750 KV ZAPORIZKA – KAKHOVSKA TRANSMISSION LINE AND 330 KV TL DIVERSIONS PROJECT (ZAPORIZHA OBLAST, KHERSON OBLAST)

DRAFT FINAL ESIA REPORT

Prepared for:

Prepared by:

MERCADOS – ENERGY MARKETS INTERNATIONAL

Together with:

RED ELECTRICA DE ESPAÑA

ERM IBERIA

ENERGY CONSULTING GROUP

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GLOSSARY AND ABBREVIATIONS

CSR	Comprehensive State Review
DBN	State Building Norms
DSTU	Sanitary Norms and Regulations
EBRD	European Bank for Reconstruction and Development
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment (refers to the „local" Ukrainian requirements)
EMF	Electromagnetic Fields
EMR	Electromagnetic Radiation
ERM	Environmental Resources Management – ERM Iberia S.A.
ESIA	Environmental and Social Impact Assessment (refers to the international "bankable" requirements)
ESMMP	Environmental & Social Management and Monitoring Plan
EU	European Union
GOST	State Standard Design Criteria
H&S	Health and Safety
IBA	Important Bird Areas
ICNRP	International Committee on Non-Ionising Radiation Protection
IFC	International Finance Corporation
IFI	International Financing Institution
LAP	Land Acquisition Plan
MENR	Ministry of Environment and Natural Resources
NEC	National Energy Company
NGOs	Non-governmental Organizations Representatives
NPP	Nuclear Power Plant
NTS	Non-Technical Summary
O&M	Operation and Maintenance
OL	Overhead Line
OVNS	The EIA in Ukrainian
PCBs	Polychlorinated biphenyls
PCDP	Public Consultation and Disclosure Plan
PR	Performance Requirement
PUE	Power Installations Guideline
ROS	Repair and operation station/ site
RoW	Right of Way
SANEPID	Sanitary Epidemiologic Department under the Ministry of Public Health

SEC	Statement on Environmental Consequences of the Planned Operations
SEE	State Environmental Expertise
SEP	Stakeholder Engagement Plan
SF6	Sulphur Hexafluoride
SPZ	Sanitary Protection Zone
SS	Substation
TDS	Technical Design Standards
TEO	The Feasibility Study in Ukrainian
TL	Transmission Line
TPP	Thermal Power Plant
UAH	Ukrainian Hryvnya (exchange rate in June 2009 approximately 1 Euro = 10 UAH
UEG	United Electricity Grid
UES	United Energy System
USPB	Ukrainian Society for the Protection of Birds
WHO	World Health Organisation
ZNPP	Zaporizka Nuclear Power Plant

I INTRODUCTION

Note: The technical description of the Project in this Draft ESIA Report is based on the current design stage, which is not yet finalised. Therefore, minor changes to the technical details as included in this Report may occur in the future. Any substantial changes will be reflected in the final version of this Report.

1.1. BACKGROUND OF ASSIGNMENT

This Report has been prepared by Environmental Resources Management – ERM Iberia S.A. (ERM) as a contractor to Mercados EMI ("Mercados") under the terms of the Contract MG094121121. Rev 3, dated March 20, 2009. Mercados has been engaged by the Ministry of Fuel and Energy of Ukraine National Power Company "Ukrenergo"(Ukrenergo) to conduct a technical feasibility review and environmental and social impact assessment (ESIA) of Ukrenergo's planned construction and operation of transmission line (TL) (Project) in southern Ukraine.

The Project entails a 190km long 750 kV TL connecting the Zaporiska Nuclear Power Plant (NPP) with a newly planned substation in Nova Kahovka (750/330 kV Kakhovska substation) along with two 330kV double circuit diversions (TL 330 kV Novokakhovska – Ostrovska and Novokakhovska – Kherson) of 28 and 17 km length, and a rehabilitation of an existing substation 330/220 kV (SS 330 kV Novokakhovska substation) (hereinafter together referred to as the "Project").[1] The project is being designed by LLC "Southern Energy Company".

Ukrenergo is considering obtaining financing for the Project from international financial institutions (IFIs), such as the European Bank for Reconstruction and Development (EBRD). Consequently, the scope of works of the ESIA is designed to conform to the international best practices for ESIA, including the EBRD's Social and Environmental Policy (2008)[2]. In addition to the ESIA being prepared by ERM, other permits and authorisations required by Ukrainian legislation are being prepared on behalf of Ukrenergo by other parties.

The ESIA Report will form the basis for specifying the environmental provisions (as stated in the Environmental and Social Management and Monitoring Plan – ESMMP) for the future detailed design, construction, and operation and maintenance documents to be elaborated in the subsequent Project steps to ensure that these steps will be performed in a socially and environmentally acceptable manner, in compliance with EBRD Performance Requirements and best international practice.

The kick off meeting for this Project was performed at the Ukrenergo office in Kiev at the beginning of March, 2009.

About the Authors of this ESIA

ERM is one of the world's leading international environmental consulting firms, with over 3000 employees located in 41 countries. ERM is an independent firm and in no way affiliated with Ukrenergo, the EBRD or any other parties involved in the

[1] Further description of the Project is provided in Chapter 3

[2] Refer to http://www.ebrd.com/about/policies/enviro/policy/russia08.pdf large overhead transmission lines are included in the list of Category "A" projects for which an ESIA is required as a prerequisite for funding such projects by the EBRD.

Project. Information about ERM can be found on www.erm.com. ERM has performed numerous ESIA assignments in the past years in the former Soviet Union on behalf of private companies, EBRD and other IFIs. The ERM team who worked on this ESIA was based in Madrid, Spain, and Frankfurt, Germany. In addition, ERM was assisted by an independent Ukrainian environmental expert, Mr Olexi Kabyka.

ERM wishes to express thanks to Ukrenergo and its dedicated staff, to Mr. Olexi Kabyka, environmental expert, and Ms. Mila Ggoureyeva, translator for their assistance in the preparation of this ESIA Report.

1.2. STRATEGIC REVIEW – PROJECT RATIONALE

In line with the Development Scheme for the period 2010 to 2015 of the United Power System (UPS) of the Ukraine, Ukrenergo intends to construct a 750 kV Transmission Line (TL) between Zaporizka Nuclear Power Plant (NPP) and Kakhovska (750 kV TL ZNPP–Kakhovska), and two additional double circuit 330 kV diversions from Novokakhovska – Ostrovska and Novokakhovska – Kherson. The Project also includes the reconstruction of the existing/incomplete 330 kV Novokakhovska Substation and building a new 750/330 kV Substation near Nova Kakhovka. Overall the project is referred to as "750 kV TL ZNPP – 330 SS Kakhovska Project" (abbreviated in this document also as the "Project"). The routing and locations of the various parts of this Project are shown in Annex 3-1. Transmission line and diversions within the Ukranian electric grid are shown in Figure 1-1.

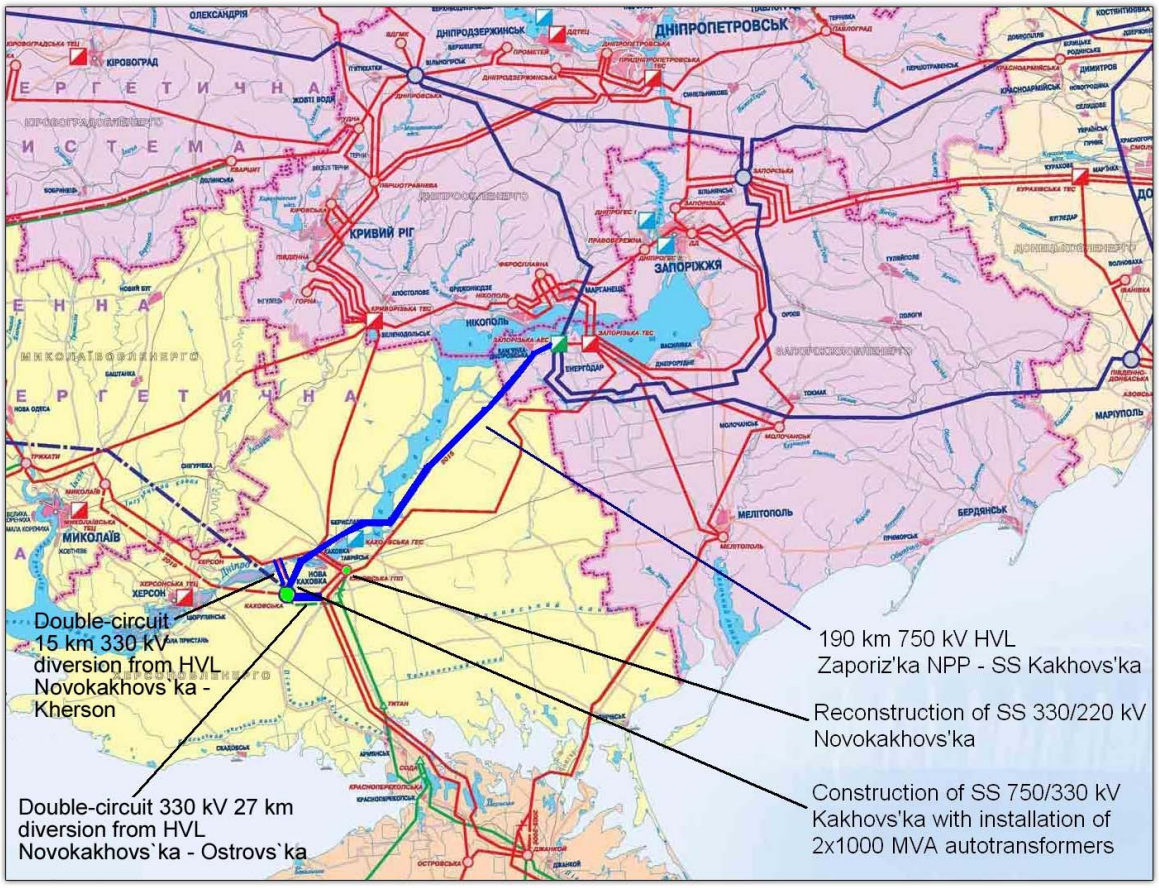

Figure 1-1: *National electric grid of Ukraine. One of the options for TL 750 kV Zaporizka NPP – Kakhovska. For current routing see Annex 3-1.*

On the national scale, the Project is an integral part of the planned "Southern 750 kV Backbone Transmission Line system" extending about 1000 km (connecting Khmelnitska NPP – Dniestrovska HPSP – SS Prymorska – SS Kakhovska – Zaporizka NPP) and including the Kakhovska Substation[3]. The Southern part together with the Northern part of the power system together will provide the necessary basis for stable and parallel operation of the Ukrainian UPS with the European UCTE power systems. Further transmission lines connecting Kakhovska Substation further to the Ukrainian UPS are envisaged in the long term (e.g. a TL 750 kV and TL 330 kV line in western direction until end of 2020, a TL 220 kV line to the south-east).

The Ukrainian UPS is in need of substantial rehabilitation and upgrading. The increase in demand patterns during the past 15 years, coupled with extended periods of insufficient investment, have made the network structure inadequate to support the present load. As now configured, the network leads to high technical losses and poor quality of power supply. This is costly, inconvenient and potentially dangerous to customers.

The Zaporizka Nuclear Power Plant (ZNPP), with 6000 MW of installed capacity (6 power units of 1000 MW each), is a part of the largest generation node in Ukraine that also includes the Zaporizka Thermal Power Plant with an installed capacity of 3600 MW (three 800 MW units and four 300 MW units). Electricity from this generation node is targeted to supply the load of the central part of Ukraine, including the Dnieper Energy System, and in the deficit regions of the Northern, Southern, Donbas and Crimean Energy Systems. The ZNPP was constructed in the 1980s using soviet-type VVR-1000 pressurized light water technology and secondary containment (this third generation VVR technology is more modern than the older RBMK-type Chernobyl reactor design stemming from the 1960's and not having a containment).The first five reactors at ZNPP were brought online between 1985 and 1989, and the sixth block was added in 1995.

As part of the commissioning of Unit 6 at ZNPP the construction of the 750 kV line ZNPP – Kakhovska was considered as an integral part of this project. In accordance to the studies performed at the time by the institute «Ukrenergomerezhproekt» and approved by the Ministry of Energy of the former USSR, the full utilization of the 6000 MW capacity of ZNPP required at least four 750 kV lines, which according to the original design were as follows:

- TL 750 kV to SS 750/330 kV Dnieprovska of the Dnieper Region;
- TL 750 kV to SS 750/330 kV Zaporizka of the Dnieper Region;
- TL 750 kV to SS 750/330 kV Southern Donbaska of Donbas Region;
- TL 750 kV to substation of Kakhovka Region.

Three of the four planned transmission lines were built and are currently in operation (ZNPP – Dnieprovska, ZNPP – Zaporizka, and ZNPP – Southern Donbaska). The fourth TL 750 kV to the substation of the Kakhovka Region was planned and construction started at the beginning of the 1990s, but it was never completed. Approximately 40% of towers were built along the originally planned

[3] Source: Energy Strategy of Ukraine for the Period until 2030

routing and are still present, as are some foundations and partly built metal structures at the Kakhovska substation (without electrical equipment).

As a result of the non completion of the ZNPP – Khakhovska 750 kV line, the currently implemented scheme does not comply with the Technical Design Standards (TDS) for the ZNPP, because the maximum output (6000 MW capacity) is restricted to 5300 MW due to dynamical instability of the nuclear units in the case of cascade disconnection of two other 750 kV overhead lines (to the Dnieper and Zaporizka Substations). This, in turn, reduces the potential of nuclear generation at this plant by about 0.4 – 1.0 TWh/year.

At the same time, the 5,300 MW generation capacity of ZNPP is currently limited by the throughput capacity of the transmission network. The proposed TL 750 kV ZNPP-Kakhovska will re-enforce the existing network and help to deliver an additional 700 MW from existing capacity at the ZNPP to other regions.

According to the Energy Strategy of Ukraine for the Period until 2030, the ZNPP units #1-5 are "normally" scheduled to retire between 2014 and 2019, but the Energy Strategy foresees an extension of operation through to 2030 and beyond (See Figure 1-2).

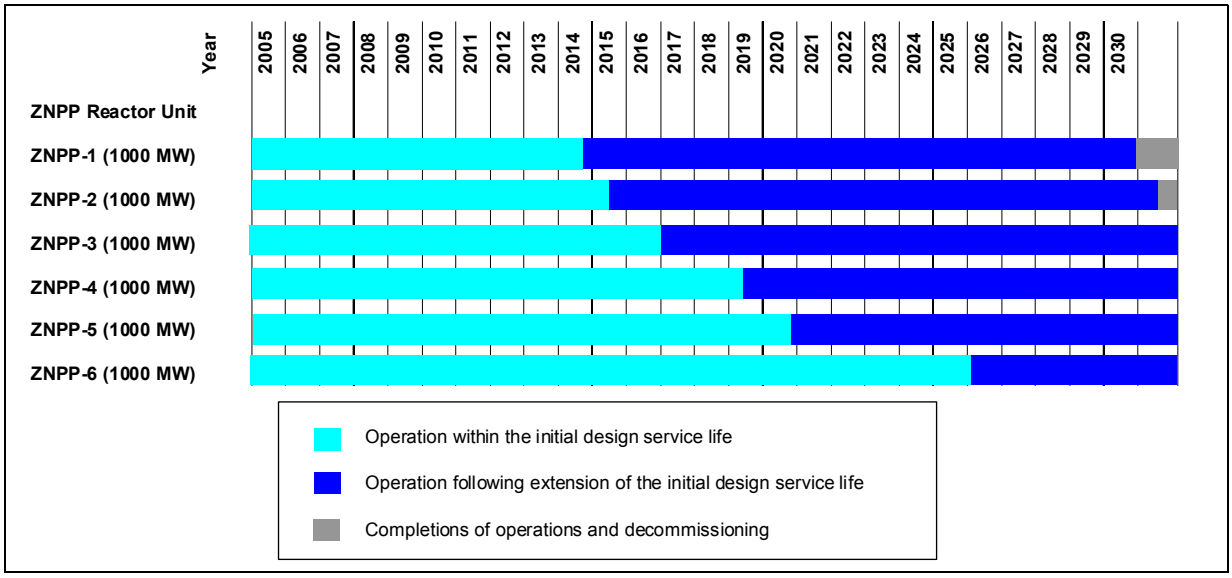

Figure 1-2: Operation time of units 1-6 of the ZNPP according to the Energy Strategy of Ukraine for the Period until 2030

Reactors of the VVR-1000 pressurized light water technology type are generally considered to last about 40-50 years. With the construction period of units 1-6 of the ZNPP between 1985 and 1995, an extended operation till 2025 appears technically feasible. The Energy Strategy of Ukraine for the Period until 2030 does not foresee a decommissioning year for the entire ZNPP, including all 6 units. The present project of installing a fourth 750 kV transmission line at the ZNPP is therefore associated with present generation capacity of units 1-6 well until 2020 and beyond.

The objective of this Project, therefore, is to increase the efficiency of the national power sector by allowing the ZNPP to operate at full power (6000 MW) following a better connection to the power network. The regions will ultimately also benefit from the improvement of both the power supply reliability and electricity quality.

Overall, the construction of the proposed transmission line is anticipated to yield a number of tangible benefits to the electricity system and its users that include:

- Improved stability of the system - The reliability of the gird will be significantly improved as additional redundancy will be built into the network that will reduce the need for power cuts in the event of the unplanned breakdown of a major piece of equipment.
- Optimised supply of power to the southern region – from being able to exploit all the potential generating capacity established in Eastern Ukraine (including both conventional and renewable sources).
- Increased energy efficiency - through increased efficiency of operation of existing ZNPP, as well as higher levels of energy efficiency in the transmission system.
- Compatibility with European networks - the design of the transmission grid will be compatible with European systems that will allow greater flexibility in optimising electricity supply and demand.
- Transfer and dispersion of skills - implementing projects of this nature provides for skills transfer and associated income for contractors and sub-contractors.

1.3. PROJECT OWNER

The proposed Project is put forward by the State Enterprise National Power Company Ukrenergo, responsible for operational dispatch management of 220-750 kV transmission lines and balancing energy supply and demand.

Any communication regarding comments on the Project, in written form, by phone or by e-mail, should be addressed to the following:

Organization	Southern Electric Power System, NPC Ukrenergo	Southern Electric Power System, NPC Ukrenergo
Responsible	Mr. A.S. Kozlov, Director	Mr. A.M. Shvedkyi, First Deputy Director
Address	11 Koblivska Str., 65029, Odessa	11 Koblivska Str., 65029, Odessa
Telephon	Tel. 8 (048) 730 18 50 Fax.: Tel. 8 (048) 730 18 60	Tel. 8 (048) 730 18 50 Fax.: Tel. 8 (048) 730 18 60
e-mail		kanc@rdc2.south.energy.gov.ua

II PROJECT STATUS AND REGULATORY FRAMEWORK

Note: The technical description of the Project in this Draft Final ESIA Report is based on the current design stage, which is not yet finalised. Therefore, minor changes to the technical details as included in this Report may occur in the future. Any substantial changes will be reflected in the final version of this Report.

1. UKRAINIAN REQUIREMENTS

1.1. GENERAL LEGAL FRAMEWORK

The following shows an overview of regulations and standards relevant for preparation of the local EIA, planning of environmental protection measures and implementation of this type of project:

Laws of Ukraine

- "On Protection of Environment" (1991) as amended;
- "On Natural Reserve Fund of Ukraine" (1992);
- "On Environmental Expert Evaluation" (1995); as amended;
- "On Protection of Cultural Heritage" as changed and amended;
- "On Ratification of the Convention on the Environmental Impact Assessment in a Transboundary Context (Espoo Convention)" (1999);
- "On valuation of property, property rights and professional valuation activities in Ukraine" (2001);
- "On valuation of lands" (2003).

Regulatory Codices of Ukraine

- Forest Code (1994) as amended;
- Water Code (1995) as amended;
- Land Code (2001) as amended.

Binding Decisions and Instructions

- Resolution of the Cabinet of Ministers of Ukraine "0n Approval of the Procedure for Determination of Dimensions and Limits of Water protection Zones and Regime of Economic Activities in Such Zones" of 08.05.1996, No. 486;
- Resolution of the Cabinet of Ministers of Ukraine of 27.07.95 No.554 on "On the List of Activities and Objects that Pose High Environmental Danger";
- Resolution of the Cabinet of Ministers of Ukraine of 17.11.1997 No. 1279 "On Size of and Procedure for Calculation of Agricultural and Forestry Losses Subject to Compensation" and "Procedure for Calculation of Agricultural and Forestry Losses Subject to Compensation";

- Resolution of the Cabinet of Ministers No 483 On the Order of Approval of Investment Programmes and Construction Projects and Their Comprehensive State Review, 2002;

- "Procedure for Calculation and Compensation of Losses to Land Owners and Land Users" approved by Resolution of the Cabinet of Ministers of Ukraine of 19.04.1993 No.284;

- Decree of the Cabinet of Ministers of Ukraine "On methodology for expert valuation of lands" (No 1531 dated 11.10.2002);

- Order of the State Committee on Land Resource "On approval of procedure for expert monetary valuation of the land parcels" (dated 09.01.2003 No.2).

Standards and Rules

- Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus Convention), 1999;

- Ministry of Environment Guidelines for Public Participation in Environmental Decision-Making, 2004;

- State Construction Standard DBN A.2.2-1-2003 Structure and Contents of Materials of the Environmental Impact Assessment (EIA) in Designing and Construction of Production Facilities, Buildings and Structures;

- Rules for Guarding of Electricity Transmission Lines (1997) [Resolution of the Cabinet of Ministers of Ukraine of 04.03.97];

- Rules for Set-Up of Electric Equipment (2006);

- State Sanitary Regulations and Norms for Protection of Population against EMR, Order of Ministry of Health of Ukraine, No. 239, August 1, 1996;

- GOST 12.4.154-85 "Shielding Devices for Protection from Industrial Frequency Electric Fields";

- SNiP 3.05.06-85 "Electrotechnical Devices";

- State Construction Standard DBN B.2.5.-16-99 "Determining Dimensions of Land Plots for Power Network Installations";

- SNiP 2.01.01-82 "Construction Climatology and Geophysics";

- SNiP II-12-77 "Noise Protection" (amended 2003);

- "Technical Operation of Power Stations and Networks. Guidelines." GKD 34.20.507-2003;

- "Guidelines for Safe Use of Consumer Power Appliances" DNAOP 0.00-1.21-98);

- Sanitary Norms and Regulations (DSTU) approved by the Ministry of Health Protection of Ukraine (Order No. 476 of 18.12.2002);

- DBN 360-92** "City Development. Planning of Cities and Villages";

- "Norms for Technological Design of 6-750 kV AC Substations" (GKD 341.004.001-94), which had been approved by the Ministry of Energy of Ukraine on 5 September 1994 and came into force on 1 January 1995;
- GOST 12.1.019-79* "Electrical Safety. General Requirements and Protection Types";
- SNiP III-4-80* "Construction Safety";
- "Guidelines for Lightning Protection of Buildings and Installations" RD 34.21.122-87;
- SNiP 2.01.07-85* "Loads and Impacts";
- SNiP 2.03.01-84* "Concrete and Armoured Concrete Structures";
- SNiP II.7-81* "Construction in Seismic Areas";
- SNiP II.23-81* "Steel Structures";
- DBN B.2.3-4-2000 „Automobile Roads";
- Fire Safety Rules of Ukraine" (NAPB A.01.001-2004);
- SNiP 3.05.06-85 "Electrotechnical Devices";
- SNiP 3.05.06-85 "Electrotechnical Devices";
- GOST 12.4.009-83 "Fire Equipment for Protection of Installations";
- „Fire Safety Guideline" GKD 343.000.004.003.001-2001;
- Guideline for Operation of SF6 Switchgear (GND 34.47.503-2004).

1.2. LOCAL ENVIRONMENTAL IMPACT ASSESSMENT

Environmental assessment requirement was first introduced in Ukraine (then part of Soviet Union) in 1988. In essence, the current Ukrainian environmental assessment system is geared more towards compliance with regulatory requirements and approval procedures, compared to the western EIA approach which is more focused at risk mitigation.

The Environmental Impact Assessment - EIA (abbreviated OVNS in Ukraine) is a compulsory component of any investment project in Ukraine in the meaning of Article 51 of the Law of Ukraine "On Environmental Protection" and is part of the Ukrainian project planning and permitting procedures. The OVNS in Ukraine is regulated by at least 12 International Conventions and Agreements, 42 laws and numerous regulatory acts, methodological guidelines and national standards.

The OVNS serves as a main input for project permitting by the competent Ukrainian regulatory authorities. It is the basis for specifying the environmental provisions for engineering, procurement and construction, and operation and maintenance documents to be elaborated in the subsequent project planning steps, to ensure that the design, construction and operation of a project will be in an environmentally acceptable manner.

The sequence of steps for obtaining the formal OVNS are as follow:

Any Developer planning a project that might have an impact on the environment should notify the territorial bodies of the Ministry of Environment and Natural Resources (MENR). The Developer is required to collect relevant environmental data and submit a package of OVNS materials within a portfolio of the investment project documentation.

A full-scope OVNS is mandatory only for objects referred to the category of highly hazardous objects (as per the Decree of the Cabinet of Ministers' No.554 "On the List of highly hazardous objects" dated July 27, 1995). High voltage power transmission lines are not included into this category. In such cases, an OVNS with a narrower scope is sufficient for obtaining approval by the regional departments (e.g. Zaporizhzha and Kherson Oblast) of the MENR and by the Sanitary Epidemiologic Department under the Ministry of Public Health (SANEPID). The MENR can also decide to have the project approved at national level due to the geographic scope of the project or other aspects.

For this Project, an OVNS of narrow scope according to national legislation is currently being prepared by the LLC Southern Energy Company on behalf of Ukrenergo, with scheduled completion in September 2009.

Most OVNS activities are implemented at the very early stages of project development, during feasibility studies (Section 5.1 of DBN A.2.2-1-2003). The project developer should prepare an important document - *Statement of Intentions* (Annex G to DBN A.2.2-1-2003) in which all environmental issues should be addressed and potential environmental risks identified. The statement should also propose remedies for existing environmental concerns in the project. For this Project a Statement of Intentions will be prepared by Ukrenergo in August 2009.

The OVNS materials will be approved by the MENR, SANEPID, the State Agency for Land Resources, the State Water Management Committee and the State Committee for Forestry if relevant. The authorities typically conduct their reviews within a period of 30 to 120 days, as stipulated by the Law of Ukraine on Ecological Review, 1995. According to current information, OVNS permitting approval for this Project, falls into the competence of the Zaporizhzha and Kherson offices of the above-mentioned authorities. MENR however has the right to decide upon other authority levels to be responsible (see above).

Afterwards, the OVNS conclusions are summarised in *the Statement on Environmental Consequences of the Planned Operations (SEC).* The SEC in a concise form states the main conclusions of OVNS and important comments, as well as legal commitments of the developer to comply with all environmental requirements (Section 4 of DBN A.2.2-1-2003). The SEC is published in the national and/or local press, and placed on the Internet. According to this standard (Sections 1.9, 1.10), the extent of information disclosure and public consultations on the project is carried out depending on the scale of expected impacts.

1.3. PROJECT PERMITTING AND PLANNING PROCESS

As described in Section 1.2, the construction of the 750 kV line Zaporizka NPP – Kakhovska was considered as an integral part of the construction of unit 6 at the Zaporizka NPP which was commissioned in 1995. The Zaporizka NPP – Kakhovska 750 kV transmission line and Kakhovska substation was planned during the 1980s

and construction started at the beginning of the 1990s. The construction of this line, however, was never completed. The 330 kV Novokakhovska-Ostrovska double circuit diversion and 330 kV Novokakhovska-Kherson double circuit diversion routing was not part of the project at that time.

As a result of this the current status of Project Implementation is as follows:

- The formal State Acts for Permanent Use of Land Plots (State Acts) where towers are located of the 750 kV Zaporizka NPP–Kakhovska TL were acquired by Ukrenergo as part of the planning process during the 1980s/1990s and are still held by Ukrenergo. Ukrenergo also holds the State Act for the location of the planned Kakhovska substation. The State Acts do not provide for an expiry date.

- Approximately 40% of towers and parts of metal structure of the Kakhovska substation (without electrical equipment) were built during the 1980s/1990s along the originally planned routing and are still present.

- Ukrenergo/Southern Energy System, through the Kherson Land Use Institute (Contract #136/165-A, dated June, 5, 2008), is currently in the process of finalizing the routing of the 330 kV Novokakhovska-Kherson double circuit diversion to Kakhovska substation and acquiring related land plots where towers will be located.

- A maintenance, repair and storage site will be established at a green field site within a mixed industrial and residential area at Gornostayivka village. The site is located at a distance of 10 km from the planned route of the 750 kV TL.

- A housing area (approximately 5-6 ha) will be erected at Novi Lageri Village comprising approximately 15 houses for workers who will be employed at the 750 kV Kakhovska substation. A 7-floor apartment building will be erected at Tavriysk At both sites construction of buildings had started but not completed at the beginning of the 1990s. Unfinished building structures are currently present at these sites.

In recent times, plans to proceed with this transmission line have been renewed, and the Zaporizka NPP – Kakhovska 750 kV overhead transmission line, the Kakhovska 750 kV substation and related 330 kV double circuit diversions is part of the Energy strategy. The regulatory basis for this is provided by the Action Plan for 2006-2010 implementing the Energy Strategy of Ukraine through 2030 and being approved by the Executive Order of the Cabinet of Ministers of Ukraine #436-p, dated July 27, 2006.

Ukrenergo approved the terms of reference for this TL Project in August 2008 and current activities as part of the design and planning phase include the following:

- Ukrenergo has contracted the State Project Development and Research Institution – Ukrenergomerezhproekt - to conduct the Technical and Economic feasibility studies (abbreviated TEO in Ukrainian) for the Project, which has been completed and endorsed by the Scientific and Technological Council of the Ministry of Fuel and Energy of Ukraine.

- The detailed planning and design of the project, i.e. preparation of Proyekt (Detailed Design Document), is currently being carried out by Southern Energy Company LLC (Contract # 276-TA, dated November 2008) with completion scheduled for September 2009. This Document will consist of a number of volumes, including the OVNS report.

- The Local EIA (OVNS), as described above, has been subcontracted to Southern Energy Company LLC as well, with the same completion date of September 2009. The OVNS report will be presented as a separate volume in the Proyekt documentation and will include a short review of potential environmental impacts and their mitigation.

- Upon completion of a Comprehensive State Review (CSR), the full Proyekt documentation will be submitted for approval to the Cabinet of Ministers for its approval. The CSR process includes approval by environmental, sanitary-epidemiological, fire safety, occupational safety, and emergency planning authorities. By law, the process takes between 45 and 120 days.

- Property related activities undertaken by Novi Tekhnologii SPF (Contract # 279-TA, dated November 11, 2008) include a survey of additional tower locations for the 750 kV TL and 330 KV Novokakhovska - Khersonska double circuit diversions, which had not yet been included in previous designs, assignment of cadastral numbers to land plots, entry into the state land cadastre database, entry of records into the land register, and registration of State Acts. Completion of this work is scheduled for July 2009, however dealing with land issues in Ukraine is often a lengthy process, and progress can be unpredictable.

- Upon finalization of the land and property issues, the Cabinet of Ministers of Ukraine is expected to issue a decree approving these land issues.

- After the approvals described above are in place, a Construction Permit is issued by the State Inspectorate for Architectural and Building Control, and the actual construction activities can go ahead.

Currently some flexibility is envisaged in selection of the exact sites for the towers and for variations in the Right of Way (RoW) to avoid ownership, environmental and socially sensitive problems.

After obtaining the Construction Permit by the competent authorities, the terms and conditions for procurement tender will be prepared to contract a construction contractor or a consortium that will implement further project activities. The tendering conditions and procedures will be prepared by Ukrenergo in cooperation with an international consultant and the selection of the contractor will be implemented in compliance with the EBRD procurement policies.

Ukrenergo or its contractor will prepare the Land Acquisition Plan (LAP), valuations of relevant costs and compensation, receive all necessary conclusions of the state authorities and state expertise, and obtain all permits before actual start of construction works. The LAP needs to be developed by a licensed expert organization (the Laws of Ukraine "On organization and management of lands in Ukraine", "On Public Procurement" and Decree of the Cabinet of Ministers No.677, 2004). The LAP will contain:

- All relevant data on the ownership, designated use, the rights of use, rights of way, and archaeological data on the plots required for the tower bases, the RoW as access roads, stockpiles, construction areas etc..

- Documents confirming that the land owners/users have been duly informed and their consent has been obtained, approvals of local and state authorities have been also received.

- Valuation reports and compensation schedules for each landowner and land user – this covers the value of the land (for landowners), improvements, crops (permanent and standing crops), hay meadows and forests.

1.4. LAND ASPECTS

Background on Land Tenure in Ukraine

The legal framework for land tenure is currently being debated and some changes may take place in the near future. Currently there is a moratorium on the sale of agricultural land established in Ukraine until 1st January 2010, and it's possible that it will be extended beyond this date, as already happened in the past. A draft law on easements (*servitude*) is under consideration in the Parliament. A draft law on organisation of withdrawal (*buyout*) of land for public needs has been adopted in first draft on 18 March 2009, but is still to go through further revisions in the Parliament. Until these laws are approved and finalized there are uncertainties relating to easements of the kind required by the Project.

Since 1995 people that had worked on the collective and state farms were given shares in their farm lands and by 2005 most of those nominal landowners had received land ownership certificates (*acts*) that converted their shares into actual plots of land defined on the maps by the State Land Authority.

Due to the moratorium on the sale of agricultural land plots, they can be inherited but cannot be sold or given as a present, but may be withdrawn (buyouted) for social use. There is a specific purpose determined for each land plot in accordance with the Land Code of Ukraine – for instance agricultural land can only be used for farming and cannot be freely converted by its owner to any other use without a decision by a competent state authority.

Some people had not even applied for acts on ownership because it would have an adverse effect on their incomes or they found it more convenient to rent their land rights to third parties.

Ukrenergo holds the state acts for all tower locations of the TL 750 kV line and therefore the implications of land tenure and the moratorium described above are considered to be less relevant for the overall Project.

Other relevant land ownership models include:

- State reserve lands (State owned). These state owned land plots are held in trust by the Village (District or Regional) Councils on behalf of the State within their particular competences;

- Communal lands (owned by Village, Town Communities) - these lands are used jointly by the communities;

- House lots – are in full private ownership and can be freely bought and sold.

Land Acquisition and Compensation Process

Compensation for withdrawal of land plots will only be paid to the owners of the land required for the towers (permanent withdrawal, buyout). At this stage of route planning the 750 kV TL and 330 KV Novokakhovska - Khersonska double circuit diversions, it is not yet sure whether there will be people without certificates but those will be identified (if any) at a later stage of the planning process. As to

international practice this people are entitled for compensations as land owners too.

The plots for the towers will be assigned to Ukrenergo for permanent use by the State and Ukrenergo will be given a State Act *(derzhavni akty)* for each such plot of land. The village councils will be compensated for any communal land, i.e. within the village boundaries, and the State Regional Administrations will be compensated for lands outside the boundaries of the villages. The decision to issue the land use Acts will be taken by the Cabinet of Ministers with regard to State owned land.

Other land affected by transmission lines operations include the following:

- Right of way (ROW): For land within a corridor along the transmission line Ukrenergo will acquire the easement for the Right of Way (ROW). The ROW is a 40 metres corridor along the selected route.

- Protection zones: Ukrenergo will establish a sanitary protection zone (SPZ) and safety protection zone within certain distances from the outermost electric conductor /cable. For the 750 kV transmission line, the SPZ and safety zone is defined as a distance of 40 m from the outermost conductor/cables, giving a total corridor of 116 m. For 330 kV double circuit diversion towers the SPZ is defined as a distance of 20 m, the safety zone as a distance of 30 m from the outermost conductor/cable, giving two corridors of 58 m (SPZ) and 78 m (safety zone) (see also Chapter 5.6). Where two transmission lines (750 and 330 kV) run in parallel the distance between them will be at least 10 m for 330 kV double circuit diversions and 20 m for 750 kV transmission line between the wire/outermost conductor. In accordance with Ukrainian legislation buildings, offices, car service stations, car parking, etc. should not be located within the SPZ.

Owners and users of land crossed by the transmission lines and within the ROW and protection zones as described above will be compensated for damage to crops and loss of potential earnings while assembling and erecting the towers (during construction), for access to the transmission lines, as well as the land required for construction camps, stockpiles, parking and maintenance of vehicles and equipment and any other uses.

Ukrainian Land Code determines land use and in principle, the restrictions on use should do little or nothing to change the status or potential value of the land. Apart from prohibiting the construction of housing and other buildings, in the vicinity of transmission lines there are three basic limitations:

- In areas where the cables are hanging. Under the transmission line maximum working hours are restricted due to electromagnetic radiation depending on the height of hanging lines. With normal tower height, for instance, the cables are hanging at the standard 12 m above the ground so people are not supposed to work for more than 1,5-3 hours at a time under the transmission line (for further details see also chapter 2.1.5 and 5.6).

- In forested areas trees would have to be cut on a regular basis to keep them to a pre-defined height.

- Owners and users of the land in the RoW are obliged to allow maintenance and repair crews to have access to the transmission line. Any damage caused by Ukrenergo maintenance should be compensated on a case-by-case basis.

There is no provision for compensation for the easement that is required for the protection zone/ROW under Ukrainian legislation. Ukrenergo will have to sign contracts for the easement with the private landowners whose land is situated in the protection zone of the power line and with the Village Councils (for land within village boundaries) and with the State Rayon Administrations (for lands outside village boundaries).

No compensation is paid for the visual impacts on the landscape or for potential or possible hazards associated with the electro-magnetic radiation (EMR) generated by the transmission line. This is the same as the current practice in other parts of the world including Western Europe.

The levels of compensation will be determined by commissions created by the State Rayon Administrations that will include representatives of the affected Village Councils, the State Land Use Authority, the Rayon Architecture and Planning Authority, the Rayon Department of Finance, Ukrenergo and the affected landowners. The compensation for private landowners and land users will be assessed on the basis of Cabinet of Ministers Decree No 284 (1993), which provides for compensation for: i) the value of residential buildings, other premises and unfinished buildings, ii) fruit trees and other permanent crops, iii) forests and bushes, iv) sources of water and irrigation systems, and v) investments in agriculture including the loss of investments in crops (cost of ploughing, agrochemicals and so on).

The compensation for private owners will be paid by Ukrenergo to the relevant local administration or local council within one month of the valuation being approved by the state administration and the local government executive body. The local administration will then pay the affected landowner or land user. Payment must be made before the land can be taken for construction or other purposes.

For further details on compensation related to this project refer to Section 6.

Land Valuation

The valuation is a constituent part of LAP preparation (See Section 2.3). The contractor developing the LAP for Ukrenergo project should employ professional licensed valuators. Activities of professional land valuators in Ukraine are regulated by the following legislative acts:

- Law of Ukraine "On valuation of property, property rights and professional valuation activities in Ukraine" (2001) No.2658-III;

- Law of Ukraine "On valuation of lands" (dated 11.12.2003, No1378-15);

  In particular this legislative act establishes the principles and types of land valuation in Ukraine depending on its purpose (economic and monetary valuation). The monetary valuation can be carried out as a standardized procedure (based on established indexes) or an expert valuation.

  The standardized procedure is applied to calculate the value of land as a productive natural resource and amounts of land tax or rent payments by users of public lands, or to establish losses of agricultural producers caused by temporary encumbrances. Standardized valuation is done for all purposes other then commercial transactions with the land.

The expert valuation is compulsory if a market price of land needs to be established for any commercial transaction. Particularly in cases when land deeds are concluded between public authorities and legal entities or individuals (withdrawal, buyouts, transfer of ownership either under contracts or under court decisions).

The expert valuation is performed only by licensed valuators contracted by the relevant land owner/user or by other interested party. The method of expert evaluation is based on calculation of the three following factors:

- capitalization of the operational revenues of the land owner or rent payments;
- comparative prices for similar land parcels; and
- the calculation of cost of all improvements to the land. The valuation reports are subject to the state expertise.

The valuation reports on private land buyouts due to public needs require obligatory professional review by authorized valuators having at least 2 years of experience or by the expert councils under professional associations of land valuators.

- Decree of the Cabinet of Ministers of Ukraine "On methodology for expert valuation of lands" (No 1531 dated 11.10.2002);

  This regulation prescribes detailed techniques for calculation of capitalization of land owner/user's revenues, rent payments, adjustments to prices during comparison of land prices, discounts on value of land improvements etc. It also establishes procedures for calculation of incomes and cost of agricultural land production, the lands under water objects (ponds, lakes, canals), lands occupied by immovable property. There are procedures to calculate values of servitudes – basically the value of these rights is established as a difference in the market value of a land parcel before and after establishment of a particular encumbrance on the land.

  All valuation reports are subject to approval by the state authority for land resources of relevant jurisdiction.

- Order of the State Committee on Land Resource "On approval of procedure for expert monetary valuation of the land parcels" (dated 09.01.2003 No.2);

  This regulatory document is a step- by-step guidance for implementation of expert land valuation and for the form of expert land valuation reports. It establishes that any land evaluation report is valid during one year since its approval.

  The procedure of expert land valuation includes the following steps:

  - Investigating the land parcel "on site" (analysis of all available legal, technical and land cadastre documents);
  - Analysing the relevant land market situation;
  - Establishing cost factors to be considered;
  - Defining a Scope of Work for the valuator and signing an agreement;

- Collecting and analysing relevant data;
- Defining the most effective use of the land parcel;
- Selecting the most appropriate method for valuation;
- Calculating a value on the basis of the selected method;
- Drawing conclusions and producing a land valuation report.

1.5. HEALTH ASPECTS - ELECTRIC MAGNETIC RADIATION (EMR)

When electricity is transmitted through a conductor with alternating current (AC) both electric and magnetic fields occur. The voltage produces electric fields, where the strength of the electric fields depends on the voltage difference between the conductors, the ground and nearby objects. The strength of electric fields is usually measured in units of Volts per meter (V/m). The current flowing through a conductor generates a magnetic field. Magnetic fields are expressed referring to the magnetic flux density (i.e. magnetic induction respectively) in the unit of Tesla. Electric and magnetic fields are commonly referred to as EMR.

The potential effects of EMR on human health have been a disputed issue throughout the 1980s and 90s, in particular long term exposure to low frequency EMR arising from installations such as transmission lines. However, authoritative, internationally recognized epidemiological studies to date have failed to establish a reliable causal relationship between exposure to EMR from power transmission infrastructure (50 Hz) and disease (the possibility of leukemia being the main concern).

In Ukraine EMR exposure limitation is provided by the State Sanitary Standards and Rules for Protection of Population from Impact of Electromagnetic Radiation (1996).

Reference levels for general public and for occupational exposure to 50 Hz electric and magnetic fields are below:

Public Exposure EMR limits:

- Electric Field [E]: 5 kV /m
- Magnetic Field [B]: 1.4кА/м

Occupational Exposure EMR limits:

- Electric Field [E]: 5 kV /m
- Magnetic Field [B]: 1.4кА/м

The strength of the EMR emitted by the transmission lines is depending on the voltage level and rapidly decreases with distance from the conductor.

The Ukrainian standard has defined sanitary protection zones (SPZs) for protection of the public from long term exposure. Outside these zones the above EMR limits will not be exceeded. The extend of the sanitary protection zone depends on the Voltage level. For the Project, a SPZ will be established of 40 m for the 750 kV line, of 20 m for the 330 kV double circuit diversions (see also Chapter 5.6).

2. INTERNATIONAL GOOD PRACTICE STANDARDS AND EBRD/EIB REQUIREMENTS

2.1. ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

According to EBRD's Environmental and Social Policy, dated May 2008, the bank seeks to ensure through its environmental and social appraisal and monitoring processes that the projects it finances:

- are socially and environmentally sustainable;
- respect the rights of affected workers and communities; and
- are designed and operated in compliance with applicable regulatory requirements and good international practice.

The Environmental and Social Impact Assessment (ESIA) is an instrument to ensure the above listed objectives. As a result, an ESIA is required for Category "A" projects (which includes large overhead transmission lines) as a prerequisite for funding such projects. Annex 1 of this policy provides environmental screening categories for different project types.

The construction of overhead electrical power lines is included under No. 21 of the "A" level category list which applies to "greenfield" or major extension or transformation-conversion projects. Level "A" category is also applicable when projects are planned to be carried out in sensitive locations (No. 26).

A similar approach is taken by the European Investment Bank (EIB) whereby an Environmental Impact Assessment (EIA) is required for Category "A" projects as part of the Investment Loan process[1]. This type of project is based on Annex I of the EU EIA Directive 85/337/EEC amended by 97/11/EC), which lists as No. 20 "Construction of overhead electrical power lines with a voltage of 220 kV or more and a length of more than 15 km".

For a comparison with Ukrainian standards refer to Chapter 2.3.

2.2. INTERNATIONAL STANDARDS FOR COMPENSATION

According to the information published by Eurelectric – the European Union of the Electricity Industry (www.eurelectric.org) – most countries in Western Europe including Austria, Finland, France, Germany, the Netherlands, Norway, Portugal, Spain, Switzerland and the UK pay compensation for the impacts of new transmission lines on land use, but not for the visual impacts or the possible impacts of EMR[2]. In Denmark compensation is paid for buildings such as farmhouses that are situated at a distance of less than 35m from a new 132/150kV transmission line or less than 50m from a new 400kV transmission line. In Italy compensation is paid for "the disadvantages" to properties situated up to 50m from a 130/380kV transmission line.

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1 Environmental and Social Handbook, European Investment Bank, September 2007

2 Union of the Electricity Industry – EURELECTRIC publication: "Public Acceptance for new transmission overhead lines and substations", dated March 2003

In regard to the impacts on population, the good practices recommended by Eurelectric for new transmission lines state:

"As far as possible the line corridor must be sited away from population centres, isolated dwellings and areas of potential urban, tourist or recreational development. If technically this cannot be avoided then technical design considerations and construction practices ought to be sought".

Finally, the conclusions of the practices of the member countries of Eurelectric include the following recommendations in regard to land acquisition and compensation:

"Affected landowners must be respected and they should continue to own the affected land unless the required development hinders to a predetermined level the free use of the land. In such cases the acquisition of the land must be possible through national law in return for reasonable and objectively defined compensation. In all other cases, landowners must be satisfactorily compensated through regulated procedures for the limitations that are imposed the free usage of the land."

2.3. INTERNATIONAL STANDARDS ON EMR

Based on the findings available, the International Committee on Non-Ionising Radiation Protection (ICNRP) in 1998 has recommended precaution limit values for tolerable exposure to low frequency fields (Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz), Health Physics Vol. 74, No 4, pp 494-522, 1998): both for long term public exposure and for short term occupational exposure. These limit values are internationally widely accepted.

Other international guidelines, including International Finance Corporation (IFC) guidelines[3], the EU Council Recommendation 1999/519/EC (dated 12 July 1999) on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) and the Directive 2004/40/EC of the European Parliament and of the Council (dated 29 April 2004) on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields) have adopted the ICNRP limits.

Reference levels for general public and for occupational exposure to 50 Hz electric and magnetic fields are below:

Public Exposure EMR limits:

- Electric Field [E]: 5 kV /m
- Magnetic Field [B]: 100 μT

Occupational Exposure EMR limits:

- Electric Field [E]: 10 kV /m
- Magnetic Field [B]: 500 μT

[3] IFC EHS Guidelines such as "General EHS Guidelines: Occupational Health and Safety, dated April 30, 2007" or "Electric Power Transmission and Distribution, April 30, 2007"

The strength of the EMR emitted by the transmission lines is depending on the voltage level and rapidly decreases with distance from the conductor. Also in other western states as a result of this protection zones involving minimum distances and restriction of use have been defined. In Germany for instance, the public exposure EMR safeguard minimum distance for 380 kV systems is 20 metres from the outermost electric conductor (German Radiation Protection Commission, LAI, May 1998).

For a comparison with Ukrainian standards refer to Chapter 2.3.

3. COMPARISON OF UKRAINIAN AND INTERNATIONAL STANDARDS

An overview table showing a comparison between Ukrainian requirements versus International good practice standards and EBRD/ EIB requirements is provided in Annex 2-1.

In summary, it can be stated that similar elements for the EIA process are established in Ukraine as are in other Western states. While no comprehensive EIA though is needed according to Ukrainian requirements for this type of project (Project not categorized as category of highly hazardous objects) a compulsory Environmental and Social Impact Assessment (ESIA) involving a wider scope is required according to EBRD/EIB standards.

The ESIA as described in this report was performed to fulfill the policy expectations of potential International Financing Institutions (IFIs) (such as EBRD) to be used for funding decisions while the OVNS aims at reaching an environmental consent from the Ukrainian regulators.

Referring to compensation standards for new transmission lines, those applied in Ukraine appear to be similar to those of most Western European countries. In fact, the standards in relation to EMR appear to be stricter, since they do not allow for any construction within 40 m of the outer cables of the transmission line. However, unlike many Western European countries the Ukrainian standards do not envisage the payment of any compensation for the restrictions placed on the use of the areas under the cables (i.e. the land crossed by the transmission line).

Referring to electro magnetic Radiation (EMR) exposure and related requirements, those applicable in Ukraine are well within the range of international planning practices and with established planning guides derived from ICNRP exposure limits.

III DESCRIPTION OF THE PROJECT

Note: The technical description of the Project in this Draft ESIA Report is based on the current design stage, which is not yet finalised. Therefore, minor changes to the technical details as included in this Report may occur in the future. Any substantial changes will be reflected in the final version of this Report.

1. SALIENT FEATURES OF THE PROJECT

The Project includes the following key features:

- Construction of the 750 kV Transmission Line Zaporizhka NPP – Kakhovska (app. 190 km length);
- Construction of 330 kV double circuit Novokakhovska – Ostrovska diversion to SS 750 kV Kakhovska (app. 28 km length);
- Construction of 330 kV double circuit Novokakhovska – Khersonska diversion to SS 750 kV Kakhovska (app. 17 km length);
- Construction of new 750kV Kakhovska substation including two autotransformers 2x1000 MVA;
- Rehabilitation of existing 330kV Novokakhovska substation;
- Construction of auxiliary facilities such as construction workers camp, housing and repair and operation site (ROS).

It is foreseen that the time needed for construction of the Project will be approximately 30 months.

2. TRANSMISSION LINE

2.1. ROUTE OF THE TRANSMISSION LINES

The route of the planned overhead transmission line and diversions passes through the Oblasts of Kherson and Zaporizhzha. The landscape is part of the Pre-Black Sea lowland and presents a slightly rolling plateau area between the Kakhovska reservoir of the Dnieper River and the Crimea Semi-island.

The line traverses mainly agricultural land with large agricultural fields and passes by several small rural communities. Bi-section of agricultural structures and thus potential hindrance of agricultural fields is largely minimised by routing along the edges of the fields.

A survey of tower locations is planned to be completed by a contractor of Ukrenergo by July 2009. The exact routing of the current design and planning stage will therefore be established following that date.

The current alignment developed within the planning process is shown in the overview map (see Annex 3-1).

The general characteristics of the routes of the three transmission lines and locations of the substations involved are described below.

750 kV Zaporizka NPP - Kakhovska line

The planned Zaporizka NPP – Kakhovska 750 kV transmission line route has a length of app. 190 km and runs across the territory of Kamyanka-Dniprovska district of Zaporizhzha oblast, and Verkhniy Rohachyk, Velyka Lepetykha, Gornostayivka, Kakhovka and Tsyuryupynsk districts of Kherson oblast.

The line begins at the substation of the Zaporizka nuclear power plant (ZNPP) leaving the substation in bundling1 with two other 750 kV transmission lines (ZNPP – Zaporizka, and ZNPP – Southern Donbaska). The three transmission lines go in south-western direction, outside of residential settlements, passing the lands of Energodar town council, Vodyane village council and Kamyanka-Dniprovska town council to the south. The 750 kV Zaporizka-Kakhovska line leaves the bundling turning west towards the Velyka Bilozerka River. The line crosses this river along with an already existing 330 kV transmission line and proceeds towards Verkhniy Rogachyk municipal settlement. Near Verkhniy Rogachyk, the line turns south to Samiylivka village where it turns again proceeding in south-western direction further passing Nikolaievka village to the south-east, Rubanivka village to the north-west. It turns north-west going between Vesele and Kozachi Lageri villages proceeding further in western direction passing Olgine village on its north and along the Kairska Balka, a side arm of the Dnieper River. The line crosses Kayirska Balka approximately 1.5 km to the east of the paved local road T-08-04 and proceeds further in bundling with an existing transmission line (330 kV) crossing the Kakhovski canal and the Northern-Crimski canal south of Tavriysk town and north of Nova Mayachka town. It proceeds in bundling with the Novokakhovska-Ostrovska diversion, later with an existing line (150 kV) and the paved local road T-22-06. North of Nova Mayachka near Obryvka village the line turns north until it reaches the 750 kV Substation Kakhovska to the west of Novi Lageri village and Dnipryany municipal settlement.

330 kV double circuit Novokakhovska-Ostrovska line diversion to Kakhovska SS

The planned 330 kV double circuit Novokakhovska-Ostrovska transmission line diversion to Kakhovska substation has a length of app. 28 km across the territories of Novovkakhovka town council and Tsyurupynsk districts of Kherson oblast.

It runs over the entire length in bundling with the 750 kV Zaporizka-Kakhovska line.

The alignment starts from the new 750 kV Kakhovska substation going southwards until it crosses the paved local road T-22-06 near Obryvka village and turns to the east. It runs in bundling with the 750 kV line, an existing line (150 kV) and the paved local road T-22-06 until it turns to the north-east. It crosses the Severo Crimski canal and connecting to the existing 330 kV Transmission Line Novokakhovska–Ostrovska north of Tsukury village.

[1] Bundling is the co-alignment of several infrastructure lines, i.e. several transmission lines together or a transmission line and a railway track or road.

330 kV double circuit Novokakhovska – Khersonska line diversion to Kakhovska SS

The planned 330 kV double circuit Novokakhovska-Khersonska transmission line diversion to Kakhovska substation has a length of approx. 17 km across territories of Dnipryanska municipal settlement council of Nova Kakhovka town council and Lvivska village council of Beryslav district, Kherson oblast.

The alignment starts from the new 750 kV Kakhovska substation going northwards passing Korsunka village to the west. It turns to the north-west going along the bank of Dnieper River and turns to the north crossing the Dnieper river at a location where the river has a width of about 300 m. The diversion passes Lvovo village to the west going northwards until it connects to the electricity grid of the existing 330 kV TL Novokakhovska-Khersonska near the national road M-14.

Figure 3-1: Location of planned Dnieper crossing near Lvovo village, view from Lvovo to the south downstream.

2.2. TECHNICAL FEATURES OF THE LINE

The design of the transmission line and diversions is prepared in accordance with currently applicable national norms and regulations such as the technically proven state standard design criteria (GOST, PUE 2006).

The transmission lines consist of a large number of towers along the route that support the wires that carry the electricity. A high voltage wire diameter is used to maximize the carrying capacity. The towers are spaced at 400 to 500 meter intervals for 750 kV transmission line, 300 to 350 m for 330 kV diversions, depending on the landscape characteristics. Insulators are used to isolate the towers from the live wires that carry the electricity.

In summary the transmission line and diversions have the following technical characteristics (refer to Table 3-1). Further description is provided in the sections below:

Table 3-1 Technical Line Parameters

	750 kV Transmission Line	330 kV Diversion Novokakhovska – Ostrovska	330 kV Diversion Novokakhovska-Khersonska
Line length	**190 km**	**28 km**	**17 km**
Number of phases	3	6 (double circuit diversion)	6 (double circuit diversion line)
Conductors	5 main conductors per phase, 2 per tower	2 sub-conductors per phase (i.e. double bundle)	2 sub-conductors per phase (i.e. double bundle)
Conductor cross-section	5x 400/51 mm² ACSR	2x 400/51 mm² ACSR	2x 300/39 mm² ACSR
Earth wire	2 earth wires	2 earth wires	2 earth wires
Earth wire cross-section	232,2; 166,42	72,95; 284mm²	72,95; 284 mm²
Insulators	suspension-type insulators made of glass insulator disks	cap and pin insulators 25 disks	cap and pin insulators 25 disks
Length of insulation chain	6,6; 7,2; 8,1m	3.50 m	3.50 m
Intermediate support towers	Self supported lattice steel towers	Self supported lattice steel double circuit towers	Self supported lattice steel double circuit towers
Angle-tension (anchor) towers	self supported lattice steel towers for angle and dead end towers, and for infrastructure (e.g. railway road crossings) or wider spans across water bodies	self supported lattice steel towers for angle and dead end towers, and for infrastructure (e.g. railway road crossings) or wider spans across water bodies	self supported lattice steel towers for angle and dead end towers, and for infrastructure (e.g. railway road crossings) or wider spans across water bodies
Foundations	pre-fabricated concrete foundations	pre-fabricated concrete foundations	pre-fabricated concrete foundations
Total number of structures	496	83	Subject of current design

The specific details relevant to the materials selected and the design approach will be the responsibility of the construction contractor, however a typical configuration would comprise the following:

- The pad and chimney type of reinforced concrete foundation is used. In high water tables on peaty sites, foundations of the towers may be piled involving piles with solid-cast reinforced concrete raft.

- Gravel bed is used in foundations in aqueous soils.

- The grounding wire is connected to an isolator – so if there is a lightning strike, it will go through the closest isolator to the ground. Lightning protection of the project lines is provided by means of two cables.

- Insulators are attached to the towers where the conductors will be connected. They are typically made of glass, ceramic or some form of composite materials.

- Line conductors are mounted to the towers. The conductors are made of aluminum core steel reinforced and they come in large drums. Each tower will have 3 circuits (of 5 conductors each) plus two earth wires.

750 kV Zaporizka NPP - Kakhovska line

For the new transmission line it is planned that approximately 500 towers will be erected.

The two types of towers intended to be used are as follows:

- Self-supporting towers ПС 750-3 are used as intermediate support towers. The tower height to the cross-arm is 35 m. To make the towers higher base units of two types (5 and 10m) are used.

- Angle-tension (anchor) towers of УС 750-1 1 or УС 750-1+5 type are the self-supporting tower-shaped rising mains. Angle-tension tower height to the cables is 20m, with the help of base units it can be increased up to 35 m.

Altogether approximately 400 intermediate support towers and 100 angle-tension towers will be needed. Average intermediate tower height is about 42 meters. Land requirement for intermediate self-supporting towers is 174 m², for a tension tower is 360 m² (Standard DBN B2.5-16-99).

Specific characteristics of the 750 kV transmission line are as follows:

- There are 5 wires in each of three phase (i.e. there are three bunches of wires with five wires in each bunch).

- The distance of the cables to the ground ranges from 24,5 m (at the tower) to 12,5 m (midway between towers). At crossing points with motor and railways the distance is 16 m.

- The width of the sanitary protection zone (SPZ) and safety zone is 40 meters from the outer conductor/cable (for long term exposure to electromagnetic radiation). For navigable surface water the required distance is 100 m. Together with the 36 m wide footprint of the line, the SPZ and safety zone will establish a corridor of 116 m width along the line route. The land beyond this area can be used for agriculture purposes without restrictions (see also chapter 5.6).

- Minimum span length between towers is not regulated, maximum length is 400-500 m.

- The pad and chimney type of reinforced concrete foundation will be used. The bearing capacity is up to 24 tons. They are typically used for installation on dry firm ground. The size (type) of the foundation is selected depending on geologic and geodetic conditions. In order to install a foundation of this sort a 3x4 m hole is dug, with 4m depth for tension towers and 3m depth for intermediate towers. Normally, earth that is removed is carefully separated so as to preserve the topsoil, and the foundation is strengthened with cross-bars. The subsoil is then backfilled into the hole and compressed to strengthen the foundation. The foundation do not result in a solid concrete-made platform on the ground since the foundation remains below ground level, top soil is laid on top and the area is reseeded with appropriate vegetation. Only where the towers are connected the concrete foundation is about 20 cm above the ground level. Connections are provided using a bolted joint.

Drawings of the standard tower designs for angle-tension and intermediate support towers are provided in Figure 3-2 and 3-3. The height of the towers varies with topography and objects crossed by the line route.

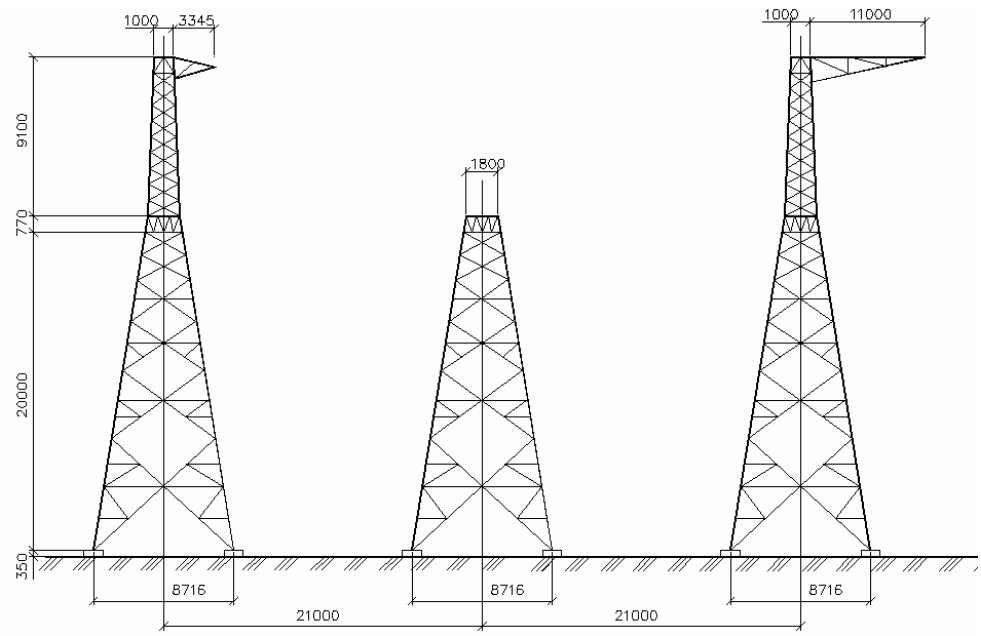

Figure 3-2: Typical 750 kV angle-tension tower YC750-1

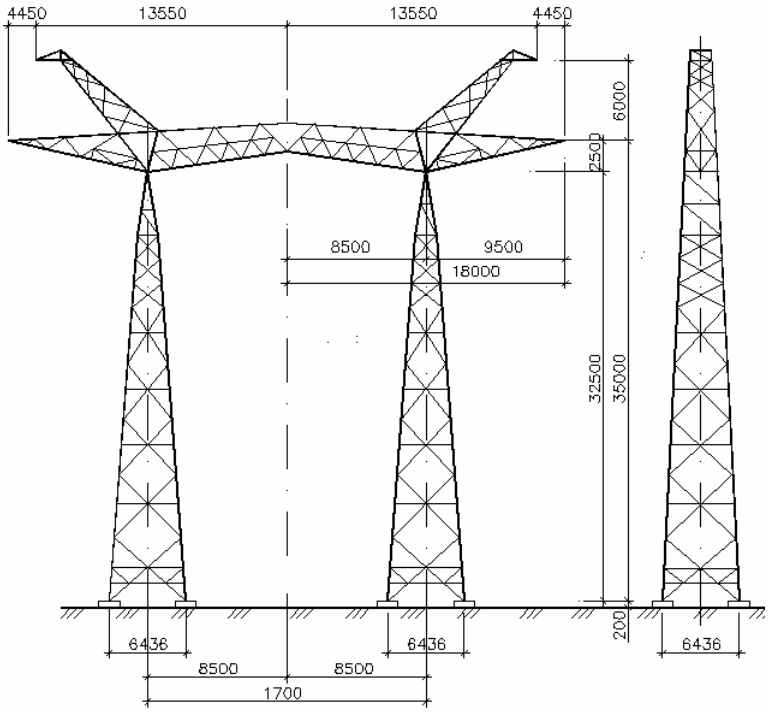

Figure 3-3: Typical 750 kV suspension tower ПС750-3

330 kV double circuit Novokakhovska-Ostrovska and Novokakhovska – Khersonska diversions to SS 750 kV Kakhovska

For the 330 kV Novokakhovska-Ostrovska double circuit diversion, altogether approximately 30 suspension towers and 10 tension towers will be erected. For the 330 kV Novokakhovska–Kherson double circuit diversion, altogether approximately 20 suspension towers and 10 tension towers will be erected (number currently subject of design). The two types of towers intended to be used are as follows:

- Suspension towers of double concrete type are used as intermediate support towers. Average tower height is between about 25 meters. Land requirement for a suspension tower is 52 m²,

- Self-supporting tower of lattice steel are used as Angle (Tension) and intermediate towers. Average tower height is about 30 meters. Land requirement for a self-supporting tower is approximately 81 m²,

Specific characteristics of the 330 kV double circuit diversions are as follows:

- There are 2 wires in each of three phase (i.e. there are three bunches of wires with two wires in each bunch).

- The distance of the cables to the land ranges from 9 to 24 m (at the tower), and from 8 to 12 m (midway between towers).

- The width of the sanitary protection zone (SPZ) is 20 meters, the width of the safety zone is 30 meters from the outer conductor/cable (for long term exposure to electromagnetic radiation). Together with the 12 m wide footprint of the line, the SPZ will establish a corridor of 52 m width, the safety zone will establish a corridor of 72 m width. The land beyond this area can be used without restrictions (see also chapter 5.6).

- Minimum span length between towers is 270 meters.

- The pad and chimney type of reinforced concrete foundation is generally used (*for description see above under 750 kV line*).

- For the river crossing of the 330 kV Novokakhovska–Khersonska double circuit diversion, a different design is currently being developed involving different foundations and tower height: Tower height for crossing of the Dnieper river is currently planned to be approximately 100 m. Given a high water table at the river bank pile foundation may be applied. Pile foundations are used in construction on weak highly compressible water saturated grounds, as well as in case of transmission of large loads to the foundation bed. They allow the load from the building to be transmitted onto more solid grounds at greater depth. Piles can be made of reinforced concrete, steel or a combination of the above. Technical design is currently ongoing and it is not known yet which type of foundation will be used in this area.

Drawings of the standard tower designs for tension and suspension towers are provided in Figure 3-4 and 3-5. The height of the towers varies with topography and objects crossed by the line route.

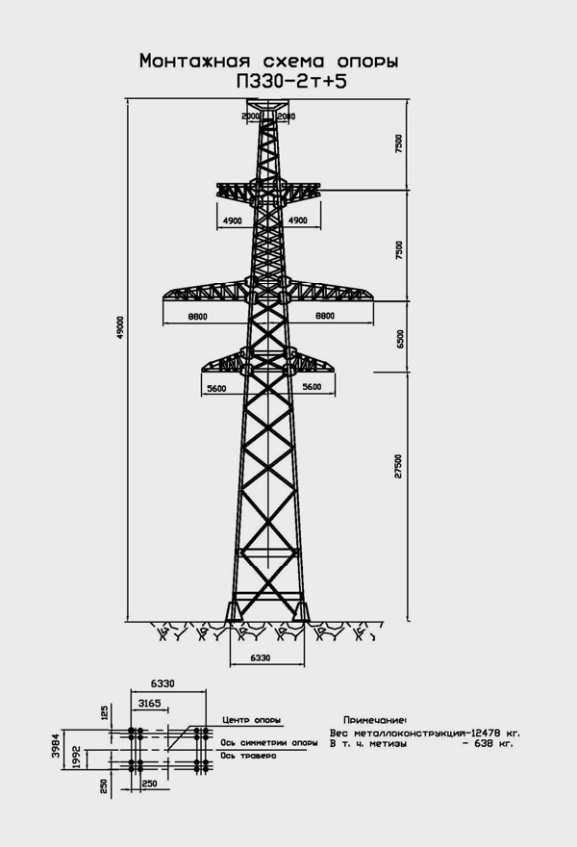

Figure 3-4: Typical 330 kV Intermediate Suspension Tower П330-2т+5

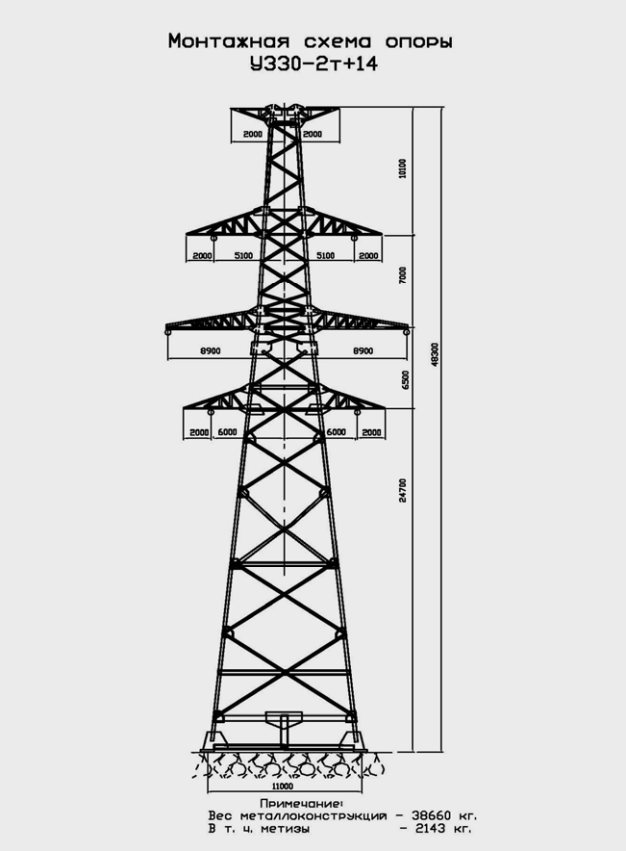

Figure 3-5: Typical 330 kV Angle (Tension) Tower У330-2т+14

3. SUBSTATIONS

3.1. NEW SUBSTATION 750 KV KAKHOVSKA

The Kakhovska substation will be newly constructed at the location of the existing partly built facility. The site of the planned 750/330 kV Kakhovska Substation (SS) is located to the south-west of Nova Kakhovka about 500 m to the east of Novi Lageri village in the Nova Kakhovka town council of Kherson oblast (see Figure 1-2).

Figure 3-6: Concrete shed and metal structure at area of planned Kakhovska substation, structures from start of construction at the beginning of the 1990s

An access road with hard surface will be constructed branching off the main road at a distance of 500 m and leading to the site of the substation.

The substation will have a size of approximately 32 ha.

The primary equipment will include the construction of a 750 kV open lead-in distributor (LID), with installation of two 750/330 kV autotransformers (AT), 3 x 333 MVA each with a reserve phase and phase-shifting transformers (PST), as well as a 330 kV LID.

It is planned to install the switching bays in an open air switch yard in order to connect the lines to the substation. Switching will be done according to the standard circuit 'transformers – buses with lines connected through two circuit breakers'.

750 and 330 kV Circuit breakers and 750 kV/ 330 kV measuring transformers will be gas-insulated (SF6).

Control and monitoring of switching equipment and disconnectors, including also grounding blade operations, shall be provided for with remote control and with integration in the substation's automated process control system (APCS). Glass suspended LID insulation shall be used. External insulation for Kakhovska 750 kV SS shall be chosen according to insulation level maps for areas with natural pollutions (GOST 9920-89).

To secure reliable operation of relay protection and automatics (RPA) devices, the need for installation of 750 kV voltage transformer (VT), 330 kV VT, and 15 kV VT on the autotransformer high voltage, medium voltage and low voltage sides shall be considered.

The following auxiliary equipment and safety devices will be installed:

- Automatic water extinguishing system, as well as installation of a Sergi-type explosion prevention system on main transformers.
- Diesel generator with necessary power to provide incoming-line device (ILD) emergency supply.
- Automatic weather station integrated into the substation's APCS.
- Bio-protection shields devices for protection from electro magnetic radiation (EMR) at the 750 and 330 kV switch yard. Protection of workplaces of the operation personnel and the respective step voltage (e.g. on footpaths) are designed in compliance with GOST 12.4.154-85.
- Protection from lightning and internal over-voltage at the 750 kV and 330 kV equipment through existing valve arresters. Lightning protection of the new switching bays will consist of lightning rods installed on portals (overall height 23 m) and a single tower with a height of 30.5 m.
- Illumination of switching bays by floodlights with 400 Watt lamps which will be installed at a tower.
- Grounding circuit in the switching bays will be made of a steel bar with a cross-section 40 x 4 mm, vertical steel grounding wires with a diameter of 16 mm. Connections between the equipment and the grounding circuit will be made of a steel bar with a cross-section 40 x 4 mm.

Safe standards of air temperature conditions according to existing normative and technical documents, manufacturer's instructions for the installed equipment, and sanitary and hygienic standards in production areas and SS staff premises.

The placement of the high voltage equipment will facilitate access to it as well as repair and installation works at the substation.

Temporary power supply for Kakhovska 750 kV SS for the period of construction and installation and setup works.

All substation works will be carried out within the existing perimeter of the already owned premise and no additional territory will be required.

3.2. 330/110/35/6 kV Novokakhovska Substation

The existing Novokakhovska substation will be re-built and receive additional equipment. The site of the operating 330/110/35/6 kV Novokakhovska substation is situated in a mixed industrial and residential zone in the eastern part of the city of Novokakhovska. The city centre is at a distance of approximately 1 km. Nearest residential housing is at a distance of approximately 80 m to the north of the site.

A hard-surfaced access road reaches inside the substation site.

Figure 3-7: Novokakhovska substation

Figure3-8: Vacant area, northern side, where Novokakhovska substation is planned to be extended

The substation has a size of 11 ha. Approximately 8 ha (72%) are presently built-up area which will be enlarged by the additional equipment to about 90%.

The additional equipment to be installed will include the replacement of a 1AT 220/150/35 kV autotransformer (AT) with a 330/220/35 kV autotransformer having necessary power to supply Titan 220 kV overhead transmission line, with circuit elaboration of connection of the 1AT to the 330 kV LID of Novokakhovska 330 kV SS in the position of the existing 35 kV LID.

330 kV circuit breakers and 330 kV measuring transformers will be hermetically sealed SF6 gas-insulated. 35 and 15 kV circuit-breakers will be vacuum insulated.

Various other equipment will be replaced including a storage battery, switch boards (ILD and DC boards) and 1T and 2T transformers which are replaced by 35, 6 kV ISG equipped with vacuum circuit-breakers.

Bio-protection shields devices for protection from electro magnetic radiation (EMR) at the 330 kV switch yard will be provided for newly installed equipment.

A new grounding device at the reconstructed SS section shall be connected to existing equipment and new equipment shall be grounded according to manufacturer's installation and operation instructions

The newly installed AT 330 / 220 кВ will be equipped with a water extinguishing system and a Sergi-type explosion prevention system.

The placement of the high voltage equipment will facilitate access to it as well as repair and installation works at the substation.

In addition to the above new equipment, the following auxiliary equipment and safety devices are already installed at the existing SS:

- Protection from lightning and internal over-voltage through existing valve arresters. Lightning protection of switching bays consists of lightning rods

installed on portals (overall height 23 m) and a single tower with a height of 30.5 m.

- Illumination of switching bays by floodlights with 400 Watt lamps which will be installed at a tower.

All substation works will be carried out within the perimeter fence of the existing substation area and no extra land is needed. The open air extensions (new switching bays and autotransformer) will be extended northwards within the existing outer fencing of the substation. The area is mainly vacant, occupied by some concrete structures and a workshop, which will be demolished as part of the Project. As part of the Project large parts of the currently operated area will be redesigned, groups of switching bays and other equipment will be relocated.

4. OTHER FACILITIES

Maintenance, repair and storage site

A repair and operation site (ROS) will be established at the outskirts of Hornostayivka settlement, Kherson oblast, approximately 10 km to the north and west of the 750 kV transmission line. The site will be used mainly for repair and maintenance (metal processing, welding) and storage.

Figure 3-9: Greenfield area where repair and operation site (ROS) is planned

The area is currently owned by the village council and Ukrenergo plans to buy the premise. It will be located within a mixed industrial and residential area. The area is currently a green field with residential housing at a distance of 20-40 m. The site covers an area of approximately 0.9 ha. Once the transmission line is in operation,

10 to 15 workers will be based at this site. The site will also be used during the construction phase.

The area will be fenced and buildings will be made of bricks with a pyramidal roof. The ROS includes the following building and facilities:

- machine workshops, warehouse and garages for vehicles;
- worker recreational area and temporary housing for seconded staff (changing rooms, showers, dining etc.);
- fire water and sanitary water supply by two separate groundwater boreholes installed at the site;
- wastewater sewage through on-site septic system;
- storm sewage, drainage and flood control systems.

No hazardous materials will be stored at the ROS.

Housing areas

A housing area will be erected at Novi Lageri settlement comprising 15 two-apartment double-storied residential houses (approximately 5-6 ha). This will entail the completion of the existing, partly built houses. The houses will be allocated to workers employed at the 750 kV Kakhovska substation.

A 9-floor apartment building will be erected at a premise town of Tavriysk town comprising 72 apartments (approx. 0.3 ha premise). The building will be partially equipped with basement. The premise is located within a residential area.

Figure 3-10: Unfinished building at housing area, Novi Lageri settlement

Figure 3-11: Existing concrete structure (ground floor) of apartment building near Tavriysk town

5. CONSTRUCTION

5.1. ORGANIZATION OF CONSTRUCTION ACTIVITIES

The "Program of work" will be developed by the planning contractor as part of the project design documentation. It is a special document that describes the construction process in detail, the work schedule, the amount of man power and machinery used.

The following paragraphs therefore describe the standard practice typically used in constructing transmission lines:

Timing of Construction

The construction of the line and substation works will be carried out independently from each other.

Substation works do not depend on seasons, while the construction of the line cannot start before agricultural activities are completed after harvest in autumn.

Therefore, the start date and the sequence of construction will be set forth in the contractor's working plans accordingly.

Construction Materials

Mostly prefabricated units and elements will be used during construction, such as re-enforced concrete foundations, re-enforced elements, steel re-enforced concrete towers, portals, steel elements, sections or parts of steel towers or portals, wires, conductors, substation equipment.

For the project there will be no new construction material borrow sites. All materials for concrete generation and backfill with gravel and sand etc will come from existing licensed operations.

5.2. TRANSMISSION LINE CONSTRUCTION

The line construction will be carried out in accordance with the work process schedule and instructions developed according to SNiP 3.05.06-85 "Electrotechnical Devices". The overall construction period is planned to be 8-12 months.

Approximately 40% of towers and foundations were installed at the beginning of the 1990s and are still present. All existing structures including foundation will be removed and waste disposed as legally required or recycled.

Figure3-12: Two existing 750 kV transmission lines and angle tower without wires built at the beginning of the 1990s. Location near substation of ZNPP.

It is planned to establish additional temporary construction facility sites and storages for material and equipment. This will be subject of further planning by the construction contractor. These sites will be located in the vicinity of villages along the line route. Special assembling and erection sites are planned for some tension towers (e.g. crossing of road and railways and crossings of some water bodies). Assembly time is 4 days per tower.

Tower foundations are prefabricated. A 3 meter deep hole will be dug out mechanically, and then a crane will install the mushroom-shaped foundations. The base plates size depends on the load. The average width is 2.5 m.

The construction process is put into practice by groups of single purpose workers that execute their particular tasks. The construction teams at each location would consist of seven or eight crews of up to 10 people, working one after another, with each crew responsible for one of the construction assignment (preparing the RoW, laying the foundations for the towers, assembling the towers on the ground, erecting of the towers and installing the wires and testing and commissioning the line).

Workers involved in the construction works will dwell in the settlements neighboring the construction site (in dormitory accommodations, private houses etc.). There will be transport (bus) link arranged between the construction sites and the places of residence of the construction brigades.

In order to make the construction duration shorter (which will anticipate more workers but also the regular loading of the construction machinery) the line will be constructed in parallel on a number of sites.

Preliminary studies suggest that it will not be necessary to provide new access roads and that the right of way will be used to move equipment from one tower base to the next. The construction work will be carried out in daytime, avoiding

unsociable hours. Construction waste will be disposed of at waste disposal sites, following the consent of the local authorities managing these disposal sites.

The work sequence is expected to be the following:

1. A design company make "siting and layout" of the route on the base of working drawings (5 km a day).

2. A construction company makes a break-down of the ditch for the pad and chimney foundation or a layout for piles with defining the top of the foundations. The team comprises two-four people.

3. The route is to be cleared up (leveling of sites for foundations, cutting a glade) and temporary approach driveways to the towers are to be built – the time of execution depends on the conditions, in which the tower is installed.

4. The ditch is dug for the pad and chimney foundation bed (1 day for 1 ditch) or piles are driven in (1 day for 1 piling foundation). This job is usually carried out by one brigade of seven-eight people.

5. Pad and chimney foundations and cross bars with the ground back-filling (3 days for a foundation for a tower) or a metal grill on plies (1 day for installation of metal grills for a tower) are installed

6. The tower is assembled from separate galvanized angles and sheet steel parts by means of bolt joint (10 days for 1 tower). These assignments are done by a team of ten individuals, but exact numbers depends on the technology.

7. Bolts are welded up to the height of 10 m (1 day for 1 tower, by a group of two)[2].

8. The tower is raised by a swivel device attached to the foundation by means of the «falling jib» technique (2 days with preparation and regulation). It takes from six to nine people to raise a tower, but it also depends on technology

9. Tension and suspension sets of insulators for wires and wire ropes are assembled on the ground for the whole anchor span, i.e. from one angle tower to the next.

10. Wires and wire ropes are unfolded on the ground along the anchor span.

11. Wire ropes and wires are raised and stringed sequentially on the towers. The tasks 9, 10 and 11 are carried out by one brigade of up to 10 people.

12. Wires are connected together on the anchor (angle-tension) tower and wire stub (number of wires) is being connected to the previous anchor span (up to 4 people)

13. The ground around the tower bases is re-cultivated (up to 6 people for each tower area)

[2] Welding of bolts also to prevent theft of metal pieces

14. A protective voltage is supplied – this voltage is required to protect the unfinished line, for those sectors that are ready, to prevent stealing of the wires and steel parts: Towers will have a special warning sign "Danger! High voltage!".

15. For 24 hours after the construction of the line is finished it works on the design voltage, and after that the line can be handed over to the Client

The area used for assembling towers varies depending on the type of tower between 2,125 m² (ПС 750-3 type), 3855 m² (УС 750-1) and 4,455 m² (УС 750-1+5). In addition to this, a further area for tower construction is temporarily needed for intermediate support towers (885 m²) and for angle-tension towers (4,700 to 5,172 m²), excluding the 21 m strip for unfolding and mounting the wires. For erecting angle towers the range of 4,700 to 5172 m² includes an area of about 2,000 m² which is needed for passage of special machinery.

Figure 3-13 shows how wires and towers are typically laid out on the ground including the temporary allotment of land for both types of towers (angle tension tower and suspension tower).

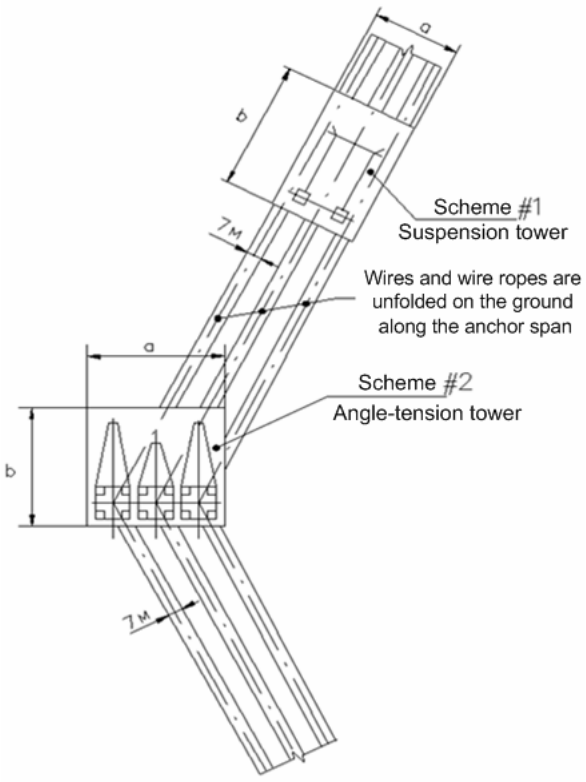

Figure3-13: Temporary allotment of land for placing the towers and wires before lifting the towers and stringing the wires To unfold and mount the wires and wire ropes there are three strips provided along the line with the total width of 21 m.

5.3. SUBSTATION CONSTRUCTION

Construction time foreseen is 6-12 months for construction of new Kakhovska substation, and 6-12 months for re-habilitation of existing 330kV Novokakhovska substation.

At the new Kakhovska substation, concrete and metal structures are present at the site originating from the start of construction at the beginning of the 1990s. No

electronic equipment had been installed yet. There is no known or suspected contamination at the site. All these will be demolished and construction waste disposed of according to legal requirements.

At the operating substation Novokakhovska and area of the new substation, no soil contamination is known. No leveling of the site is needed. The area of the open air switching station will be sown with perennial herbs. Design evaluation will be conducted to determine the most favorable year period and a sequence of necessary disconnections of 330 kV overhead lines and related equipment to secure reliable supply for the Crimean energy system and stability in intersections of the southern part of Ukraine's UES.

5.4. OTHER FACILITIES

At both housing site construction of buildings had started but not completed at the beginning of the 1990s. Unfinished building structures are currently present at these sites. Houses at Novi Lageri settlement are covered with asbestos cement roofing panels (eternit type) which will be removed and disposed of as legally required. Appropriate roofing will be installed.

The housing area at Novi Lageri settlement will be re-constructed using existing structures. Asbestos cement roofing panels will be removed and disposed of according to regulatory requirements.

At the apartment building near Tavriysk town, foundation will be reused for the new building.

5.5. CONSTRUCTION EQUIPMENT

The works will involve the use of machinery and vehicles.

The general contractor for the construction will be selected after a tender announced by Ukrenergo, therefore the exact quantity and quality of the contractor's equipment and tools are unknown at this point.

The equipment, machinery and materials required for the construction works (including foundations and tower sections) will be supplied from the places of their storage along the route of the line and the ROS site. Trucks of small tonnage (8-10 ton) will be used for supply.

Equipment for Transmission Line works

Typically the following construction machinery is involved in the works to build the transmission line:

- An excavator will be used for excavating the foundation pits. If soil removal is necessary, dump trucks are used. If site access is too difficult, manual excavation is done.

- For the foundation of the transmission towers mainly pre-fabricated elements (base plates and piles) will be used. These will be transported by trucks, preferable equipped with a loading crane. Monolithic concrete is not used for construction of overhead transmission lines.

- Iron parts for lattice steel towers and concrete poles for suspension towers will be delivered by trucks preferably equipped with truck-mounted cranes for unloading.

- Cranes are constantly used during construction of overhead transmission lines. Towers are assembled on the ground, and then erected by cranes and tractors or by cranes only depending on the erecting procedure applied. Cranes are also used to put tower foundations into their pits.

- Drums with conductors are transported to the angle points of the transmission line by trucks. Cranes are used to unload them.

- Cable winches and cable brakes are generally trailer-mounted. They are transported to the angle points for stringing.

- Conductor stringing will be done by pulling with the use of construction machinery (tractor).

- Surveyors, construction workers, lines men etc. will drive along the line route with vehicles from tower to tower throughout the construction period up to commissioning of the line.

Construction Machinery for Substation works

For the equipment extension and construction, at the substations trucks and small vehicles will be used for transport of equipment and personnel for erection.

5.6. OPERATION

The main impacts associated with the operation of transmission lines are the creation of Electromagnetic Fields (EMR), noise, radio interference:

Electromagnetic Radiation (EMR):

High voltage transmission lines generate electromagnetic fields which may cause a hazard to human health and the environment. The size of the RoW and sanitary protection zone is largely determined by electromagnetic radiation (EMR), where measurements have shown that the EMR of 750 kV lines at a distance of 40 m from the footprint of the line is < 5 kV/m, which is the national standard for limitless exposure. According to the Ukrainian national standard, the permitted exposure time is 3-8 hr for an electric field intensity of 5 – 10 kV/m, 1.5-3 hr for an electric field intensity of 10 – 15 kV/m and less than 1.5 hr for an electric field intensity of above 15 kV/m (see also chapter 2.1.5.)

The distribution of the electrical field under wires of a 750 kV transmission line, at a distance from the wire down to the ground at 12 and 16 meters is shown in Figure 3-14 (the dash line shows the border of the SPZ):

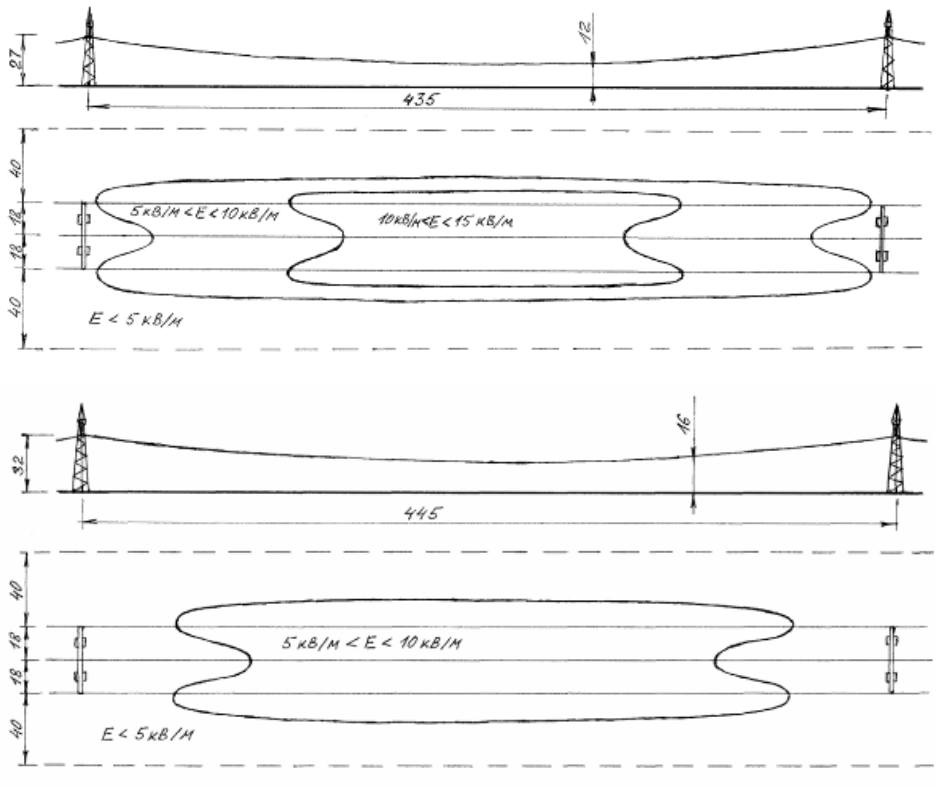

Figure 3-14: Distribution of the electrical field under wires of 750 kV TL with the minimum distance from the wire down to the ground being 12 m (figure above) and with a suggested change of wire height to 16 m (figure below); the dash line shows the border of the sanitary zone the distribution of the electrical field under wires of 750 kV TL

In those places where the transmission line passes through agricultural areas, mechanized work (tillage etc.) is not limited. Manual labor (vegetable gardens, sites of summer cottages etc.) under the transmission line middle conductor is limited due to the electromagnetic field (see the picture above – with normal tower height the cables are hanging at the standard 12 m above the ground so people are not supposed to work for more than 1,5-3 hours at a time under the transmission line) – this is a limitation that would affect areas of arable land worked by hand or with animal traction. Ukrenergo has proposed that the cables will be raised to 16 m in areas used for arable farming and in this case people will be allowed to work for about 3-8 hours under the power lines.

Noise:

Transmission lines produce electro magnetic generated noise termed Corona effect that can generate reasonable, loud noise under certain meteorological and transmission system conditions. The level of noise or its loudness depends on voltage level and weather conditions. In foggy, damp, or rainy weather conditions, power lines can create a subtle crackling sound due to the small amount of the electricity ionizing the moist air near the wires. During heavy rain the general background noise level is usually greater than the noise from a transmission line. During light rain, dense fog, snow, and other times when there is moisture in the air, the transmission lines may produce audible noise higher than rural background levels but similar to household background levels. During dry weather, audible noise from transmission lines is a nearly imperceptible, sporadic crackling sound.

The Corona can produce ozone and oxides of nitrogen in the air surrounding the conductor, especially in humid conditions. Corona consists of the ionization of air within a few centimeters immediately surrounding conductors. Because of its reactivity, ozone is relatively short-lived.

Radio interference:

Corona on transmission line conductors can cause interference with radio waves, primarily with AM radio stations and the TV signals, depending on the frequency and strength of the radio and television signal. Interference with communications equipment is also caused by loose or damaged hardware on the transmission line itself and can be remedied by repairing equipment.

Accidental events:

Among the potential hazards of operation of the transmission line there are fires, wire break, grounding wire break, tower falling, with the electric shock. A transmission line cannot burn. But in case of fire under the transmission line (burning of agricultural waste, burning of dried grass, forest fire etc.), a short circuit arises, and the automatic protection stops line operation. If the grounding wire falls it makes a short circuit with high voltage wires and the line is disconnected. This occasion is unlikely, but in certain set of circumstances – the weather, third parties actions - it may happen. The wire break can be caused by an attempt to steal the wire or due to unfavorable weather conditions. If the wire breaks it will create short circuit with ground surface. Falling of towers is very unlikely if all the standards and rules of construction and operation are followed. In case of theft of steel angles or weather disaster (storms etc.) the tower can fall, followed by a break of wires (see above - a short circuit – line disconnection). The most common cause of tower toppling is theft of key metal parts near ground level.

5.7. MAINTENANCE

The main part of service is maintaining the protective zone of the transmission line: cutting trees, lopping branches, refreshing earth fillings near the towers.

Scheduled patrolling (inspections) of the line is held twice a year with a view to the visual revealing of cut-offs, breaks etc. If any problems are revealed that call for repairing with disconnection of the line, such disconnection is agreed with the regional electric networks and is made in the period of the least network loading.

All service and repair works are carried out with the safety regulations being observed concerning workers staying in the coverage of the electromagnetic radiation of the transmission line.

All service and repair work that anticipate disconnection of line are followed by change of electricity flow (other transmission lines), or limitation of power generation.

5.8. DECOMMISSIONING

The expected field life of a transmission system is approximately 50 years. The decommissioning process is essentially the reverse of the installation process.

No 750 kV lines have yet been decommissioned in the Ukraine.

In case of decommissioning, wires need to be removed, welded tower connections disconnected and towers disassembled. Foundations need to be dug up and removed, tower locations re-cultivated. Metal components can be fully recycled after separation from non metal parts. It can be anticipated that at the future time of decommissioning, there will exist more advanced techniques fro comprehensive recycling/recovery of system parts and components.

IV ALTERNATIVES STUDIED

Note: The technical description of the Project in this Draft ESIA Report is based on the current design stage, which is not yet finalised. Therefore, minor changes to the technical details as included in this Report may occur in the future. Any substantial changes will be reflected in the final version of this Report.

This section discusses the following three alternatives for the transmission line Project:

- A No-Project – "Zero-Option" alternative;
- Alternative routing of the transmission line;
- Optimisation of the proposed Project routes and installations.

1. ZERO-OPTION/NO ACTION

The "Zero-Option" would mean that the Project would not be implemented at all.

As stated previously in Chapter 1, the Project is a component of the broader national energy planning of Ukraine. According to the 2030 Energy Strategy, the Project is an integral part of the planned "Southern 750 kV Backbone Transmission Line System" extending about 1000 km (connecting Khmelnitska NPP – Dniestrovska HPSP – Prymorska – Kakhovska – Zaporizka NPP) and including the Kakhovska Substation.

Furthermore, the construction of a 750 kV OL from ZNPP to Kakhovka is a specific part of the operational design of the ZNPP to enable the use of the full 6000 MW capacity of the plant (generation now limited to 5300 MW) and to stabilise the quality of electricity in the regions serviced by the network. The line completion was only halted in the early 1990's due to socio-economic changes as a result of the break-up of Soviet Union and ensuing lack of funds;the present Project is thus not per se a "new project", but rather the completion of an existing project. In fact, for about 40% of the route, the tower foundations were already built and numerous towers are standing (though no wires strung).

If the Project were to <u>not</u> be implemented, there would be no direct negative impacts on the environment, as the existing, unfinished components of the line do not pose any significant risks; also, the potential negative effects during construction and operation of the Project would be avoided (refer to the subsequent Chapter 6 describing the impacts). For example, the mostly temporary impacts such as the damage to fields and crops during tower construction would not occur; also, there would be no risk of bird collisions with the wires during operations. Thus, the current status of incompletion does not generate any positive environmental benefits, but avoids the negative impacts related to Project implementation.

From a socio-economic perspective, the non-implementation of the Project would have both positive and negative impacts. By not completing the Project, a number of negative potential impacts – mainly of local scale - would be completely avoided, such as:

- Temporary disruption and nuisance to villagers from noise, truck traffic and other construction activities;
- Restrictions to local landuse within the safety zone of the OL route;
- Visual-aesthetic impacts of new towers and cables.

The socio-economic benefits of the Project are mainly of a wider-scale. The overall stabilization of the ZNPP operations and the better integration of regional, national, and European-wide grid systems will improve the long-term quality of electric power service, meaning less frequency fluctuation and a lower risk of outages. Such instability poses risks for the use of all sorts of electrical equipment at industrial-commercial implications (and thereby threatening economic growth and jobs) and also at consumer levels (e.g. use of home appliances, PCs). Thus, the Zero-Option would prevent the realization of these positive impacts.

During the scoping meetings, questions were also posed whether the development of windpower and other renewable electricity sources in the region could preclude the need for the Project. The 2030 Energy Strategy also foresees the expansion of renewable sources across the country, and for example the favourable wind conditions of the Crimea and other Black Sea regions appear to offer promising potential. Biomass, geothermal and other sources are also addressed in the Policy. As based on experience in other countries, the successful implementation of renewables requires a very robust and flexible grid network to handle the fluctuations in renewable supply (in a number of Central European countries, the present bottleneck to growth of windpower, e.g. is not lack of suitable project sites or investors, but inadequate capacity of the transmission system and grid management to handle the fluctuating power input).

In summary, the Zero-Option of not implementing the Project would avoid the potential negative environmental and social impacts of the construction and operational phases. But on the other hand, this would prolong the current sub-optimal and sub-capacity status of the ZNPP operations and prevent the completion and efficient operation of both the local grid network and the national grid-backbone; this can be seen as a bottleneck to meet the modern electricity demands of consumers on par with other European countries. Likewise, the overall stabilisation of the grid would not hinder, but rather support the long-term expansion of renewables in southern Ukraine.

2. OTHER ROUTES BETWEEN ZNPP AND KAKHOVSKA

According to Ukrenergo engineers, during the original planning stages in the 1980's there were initial considerations of other route corridors, e.g. along the right bank of the Dnieper River. Some out-dated planning maps still exist showing various corridors. But these alternatives were quickly considered by Ukrenergo planners as being infeasible for various reasons, including the fact that they would have required multiple river crossings and/or have been of much greater length.

As these historical alternatives were determined many years ago to not be feasible and were discarded, no further specific environmental or social assessment is performed as part of this ESIA. In general, from environmental and social viewpoints, it is preferable to minimise the number of river crossings and to follow the shortest route that still avoids any sensitive landuses and populated areas.

3. OPTIMISATION OF PROPOSED ROUTES

The sections below describe the findings to date from the ESIA that may affect the further planning of the alignment of the main transmission line, diversions, substations and other structures. In any case, during the implementation of the ongoing/future detailed planning and construction measures, Ukrenergo will need to be aware of any new/unforeseen issues that may arise and that may require further fine-tuning and local deviations of the route alignments or facility locations to avoid or mitigate potential negative impacts of the Project (see Chapter 8, ESMMP).

Main 750 kV OL

As stated by Ukrenergo the existing route was selected during the 1980's planning because it is essentially the shortest connection between ZNPP and Kakhovka, taking into account the avoidance of villages. The routing of the proposed line is shown in Annex 1-1 (Routing Overview Map). For route selection at that time, the comments and recommendation of the various administration authorities were considered in the line route decision, and the current route alignment was confirmed and approved.

So far during the ESIA preparation, no hindrances have been identified which would induce a significant variation of the planned route. For example, the route circumvents the main populated areas of the towns and villages. Nevertheless, as part of the field reviews and baseline evaluation, several sensitive areas were identified along the route which may warrant local deviations ("micro-detours") to the existing plans. Such areas include, e.g.:

- Crossing of landscape reserve "Kairska Balka" (area of local importance);
- Crossing of landscape reserve "Urochyshche Bilozirske" (area of national importance);
- Proximity to housing at several villages/isolated farms (i.e. within the 250 m buffer zone for residential dwellings for the 750 kV line).

These sensitive areas are further discussed in Chapter 5 - Baseline and Chapter 6 – Impact Analysis of this Report.

330 kV Diversions

Two aspects were identified related to the 330 kV Novokakhovska – Kherson line diversion that may warrant future deviation from the existing plans.

- Planned designation of a portion of the Dnieper River area as a National Nature Park in 2010 at the location of the planned crossing by the 330 kV diversion; and
- Archeological site of local importance near Village of Lvovo at north side of the proposed Dnieper Crossing location (exact location to be confirmed during detailed planning – refer to ESMMP in Chapter 8).

As described in Chapter 6 and the Action Plan of Chapter 8, Ukrenergo will need to further review the planning for the river crossing with the relevant authorities regarding the park planning and the archeological site and, if needed, make the appropriate modifications to the existing planned alignment.

The alignment of the 330 kV Novokakhovska-Ostrovska line diversion runs parallel to that of the main 750 kV line. As discussed above, the ESIA evaluation revealed that several houses/farms may be within the buffer zones, and further review is warranted to determine if detours are required.

Substations and other structures

The two substations and the other related structures are an integral part of the Project; the safe and efficient operation of the 750 kV OL is not feasible without corresponding substations and other supporting infrastructure. The locations of the two substations are shown in Figure 4.1 below.

On a national level, some 76% of the key equipment at the substations is beyond its useful life expectancy and requires substantial rehabilitation and modernization (2030 Energy Policy). This is also the case with the existing Novokakhovska Substations of this Project. The existing 330kV Novokakhovska substation will be modernized with new equipment – no additional areas will be needed. It should be noted that at the time that the substation was first constructed in the 1950's, this location was on the outskirts of Novakakhovka town, and since then the town has expanded around the substation.

The new/rebuilt 750 kV Kakhovska substation is located to the west of Nova Kakhovka town council, at the territory of Dnipryany municipal settlement council in the Nova Kakhovka town council of Kherson oblast. As described in Chapter 2, this facility (substation and nearby housing facility at Novi Lageri Village) is already existing in a partly-built stage. There are no obstacles identified to date regarding the rebuilding the substation and completing the nearby housing areas at their existing locations. As shown in the figure, the substation is located well outside of the main populated areas and not in the vicinity of any protected or sensitive areas.

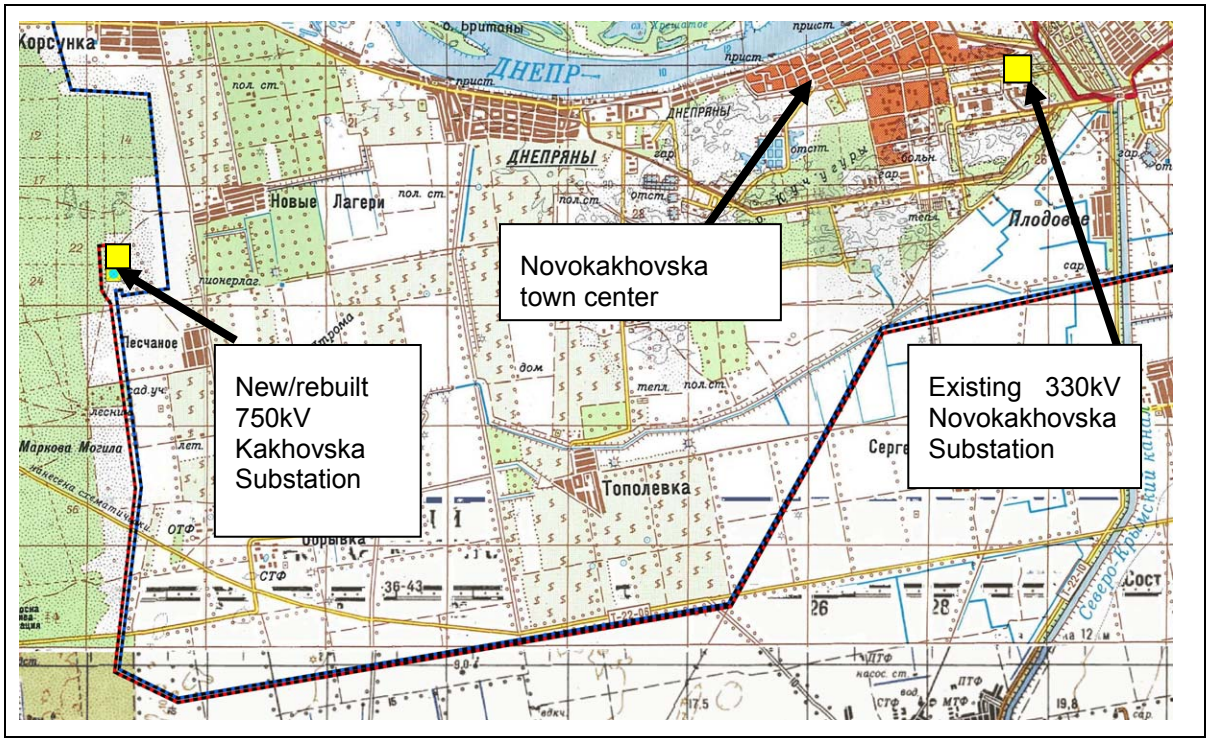

Figure 4-1: Location of existing Novokakhovska Substation and new/rebuilt Kakhovska substation.

No significant issues were identified during the ESIA that warrant a review or reconsideration of the planned locations for the maintenance, repair and storage site at Gornostayivka village, nor the 7-floor apartment building in Tavriysk.

V BASELINE

Note: The technical description of the Project in this Draft ESIA Report is based on the current design stage, which is not yet finalised. Therefore, minor changes to the technical details as included in this Report may occur in the future. Any substantial changes will be reflected in the final version of this Report.

1. GEOGRAPHIC UNITS AND GEOMORPHOLOGY

In terms of physiographic zoning, the planned transmission line and associated facilities are situated in the northern part of Black Sea Lowlands, in the steppe zone of Lower Dnieper River catchment area.

The landscape of the Project area is generally a flatland that is used for growing agricultural crops, with extensive irrigation due to the lack of natural precipitation. The relief of the Project area is shown in Figure 5-1. Main features of depression are the area of Energodar/Zaporiska ZNNP which is situated at a lower level towards Kakhovske water reservoir and some river valleys and side arms of the Kakhovske water reservoir such as Bairska Bilka. The differences of elevation at these areas are approximately 40-80 m.

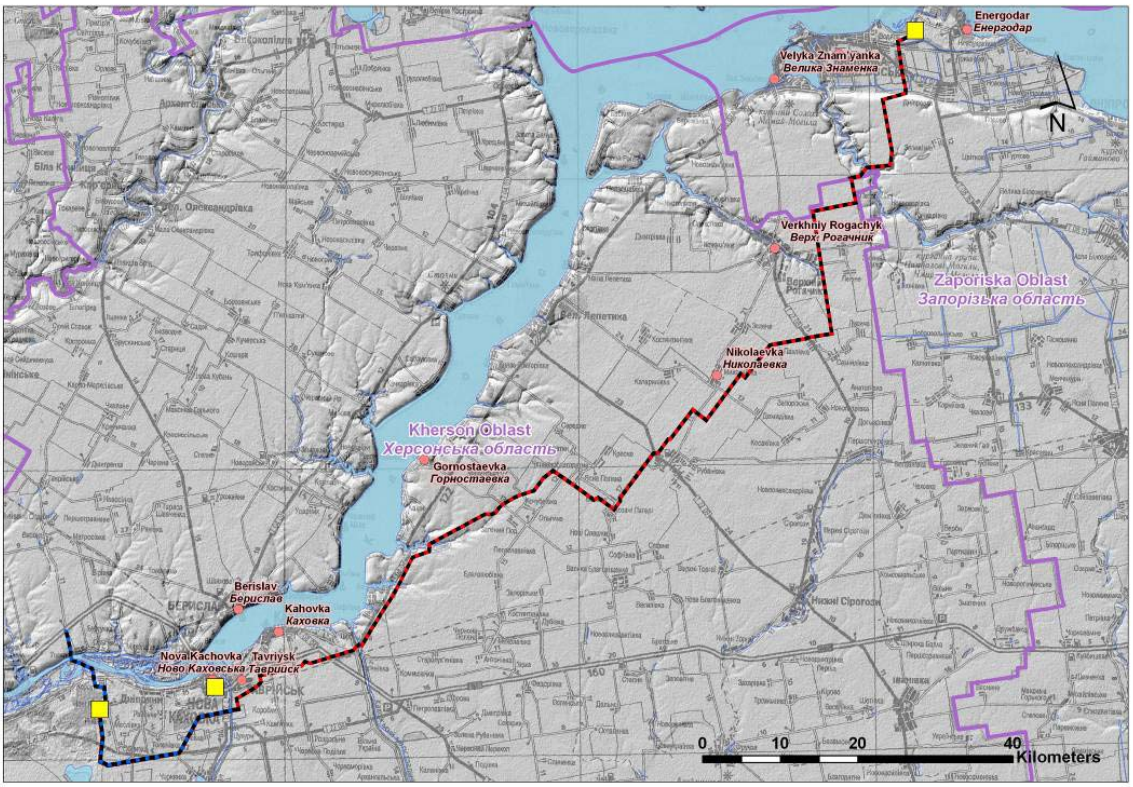

Figure 5-1: Map showing mainly flat relief of Project area and Project components (750 kV transmission line, 330 kV diversion and substations)

The 750 kV Zaporizka NPP – Kakhovska Substation transmission line route crosses the boundaries of two administrative regions, Zaporizhzha and Kherson Oblasts.

The major part of the transmission line, and all other facilities envisaged by the Project, are located in the north-eastern and central parts of Kherson Oblast.

The route starts at Zaporizka nuclear power plant, and goes in south-western direction through flat landscape, crossing large agricultural fields separated by trees planted to serve as a shelter against wind erosion and dust storms. The Project area also includes small rivers and gullies, small patches of planted forest, orchards, as well as urbanized landscape features such as automobile roads and railways, electric transmission lines, irrigation canals, industrial facilities, residential settlements, etc.

The proposed route has been selected by Ukrenergo planners so as to avoid any direct crossing of residential settlements.

The elevations in the Project area range between approximately 20 to 70 m.

Kakhovske water reservoir, artificially created on Dnieper River as a result of constructing the hydropower dam in Nova Kakhovka, is located to the west and north-west of the route. Dnieper River downstream of this dam has largely natural condition, with many small sand islands and associated wetlands.

2. GEOLOGY AND SEISMIC

The territory of the line route is located in the Black Sea Lowland where the crystalline base foundation bears a thick layer of sediment consisting of Cretaceous, Palaeogene, Neogene and quaternary deposits. The underlying rock formation of the region is part of the East-European pre-Riphean platform. Figure 5-2 provides a geological overview of the Project area. The majority of the Project area is underlain by red and greyish brown clays of the Pliocene, Neogene System (*N2ks*). The northern and southern part of the Project area is underlain by sandstone and limestone formations of the Miocene, to the north at the Energodar area this is followed by the Dniepropetrovskiy Complex made up of crystalline rock compositions (*P3mk1).*

Figure 5-2: Geological structure of the Project area. Map shows alignment of Project components (750 kV transmission line, 330 kV OL diversions). Source: Geological Map of Ukraine composed by the State Geological Services, 2000.

Within Ukraine seismic activity is most apparent in western, southwestern and southern areas, where two basic seismic regions, Carpathian and Crimean-Black Sea, are allocated. Based on publicly available information the southern region of main land Ukraine (except Crimea) is an area with low seismic activity and thus low seismic hazards[1].

In accordance with the State Standards (DBN V 1.1-12/206: Construction in seismic regions of Ukraine), seismic zoning in Ukraine is applied for three factors of earthquakes frequency: 500; 1000 and 5000-year earthquakes. The transmission line route is located within a seismic area of relatively low seismic risk, with a probability of 10% of seismic activity exceeding the level 5 (fairly strong)[2] on the MSK-64 scale during 50 years (frequency is once per 1000 years).

3. SOIL AND SUBSURFACE

The Project area has a varied soil cover. In the north, Southern Black Soils (also called Chernozems) on the loess deposits are common. In the south, there are

[1] According to European Seismologic Commission http://wija.ija.csic.es/gt/earthquakes/imatges/ESC-SESAME_poster_A4_75q.jpg

[2] MSK 64 = Medvedev-Sponheuer-Karnik scale, proposed in 1964. According to this scale level 5 is described as hanging objects move. First damages to buildings are described for level 7 (very strong) onwards.

Chestnut soils, along with Solonetzs and Solonchaks (soils with high sodium content and saline soils). These soils in the south have lower humus content than the Chernozems. Close to the south-western end of the transmission line route, there are several sand areas, including Oleshkivski sand dunes, an area earmarked for establishment of a national park (refer also to chapter 5.7).

Much of these soils are used for cultivation of various crops (sunflower, wheat, corn, vegetables, etc.). Up to 90% of agricultural lands are plowed lands, which is one of the highest rates in the country. Due to intense agricultural use of land, along with dry climate with frequent dry winds, much of the land in the area is prone to wind erosion and consequent degradation. In the Project area, Kakhovka and Verkhniy Rogachyk districts are particularly affected by wind erosion.

Water erosion of lands is also common, particularly in Beryslav and Velyka Lepetykha districts, as well as on the banks of Kakhovske water reservoir.

4. GROUNDWATER

The main aquifer commonly found in the Project area is water-bearing layers of Sarmat Tier. Most important for water supply purposes are the layers associated with lime-stones of Upper and Middle Sarmat.

Underground water supply from the aquifer is the main source of drinking water across Kherson Oblast. The boreholes bring in water from Pont-Meotic-Upper-Sarmat water-bearing layer, Upper-Miocen (Torton), Paleogen and Quaternary Period water-bearing layers.

There are approximately 2,500 boreholes in Kherson Oblast, although only 55% of them deliver water of the quality that conforms to the national drinking water standard.

Water-logging

Water-logging - both natural and induced by human activities - is one of the environmental challenges in the area. Water-logging is defined as high ground water table being less than 2m below ground level, too high to conveniently permit an anticipated activity such as agriculture. In agriculture, various crops need air (specifically, oxygen) to a greater or lesser depth in the soil. Water-logging of the soil prevents adequate soil aeration.

Approximately 11,297 km² of Kherson Oblast (about 40% of the total area) are affected by permanent water-logging, with most affected areas in the north-west, south, and Dnieper River delta. Water-logged areas in Kherson Oblast includes in total 195 settlements: 2 towns, 10 urban settlements and 183 villages. Compared to the year 1981, most of the administrative districts of Kherson Oblast have suffered an expansion of the areas affected by water-logging.

The main cause of water-logging progression is the intensive and long-term irrigation operations in the area, such as exploitation of irrigation canals and watering systems.

Mineralisation

In terms of mineralization and chemical composition, the main groundwater layers in the Project region are varied, and distributed unevenly. The water intake from underground sources in 2000 has had the following mineralization data:

Table 5-**1** Mineralization levels of groundwater

No	Mineralization, g/l	Percentage of samples, %
1	Up to 1	58
2	1-1.5	15
3	1.5-3	25
4	More than 3	2

In terms of geography of groundwater mineralization across the Project area and adjacent territories, the following distribution broadly applies:

- Up to 1.0 g/l - is mainly found in the Districts of Tsyurupynsk, Gola Prystan, Skadovsk, Kalanchak, as well as Towns of Kakhovka, Nova Kakhovka and Kherson;
- 1.0-1.5 g/l – Velyka Lepetykha, Verkhniy Rogachyk, Kakhovka, Nyzhni Sirogozy and Genichesk Districts, as well as territories adjacent to Kakhovske water reservoir and Dnieper River;
- 1,5-3,0 g/l – most of the remaining territories of Kherson Oblast (north and south-east);

More than 3.0 g/l – north-western part of Ivankiv District, southern part of Kakhovka District, northern part of Novotroyitske and Bilozerka Districts.

The protection of water resources, including groundwater, is governed by the Water Code of Ukraine.

5. SURFACE WATER

The Project area is located in the northern part of the Black Sea Lowlands, which has only minor surface waters, except Dnieper River.

Kakhovka water reservoir, established on the Dnieper River as a result of the construction of Kakhovka dam north of Nova Kakhovka, is located to the north and north-west of the OL route. Its water is used for various economic activities, including large-scale irrigation of the southern part of Ukraine.

Although the quality of water in Kakhovka reservoir has degraded due to various sources of pollution discharged upstream Dnieper River, it is still used as a source of drinking water by the local communities where other water is not available, or of inferior quality.

Other significant surface water bodies are summarized in the Table 5-2 below.

Table 5-**2** Surface waters which are crossed by the transmission line

No	Name	Location	Notes
1	Velyka Bilozerka River	North part of 750kV route	OL crosses the river
2	Rogachyk River	Verkhniy Rogachyk	OL goes nearby
3	Kairka gully and estuary	South-east of Kairy	OL crosses the gully, which is a protected area of local significance
4	Vesilyevka gully and estuary	North-east of Vasilyevka	OL crosses the gully
5	Kakhovsky trunk irrigation canal (see Figure 5-4)	South-east of Lyubimovka	OL crosses the canal
6	North-Crimean irrigation canal (see Figure 5-3)	South of Tavriysk	OL crosses the canal
7	Dnieper River	Between Korsunka and Lvovo	330 kV diversion of OL crosses the river
8	L'vove Reservoir	Northwest of L'vove	OL goes nearby
9	Small Pond	Upper Kairka Gully	OL crosses the pond
10	Small irrigation canals	Various locations	

The surface waters from Table 5-2 are shown in the Map in Annex 5-1. In a distance of 250 m from the transmission line no further subsurface waters have been identified.

Figure 5-3: North-Crimean irrigation canal view southwards

Figure 5-4: Kakhovsky trunk irrigation canal, view southwards

6. CLIMATE CONDITIONS

The climate in the Project area is temperate continental, dry, with relatively mild winter and hot, long summer. The average air temperature in summer is +22.4 °C, in winter −2.1 °C. Maximum summer temperature is +40 °C, winter −31.5 °C. The mean average temperature is +9.3 °C +9.8 °C, and has a reliable tendency to increase. The frost-free period is on average 179 days per year.

Average annual precipitation ranges between 300 and 420 mm, higher in the north and lower in the south. Over the last decade, the precipitation levels are increasing. Seasonal distribution of precipitation is uneven, with most of it in summer (up to 60 %) in the form of showers/thunderstorms which cause significant water erosion of the soils. Vegetation period lasts approximately 200 days.

Dry winds and dust storms are common features in the region, which are characterized by strong winds (more than 5m/s), low humidity (below 30 %) and high temperatures (above 25 °C). During dust storms over the previous several years, wind speeds up to 40 m/s were registered.

The prevailing winds in the area are easterly and south-easterly.

7. FLORA, FAUNA AND HABITATS

This section describes the relevant flora, fauna and habitats in the Project area. Firstly, the data basis is described. After that, the protected areas on national and local level are listed, followed by a description of the areas protected on international level (related to bird species).

The location of the protected areas is shown in the maps in Annex 5-2.

7.1. DATA BASIS

The evaluation is based on existing information on flora and fauna from various sources (national and international level):

- Information from Environmental authorities at Kherson and Zaporisha Oblasts on areas of local and national significance
- Information on Ramsar sites (Wetlands International)
- Information on Important Bird Areas (IBA) (BirdLife International)
- EBCC (European Bird Census Council) Atlas of European Breeding Birds (HAGEMEIJER & BLAIR 1997)
- Birds in Europe, incl. information from BirdLife International on inventory, trend and protection status for each European state (BURFIELD & VAN BOMMEL 2004)
- Handbook of Birds of the Soviet Union (ILICEV & FLINT)
- Internet research on avifauna data in Ukraine
- Information on areas of local and national significance

Information available for the time being was used in the framework of this study.

Note: The Ukrainian Society for the Protection of Birds (USPB) was contacted regarding baseline information, however at time of writing the report (June 2009) no answer was provided, yet. A response is anticipated in July 2009 and will be incorporated into the final report.

7.2. PROTECTED AREAS ON NATIONAL AND LOCAL LEVEL

Ukraine has adopted the necessary legislation to develop a national ecological network in line with the Pan-European Strategy for Protection of Landscape and Biological Diversity (1995) and the establishment of a Pan-European international ecological network. The main piece of legislation on this subject is the Law of Ukraine N1989-III "About all-state Programme for establishment of National Ecological Network of Ukraine for 2000-2015" dated 21 Sep 2001.

The Dnieper River forms one of the key ecological corridors in Ukraine and comprises a number of core ecological areas. This concept is currently being developed. Each oblast prepares regional maps of the core areas and corridors of the ecological network. Below is a map outline prepared for Zaporizhzha Oblast.

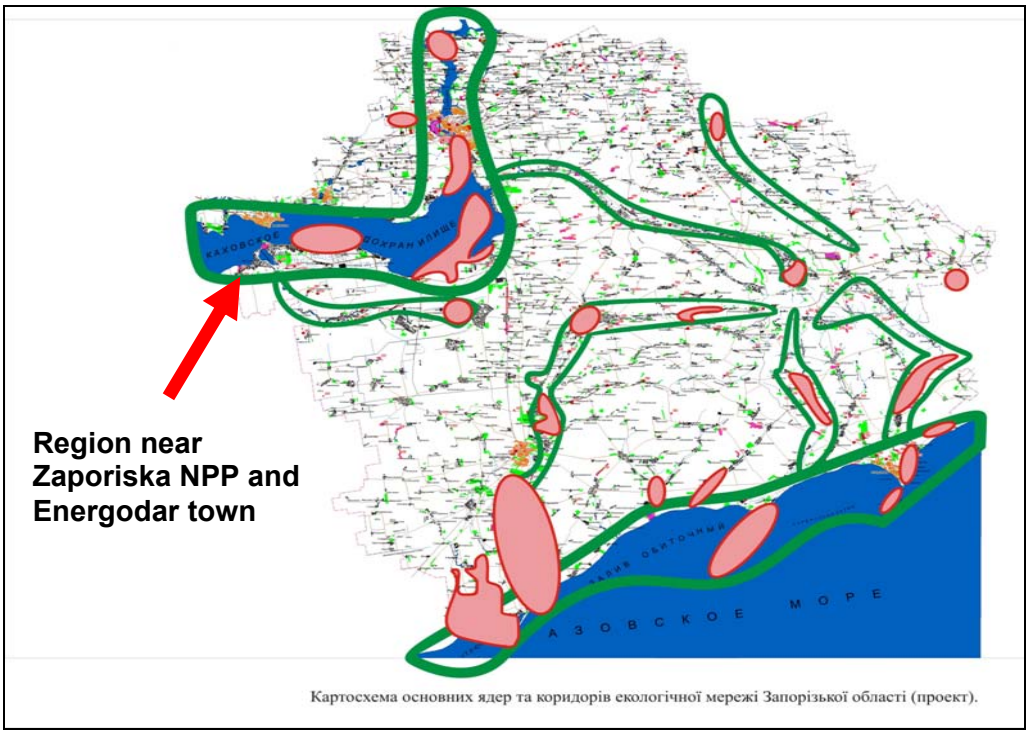

Figure 5-5: Outline of the Ecological Network in Zaporizhzha Oblast, pink areas represent core areas, green circles represent corridors of the ecological network clustering core areas based on a pattern of ecological interactions between core areas;

There is a variety of types of protected areas in Ukraine. Broadly, they can be divided into two types:

- Protected areas or conservation objects of national significance, such as biosphere reserves, national nature parks, zapovedniks, national zakazniks[3], etc.; and

- Protected areas or conservation objects of local significance, such as local zakazniks, nature monuments, parks, individual protected trees, etc.

In total, there are 11 protected areas of national significance and 66 protected areas/objects of local significance in Kherson Oblast. In Zaporizha Oblast, where the 750 kV OL route starts, there are 22 conservation objects of national significance and 288 conservation objects of local significance.

The protected areas located in immediate proximity to the transmission line route are presented in the Table below. Subsequently, the activities which are forbidden to be performed in the protected areas are summarized in a further table.

[3] Zakaznyk is a category of protected area in Ukraine with medium strictness regime. Commonly, construction or similar activities that can impact the area are forbidden within zakaznyk, except those required to protect the area itself. The lands are not withdrawn from the landowners or users; rather the protected status is given while the primary use of land is maintained. Each zakaznyk is governed by a set of Bylaws. Reference: Articles 25 and 26 of Law of Ukraine "About protected areas of Ukraine" No 2456-XII dated 16 June 1992

Table 5-3 Protected areas located in immediate proximity to the OL route

Ref No	Name	Category Area (ha) Year established	Description/species list	Purpose /Objective of protection	Location in relation to Project facilities
Zaporizha Oblast					
National significance					
13	Urochysche Bilozirske	Landscape *Zakaznyk* *390 ha* *2002*	The following species from the Red Book of Ukraine have been found: Flora: • Тюльпан гранітний (Tulipa graniticola Klok. et Zoz) • Ковила волосиста (Stipa capillata L.) • Ковила Лессінга (Stipa lessingiana Trin. et Rupr.) Fauna (insects): • Swallowtail (Papilio machaon) - Махаон • Predatory Bush Cricket (Saga pedo) - Дибка степова • Mammouth Wasp (Scolia maculata) Сколія-гігінт	• conserve and facilitate restoration of natural habitat; • protect wetland landscapes; • protect and restore genetic fund of fauna and flora (esp. species from Red Book of Ukraine); • sustain general ecological balance in the region; • disseminate environmental knowledge etc.	Located at the territory of Kamyanka-Dniprovska District of Zaporizhzha Oblast, next to the administrative boundary with Kherson Oblast and adjacent to the right bank of Velyka Bilozirka River. **Transsected by 750 kV OL**

Ref No	Name	Category Area (ha) Year established	Description/species list	Purpose /Objective of protection	Location in relation to Project facilities
Local significance					
110	Mixed broadleaf forest	Forest *Zakaznyk* *40 ha* *1993*	-	Protection of forest with rare plant and animal species (partly listed in Red Book of Ukraine)	Located approximately 2km to the south of Kamyanka-Dniprovska Town of Zaporizhzha Oblast. Approx. 3 km west of OL
113, 120, 121, 123	Tsilynna Balka	Entomology *Zakaznyk* 8 ha 1984	-	Protection and recovery of typical natural landscape of Southern Ukraine steppe zone as complex ecosystem, incl. rare species of insects from the Red Book of Ukraine.	Located on the lands of Novodniprovska Village Council, Kamyanka-Dniprovska District of Zaporizhzha Oblast and includes several independent locations. Different parts of this protected area are located between 0.5 to 3km to OL.
142	Virgin water-protection lands	Botanical *Zakaznyk* 7 ha 1980	-	Protection and recovery of typical natural landscape of Southern Ukraine steppe zone as complex ecosystem, incl. rare species of plants from the Red Book of Ukraine.	Located on the lands of Velykoznamyanska Village Council, Kamyanka-Dniprovska District of Zaporizhzha Oblast, and adjacent to the left bank of Velykha Bilozirka River (adjacent to Urochysche Bilozirske protected area) 1km north of OL.

Ref No	Name	Category Area (ha) Year established	Description/species list	Purpose /Objective of protection	Location in relation to Project facilities
143	Vodyanski and Ivanivski Sands-Kuchugury	Botanical Zakaznyk 3 ha 1980	-	Protection and recovery of typical natural landscape of Southern Ukraine steppe zone as complex ecosystem, incl. rare species of plants from the Red Book of Ukraine	Located on the lands of Vodyane Village Council, Kamyanka-Dniprovska District of Zaporizhza Oblast, approximately 1km to the north-east of the village. 1km west of OL
199	Vodyanski Sands-Kuchugury	Landscape *Zakaznyk 1238 ha 1984/1998*	-	Protection of pine forest planted in 1920, as well as overall plant and animal complex of the area.	Located on the lands of Vodyane Forest Enterprise, Kamyanka-Dniprovska District of Zaporizhza Oblast, at quarters No 2-5, 8, 11, 13-17, 19-22. **Transsected by OL**

Ref No	Name	Category Area (ha) Year established	Description/species list	Purpose /Objective of protection	Location in relation to Project facilities
Kherson Oblast					
National significance					
	None				
Local significance					
17	Korsunskiy	Zoology *Zakaznyk* 3357 ha 1978	Most part of this protected area is planted forest. Initially, the protected status of the area was established for a limited period of 10 years. Currently, the status is being reviewed by Kherson Oblast branch of the Ministry of environment and natural resources.	The purpose of this reserve is to facilitate protection and breeding of wild animals, such as elk, roe, wild bore, hare, pheasant and partridge. There are restrictions on economic or recreational activities in the area, and no activities that would damage the natural objects are allowed.	Located 2km to the west of Pischane village, Nova Kakhovka Municipal Council of Kherson Oblast. **Located close to 750 kV and 330 kV OLs as well as to Kakhovska 750 kV substation.**
21	Kairska Balka	Landscape *Zakaznyk* 665 ha (thereof 106 ha water area) 2001	All species below listed in Ukrainian Red Book. Flora: • Ковила волосиста (Stipa capillata L.) • Ковила Лессінга (Stipa lessingiana Trin. et Rupr.) • Ковила українська (Stipa ucrainica P.Smirn.) • Тюльпан бузький (Tulipa hypanica Klok. et Zoz) • Сальвінія плаваюча (Salvinia natans (L.) All.) • Гриб зморшок степовий (Morchella steppicola Zer)	• facilitate restoration of rare species of flora and fauna from Red Book of Ukraine; • preserve the natural conditions in the steppe, wetland and forest cenosises; • restore a variety of water species in the enclosed water body, to facilitate better conditions for feeding and resting of birds migrating through the Dnieper River ecological corridor.	Located 1.5km south east of Kayiry village. Located in IBA UA129 „Kakhovske reservoir (Kajiry village)" **Potentially transsected by OL**

Ref No	Name	Category Area (ha) Year established	Description/species list	Purpose /Objective of protection	Location in relation to Project facilities
			• Лишайник целокаулон степовий Coelocaulon steppae (Savicz) Fauna: • Scarce Swallowtail (Iphiclides podalirius (Linnaeus, 1758)) - Подалірій • Southern Festoon (Zerynthia polixena (Denis et Schifermuller, 1775)) - Поліксена (парусник-поліксена) • Large Wipe Snake (Coluber jugularis Gmelin, 1789) - Полоз жовточеревний • Tawny Eagle (Aquila rapax Temminck, 1828) - Орел степовий • Ferruginous Duck (Aythya nyroca (Guldenstadt, 1770)) - Чернь білоока • Crane (Grus grus (Linnaeus, 1758)) - Журавель сірий		
36	Krynkivska beaver settlement	Zoology *Nature Monument* 5 ha 1975	-	Beaver protection, study and environmental education.	Located to the north-west of Krynki village, Tsyuryupynsk District of Kherson Oblast. Approx. 4 km west to the line.
29	Old *Platanus* trees (3 trees 120 years old)	Botany *Nature Monument* *1967*	-	Tree protection, study and environmental education.	Located in Nova Kakhovka Town, in the central city park on the banks of Dnieper River. 2 km north of OL

Ref No	Name	Category Area (ha) Year established	Description/species list	Purpose /Objective of protection	Location in relation to Project facilities
30	Memorial oaks (2 trees of 100 years old)	Botany *Nature Monument 1970*	-	Tree protection, study and environmental education.	Located in Nova Kakhovka Town, in the central city park on the banks of Dnieper River. Approx. 1 km southwest of Novokakhovka substation.
60	Malokakhovskiy forest	Zapovidne Urochysche 177 ha 1979	-	Forest protection, study and environmental education.	Located on the left bank of Kakhovske water reservoir, approximately 1km to the west of Malokakhovka village, Kakhovka District of Kherson Oblast. Approx. 2.5 km northeast of Novokakhovska 330 kV substation.
	Dendropark Botanichniy	Botanical garden-park 9 ha 2006	-	Preserve plants valuable for steppe zone of Ukraine that have been introduced to the area from elsewhere, such ether, oil and medicinal plants.	Located at the following address: 1 Sadova Street, Plodove village, Nova Kakhovka Town, Kherson Oblast. 1 km north of OL and south of Novokakhovska 330 kV substation
	Lower-Dnieper	Planned National Nature Park approx. 12,800ha	The Law of Ukraine N1989-III dated 21 Sep 2001 "About All-state Programme for establishment of National Ecological Network of Ukraine for 2000-2015", among various other provisions, includes establishment of the "Lower-Dnieper" National Park within the period 2009-2011.Also, the Presidential Decree No 1129/2008 dated 01 Dec 2008 "About the expansion of the network and territories of national nature parks and other nature conservation objects" mentions plans to establish the National	areas of varying degrees of protection planned, from strict protection where no activities or public access is allowed, to areas with restricted recreational or economic use. Area important for fish spawning and feeding	The diversion from Novokakhovska-Khersonska 330 kV OL to Kakhovska 750 kV substation, as currently planned, will be **crossing the Dnieper River through the territory to be designated as national nature park** within the period 2009 to 2011 (cf. IBA UA066 „Kakhovske reservoir (Kozatski islands)")

Ref No	Name	Category Area (ha) Year established	Description/species list	Purpose /Objective of protection	Location in relation to Project facilities
			Nature Park "Lower-Dnieper". According to the information from Krson Oblast branch of the Ministry of environment and natural resources, it is expected that this park will stretch from Kozachi Lageri village up to Kakhovska dam, covering the water, islands and adjacent Dnieper river banks.		
	Oleshkivski Sands	No current status, protected area being established	The Presidential Decree No 1129/2008 dated 01 Dec 2008 "About the expansion of the network and territories of national nature parks and other nature conservation objects" mentions plans to establish the National Nature Park "Oleshkivski sands.	Protect the largest natural sand dunes in Europe – Oleshkivski Sands.	According to the information from Kherson Oblast branch of the Ministry of environment and natural resources, the park will include two areas, Kozachelagerska and Burkutska. The one closest to the Project, the Kozachelagerska area, will occupy 31,604 ha of land to the west-south-west of Kakhovska substation site. Approx. 5 km west of OL (330 kV and 750 kV), approx. 8 km southwest of Kakhovska substation. It is expected that "Korsunskiy" zoological zakaznyk, described above, will become part of this park (located adjacent to the TL and substation). The territory is planned to become a national nature park by approximately 2011.

Table 5-4 Activities forbidden in Protected Areas

Forbidden activities	Protected Areas												
	Urochysche Bilozirske	Mixed broadleaf forest	Tsilynna Balka	Virgin water-protection lands	Vodyanski and Ivanivski Sands-Kuchugury	**Vodyanski Sands-Kuchugury**	***Korsunskiy***	**Kairska Balka**	Krynkivska beaver settlement	Old Platanus trees	Memorial oaks	Malokakhovskiy forest	Dendropark Botanichniy
Construction of any structures that may impact the landscape and biodiversity, and not associated with protection.	x	X	x	x	x	x	-	x	-	-	-	-	x
Transfer of forest lands to other users.	-	-	-	-		x	-	-	-	-	-	-	-
Activities that may lead to changes in hydrology, hydrochemistry or soil cover.	x	X	x	x	x	x	-	x	-	-	-	-	-
Mining works of any kind.	-	X	x	x	x	x	-	x	-	-	-	-	-
Construct any roads, pipelines, dams, canals, ditches, etc.	-	-	-	-	-	-	-	x	-	-	-	-	-
Enter the territory by any mechanical vehicles, except those belonging to the landowner, controlling agencies or fire-fighters.	x	-	-	-	-	-	-	x	-	-	-	-	-
Activities that can damage the site or impact the ecological processes.	x	X	x	x	x	x	x	-	x	x	x	x	x

Legend: "x" symbolizes an activity forbidden in this protected area

7.3. PROTECTED AREAS ON INTERNATIONAL LEVEL

Whereas the protected areas on national and local level have different protection objectives of different species groups, the international protection areas are all related to the protection of birds.

400 bird species are present in Ukraine, of which 10 are worldwide endangered, 86 are important according to European criteria and 86 species are listed in the Ukrainian Red List.

The following table describes the protection areas of international importance, such as Important Bird Areas (IBA) and Ramsar sites (according to Ramsar convention) and the relevant bird species which fit the criteria of these international sites.

Table 5-5 Overview table of protection areas of international importance

Name of Protected area	Size (ha) Location	Species [English, Latin, Ukrainian name; max no. of breeding pairs (pairs) or individuals (ind)]	Relevance for Transmission Line
IBA UA115 „Kakhovske reservoir (Energodar)"	28,000 Directly north of Zaporisha NPP and the OL	**Breeding birds:** Bee-eater — Meriops apiaster — 100 pairs Little Bittern — Ixobrychus minutus — 150 pairs **Resting and migratory birds:** White-fronted Goose — Anser albifrons — 10,000 ind Greylag Goose — Anser anser — 2,000 ind Great Bustard — Otis tarda — Дрофа, дрохва, дудак — 60 ind Cormorant — Phalacrocorax carbo — 1,000 ind Common Crane — Grus grus — Журавель сірий — 300 ind Red-breated Goose — Branta ruficollis — 60 ind Goldeneye — Bucephala clangua — 1,200 ind Black-necked Grebe — Podiceps nigricollis — 1,000 ind Smew — Mergellus albellus — 1,000 ind	Important area for waterfowl, especially the reservoir, since most of the listed waterfowl species favours large and deep water areas. High numbers of little bittern suggest presence of wide shore areas covered with reed. The geese species and the bustard are estimated to be present mainly in the open areas located in the south of the IBA for foraging. Due to typical behaviour pattern of listed species planned OL can potentially have high impacts. **Relevant**

Name of Protected area	Size (ha) Location	Species [English, Latin, Ukrainian name; max no. of breeding pairs (pairs) or individuals (ind)]	Relevance for Transmission Line
IBA UA130 „Kakhovske reservoir (Knyazhe-Grigorivka village)"	32,000 ha 5 to 10 km distance to OL	**Resting and migratory birds:** Greylag Goose — Anser anser — 500 ind Red-footed Falcon — Falco vespertinus — 200 ind	Based on the available data area seems to be less important than neighbouring IBAs. Species expected to have connections to the other IBAs (commuting to these IBAs along Dnieper). Presumably geese use reservoir area and its eastern tributaries for roosting/sleeping, and commute to adjacent open areas for foraging. The Red-footed Falcon is an areal predator feeding large insects. Uses water areas and adjacent steppe areas for foraging. Due to the characteristics of the listed species in combination with the distance to the OL effects by OL unlikely. **Not relevant**
IBA UA129 „Kakhovske reservoir (Kajiry village)"	16, 000 ha Located in the southern part of reservoir. OL basses by in distance of 2 -3 m. OL crosses eastern tributary	**Breeding birds:** Bee-eater — Meriops apiaster — 200 pairs Little Bittern — Ixobrychus minutus — 100 pairs **Resting and migratory birds:** Bee-eater — Meriops apiaster — 1,000 ind Greylag Goose — Anser anser — 500 ind Common Crane — Grus grus — 500 ind	Although only few species listed, presence of further waterfowl and species preferring shores very likely due to the characteristics of the eastern tributaries. Conflicts with planned OL likely. **Relevant**

Name of Protected area	Size (ha) Location	Species [English, Latin, Ukrainian name; max no. of breeding pairs (pairs) or individuals (ind)]	Relevance for Transmission Line
IBA UA066 „Kakhovske reservoir (Kozats'ki islands)"	1,00 ha Located south of dam, crossed by OL	**Breeding birds:** White-taled Eagle Haliaaetus albicilla 3 pairs **Resting and migratory birds:** Greylag Goose Anser anser mit 1,500 ind Common Crane Grus grus Журавель сірий 400 ind Red-breated Goose Branta ruficollis 60 ind Part of planned national park at Dnieper.	Although only few species listed, presence of significant number of waterfowl of all types, of species preferring shores, of ciconiiformes (such as storks) and birds of prey very likely due to the characteristics and the structure of this Dnieper section comprising wide areas with ponds, floodplains, shallow waters and shallow shores and corresponding lowland riparian forests. Conflicts with planned TL likely. **Relevant**
IBA UA064 „Dnipro delta"	26, 000 ha 50 km southwest of OL	**Resting and migratory birds:** White-fronted Goose Anser albifrons 7,000 ind Coot Fulica atra 90,000 ind Greylag Goose Anser anser 5,000ind Mute Swan Cygnus olor 8,000 ind Cormorant Phalacrocorax carbo 10,000 ind Common Crane Grus grus Журавель сірий 700 ind Red-breasted Merganser Mergus serrator 300 ind Tufted Duck Aythya fuligula 5,000 ind Goldeneye Bucephala clangua 340 ind Mallard Anas plathyrhynchos 30,000-50,000 ind Pochard Aythya ferina 6,000ind	Not directly relevant due to large distance. However, huge avifaunistic relevance for resting and migration. Also Ramsar area. During migration period functional relations to the other IBAs upstream at the Dnieper and the reservoir (birds commuting between all these areas). **Not Relevant**

Additional Information Sources

Ukrainian Society for the Protection of Birds (USPB)

The Ukrainian Society for the Protection of Birds (USPB) was contacted, however at time of writing the report no answer was provided, yet (reply expected in July 2009). Below information available on their website[4] is summarized.

Table 5-6 Important Birds listed by USBP

Bird Species	Description	Relevance
Aquatic warbler Acrocephalus paludicola	500 – 600 pairs were counted in the most important area at Desna-Dnieper (2007). Due to distance to the Project area, effects unlikely	**Not relevant**
White-tailed eagle Haliaaetus albicilla	47 wintering individuals were counted for the total Dnieper basin. Thus, species is very likely to be present in the Project area (see above IBA Kozatski Island)	**Relevant**
Saker Falco cherrug Балобан, сокіл-балобан, кібець	Worldwide population is 7,200 – 8,800 pairs, of which approx. 280 – 300 pairs are present in Ukraine, mainly in southern part of the country (thus also expected in Project area). However, birds of prey not considered sensitive to OL (refer to chapter 6.5).	**Not relevant**
Red-breasted goose Branta ruficollis	Most important wintering areas of the red-breasted goose are the southern Ukraine and black sea region, up to 15,000 were counted (2003-2006)	**Relevant**

The Red-breasted goose is listed in the IBAs above and will therefore be considered in the evaluation of these IBAs. Saker and White-tailed eagle are birds of prey; usually birds of prey are not endangered by OLs due to their good 3D-vision and they can thus avoid collision. However, due to its significant size, the White-tailed eagle is considered relevant in a conservative approach.

Other source: Atlas of European Breeding Birds

Since limited information on bird species was available, an additional assessment of potentially present species was made based on the Atlas of European Breeding Birds[5]. The following table gives an overview on bird species sensitive to OLs and which are potentially present in the Project area including information on classification of European importance and state of endangerment (1 very important/endangered – 3 less), trend of population in Ukraine, number of breeding pairs and typical habitat. Since the spatial resolution of this method is quite low (50 km), it is not possible to conclude from the presence of a species in the wider area that the species is in fact present in the Project area and thus may be affected by the OL. However, this method gives a hint of what types of habitat should be evaluated in the impact assessment because the species typical for this habitat may be present in the Project area.

[4] http://www.birdlife.org.ua/eng/index.htm

[5] HAGEMEIJER & BLAIR (1997)

Table 5-7 Birds potentially present in the Project area

Species	Presence in the region	Classification of European importance*	Trend in Ukraine	No. of Breeding pairs in Ukraine	Typical Habitat
Bittern Botaurs stellaris	present	3	decreasing	10,000-15,000	Extensive cane brake/reed
Purple Heron Ardea purpurea	present	3	constant	6,000-12,000	Extensive cane brake/reed
White Stork Ciconia ciconia	present	2	constant	26,000-32,000	Open areas
Garganey Anas querquedula	present	3	decreasing	22,000-35,000	Silted areas of shallow water
Lapwing Vanellus vanellus	present	2	decreasing	65,000-125,000	Wet open area, areas of siltation
Corncrake Crex crex	potentially present	1	decreasing	80,000-150,000	Steppe, greenland
Little Bustard Tetrax tetrax	potentially present	1	increasing	100-110	Steppe, badland
Great Bustard Otis tarda	potentially present	1	constant	500-720	Steppe
Stone Curlew Burhinus oedicnemus	potentially present	3	decreasing	100-150	Steppe, badland

*Legend: 1 = Very Important/Endangered; 3 = Less Important

The species with a low number of breeding pairs should be considered in the impact assessment (< 1,000 breeding pairs). These are Little Bustard, Great Bustard and Stone Curlew which are usually found in steppe or badland areas.

8. SOCIOECONOMIC CONDITIONS AND LAND USE

The project facilities will be constructed in two administrative regions, Zaporizhzha and Kherson Oblasts. The Table 5-8 below presents population figures in the districts that are being crossed by the transmission line, and the largest towns located nearby. The population within districts ranges from 14,300 at Verkhniy Rogachyk to 72,300 at Tsyuryupynsk District. The biggest towns in the area are Energodar (56,200 inhabitants) and Nova Kakhovka (52,100 inhabitants). The average density of rural population in the Project area is approximately 40 persons per square km, and slightly higher in the built-up area adjacent to Tavriysk, Nova Kakhovka and Energodar towns.

Table 5-8 Population data in the Project area

Name	Population	Population density, people per km²
Zaporizhzha Oblast		
Kamyanka-Dniprovska District	45,800	35
Energodar Town	56,200	1,130
Kherson Oblast		
Verkhniy Rogachyk District	14,300	14
Velyka Lepetykha District	17,900	16
Gornostayivka District	21,900	22
Kakhovka District (excluding Kakhovka Town)	40,100	27
Kakhovka Town	38,200	-
Tsyuryupynsk District	72,300	40
Beryslav District	55,900	30
Nova Kakhovka Town	52,100	236

Sources: State Committee on Statistics http://www.ukrcensus.gov.ua/ Parliament of Ukraine http://portal.rada.gov.ua/

Average monthly salary and unemployment rate within the Project regions show levels at or near Ukrainian average (see Table 5-9). The average monthly salary of the Kherson Oblast is at a lower average as Ukrainian average (i.e. 77% of national average).

Table 5-9 Economic indicators in the Project area (April 2009)

	Zaporizhzha Oblast	Kherson Oblast	Ukraine average
Average Monthly Salary [UAH]	1823	1428	1845
Registered Unemployment Rate [%]	3.0	3.3	2.9

Source: State Committee on Statistics of Ukraine http://www.ukrstat.gov.ua, Kherson Oblast Administration http://www.oda.kherson.ua, Department of Zaporizhzha Oblast http://zapstat.r.zp.ua

The majority of people within the Project regions is of Ukrainian ethnic origin (82%) followed by the ethnic group of Russians (14.1 %). An overview of the various ethnic groups in the Kherson Oblast is presented in Table 5-10.

Table 5-10 Ethnic composition of the population in Kherson Oblast (2001)

No	Ethnic origin	Percentage of Total Population [%]
1	Ukrainians	82.0
2	Russians	14.1
3	Belarusians	0.7
4	Tatars	0.5

No	Ethnic origin	Percentage of Total Population [%]
5	Armenians	0.4
6	Moldovans	0.4
7	Turks	0.3
8	Crimean Tatars	0.2
9	Other nationalities	1.4
	Total	100

Source: Population Census, 2001

The alignment of the project is located in primarily rural areas characterized mainly by villages and farms. Main towns in the Project area are Energodar and Kamyanka-Dniprovska near Zaporizka NPP where the 750kV routing starts and Tavriysk, Kakhovka and Nova Kakhovka near the existing and new substation at the end of the 750 kV routing. Within the Kherson Oblast, the urban/rural population distribution is currently about 61% (672,000 urban population) to 39% (426,700 rural population).

The transmission line passes mainly through agricultural land. Main source of income in the Project area is primarily generated from agricultural land use. Grain, sunflower, vegetables and fruits are the main crops being cultivated. In addition, vineyards are found in the area south and south-west of Novokakhovka. A significant proportion of grain grown in the region, and much of sunflower oil being produced, is exported. The exports are facilitated by to the proximity of harbors at Southern Ukraine such as Kherson and Odessa.

Due to low precipitation levels in the region large areas are irrigated. An extensive irrigation channel system is operated in the area south of the Dnieper reservoir. As irrigation facilities also moving watering systems are used such as the "fregate" type moving watering systems. Figure 5-6 shows areas near the planned line route where those irrigation facilities were identified through an evaluation of satellite photographs.

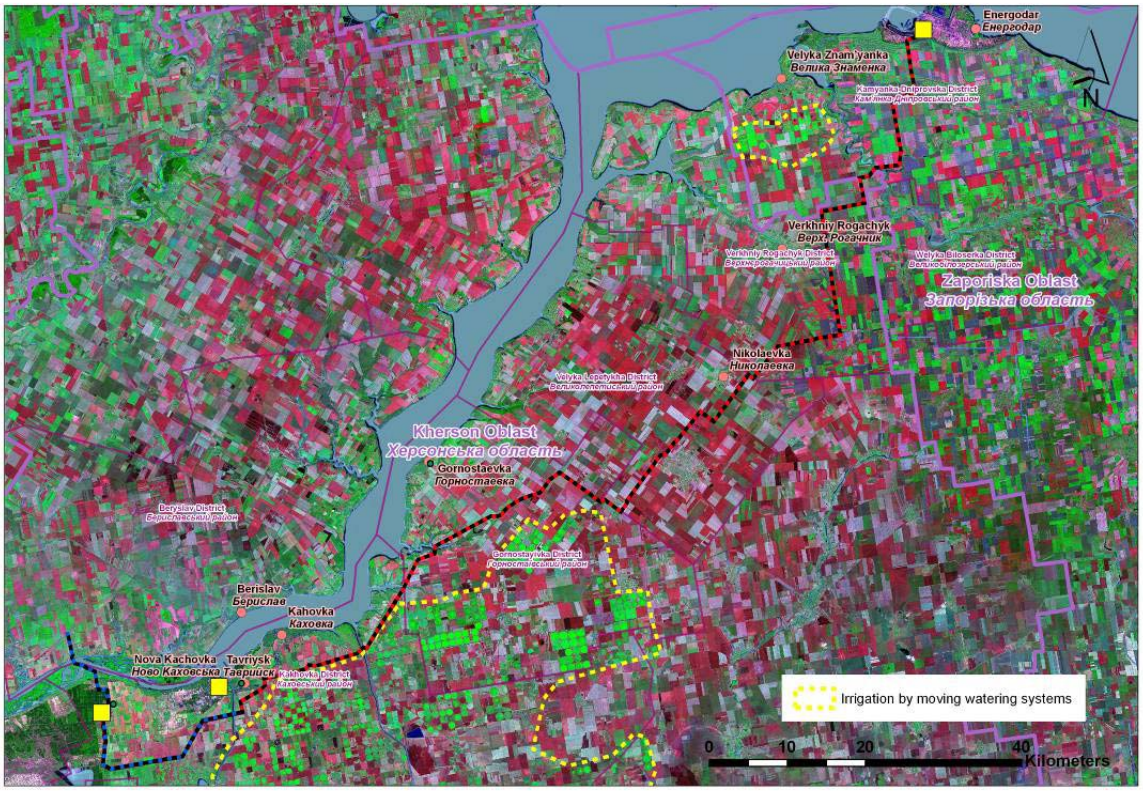

Figure 5-6:. Areas where moving sprinkler watering Systems (Fregate Type) are used for irrigation (yellow dotted line) as indicated in Satellite photographs

There are also limited mining activities in the region, such as clays suitable for manufacturing of bricks, limestone, peat, etc.

The characteristics of land use under the line route by district sections are presented in following Table 5-11.

Table 5-11 Land use along the Line Route Corridor (by district)

Oblast	Rayon	Land use	Line length [km]
1. 750 kV Transmission Line			
Zaporiska	Kamyanka-Dniprovska District	Agricultural Land	20.7
		Dunes and River Shore	2.8
		Industrial Area	0.2
		River Valley	1.6
		Water Body	0.1
		Vacant Land	0.4
		Total within district:	**25.4**

Oblast	Rayon	Land use	Line length [km]
Kherson	Gornostayivka District	Agricultural Land	34.4
		River Valley	1.1
		Water Body	0.2
		Total within district:	**35.8**
Kherson	Velyka Lepetykha District	Agricultural Land	27.1
		Total within district:	**27.1**
Kherson	Verkhniy Rogachyk District	Agricultural Land	39.3
		Total within district:	**39.3**
Kherson	Kakhovka District	Agricultural Land	49.5
		Agricultural Land (irrigated)	4.1
		Garden Land	1.1
		River Valley	0.2
		Water Body	0.4
		Total within district:	**58.1**
2. 330KV Ostrovska			
Kherson	Kakhovka District	Agricultural Land	25.5
		Vacant Land	1.6
		Water Body	0.2
		Total within district:	**27.2**
3. 330KV Kherson			
Kherson	Kakhovka District	Dunes and River Shore	2.0
		Vacant Land	6.9
		Water Body	0.1
		Wetland	1.6
		Total within district:	**10.6**
Kherson	Beryslav District	Agricultural Land	1.6
		Area near settlements	2.0
		Water Body	0.5
		Total within district:	**4.1**

Table 5-11 shows that the 750 kV line crosses agricultural land on 92% of a total of 190 km with the remaining 8% representing land area types such as dunes and river shores, river valleys, vacant land and areas near settlements. Further details are also shown in the maps of Annex 5-3 showing the land use within a 1,000 m corridor along the routing of the 750 kV line and 330 kV diversions.

9. LANDSCAPE AND SCENERY

The following three main types of landscape can be found in the line construction area:

- Flat landscape with large agricultural fields, separated by wind shelter green belts with trees and bushes.
- Vacant land, possibly used for pasture
- Dunes, patches of pine forest
- River valleys, canals and gullies with wetland vegetation
- Urbanised landscape: settlements, railway and automobile road crossings.

The landscapes the Project area is a rolling flatland that is used for growing agricultural crops. Man-made and natural obstacles that influence choice of the route are residential settlements, farms, small rivers, gullies and estuaries.

10. CULTURAL HERITAGE AND ARCHAEOLOGICAL SITES AND RECREATION

Kherson and Zaporizhzha Oblasts both have rich and diverse cultural heritage and archeological sites. There are 5807 objects of cultural heritage under state protection in Kherson Oblast, and 8031 – in Zaporizhzha Oblast.

Some of the cultural heritage and archeological sites in the area are being threatened by negative natural (such as water-logging, land slides) and direct human impacts. Particularly prone to these impacts are sites located at the banks on rivers or other water bodies. For example, approximately 10 hectares of Lyubymivske gorodysche site in Kakhovka District are threatened with water erosion and logging.

Archeological sites identified in the vicinity of the transmission line routing according to publicly available information are shown in Table 5-12.

Table 5-12 Known archeological sites in the Project area

№	Name of the site	Location	Comment
	Zaporizhzha Oblast, Kamyanka-Dniprovska District		
5	Kamyanske gorodysche (Кам'янське городище), site of early iron age	Kamyanka-Dnispovska	Village > 1 km from transmission line
6	Burial site Mamai-Mohyla (Курганний могильник Мамай-Могила), bronze age	Velyka Znamyanka village	Village > 1 km from transmission line
7	Burial site Solokha (Курганний могильник Солоха)	Velyka Znamyanka village	Village > 1 km from transmission line
	Kherson Oblast, Beryslav District		
3	Settlement in Lvove, early iron age, Skif culture	Lvovo village	Village at app. 150 m from diversion
	Kherson Oblast, Kakhovka District		
19	Lyubymivske gorodysche (Любимівське городище), early iron age, Skif culture	Lyubymivka village	Village > 1 km from transmission line

The exact location of the archeological sites is not known, but the information suggests that no archeological site is known near the proposed transmission line route except for Lvovo village where an archeological site, a skif culture settlement of the early iron age Lvovo was is situated less than 1 km from the transmission line routing (near 330 kV Novokakhovska-Kherson diversion). According to a letter to Ukrenergo (No. 1082 M, May 27, 2008) by Kherson Oblast Inspection for Protection of Cultural Heritage Objects, the planned routing of the Novokakhovska-Kherson diversion with regard to the subject of Lvovo was approved as per applicable legislation and no objection to land plots acquisition in the proposed area was raised.

Recreational potential

Most of the significant recreational resources in Kherson Oblast are located at the coasts of Black and Azov Seas. In the immediate project area, the most popular recreational sites are located on the banks of Dnieper River and along the waterside of Kakhovske water reservoir and related side arms (e.g. Kairska Balka) and in the forests (e.g. Korsunskiy forest, the mixed broadleaf forest near Kamenka). Popular recreational activities in the Project area include fishing, hunting and hiking (see also Figure 5-7).

Figure 5-7: Indication for fishing and hunting activity in the region

There are plans to further develop the recreational potential of the area with establishment of new protected areas with public access. Specifically, two new national parks are currently being established:

- Oleshkivski Pisky National Park (planned to become national nature park by approximately 2011); and
- Lower Dnieper National Park (planned to become national nature park by approximately 2010/2011);.

More detailed information about these sites is presented in the protected areas Section above (See Section 5.7).

VI ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Note: The technical description of the Project in this Draft ESIA Report is based on the current design stage, which is not yet finalised. Therefore, minor changes to the technical details as included in this Report may occur in the future. Any substantial changes will be reflected in the final version of this Report.

Methodology

Given the early planning stage of the Project, relevant data and information that could serve as a basis for this ESIA were in general limited. The local EIA (OVNS) and the Project Design (Proyekt) are presently being prepared by Ukrainian institutes on behalf of Ukrenergo with the reports planned for September 2009. Thus, the related information was not available at the time of the preparation of this ESIA, including digital data on the alignment of the transmission line (e.g. digital coordinates of tower locations).

The main sources of information for this ESIA were as follows:

- Field survey by ERM from May 14-19, 2009; during the survey the alignment of the planned lines was measured via GPS;
- Documents provided by Ukrenergo (see Document List Annex 6-1)
- Satellite Photos (Google map, Landsat);
- Publicly available maps (topographic maps 1:50 0000, geologic map 1:500 000, maps of areas of local and national significance, maps of IBAs etc.);
- Meetings with environmental authorities of Zaporizhzha and Kherson Oblast, May 19, May 27 and 28, 2009,

The above data were mainly collected and assessed during May and June 2009.

Given the limitations described above, the Environmental and Social Impact Assessment of this Report is based on the following key assumptions:

- Maps showing the assumed alignment of transmission lines and diversions were prepared by ERM, the routing was verified through satellite photographs. For the alignment where tower locations are already present, the accuracy of the map is considered to be relatively high. A contingency has to be considered for the remaining part of the lines.
- Along the alignment a zone of 300 m width was chosen for further assessment. This zone was based on a minimum distance of 250 m for any settlement (for 750 kV line) plus a 20% of contingency.

The impact assessment of this chapter refers to the following Project implementation stages:

- Planning Design,
- Construction;
- Operation and maintenance;
- Decommissioning.

Where applicable, subheadings were inserted accordingly. The Environmental and Social Management and Monitoring Plan (ESMMP) of Chapter 8 and related mitigation measures reflect these stages.

1. IMPACT ASSESSMENT GEOLOGICAL STRUCTURES AND SOILS

1.1. IMPACTS FROM CONSTRUCTION

For the project there will be no new construction material borrow sites. All materials for concrete generation and backfill with gravel and sand etc. will come from existing licensed operations.

The total area of temporary allotment for tower construction varies between 2,100 m² (suspension towers) and 5,200 m² (angle tension towers). The width of the strip for unfolding and mounting the wires is 21 m. Overall across the entire route, a total area of approx. 620 hectares will be temporarily needed for construction of the transmission lines (incl. space for tower erection and strip for wires). Additional space may be temporarily needed for access roads.

As the majority of the line route is under agricultural use with heavy machinery, the risk of soil compaction from construction works for the transmission line is considered negligible as the machinery used for construction will have similar impact magnitude.

The (re-)construction of the substations will take place in the present perimeter of the sites, no additional space is needed.

The repair and operation site (ROS) which will be established in the area of Hornostayivka settlement, Kherson oblast will be used during construction and operation of the line. It will cover an area of 0.9 hectares.

For the housing areas (covering approx. 5 - 6.5 hectares) the area needed for construction will be located within the existing areas at Novi Lageri settlement.

Contamination of the subsurface is possible during construction and installation works due to potential spills and leakages of oils from machinery or vehicles; such potential subsurface impacts are expected to be local and of minor extent.

1.2. IMPACTS FROM PHYSICAL PROJECT STRUCTURES

There are no geological deposits of commercial interest within 1 km from the line route or the substations.

Soil along the transmission line is impacted as a result of installing foundations at tower locations. Sizes of permanently withdrawn plots are determined by standards for various types of towers. On average, for the 750 kV line, land requirement for a suspension tower is 174 m², for an angle-tension tower is 360 m². For the 330 kV double circuit diversions, land requirement for a suspension tower is 52 m², for a tension tower is 81 m². This land cannot be used for agriculture.

For the 750 kV line about 40% of foundations have previously been built and are going to be replaced as part of this Project which reduces the amount of arable land loss.

No additional land is needed for the substations. The ROS will cover an area of 0.9 hectares. No additional land is needed for the housing areas (covering approx. 5 - 6.5 hectares) since they are already constructed (footprints already present) but buildings are not completed.

1.3. IMPACTS FROM OPERATION AND MAINTENANCE

No impact on geological or geomorphological aspects is expected from operation and maintenance of the transmission line, substations or other facilities.

No impact on soil is expected during operation and maintenance of the new facilities. Contamination of soil by oil products at the existing Novokakhovska substation is unlikely given that oil-containing equipment is equipped with emergency oil catchers and according to Ukrenergo, no soil contamination by oil has been observed in the past. During the site visit of ERM in May 2009, no oil spillage or significant stains were observed. For the new/rebuilt Kakhovka substation site, no equipment containing oils or hazardous chemicals was ever installed or used in the past. During the site visit of ERM in May 2009, no oil spillage or significant stains were observed. New equipment to be installed has secondary containment and potential for spills or leakages is considered to be low.

No hazardous equipment is planned to be used neither at the ROS nor at the housing areas.

1.4. MITIGATION MEASURES

At the temporarily construction sites, about 0.4 m thick fertile layer will be removed from the plots in advance and stored for re-vegetation (restoration of sites after construction or improvement of less fertile soils at other locations). Temporarily used areas will be restored, agricultural land will be re-cultivated and the micro relief will be re-established. Access roads will be carefully planned so that use of existing roads and pathways is maximized.

The potential for soil and subsurface pollution from construction will be minimized by proper construction site management. Once the construction contractor is awarded contract, he will be required to prepare a construction site management plan which includes aspects of proper handling and storage of materials and collection and disposal of solid and liquid wastes, measures to prevent soil erosion (e.g. appropriate slopes of earth piles, cover of earth piles to prevent water or wind erosion). Any contamination during construction (such as spills of oil products) will need to be cleaned up by the construction contractor.

2. IMPACTS ON DEEP GROUNDWATER

2.1. IMPACTS FROM CONSTRUCTION

No impacts on deep groundwater are anticipated. Even in areas with relatively high groundwater table, as in the widespread waterlogged areas, the permanent construction works will comprise only the foundations for the towers with limited footprint and that will not have an impact on the aquifer.

Direct ingress of contaminants into near-surface aquifers is possible during the construction process, during foundations assembly and piling in particular (e.g. due to potential spills and leakages of oils from machinery or vehicles, as discussed

above for soils). The significance of such impacts is expected to be small, limited to the area adjacent to the line towers.

No extensive groundwater pumping for draining the foundation-excavation pits will be necessary.

2.2. IMPACTS FROM PHYSICAL PROJECT STRUCTURES

The structure which are placed into the ground for foundation purposes are only limited in size. They reach into the groundwater only where the groundwater is near the ground level, e.g. in waterlogged areas, near surface waters like rivers und gullies.

2.3. IMPACTS FROM OPERATION AND MAINTENANCE

No impacts on groundwater are expected from operation of the transmission line. Similar impacts (such as direct ingress of contaminants into near-surface aquifers) as from construction but at a lower scale may also occur during transmission line inspection and maintenance.

The new equipment which will be installed at the two substations has a low potential for impacting groundwater, as the equipment is/will be sealed and/or will have the obligatory oil spill secondary containment facilities.

2.4. MITIGATION MEASURES

No specific mitigation measures are required. From construction activities no particular risk for groundwater arises provided that fuel and lubricants are stored and handled with diligent care. The contamination of groundwater will be avoided through the application of best practice during construction and site management during operation of the line, including the management of subcontractors. This will be properly addressed in the construction site management plan which includes aspects of proper handling and storage of materials and collection and disposal of solid and liquid wastes. Any spills during construction will need to be cleaned up by the construction contractor.

3. IMPACTS ON SURFACE WATERS

3.1. IMPACTS FROM CONSTRUCTION

The line route directly crosses several water bodies as described in the Baseline. Crossing conditions are set forth in The Electrical Equipment Arrangement Guideline (PUE), see in section Impacts from physical Project structures below.

The Construction activities, in particular conductor stringing, are not expected to have adverse impacts on the water bodies, as boats will be used to reach the opposite bank when installing conductors over the rivers and smaller surface waters will be circumvented.

Temporary contamination of the surface water may occur due to runoff from construction areas during the construction of the transmission line. Related contaminants may comprise:

- Soil particles (turbidity)
- Fuel or oil leaks
- Paints and solvents
- Construction waste and domestic garbage

3.2. IMPACTS FROM PHYSICAL PROJECT STRUCTURES

The routing of the lines conforms to the necessary distances to surface waters which are as defined as airspace over the surface of water bodies limited by vertical planes on both sides at distance from the outermost conductors. The distance for navigable waters is 100 m, for non-navigable waters it is set at the same distance as for overhead transmission line that are located overland (7.5 m). The structures related to the Project will not have a direct impact on the quality or usage of surface waters or local hydrologic characteristics.

Pursuant to Paragraph 8 Article 85 of the Water Code of Ukraine and Resolution of the Cabinet of Ukraine "On Approval of the Procedure for Use of Water Fund Lands" No.502 of 13.05.96, it is not prohibited to construct transmission lines within boundaries of water objects. Relevant normative documents apply where the line crosses or approaches water bodies. The angle at which it crosses the water bodies is not subject to regulation. Distances between towers in areas where the line crosses water bodies are determined at the design stage. The minimum distance between the sagging part of the wires and the water surface is 7.5 m (in non- navigable waters), as per the normative documents (The Electriacal Equipment Arrangement Guideline (PUE) 2006. There are no international or European standards with regard to minimum clearance height in navigable waters. In Germany, the clearance height is determined according to the kind of navigation on the surface water and has to be approved by the respective authority. The minimum height of the wires for the 330 kV crossing of the Dnieper River (navigable water) is to be calculated in the design stage.

3.3. IMPACTS FROM OPERATION AND MAINTENANCE

No impacts on surface waters from operation of the transmission line or the substation facilities are expected.

3.4. MITIGATION MEASURES

The routing of the line is in conformance with the necessary distances to surface waters. The minimum height of the lines at the Dnieper Crossing must be identified at the design stage.

The contamination of surface water will be avoided through the application of best practice during construction and site management during operation of the line, including the management of contractors. This will be properly addressed in the construction site management plan which includes aspects of correct handling and storage of materials and collection and disposal of solid and liquid wastes. Any spills during construction will need to be cleaned up by the construction contractor.

4. IMPACTS ON AIR AND CLIMATE

4.1. IMPACTS FROM CONSTRUCTION

During construction, short term and localised air impact might occur from dust from the working areas and engine emissions from the construction and transport vehicles.

4.2. IMPACTS FROM PHYSICAL PROJECT STRUCTURES

The physical structures which will be erected for the transmission line or the construction and the extension of the substation, due to their limited physical extent, do not pose any wind barriers or otherwise significantly influence local air flow or quality.

4.3. IMPACTS FROM OPERATION AND MAINTENANCE

During operation of a transmission line, there are no significant emissions to air (with gases, aerosols etc.). The corona effect might lead to insignificant production of Ozone (O_3) in the proximity of the conductors during wet weather conditions.

There are no significant operating emissions from the substation facilities. There is emergency ventilation installed, which is intended to remove excessive heat from the environmentally safe technological equipment (panels with meters and microprocessor devices or boxes with air-tight vacuum switches). The new equipment for the substations includes the installation of hermetically sealed gas-filled (sulphur hexafluoride - SF6) equipment such as switches and transformers. SF6 is an inert and non-toxic gas, but if released has a very high global warming potential.

4.4. MITIGATION MEASURES

Adoption of modern construction practices to avoid dust emission during construction phase, such as water-spraying.

Ensure that all motorized equipment is outfitted with the appropriate exhaust filters, catalytic converters etc as per the current standards and regulations.

Appropriate handling of the SF6 gas will be implemented according to manufacturer's instructions and international best practice guidelines (e.g. CIGRE guideline no. 117 on SF6 recycling and handling, published 1997, or US EPA guidelines, IFC - EHS Guidelines, Sector Power Guidelines for Electric Power Transmission and Distribution, 2007).

5. IMPACTS ON FLORA, FAUNA AND HABITATS

Since no field survey was carried out, the available baseline data of Chapter 5 gives only a rough overview on the location of single species. Thus, potential impacts by the project facilities are considered when the project crosses a dedicated protected area.

In contrast to flora, fauna species are mobile to a certain extent. Out of the fauna species, birds show the highest mobility and certain bird species are sensitive to OLs. Therefore the study area was extended (see below).

Bird species show typical behaviour and local migration patterns. For this impact assessment, the typical patterns of the bird species listed in the referenced information sources were compared with the existing information on natural habitats and land use.

5.1. PROTECTED AREAS ON NATIONAL AND LOCAL LEVEL

The study of project materials show that the route of TL 750 kV gets close to, or possibly crosses the territories of three zakazniks, Urochyshche Bilozirske, Vodyanski Kuchugury ("Sands"), and Kayirska Balka, which do not have their boundaries marked on the ground (see maps in Annex 5-2). In addition, there is an Important Bird Area "Kakhovske Water Reservoir. Kayiry Village" (IBA UA 129) in the vicinity of Kayirska Balka.

Zakaznyk Vodyanski Kuchugury was established in 1984. The initial TL route was approved by all stakeholders, and a part of the route that goes through this territory was constructed in the early 1990s, State Land Acts were received. The other two zakazniks were established in 2001 and 2002, which means this has taken place after the initial route design, approval, land acquisition and construction of TL 750 kV. The State Land Acts for plots for all 750 kV OL towers were obtained by Ukrenergo.

Each of these protected areas is governed by its Regulations that include references to Articles 25 and 26 of Law of Ukraine "About protected areas of Ukraine" No. 2456-XII dated June 16, 1992. The protected area has limitations on development and full agreement with National legislation needs to be attained.

Any issues related to the crossing of these territories by the 750 kV OL and potential impacts mitigation measures should be addressed at the design and approval stage of the Project.

Based on the available species data for the local protected areas, the OL crossing of Vodyanski Sands and Urochysche Bilozirske is anticipated to have minor impacts on flora and fauna, since mainly plant species and insect species are mentioned as important species. The objective of the protection of Vodyanski Sands is mainly related to the protection of the pine forest in the sand area in order to avoid erosion of the sands. There is already another 750 kV line running through the protected area, and the new line is planned in bundling with the existing one. The towers of the planned OL are already built in parallel (cf. figure below). Only at Kairska Balka are bird species mentioned which might be impacted by the OL

Figure 6-1: View on Existing OL and Planned OL (towers already built) at Vodyanski Sands

Figure 6-2: View towards the river valley of the Velyka Bilozerka river

The planned 330 kV Novokakhovska-Khersonska OL diversion, as well as a part of the 750 kV OL and Kakhovska 750 kV SS, are located close to the Korsunskiy zakaznik protected area (partly directly adjacent to the borders of the area). The planned National Park Oleshkivski Sands is located approx. 8 km southwest of the Kakhovska substation and the minimum distance to the 330 kV OL will be approx. 5 km. It is expected that Korsunskiy zakaznik will be included into this national park. Based on the species list available for Korsunskiy zakaznik, no significant impacts are anticipated for the mentioned mammals or bird species (pheasant and partridge are considered not to be affected by the 330 kV OL). However, it is recommended to coordinate with the local environmental authorities due to the close distance of the 330 kV OL to the protected area.

The 330 kV Novokakhovska-Khersonska OL diversion also crosses the Dnieper River in an area which is planned to be designated as National Nature Park in the future. Potential impacts on birds and fishes (in case tower locations are not on land) may occur and are assessed in the following section.

5.2. PROTECTED AREAS ON INTERNATIONAL LEVEL

Potential Effects of overhead lines on Birds

OLs can affect birds in various ways, and different bird species have different sensitivities to the lines. In the following, the anticipated environmental effects of high voltage transmission lines on birds are listed. The identification of the anticipated effects is based on several investigations carried out in Western Europe, especially Germany[1]. The effects are evaluated as to their relevance for the Project.

[1] cf. ALTEMÜLLER et al. 1997, BALLASUS & SOSSINKA 2002, BERNSHAUSEN et al. 1997, 2000, BRAUNEIS et al. 2003, HEIJNIS 1980, HOERSCHELMANN et al. 1988, KOOPS 1997, KREUTZER 1997, PNL 2001, 2008, RICHARZ & HORMANN 1997, SUDMANN 2000)

Table 6-1 Anticipated Effects of OL on Birds

Anticipated Effect	Description	Relevance
Land use (by physical structures or during construction)	Land use by Project facilities (towers, substation etc) and land use for construction lead to reduction of the size of habitats. However, land use by towers very limited, land use during construction temporarily limited.	Not relevant
Decrease of habitat quality due to limitation of height of trees in sanitary protection zone	Potential effect on bird species using high woods for nesting (such as rare colonial birds or birds nesting only in matured woods). Given the rare presence of woods in the project area, bird species using these wood habitats are also considered rare and thus sensitive.	Relevant
Decrease of habitat quality due to avoiding the surrounding of the OL	Some bird species (such as goose) avoid the close surrounding of an OL up to 100 – 300 m distance[2].	Relevant
Disturbance by construction activities	Usually no significant effect since construction activities can be limited to certain periods in sensitive areas. However, route has substantial length of which significant sections are located in potential bird habitats. Potential disturbance of single bird species might happen up to a distance of 100 to 300 m to the OL during construction (sometimes even more)3.	Relevant
Bird collision with OL	Bird collision mainly reported for large and heavy birds with poor manoeuvrability and having a limited 3D-vision. Especially critical when flying in flocks[4]. Main species groups are goose, swans, all waterfowls, ciconiiformes (such as storks), shorebirds, seagulls, bustards. Birds of prey usually have very good 3D-vision and are therefore not considered relevant. As conservative approach only very large eagle species (such as white tailed eagle) are considered.	Relevant
Electrocution	OLs of that voltage usually have significant distances of the current-carrying wires. Not considered relevant[5].	Not relevant

Birds are very mobile species and move around within their home range during the day to perform different actions (e.g. feeding, roosting/sleeping). The size of the typical home range varies from species to species and may extend the borders of a given bird habitat or protected area. Thus, not only the bird species located in

[2] Cf. BALLASUS & SOSSINKA 1997, KREUTZER 1997

[3] SCHNEIDER 1986, SCHNEIDER-JACOBY et al.1993, GÄDTGENS & FRENZEL 1997, SPILLING et al. 1999, SCHELLER et al. 2001, WILLE & BERGMANN 2002

[4] BERNSHAUSEN et al. 1997, 2000, BRAUNEIS et al. 2003, HEIJNIS 1980, HOERSCHELMANN et al. 1988

[5] HAAS et al. 2003

protected areas which are dissected by the line need to be considered but also bird species located in protected areas with a certain distance to the line. The following table gives an overview of the area which needs to be considered in the impact assessment depending on the bird species, action performed by the bird, and anticipated effect:

Table 6-2 Affected Impact Areas for Birds

Anticipated Effect	Description	Affected Area
Decrease of habitat quality due to limitation of height of trees in safety zone (SZ)	Cutting of trees may be necessary in forest areas in safety zone (SZ). Significant impacts may happen on known nesting sites/ or huge resting areas in woods located in SZ. No effect on bird populations in forests outside SZ.	Bird species nesting in woods located in safety zone (SZ)
Decrease of habitat quality due to avoiding the surrounding of the OL	Affects nesting and feeding of birds. Thus, nesting bird populations dissected by the line and nesting bird populations in a greater distance but whose typical average home range is reaching the line needs to be considered. For evaluation of the home range, not only the distance but also the characteristics of the area needs to be considered (e.g. location of further feeding areas) since closer feeding areas are preferred to farer ones ("optimal-foraging theory"6).	3000 meter for nesting large birds (birds of prey, grey heron, spoonbills, storks, goose, cormorants, seagulls and terns). 5000 meter for "guests" outside breeding time (more mobile when not breeding) such as migrating and resting birds spending significant time periods in the area.
Disturbance by construction activities	Affects home range of species (see above).	3000 meter for nesting large birds, 5000 meter for guests (see above)
Bird collision with OL	Affects home range of birds, especially nesting and foraging birds	Due to lethal effect, distance for nesting large birds (see above) enhanced to 5000 meter. 5000 for guests (see above)

Note: The available information on bird populations is limited, especially regarding spatial distribution of single species. No information on exact location of single individuals or nesting sites is available. Thus, the potential of the habitats is assessed in principle. It is recommended that additional avifaunistic information (surveys etc) is considered in the detailed planning to optimize mitigation measures.

For each of the relevant bird protection areas (IBAs), the above mentioned four relevant effects identified for this Project are evaluated in the following table (the relevant mitigation measures are further elaborated in Table 8-1):

[6] KREBS & DAVIES 1978; NEWTON 1979, CODY 1985, BLOMQUIST & JOHANSSON 1995, SCHELLER et al. 2001

Table 6-3 Impacts on Important Bird Areas (IBA)

Name of Protected area	Decrease of habitat quality due to Limitation of the Height of Trees	Decrease of Habitat Quality due to Avoidance 100 – 300 meter area at the OL	Disturbance during Construction	Risk of Bird Collision
IBA UA115 „Kakhovske reservoir (Energodar)"	Crossing of small forest areas in the North of the OL. Based on available IBA data, presence of bird species nesting in woods unlikely. Impacts unlikely Best practice: In case additional information at a later stage reveal the presence of nesting colonies of herons, cormorants or roost of birds of prey (esp. white-tailed eagle), measures to mitigate impacts on birds should be taken. .	Relevant for geese. Based on current avifaunistic knowledge, relevant for White-fronted Goose and Bean Goose (Anser fabalis); as conservative approach also for Red-breasted Goose assumed since it is globally endangered. No effects on Greylag Goose known. Since the OL runs very close in parallel to two existing 750 kV OLs no significant additional impact expected. Minor impact.	Major parts of listed species sensitive to disturbance, especially during breeding period. However, for the water birds and birds living at the shores, it is considered unlikely that they are present along the OL route. Impact unlikely. Birds species preferring open areas (e.g. geese, bustards) are assumed to be present along the line and they are sensitive to construction disturbance. Bee-eaters are reported breeding in the area, however they are considered not be sensitive against construction disturbance (provided minimum distance to nest of at least 100 meter). Non-breeding birds present for wintering purposes may be disturbed. In case additional information at a later stage reveal the presence of nesting colonies of herons, cormorants or roost of birds of prey in the forest, these species may be disturbed by construction activities. Significant impact on breeding birds	Relevant for all listed species. Due to location of the OL related to the water areas it is very likely that water birds will perform frequent commuting flights in East-West direction and will therefore cross the northern most part of the OL (10 km) often. Also species preferring open areas (e.g. geese) will cross the line often since the commute to the open areas in the northern part of the line. Due to the presence of the existing line, the additional risk for bird collision is considered moderate provided that both lines run in parallel and have almost similar shape. Moderate impact on waterfowl and bird species preferring open areas. Mitigation: Ensure that new and existing lines run very close in parallel and have the same dimensions (similar height, similar tower locations and thus similar wire sagging). Reduction of bird collision risk through bird markers of the Northern most 5-10 km OL section and the existing line in the bundling

Name of Protected area	Decrease of habitat quality due to Limitation of the Height of Trees	Decrease of Habitat Quality due to Avoidance 100 – 300 meter area at the OL	Disturbance during Construction	Risk of Bird Collision
			(herons, cormorants, birds of prey potentially breeding in forest) likely during breeding period. Significant impacts on wintering birds preferring open areas (geese and bustard) likely. Mitigation: Perform construction activities along the northern most 5-10km (approx. tower no. 1-25) not during breeding period and not during winter time. Thus, best period for construction is August to November.	sections.
IBA UA129 „Kakhovske reservoir (Kajiry village)" Kairska Balka (area of local significance)	Cutting of trees may happen in gallery forest areas present along the shores of Kairky estuary and Vesilyevka estuary. Effects on listed species unlikely at Kairky estuary (species not breeding in woods). At Vesilyevka estuary OL runs in parallel to existing line, thus it is assumed that no significant tree	Listed species considered not to be sensitive to this effect. Impacts unlikely	Species listed in IBA and local protected area considered sensitive to this effect. At crossing of Kairky estuary significant impacts likely on species breeding in shallow water and at the shores. Significant impacts on species breeding in woods likely (if these species are present, cf. left column on limitation of tree height). Potential impacts on resting and wintering birds considered minor due to short length of this section (OL crossing the water) and thus short construction period. Significant impacts on breeding birds likely (esp. at shallow water and	Species listed in IBA and local protected area considered sensitive to this effect. Risk for collision very high a crossing of surface water (Kairky estuary). Significant impact due to collision risk at surface water crossing (Kairky estuary). Mitigation: Because of construction limitations, decisions on the matters related to 750 kV OL routing across these territories will be completely agreed, according to national legislation, in the design and approval stage.

Name of Protected area	Decrease of habitat quality due to Limitation of the Height of Trees	Decrease of Habitat Quality due to Avoidance 100 – 300 meter area at the OL	Disturbance during Construction	Risk of Bird Collision
	cutting is necessary. Impacts unlikely Best practice: In case additional information at a later stage reveal the presence of nesting colonies of herons, cormorants or roost of birds of prey (esp. white-tailed eagle), measures to mitigate impacts on birds should be taken.		shores). Mitigation: Construction at the crossing of surface water outside breeding time (breeding period is usually between April to July).	
IBA UA066 „Kakhovske reservoir (Kozatski islands)"	No forests present in the area of Dnieper crossing. Impacts unlikely Best practice: In case additional information at a later stage reveal the presence of nesting colonies of herons, cormorants or roost of birds of prey (esp. white-tailed eagle) on single trees,	Effect not considered relevant at surface water areas or shore areas. Impacts unlikely	Major parts of listed species sensitive to disturbance. Due to complex conditions, the presence of a great variety of species is expected, such as breeding birds, resting birds and wintering birds. Thus, significant disturbances are very likely throughout the whole year. Significant impacts on variety of bird species throughout the year. Mitigation: Construction at the crossing of surface water outside breeding time (breeding period is usually between April to July).	Relevant for all listed species. At the Dnieper crossing very high risk for bird collision. This is caused by the following: ▪ Important resting area for birds ▪ Important migration route for birds in the direction Dnieper delta and Black Sea where a very high variety of species sensitive to bird collision risk are present ▪ Risk for migrating birds is even bigger since they do not know the area so well (birds staying in an area for a longer time get to a certain extent used to obstacles such as OL) and many species migrate

Name of Protected area	Decrease of habitat quality due to Limitation of the Height of Trees	Decrease of Habitat Quality due to Avoidance 100 – 300 meter area at the OL	Disturbance during Construction	Risk of Bird Collision
	measures to mitigate impacts on birds should be taken.		In order to minimize disturbance for the rest of the year bird monitoring should be carried out to identify the time periods during which important or endangered birds are present in the area. This information will be used to determine the time periods during the year when construction would have the lowest impact on the bird species. However, it is expected that even by selection of the most favourable time period for construction significant impacts through disturbance still remain. Therefore additional measures needs to carried out as follows: create alternative areas where the disturbed species can evade to by calming the area of a distance up to 3000 meter around the construction site. Calming means e.g. no hunting.	during night (shorebirds, ducks, cranes) where collision risk is much higher. The impact on the birds is intensified through the fact that no other OL facilities are in the closer distance and the central parts of the birds area is crossed. Significant impact at Dnieper crossing on all type of birds (breeding, resting and migrating birds). Mitigation: It is possible that even after implementation of mitigation measures (such as extensive installation of bird markers), specific impacts may remain. The area of the Dnieper river is considered a natural habitat according to EBRD Performance Requirement (PR) 6 on Biodiversity Conservation. According to PR6, natural habitats must not be compromised unless there are no technically and economically feasible alternatives.

Besides the above mentioned international protected areas, the OL crosses various streams (see section 6.3 – Impact on Surface Waters). Usually only a short section of the OL touches these areas. Since all earthing wires of the OL crossing surface waters will be outfitted with bird markers, overall impact on birds due to collision risk is considered minor. Recommended intervals for marker placement on the earth wires are as follows:

- 20 m intervals on wire up to three km distance to the crossing; and

- 10 m interval on the crossing section.

The earthing wires are usually the most critical for marking because it is typically thinner (and thus harder for the birds to see) than the conductors, and they are situated at the top of the towers above the conductors.

Evaluation of Bird Species listed in other information sources

Based on table 5-4 (Birds potentially present in the Project Area), it can be concluded that the globally endangered Little Bustard, Great Bustard and Stone Curlew are considered relevant for the project area, although no detailed information on location of nests is available. These three species usually live in steppe areas. In case nesting areas of these species are identified in the close vicinity of the OL during later project stages, mitigation measures such as installation of bird markers on the earth wires needs to be implemented.

5.3. CONCLUSION AND MITIGATION MEASURES

- The planned 330 kV Novokakhovska - Khersonska double circuit diversion would cross the Dnieper River at an ecological sensitive area (Important Bird Area – IBA, planned national park). Specific impacts, especially on birds, are expected. It is very likely that even after implementation of mitigation measures (such as extensive installation of bird markers), significant impacts may remain.

- A bird survey in cooperation with local bird experts (e.g. BirdLife Association) comprising at least one complete annual cycle, incl. breeding, migration and wintering periods should be performed to collect further data. Based on that additional information, a re-evaluation on the impact on birds can then be made including consideration of future development (e.g. extension of 750 kV line along the Southern Backbone System) and mitigation measures in the re-evaluation.

- The planned 750kV OL will probably cross three areas of local/national significance (Vodyanski Sands, Urochysche Bilozirske, Kairska Balka) that have construction limitations, therefore agreement according to national legislation must be secured.

    - At Vodyanski Sands the present routing which runs in bundling with an existing 750 kV OL. Thus, it is recommended to discuss with the authorities a potential exemption from the protection status under consideration of mitigation measures.

    - At Urochysche Bilozirske, bundling with the existing TL should be considered in order to avoid crossing of this area.

    - At Kairska Balka the TL crosses a sidearm of the Kakhovske reservoir which may have significant impacts on birds (collision risk).

- Besides the above mentioned water crossings, the alignment crosses additional streams and small rivers. Appropriate mitigation measures (e.g. installation of bird markers) should be implemented. Details are described in the ESMMP.

- Many bird species are sensitive to disturbance during construction. Due to the habitat structure at the Dnieper crossing, very different types of bird species are expected to be present around the year (breeding, migrating, resting, wintering) of which many are likely to be disturbed by construction activities. In order to determine the period with the least impact during construction, it is recommended to perform a bird survey throughout a whole year cycle. In addition, the determination of construction periods should be carried out in cooperation with local bird experts (to determine whether potential breeding birds are present).

- In addition to the Dnieper area, bird species sensitive to construction disturbance during breeding time are expected at the northern part of the route (5 – 10 km) and at the crossing of the sidearm of the reservoir (close to Kajiry village). Thus, construction activities should be carried out in these areas outside of the breeding time (thus not between April – June).

- In case the OL is close to forests, timing of construction should be coordinated with local bird experts to avoid impacting birds breeding in woods. Coordination should also take place regarding potential breeding areas for bird species preferring open areas (e.g. geese, bustards).

6. SOCIAL AND ECONOMIC IMPACT ASSESSMENT

6.1. IMPACT ON LAND USE

During the construction process, temporary construction areas are needed for assembly of towers, for passage of machinery and for unfolding of wires and wire ropes. An overview of related areas needed for the 750 kV OL and 330 kV OL diversions is given in Table 6-4.

Table 6-4 Overview of related areas for the 750 kV OL and the 330 kV OL diversions

Construction activity	*Average area needed*	*No of towers*	*Total Temporary area necessary for construction (ha)*
750 kV OL			
Area needed for assembly of angle tower (including passage of machinery)	*3400 m²*	*69*	*app. 23.4*
Area needed for assembly of intermediate tower	*2400 m²*	*427 (estimate)*	*app. 102.4 ha*
Temporary working strip for unfolding wires and wire ropes on the ground	*Tree 7 m strips along 190 km (excluding tower locations)*		*app. 399 ha*
330 kV OL diversions (Novokakhovska – Ostrovska and Novokakhovska – Khersonska)			
Area needed for assembly of angle tower	*250 m²*	*21 (estimate)*	*app. 0.53 ha*
Area needed for assembly of intermediate tower	*450 m²*	*116 (estimate)*	*app. 5.2 ha*
Temporary working strip for unfolding wires and wire ropes on the ground (DBN B.2.5-16-99)	*Average strip of 14 m along 17 and 28 km (excluding tower locations)*		*app. 63 ha*

Note: A ratio of 1:8 was used for tension towers-suspension towers

Overall, a temporary area of approximately 530 ha will be necessary for construction of the 750 kV line, and approximately 70 ha for the 330 kV OL diversions. It is expected that other temporary sites will also be required for construction camps, for stockpiling materials and for parking and the maintenance of vehicles and equipment (cranes, generators etc.) that will be used during the construction phase.

During the construction period, the required land areas will be provided to Ukrenergo under a short-term lease contract with the landowners or an easement agreement, with each separate agreement reflecting only the duration of the construction time at that particular location. The typical construction time for a foundation and tower is estimated to be approximately 5 days, including site preparation, construction work, demobilisation and site restoration. Agricultural and other activities on these construction areas - and along the access routes to reach these areas - will be restricted during the construction phase. Damage caused by construction activities such as loss of crops will be compensated (see Section 7.6 for further details).

The details of the construction program, including the selection of access routes to the points of construction, the number of work fronts, the selection of sites for construction camps, stockpiles and vehicle/equipment parking and maintenance sites will only be determined once the construction contract has been awarded and a detailed *Construction Plan* is prepared.

No impact on land use was identified with respect to the construction of the Kakhovka substation and housing areas, and the rehabilitation of the Nova Kakhovka substation, since these land plots are already owned by Ukrenergo and

currently not used by other parties. The repair and operation station (ROS) is currently a green field site which appears not to be used for agricultural or other purpose. The ROS is at a distance of approximately 20 m to the residential housing of Gornostayivka. All construction activities at these sites will be performed within the fenced premises.

6.2. IMPACTS FROM PHYSICAL PROJECT STRUCTURES

For the 750 kV line, land requirement for a suspension tower foundation is 174 m², for an angle-tension tower is 360 m². For the 330 kV diversions, land requirement for angle-tension and suspension towers is 81 m². Based on the estimated number of towers as indicated in Table 6-4, a total area of approximately 12.6 ha (11.5 ha for 750 kV line and 1.1 ha for 330 kV diversions) will be needed which will be permanently lost for agricultural or other use. Taking into consideration that about 40% of towers of the 750 kV line have already been constructed and therefore are not being used agriculturally at this moment, the resulting net additional area lost for agricultural use reduces to about 8 ha. The area in the OL safety zone can still be used for agriculture.

A considerable amount of the transmission line routing goes in bundling with other infrastructure lines such as existing transmission lines or roads (see Table 6-5). Overall about 50% of the 750 kV line goes in bundling, 100% of the southern 330 kV diversion to 330 kV Ostrovska SS and 0% of the northern 330 kV diversion to 330 kV Khersonska SS. The practice of bundling is commonly used for establishing the alignment of a new OL to minimize the effects on land use, and is also consistent with the provisions of the Land Code of Ukraine.

Table 6-5 Bundling with other infrastructure lines by administrative unit

Oblast	*Rayon*	*Bundling*	*Line length [km]*	*% of stretch [%]*
1. 750 kV OL				
Zaporizhzha	*Kamyanka-Dniprovska District*	*OL*	*18.4*	*72.4*
		No bundling	*7.0*	*27.6*
Kherson	*Gornostayivka District*	*Road*	*1*	*2.8*
		Minor Road	*3.8*	*10.8*
		OL	*3.2*	*8.9*
		OL and Road	*0.6*	*1.7*
		No bundling	*27.2*	*76*
Kherson	*Velyka Lepetykha District*	*Road*	*7.4*	*27.3*
		Minor Road	*0.2*	*0.7*
		OL	*19.5*	*72.0*
Kherson	*Verkhniy Rogachyk District*	*Road*	*1.9*	*4.8*
		Minor Road	*5.1*	*13.0*
		OL	*4.4*	*11.2*
		No bundling	*27.9*	*71.0*

Oblast	Rayon	Bundling	Line length [km]	% of stretch [%]
Kherson	*Kakhovka District*	*Road*	*1.4*	*1.4*
		Minor Road	*0.5*	*0.9*
		OL	*32.1*	*55.2*
		OL and Road	*12.8*	*22.0*
		No bundling	*11.9*	*20.5*
2. 330KV Ostrovska				
Kherson	*Kakhovka District*	*OL*	*16.4*	*60.7*
		OL and Road	*10.4*	*38.2*
		No bundling	*0.3*	*1.1*
3. 330KV Kherson				
Kherson	*Kakhovka District*	*No bundling*	*10.6*	*100*
Kherson	*Beryslav District*	*No bundling*	*4.1*	*100*

No impact on land use was identified with respect to the physical structures of the Kakhovka and Novokakhovka substations, housing areas or the ROS.

6.3. IMPACTS IN OPERATION AND MAINTENANCE

Apart from land permanently occupied by towers, land between the towers (i.e. the Right of Way) can continue to be used during operation of the transmission line for agricultural purposes, whereby there are certain restrictions within safety zone (SZ) in a corridor with a width of 116 m for the 750 kV line and 76 m for the 330 kV double circuit diversions (see also section 6.9). The Ukrainian norms require that a formal Sanitary Protection Zone (SPZ) is established to protect the population from the possible impacts of EMR (i.e. where electric field strength exceeds 1 kV/m). In addition, safety zones are established to protect the power grid elements. For the 750 kV TL, the minimum distance to residential settlements is 250 m.

Electro-magnetic radiation (EMR) is emitted by the conductors during the operation of such transmission lines. The potential health effects on humans from EMR (e.g. some forms of cancer, depression) are being extensively researched, and to date there is no conclusive evidence either proving or disproving this question. In any case, international organisations such as the World Health Organisation (WHO) and many national governments pursue a precautionary approach in which certain minimum distances are recommended between the lines and housing areas. In this respect, the norms of Ukraine (and other former Soviet Republics) are generally more stringent than those of Western European countries.

Depending on the height of wires crossing the fields, the effects of the EMR vary, and consequently a maximum working time within the SPZ has been defined in the State Sanitary Norms on EMR of 2002[7]. It is recommended that people do not work for more than 1.5 - 3 hours at a time under the cables with a minimum height of

[7] The State Sanitary Norms and Regulations for work with sources of EMR" approved by Ministry of Health - Protection of Ukraine (Order No. 476 of 18. December 2002)

12.5 m above the ground. Ukrenergo has proposed that the cables will be raised to 16 m in areas used for farming. This would reduce the likelihood of any effects from EMR and would allow people to work under the power lines for 3-8 hours at a time as per the Norm.

Given these time limitations, mechanized work (tillage and harvesting with machines etc.) will not in practice be restricted in the SPZ because of the short time periods spent by the operators within the SPZ. Manual labor within the SPZ, however, is restricted due to the impact of EMR as described above. Main areas affected will be vegetable gardens, sites of summer cottages etc. There are no vineyards identified within the SPZ.

According to Item 9 of the Rules for *Guarding of Electricity Transmission Lines – 2002*[8], among other activities, irrigation of agricultural crops within the safety zone of OL is forbidden, i.e. the irrigation front may not extend to the SPZ (unless specific written exemptions given authorised by Ukrenergo). The originally planned route of the OL was designed to bypass any irrigated territories. As part of evaluation of the satellite photographs by ERM, land which appears to be sprinkler-irrigated with a circular pattern was identified at and near the 750 V transmission line within the 300 m buffer area between Zavetnoe and Tavriysk of Kakhovka District. The area is mainly south of the railway line running in parallel south of the planned 750 kV OL route (Figure 5-4).

Beyond the SPZ there are no restrictions of land use, except for the prohibition to build residential housing within a distance of 250 m from the 750 kV OL. There is no such restriction with the 330 kV OL diversions regarding land use beyond the SPZ.

For maintenance purposes, motor vehicles used for operational inspections of the line will move along field borders. Overall, only very limited impact is expected from operation and maintenance of the line.

All settlements along the OL route are typical agricultural settlements. There are no industries or airports that may interact with the planned OLs.

No land use impact was identified from operation and maintenance of substations, housing areas and ROS of this Project.

6.4. MITIGATION MEASURES

When preparing the Construction Schedule for implementation by the Construction Contractor, it has to be ensured impact to land users and owners is minimized (e.g. construction work planned outside harvest season, access routing planned along existing tracks/roads etc.).

Ensure compensation and land valuation process is followed as part of developing the Land Acquisition Plan (LAP) (refer to chapter 7.7) for temporary and permanent land use issues.

Ensure no sprinkler irrigation systems are installed within the SZ of the planned lines. In particular verify presence of such facilities in relation to the planned alignment within the Kakhovka district area.

[8] Rules for Guarding of Electricity Transmission Lines" (1997) [Resolution of the Cabinet of Ministers of Ukraine of 04.03.97]

7. PROPERTY ISSUES, IMPACT ON INCOME

This section describes the impacts of the Project in the various stages on the local landuse (mainly agricultural use) and how such losses will be compensated by Ukrenergo. In summary, it can be said that overall negative economic impacts to local landusers are relatively minimal. Ukrenergo already owns most of the necessary land plots for the tower locations; a Land Acquisition Plan exists for the remaining plots now under negotiation with the landowners. A formal, fair and legally based compensation process will be in place (as with other such Projects) for both permanent impacts (e.g. land acquisition for towers) and temporary damage to land and crops during construction and maintenance as per the Ukrainian regulations. No farms or businesses will be destroyed or means of livelihood seriously impaired by the Project. Consequently, the elaboration of a formal "Livelihood Restoration Framework" as per the EBRD Policy[9] is not applicable.

As per the present planning assumptions, there are no occupied buildings within sanitary protection zone of the line, and thus a formal Resettlement Action Plan as per EBRD Policy is also not warranted for this Project[10]. I

7.1. Overview of Land Tenure Regime in the Project Affected Area

The land plots of tower locations of the 750 kV OL are owned by Ukrenergo. The number of private individuals and agricultural firms owning land which is crossed by the OL is provided in Table 6-6. In total 350 private individuals and 32 agricultural firms will be affected. The land acquisition of the 330 kV OL diversions is still ongoing.

Table 6-6 Overview by District on the number of owners, length of line sections traversing public and private land plots and respective size

	Number of owners affected by OL crossing1)				***Traverse length and land requirement for towers***	
Rayon / District	***Public***	***Private***	***(Agricultural) Firms***	***Total***	***Ukrenergo 2)***	
					Km	*ha*
750 kV OL						
Kamyanka-Dniprovska	*1*	*-*	*4*	***5***	*2) 26,3*	*53,55*
Verkhniy Rogachyk	*1*	*82*	*5*	***88***	2) 37,6	*73,038*
Velyka Lepetykha	*1*	*100*	*2*	***103***	2) 25,2	*51,169*
Gornostayivka	*-*	*97*	*8*	***105***	2) 39,8	*81,3*
Kakhovka	*1*	*42*	*11*	***54***	2) 46,1	*93,94*

[9] 2008 Policy, PR5

[10] As described further below in this section, confirmation needs to be made during detailed planning regarding the status of a few isolated buildings near the line; if needed, the resettlement will be negotiated on a case-by-case basis.

Rayon / District	Number of owners affected by OL crossing1) Public	Private	(Agricultural) Firms	Total	Traverse length and land requirement for towers Ukrenergo 2) Km	ha
750 kV OL						
Tsyuryupynsk		*4*	*1*	***5***	2) 15	*31,26*
330 kV Novokakhovska–Ostrovska OL diversion						
Kakhovka	*Not known*	*Not known*	*Not known*	***-***	*13,5*	*22,95*
Tsyuryupynsk	*Not known*	*Not known*	*Not known*	***5***	*13*	*22,1*
330 kV Novokakhovska–Khersonska OL diversion						
Kakhovka	*Not known*	*Not known*	*Not known*	***1***	*10*	*17*
Beryslav	*Not known*	*Not known*	*Not known*	***2***	*4,7*	*7,99*
Total	***6***	***350***	***32***	***388***	***231,2***	***454,29***

7.2. TEMPORARY ECONOMIC IMPACTS DURING CONSTRUCTION

The presence of the OL is not expected to have an overall marked negative impact on the economic livelihood of the local land users/farmers.

Temporary economic impacts are expected to include damage or loss of crops and possibly some damage to agricultural infrastructure such as fences, bridges and drainage ditches and restricted access to fields. The impacts may occur at the temporary construction sites used for assembling the towers and along the related access routes, as well as for construction camps, for stockpiling materials and for parking and the maintenance of the vehicles and equipment (cranes, generators and so on).

It is important to emphasize that the details of the construction program – including the selection of access routes, the number of work fronts, the selection of the sites for construction camps, stockpiles and vehicle maintenance sites - will only be defined once the construction contract has been authorized and the formal Construction Plan is elaborated.

Compensation to landowners for the temporary withdrawal of their land for the construction period shall be determined in the LAP pursuant to the *Resolution of the Cabinet of Ministers of Ukraine of 19.04.2003 No. 284 "Procedure for determination of losses and compensation of losses to landowners and land users"*.

Landowners/users will be fairly compensated for land sold to Ukrenergo for the tower locations and for any temporary losses during tower construction or routine line maintenance. Overall, given the minimal economic impact on the local farmers and land users, and in consideration of the EBRD Policy (PR5 Para 24, the

preparation of a formal Livelihood Restoration Framework is not warranted for this Project.

Compensation is based on the average yield of the land plot and the market price of the agricultural products that might have grown on this plot. If there are crops on the land plot during the construction period, losses will be compensated based on calculation of actual damage and the market value of the yield that might have been obtained from the damaged area (*Resolution of the Cabinet of Ministers of Ukraine No. 284*). Compensation amounts will be determined by the "Compensation Commissions".

Owners (and users) of land plots that, according to the design, are located near or under the line, shall be informed about the construction through the mass-media one year before the construction starts according to *Article 146 of the Land Code of Ukraine and Article 350 of the Civil Code of Ukraine*. Past experience of Ukrenergo with other transmission line projects has shown that the process for compensation for temporary damage does not represent a significant problem.

Ukrenergo will develop routine procedures for the following actions relevant for this Project:

- payment of fair value for land permanently withdrawn for the tower locations; and
- compensation for temporary losses during construction and – to a lesser extent – during operation of the OL.

The key aspects of the above are shown in the Entitlement Matrix (Table 6-7). It should be pointed out that as the national grid operator Ukrenergo has extensive experience in implementation of such entitlement programs.

7.3. OTHER TEMPORARY IMPACTS DURING CONSTRUCTION

The construction activities may include additional positive and negative impacts.

The possible **positive impacts** include the generation of some direct employment for people living in the project area, an increase in opportunities for indirect income generation and possibly the reconstruction of roads in the project area.

- Direct employment. Unemployment rates of the regions are around average, local rates in the villages situated along the route of the OL however may be higher and therefore direct employment effects may be of considerable importance. The employment of local labour would help to maximise the potential benefits to people living in the nearby settlements. It is likely that the construction workers will be organised as four or five separate teams at each work front. The teams would be responsible for:
    - Laying the foundations for the towers,
    - Assembly of the towers,
    - Installation of the electric cables.

The first team as a rule will not require highly skilled labour and the work could potentially be carried out by local excavator and bulldozer drivers and builders under the supervision of qualified taskmaster. In fact, the main contractor may conceivably sub-contract these tasks to local companies. The other tasks,

particularly the erection of the towers and hanging the cables requires labour with specialist skills that will have to be drawn from all over Ukraine.

In addition to employment on the construction sites, there may be opportunities for indirect employment – perhaps through local sub-contractors – in areas such as catering (at construction camps), transport (bringing workers and/or materials to the construction sites) and security.

- Opportunities for income generation. As well as the sub-contracts noted above, the influx of construction workers and/or the increased disposable income available to the local workers employed on the project will have a minor multiplier effect on the economy of the towns and villages situated along the OL route. There may be an increased demand for rented accommodation, meals and so on. There may also be some opportunities for linkages, such as the provision of food to the caterers at the construction camps, sale of clothing for workers, maintenance of vehicles and so on.

- Improvements to the road network. In some cases there will be a need to improve or construct access roads leading to the RoW of the OL. These roads can be used by other traffic and will improve the transport network in the project area. However, negative secondary impacts may also arise from improved access, disturbance of birds at nesting times or illegal logging.

Other potential **negative impacts** during construction include the following:

- Road traffic and risk of accidents. The project will increase the movement of heavy traffic on roads near the OL route. This will include movements of excavators and bulldozers, cranes and other lifting gear, trucks carrying building materials for the towers and the cables, and buses or minibuses carrying workers to and from the construction sites. The negative impacts of this traffic flow can be reduced by selecting specific access roads to the route of the transmission line and avoiding or by-passing the built-up areas of villages and towns and especially avoiding routes that pass in front of schools, old people's homes or hospitals. The access routes – especially for oversized or hazardous loads – will be determined in coordination with the local authorities and will be binding on the contractors and sub-contractors. This can be enforced by putting up signs to show the selected route and/or the roads where access is prohibited. The impacts can also be reduced by restricting traffic to certain hours, for instance from 8 a.m. to 10 p.m. and/or by prohibiting heavy traffic on minor roads outside daylight hours. The risk of road accidents can be reduced through strict enforcement of the health and safety policy (particularly in regard to vehicle maintenance), speed limits and the code of conduct, especially in regard to the consumption of alcohol or drugs (see below).

- Noise, dust and traffic fumes. The main problems during construction relate to the traffic movements and possibly pile driving in some areas for construction of the foundations of towers. As noted above, the worst impacts on the local population can be avoided by ensuring traffic is restricted to specific, clearly-defined access roads and by limiting traffic movements outside normal working hours. Dust may be a problem in some areas during the summer months, especially where heavy traffic is moving along dirt roads. It can be controlled by establishing speed limits and by water spraying. Controls on noise, dust and traffic fumes have to be addressed in the tender documents and subsequently the Construction Plan.

- Presence of an outside workforce. There is a potential for conflict if much of the workforce is brought from outside and is housed in a temporary construction camp or camps near the work sites. Typical problems include disputes with local people and possibly the presence of bars and prostitutes, leading to a risk of altercations, accidents, increase in sexually transmitted diseases and so on.

The construction of the OL is not concentrated in a single place but is continually moving from one site to another. Since the work requires four or five separate teams on each front and a number of fronts may be working simultaneously, it is expected that the contractors will bring the workers to the construction sites on a daily basis, bussing them in from the nearest towns or villages. In this case the workforce is less likely to have a negative impact on villages along the OL route; indeed many of the less specialised workers could be hired locally and would live at home.

7.4. PERMANENT IMPACTS - INVOLUNTARY RESETTLEMENT

For the purpose of the ESIA, the potential presence of housing along the routing was evaluated using satellite photographs and topographic maps. A search area of 300m on each side of the 750 kV line was defined (versus the buffer zone restriction up to 250 m) to account for potential inaccuracies in the map projections. As a result, a total of 10 objects or object clusters were identified to be within 300 m of the 750 kV transmission line and diversions, as listed in Annex 6-2, and shown on maps of Annex 5-3.

The following objects and object clusters were identified within a 250 m zone along the 750 kV line and within a 30 m zone along the 330 kV Nova Kakhovka-Ostrovska double circuit diversion. No object was identified within the 30 m zone of the 330 kV Nova Kakhovka – Kherson double circuit diversion. All objects or object clusters listed in Table 6-6 appear to be used for temporary purpose or as warehouse, but not for residential use. Temporary residential use may be possible at summer cottages near Mitshurina and at houses of a diary farm East of Malokakhovka.

Table 6-7 Objects and object clusters identified within a 250/300 m zone.

No.	Name of Town/ village	Line [kV]	Distance within 300m buffer of 330 kV OL [m]	Distance within 300m buffer of 750 kV OL [m]	Description of use
3	Plodojoe	330 kV /750 kV	57	131	Pump station (not used for housing)
4a	Tawryisk	750 kV	N/A	183	Storage (commercial property)
4b	Tawryisk	750 kV	N/A	192	Temporarily building for field guards (premise control)
4b	Tawryisk	750 kV	N/A	250	
4b	Tawryisk	750 kV	N/A	64	
5a	East of Malokakhovka	750 kV	N/A	226	Dairy farm (various buildings) - commercial use

No.	Name of Town/ village	Line [kV]	Distance within 300m buffer of 330 kV OL [m]	Distance within 300m buffer of 750 kV OL [m]	Description of use
5a	East of Malokakhovka	750 kV	N/A	182	
5b	Zawetnoje	750 kV	N/A	178	Storage (commercial property)
6	West of Vasylevka	750 kV	N/A	184	Building owned by fishing breeding company
7	Weseloje	750 kV	N/A	160	Warehouse/Storage
8	North of Rubanovka	750 kV	N/A	101	Commercial buildings for workers of mechanical brigade
10	Mitshurina	750 kV	N/A	241	Summer cottages (private property)
10	Mitshurina	750 kV	N/A	242	
10	Mitshurina	750 kV	N/A	246	
10	Mitshurina	750 kV	N/A	250	
10	Mitshurina	750 kV	N/A	252	

Source: ERM evaluation using Google Earth

Figures 6-3 to 6-7 illustrate the location of a selection of objects in relation to the planned OLs as projected on satellite photographs. All satellite photographs show the planned OL and buffer zone of 300 m to both sides.

Figure 6-3: Object/Object cluster 1b and 1c – 330 kV double circuit diversion at L'vove village

Figure 6-4: Object/Object cluster 5a, 750 kV OL near Dairy farm (various buildings)

Figure 6-5: Object/Object cluster 7, 750 kV OL near Warehouse/Storage

Figure 6-6: Object/Object cluster 8, 750 kV OL near buildings for workers of mechanical brigade

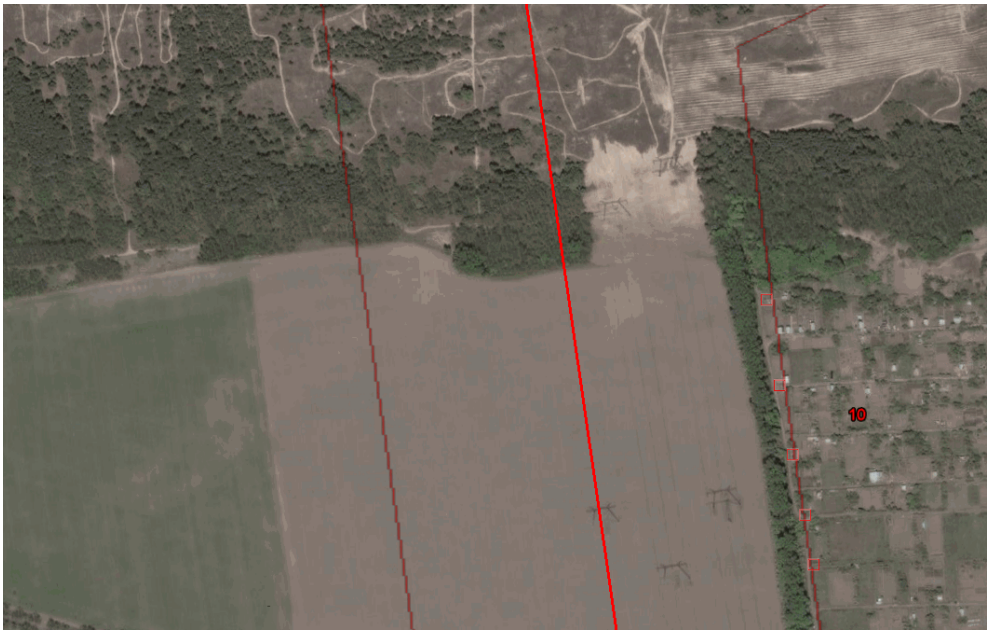

Figure 6-7: Object/Object cluster 10, planned 750 kV line and two existing 750 kV lines near summer cottages (private property)

As part of the further detailed planning and design, the locations and use of the above buildings needs to be confirmed. There are no resettlement measures intended as per the current planning stage. In the event that housing is discovered within a restricted zone, then Ukrenergo must take appropriate steps in accordance with applicable legislation. In case of any resettlement, this will be negotiated in accordance with the applicable Ukrainian norms and policies of the international lenders[11] to ensure that the resettlement is undertaken in a fair and equitable manner[12]. Overall, given the minimal relevance – if any at all – of occupied dwellings for this Project, the preparation of a formal Resettlement Action Plan is not warranted.

[11] e.g. EBRD Policy 2008, PR 5

[12] For example, according to good international practice, property owners are compensated for land and building at full replacement value, plus costs of moving.

7.5. PERMANENT IMPACT DUE TO LAND WITHDRAWAL AND RESTRICTION OF LAND USE

For the 750 kV line, land requirement for a suspension tower is 174 m², for an angle-tension tower is 360 m². For the 330 kV diversions, land requirement for an angle-tension and suspension tower is 81 m² (for further details refer also to section 2.2). These areas are very small compared to the average field size in the Project Area, and thus the incremental loss of related land use/income is similarly very minor.

The need for additional land acquisition for this Project is limited because Ukrenergo already holds the formal State Acts for Permanent Use of Land Plots (State Acts) for all presently planned towers locations along the 750 kV OL route and for the locations of the Kakhovka substation and housing areas at Novi Lageri and Kakhovka town.

The routing for the 330 kV Nova Kakhovka-Kherson and Nova Kakhovka – Ostrovska double circuit diversions, however, is currently being finalized and Ukrenergo therefore is in the process of acquiring the State Acts for these towers locations. Also, the premise for the repair and storage site (ROS) near Gornostayivka village is in the process of acquisition.

The process of land withdrawal, acquisition and compensations for permanent tower locations is described below (See also chapter 2.1.4).

Land Acquisition Plan

A land acquisition plan (LAP) will be prepared by Ukrenergo. The LAP contains the Register of Land Acquisition for Installation of Towers. Information about each land plot withdrawn for permanent use is included in the Annex 6-2 of the LAP.

Ukrenergo specialists will directly contact the land owners (users) whose plots are located in the project area. They will also provide necessary information through the mass-media and public authorities about the proposed acquisitions. In particular, *Paragraph 3 Article 350 of the Civil Code of Ukraine* obliges public authorities to provide information in advance of the acquisition process.

The specifics of the acquisition process depend on the nature of the ownership:

<u>Land in Private Ownership</u>

If towers are to be installed on a plot that belongs to a land owner or user (the ownership must be confirmed by possession of a State Act), the land for the tower foundations will be permanently withdrawn and transferred to Ukrenergo pursuant to *articles 92, 146-149 of the Land Code of Ukraine*.

Compensation to Land Owners will be made in accordance with the *"Procedure for determination of losses and compensation of losses to landowners and land users" approved by Resolution of the Cabinet of Ministers of Ukraine of 19.04.1993 No. 284*. In order to determine the scope of the losses and the full compensation, a "Compensation Commission" will be created in accordance with the legal requirements to ensure the loss compensation process is carried out in a transparent way. The commission is created by the State Rayon Administrations and include representatives of the affected Village Councils, the State Land Use

Authority, the Rayon Architecture and Planning Authority, the Rayon Department of Finance, other bureaus if applicable, with participation of Ukrenergo and the affected landowners (see 2.4). Compensation to land owners is based on the fair market price of the land plot at the moment of withdrawal. The market price of the land depends on its quality, average yield, and is calculated with a capitalisation period (33 years). If land owners (land users) are not satisfied with the decision of the commission and no other agreement can be made between Ukrenergo and the affected land owners/users, then the dispute can be decided by a court.

Land Belongs to State Funds

If the land is to be withdrawn from villages and/or the state fund (i.e., it is not private property), the compensation must be calculated pursuant to the *Resolution of the Cabinet of Ministers of Ukraine of 17.11.1997 No. 1279*. The quality of land, its use rate and yield must be taken into account in this case as well.

Compensation for Trees

In either case, the number of trees and bushes to be cut to construct the line needs to be identified (this has not been done to date, and will be part of the detailed design). No major forest areas will be crossed by the line routing, but nevertheless the affected trees (e.g. along field borders) may be of high ecological value. Compensation for any trees cut must be paid by Ukrenergo to the owner of the trees via a standard procedure pursuant to *Resolution of the Cabinet of Ministers of Ukraine of 17.11.1997 No. 1279 "Procedure for Calculation of Agricultural and Forestry Losses Subject to Compensation"* and the *"Procedure for determination of losses and compensation of losses to landowners and land users" approved by Resolution of the Cabinet of Ministers of Ukraine of 19.04.1993 No. 284*.

7.6. COMPENSATION DUE TO RESTRICTION OF USE AND DURING OPERATION AND MAINTENANCE

It is anticipated that the operation of the transmission line and diversions will have negligible overall impact on the agricultural production process and income and earnings from agriculture for the following reasons:

- The lines frequently run along the borders of fields, roads and other existing objects (overall about 50% of route is bundled);
- spans between the towers are wide (400-500 m for 750 kV OL and 300-400 m for 330 kV OL);
- only direct loss of farming areas is due to the tower foundations;
- farm fields are often large scale and heavily mechanized, and thus the work-time restrictions of the SPZ are not significantly relevant.

Based on the above, it is anticipated that there will be no significant negative effect of the Project on income generation for the affected farmers and agricultural firms.

Ukrenergo´s rights of access to the line for repair and maintenance purpose is regulated by *"Power Networks Protection Rules" approved by Resolution of the Cabinet of Ministers of Ukraine of 04.03.1997* as well as by easement contracts for limited use of land that Ukrenergo will conclude with owners (users) of the affected

land plots. Regular repair of the line will be scheduled after harvesting. Access to the line during regular and emergency repairs will be regulated by the concluded easement contract (table 6-7).

Compensation of damages to the crops during line repair works will be calculated on a case-by-case basis, and statements shall be prepared in each case. The actual size of the damage is to be determined by the commissions as described previously.

7.7. MITIGATION MEASURES

Verify distance of objects and object clusters identified as part of this assessment (see List of Annex 6-2) from the alignment once survey of tower locations has been finalized (expected to be in July 2009). Should any of these objects be located within 250 m zone of 750 kV line, verify that the buildings are not used for residential purpose.

Ensure compensation and land valuation process is followed as part of developing the Land Acquisition Plan (LAP) for remaining land plots to be acquired. Compensation for different types of people and institutions affected and types of impact (e.g. permanent withdrawal, temporary impact/easement) should be managed according to the following matrix table:

Table 6-8 Entitlement Matrix

People & Institutions Affected	Land acquisition for the towers	Restrictions of use of land in the RoW*	Land used during construction
1. Private owners working their own land	Cash compensation for withdrawal of land or the option of an alternative plot from the village or Rayon land reserve according to the decision of the local authorities	The easement contract will be signed between Ukrenergo and the land owner. Subject to restrictions on use of land and must allow access to the power line. The only compensation is for actual damage & loss of earnings during repairs or maintenance	Compensation for damage to crops & infrastructure and/or loss of earnings
2. Private owners that are renting their land to others or who are not using the land	Cash compensation for the transfer of ownership or the option of an alternative plot	Same as above, except compensation paid for loss of earnings to land user (not owner)	Compensation for damages will be paid to the land user
3. Entrepreneurs working on reserve lands	The Village Council or Rayon administration can provide alternative plots of equivalent size and quality from the land reserve	Subject to restrictions on use and entrepreneurs must allow access. Entrepreneurs will be compensated for any damages that occur during repairs and maintenance	Farmers will be compensated for damage to crops and other assets. With sufficient advance warning farmers can be offered alternative plots from the land reserve

People & Institutions Affected	Land acquisition for the towers	Restrictions of use of land in the RoW*	Land used during construction
4. Agribusiness and other entrepreneurs working on land belonging to other owners	Landowners will receive compensation for the redemption	Subject to restrictions on use of land plots and the users must allow access to OL. The enterprises and entrepreneurs will be compensated for any damage to crops or loss of earnings	Compensation for damage to crops and other assets and for loss of earnings for the enterpreneurs
5. Village councils which hold the land within and outside the village boundaries	Compensation will be paid to relevant budgets	The Village/Rayon Council will sign the easement contract with Ukrenergo and the users will be subject to restrictions on use and must allow access to OL.	The land users will be compensated for damages

The following table provides a summary of the key entitlement aspects and the corresponding Ukrainian legislation that is applicable to such cases.

Table 6-9 Entitlement Matrix – Regulatory Cross Reference

Activity	Compensation procedure	Regulatory Basis
Land acquisition for the towers:	Cash Compensation to land owners based on the fair market price of the land plot at the moment of withdrawal (depends on its quality, average yield etc), as facilitated by a Commission	Procedure for Calculation and Compensation of Losses to Land Owners and Land Users" approved by Resolution of the Cabinet of Ministers of Ukraine of 19.04.1993 No. 284
Land used during construction and resulting damage and croploss	Cash Compensation to land owners or users for damage to crops & infrastructure and/or loss of earnings as facilitated by a Commission	Same as above
Restrictions of use of land in the RoW, loss during maintenance	An easement contract will be signed between Ukrenergo and the land owner, subject to restrictions on use of land and must allow access to the power line. The only cash compensation is to owners or users for actual damage & loss of earnings during repairs or maintenance.	Same as above, plus Power Networks Protection Rules" approved by Resolution of the Cabinet of Ministers of Ukraine of 04.03.1997 # 209

8. IMPACTS ON VISUAL AMENITY AND SCENERY

8.1. IMPACTS FROM CONSTRUCTION

As typical for other construction, the construction of this line will temporarily change the landscape. Local areas will be prepared to store construction materials and machinery and parts and supplies. Machinery will be used at places where the towers are installed. Tower foundation pits will be dug out, towers will be assembled and erected, conductors will be strung. On average, 5 days are needed to assemble and erect one tower. The whole line construction period will be about 30 months. Materials will be transported to the construction site from other places. No sand or gravel or other pits will be quarried along the line route. All materials needed to make cement and the filling – sand, gravel, etc. – will be delivered from existing pits. Construction and material storage sites will be visible, however these will only be temporary features which constitute relatively little change to the overall background of agricultural activities in the project area.

After conductor stringing and in the first months after construction, the line may be more distinctly perceivable under certain light conditions, as initially the surface of the metal conductors is shiny and reflects and glares when struck by sunlight. This effect is diminished with the weathering of the new surfaces.

The areas where trees must be cut to build the line will be indicated in detail in the set of planning documents to be prepared by the contracted construction company. Measures to compensate for the lost trees are described in chapter 6-5.

The landscape surface will be temporarily changed during construction within construction sites. The micro-relief and vegetation will be restored after the construction is over, which is a mandatory requirement to the construction process.

8.2. IMPACTS FROM PHYSICAL PROJECT STRUCTURES

The transmission line route crosses a rather flat terrain over the 190 km of total length. In those segments of the route where the line crosses forest areas, the visibility of towers and cables is reduced and so is the visual impact to local inhabitants and visitors. This is only to a limited amount the case (e.g. patches of pine forest near Vodyanski and Ivanicski Sands), since the line mainly crosses non-forest areas, where the line may be visible from long distances.

Effort has been put during the original route design to mitigate visual impacts as far as possible, through:

- Routing the line away from inhabited areas (the closest settlement is at a distance of more than 250 m from the route);
- Avoiding angle towers, which are larger and thus far more noticeable than suspension towers;
- Bundling alongside other infrastructure (i.e. highways, transmission lines);
- Routing the line close to the edge of forest plots in order to conceive the lines in the dark background.

As shown in chapter 6.5, about half of the 750 kV line and the entire Ostrovska 330 kV double circuit diversion line are bundled with existing infrastructure, and thus reducing the landscape impact. Nevertheless, the development of the new OL will still cause visual change of the existing landscape and scenery to a limited extent. The visual impacts are moderated due to the relatively slim design of the intermediate suspension towers - which account for about 85% of all towers - the general large scale of the landscape, the routing principle of parallel alignment/bundling with existing structures, and the mostly large distance to major settlements.

The line does not pass through or near historic, architectural or park and garden monuments which might be impacted in their visual appearance. The impact on landscape protection areas is described in chapter 6-5.

Due to careful routing, no extended cut-lines for the line and the safety zone through forested or wooded areas is necessary, which would create adverse visual effects.

Notable visual change will occur where the line is crossing the following topographic structures:

- River valley Urochysche Bilozirske, which is crossed by the 750 kV line;
- Kairska Balka gully, a side arm of the Dnieper River, which is crossed by the 750 kV line approximately 2 km from the national road T-08-04 (see Figure 6-8);
- River arm near Vasylevka, (see arrow in Figure 6-9), which is crossed by 750 kV line approximately 1.5 km from national road T-08-04 in bundling with existing 330 kV line (see Figure 6-9);
- Dnieper river near L'vove where 330 kV diversion crosses the river at a length of approximately 400 m (see Figure 6-9).

In these areas the line will cross the line of sight in the valley and gullies. All locations listed above are also further described and assessed in chapter 6-10.

Figure 6-8: View from national road T-08-04 into river arm Kairska Balka, in front existing 330 kV line, arrow shows 750 kV tower

Figure 6-9: View from national road T-08-04 into river arm near Vasylevka, arrow shows existing 330 kV line and location of planned 750 kV line crossing the water in bundling

Figure 6-*10*: View from L'vove village to the south across Dnieper river at location where about 330 kV crossing is planned

Figure *6-11*: Comparable crossing, view towards existing 330 kV line crossing the Dnieper river upstream from the planned crossing

Impacts from Operation and Maintenance

No notable visual effects arise from operations and maintenance activities.

Mitigation Measures

The visual landscape characteristics can be partly preserved via limiting as far as possible the cutting of trees, bushes and other important landscape elements. Compensation for cut vegetation can be made by growing greenery belts in free areas. Also, re-cultivation of disturbed areas during tower construction can be enhanced via prompt re-contouring of the soil and re-vegetations, plus e.g. sowing perennial herbs under towers.

The respective mitigation measures at the protected areas listed above, refer also to Chapter 6.5.

9. PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY

9.1. IMPACTS FROM CONSTRUCTION

Occupational health and safety hazards during construction include, among others, exposure to physical hazards from use of heavy equipment and cranes, trip and fall hazards, exposure to dust and noise, falling objects, work in confined spaces, exposure to hazardous materials and exposure to electrical hazards from the use of tools and machinery. Hazards specific to electric power transmission and distribution projects mainly include live power lines, working at heights, electric and magnetic fields and exposure to chemicals.

The main public health and safety hazards during construction are related to increased road traffic and risk of accidents (through movements of excavators and bulldozers, cranes and other lifting gear, trucks carrying building materials for the towers, cables, substations and other facilities, and buses or minibuses carrying workers to and from the construction sites). The traffic will also cause additional noise and air emissions in the local villages. Dust may be a problem in some areas during the summer months, especially where heavy traffic is moving along dirt

roads. Further impacts (noise, dust emissions) may arise through pile driving (e.g. at the river banks).

The unhindered access to construction sites could pose a risk to children or livestock. In addition it could encourage stealing of construction material.

Mitigation Measures

The occupational risks on the construction sites will be reduced by the set-up and implementation of a construction health and safety plan which will be part of the contract with the construction company.

The negative impacts of the construction traffic can be reduced by selecting specific access roads to the OL route (avoiding built-up areas of villages and towns, especially avoiding passing of schools, old people's homes or hospitals). The access routes (especially for heavy loads) will be selected in coordination with the local authorities and will be binding on the construction contractor. If appropriate, traffic should be restricted to certain hours (e.g. 8:00 a.m. to 10:00 p.m.). The risk of road accidents can be reduced through strict enforcement of the health and safety policy (particularly in regard to vehicle maintenance), speed limits and a code of conduct (especially regarding alcohol consumption). This can be accompanied by installing a health and safety focused working culture among all drivers and other employees including the obligation to drive slowly in village areas. Furthermore, there may be opportunities to organize road safety classes in local schools in order to enhance awareness of the potential hazards of road traffic among pupils.

Security at the construction sites should be established if needed either by a watchman or be fencing the construction site in order to prevent livestock or children entering the construction site and to prevent stealing of construction materials. The watchmen or security guards will get adequate training in dealing with the situations that are likely to arise. In particular they must be trained not to overreact to minor incidents.

Dust impacts from use of heavy machinery and transport during construction may be limited through adequate water spraying and speed limits control.

9.2. IMPACT FROM OPERATION OF TRANSMISSION LINE

The working design has been prepared to meet effective norms and rules which ensure safe operation of the designed transmission line, including explosion and fire safety rules.

In particular, the towers will be equipped with warning shields "Warning high voltage" at a height of 2.5 to 3.0 m.

The approved placement of towers ensures the normative distance between the lowest part of sagging wires to ground is met in compliance with the Power Installations Guidelines even for the lowest sagging arch.

Standard design towers will be used for this line, which allow safe climbing of qualified personnel without disconnection of power.

The design foresees installation of grounding devices for towers, which ensure the normative grounding resistance.

The line operation and maintenance personnel have necessary working premises at the existing and planned repair and operation bases and substations. The maintenance personnel must timely trim trees throughout the whole cut-down area along the line.

Existing power installations must be operated pursuant to effective normative documents ("Technical Operation of Power Stations and Networks. Guidelines." GKD 34.20.507-2003; "Guidelines for Safe Use of Consumer Power Appliances" DNAOP 0.00-1.21-98).

To protect the population from impact of electric field of electricity transmission lines, a Sanitary Protection Zone is established. The Sanitary Protection Zone is a territory along the overhead transmission line routes where electric field strength exceeds 1 kV/m. The sanitary protection zone for a 330 kV overhead transmission line is established in the form of a land plot whose borders are set by the regulations at the distance of 20 m from the ground projection of the outer phase wires in the direction perpendicular to the direction of the overhead transmission line (Sanitary Norms and Regulations (DSTU) approved by the Ministry of Health Protection of Ukraine (Order No. 476 of 18.12.2002), DBN 360-92*). The sanitary protection zone for the 750 kV line is 40 m from the outer conductor.

Specialised laboratories inspect and certify workplaces of the Southern Energy System for labour safety compliance every five years. The inspection includes metering of electric field strength of the existing 750 kV and 330 kV overhead transmission lines and substations. The results of the inspections are kept in the Southern Energy System. Electro-magnetic field strength is metered with an INEP-2 type meter.

The electric field strength does not exceed 5 kV/m within the sanitary protection zone and does not exceed 1 kV/m beyond it at a height of 1.8 m from the ground with the designed hanging of wires. Maximum working hours are restricted depending on the height of hanging lines and might affect areas of arable land worked by hand or with animal traction (e.g. if maximum working hours are restricted to three hours). However, Ukrenergo has proposed that the cables may be raised to 16 m in areas so that the length of time people can work under the power lines will be increased to up to 8 hours at a time if needed (cf. section 6.6 on land use)

Conditions for carrying out works within protection zones of electricity transmission lines are laid down in the Attachment to the Rules for Guarding of Electricity Transmission Lines (1997).

The overhead transmission line will be protected from direct lightning hits by the grounding (earthing) wire.

9.3. IMPACT FROM OPERATION OF THE SUBSTATIONS

The construction plans for the two substations will be prepared in compliance with the effective "Norms for Technological Design of 6-750 kV AC Substations" (GKD 341.004.001-94), which had been approved by the Ministry of Energy of Ukraine on September 5, 1994 and came into force on January 1, 1995.

All technical solutions in terms of both design and equipment have been developed and adopted in keeping with the effective norms and rules, including explosion and fire safety rules, guidelines and state standards.

The following requirements have been taken into account:

- The Electrical Equipment Arrangement Guideline (PUE) – 2006;
- "Rules for Safe Use of Consumer Power Installations" (DNAOP 0.00-1.21-98);
- GOST 12.1.019* "Electrical Safety. General Requirements and Protection Types";
- SNiP III-4-80* "Construction Safety";

„Operation of Power Stations and Networks. Guidelines." GKD 34.20.507-2003

The following measures will be taken to prevent accidental contact with energised parts at substations:

1) protective fencing, temporary and permanent;
2) safe placement of energised parts;
3) improved insulation of energised parts;
4) insulation of workplaces;
5) protective disconnection;
6) alarms, blocks, safety signs.

The following measures will be taken to prevent from electrocution through touching metal non-energised parts that may become energised when insulation is damaged:

1) protective grounding;
2) zeroing;
3) potential levelling;
4) a system of protection wires;
5) protective disconnection;
6) insulation of non-energised parts;
7) electrical segmentation of the network;
8) insulation control;
9) grounding of short-circuit currents;
10) personal protection equipment.

The substations are equipped with water supply, heating and ventilation systems.

The project includes installation of bio-protection shields and EMR protection devices at the substations in both the switching bays that are being designed and the operating open distributors. Protection of workplaces for the personnel and

footways is designed according to GOST 12.4.154-85 taking into account the information about EMR strength of existing 330 kV and 750 kV open distributors measured by the Southern Power System. The lightning protection measures are designed to meet the requirements of the "Guidelines for Lightning Protection of Buildings and Installations" RD 34.21.122-87.

Mitigation Measures

The planned transmission line is routed as such that on all sections the sanitary protection zone will be established. The following measures are recommended to be applied in the sanitary protection zone:

- Only crops that do not require manual labour are cultivated;
- Machinery on pneumatic tires should be grounded;
- Young people under 18 should not work in the sanitary protection zone.
- Personnel employed for maintenance of OLs should raise awareness of population regarding safe behaviour near power lines. If any works are planned in sanitary-protection zone or near OLs, personnel responsible for labour safety should provide necessary briefing for involved workers (cf. chapter 8).

10. NOISE

10.1. IMPACTS FROM CONSTRUCTION

Construction typical noise effects will be inevitable. However the construction activities will be neither extremely noise intensive nor of long duration.

In the course of construction activities, construction typical noise will occur from the movement of trucks and equipment. For line construction no extreme noise activities such as blasting are necessary. Noise sources are movement and operations of trucks, and excavators and other equipment.

From line construction, only limited disturbance to potential sensitive receivers is anticipated as the line on most locations is at great distance from settlements and the duration of construction in a certain area is of limited time due to the step-wise nature of the progressing line development. Overall it is anticipated that the noise impact and possible disturbance can be compared with noise from agricultural machines such as tractors and harvesters. Appropriate scheduling of working hours will be applied to minimise disturbance when the construction is in the vicinity of settlements (e.g. Tawryisk, Kazachi Lageri, Mitshurina).

Construction works at the Kakhovka substation do not constitute a significant impact, as the substation located away from potential sensitive noise receivers in vacant land. The construction of Nova Kakhovka substation will cause limited noise effects for the nearby settlements. However, this will be limited to the construction period. Besides, the nature of construction works carried out within the present substation premises constitute no major noise sources.

The construction of the Repair and Operation Sites (ROS) and the housing areas will cause noise for the nearby settlements. However, this will be limited to the construction period and will mainly comprise normal construction noise (demolition noise, vehicle moving).

Impacts from physical Project structures

The physical structures of the Project do not generate noise emission – unless in operation phase, as described below.

Impacts from Operation

Transmission Line

During operation phase, audible noise is generated by the corona effect around live (i.e. energised) conductors. This may be perceived by residents as a disturbing nuisance when the line is very close to houses.

For the specific type of the planned 330 and 750 kV lines, there are no reference measurement figures of corona noise levels available from Ukrenergo, as such measurement were not made in the past. However reference levels from other lines can be used as an orientation to estimate the anticipated noise emissions. Corona noise depends on various factors, such as voltage level, type of conductor bundle, geometrical layout of the line components and weather conditions. For example, for 380 kV lines in Germany, noise levels at 20 m from the live conductor range from 30 dB(A) during dry weather and up to 45 dB(A) for wet atmospheric conditions.

For OLs with higher voltage higher noise levels can be found such as approx. 70 dB(A) at a 100 m distance from a 750 kV line in wet weather conditions.

An overview of typical sound power levels is given below for comparison:

Table 6-10 Examples of noise sources and their sound pressure level

Noise source/threshold	Approximate Sound Pressure Level (L_{eq}) in dB(A)
Pain in the ears	140
Jet take-off (30m)	140
Hearing damage (short-term exposure)	120 – 135
Non-comfort, first pain	120
Jack hammer, Chain saw	100 – 110
Heavy diesel truck (3 m distance)	80 – 90
Hearing damage (long-term exposure)	85
Major road (boardwalk)	70 – 80
Busy restaurant	70
Passenger car (1 m distance)	65 – 75
Normal conversation	45 – 60
Whispered conversation	35 – 45
Breathing	25
Very calm room	20 – 30

Evaluation Standards

The maximum noise limit values in the residential areas are regulated by the Sanitary norms for allowable noise in residential and community areas № 3077-84 dated 03.08.1984 (*САНИТАРНЫЕ НОРМЫ допустимого шума в помещениях жилых и общественных зданий и на территории жилой застройки 03.08.1984 № 3077-84*). The Norms give two types of noise values: the LA equivalent value (LA equiv) and the LA maximum permissible value (LA max). The noise levels according to the Ukrainian standards are given in Table 6-9 below. In addition, the noise standards taken from IFC EHS Guidelines are given as a comparison against international standards:

Table 6-11 Ukrainian and IFC Standards for Environmental Noise at Residential Areas

Applicable Territory	*Time of Day*	*LA equv in dB(A)*	*LA max in dB(A)*
Ukrainian Standards according to Sanitary Norm No. 3077-84			
Territories adjacent to residential properties, schools, hospitals, community centres	07:00 to 23:00	55	70
	23:00 to 07:00	45	60
Territories adjacent to hotels and dormitories	07:00 to 23:00	60	75
	23:00 to 07:00	50	65
Recreational areas within the built-up territories, sanatoriums, resorts, children playgrounds and similar	00:00 to 24:00	45	60
IFC Guideline Values* according to IFC General EHS Guidelines, 2007			
Residential	07:00 to 22:00	55	-
	22:00 to 07:00	45	-

* Noise abatement measures should achieve either the levels given above or a maximum increase in background levels of 3 dB(A) at the nearest off-site receptor location shall be met (IFC General EHS Guidelines, 2007).

The table shows that the Ukrainian noise standards are in line with international noise standards. For single sensitive receptors (such as hotels, sanatoriums etc) even stricter noise standards are given.

Evaluation

The 330 kV double circuit transmission line is not approaching houses closer than approx. 115 meter. Thus, disturbance from corona noise above the applicable noise limit values (cf. Table 6-9) is unlikely. For the 750 kV transmission line also no nuisance is expected given a minimum distance to settlements of 250 meter. The single houses which where identified to be located closer than 250 meter from the line are considered not to be permanently used residential houses (cf. section 6.7 on land use).

Overall, no disturbance or nuisance is anticipated from corona noise as noise levels decrease with distance from the source and the corona noise is a negligible effect. Ukrenergo will design and implement the Project in a manner that conforms to the

applicable limit values for the protection of sensitive receivers such as residential houses and other noise sensitive facilities.

Substation

The extension of the existing substations will in general not alter the present operational noise conditions of the existing substations.

Other facilities

The operation of the ROS will cause limited noise effect on the nearby dwelling of Hornostayivka settlement (20 to 40 m distance). The use of the housing area will not have any significant impact on noise levels.

10.2. IMPACTS FROM MAINTENANCE

Line maintenance will not involve activities which significantly generate noise. It is not planned to carry out periodic inspection with helicopters.

10.3. MITIGATION MEASURES

Adoption of good construction practices will avoid noise emission and nuisance during construction. Adequate scheduling of working hours will be applied to minimise disturbance when the construction passes in the vicinity of settlements. Working hours at the ROS must be limited to normal schedule. Neighbours of the facilities (such as neighbours of the ROS or the transmission lines) must have the opportunity to complain about elevated noise levels from operation (or unexpected corona noise due to unfavourable weather conditions) as set out in the *Public Communication Program* (cf. section 8).

11. IMPACTS ON CULTURAL HERITAGE

11.1. IMPACTS FROM CONSTRUCTION

No important cultural structures are known to date in the immediate proximity of the planned route.

The nearest known archaeological site, a Skif culture from early Iron Age near the L'vove village, is located about one kilometer away from the planned 330 kV double circuit diversion Novakakhovska – Khesonska line on the north bank of the Dnieper River. The Kherson Oblast Inspection for Protection of Cultural Heritage Objects has approved the diversion route (letter to Ukrenergo No. 1082 M, May 27, 2008) with regard to the subject of L'vove as per applicable legislation. Therefore, construction may be carried out along the planned route passing west of the village L'vove.

It may be possible that planned tower locations conflict with other, not yet identified archaeological sites along the alignment. However, as the foundations already exist for about 40% of the 750 kV route, it is unlikely that any additional archaeological impacts will occur at those locations as part of the re-construction works.

11.2. IMPACTS FROM PHYSICAL PROJECT STRUCTURES

No visual effects are anticipated on the surroundings of the L'vove cultural site.

The towers will be installed in a way that does not interfere with this site, as per the approval from the Kherson Oblast Inspection for Protection of Cultural Heritage Objects.

11.3. IMPACTS FROM OPERATION AND MAINTENANCE (O&M)

No impacts to the L'vove archaeological site are anticipated from Operation and Maintenance.

11.4. MITIGATION MEASURES

Pursuant to Article 7 of the Law of Ukraine "On Protection of Archeological Heritage", cultural heritage protection authorities shall approve the allocation of land plots for city development, road construction, reclamation and other land works at the design stage after archeological survey is carried out. Pursuant to Article 12 of the Law of Ukraine "On Protection of Archeological Heritage", a scientific archeological analysis of the land plots must be undertaken by the Institute of Archeology of the National Academy of Sciences of Ukraine. For the project area, this is the Kherson Oblast Inspection for Protection of Cultural Heritage Objects, with respect to necessary site protection procedures.

Pursuant to Article 37 of the Law of Ukraine "On Protection of Cultural Heritage", all archaeological activities must be carried out at the expense of the customer.

In case archaeological finds are identified during tower foundation works, the construction process will be stopped and representatives of the competent authority will be contacted and informed by the management pursuant to the effective legislation. The scope of monument protection measures will then be determined by the authority.

ERM assumes that an archeological survey of planned tower locations is being conducted as part of the preparation of the local EIA/OVNS. If this is not the case, then such a study needs to be undertaken as part of further detailed planning.

12. CUMULATIVE IMPACTS

Transmission lines do not generate direct emissions of pollutants to air, water or land during their operations, and thus there are no relevant cumulative effects in this respect with any other pollutant emitters in the region.

The generation of noticeable corona noise under certain atmospheric conditions (as described in Section 6.10) is not likely to have a significant overall cumulative impact because most of the TL and diversion routes are through sparsely settled, rural areas. Thus, if the corona noise is heard by the local residents of villages or farms, it is more likely to be perceived as a "stand-alone" noise rather than compounding other existing background noises as might occur in a more urban environment.

Cumulative impacts may occur due to the visual characteristics of the transmission line structures and the interaction with other transmission lines, roads, and other linear structures. Where possible, the routes of the Project TL and diversion lines have been planned to be bundled with other existing structures, i.e. to run in parallel and as close as reasonable (as described in Section 6.6 Land Use, over half of the total line routing is bundled). Such bundling is in conformance with the provisions of The Land Code of Ukraine, which requires that infrastructure

developments such as power transmission lines and communication lines should follow the routes of roads and highways, i. e. in those regions, where the aesthetical value has already been reduced by the existing objects. These provisions have to be balanced to avoid the creation of an unsightly "wirescape", when numerous different transmission systems converge. Based on the current stage of planning, there do not appear to be any cases of such extreme wirescape in the Project Area.

Another negative cumulative impact is the creation of "islands", in which a relatively small land area is surrounded by various transmission lines or roads visible in most/all directions. Based on the current stage of planning, there appear to be only one case of such islands in the Project Area, involving two adjacent farms south of Kakhovka that are bordered by the new 750 kV TL, an existing 330 kV line and a motor road.

VII NATURAL HAZARDS, ACCIDENTS AND COMMUNITY SAFETY

Note: The technical description of the Project in this Draft ESIA Report is based on the current design stage, which is not yet finalised. Therefore, minor changes to the technical details as included in this Report may occur in the future. Any substantial changes will be reflected in the final version of this Report.

1. INTRODUCTION

The purpose of this Chapter is to describe and evaluate the risks and potential impacts to the affected communities stemming from non-routine operations/emergencies as well as from natural hazards with respect to community health, safety and security[1].

Recommendations are given, where appropriate, with respect to preventive and mitigative measures and plans to address the issues in a manner commensurate with the identified risks and potential impacts.

2. INTERFERENCE WITH OTHER FACILITIES OR ACTIVITIES

No other industry is known in the surrounding of the substation which might interfere with their activities. The sanitary protection zone at both sides of the OL and corresponding use restrictions ensures that no interference with other activities or uses might happen.

3. EQUIPMENT SAFETY/MAJOR ACCIDENTS

Major accident hazards of concern with respect to the construction and operation of the OL and the substations are those with the potential for injury, impairment and/or damage to third parties, facilities or population (along the line route or outside the perimeter of the substation sites).The emergencies that may occur at the OL or in substations are typically related to physical damage (such as toppling of the towers), fires and electrical impacts (mainly relevant for the substations), as well as vandalism, with these often being interrelated. Due to its extensive experience with such installations, Ukrenergo is highly familiar with such risks and the associated preventive and reactive measures to minimise the potential impacts to local populations and the affected workers.

The Project will include an extensive number of safety aspects to prevent accidents and to ensure the safe, continuous transfer of power through the system. The Project Design is presently being developed by the design institutes; the following is based on preliminary information and experiences with similar projects.

[1] As per the PR4 of the EBRD Environmental and Social Policy 2008

3.1. TRANSMISSION LINES

The design of the towers and foundations meets applicable norms, such as Power Installations Guidelines (2006), SNiP 2.01.07-85 "Loads and Impacts", SNiP 2.03.01-84 "Concrete and Armoured Concrete Structures", SNiP II.7-81 "Construction in Seismic Areas", SNiP II.23-81* "Steel Structures". The OL will be equipped with lightning protection.

The key risks for the OL operations are toppling of towers and wire breaks due both natural events such as severe weather conditions (e.g. in winter when ice is forming on the conductors and the conductor falls down due to the heavy load, or in summer when heat from a fire could affect the insulators) and vandalism. The causes of tower toppling at 750 kV overhead lines in the past years as reported by Ukrenergo are shown below:

1997

- one case (1 tower) – theft of metal angles;
- one case (2 towers) – strong winds;

1998

- three cases (4 towers total) – theft of metal angles;

1999

- two cases (2 towers) – theft of metal angles;

2000

- one case (1 tower) – theft of metal angles;
- two cases (24 towers) – strong winds;
- one case (36 towers) – severe ice coating[2];

2001

- three cases (4 towers) – theft of metal angles;
- one case (2 towers) –strong winds;

2005

- one case (two towers) – theft of metal angles.

Data on 2005 onwards will be presented in a Final Report.

A partial tower collapse or complete toppling usually causes a wire break and a resulting short circuit in the transmission; the automatic circuit devices then trigger a nearly instantaneous interruption of line operation. In addition, wire-

[2] This severe event occurred on 27 Nov 2000; throughout the country about 100 of 330 kV towers were also destroyed due to the extreme icing conditions.

breaks/interruptions have also occasionally been caused in the past by vandals attempting to steal the OL wires.

Any disconnection of the line will become immediately known to the Ukrenergo operating/maintenance services. The type of damage can be assumed in advance judging from the type of the short circuit. A repair brigade visits the site, depending on the degree of damage repairs take from several hours (spanning of wire ropes and wires) to several days (restoration of a tower). Within this time the voltage is transferred to other OLs, or if necessary the electric power production at the ZNPP is temporarily reduced.

The main consequence to the public of tower toppling is a temporary limitation of power supply, whereby the local villages nearest to the damaged tower may or may not be affected depending on the layout of the local distribution.

It is unlikely that persons would be directly struck by the toppling towers or lines because the buffer-zone to houses or occupied dwellings/work-places is 250 m from the towers (compared to the tower heights of approximately 30 to 35 m. However, the collapsed towers and lines may damage the ground and/or temporarily restrict the use of the surrounding land – e.g. crop damage and prevention of timely harvesting until repairs are made.

The towers will be specified for construction in accordance with the modern design standards existing today; it is worth noting that many of the collapsed towers in the past were built according to older design standards that are not as stable as the current designs.

The OLs (main line and diversions) will be equipped with an electrical safety system which comprises insulators, the earth wire and proper grounding of structures and lightning protection. In the rare event when a conductor breaks, the line will be switched off automatically.

Furthermore, to prevent theft of metal parts, the specifications will call for the welding of the nuts and bolts in the angles within the first 10 m from the ground. This combination of measures will help greatly reduce the risk of tower toppling.

The risk of damage from severe icing of the wires and the structures cannot be completely ruled out, even when conforming to the design norms that also anticipate such loads, especially when in combination with high winds. Given the series of ice-related failures in the past (especially in November 2000), special attention will need to be paid to the underlying assumptions of the norms related to icing effects on the towers and lines.

Line maintenance and emergency repair personnel of the Southern Power System are well trained and equipped to work on the line and implement repairs quickly.

Recommended Preventive and Mitigative Measures:

- Ensure that the theft-prevention measures are specified and implemented during construction – corresponding warning signs should be posted on each tower highlighting the dangers posed (although to the thieves);

- Review the design assumptions related to icing effects; if appropriate, include more conservative design parameters assuming a greater frequency in future of extreme weather events;

- Ensure during planning and detailed routing alignment that there are no dwellings or other occupied buildings within the buffer zone around the towers and lines;

- Provide information to the affected populations with respect to the potential emergencies (including vandalism/theft) and appropriate responses as part of the annual Community Information Program. (refer to chapter 8, table 8-1, item O3).

3.2. SUBSTATIONS

The greatest risk at substation operations is fire, typically caused by malfunction and subsequent overheating of transformers and other equipment. Additional risks include exposure of workers to electromagnetic radiation (EMR) and local rupture-explosion of compressed SF6 gases.

Fires

Both Project substations will be outfitted with modern equipment for avoiding, detecting and fighting fires in accordance with the existing norms and standards; the topic of fire safety is also part of the rehabilitation of the existing Novokakhovka station. In general, the substations will be equipped with the following key components:

- automatic fire alarm systems;

- automatic fire extinguishing units for the autotransformers;

- control units;

- fire pump station and tank holding a water reserve for fire extinguishing;

- a ring water supply network with fire hydrants;

- primary fire extinguishing means, such as manual carbon dioxide extinguishers, tools, boxes with sand.

Lightning protection will be installed at the substation according to the detailed Project design and the "Guidelines for Lightning Protection of Buildings and Installations" RD 34.21.122-87.

Access will be provided for fire engines to buildings and installations as well as to all units of high-voltage equipment. Appropriate emergency signs and arrows will be installed near fire hydrants and tanks.

The local population will not normally be affected by fires at the substations, except for the potential temporary interruption in power supply. There are no residential areas near the new/rebuilt Kakhovka Substation, whereby the existing Novokakhovka Substation is located in a populated area. Emergency Plans will be prepared for both substations in accordance with the applicable norms. The specific fire and emergency measures related to the modernisation-expansion of the Novokakhovka Substation will be communicated to the local residents, who may not be aware of the changing situation at that substation.

Gases

The Project will include the use of sulphur hexafluoride (SF6) gas for insulation of switch gear and current transformers. SF6 is an inert insulating gas that is non-toxic, non-flammable and poses no hazard to soil or groundwater. The gas is, however, a very strong greenhouse gas with an atmospheric lifetime of more than 1000 years, and therefore the equipment must be carefully sealed and pressurised to prevent emission releases. As a result, however, there is a potential risk of sudden depressurisation and release.

The high-voltage equipment will be operated by highly skilled personnel who have been trained in operation and maintenance of such equipment, including the handling of SF6. Operation and maintenance of SF6 switchgear will be regulated by the following industry normative documents:

- Guideline for Operation of SF6 Switchgear (GND 34.47.503-2004) approved by the Ministry of Fuel and Energy of Ukraine, Order No. 135 of 05 March 2004, and put into force 05 April 2004;

- Technical Operation of Power Stations and Networks. Guidelines (GKD 34.20.507-2003).

A separate room is allocated to store SF6 cylinders that is equipped with specialised SF6 concentration indicators.

The use of the SF6 gas at the substations is not expected to have any implications for the local public.

Transformer Oils

Transformer oils applied are free of Polychlorinated Biphenyls. Transformers are equipped with secondary containment as a preventive measure in case of leakage.

Exposure to EMR

The workers at the substations are exposed to electromagnetic radiation (EMR) generated by the high-voltage equipment. Stringent standards and norms exist about the maximum permitted emissions from equipment and the exposure to workers.

The workplaces of the Ukrenergo Southern Power System, including the two substations, will be subject to inspection for labour safety compliance – including exposure to electromagnetic radiation - every five years. The inspection includes metering of electromagnetic field strength of the open distributors (VRU) at substations. Strength cards are prepared for each substation, from which maximum exposure periods are calculated and monitored.

The project envisages installation of EMR protection devices at both substations. Protection of workplaces is designed in compliance with GOST 12.4.154-85 "Shielding Devices for Protection from Industrial Frequency Electric Fields".

The public is protected from EMR exposure from both the lines and the substation equipment via the mandatory safety zones for occupied dwellings as specified by the norms (refer to Chapter 2 regarding applicable regulations).

The EMR emissions at the substations are not expected to have any implications for the local public, provided that the mandatory safety zones are maintained.

General Security

The substations are illuminated to prevent injuries to the personnel and to facilitate repair works during evening hours, plus to help prevent trespassing and vandalism.

The lighting fixtures are not expected to pose a nuisance at the Kakhovka Substation, as there are no local residential areas. However, potential nuisance effects on neighbours may occur at the Novokakhovka Substation.

Recommended Preventive and Mitigative Measures:

- Provide information to the affected populations near the substations with respect to the potential emergencies (including vandalism/theft) and appropriate responses as part of the annual Community Information Program. (reference to Ch 8 plan measure);

- Monitor any complaints regarding substation activities at Novokakhovska 330 kV SS, e.g. night-time lighting, noises, etc.

4. EXPOSURE TO NATURAL HAZARDS

The OL installations will be designed to withstand natural hazards and disaster impacts according to the applicable design standards and criteria.

In general, the actions related to Project construction and operation will not alter the present land uses and physical characteristics (e.g. extensive clearing of vegetation or change of topography or hydrology) to the extent that this will have any significant effects on the probability of events such as floods, fires, storms, etc, nor to exacerbate (or minimise) the effects of such events on the local communities.

Furthermore, the nature of this OL Project is such that there are no major threats to local communities in the event of failure or malfunction of system components.

The following subsections describe the general likelihood of selected natural hazards and the potential implications to the Project installations and subsequently to the local population.

4.1. SEISMIC RISK

As described in Section 5.2, the Project is located in an active seismic region.

The overhead lines, the substations and the other installations will be designed to withstand seismicity levels of 8 point magnitude (MSK Scale), with reference to the *Construction Standards and Rules for Construction in Seismic Areas* (SNiP II-7-81).

There are no reported events of tower-toppling or other damages to OL installations in Ukraine caused by seismic events.

Recommended Preventive and Mitigative Measures:

- Ensure that construction specifications refer to the appropriate Construction Standards and facilities are built accordingly;

- Ensure during planning that there are no dwellings or other occupied buildings within the buffer zone.

4.2. FLOODING RISK

The most significant water body in the Project Area is the Dnieper River, which is protected from flooding by a series of dams, including the Kakhovka and Zaporizha Dams in the Project Area. The two substations in Novakakhovka and Kakhovka are not located within areas prone to flooding, and are situated at elevations well above the Dnieper Valley. Based on Ukrenergo statements, there has been no known flooding of these two locations (Kakhovka substation exists since the 1950's). Thus, the risk of flooding is considered unlikely in the future.

The tower structures are mainly located away from the Dnieper and other smaller rivers/water bodies, whereby local flooding would not be expected to cause damage to the towers. The towers built near the Dnieper at the point of crossing of the 330 kV diversion will be designed to withstand any predictable flooding, if in the flooding zone, in accordance with the existing design standards.

4.3. STORMS, ICING AND HIGH WINDS

The main impact of severe storms and the associated high winds and/or icing in winter is tower collapse or toppling, whereby the older tower designs were reportedly less stable and also there was frequently a further man-made factor to compound the failure risk, namely theft of metal components of the structures thereby weakening the stability.

The transmission lines carry a lighter conductor wire over the main power conductors. This conductor is grounded at various points along the link and insulated from the tower structures by insulators.

Electrical substations have a system of grounding devices covering the whole plant.

The implications of tower toppling and preventive measures are described in chapter 7.3.1.

4.4. FIRES

The fires that occur along the OL routes are usually caused by human actions such as burning of agricultural wastes, rush/reeds, dried grass, tall grass, etc. Each year in the past there have been one or two events of this type reported along 750 kV OL routes in Ukraine. In 2003 there was one event involving a local forest fire.

The damage inflicted by such fires to the OL systems is usually not severe, but in case the fires reach the low-hanging portions of the wires, it can lead to wire failure/break. In such cases the power through the lines is automatically cut off. The wires must then be repaired.

Recommended Preventive and Mitigative Measures:

- *Provide instructions and guidance to local residents and agricultural workers as part of the community information program on an annual basis about the risks of fires near the OLs.*

5. HAZARDOUS MATERIALS SAFETY

There are relatively few hazardous materials or wastes associated with the Project.

Overhead lines

During construction, the old partly built concrete foundations and steel towers along the 750 kV line will be removed and disposed of/recycled; this material is not hazardous.

Whilst not related to a "material" per se, the operation of the OLs poses a potential hazard to the local public from the emission of electromagnetic radiation (EMR) from the lines. EMR is heavily regulated, and the permitted emission/exposure standards under the Ukrainian norms are more stringent than those in the European Union, e.g. with respect to the minimum distance to nearest residential areas. This topic is discussed in more detail in Chapters 2.1.5 and 6.9, including the applicable norms and implications for line routing and land use restrictions.

Substations

During construction at the Kakhovka Substation, the old partly built concrete foundations and steel towers/equipment will be removed and disposed of/recycled; this material is not hazardous. At the partially built housing settlement near the Kakhovka Substation, the existing roofing panels (on some houses) are made of corrugated asbestos-cement; these panels will be removed and disposed of at a licensed landfill in accordance with the applicable regulations for hazardous wastes [3]. During rehabilitation of the Novokakhovka Substation, any old transformers and other specialised equipment will need to be properly dismantled and processed for either re-use (e.g. as spare part), or off-site disposal or recycling. Special attention must be given to avoid spills/releases of oils and lubricants onto the ground and PCBs – threat to public health.

During operation of the Substations, there are hazardous materials involved such as oils, gases, and the high-voltage equipment. These are described above in Section VII-3.2.

Provided that the corresponding norms are adhered to, the potential impacts to the local population and workers near the OLs and substations are minimised.

6. COMMUNITY EXPOSURE TO DISEASES

Given the limited number of workers involved in the construction crews involved with this Project, it is not anticipated that the transmission of communicable diseases due to the presence of the workforce will pose a significant risk to the local village populations.

Nevertheless, this topic will be included in the training to the workers with respect to overall code-of-conduct with the public and minimising any negative impacts of the Project activities to the local villages. The villagers will be made aware of the upcoming construction activities and the method for contacting Ukrenergo in case of questions or grievances, as per the Community Information Program.

[3] landfilling of such asbestos-containing material is also the generally accepted method of disposal in the EU

Recommended Preventive and Mitigative Measures:

- Provide instructions and guidance to construction crews regarding the proper code-of-conduct vis a vis the local villagers
- Ensure quick response by Ukrenergo and/or the Construction Contractor in case of queries or complaints by the public about the construction crews.

7. EMERGENCY PREPAREDNESS AND RESPONSE

The key causes of emergencies related to Project implementation and operations are discussed in the sections above.

In accordance with the norms and permitting requirements, Ukrenergo and contractors are developing the required emergency plans as appropriate for each type of installation and the related functions and activities. Maintaining safe operations and providing rapid response are inherent aspects of such electrical utility installations. The emergency plans will include, among others, a description of the following topics on accident prevention and emergency response:

- Organisational structure and responsibilities (including interface of Ukrenergo, contractors and local fire/emergency bodies);
- Specific preventive and response procedures;
- Communication with workers and affected public;
- Training of workers;
- Required resources to ensure successful implementation.

As partly discussed in the preceding sections, Ukrenergo will need to liaise closely with the representatives of the local Rayons and villages to ensure close communication with local populations about the potential hazards of OL operations and appropriate prevention measures and responses. This should be integrated with the overall Public Information Program about the Project.

Likewise, arrangements will need to be made with the local responsible fire and rescue services to ensure that appropriate response can be made in the event of a tower collapse, fire or other emergency. Such actions are in any case prescribed by the applicable regulations and permit requirements for construction and operation of the OL.

Any cases of emergency events will be included in the annual information bulletin for the public, along with lessons-learned regarding improvement of prevention and/or response measures.

VIII ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN (ESMMP)

Note: The technical description of the Project in this Draft ESIA Report is based on the current design stage, which is not yet finalised. Therefore, minor changes to the technical details as included in this Report may occur in the future. Any substantial changes will be reflected in the final version of this Report.

1. GENERAL ESMMP BACKGROUND

This section comprises the Environmental and Social Management and Monitoring Plan (ESMMP) for the ESIA for this Project. It summarises the organizational requirements, actions and monitoring plans to ensure that the necessary measures are taken by Ukrenergo to avoid potentially adverse effects - and maximise potential benefits - of the Project with respect to environmental, health and safety (H&S) and social aspects, and to operate In conformance with applicable laws and regulations of Ukraine, as well as the policies of international financial organizations[1] .

The specific ESMMP items are based on the Baseline Conditions and the Impact Assessment described in previous chapters, plus the results of discussions with Stakeholders and Ukrenergo.

The primary objective of the mitigation measures outlined previously and this ESMMP is to avoid negative impacts of the Project where possible, or otherwise to minimise the residual impacts to an acceptable level. Likewise, appropriate measures are suggested to maximise the potential for any benefits arising from the Project implementation.

The ESMMP takes a long-term view of the entire life-cycle of the Project and will continue to evolve in scope and depth within the four key stages of the project implementation:

- Final Planning-Design (preconstruction);
- Construction;
- Operation; and
- Decommissioning (including reinstatement).

The ESMMP consists of a combination of operational policies, procedures and practices. Overall responsibility for the ESMMP lies with Ukrenergo, whereby a number of the specific actions will be carried out by the third-party Contractors in the different stages. The Contractors' activities, however, will be supervised by Ukrenergo to ensure that the implementation by the Contractors is being performed as planned. These will be pointed out in a separate Contractors Management Plan.

[1] Of particular relevance is the EBRD 2008 Policy - Performance Requirement (PR) #1 regarding ESAPs (ESMMPs)

International Standards and guidelines relevant for the detailing of the ESMMP action items include, but are not limited to:

- IFC Performance Standards on Social and Environmental Sustainability, 2007, particularly Performance Standard 2 on Labour and Working Conditions;
- EBRD Environmental and Social Policy, 2008;
- ILO Best Practise Guide "*Safety and Health in Construction"* ILO-OSH (2001);
- Recommendation Concerning the List of Occupational Diseases and the Recording and Notification of Occupational Accidents and Diseases (ILO Recommendation 194).

The ESMMP is thus divided into two parts:

- The first part (Section 8.2) describes the ESMMP measures with respect to overall implementation and monitoring by Ukrenergo, including the organisational/review measures that Ukrenergo should undertake with respect to the Contractor works.
- The second part (in Section 8.3) includes the more specific action-mitigation items related to the various environmental and social topics described in Chapters 6 and 7 - these are spelled out in Table 8-1.

2. UKRENERGO MEASURES THROUGHOUT THE PROJECT

Ukrenergo will need to undertake a number of measures lasting throughout the Project to ensure successful implementation of the ESMMP[2]. For each topic, one or more "Key Performance Indicators" are given that will permit objective confirmation of the implementation of the measure.

2.1. ORGANISATIONAL CAPACITY

Ukrenergo must establish and maintain an organisational structure that defines roles, responsibilities, and authority to implement the ESMMP described in this ESIA Report. This will include the following aspects:

- Designation of a Senior Manager with overall responsibility and one or more Managers with day-to-day responsibility for specific areas or stages of the ESMMP, including management of the various Contractors;
- Statement of commitment by Senior Management to devote the necessary human and financial resources on an ongoing basis throughout the Project to achieve effective and continuous conformance with the ESMMP;
- Communication of the commitment, roles and related responsibilities to the Ukrenergo Project teams and public/stakeholders Program of awareness and training of employees involved with the Project with respect to the social and environmental aspects of the Project and the specific relevant obligations under the ESMMP.

[2] Note: the "overall ESMMP items" described in this Section are in addition to and supplement the more detailed items listed in Table 8-1

Key Performance Indicators for Organisational Capacity:

- Publication of management commitment and delegation of roles and responsibilities on the Ukrenergo project web-site
- Written confirmation of in-house trainings of Project employees regarding social and environmental awareness and ESMMP implementation

2.2. CONTRACTOR MANAGEMENT PLAN

Whilst Ukrenergo has overall responsibility for the Project and implementation of the ESMMP, much of the work will be done by various contractors engaged by Ukrenergo. These include design firms, surveyors, and permitting specialists in the Planning Stage and especially the main Construction Contractor during the Construction Stage and later Commissioning Stage. Thus it is important for Ukrenergo to implement procedures in a Contractor Management Plan to ensure that the Contractors are fully aware of the relevant ESMMP issues and similarly committed as is Ukrenergo to the successful implementation of the ESMMP.

The main components of the Contractor Management Plan will include:

- Designation of senior Ukrenergo managers responsible for the Contractor Management Plan (or portions thereof, as relevant for the Project Stages);
- Training and awareness sessions for the responsible persons in the Ukrenergo Contracting/Procurement Department regarding the ESMMP requirements for Contractors;
- The specific relevant ESMMP provisions (including requirements regarding occupational health and safety) will be included into tender documents as appropriate for the tendered services;
- The bidding contractors' capacity to meet the ESMMP requirements (i.e. sufficient skills and experience) will be screened and included in the award-decision criteria;
- Each contract will include requirements regarding the relevant environmental and social risks and ESMMP requirements associated with the contract activities and will include appropriate non-compliance remedies. Plus contracts will include requirements that in the case of sub-contracting, the subcontractors will be subject to similar obligations as the main contractor;
- The contractor will be obliged to provide all necessary skilled and trained EHS staff to ensure that all activities are carried out in accordance with the EHS regulations, and guidelines of Ukraine and international best practice (such as EBRD Performance Requirement 2 on Labour and Working Conditions). Potential risks at work places have to be assessed, like chemicals, mechanical and electrical risks, working at heights, confined space, hot work;
- The contractor will have to demonstrate the appropriate skills, qualification and/or working experience of his staff and subcontractors to the Supervisor (at Ukrenergo). Construction workforce and sub-contractors will receive comprehensive H&S training at the beginning of an appointment, thereafter on a regular basis throughout the entire construction period. Special safety instructions will be provided for temporary workforce and for young workforce;

- In the event that foreign firms are contracted and significant numbers of foreign workers will be involved in the Project, special attention will be given to ensure that all Ukrainian and international labour laws and regulations (e.g. ILO core labour standards such as respect to child labour, working hours, overtime compensation, etc) are complied with;

- Ukrenergo will routinely monitor the performance of the contractors with respect to ESMMP requirements (see also Part C. Annual ESMMP Performance Monitoring, below).

Standards and guidelines relevant for the detailing of the ESMMP action items include, but are not limited to:

- EBRD Environmental and Social Policy, 2008
- ILO Best Practise Guide "*Safety and Health in Construction"* ILO-OSH (2001)
- Recommendation Concerning the List of Occupational Diseases and the Recording and Notification of Occupational Accidents and Diseases (ILO Recommendation 194)
- Labour Code of the Ukraine
- other relevant legislation of Ukraine
- EHS Guidelines for Electric Power Transmission and Distribution (IFC, 2007)

Key Performance Indicators for Contractor Management:

- Publication of delegation of roles and responsibilities on the Ukrenergo project web-site regarding Contractor Management (can be integrated with actions regarding Organisational Capacity)
- Written confirmation of in-house trainings of Contracts-Procurement specialists regarding ESMMP implementation
- Written examples of tender specs and contracts with specific reference to and requirements for ESMMP topics.
- Inclusion of contractor ESMMP performance in the ESMMP Audits

2.3. ANNUAL ESMMP PERFORMANCE MONITORING AND REPORTING

The Project is considered by the EBRD as a "Category A" Project, and thus Ukrenergo will be obliged to retain qualified specialists to undertake periodic monitoring/audits throughout the period of EBRD involvement with the Project. Based upon previous project experience an initial ESMMP Audit should take place within six months of the start of each new Project Stage (Planning, Construction, Operation & Maintenance, Decommissioning), and based on the results, the subsequent audit schedule can be agreed, but must be conducted at least annually.

The ESMMP Audit results must be documented and forwarded for review to the senior responsible persons at Ukrenergo and the EBRD; also, in accordance with

EBRD policy on Information Disclosure[3] the Audit results must be disclosed to the relevant parties/stakeholders affected by the ESMMP.

The ESMMP Audit Reports shall cover the status of EHS-related aspects like permits, status of compliance with obligations arising from such licences or permits, exceedings of regulatory environmental standards with root cause analysis, corrective measures, as well as conformance with the ESMMP. The Audits must address the performance of both Ukrenergo and any Contractors or Subcontractors.

Depending on the findings, it may be necessary to revise the original ESMMP to better reflect the changing situation with the Project implementation, and/or the social, environmental or regulatory framework conditions.

Key Performance Indicators for ESMMP Monitoring:

- Engagement of a qualified external expert to undertake the initial and periodic ESMMP Audits
- Submittal to EBRD of initial ESMMP Audit Report after about six months from ESIA Report finalisation; thereafter (at least) annual ESMMP Audit Reports, and distribution to affected stakeholders, e.g. by publication on the Ukrenergo project web-site

2.4. COMMUNICATION AND GRIEVANCE PROCEDURE

Ukrenergo will develop and implement a *Public Communication Program* to provide ongoing information to the affected Stakeholders and general public about the key relevant environmental and social aspects throughout the future Project execution (including construction and operation). This Program will build upon the Stakeholder engagement process and Stakeholder Engagement Plan (SEP) already established as part of this ESIA Report. The basis for this Program will be outlined on the Ukrenergo project website, supplemented with use of mass media, bulletins, brochures, emails, direct mailings and other communication forms (as was done during the PCDP/SEP actions) to reach the affected Stakeholders. The main actions of the *Public Communication Program* are described in the following:

Of particular relevance will be the timely and appropriate provision of information to the local villages and land users prior to and during the local construction activities (whether directly by Ukrenergo and/or through the Construction Contractors).

- At a minimum, Ukrenergo will provide information on an annual basis to the local villages to keep them abreast of the Project schedule and when/where which activities are planned.
- Specific information will also be provided on adhoc basis should there be significant changes in the Project planning that may strongly affect certain Stakeholders, e.g. local re-alignment of the route, or revisions in local construction schedule.

[3] EBRD 2008 Policy - PR 10

Ukrenergo will also maintain an information "hotline" via telephone, mail and email to facilitate communication with the public and Stakeholders. As of this present stage of the Project, Ukrenergo has designated Mr. A.N. Shvidkyi, First Deputy Director of Southern Electric Power System – Ukrenergo, as the "Public Liaison Officer" and thus also responsible for project communication. Contact details of Mr Shvidkyi are given in the PCDP/SEP. These contact details and hotline information will be distributed widely throughout the Project area and posted on the Ukrenergo Website.

This provision of information will be coupled with the availability to the Stakeholders of the Grievance Procedure, as already begun to be implemented as part of the ESIA process (as described in the PCDP/SEP).

The Grievance Procedure (sometimes also called Grievance Mechanism), provides Stakeholders a way to formally register any complaints/ grievances to Ukrenergo about any part of the process of the Project implementation (incl. construction and operation). Examples of Grievance issues may include items such as:

- Damage to crops during tower construction;
- Unexpected corona noises during TL operations.

As Public Liaison Officer, Mr Shvidki is presently also responsible for handling of grievances. The Grievance Procedure will be updated as appropriate during the course of the Project and subsequent operational stage. The Construction Contractor will also be required to implement a "Quick Response" procedure to react as efficiently and directly as possible to urgent Stakeholder concerns in the field; i.e. without necessarily having to first go through the formal Grievance process with Ukrenergo.

Should the need arise, Ukrenergo will consider the establishment of a conflict resolution "committee" (comprising Ukrenergo representatives, village council representatives, and other persons as appropriate) for the management of complex grievance issues. The intent of the Grievance Procedures and the conflict resolution committee will be to quickly and effectively respond to Stakeholder and public concerns on a direct basis, thus avoiding the need for escalation of the issue to the administrative-judicial bodies[4].

Grievance statements may be provided via letter, email, fax, or telephone call. Grievances will in general be responded to within 1 month after receipt according to the Law of Ukraine on Citizens' Appeals.

Ukrenergo will maintain a log of grievances received and the manner in which the issues have been handled.

A summary of the Grievance issues will be included in the annual reporting of project implementation on the Project Website, whilst maintaining the confidentiality of individual persons/Stakeholders involved.

[4] Nevertheless, these Procedures do not replace or impede the right of the Stakeholders to seek formal redress.

Key Performance Indicators for Communication and Grievance Procedures:

- The Public Communication Program, including Grievance Procedure, is elaborated and posted on the Ukrenergo Website.
- A "Quick Response" procedure has been agreed with the Contractor to be able to respond directly to urgent issues in the field, and this is published on the Ukrenergo Website.
- Local villagers/Stakeholders are aware of the Project and in particular the planned schedule of activities most likely to affect them (e.g. local construction dates).
- The Annual Reports are posted on the Ukrenergo Website regarding progress of the Program and update/results of the Grievance Procedures.

3. SPECIFIC MITIGATION ITEMS

The specific recommended mitigation measures for each Stage of the Project are spelled out in Table 8-1. For each item the following information is provided:

- Key activities/aspects (which results in a potential impact);
- Potential significant impacts of the activities (negative impact, unless stated otherwise);
- Recommended avoidance/mitigation measures, including a qualitative indication of implementation timing, where applicable;
- Key Performance Indicators (to show/confirm the mitigation measures are implemented); and
- The extent of any residual impacts (even if the avoidance/mitigation measures are implemented as planned).

Each of the described measures is based on the information gathered in the Baseline Assessment and the evaluation of impacts described in previous Chapters.

Table 8-1 Environmental and Social Management and Monitoring Plan (ESMMP)

General Notes:

Any plan or procedure/work instruction listed in the following will be based on the contractual provisions specified by Ukrenergo with the Construction Contractor and other third parties and requires approval by Ukrenergo before implementation. Implementation Supervision will be provided by Ukrenergo and oversight by the Lenders and their advisors. Plans and measures are subject to revision for performance improvement if monitoring reveals weaknesses in implementation. Action item implementation will be benchmarked against key performance indicators. All activities related to construction and operation will also be subject to inspection by the responsible Ukrainian authorities and regular monitoring visits by the Lender's environmental and social specialists.

I. PLANNING-DESIGN STAGE

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
P1	6.3	**Minimum clearance height of the line at the Dnieper Crossing and flood aspects at tower locations nearby (navigable water)**	Impact on shipment activities on Dnieper river	In the detailed planning stage: ▪ Confirm the minimum height of the lines at the Dnieper crossing with relevant authorities ▪ Confirm tower locations as to effect on water flow in case of flooding with relevant authorities	Ukrenergo/Planner In agreement with relevant authorities (e.g. shipment authorities)	Correspondence with relevant authorities showing agreement with planned height conditions and tower locations near Dnieper crossing	Minor
P2	6.6	**Crossing of surface waters**	Potential for bird collision	In the detailed planning stage: ▪ Confirm water crossings ▪ Reduce bird collision risk through installation of bird marker on the earth wire of the new TL at the surface water crossing up	Ukrenergo	Make bird markers part of terms of reference for construction. Audit TL after construction whether markers installed correctly.	Bird collision risk reduced by 80% (according to various investigations in western Europe)

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
				to a distance of 3 km ▪ Installation of markers in 20 m intervals, at the water crossing at 10 m intervals ▪ In case of bundling with existing TL while crossing surface water, also installation of markers on existing TL.			
P3	6.5	**Planning of construction activities at** **- Dnieper crossing before construction** **- further sensitive areas (IBA Kajiry and IBA Energodar) before construction**	Disturbance of birds during construction	In the detailed planning stage ▪ Construction time outside breeding period from April to July In addition the following for the Dnieper crossing: ▪ perform bird survey comprising complete annual cycle, incl. breeding, migration and wintering periods ▪ determine time period for construction with the least impact also considering migration/wintering time based on survey ▪ determine additional measures (such as calming of areas, hunting restrictions) to enable affected species to evade from construction sites.	Ukrenergo/Consultant	Appropriate scheduling of construction, particular focus on construction time at southern shore of the Dnieper river Successful implementation of additional measures (such as calming of Dnieper construction site) Monitor scheme during construction activities (see below construction)	Minor

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
P4	6.5, 6.8	**Vodyanski Sands: Planned 750 kV route crosses a designated protected area in bundling with two existing 750 kV lines**	Impact on flora/fauna/ habitats of designated protected area Crossing of protected area involving construction activities	▪ Prepare final detailed design to include mitigation measures based on the public consultation and agreement with the competent authorities to ensure compliance with applicable Ukrainian legislation. ▪	Ukrenergo	Agreement with competent authorities accepting current planned routing in bundling with existing 750 kV lines through protected area and in compliance with regulatory requirements Ukrenergo to provide to the Lenders and interested stakeholders correspondence showing agreement with authorities Design the route in compliance with Ukrainian legislation if no agreement with the authorities can be obtained.	Minor
P5a	6.5, 6.8	**Urochysche Bilozirske:: Planned 750 kV route potentially crosses designated protected area**	Impact on flora/fauna/ habitats of designated protected area Potential crossing of protected area involving construction activities in this	▪ Confirm with authorities the boundaries of protected area ▪ Where a protected area is crossed by current TL routing, consider design of mitigation measures that will ensure compliance with National laws and limit environmental impacts. This may include the review of the line	Ukrenergo	Final detailed design of the route includes mitigation based on the public consultation and agreements with the competent authorities to ensure compliance with applicable Ukrainian legislation.Ukrenergo to publish summary of mitigation measure agreed with local	Minor

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
			area	design e.g. higher towers to limit impact ▪ Obtain agreement with competent authority to agree on the route ▪ Install bird markers as appropriate, e.g. if final routing involves crossing of surface water or bird flight paths (see item P2)		authorities Ukrenego to provide to the Lenders and interested stakeholders correspondence showing agreement with authorities	
P5b	6.5, 6.8	**Kairska Balka: Planned 750 kV route potentially crosses designated protected area (assumed to be in Important Bird Area, IBA)**	Impact on flora/fauna/ habitats of designated protected area Potential crossing of protected area involving construction activities	▪ Confirm with authorities the boundaries of the protected area / IBA ▪ Perform bird survey in cooperation with local bird experts (e.g. BirdLife Association) comprising two complete annual cycles, incl. breeding, migration and wintering periods to collect further data (*bird survey see also item P3*) ▪ Re-evaluate the impact on birds based on additional information and mitigation measures (including Installation of bird markers/diverters); ▪ Submit re-evaluation report to the EBRD for agreement	Ukrenergo/Consultant	Final detailed design includes mitigation based on the public consultation and agreements with the competent authorities to ensure compliance with Ukrainian legislation Ukrenergo to publish summary of mitigation measure agreed with local authorities Ukrenergo to provide to Lenders and interested stakeholders correspondence showing agreement with authorities	Minor

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
				▪ Optimize design, if needed, based on additional studies; ▪ Prepare final detailed design to include mitigation measures based on the public consultation and agreement with the competent authorities to ensure compliance with applicable Ukrainian legislation.			
P6	6.5, 6.8	**Kakhovka substation and routing of 750 kV line and 330 kV diversions is located near existing protected area (Korsunsky forest area) and planned nature national park (Oleshkivski sands)**	Potential impact on flora/fauna/ habitats of designated protected area	▪ Agree with competent authorities (local/regional/national) on currently planned location of Kakhovka substation and routing of lines;	Ukrenergo	Agreement with competent authorities accepting currently planned locations and line routing near (planned) protected areas and in compliance with regulatory requirements Correspondence showing agreement with authorities	Minor
P7	6.5	**330kV Diversion Kakhovka-Kherson crossing a flood plain area and the Dnieper River near Lvovo/ Korsunske**	High risk for bird collision since Dnieper is main migration route between several Important Bird	▪ Perform bird survey in cooperation with local and recognized ornithological experts comprising two complete annual cycles, incl. breeding, migration and wintering periods to	Ukrenergo, planner, consultants	Documentation on bird survey Report on re-evaluation report of bird impact	Moderate

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
			Areas. Crossing of planned National Park planned at Dnieper River in Kakhovske water reservoir by 2010/2011	collect further data (*bird survey see also item P3*) ▪ Re-evaluate the impact on birds based on additional information, consider aspects of future development (e.g. extension of 750 kV line along the southern backbone system) and mitigation measures in the re-evaluation (incl. bird markers/diverters also at other existing power lines crossing the Dnieper); ▪ Submit re-evaluation report to Lenders for agreement ▪ Optimize design, if needed based on additional studies; ▪ Agree with authorities, stakeholders on final design; ▪ If required perform study of additional mitigation measures to allow an appropriate design that is agreeable to authorities and stakeholders and is based on the most optimal technical, economic and environmental solution. ▪ Install bird markers at line		Final detailed design of the crossing includes mitigation measures based on the public consultation and agreements with the stakeholders and competent authorities.	

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
				where the line crosses surface waters and is near sensitive bird areas (see item P2)			
P8	6.5	**Coordination/operation in vicinity of breeding areas - local bird situation not reflected adequately in present planning**	Disturbance of breeding population during construction Dissecting habitats of species preferring open landscapes (such as geese, bustards)	▪ Identify breeding populations known to local bird experts ▪ Identify significant populations of bird species in open landscapes (e.g. geese, bustards) ▪ If needed, apply bird markers to transmission line in affected areas	Ukrenergo/Consultant	Documentation of detailed planning showing breeding areas and line sections where markers are applied	Minor
P9	6.7	**Land acquisition for towers**	Loss of land value to owner/user through permanent land withdrawal	During the pre-construction phase: Develop a Land Acquisition Plan (LAP) including: ▪ List of all affected landowners and advance information of intended land withdrawal ▪ Compensation based on either replacement with other plot or fair market price of the plot at the time of withdrawal ▪ Involving professional	Ukrenergo (LAP and valuation) Compensation-entitlement process managed by Ukrenergo as part of Compensation Commission	An LAP exists Documentation on publication in mass media on planned construction start Documents that show each land owner/user has been duly informed and their consent obtained, approvals of local and state authorities and/or Compensation Commissions Valuation report and	Minor

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
				licensed land valuators and the Compensation Commissions ▪ Address various types of land owners/land users for compensation: (1) Private owners working own land (2) Private owners renting their land to others (3) Entrepreneurs working on private or village reserve lands: (4) Village councils holding land ▪ Conform to Ukraine Land Code and other relevant regulations, and EBRD PR5		compensation schedules for each land owner and land user .	
P10	6.1, 6.6, 6.7	**Private properties temporarily used for access roads, construction work/assembly of towers, unwinding of cables, construction camps, etc.**	Temporary loss of agricultural land use and physical damage to crops and land, limited access to fields, etc resulting in reduced yield/harvest and thus reduced income/earnings.	Prior to start of construction: Prepare as part of the *Construction Plan* ▪ Careful plan of access roads and construction site layouts and timing to ensure minimum damage-footprint (e.g. by using existing roads and pathways as far as possible, work outside harvest season) ▪ List of all landowners/users who will be affected by construction activities	Ukrenergo Designers and Construction Contractor	Written construction Plan showing layout and schedule of works, list of affected landowners, confirmation that landowners are notified of pending works. Short-term lease agreements signed by all landowners Long-term easement agreements signed with land-owners along the route	Minor, temporary

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
				Notify affected owners and users of land plots near about the construction through mass-media one year before the construction starts ▪ Sign short term lease agreements with the affected owners, including information about the compensation-entitlement process. ▪ Sign long-term agreements for easements to access TLs for maintenance during operational stage			
P11	6.6	**Transmission Line route potentially overlaps with operating areas of existing moving sprinkler- irrigation facilities**	Interference with the sprinkler operations due to physical blockage by TL towers and restriction s of SPZ, resulting in reduced yield and income for the farmers	During detailed planning/design: ▪ Confirm which/if any sprinkler systems are affected; ▪ Determine if local shifting of towers and/or sprinkler systems is possible to avoid overlap; ▪ If needed, provide one-time fair-value compensation to farmers for reconfiguration of irrigation system as per the Compensation-Entitlement Process	Ukrenergo/Planner	Final routing provides for sufficient clearance for irrigation facilities and/or evidence of compensation paid to the farmers	Minor

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
P12		**Clearance of areas for preparation of TL corridor and tower locations**	Loss of trees along the route	During detailed planning/design: As part of the Construction Plan ▪ Identify number of trees to be cut in corridor as part of the Construction Plan and the respective land owners ▪ Establish adequate compensation as per Entitlement Plan, preferably via replacement of ecological value of lost trees by planting same tree species at comparable location ▪ Ensure tree cutting measures are minimised during periods of wildlife nesting and breeding in the forests	Ukrenergo / planner/Construction Contractor	Construction Plan shows trees to be cut, timing and landowners; Compensation is made to tree owners	Minor
P13	6.7, 6.9	**EMR emissions from TLs**	Health effects on humans if TLs too close to homes and other occupied buildings	▪ Ensure adequate sanitary protection zone will be established ▪ Verify distance of objects and object clusters identified as part of this assessment (see List of Annex 6-2) and possibly others from the alignment once survey of tower locations has been finalized (expected to be in July	Ukrenergo / planner	Final approved routing provides minimum buffer-distance (250 m minimum distance from settlement to 750 kV line) or 40 m for SPZ of 750 kV, 20m for SPZ to 330 kV) Documentation that occupants / owners of	Minor, temporary

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
				2009). If any of these objects are situated within 250 m zone of the 750 kV line there will be taken the relevant decision according to the Ukrainian legislation.		houses were contacted and use of housing was verified to be not residential in case settlements or houses are located within the 250 m zone or SPZ (based on Annex 6.2, and possibly others). Compensation is paid for any relocation needed.	
P14	6.11	**TL potentially too close to archaeological, cultural heritage or designated recreation sites**	Visual disturbance of esthetical value of these sites, violation of laws on protection of cultural-historical monuments Physical damage to suspected buried objects	▪ Further evaluation of the site to determine exact location of archaeological sites near the route; agreement with authorities on adequate buffer-distance to TL; potential need for micro-detour of the TL route at this location	Ukrenergo	Letter of confirmation by the authorities that the final routing plans of the TL, and especially the tower locations, will not negatively affect any known or suspected historical site	Minor
P15	6.12	**Cumulative effect through creation of "islands" (i.e. a relatively small land area is surrounded by various transmission lines or roads visible in**	Deterioration of connectivity and access through enclosure of housing (e.g. farms, stables etc.) through infrastructure	▪ Based on the current stage of planning, there appear to be only one case of such islands in the Project Area, involving two adjacent farms south of Kakhovka that are bordered by the new 750	Ukrenergo / planner	Documentation that alternatives were evaluated to avoid "islands" Final approved alignment allows "islands" within routing only if no	Minor

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
		most/all directions)	lines from different sides	kV TL, an existing 330 kV line and a railway ▪ Where island effect is identified, evaluate if additional mitigation measures are economically, environmentally and socially feasible.		alternative is reasonable	

II. CONSTRUCTION STAGE

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
C1	6.1, 6.2, 6.3, 6.4	**Environmental, Performance of construction activities / Good Practice**	Potential spills or soil/surface water/groundwater contamination during construction, potential soil erosion/compaction during earthworks, air impact from dust, potential damages on lands through construction traffic	• *Construction Site Management Plan including sub-plans:* - *Spill Prevention and Contingency Plan*; - *Soil Handling and Storage Plan (incl*. measure how to pile earth, restore of earth after foundation works etc.) - *Materials Handling and Storage Instructions* - *Hazardous Material Handling Plan* (incl. international labelling system)	Setup by construction contractor prior to construction; implementation throughout construction under supervision of Ukrenergo.	Construction contractor's Site Manager and EHS-Responsibles in place; Construction site management plan and sub-plans including work instructions for environmental aspects in place and implementation monitored;	Minor

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
				- *Construction Waste Management Plan*; - *Vegetation management plan - Minimizing the cutting of ecologically valuable tree/bush vegetation near fields/canals at and near construction areas* - *Construction Site Closure Plan*; - *Plan for dealing with cutting trees/ecological* • *Designated Construction's Site Manager and EHS-Responsibles*		Internal auditing and reporting by contractor; Verification of training, trainings completed (written logs)	

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
C2	6.5	**Construction activities according to the pre-planned time schedule at** **- Dnieper crossing before construction** **- further sensitive areas (IBA Kajiry and IBA Energodar) before construction**	Disturbance of birds during construction.	▪ Adhere to the designated construction periods (outside breeding period from April to July) In addition the following for the Dnieper crossing: ▪ Adhere to the designated construction periods determined based on the bird survey ▪ Implement all additional measures identified (e.g. calming of certain areas as determined in the bird survey)	Ukrenergo Construction Contractor	Monthly status report showing sections where construction activities were carried out over the last and where those are planned in the upcoming month Monthly inspections of construction work to monitor conformance with construction time schedule and no violations	Minor
C3	6.7	**Private properties temporarily used for access roads, construction work/assembly of towers, unwinding of cables, construction camps, etc.**	Temporary loss of agricultural land use and physical damage to crops and land, restricted access to fields, etc resulting in reduced yield/harvest and thus reduced income/earnings.	Implement the mitigative measures described in the C*onstruction Plan* (see Action Items in Planning Stage). ▪ Kickoff Training of all work crews re awareness to minimizing damages and impacts to landusers ▪ Conduct routine monitoring/inspection of construction sites to ensure conformance with Construction Plan, e.g. measures to minimize damage-footprint, and site cleanups	Ukrenergo Construction contractor	Protocols of Kickoff training to work crews Protocols of routine inspections of construction works and site restoration Photos and documents demonstrating baseline facts on land damage Compensation is paid damage/loss of earning incurred during the construction phase	Minor-Moderate

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
				▪ After construction works are completed, conduct cleanup and restoration of site. Agree with landowner on extent of land damages incurred as basis for compensation process. ▪ Ukrenergo to provide feedback to Contractor re any improvement issues for implementing the Construction Plan ▪ Ensure compensation procedure is implemented for temporary damages/losses during construction ▪ Ensure grievance procedure is functioning		Evidence of calls or letters as part of grievance process	
C4	6.7	**Traffic movements, pile driving for construction of the foundations of towers**	Impact from noise, dust and traffic fumes	*Management procedure* to: ▪ ensure traffic is restricted to specific, clearly-defined access roads ▪ limit traffic movements outside normal working hours. ▪ Reduce risk of dust impact by choosing to work not in summer months (especially where heavy traffic is moving along dirt roads) ▪ Possibly control by using water spraying from bowsers (but: risk roads getting slippery)	Ukrenergo/construction contractor	*Management procedure* as part of Construction program	Minor

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
				Design for local re-routing in compliance with Ukrainian legislation should no agreement with the authorities be obtained. and transport speed limits control.			
C5	6.7	**Presence of an outside workforce**	Potential for conflict if much of the workforce is brought from outside and is housed in a temporary construction camp or camps near the work sites (e.g. disputes with local people and possibly the presence of bars and prostitutes, leading to a risk of altercations, accidents, increase in sexually transmitted diseases etc.)	▪ Minimize use of outside workforce, hire local employees as far as possible (for less specialized work) who can live at home ▪ Minimize negative impact to small villages by providing housing to workforce in larger towns and transporting them to the construction site on a daily basis	Construction contractor	Adequate requirements to be included in tender document fro construction company	Moderate
C6	6.9	**Construction Health and Safety**	Occupational risks of accidents during construction (e.g. falling from heights, handling of heavy materials etc.)	• *Construction Health and Safety Plan*, inter alia including provisions for: - workplace risk-assessments, personal protective equipment (PPE, fall protection) - construction workers training	Setup by construction contractor before construction; Implementation by construction contractor throughout construction under supervision of	• Work Place Risk assessment undertaken before start of operations; • Health ad Safety Plans and plan for emergency preparedness in place	Moderate

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
				and awareness - working at great heights and confined spaces - construction traffic safety (see below) - addressing public health and safety, noise, vibration and dust. • *Emergency Preparedness Plan* for accidents response	Ukrenergo. (in coordination with relevant agencies	and implemented; • HSE Instructions and PPE available	
C7	6.9	**Construction traffic safety on-site and off-site**	Traffic accidents on- and offsite affecting health and safety of public and workers and local properties	• *Construction Traffic Management Plan:* Transport traffic routing (oversize loads, peak delivery traffic etc.) Instruction of construction workforce and permanent Ukrenergo workforce (e.g. speed limits, no alcohol etc) Information of local communities Instruction of contractors (e.g. drivers, suppliers) Training of drivers on safe driving; posting speed limit signs, advance warning to villages of pending construction activities. Safety alerts-awareness training. First-aid/rescue plan coordinated with local authorities/clinics.	Setup by construction contractor before start of works in coordination with Ukrenergo; Implementation by construction contractor throughout construction; supervision of implementation by Ukrenergo.	Plan in place and communicated Recording of violations and corrective measures Monthly reports by construction contractor Supervision by Ukrenergo (check of reports) Instruction and information events for workforce performed (construction workforce, permanent Ukrenergo workforce); number of participants (target = 100%) Information events for local communities performed, number of participants Instruction and information events for	Minor

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
				Compensation payments for valid claims		contractors performed (target = 100% participation) Number of accidents (target = 0) Number of grievances (target = 0) Documentation on trainings completed (written logs). Grievance procedure in place. Compensation paid	
C8	6.11	**Construction of towers and access roads**	Impact on archaeological objects	*Management procedure* - Awareness training for construction staff for identification and dealing with potentially archaeological findings In case potential archaeological objects are found: - Stoppage of construction - Contacting of representatives of the competent authority. - Determining scope of monument protection measures pursuant to the effective legislation	Setup by construction contractor before construction; Implementation by construction contractor throughout construction under supervision of Ukrenergo. Coordination with relevant agencies, in case archaeological objects are found	Management procedure is part of the Constructors management plan Documentation on training materials and participation of trainings Chance finds reports by construction contractor (monthly status) Documentation on involvement of authorities	Minor

III. OPERATION STAGE

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
O1	6.5	**Repair and maintenance of TL**	Destruction/loss of bird markers	• Regular control whether bird markers are still in place • Re-Installation of lost markers	Ukrenergo	Annual control of bird marker during regular TL maintenance, replacement if needed	minor
O2	6.6, 6.7	**Transmission lines crossing private/communal land**	Potential restrictions of land use	• Sign contracts for easement with land owners whose land is situated in the protection zones of the transmission lines in case of repair or emergency works	Ukrenergo	Signed easement contracts with above land owners	minor
O3	6.7	**Motor vehicles used to access towers during repair and maintenance of the TL**	Damage to crops and local property by the vehicles	• Training of drivers on safe driving; posting speed limit signs, Compensation payments for valid claims, case by case decision on compensation as per the Compensation-Entitlement Procedure	Ukrenergo	Compensation paid for loss of income/damage to crops or local property	minor
O4	6.9	**EMR emissions from TLs**	Health effects on humans if norms exceeded on working times within the SPZ	• Distribute info brochures on EMR safety-maximum working times to all land users along TLs annually • Information of local public by newspaper and radio once a year on key H&S issues: status of current research (if any new), safe exposure times for	Ukrenergo	Brochures are received and understood by land users; warning signs exist and are legible, periodic inspections to check conformance with norms. Training to employees to hold H&S briefings/awareness training	Minor, temporary

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
				adults working beneath the lines, information that children should be kept out of sanitary protection zone (no work for children under 18), risks from climbing the towers, electrocution (e.g. by trying to steal equipment), tower toppling in case nuts and bolts are stolen (nuts and bolts below level of 10m to be welded). Personnel employed for maintenance of power lines should raise awareness of population regarding safe behaviour near power lines (e.g. H&S briefings for involved workers).			

IV. DECOMMISSIONING STAGE

Action Item #	Chapter/ Section	Activity/Aspect	Potential Impact	Mitigation / Management	Responsibility / Implementation	Monitoring / Key Performance indicators	Residual Impacts
D1	7.	**Demolition and removal of equipment and line structure in future (expected life of TL is about 50 years)**	Pollution to soil and water, exposure of workers to toxic substances due to improper handling and disposal	The Dismantling Contractor will be obliged to prepare a Construction Plan that includes relevant provisions in line with applicable future regulations, e.g. • Ensure hazardous material is separated and disposed of as legally required • Separate other waste streams and dispose of/recycle as legally required	Ukrenergo Dismantling Contractor	Written Decommissioning management plan	Minor
D2		**Demolition and removal of equipment and line structure in future (expected life of TL is about 50 years)**	Impacts are similar to Construction Impacts as previously described above, e.g. temporary damage to soils, crops, loss of income, etc Long-term impact will possibly be a re-naturalised environment	The Dismantling Contractor will be obliged to prepare a Construction Plan that includes relevant provisions in line with applicable future regulations, e.g. • Optimise procedures and timing to minimise impacts to landowners/users; • Compensation paid to affected persons, etc. • Restoration of impacted land areas	Ukrenergo Dismantling Contractor	Written Decommissioning management plan Compensation paid as agreed Evidence of restored lands	Presumably the net affect of the restored lands will overall be POSITIVE

IX PUBLIC CONSULTATION

Note: The technical description of the Project in this Draft ESIA Report is based on the current design stage, which is not yet finalised. Therefore, minor changes to the technical details as included in this Report may occur in the future. Any substantial changes will be reflected in the final version of this Report.

This Chapter describes the various actions that were taken and will be taken over the course of the Project to inform and involve the public and other stakeholders with the Project implementation.

1. ORIGINAL PLANNING AND ROUTE SELECTION

The process of consultation with the responsible planning and regulatory authorities began in the 1980's when the Ministry of energy originally began to plan the route between Zaporizka NPP and Kakhovska. At that time, the comments and recommendation of the various administration authorities were considered in the line route decision, and the current route alignment was confirmed and approved by all involved parties in accordance with the regulations in force at that time. Ukrenergo obtained the State Acts of Permanent Land Use for the tower plots, and construction on the line began and about half of tower foundations were built and also a number of towers erected (but no lines were strung).

Also, the foundations were laid and buildings and structures partly erected at the Kakhovka Substation and nearby housing area in the Novi Lageri Village.

As such, there has been public awareness and specific involvement by the statutory bodies about the transmission line project since the 1980's. And the project has been physically visible at many locations due to the partial construction, until the early 1990's when the Project was halted.

2. STAKEHOLDER ENGAGEMENT PLAN

A Stakeholder Engagement Plan (SEP), also referred to in past as the Public Consultation and Disclosure Plan (PCDP), was initiated in April 2009 and prepared in line with EBRD requirements for stakeholder engagement and public consultation and disclosure. The SEP provides an analysis of the principal stakeholder groups, identifies channels of communication and describes the approach to public consultation and disclosure that will be used throughout the project. A time-line of the public disclosure process for this Project is provided in the SEP.

The SEP was released in Ukrainian language on April 27, 2009, through the webpages of

- Ukrenergo: (http://www.ukrenergo.energy.gov.ua/ ukrenergo/control/uk/publish/category) and

- Ministry of Fuel and Energy of Ukraine http://mpe.kmu.gov.ua/fuel/control/uk/index

A revised SEP was released at the above webpage in June, 2009

In the SEP, the following stakeholder groups were identified as being relevant to the project:

- State authorities and local government administrations in regions, districts and population centres crossed by the transmission line route;
- Territorial Administrations of the Ministry of Environmental Protection and the Ministry of Health Protection of Ukraine – Regional Environment and Natural Resources Administrations, district Environmental Inspections and Sanitary and Epidemiological Services;
- Land owners and land users on the area crossed by the transmission line route;
- Population of the villages adjacent to the route of the transmission line;
- Mass media;
- Non Governmental Organisations.

For names and addresses of the specific stakeholders refer to the SEP, where a list of stakeholders was provided as an Annex.

3. SCOPING PROCESS

Information about the Project and advance notice of the dates and venues of the planned Scoping Meetings was provided to the Public and the identified Stakeholders on April 15, 2009 by publication on websites of Ukrenergo and the Ministry of Fuel and Energy of Ukraine (see Section 9.2), as well as by written invitation (Statutory stakeholders) and via newspapers and radio announcements (general public). An overview of mass media utilized is provided in Annex 9-1.

The Scoping Document was published in April 27, 2009 (Ukrenergo and Ministry of Fuel and Energy of Ukraine websites – see above) containing a project description and the results of the initial screening process. The scoping document contains the key facts and figures about the proposed project and also outlines the studies which are undertaken to assess the environmental and social impacts of the project, the envisaged timelines and next steps. Also, the scoping document and the SEP were sent by mail to the statutory stakeholders and identified NGOs prior to the scoping meetings.

As part of the public consultation process, Ukrenergo held three initial Scoping Meetings aimed at a preliminary introduction and discussion of the Project to identify important environmental and social issues and concerns for the ESIA and to the SEP. The meetings took place as follows:

- Zaporizhzha, Str. Grebelna 2 (Dniprovska ES Offices), on April 27, 2009, at 2 pm.
- Nova Kakhovka, Prospect Dniprovskiy 23 (Town Hall), on April 29, 2009, at 2 pm.
- Kiyv, Sofiyvska Str. 23-27,
  (EBRD office), on May 13, 2009, at 2:30 pm.

The agenda of the scoping meetings comprised short presentations by Ukrenergo and Ukrenergo consultants, and time for the audience to take the floor and raise issues of concern or request clarifications on particular project aspects. Each meeting lasted between 1.5 to 2.5 hours. Copies of the draft Scoping Document and SEP plans were available at the meetings, as well as forms for submitting comments or grievances.

The experience with the above Scoping Meetings and subsequent comments received has shown that some Stakeholders were not aware of the meetings – even though their organisations are listed in the stakeholder list and mailings were sent to them. Also, we discovered that some residents of the local villages along the route were not yet aware of the Project at all.

An overview on the scoping meeting audience by stakeholder groups is provided in the following table

Venue Location	**Zaporizhzha**	**Nova Kakhovka**	**Kiyv**
Venue Date	April 27, 2009	April 29, 2009	May 13, 2009
Total number of people	**11**	**23**	**19**
of which			
- State authorities, public administration	6	13	1
- Organizations, institutes,	1	1	2
- Companies, lawyer	None	5	1
- Media	None	4	None
- NGOs	4	None	15
- Public	1	None	None

Table 9-1: Breakdown of scoping meetings attendance to Stakeholder Groups

An overview of issues raised during the scoping meetings and a reference to how/where these issues are addressed in the currently prepared ESIA Report is given in the Consultation Matrix (see Annex 9-2).

Main issues/concerns identified in the Scoping relate to:

- relationship of planned transmission line to potential extension of ZNPP (units 7 and 8)
- employment opportunities
- effects on spatial expansion/coherence of towns transacted by the line
- Impacts of electromagnetic fields on human health and crops,
- Impact on agricultural work activities,
- Procedure and conditions for land and property issues and compensation, and

- Impact on irrigation facilities.

A Protocol of the scoping meetings was produced, which provided a comprehensive reference to the issues that were raised during the meetings and the responses given. The Protocol is available through the web site of Ukrenergo.

4. PUBLIC DISCLOSURE PERIOD

The Draft ESIA Report (as of early July 2009) will be publicly disclosed for a 120 day period as required by EBRD policy. At present, it is anticipated that this 120 period will extend from July to November 2009; specific dates will be made public once confirmed. During this period the public and Stakeholders can review the Report and provide comments and questions to Ukrenergo.

The full text of the Draft ESIA Report will be available for review at the following locations:

- Ukrenergo offices in:
  - Kiev (25, Kominternu Str)
  - Nova Kakhovska (2 Elektromashinobudivnikiv),
  - Zaporizhzha, (2 Grebelna Str)
- EBRD offices in:
  - Kiev (Sofiyvska Str. 23-27),
  - London (One Exchange Square)
- Oblast State Administrations of the Zaporizhzha and Kherson Oblast, and at the District State Administrations or Municipal Councils of the seven Rayons through which the OL passes.

The executive summary of the Draft ESIA Report will be available at the larger towns and villages located near the planned OL routes, while shorter brochures will be distributed at the smaller villages.

The SEP provides information for each of the 35 relevant communities (at level of Oblast capital, Rayon capital, or town/village) the location (and contact person) of the local Bulletin Board where Project information will be available (at least in brief summary form), along with the nearest location to review the full Draft ESIA.

In addition, the full Draft ESIA will be available for review on the Ukrenergo and Ministry of Fuel and Energy of Ukraine websites (see Section 9.2).

The Executive Summary will be available throughout the 120-period and afterwards on the EBRD web-site: www.ebrd.com/projects/eias/.

5. PUBLIC HEARINGS ON ESIA RESULTS

As part of the disclosure process Ukrenergo will hold several Public Hearings in the course of the 120-day disclosure period. The intent of the Public Hearings is to present the Draft ESIA to the public and provide an additional chance for open

discussions and clarifications between the public and the Project team, as well as further input to the ESIA by the Stakeholders.

At present it is tentatively planned to hold one hearing in each of the seven districts/rayons through which the transmission line passes:

- Kamyanka-Dniprovska Rayon of the Zaporizhzha Oblast; and
- The Six Rayons of the Kherson Oblast: Verkhniy Rogachyk, Velyka Lepetykha, Gornostayivka, Kakhovka, Tsyuryupynsk, Beryslav.

This will allow for easier access and participation by local residents. If additional or alternative Hearing venues are requested by the Stakeholders, we will try to accommodate for this as far as possible.

The hearings are currently scheduled for September 2009, after the national summer vacation and harvesting period in July/August. The public and the stakeholders will be informed at least 3 weeks in advance of the Public Hearings (dates and locations will be identified and disclosed). Based on the experiences in April and May 2009 from the public notification of the Scoping Meetings, more effort is needed to reach the local village residents by posting bulletins at central locations. Therefore, for the hearings it is planned to inform the general public via:

- newspaper advertisements
- radio announcements
- bulletins posted at the offices of the local authorities and town halls of the affected Rayons and Oblasts

In addition, direct notification will be made by mail and/or email to the identified stakeholders, including participants of previous Scoping Meetings and persons who submitted comments directly to Ukrenergo in the past, as well as landowners/users.

Furthermore, Ukrenergo will provide for transportation for villagers who are not otherwise able to attend the hearings.

Comments, questions and suggestions concerning the Draft ESIA Report will be invited from Stakeholders and the public throughout the 120 day public disclosure process, and during the Public Hearings.

The Stakeholder input will be considered by Ukrenergo and the Project consultants. In general, comments will be responded to by Ukrenergo in writing within 2 weeks after receipt (whereby some responses may require more time if translation needed or otherwise complex). Where appropriate, the draft ESIA report will be revised accordingly during finalisation.

Information on the Project is available throughout the Project period on the websites of Ukrenergo (**http://www.ukrenergo.energy.gov.ua**), and the Ministry of Fuel and Energy of Ukraine (**http://mpe.kmu.gov.ua**)