

FYR Macedonia/Bulgaria Transmission Interconnection Project

SUMMARY OF THE ENVIRONMENTAL IMPACT ASSESSMENT CONDUCTED IN BULGARIA

This Summary Report has been excerpted from the Environmental Impact Assessment Report that was produced by the Technical University of Sofia and the Environmental Technologies and Management Laboratory of Bulgaria in connection with the Elektrostopanstvo na Makedonija: FYR Macedonia/Bulgaria Transmission Interconnection Project.

Chapters 1, 2 and 8 (Characteristics of the Project (Chapter 1); the Summary Chapter (Chapter 2); and the Conclusion (Chapter 8)) of the Environmental Impact Assessment Report are reproduced here in their entirety.

1. CHARACTERISTICS OF THE PROJECT

1.1. Owner of the Project

- 1.1.1. Project title:* HPL 400 kV Substation Chervena Mogila (Bulgaria) - Substation Dubrovo (Macedonia) /on Bulgarian Territory from Tower 1 to Tower 251/ and Reconstruction of Substation Chervena Mogila – open-air switchgear 400 kV
- 1.1.2. Investor's address:* Natsionalna Elektrieska Kompania EAD
P TRAFEOELEKTROINVEST
1408 Sofia; 24, P.U. Todorov Blvd.

1.2. Review and expediency of project implementation

The reconstruction project for substation Chervena Mogila will be performed in a single stage. The construction and putting into operation of the new HPL 400 kV have been foreseen to be performed in a single stage, too.

1.3. Alternative Solution

Due to the nature of the projected line, namely an element of the infrastructure of two states, the starting and final points of the power line path are fixed and cannot be modified. At the stage of path selection the alternatives for the choice of another path have been considered by the interested bodies, including by a representative of the MEW. Since the construction of electric power lines 400 kV through populated areas is forbidden by the effective normative regulations, the alternatives of connecting the starting and final points are strongly limited. The lack of free power generating resources in Western Bulgaria excludes the possibility of transferring electricity to Macedonia along another path.

In the process of surveying, path selecting, and project designing two main variants have been initially proposed for the path of the new HPL 400 kV.

The construction of the new HPL 400 kV will be performed in coordination with the reconstruction of the open-air switchgear (OSG). The starting point of the HPL 400 kV on Bulgarian territory will be at the new terminal field in the OSG 400 kV of substation Chervena Mogila. The OGS 400 kV will be widened in southward direction, and performing the connection of HPL to the new terminal field will not require any reconstruction of the existing “fan” of 400-kV power lines at the substation’s front side.

The climate conditions along the proposed paths of HPL 400 kV are very different due to the great difference in the elevations above sea level, from 450 to 1200 m, and the variety of terrain forms (from plane to typical rugged mountain terrain) of various orientations and situations of the slopes in respect to the strong winds.

The proposed variants for the path of HPL 400 kV are situated in the Transitional physico-geographical region, namely between the Balkan-mountains physico-geographical region (young-folded) and the Rila-Rodopi physico-geographical region (old-folded). The transitionality is manifested by the relief development: it is shaped by blocks and-faults, mountains and kettles.

The Transitional region is divided into 4 sub-regions. The first of them is the Vitosha-Kraishte sub-region which, in its turn, is sub-divided into two parts: the Vitosha mountain-and-kettle part, and the Kraishte part.

The Kraishte part includes two mountain ranges: the Verila-Ruy and Konyavo-Milevo ranges as well as the kettles between them. The kettles are those of Radomir and Divlyane north of the Konyavo-Milevo mountain range, and those of Dupnitsa and Kyustendil south of that range. The small Kamenitsa kettle is situated to the west of the Lisets mountain.

Breaking into blocks and faults during the Neogene and Quaternary resulted in block morphostructures, some of which rised sharply (mountain massifs), and other sank (bottoms of multiple kettles). The result was a real mosaic of mountains, kettles and deep valleys. The final relief formations had been foreshown by the fault lines of the geological base.

Detailed description of path variants is presented in section 2 of the EIA report.

The path of variant I (in red) - of total length 82.6 km. A total number of about 250 towers will have to be set upright. For their base sites a total area of about 12.4 da agricultural lands will have to be alienated, and a total of 390 da of forest will have to be cut down for openings.

The path of variant II (in green) - of total length 81.9 km. A total number of about 252 towers will have to be set upright. For their base sites a total area of about 12.28 da agricultural lands will have to be alienated, and a total of 120 da of forest will have to be cut down for openings.

The proposed new HPL path in accordance with *variant II* will differ from that of *variant I* in the its section from **point “A”**, located at about 1.8 km to the south-east of the substation Chervena Mogila, to **point “B”**, located at about 2.2 km to the north of the village of Kremenik. **For the section between the substation Chervena Mogila and the 1.8-km point it is not possible to propose a variant for the HPL path other than the already proposed path *variant I*.** From **point “B”** to **point “C”** it will be expedient that the new HPL path follow in parallel the existing HPLs of 400, 220 and 110 kV. **In that section the *variant-II* path will also coincide with the *variant-I* path.** From **point “C”** to the Macedonian border the *variant-II* path will be considerably different from that of the *variant-I* path with some small exceptions.

During the inspection of both *variant* paths the Committee has found out that separate sections under *variant-I* are almost impossible for realization because of passing through strongly rugged rock massifs as well as for the presence of about 25 residential or other buildings. Taking into account the provisions of the Agricultural Lands Protection Act and the Regulations for its enforcement, the Committee has done its best by directing the path in such a way as to eliminate its passing through orchards, apple- or cherry-tree plantations, etc.

The path proposed has been modified by introducing the following corrections:

- From **point 1** to **point 2** along the green variant path (on the land of the village of Yabalkovo), the path being laid after the **“orange variant”** on both sides along the bed of river Bistritsa with approximative length 1.5 km.

- To the north of the villages of Gorna Grashtitsa and Tavalichevo, the path proposed under the green variant, which passes through a corridor of maximum admissible distance of existing HPL 110 kV “Yabalka” should pass between the two existing HPL 110 kV “Yabalka” and HPL 110 kV “Kadin Most”, out of the sections with perennial plantations.

At the request of the Regional administration of Kyustendil region the Committee has also considered the proposed future general town-planning concept of Kyustendil. As a result the path section from **point 2** to **point 3** (under the green variant) had to be corrected in accordance with the orange variant as the only possible further development of the town requires that the path goes round the reservoir situated south-west of the village of Nikolichevtsi. The new path passes north of the green variant path, goes round the village of Lozno from the north and west, and with several consecutive bends advances southward to **point 3** located north of Kyustendil's district of Zhilentsi.

The amended path along the “**variant**” is of approximative length 5.6 km.

Operative project for building the new HPL 400 kV has been also prepared in accordance with the approved variant II.

A reconstruction of the existing HPL 110 kV substation Chervena Mogila - substation Radomir is being also performed in the section from tower 31 (existing) to tower 37 (36, existing). This reconstruction is necessary in order to be provided a path for the new HPL 400 kV to Macedonia between existing HPL 400 kV “Djerman-Osogovo” and HPL 110 kV “Varba” in the area in close proximity to substation Chervena Mogila.

The HPL 400 kV substation Chervena Mogila (Bulgaria) - substation Dubrovo (Macedonia) will be mainly used for electric power exchange between the two Electric Power Grids (EPG) in a regime of parallel operation. The maximal continuously admissible flow of active power through the power transmission line shall be no less than 800 MVA.

On Bulgarian territory the new HPL 400 kV will be realized with a conductor triad of the type ASO-500 in a bundle of two conductors wires for each phase and two lightning protection cables. It shall supply power to consumers of category I.

1.4. Parties that might be affected by the project implementation.

The project implementation shall affect:

1. The owners of agricultural lands – those located on the power line's path. Their interests will be affected because the agricultural lands have to be used for non-agricultural purposes, which will lead to: land alienation and change in land purpose at the tower base sites; construction of temporary roads for the access of heavy machinery and equipment to the tower base sites; construction and excavation for the tower foundations as well as deposition of ground masses; preparation of temporary mounting openings by cutting down the perennial vegetation for the transportation vehicles used in conductor stretching; maintenance of safety zone subject to limited access and usage; limiting the height of perennial vegetation growing in the forementioned zone to no more than 4 meters. The land to be alienated for the construction of tower base sites shall be purchased from the owners at market prices, and those owners, whose lands will be temporarily unusable shall be compensated for lost benefits caused by not-gathered crops for the duration of both the construction and mounting works. The path passes through the territories of two regions as follows:

- In Pernik region, Radomir municipality: through the lands of the villages of Chervena Mogila, Egretsie, Drugan, Stefanovo, Dolni Rakovets, Chukovets, and Galabnik;

- In Kyustendil region, Dupnitsa municipality: through the lands of the villages of Kremenik and Dyakovo;

- In Kyustendil region, Bobovdol municipality: through the lands of the villages of Mlamolovo, Babinska Reka, Novoselene, Korkina, Gorna Koznitsa;

. - In Kyustendil region, Kyustendil municipality: through the lands of the villages of Tavalichevo, Gorna Grashtitsa, Konyavo, Kopilovtsi, Nikolichevtsi, Lozno, Gorna Brestnitsa, Mirovo, of the town of Kyustendil, and of the villages of Garlyano, Ranentsi, Kamenichka Skakavitsa and Gyueshevo.

2. The owners of lands located in close proximity to the path. In the area of 30 meters from the end conductors along entire path (a safety zone in the sense of Appendix No. 2 to article 3, paragraph 3, of Regulations No. 7) no one is allowed to build dwellings, stay for a long time or practice activities, and no presence of residential or temporary should be supposed as allowable. The HPL path does not pass through the urban areas themselves.

3. Forestry enterprises that will be crossed by the path. The path construction will be accompanied by cutting down openings in the forest areas along the path. During the construction the following activities shall take place: -construction of temporary roads for heavy machinery access to the tower base sites; preparation of temporary mounting cut-down openings between the towers for conductor stretching. The perennial vegetation to be cut-down as well as the routes of temporary roads shall be determined solely after a preliminary inspection and evaluation have been carried out by a committee. The following parties should be represented in that committee: the Regional Administration of Agriculture and Forestry, forest owners, Local Land Committees, Local Municipality, investor, and path owner. The affected forest owners and forestry enterprises shall be compensated as per the legal procedure.

4. The Fire Protection Authorities and Civil Safety Authorities at the towns of Radomir and Kyustendil.

5. Municipal councils, where the path crosses municipal grounds.

1.5. Legislative and Institutional Framework.

This Environmental Impact Assessment Report complies with the requirements of:

- Environmental Protection Act, dated 18.01.1991, published in State Gazette (SG) issue No. 86/1991, revised in SG issue No. 90/1991; amended in SG issue No. 100/1992; issues Nos. 31 and 63/1995, issues Nos. 13 and 85/1997); and Appendix No. 2 to Article 13, Paragraph 1, Item 2;
- Regulations No. 4 issued by the Ministry of Environment and Waters, Ministry of Regional Development and Town Planning, Ministry of Health, and Ministry of Agriculture, Forestry and Agricultural Reform, dated 07.07.1998 for the Environmental Impact Assessment (SG issue No. 84/1998);
- Regulations No. 2 for Personal Certification of Professional Competency of the experts performing EIA (SG issue No. 73/1995, amended and supplemented in SG issues Nos. 35/1994 and 114/1997);
- Regulations No. 7 for the Hygienic Requirements for Health Protection of the Residential Environment (SG issue No. 46/1992, amended and supplemented in SG issue No. 46/1994);
- Electrical Equipment Structural Regulations – (1980);
- Others.

1.6. EIA Report Authors.

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1.7. Legal grounds for developing the EIA report:

This EIA report has been prepared on the grounds of Article 20, Item 1, of the Environmental Protection Act (EPA), Item 3.3 of the Appendix to Article 20, Item 1, of the fore mentioned Act, and in accordance with Appendix No. 2 to Article 13, Paragraph 1, Item 2, of Regulations No. 4 of 07.07.1998 for the EIA (SG issue No. 84/1998), issued by the Ministry of Environment and Waters (MEW), Ministry of Regional Development and Town Planning (MRDTP), Ministry of Health (MH), and Ministry of Agriculture, Forestry and Agricultural Reform (MAFAR), and a Service Contract concluded between the Investor – Natsionalna Elektricheska Kompania - EAD, TRAFEOELEKTROINVEST, Sofia and a team of licensed experts with the Environmental Technologies and Management Laboratory at the Technical University of Sofia.

2. SUMMARY

2.1. Description of the project

The new HPL, the construction project of which is the subject of the present EIA report, will be the first connection line of voltage 400 kV between the Electric Power Grids (EPG) of Bulgaria and Macedonia for the exchange of electric power between the two EPGs in a regime of parallel operation. The new HPL will be built in accordance with the inter-governmental agreement concluded between the two countries. The construction of the new inter-grid HPL 400 kV will be a stage of the strategy realized by the electric-power companies of the Balkan states. The objective of this strategy is the implementation of parallel operation of national EPGs from this region, having in mind their future joining the UCPTE.

Initially two path variants have been proposed for the new HPL.

The path under variant I (in red color):

Under *variant I* the path starts from the terminal gate of OSG 400 kV at substation Chervena Mogila and goes in east-southeast direction together with existing HPL 400, 220 and 110 kV. Upon crossing the existing HPL 110 kV “Dren” it turns to the south-southeast direction and continues along the corridor with existing HPL 400 and 220 kV. After 3.3 km the HPL path is directed southwards, crosses the road Drugan - Staro Selo and afterwards continues in

southeast direction. After 2.2 km the HPL path turns to the south-southwest direction, crosses the road Radomir - Dolna Dikanya, passes east from the village of Vladimir and continues in parallel with HPL 400 kV "Djerman-Osogovo" along its west side at the minimal admissible distance. The path crosses the railway line Sofia - Kulata, the road Chukovets - Galabnik, passing west from the village of Galabnik. After 3.7 km the HPL path turns to the south direction and continues in parallel with HPL 400 kV "Djerman-Osogovo" only. After 4.1 km the HPL path changes its direction to the southwest and continues in a corridor with the HPL 400 and 220 kV. It crosses the road Mlamolovo - Dyakovo and after about 1 km leaves the bundle of existing HPLs, turning to the northwest direction, passes south of the village of Mlamolovo, crosses the road Mlamolovo - Malo Selo, the railway line Bobovdol - Dupnitsa, and the river Babinska. After 6.7 km the HPL path changes its direction to the southwest, crosses the road Gorno Gabreshevo - Dolno Gabreshevo, and reaches the existing HPL 110 kV "Kadin Most". The new HPL path turns to the northwest direction, crosses the existing HPL 110 kV "Yabalka", and from this point on begins to follow the existing HPL 110 kV "Kadin Most" from its north side at a minimal admissible distance, passing from the north side of the villages of Gorna Koznitsa, Tavalichevo, Gorna Grashtitsa and Konyavo.

Upon crossing the river Struma and the railway line Sofia - Kyustendil, the path turns to the southwest direction, crosses the river Bistritsa, passes north of Kyustendil, crosses the railway line Kyustendil - Gyueshevo, and turns to the south. It crosses the existing HPL 110 kV "Gyueshevo" and continues from its southern side at a minimal admissible distance, passing south of the villages of Lozno and Gorna Brestnitsa. The path passes south of the village of Barzetsi, turns to the west direction and crosses the existing HPL 110 kV "Gyueshevo". After about 2.1 km the path reaches the Izgorelichkata Mahala and turns to the southwest direction. It passes north of the villages of Garlyano and Ranentsi, turns round the village of Kamenichka Skakavitsa from its north side and continues in southwest direction, crosses the road Kamenichka Skakavitsa - Gyueshevo, and after 3.4 km reaches the existing HPL 110 kV "Stratsin". From this point on to the point of crossing the border the path goes along the north side of HPL 110 kV "Stratsin" (substation Skakavitsa - substation Kriva Palanka, Macedonia).

The above-described path under variant I is of total length about 82.6 km and passes through the territories of two regions as follows:

- In Pernik region, Radomir municipality: through the lands of the villages of Chervena Mogila, Egretsie, Drugan, Vladimir and Galabnik; affecting in this region about 22.2 km of vegetation lands including 13.9 km of agricultural lands, 5.9 km of pastures and uncultivated lands, and 2.4 km of forests.

- In Kyustendil region, Dupnitsa municipality: through the lands of the villages of Kremenik and Dyakovo; Bobovdol municipality: through the lands of the villages of Mlamolovo, Babinska Reka, Novoselene, Korkina, and Gorna Koznitsa; Kyustendil municipality: through the lands of the villages of Tavalichevo, Gorna Grashtitsa, Konyavo, Kopilovtsi, Nikolichevtsi, Lozno, Gorna Brestnitsa, Mirovo, of the town of Kyustendil, and of the villages Garlyano, Ranentsi, Kamenichka Skakavitsa and Gyueshevo, affecting in this region about 60.4 km of vegetation lands including 19 km of agricultural lands, 24.8 km of pastures and uncultivated lands, 7.8 km of orchards, and 7.4 km of forests.

The path under variant I will require to set upright about 250 towers for the base sites of which it will be necessary to alienate an average area of 150 m²/km (agricultural land) or a total of about 12.4 da of agricultural land. The purpose of use of this land will have to be changed upon being alienated for the purposes of HPL construction. At passing through forest vegetation a forest opening of average width 40 m shall be cut down, or as a total approximately 390 da of forest vegetation will have to be cut down.

The characteristic data about the path terrain and the vegetation affected are given in the following table:

No.	Type of Vegetation	Length	
		km	%
1.	Agricultural lands	32.9	39.8
2.	Uncultivated lands and pastures	30.7	37.2
3.	Forest vegetation	9.8	11.9
4.	Orchards	7.8	9.4
5.	Vineyards	1.4	1.7
Total		82.6	100.0

Table 1

The path under variant II (in green color):

Under *variant II* the new HPL path suggested **differs** from that under *variant I* in the part from **point "A"**, located at about 1.8 km southeast of substation Chervena Mogila, to **point "B"**, located at about 2.2 km north of the village of Kremenik. In the part from substation Chervena Mogila to the point at 1.8 km no other variant for the HPL path could be suggested, except the above-described path variant I. From **point "B"** to **point "C"** it is expedient that the new HPL path follow in parallel the existing HPLs 400, 220, and 110 kV, and moreover, in this part the path under variant II will coincide with that under variant I. From **point "C"** to the border with Macedonia the path under variant II will, with small exceptions, differ considerably from that under variant I.

The path under variant II from substation Chervena Mogila to **point "A"** **coincides** with that under variant I. From **point "A"** it goes in southeast direction and after 3.4 km crosses the existing HPL 110 kV "Dren", turns to southwest direction, crosses the road Radomir - Dolna Dikanya and continues in parallel to the existing HPL 110 kV "Dren" from its east side, passing east of the villages of Stefanovo and Dolni Rakovets. After 4.4 km the path turns to the southeast direction, crosses the railway line Sofia - Kulata, passes east of the village of Chukovets, crosses the road Chukovets - Galabnik and reaches **point "B"**, located at about 2.2 km north of the village of Kremenik, and goes on along the path variant I up to **point "C"**.

From **point "C"**, located southeast from the village of Mlamolovo the path of variant II turns to the south-southwest direction, passes south of the villages of Babinska Reka, Novoselene and Korkina, crossing the road Korkina - Dupnitsa. Near the road, south of the village of Korkina, the HPL 400 kV passes at a distance of about 35 m from a gas pipeline. From this place of maximum approaching to HPL 400 kV the gas pipeline goes on in southwest direction, and HPL 400 kV continues in northwest direction and passes south of Golemi Vrah. Upon crossing the existing HPL 110 kV "Pchelintsi" and HPL 110 kV "Kadin Most", the path of HPL 400 kV turns to the west-northwest direction. At about 0.6 km southwest of the village of Gorna Koznitsa the path turns to northwest direction, and upon crossing the existing HPL 110 kV "Yabalka", turns to nearly west direction, continuing in parallel with HPL 110 kV from its north side at a minimal admissible distance. Before crossing river Struma, the path changes its direction to northwest, leaving the existing HPL 110 kV "Yabalka". It crosses the river and upon crossing the road Sofia - Kyustendil turns westwards. The path passes south of the village of Kopilovtsi and upon crossing the railway line Sofia - Kyustendil at about 0.5 km southeast of the village of Nikolichevtsi turns to the southwest direction. At about 0.5 km north of Kyustendil's district of Izgrev the path turns to the west-southwest direction, passes north of the town, crosses the railway line Kyustendil - Gyueshevo, and upon crossing the road Kyustendil - Radlovtsi turns to the south-southwest direction. Upon crossing the existing HPL 110 kV "Gyueshevo" the path turns to the southwest, continuing to the village of Mirovo along the path of the partially built and later abandoned HPL 110 kV substation Pautalia - substation Ruen. At about 1 km west

of the village of Mirovo the path turns to the west direction, crosses the existing HPL 110 kV “Gyueshevo” and before crossing the road Garlyano - Dolno Selo, turns to the southwest direction, coinciding in the part between the villages of Ranentsi and Kamenichka Skakavitsa with the path under variant I. From the village of Kamenichka Skakavitsa the path turns to the south-southwest direction, crosses the road to Gyueshevo, and immediately before the border coincides again with the path under variant I.

During the inspection along the paths under both variants the Committee in charge found out that certain parts under variant I were almost impossible for realization because of passing through strongly rugged rock massifs as well as for the presence of about 25 residential or other buildings. Taking into account the provisions of the Agricultural Lands Protection Act and the Regulations for its enforcement, the Committee has done its best by directing the path in such a way as to eliminate its passing through orchards, apple- or cherry-tree plantations, etc.

The path suggested has been modified by introducing the following corrections:

- From **point 1** to **point 2** along the green variant path (on the land of the village of Yabalkovo), the path passing under the “**orange variant**” along both sides of the bed of river Bistritsa with approximate length of 1.5 km.

- To the north of the villages of Gorna Grashtitsa and Tavalichevo, the path proposed under the green variant, which passes through a corridor of maximum admissible distance of existing HPL 110 kV “Yabalka”, should pass between the two existing HPL 110 kV “Yabalka” and HPL 110 kV “Kadin Most”, out of the sections with perennial plantations.

At the request of the Regional administration of Kyustendil region the Committee has also considered the proposed future general town-planning concept of Kyustendil. As a result the path section from **point 2** to **point 3** (under the green variant) had to be corrected in accordance with the orange variant as the only possible further development of the town requires that the path goes round the reservoir situated south-west of the village of Nikolichevtsi. The new path passes north of the green variant path, goes round the village of Lozno from the north and west, and with several consecutive bends advances southward to **point 3** located north of Kyustendil’s district of Zhilentsi.

The amended path along the “**orange variant**” is of approximative length 5.6 km.

The above-described path under variant II is of total length about 81.9 km and passes through the territories of two regions as follows:

In Pernik region, Radomir municipality: through the lands of the villages of Chervena Mogila, Egretsie, Drugan, Stefanovo, Dolni Rakovets, Chukovets, and Galabnik; affecting in this region about 18.5 km of vegetation lands including 9.0 km of agricultural lands, 8.5 km of pastures and uncultivated lands, and 1.0 km of forests.

In Kyustendil region, Dupnitsa municipality: through the land of the village of Kremenik;

In Kyustendil region, Kyustendil municipality: through the lands of the villages of Tavalichevo, Gorna Grashtitsa, Konyavo, Kopilovtsi, Nikolichevtsi, Lozno, Gorna Brestnitsa, Mirovo, of the town of Kyustendil, and of the villages of Garlyano, Ranentsi, Kamenichka Skakavitsa and Gyueshevo, affecting in this region about 63.4 km of vegetation lands including 21.3 km of agricultural lands, 33.9 km of pastures and uncultivated lands, 0.8 km of orchards, and 7.4 km of forests.

The path under variant II will require to set upright about 252 towers for the base sites of which it will be necessary to alienate an average area of 150 m²/km (agricultural land) or a total of about 12.28 da of agricultural land. The purpose of use of this land will have to be changed upon being alienated for the purposes of HPL construction. At passing through forest vegetation a forest opening of average width 40 m shall be cut down, or as a total approximately 120 da of forest vegetation will have to be cut down.

No.	Type of Vegetation	Length	
		km	%
1.	Agricultural lands	30.3	37.0
2.	Uncultivated lands and pastures	42.4	51.7
3.	Orchards	8.4	10.3
4.	Forest vegetation	0.8	1.0
Total		81.9	100.0

Table 2

Upon examining the project documentations and inspecting the routes of both path variants the Committee in charge has considered *variant II* (shown in green) of total length 81.9 km as more suitable for the construction of the new HPL.

From the view-points of engineering realization, cost-effectiveness and operational advantages the grounds for the above statement are as follows:

1. The path under the “**green**” variant affects much smaller area of coniferous vegetation compared to that of the “**red**” variant which affects a large area of young forest vegetation of the age of 15 to 30 years.

2. In Pernik region the path under the “**green**” variant does not pass in the vicinity of residential areas and over existing buildings, while the “**red**” variant path passing through the land of the village of Staro Selo would constrict its expansion southwest of HPL 400 kV “Djerman-Osogovo”.

3. In Kyustendil region, between **point 3** above the Zhilentsi district and **point 4** located northeast of the Garlyano district, may ram. the path uses the corridor of the unfinished HPL 110 kV “Osogovo”, now abandoned as construction site.

4. The path passes through sections of lower elevation above the sea level, which defines more favorable climatic conditions permitting the use of larger inter tower spans as well as lighter towers (lighter openwork steel structures).

5. In case of emergencies and failures the access to the path under the “**green**” variant will be considerably better than that under the “**red**” one, and this is guaranteed by the terrain and climatic specificities. On the contrary, under severe meteorological conditions it may turn out that the access to some parts of the “**red**” variant path is impossible.

6. In Kyustendil region the whole path under the “**green**” variant in its parts in the vicinity of residential areas has been traced in a manner meeting the requirements for normal technical operation and sanitary protected zones according to the normative requirements being now effective.

7. Both path variants proposed do not pass through protected territories in the sense of the Protected Territories and Sites Act in accordance with the Nature Protection Act. The above text relates to the path “corrected in orange” as well.

8. The chosen path under the “**orange-green variant**” is in complete conformity to the requirements for normal operation of the inter-grid electric power transmission lines because of the high safety criteria.

An operative construction project for the new HPL 400 kV has been also developed.

The operative projects have been developed in accordance with the requirements of the EESP (1980) as well as with those of all regulations and standards related to this type of installations.

The proposed path variant of the new HPL 400 kV is of length 81.9 km. The path is represented in the operative projects with working blueprints – longitudinal profiles. The operative project itself has been developed by subdividing the path into three sections:

Section I of the HPL: from substation Chervena Mogila to tower No. 93 (from substation Chervena Mogila to reference point R₁₂) of length 30.85 km.

Section II of the HPL: (from reference point R₁₂ to reference point R₂₃) from tower No. 93 to tower No. 176 of length 27.27 km.

Section III of the HPL: (from reference point R₂₃ to reference point R₄₀) from tower No. 176 to tower No. 251 of length 20.77 km.

2.2. *Precaution Actions*

The HPL's project implementation will not lead to negative impacts on the environmental components if all the normative requirements are complied with. It is, therefore, not necessary that special additional measures be undertaken in this respect, besides meeting the regulation requirements. It could be recommended that only low-height vegetation be planted on the path as well as along its sides in order to prevent future cutting-offs of tops of taller plants to comply with the Electrical Equipment Structural Regulations.

2.3. *Labor Safety and Hygiene. Fire Protection*

The projected line is not subject to potential hazard of fire or explosion.

The technological process of HPL consists in the transmission of electric power. All erection and dismantling works are performed outdoors. The HPL maintenance is performed by Monitoring Inspectors working at normal physical loads, and by Maintenance Workers whose work is connected with stress and higher physical load only in cases of emergency and failures.

General rules of performing Construction and Mounting Works on the site

In performing Construction and Mounting Works (CMW) the requirements of following normative documents should be complied with: the Electrical Equipment Structural Regulations (EESR); Labor Safety Regulations (LSR) for CMW effective since 1982, and the additional regulations and orders for labor safety listed in Section I, Article 2 (1) of LSR: -Regulations for Performing and Approval of Construction-Mounting Works (RPACMW); - Labor Safety Regulations for Loading and Unloading Operations, 1971; - Labor Safety Regulations for Metal Welding and Cutting Operations, 1971; Fire Protection Norms for Construction and Technical Operations, issued by the Ministry of Construction and Constructive Materials in 1987; Labor Safety Regulations for Electrical Equipment and Machines Exploitation – 1986; State Sanitary Control Regulations – State Gazette Issue 66/1966.

Potentially hazardous areas and places of the construction site and erection facilities should be marked with signs In accordance with State Order No. 4 for Labor Safety and Fire Protection Signs and Signals (SG No. 77/1995). The construction and mounting machine and equipment shall correspond to the character of construction and mounting works performed. When compacting the concrete only vibrators in good operating condition and supplied by safe voltage should be used. All workers should be equipped with insulating safety rubber gloves and boots. Collapsible metal scaffolds fabricated according to a standard or particular project with accompanying instructions and schemes for assembling and dismantling and data sheets containing maximum admissible load and height of applications should be solely used. Assembling and dismantling of scaffolds, platforms, and cradles should be performed by experienced workers only, wearing safety belts and boots with non-slip soles, the working area being enclosed and made inaccessible for outsiders. The mounting works should be terminated in cases of coming storm and at dusk if the working area is not well illuminated. After storms the thorough examination of all scaffolds is mandatory. Insulating works could be performed only after the Technical Supervisor and Foreman have provided for the workers all necessary safety precautions against possible exposures to poisons, volatile substances, or dust, as well as against

thermal or chemical burns, and falling from high levels. All necessary fire protection equipment should be available at the site.

The Labor Safety Regulations for Electrical Equipment and Installations Exploitation should be complied with when the construction works are performed in the vicinity of existing power lines or electrical equipment under voltage. The operation of machines directly under live conductors of electric power lines is forbidden. The erecting of site stores for construction materials and production facilities as well as the performance of CMWs in the safety zones of existing HPLs at distances measured from the most external conductor, lesser than the indicated values: 10 m for voltages up to 20 kV; 15 m for voltages up to 35 kV, 20 m for voltages up to 110 kV, and 25 m for voltages up to 220 kV, are forbidden. The drivers of construction machines, if operating near existing power lines, should not allow that the distance between the imaginary vertical planes, defined by the nearest part of machine or load and the most external conductor of the power line, become lesser than the distance values prescribed in the table below:

HPL voltage in kV up to	1	20	110	220	400	750
Distance in m	1.5	2	4	6	9	12

Table 3

If large-size loads are transported under operating HPLs the distance between the highest point of the load (or machine) and the lowest suspension point of conductors should not exceed the distance values prescribed in the table below:

HPL voltage in kV up to	1	20	110	220	400	750
Distance in m	1	2	3	4	5	8

Table 4

Works that require the minimal distances listed above should be performed by persons to whom an access permit has been issued, indicating the name of the person responsible for the safety performance of these works. In cases when the minimal distances listed above cannot be kept works must be performed at switched off power supply to the existing HPL.

The CMWs of existing and operating electrical equipment or installations should be performed in accordance with time schedule approved by the managements of both the company that operates the equipment and the one that will perform the CMWs. The planned time schedule specifies the measures required by the Labor Safety Regulations for the Electrical Equipment and Installations Exploitation, the measures assuring electrical safety during CMWs execution, and other safety-assuring measures conforming to the specific working conditions.

The electrical installations in OSG-400 kV are mounted onto tables, so all the minimal distances required are assured in accordance with EESR of 1980.

Grounding knives shall be mounted to circuit breakers in order to provide safe access to installations during repairing works. Personal safety equipment should be used while handling electrical installations. Access of outsiders to the installations is strictly forbidden. Warning signs indicating the presence of high voltage and electricity hazards should be placed where necessary.

Any activity at the OSG shall be terminated before the beginning of storms. Protection devices that are not made of water-resistive material shall not be used at work in misty or rainy

weather conditions. Fire protection barriers shall be constructed at the places of crossing cable channels. Cables should pass through the fire protection barriers via black gas pipes.

The following requirements shall be met when working at OSG-400 kV:

A. For all types of works performed in the zone of impact of the electrical field where its intensity exceeds 5 kV/m, the workers shall use, as a rule, special protection devices against the electrical field impact, namely: screening suits or screening devices (such as grounded roofs, sheds, tents, etc. made of metal or metal-plated materials and permanently erected over the working place. When protecting screening devices are used the personnel could stay in OSG for an unlimited period. The impact zone limit is located at an air distance of 20 m from the nearest current-conducting parts. Climbing up the structures and installations with voltage switched-off, not using screening devices, is forbidden.

B. For short-term works that do not involve climbing up the structures or installations and are performed in the impact zone without use of safety equipment, the admissible duration of personnel stay for a period of 24 hours is given in the following table in relationship with the electric field intensity:

Electric field intensity E, kV/m	Stay time limit, T, min
10	180
15	90
20	10
25	5

Table 5

For these works touching structures or installations, which would produce an electric charge, is forbidden. The rest of the time the worker should be located at places where the electrical intensity is equal to or less than 5 kV/m. If the electrical intensity is higher than 25 kV/m all workers shall use protection devices.

C. The impact zone limit could be specified by way of measuring the electrical field intensity. It is necessary that the screening suits be grounded when the worker is on the ground or at another place of low conductivity, or stands on a grounded structure but the suit is insulated from the structure. When the worker is in close vicinity to a metal structure or on a ground of high conductivity, special measures for grounding the screening suit are not required.

Before performing works in the OSG-400 kV all metal objects insulated from the ground and switched-off buses and conducting parts workers could touch shall be grounded. The conductors the workers could touch by accident or approach to a distance less than: 1.0 m at rated voltage up to 20 kV; 1.5 m at rated voltage up to 110 kV; 2.5 m at rated voltage up to 220 kV, and 4.5 m at rated voltage up to 400 kV, shall be switched out.

If these conducting parts cannot be switched off, that section of the distributing installation in which construction and mounting works are performed or have already been terminated is to be separated by a fence from the operating section, so that all possibilities of accessing or approaching by people to live conducting parts be eliminated. The distances between the fences and conducting parts shall not be less than 4.5 m at rated voltage up to 400 kV.

Mounting works or stays of outsiders at a distance less than 50 m from the place of testing air breakers are forbidden. All works shall be terminated and all people located in the distribution installation shall be taken away out of the hazardous zone before feeding operating current to the circuits and equipment to be tested. Before testing remote driving mechanisms with operating current or compressed air they shall be marked with warning signs.

The object is not threatened by fire or explosion. All works are performed outdoors under the current atmospheric conditions. The maintenance is carried out by Monitoring Inspectors working at normal physical loads, and by Maintenance Workers whose work is connected with stress and higher physical load only in cases of emergency and failures. All maintenance workers who climb up the towers shall pass the necessary professional tests.

2.4. Assessment of Possible Hazards for the Personnel

The personnel is endangered when performing surveys and repairs of tower tops with workers climbing up and down the towers. The hazards include: falling down from the tower; touching parts under voltage that have not been switched off or have been incorrectly turned on; being exposed to voltage of atmospheric origin or to voltages inducted by neighbor HPLs. All distances between the HPL and buildings, equipment, inflammable materials, etc. comply with EESR, FPNCTO. Fires do not threaten the HPL, and fire protection equipment is not provided.

In accordance with EESR the projected HPL 400 kV supplies consumers of category I. The HPL has one triad of conductors ASO-500 in a bundle of two conductors for each phase of horizontal configuration and two lightning protection cables C-70 and ACS 68-5.5.

The safety measures undertaken involve grounding of all lattice towers with grounders according to BDS and using movable grounders for grounding the conductors.

Protection and Rehabilitation of the Environment

All the requirements for rational usage of the land, for better construction organization, for decreasing the negative impact from electromagnetic fields, and for minimal landscape damage have been complied with in order to improve the environmental effectiveness at the path projecting, construction and exploitation.

The path was chosen with the idea of making minimal investments and avoiding the passage through urban and forest areas. The new HPL 400 kV to Macedonia will be constructed on a path chosen by a Committee that has been formed in compliance with the Agricultural Grounds Protection Act. In general the path passes along 38.7 km through agricultural lands, 42.4 km through pastures and uncultivated lands, and partially 0.8 km through forests.

The technological process of HPL consists in the transmission of electric power. The air, water and soil will not be polluted since no waste materials are obtained during regular HPL operation.

The line is an electromagnetic field source while transferring electric power. Because of this harmful effect safety distances have been foreseen between the HPL and resident buildings, recreation sites and telephone lines in compliance with the regulations of EESR.

The distance between conductors and terrain ground allows safe stay of people, animals, and machines underneath the HPL for unlimited period.

All land lots that will be used temporarily during the HPL's construction as well as those underneath the towers to be dismantled should be cleared and reclaimed at the project's completion.

The area underneath towers complies with the regulations.

The increase in the erosion and landslide processes in the region is forbidden during the construction and exploitation of HPL. The reclamation, protection and utilization of the humus of areas affected by the construction shall be performed as per regulations.

2.5. Assessment of Planned Activities at Accidents and Incident Pollutions

Prepared on the Basis of Accident Management Plan Provided by the Investor, and Contains:

2.6 Assessment of the Accident Risk Level of Accidents and Incident Runoffs of Pollutants as Concerns Harmful Impacts on the Environment and Population's Health .

Such an assessment is not necessary, since the projected HPL could not be a source of accidental and incidental runoffs of pollutants effecting harmful impacts on the environment and population's health.

2.7. Measures and Means Limiting and Eliminating Accidental Runoffs of Pollutants

Measures and means limiting and eliminating accidental runoffs of pollutants shall not be undertaken, since the projected HPL could not be a source of accidental and incidental runoffs of pollutants effecting harmful impacts on the environment and population's health.

2.8. Self-Monitoring Plan

Self Monitoring Plan is the consideration of the Means for Monitoring and Control of Dangerous Substances Emitted by the Project Site; If Necessary Also Organizing Monitoring of the Environment at Characteristic Points in Order to Limit and Prevent the Harmful Impact on the Human Health and the Environment. During its exploitation the projected HPL will not emit any hazardous substances, therefore, monitoring and control of the state of environmental components will not be necessary.

The overhead power line will be a source of electromagnetic field, so, the field's parameters – electrostatic and magnetic components – should be controlled. Measurement of electromagnetic field parameters at given locations along the path for the places of probable continuous stay of people as well as at locations of maximum conductor sag for maximal line loading shall be provided during the 72-hour tests. Performing subsequent measurements will be needed solely in case it becomes necessary to perform such activities in the area of hygienic protection, which are not described in the Ministry of Health's Regulations No. 7 of 25.05.1992 for determining the exact values of the electromagnetic field and compiling respective recommendations for people staying there.

The rest of the environmental components shall not be monitored, since the HPL does not effect any impact on the human health and the environment.

8. CONCLUSION

9.

Contains recommendations by the EIA Authors for the limiting parameters that have to be complied with when going onto the next phase of the project's design or implementation. These recommendations comply with all the valid requirements and standards of Bulgaria for allowed Environmental pollution.

The new HPL the construction project of which is the subject matter of the present EIA report, will be the first connection with a voltage of 400 kV between the Electric Power Grids (EPGs) of Bulgaria and Macedonia for electric power exchange between the two EPGs in a regime of parallel operation and will be built in conformity with the inter-government agreement concluded between the two countries. the construction of the new inter-grid HPL 400 kV will be a stage of the strategy of the electric-power companies in the Balkan states concerning the introduction of parallel operation between the EPGs of the countries in this region and their future joining the UCPTE.

Two variants have been suggested for the project realization, the variant II having sub-variants. The reasons stated in items 2, 3, and 6 of the report indicate as more advantageous the variant II of the path (in green color), corrected in the initial section near substation Chervena Mogila (in orange color), so we recommend to the Honorary Higher Ecological Expert Council at MEW to approve the realization of the project according to the variant II of the path.

The realization of the project of HPL 400 kV substation Chervena Mogila (Bulgaria) - substation Dubrovo (Macedonia) (on Bulgarian territory from tower 1 to tower 251) will be possible solely after enlargement and reconstruction of the existing installation for 400 kV of substation Chervena Mogila, which also requires a reconstruction of the existing high-voltage lines (HPLs) at the front side of the installation itself in accordance with the layout of the new outlet terminal arrays for them and for providing an access to the installation for the new HPL 400 kV.

The operative projects have been developed in conformity with the requirements of EESR of 1980 as well as with all regulations and standards related to this type of installations.

The proposed variant for the path of the new HPL 400 kV is of length 81.9 km.

The climatic conditions along the path of the newly designed HPL 400 kV are rather varied owing to the great differences in the elevations above sea level, namely between 450 and 1200 m, and in the terrain forms (from flat to typical rugged mountain terrain) of various orientations and slope locations in respect to the strong winds. There are no active sources of atmospheric air pollution. The main source of pollution is the transportation traffic on the roads, which in some sections will be crossed by the HPL path or will pass in its vicinity.

Water resources on the path's territory, namely surface and underground waters, will not be subject to an impact caused by the project realization. The operation of purification facilities is not necessary.

The path of HPL 400 kV to Macedonia passes through terrains built-up by lithological varieties of various properties and genesis. Building the towers' foundations shall be carried out as follows:

- In the terrace deposits of the rivers Manastirski Dol, Gorna Matitsa, Babinska, Struma, Bistritsa, etc.: on variegated sands and sands with gravels. It is also possible to find layers

of arenaceous clays at some places. The underground water level is at a depth from 0.5 to 1.5 - 2 m from the surface.

- In deluvial overthrusts and proluvial torrential cones covering considerable areas of the Radomir plain, the southern low-grade slopes of Konyavska mountain, the area north of Kyustendil, and the flattened areas around the village of Garlyano. The tower foundations will be built on weakly soldered carbonate breccias, coarse-fragment gravels of sandy filler, and arenaceous clays with rock pieces. The underground waters are near the surface.
- Paleogene sediments represented by rock and semi=rock materials: conglomerates, variously soldered sandstones, aleurolites, argillites, and sometimes marls and marlaceous clays. The sandstones are of prevailing participation in the geological profile. The sediments are characterised by low water-bearing capacity and no difficulties created by underground waters should be expected.
- In Triassic and Jurassic sediments built mostly of limestones, lime marls and dolomites. Some towers will be placed onto strong thick-layer sandstones, argillites and aleurolites. In most cases the foundations will be built in dry. The underground waters are of crack or crack-karst types and deeply drained.
- In the igneous and metamorphic rocks (Osogovo suite, Osogovo pluton, Struma diorite formation and Paleogene volcanites). The foundations will be built on gneisses, granites, diorites, and in the area to the west of Gyueshevo on andesites, rhyolites, and in some cases on tuffs and tuffites. The towers will be placed in the zone of weathering on a rock which is cracked and modified to various degree. It is recommended to remove the deluvial cover when it is of small thickness, and to build the foundations on a base rock.

During the construction process most attention should be paid to the section from “km 21+600” to ”km 24+350” in the area of Bobovdol, where strata of coals, coal blacks, and black coal clays of low-value physico-mechanical parameters may be found in the Paleogene sediments. In case a tower is to be placed on such materials, they should be removed until the underlying argillo-arenaceous materials are exposed, When this operation is impossible the towers should be displaced to new locations.

From the observations performed along the path and the information acquired no active landslides or other physico-geological phenomena and processes threatening the safety of towers have been found out.

In case of slopes built of argillaceous and argillo-marlaceous deposits and terrain inclination greater than 20 - 25°, it is advisable not to perform earth-excavation works at a wide front and to a depth greater than 2 - 3 m in the vicinity of towers.

Building tower foundations is possible on all geologo-engineering types.

It is not allowed to build foundations on silt or swamp soils in the area of river terraces and boggy sectors, on black coal clays or coal blacks of the Paleogene coal-bearing suite or other weak construction soils. In case that such soils are exposed in the process of building, they should be removed or the towers should be displaced to new locations.

The experience gained in the construction of existing and operating HPLs situated in the vicinity of the designed path should be used in determining the tower locations and the ways of building their foundations.

The operation of the project installation (repair works excluded) will not be connected with waste generation.

Issuing an approval for the project construction at the corresponding municipality should be coordinated with routes of waste transportation and places of its disposal.

The operation of the project HPL 400 kV will not be connected with pollution or damage of the soil and respectively with a change in soil fertility.

The path of HPL 400 kV substation Chervena Mogila (Bulgaria) - substation Dubrovo (Macedonia) does not pass through protected territories. The region as a whole is characterized by high concentration of birds of prey, which use the towers as observation points. Standard devices against bird perching will be mounted on all bearing chains. It is advisable that no construction works be performed during the period from February to August, especially in the vulnerable areas, in order to be avoided chasing the birds away from their nesting places.

The realization of the newly designed HPL path will not modify the animals' habitats or their physiological conditions.

No negative impact owing to the power line operation might be expected. The principal danger for various representatives of the fauna comes from emergency situations connected with atmospheric changes.

To limit and soften the negative aesthetic impact of the power line upon the landscape, the overhead line towers should be painted green, at least in those sectors, which are located in vegetation arrays.

The project of HPL 400 kV substation Chervena Mogila (Bulgaria) - substation Dubrovo (Macedonia) (on Bulgarian territory from tower 1 to tower 251) and reconstruction of substation Chervena Mogila - OSG 400 kV conforms to the ecological norms effective in the Republic of Bulgaria. Provided that during the construction of the new HPL 400 kV all environment protecting and rehabilitating measures foreseen by the project are implemented and the normative requirements concerning the construction and operation of linear installations are complied with, the project site impact on the environment will be local and limited as concerns the harmful physical factors and the landscape. Therefore, we propose to the Honorary Higher Ecological Expert Council at MEW to give a positive statement regarding the EIA report and to approve the realization of the project according to the variant II of the path.