cham Chiflik).

Due to the geographical spread of IPA Belasica it is not possible to avoid this designated area. However, most of the identified values of IPA Belasica are characteristic for the higher parts of Belasica mountain with the exception of three habitats (E1.33: East Mediterranean xeric grassland, G1.38: *Platanus orientalis* woods and G3.52: Western Balkanic *Pinus nigra* forests) and would not be affected by the implementation of the Project.

In regard to the protected area Cham Chiflik, based on the information provided by the Project's ESIA team, further primary mitigation measure to fully avoid this site by deviation from the existing alignment is being currently under consideration as part of the on-going optimisation of the Project's technical assessment (Conceptual Solution). This change of the alignment that avoids this protected area will be elaborated and addressed in the upcoming E&S assessment.

In principle, the impacts on biodiversity crossed by the Project from its construction and operation are various and specific depending on the biodiversity features (ecosystems, habitats, species), their coverage and sensitivity, as well as on the nature of the Project element (new construction or reconstruction/upgrade).

The principle potential impacts on the biodiversity receptors during the construction phase of the Project include:

- Loss of terrestrial habitats - direct destruction and alteration of habitats as a result of land take requirements (including access roads and other auxiliary elements) – due to site clearance and habitat conversion beneath OHL conductors (creation of a clearance corridor). Due to its irreversibility this is considered as the key impact on the biodiversity. These impacts are characteristic for the construction of new lines, less significant for the Project elements which include reconstruction or upgrade works to existing lines.
- Habitat disturbance due to construction transport and operation of machinery
- Loss of terrestrial flora, which would be more significant for the Project elements which include construction of new structures.
- Disturbance of species (breeding, foraging, roosting) due to construction works.
- Dust deposition during construction has the potential to lead to changes to plant communities.
- Adverse changes in aquatic habitats due to pollution / construction works (e.g. material storage, spoil and waste disposal).

[54] For more details refer to: Report on Selection of the Preferred Project Option; North Macedonia, Strengthening the Transmission Network in the Southeast Region of North Macedonia: Feasibility Study, ESIA WB21-MKD-ENE-03 [Ref.4]

- Risk of forest fires leading to depletion of biodiversity resources.
- Introduction of alien species, as a result of spread of seeds of alien species by workers and machinery.

These potential impacts would be mitigated by undertaking of construction works in accordance with a Project's CESMP which will include, at minimum:

- Measures of good construction practice (e.g. avoid important and sensitive habitats (e.g. alluvial terrains, riparian areas), avoid destruction of natural habitats, avoid temporal occupation and destruction of adjacent land; sound storage of hazardous substances, provide fire-protection measures and equipment / vehicle, provide spill-kits in construction and transport vehicles, sound material and waste management practices, etc.).
- Temporary land-take (including access roads, storage area, etc.) would include adequate areas of land set away from sensitive biodiversity areas.
- Seasonal restriction of the construction works to minimise impacts on particular species.
- Establish sound waste management and actions to ensure contaminated material is identified, isolated and removed to appropriate landfill to avoid any impacts on the biodiversity.
- Design and implement adequate plan to monitor the implementation of measures for biodiversity protection.

The principle potential impacts on the biodiversity receptors during the operation phase of the Project include:

- Habitat conversion beneath OHL conductors and habitat fragmentation , due to maintenance of the clearance corridor.
- Potential impacts on avian fauna (collision risk and electrocution of birds).

To eliminate or mitigate these potential operational risks, primary mitigation would need to be incorporated into the advanced Project design (e.g. fit bird (flight) diverters to the earth wire of the transmission line in respective sections identified to be associated with a potential risk of collision).

Principle measures of good maintenance practice to mitigate operational impacts from the Project include:

- Implement an integrated vegetation management approach through the selective removal of tall growing tree species and the encouragement of low-growing herbs and shrubs will assist in minimizing any impacts from the operation of the Project.
- Afforestation with native species of plants (trees and herbs). The planting may also be designed to contribute to the mitigation of visual impacts and impacts on landscape character.

In addition to the general mitigation measures that would apply on the whole length of the transmission line, specific measures are to be proposed for the OHL sections through the designated areas.

6.8 Visual Effects and Landscapes

The Project will represent a combination of:

- Newly introduced structures in the landscape of the region:
  - new 400/110 kV SS Valandovo and new 110 kV connector with the existing SS 'EVP' Miletkovo (Sub-project 1).
- Reconstruction of structures already existing in the landscape of the region:
  - existing 110 kV OHL from SS Valandovo to SS 'EVP' Miletkovo (Sub-project 1), and
  - existing 110 kV OHL Valandovo – Strumica (Sub-project 2).

6.8.1 Study Area

The specific study area for landscape identification and characterization relevant for the Project follows the newly introduced structures - the proposed approx. 1.8 km long 110 kV transmission line within approximately 1,000 m wide corridor (500 metres on both sides from the longitudinal axis of the transmission line), including the 400/110 kV substation location, considered as representative and sufficient to identify the current context of the landscape types. This zone is defined by complex pattern of rolling landform, defined by the natural characteristics, watersheds and presence of human settlements and human activities. Beyond this study area it is considered that the Project would unlikely give rise to any significant effects on landscape or visual receptors due to the scale of the proposed new structures and due to the fact that for OHL towers, the open lattice structure allows the background to be seen through the structure and the structure itself reduces in importance as the distance from the viewer increases. Therefore, the OHL towers are less visible than more solid structures of the same size.

6.8.2 Baseline Conditions

Five landscape types are identified in the study area of the Project as a whole (Table below), according to the Macedonian Strategy for Nature Protection [Ref.16]:

- Rolling submediterranean landscape (pseudo-maquis). Natural landscape in the area with presence of pseudomaquis (different degradation stadiums of Kermes oak communities). This landscape type is characteristic for the hilly areas and it is represented by different degradation stages of Kermes oak communities (pseudomaquis). The agricultural land occupies small parcels which are scattered in the matrix of forests and shrublands.
- Thermophilous degraded forests landscape. Common landscape in Macedonia with matrix of white oak forests and pronounced anthropogenic activities in the area of human settlements. It is spread between Kosturino and Strumica. Together with the previous landscape type, it holds the most natural elements in its visual aspects (forests and shrublands).
- Flatland sub-Mediterranean agricultural landscape. Landscape confined to south-east parts of Macedonia with submediterranean climate. Natural vegetation (White oak, Kermes oak forests) were transformed into agricultural ecosystems with intensive agriculture. This landscape type occupies small area between the existing SS Valandovo and the town of Valandovo.

- Rolling rural landscape. It develops in warm continental and suubmediterranea region with potential natural vegetation of White oak and Oriental hornbeam (Querco-Carpinetum orientalis). The matrix is represented with agricultural land with scattered settlements. Agricultural land is consisted of small parcels with only few hedges. The patches are represented by small oak woodlands without functional corridors. This landscape type is characteristic for the area between Valandovo and Kosturino.
- Urban landscape (Strumica). This is anthropogenic landscape type characterized by the dominance of urban and suburban habitats (settlements), roads and small portions of agricultural land (mainly gardens and small orchards).

Landscape type	Key Project components			
	Sub-project 1 (new 400/110 kV SS and 400 kV in-out connector)	Sub-project 1 (new 110 kV connector to SS 'EVP' Miletkovo)	Sub-project 1 (upgrade of 110 kV OHL from Valandovo to Miletkovo)	Sub-project 2 (reconstruction of 110 kV OHL from Valandovo to Strumica)
Flatland sub-Mediterranean agri-cultural landscape		√	√	√
Rolling submediterranean land-scape (pseudo-maquis)	√	√	√	
Rolling rural landscape				√
Thermophilous degraded forests landscape				√
Urban landscape				√

Table 6.12: Presence of landscape types within study area, per Project elements

6.8.3 Potential Impacts and Principle Mitigation

During the construction phase, the activities and facilities within the study area are considered as key sources of the direct temporary physical and visual change to the landscape. The area within the construction zones will be temporarily changed during the construction phase. These zones, together with the localities where the construction materials and prefabricated segments of the towers will be stored, would be visually discernible, and will draw changes in the aesthetics of the area. However, these changes will be localized and of a very short-term nature, and reversible - with their duration equal to the time of construction of each tower, no more than 10 days. An exception is the new substation site where the visual effects would be present during the whole period of construction, resulting from the construction plant, materials and equipment required to construct the substation as well as due to soil removal / excavation / stockpiling and from material storage and waste or spoil temporary disposal.

Principal strategy during the construction phase to mitigate the impacts, as far as practicable and to the extent possible, includes undertaking of construction works in accordance with a Project's CESMP to include, at a minimum:

- measures to retain and protect vegetation / trees during construction as much as possible;
- sitting compounds and other construction facilities via a comprehensive site selection process taking into the consideration landscape sensitivity and potential visual effects;

- at the substation site, screen the temporary construction buildings and facilities by solid fences;
- establish sound spoil and waste management system.

The potential adverse landscape and visual effects of the Project during operation would be associated with the new transmission infrastructure, particularly associated with the new OHL towers and the structures in the new substation. Most of the new transmission line(s) will be exposed to the viewpoints along their corridors due to the flat landscape that dominates the study area. However, the open lattice structure of the OHL towers allows the background to be seen through the structure and the structure itself reduces in importance as the distance from the viewer increases. Therefore, the OHL towers are less visible than more solid structures of the same size. They will be more noticeable at first, but nearly all people would become adapted to them so they become part of the landscape.

The primary landscape and visual mitigation of operational effects includes the integration of landscape design principles into the further project designing process. This approach needs to identify opportunities to mitigate impacts on the physical landscape (e.g. by avoiding residential and other properties during the further fine-tuning of the OHL corridor, as far as practicable). On addition several mitigation measures may be employed during further detailed design:

- Careful positioning of the towers in the landscape by inclusion of the visibility of the towers among the factors considered during final tower positioning, taking advantage of existing structures and including determining the proper balance between heights of towers and the number of towers (e.g. in general, larger scale landscapes will be better able to accommodate taller towers).
- Allow the maximum vegetation height within the Right of Way corridor while still maintaining the required clearance. Replacement planting of native trees and shrubs would also assist in maintaining the landscape and such planting would generally be effective in locations where the transmission line would require removal of areas of existing tree or shrub cover, and would usually provide the added benefit of visual screening.
- Width of all access roads and tracks to be kept to the minimum necessary for their use during construction and operational stage.
- Reinstatement works to any disturbed areas on the edges of tracks will be undertaken to ensure that all tracks 'fit' well into the surrounding landscape.

On completion of the Project there will be residual effects on the landscape of the area as whole. The residual effects on the landscape character will be the presence of the new substation and new transmission lines within the landscape.

6.8.4 Summary

In principle, landscape effects relate to the direct physical changes to the fabric or individual elements of the landscape due to introduction of new structures in the environment as well as to the potential indirect changes to the wider patterns of land use, land cover and the arrangement of landscape features which determine the character and the aesthetic and perceptual qualities of the landscape.

Reconstruction and/or upgrade is foreseen for existing 110 kV lines – (1) from Valandovo to Mletkovo (Sub-project 1) and (2) from Valandovo to Strumica (Sub-project 2). These existing lines are already embedded in the landscape's visual aspects. Since the new OHL towers will be of simi-

lar height as the existing ones, no additional visual effect on the landscape is likely to occur. In addition, no additional cut of trees under the line is expected. Therefore, the Project activities will have no additional long-term residual impact to the landscape values, both in construction and operation phase. Thus, the impact assessment on the visual aspects and scenic values of the landscape in the case of the Project elements which include reconstruction and/or upgrade activities are scoped-out from the present ESIA.

Hence, attention in the impact assessment will be paid on the visual aspects associated with the Project elements which include new structures - construction of the new 400/110 kV substation and new connectors with the transmission network in the region (i.e. in-out connection with the existing 400 kV OHL from Dubrovo to Thessalonica (GR) and new 110 kV connector with the existing SS 'EVP' Miletkovo).

6.9 Waste

The Project is expected to generate various waste streams, construction waste as well as waste from dismantling of obsolete transmission elements being dominant waste type. Waste generation during operational phase is expected to be very small. This section provides an overview of the potential waste generation impacts of the Project and describes the principle mitigation approach.

Waste is defined "any substance or object which the holder discards or intends or is required to discard."[55] The Project will aim to prioritise waste prevention, followed by preparing for re-use, recycling and recovery and lastly disposal to landfill as per the internationally recognised waste hierarchy (Figure below).

Figure 6.9: Waste hierarchy

6.9.1 Study Area

For the purposes of the assessment, the study area will comprise the OHL infrastructure corridor(s) (defined for the purpose of this appraisal as 100 metres wide corridor) and the substation location - and the wider region within which waste management facilities are located.

[55] Directive of the EU on Waste - Waste Framework Directive (2008/98/EC)

6.9.2 Potential Impacts and Principle Mitigation

The types of wastes that may be generated by various activities during the project lifecycle are summarised in the Table below.

Project activity	Waste generation
Site preparation / earthworks / site remediation	- Surplus excavated materials. - Stripped topsoil and subsoil.
Dismantling / Construction	- Demolition waste from dismantling works on lines subject to reconstruction. - Packaging from materials delivered to site. - Excess and broken/damaged construction materials. - Waste additives and conditioning agents used for construction purposes. - Construction workforce wastes.
Operation and maintenance	Waste arising during operation and maintenance (expected to be minimal).

Table 6.13: Key types of waste generation

The potential impacts for the above activities would be mitigated by undertaking of construction works in accordance with a Project's CESMP which will include a Waste Management Plan, based on the following principles:

- Waste would be minimized wherever practicable by reusing and recycling any materials.
- All wastes would be identified, classified, quantified and, where practicable, appropriately segregated.
- All waste materials removed from construction sites would be in accordance with relevant national waste and environmental regulations.
- Waste would be transferred using registered waste transporters to a licensed waste disposal site or waste processing installation.

Since waste generation is expected to be very small during operation of the project, these aspects are scoped out of the ESIA.

6.10 Key Social Aspects

The Project has the potential to affect the living of the local population and communities in the Project region, thus initiating a need for land acquisition and causing minor potential disruption of life during the construction phase. This section provides an overview of the current social baseline and potential impacts of the affected local communities and individuals and describes the principle mitigation approach.

6.10.1 Study Area

For the purposes of the assessment, the study area is extended to a distance of 1,000 metres from the Project elements (the substation location and OHL corridors) to include communities where private assets (e.g. residential properties, facilities and businesses) or community facilities (e.g. schools, religious temples, cemeteries) may potentially be affected during the Project implementation.

6.10.2 Baseline Conditions

The Project area is situated in Southeast region of North Macedonia, thus affecting territory of three Local Self Government (LSG) units (municipalities): Gevgelija, Valandovo and Strumica.

(1) Sub-project 1 - New 400/110 kV SS Valandovo with connection to the existing 400 kV and 110 kV transmission network

The Sub-project 1 is located in municipalities of Gevgelija and Valandovo. Settlements close to the identified OHL corridor, within the study area, are given in the Table below.

Settlements – by LSG – close to Sub-project 1 - New 400/110 kV SS and OHL connectors -			
LSG Unit	Settlement	Population 2002*)	Relative distance to settlement**) [m]
Gevgelija	Miletkovo	117	700
Valandovo	Valandovo	4,402	1000
	Pirava	1,844	1000
	Total:	6,363	

Table 6.14: Settlements close to the elements of Sub-project 1

*) Source: Census of Population, Households and Dwellings in Republic of Macedonia, 2002

**) Note: Approximate distance from the OHL corridor centreline to the nearest properties has been taken into consideration

The baseline social conditions for each of the elements of this sub-project are provided below.

- The new 400/110 kV substation Valandovo and 'in-out' connection with the existing 400 kV line from SS Dubrovo to Thessalonica (GR)

The location of the new 400/110 kV SS Valandovo is set on long-term unused pasture surrounded by shrub and low-stemmed forest, all state-owned (Figure below).

Figure 6.10: Location of the new 400/110 kV substation Valandovo, land-use context

The closest settlements to the location of the proposed substation are the village Miletkovo located at a distance of approximately 0.8 km from the SS location and the village Smokvica, approximately 1.5 km far from the SS location (Figure below).

Figure 6.11: Location of the new 400/110 kV substation Valandovo, in relation to closest settlements

- Upgrade the existing 110 kV transmission line from SS Valandovo to SS 'EVP' Miletkovo.

The alignment of the existing 110 OHL from SS Valandovo to SS 'EVP' Miletkovo passes over active arable crop fields, vineyards and orchards (Annex 3). Its starting point – existing SS Valandovo - is located approximately 1.1 km from sub-urban areas of Valandovo and 0.8 km from village Pirava. Its ending point – SS 'EVP' Miletkovo is approximately 1 km from the village Miletkovo.

- Construction of a new 110 kV OHL connector with the existing SS 'EVP' Miletkovo

The new 1.8 km transmission line, from SS 'EVP' Miletkovo to the new 400/110kV SS Valandovo passes over active arable crop fields, vineyards and orchards (Annex 3).

(2) Sub-project 2 - Reconstruction of the existing 110 kV OHL Valandovo – Strumica

The Sub-project 2 passes through the territory of two Macedonian LSG units - municipalities of Strumica and Valandovo. Settlements close to the Project, within the study area, as well as their relative distance to the Project are given in the Table below.

Settlements – by LSG – close to Sub-project 2 - Reconstruction of the existing 110 kV OHL Valandovo – Strumica -			
LSG Unit	Settlement	Population 2002*)	Relative distance to settlement**) [m]
Valandovo	Valandovo	4,402	1000
	Pirava	1,844	1000
Strumica	Zleshevo	Abandoned	500
	Kosturino	1,280	800
	Tri Vodi	12	Passing through its outskirt
	Strumica	35,311	Passing through

Settlements – by LSG – close to Sub-project 2 - Reconstruction of the existing 110 kV OHL Valandovo – Strumica -			
LSG Unit	Settlement	Population 2002*)	Relative distance to settlement**) [m]
	(part of its sub-urban and urban area)		
	Total:	42,849	

Table 6.15: Settlements close to the elements of Sub-bproject 2

*) Source: Census of Population, Households and Dwellings in Republic of Macedonia, 2002

**) Note: Approximate distance from the OHL corridor centerline to the nearest properties has been taken into consideration

The OHL passes through the outskirts of Valandovo, and is distant from the closest residential or other properties.

Furthermore, it passes nearby villages Zleshevo (abandoned) and Kosturino, both in the municipality of Strumica, distant from the closest properties. In settlement Tri Vodi, the line passes at the very edge of the village, affecting only a sheep pen.

Major social constraints that constitute risk for legal or operational incompliance for the further operation of the existing line were identified in the sub-urban and urban zones of the town Strumica, where the OHL passes over, or in immediate vicinity, to residential or industrial properties (Annex 3). Most of the identified potentially affected properties are built after construction of the line, several decades ago. Currently, along the approx. 1 km long section in the populated sub-urban and urban zones in Strumica, to the entrance of the line on the SS Strumica 2 there are several tens of properties (some of them depicted in Annex 3). Indicatively, there are around 40 properties, including residential properties / buildings at a distance less than 50 m from the axis of the line. In the section from the SS Strumica 2 and the SS Strumica 1, there are around 20 dwelling objects at a distance less than 50 m from the OHL axis and several commercial properties, including four waste processing sites, operated by Roma families. In addition, a Roma populated quarter is situated in proximity to the line, at approx. distance from 50 m to 100 m.

The interaction of the Project and the affected properties / sensitive receptors in the sub-urban and urban zones of Strumica was considered during the past Project development phase - selection of preferred Project option - in order to identify the best applicable design approach. As a result, an alternative design to replace the existing line within these urban zones with underground transmission cable has been proposed and adopted (see Section 2.2.5). The existing line will be decommissioned, thus eliminating the potential social impacts to all currently affected properties - potential public exposure to electro-magnetic radiation exceeding the exposure limits applied internationally (e.g. by the International Commission on Non-Ionizing Radiation Protection (ICNIRP[56])[57] and nuisance due to transmission line audible noise during operation ('corona discharge').

There will be no properties in the RoW (safety zone) of the reconstructed line as well as in safety zone along the underground cable which will require resettlement.

[56] For more details see: "Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz) (available at: www.icnirp.org.)

[57] In the moment, Macedonia has no national regulation on exposure limits to non-ionizing radiation.

6.10.3 Potential Impacts and Principle Mitigation

Positive Impacts

- Employment Opportunities during Construction

During the construction, the Project will generate temporary employment opportunities, whether skilled, semi-skilled or as unskilled jobs. One of the key social positive impacts would be the provision of an income source for workers and their families contributing to their wellbeing and enhancing their quality of life. Measures to enhance these opportunities would include various instruments (e.g. preferable recruitment of local workforce in accordance with a specific Local Recruitment Plan, training that would be beneficial for future job prospects).

- Local Economy and Supply Chain Opportunities

The Project construction would provide opportunities for companies at the national, and possibly regional, level to supply goods and services. Local purchases of goods and services directly by the Project and workers during construction would foster the local economy. It would particularly concern communities directly affected by the Project, but also other nearby communities located in the vicinity of the Project site (e.g. local accommodation in settlements wherever possible).

- Improvement of the National/Regional Power System

The Project is part of a strategic programme that will be implemented over a number of years period by MEPSO to strengthen the regional power transmission grid in the Southeast Region of Macedonia, in order to meet the increased power demands and to connect existing and planned power projects, principally the growth of renewable energy sources.

More specifically, the Project will provide:

- Increased security of supply, and
- Secure and reliable integration of planned RES in the southeast region of the country, which consequently contribute towards reduction in CO_2 emissions.

Land Acquisition

The project activities will permanently occupy a certain amount of land currently used for various activities. Some of the land will only be temporarily occupied during construction, to enable access to areas where the OHL towers will be built. Therefore, the Project will require temporary and permanent acquisition of land, which may involve particular economic effect on people (loss of assets) as a result of project-related land acquisition[58)] and/or restrictions on land use. No physical displacement of people (relocation or loss of shelter) is expected.

All land acquisition, either permanent or temporary will be done in compliance with the relevant Macedonian legislation[59] and international requirements (EBRD Performance Requirements). If land acquisition causes economic displacement of people, appropriate measures to assist with restoration of livelihoods and standards of living will be included in the respective land acquisition and

[58] Land acquisition includes both outright purchases of property and acquisition of access rights, such as easements or rights of way. (Source: International Finance Corporation (IFC), Performance Standard 5 - Land Acquisition and Involuntary Resettlement, January 1, 2012)

[59] Law on Expropriation (Official Gazette of RM no. 95/12, 131/12, 24/13, 27/14, 104/15, 192/15, 23/16, 178/16

resettlement documents, which are to be prepared once the detailed Project design is verified and detailed data on affected land property and its value is available.

According to the relevant Macedonian regulation[60], the minimum vertical clearance for 110 kV transmission line above the ground in areas accessible for people, including arable agricultural land, is 6.0 metres. This minimum vertical clearance is generally at the middle of a span between two towers. Therefore, all agricultural activities within the RoW which include cultivated plants (e.g. crops, vineyards, orchards, other valuable trees, etc.) which do not reach height of approx. 3 metres would not be necessary removed and can be further utilized as before construction of a transmission line. In addition, various forms of farming and livestock grazing within the RoW are not restricted, nor are regulated with applicable national legislation.

Community Health and Safety

- Construction Traffic

Construction works, heavy machinery and large transport vehicles and increased intensity and volume of the traffic will affect the normal road traffic regime in the Project area. It is expected that the principle means of transport proposed to service project construction will be by road due to the fairly developed road network in the Project area, and the flexibility required in delivering machinery and materials to locations across the corridor.

It is clear that construction traffic will increase traffic flows on some roads, particularly the local road network and on unclassified roads, where traffic levels are typically low. In order to minimise impacts on residential areas from traffic during the construction works, a set of mitigation measures needs to be proposed and detailed Traffic Management Plan to be developed as a part of the Project's CESMP, which will (i) define the characteristics of the construction fleet of vehicles and site machinery, (ii) describe the expected Project's traffic (frequency of trips, working hours, convoys) and (iii) detail all site-specific measures that would be implemented during the construction period to minimise the nuisances to neighbourhoods generated by its fleet and to reduce the risk of accidents.

- Public Exposure to Electro-Magnetic (EM) Radiation

Operationa transmission equipment is a source of EM radiation - electric field, which depends on the voltage of the equipment, and remains more or less constant as long as the line is under operation and magnetic field, which depends on the electrical current (the load) carried by the equipment, and varies according to the demand for power at any given time.

There is no specific regulation for exposure limits to non-ionizing radiation in Macedonia. Therefore, EM fields (EMF) exposure levels from the Project need to be in compliance with exposure limits applied internationally (e.g. by the International Commission on Non-Ionizing Radiation Protection (ICNIRP[61]).

The likely impact of EMF on human health was one of the key issues considered during the process for selection of the preferred Project option. In this context, the major issues of consideration were the residential and commercial zones in the Project region. As a result, the Project is de-

[60] Rulebook for Construction of Overhead Lines with rated Voltage from 1 kV to 400 kV (Official Gazette of RM no.25, from 1.2.2019)

[61] For more details see: "Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz) (available at: www.icnirp.org.)

signed to avoid the residential and other properties in the region thus minimising any concern about increasing exposure to EMF, including the replacing of the existing segment of the 110 kV OHL Valandovo – Strumica (Sub-project 2), in the residential zones of Strumica, with underground cable.

The Project would be further inherently designed to avoid the public exposure to EM radiation from its future operational use. Potential impacts on human health as a result of the EMF would be mitigated through the further design of the Project, at a minimum:

- Incorporation of respective design parameters for the minimum OHL conductor vertical clearance into the Project design.
- Establish and maintain safety zone / corridor along the path of the transmission lines and in proximity to the new substation according with the requirements of the relevant legislation. Within this areas buildings and facilities must not be constructed and certain activities are restricted to ensure, *inter alia*, protection of human health against long-term exposure to EMF.
- Appropriate selection of the towers micro locations within the selected OHL corridors in relation to residential and other properties.

Labor and Working Conditions

Labor and working conditions are a cross-disciplinary area concerned with protecting the safety, health and welfare of people engaged in work or employment.

Construction activities pose potential risks to the wellbeing of construction workers, if not managed properly. There is the risk of adverse occupational health and safety (OHS) impacts related to personal accident or injury on any construction site of the Project, including exposure to physical hazards from use of heavy equipment, machinery and cranes; exposure to electrical hazards from the use of tools and machinery; trip and fall hazards, including working on height; exposure to construction noise; falling objects.

The key OHS hazards specific to construction of transmission projects primarily include:

- Working at height: Workers may be exposed to occupational hazards when working at elevation during construction of the towers and the conductor stringing operations.
- Electrocution: Workers may be exposed to occupational hazards from contact with live transmission line during commissioning works when the line is being electrified and tested.

OHS risks during operation are similar to those in the construction phase, limited to the operational and maintenance activities for the transmission line, which will be occasional and/or involve a limited number of workers. The most significant risk would be related to the possible electrocution from the energised OHL conductors.

Working conditions and workers accommodation facilities will be set in compliance with relevant Macedonian labour legislation. Principle mitigation measures during the construction of the Project would include creation of a number of thematic plans as part of the Project's CESMP for overall social management, such are the following (at a minimum):

- Occupational Health and Safety Management Plan
- Workers' Accommodation Management Plan
- Emergency Preparedness and Response Plan

These documents would set out the mitigation requirements and would contain measures to ensure compliance of the Project construction with the relevant standards and legislation in the labor and working conditions domain.

The occupational health and safety performance during operation of the Project will comply with the requirements of Macedonian legislation and the Integrated Management System (IMS)[62] of MEPSO, which, inter alia, includes a certified management system for occupational health and safety.

6.11 Cultural Heritage

6.11.1 Study Area

For the purposes of the preliminary assessment, the study area includes protected cultural heritage assets in an area of 200 metres around the Project. This distance is considered as an area in which there may be an impact due to physical and historical connectivity and relationships as well as due to changes to noise levels, air quality and traffic during the construction.

6.11.2 Baseline Conditions

(1) Sub-project 1 - New 400/110 kV SS Valandovo with connection to the existing 400 kV and 110 kV transmission network

No cultural heritage resources - known cultural heritage site or location of cultural importance - are located within the study area of the Sub-project 1.

According to the competent authorities[63] consulted during the ESIA scoping phase, one legally protected cultural heritage site[64] of high significance – Gradishor – Mramor ('Gradishor-Marble'), located on territory of Gevgelija municipality, nearby the Vardar River, between Marvinci and Miletkovo settlements - is situated in the proximity to the Project. Based on this consultation process, the routing exercise of the new 110 kV OHL connector between the new substation and the existing SS 'EVP' Miletkovo achieved to optimise the OHL alignment and fully avoid this heritage site at a distance of more tha 200 metres(Figure below). Hence, no direct interaction between the Project and this site is expected. The Gradishor – Mramor site represents a wider archaeological complex composed of several elements. The key values of this complex are provided in the Table below.

[62] MEPSO has an IMS, incorporating quality, environment and health & safety, certified under respective international standards - ISO 9001 (quality management), ISO 14001 (environmental management) and ISO 45001 (health and safety management)

[63] National Institution Institute for Protection of Cultural Monuments and Museum - Strumica ('НУ Завод за заштита на спомениците на културата и Музеј - Струмица') and National Museum of Gevgelija (Национален музеј Гевгелија)

[64] http://kultura.gov.mk/wp-content/uploads/2020/10/NACIONALEN_REGISTAR_NA_OBJEKTI_KOI_SE_ZASTITENO_KULT_NASLEDSTVO_31122012-3-1.doc

Figure 6.12: Location of the protected cultural heritage site Gradishor-Mramor, relative to the Sub-project 1

Note: The boundaries of the protected cultural heritage site were obtained from relevant competent authortity (National Museum of Gevgelija)_, during stakeholder consultations process initiated during the ESIA scoping stage.

Legally Protected Cultural Heritage Sites (Archaeological Sites) in proximity to Sub-project 1 - New 400/110 kV SS and OHL connectors -
Municipality of Gevgelija
Miletkovo: Gradishor-Mramor. The site (with different parts listed below) has been declared a cultural heritage site of Macedonia.
Gradishor-Mramor site, at relative distance of more than 200 m from the alignment of the new 110 kV OHL. Archeological site in the Gevgelija village Miletkovo. A settlement and necropolis from early antiquity and Roman times. Some 1.5 km south of the village, on the right bank of the Vardar, opposite the Isar site in Marvinci, located on a large flattened fluvial plateau with an area of about 2.5 hectares, show the foundations of buildings, and on the surface, there are many fragments of ceramic vessels, pithos, imbrexes and building material. The profile intersected by the construction of the railway Skopje-Gevgelija shows grave structures built of stone slabs of the cyst type.
Cemetery – Monastery, at distance of approx. 500 m from the proposed location of the new 400/110 kV substation, to east. Sacred object from Roman times. Located 1.5 km southeast of the village, in the immediate vicinity of the former village cemetery, heaps of building stone and fragments of architectural beams. Fragments of ceramic vessels are also found sporadically
The vineyards – Dukovec, at distance of approx. 900 m from the proposed location of the new 400/110 kV substation, to east. Water supply system from Roman time, built from tubules was discovered. This system includes two water supply routes that are located at a distance of 1.50 m and a height difference of 0.20 m. According to the direction, it can be concluded that they supplied water to the population from the Gradishor-Mramor deposit.
Monastery, at distance of approx. 600 m from the proposed location of the new 400/110 kV substation, to east. Settlement from Roman time. The site is located between the villages of Smokvica and Miletko-

Legally Protected Cultural Heritage Sites (Archaeological Sites) in proximity to Sub-project 1 - New 400/110 kV SS and OHL connectors -
Municipality of Gevgelija
vo, opposite the Isar, not far from the Vardar bridge. Fragments of ceramic vessels and building material can be found in a large area on the surface. Foundations made of stone and lime mortar can also be seen. At this place, according to the data received from the locals, were found: torso of a female statue, profiled marble block and tortured column, which are now placed in the yard of the church of St. Dimitri-ja in the village of Smokvica.
Municipality of Valandovo
Marvinci
Isar, Marvinci, at distance of more than 2,000 m from the proposed location of the new 400/110 kV sub-station, to east. Settlement and a necropolis with continuity from the VII century BC, to the VI century AD. It is located next to the village, on its southwestern side, on a very accessible hill with a magnificent view of the Valandovo Valley and the Vardar valley. The complexity of the site can be seen in the following archaeological units: Acropolis (IV-V century BC); Roman city (I-III century BC); Castrum - fortification (III-IV century BC); Necropolis with findings from all periods. This site has been declared a cultural heritage site of Macedonia.

Table 6.16: Legally protected cultural heritage sites close to the crossed by the corridor of the In-Out 400 kV OHL Du-brovo – Valandovo (Project Option 2, Alternative 1)

Main Source: Koco Dimce (1996). 'Archaeological Map of the Republic of Macedonia' II. Skopje: Macedonian Academy of Sciences and Arts (Коцо, Димче (1996). „Археолошка карта на Република Македонија". II. Скопје: Македонска академија на науките и уметностите.) ISBN 9989649286 [Ref.19]

(2) Sub-project 2 - Reconstruction of the existing 110 kV OHL Valandovo - Strumica

The existing 110 kV OHL Valandovo – Strumica does not cross any known cultural heritage site or location of cultural importance. There are several archaeological sites located in the wider area along the OHL alignment (Figure below) which would not be affected during the implementation of the Project.

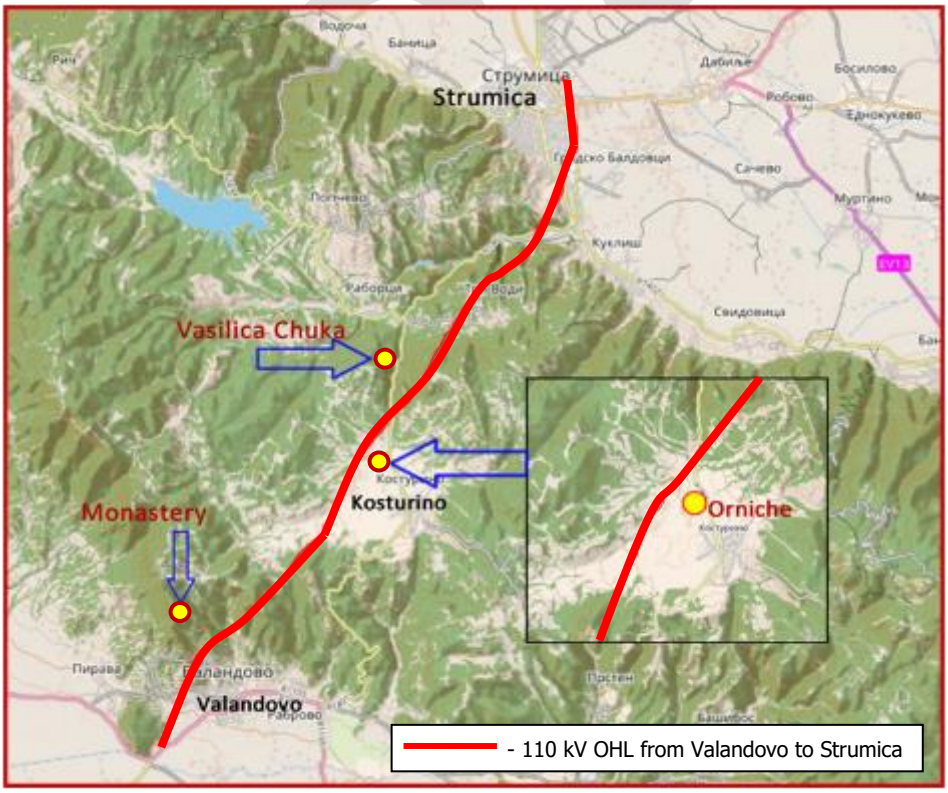

Figure 6.13: Location of the identified cultural heritage sites, relative to the Sub-project 2

These cultural resources and their approximate location are briefly described in the following Table.

Registered Archaeological Sites in proximity to Sub-project 2 - Existing 110 kV OHL VALANDOVO – STRUMICA -
Municipality of Valandovo
Valandovo
Monastery, at relative distance of more than 750 m from the alignment of the new 110 kV OHL. Late antiquity necropolis. The site lies 1 km north of the city, near the medieval fortress, where on a small plateau was discovered a group of tombs with a construction of stone slabs - cyst type, and tegulas "on two waters". Several ceramic vessels and coins from the III and IV centuries have been found in the tombs (Diocletian, Constantine I, Prob, Florian).
Municipality of Strumica
Kosturino
Vasilica Chuka, at relative distance of more than 2,500 m from the alignment of the new 110 kV OHL. Hellenistic and Roman times settlement. About 4 km north of the village is a high hill that dominates the road Strumica-Valandovo. The very top is surrounded by the remains of foundations of a wall, built of stone and lime mortar. At an area of 200 × 60 m inside the fortress, foundations of smaller buildings can be seen, and fragments of construction and pottery can be found. Several Hellenistic coins kept in the Institute and Museum in Strumica were also found.
Orniche, at relative distance of more tha 700 m from the alignment of the new 110 kV OHL. Site is located on the plateau between the Strumica field and the Valandovo hill near the village of Kosturino. This site is a Middle Neolithic settlement. The settlement is 7500 years old and the remains of dwellings, pottery and tools have been found here.

Table 6.17: List of known archaeological sites within the study area, along the existing 110 kV OHL Valandovo - Strumica

Main Source: Koco Dimce (1996). 'Archaeological Map of the Republic of Macedonia' II. Skopje: Macedonian Academy of Sciences and Arts (Коцо, Димче (1996). [Ref.19]

6.11.3 Potential Impacts and Principle Mitigation

The key potential impact during the construction of the Project is related to the risk of partial or total removal or destruction of unknown heritage assets (undiscovered archaeological sites) due to ground removal, which implies the need for setting mitigation approach.

During the construction works, as part of the Project's CESMP, a protocol ("chance-find" procedure) is to be developed and implemented. This protocol would be in compliance with the national legislation on the protection of cultural heritage[65]. Workers need to be trained in the use of this procedure.

Since the impact to the cultural heritage sites is likely to be very small during operation of the project, these aspects are scoped out of the assessment.

6.12 Cumulative Effects

Cumulative impacts refer to the accumulation of human-induced changes on valued environmental and social components over time and across space in an additive or interactive manner. Therefore, cumulative impacts are combined changes to the environment caused by two or more projects that are close to the same location or area, and which types of construction or operational impacts

[65] Law on Culture (Official Gazette of RM no. 31/98, 49/2003, 82/2005, 24/2007, 116/10, 47/11, 51/11, 136/12, 23/13, 187/13, 44/14, 61/15, 154/15, 39/16 and 11/18)

have similar nature and potential for interaction. Cumulative impacts, cumulative effects or cumulative environmental changes are generally interchangeable terms. Typically, the main cumulative impacts occur as inter-project effects - the effects of a series of other developments of similar type and scale in the vicinity of the Project which are proposed, under construction or have been consented, which when combined with the effects of the proposed project may have an incremental significant effect.

In principle, for this transmission development, cumulative effects may most likely occur during its construction in a form of typical impacts associated with construction works (air pollution, nuisance due to construction noise, traffic disturbance, etc.) or during its operation as a result of interaction with projects of similar type (e.g. other transmission projects, wind power developments, etc.) and size in its surrounding.

For the purposes of the Project's E&S appraisal, the assessment of cumulative effects arising from the Project in combination with other proposed developments will primarily constitute a desk-top study of planning documents considered relevant to the assessment. The focus of the desk-top study will be the collection of information relating to the background of relevant projects, their expected timelines and likely impacts. In addition, these developments would be reviewed with an aim to assess their potential temporal and spatial interactions with the Project.

7. Consultation and Participation Arrangements

7.1 Context

Effective stakeholder engagement and consultation is seen as fundamental to the success of the proposed Project.

The Project has a wide range of stakeholders (including statutory consultees, local communities, property owners and landowners, businesses and other affected groups) with differing interests that will require varied levels of information. Specific communication activities therefore need to be focused to meet the needs of particular individuals and groups, particularly vulnerable groups. This requires an understanding of the stakeholders and their interest in the proposed project.

Stakeholder engagement for the Project would be based on the following principles:

(i) Early and ongoing engagement with relevant stakeholders to inform and influence the Project development process;

(ii) Seeking an appropriate level of feedback at each development stage in order to achieve iterative design process by ensuring that comments and concerns received are taken into consideration.

(iii) Building of long term relationships with key stakeholders throughout the different stages of the Project to help better understand their views;

(iv) Where possible and practicable ensuring concerns are addressed; and

(v) Ensuring appropriate statutory consultation is undertaken in compliance with national requirements and best international practice.

MEPSO intends to implement the Project as an example of good practice in the development of transmission infrastructure with the aim of involving stakeholders and maintaining good communication practices throughout the life of the Project. Therefore, stakeholder engagement process has been initiated in the ESIA scoping stage and will be further carried on based on the technical analysis and environmental and social appraisal performed so far.

However, the situation with the outbreak of the pandemic COVID-19 disease, caused by SARS-CoV-2 virus, changed the familiar and widely used methods for information disclosure and stakeholder engagement, in particular the public engagement and consultation. In order to avoid, to the maximum extent where possible, the exposure to the risk of transmission of the infection, the stakeholder engagement process and information disclosure methods for the Project are to be tailored in accordance to the recommendations given by the most relevant international and national health organizations and relevant actors who are modelling and defining the good international practice.

This process will be guided by the Stakeholder Engagement Plan (SEP) that has been prepared during the ESIA scoping stage This SEP [Ref.5] has be prepared to meet IFI and international standards as well as national stakeholder engagement requirements.

This ESIA Scoping Report, along with the SEP will be disclosed and publicly consulted, at a very early stage, prior start of realization of the main ESIA document. Undertaken disclosure and consultation activities will be amended to the updated version of the SEP.

An ESIA Public disclosure package for Project will contain:

- ESIA Report

- Non-technical Summary (NTS)
- Stakeholder Engagement Plan (SEP), including Project Grievance Form
- Environmental and Social Management Plan (ESMP)
- Land Acquisition Resettlement Framework (LARF).

7.2 Consultations to Date

As part of the present development stage of the Project, MEPSO, supported by the IPF7 Team, has carried out consultation process with the selected major relevant statutory stakeholders in order to gain their views with an aim to inform and further drive the current development of the Project. These stakeholders have included concerned municipalities (Valandovo, Gevgelija and Strumica) and their administration, local public utility companies, line ministries and other relevant agencies and institutes (Annex 4). Regarding gender, the structure of these meetings was as follows:

- Valandovo meeting: total 11 participants (7 female)
- Gevgelija meeting: total 11 participants (4 female)
- Strumica meeting: total 15 participants (6 female)
- Meeting with state institutional stakeholders: total 22 participants (9 female).

The main purpose of these consultations was to seek feedback from the key statutory stakeholders in regard to the suitability and acceptability of the proposed preferred Project option, with emphasis to the key spatial planning, environmental and social constraints that may influence the further development process of the Project. The responses from these consultations will be taken into account in the upcoming technical and E&S assessment of the selected Project option.

MEPSO agreed with Municipality of Valandovo and Municipality of Gevgelija to closely cooperate for obtaining necessary administrative permits and information within their domain of authority, for the needs of the further Project development and implementation.

An official written communication with two national institutions (museums) with legal jurisdiction in the wider Project region (area of Valandovo-Gevgelija and Strumica) was performed by MEPSO, supported by the Project's ESIA team, in order to obtain data on locations of respective archaeological sites that might impact the Project planning. In addition, a joint site visit with the responsible archaeologists was conducted in the Project region. As a result of this exercise, and based on the obtained data and findings from the site visit, the initially proposed 110 kV OHL alignment has been optimised to avoid potentially affected cultural resources (see Figure 6.12).

All measures in force regarding COVID-19 were implemented by the organizers and all participants at these meetings.

References and Literature

Project Reports to date:

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Annexes

Annex 1: Project Maps

Annex 2: Project Options and Alternatives with High-level Environmental Constraints

Annex 3: Key Social Sensitivities associated with the Project

Annex 4: Summary of Stakeholder Engagement Activities to date

Annex 1: Constraints Map – Designated Sites in the Project Region

(given under separate cover)

Annex 2: Project Options and Alternatives with High-level Environmental Constraints

(given under separate cover)

Annex 3: Key Social Sensitivities associated with the Project

(given under separate cover)

Annex 4: Summary of Stakeholder Engagement Activities to date

(given under separate cover)