330 kV Usatove – Adjalyk
Transmission Line Project
(Odessa Oblast)

Environmental Impact Assessment
(EIA)

Executive Summary

July 2005

Project Proponent: Ukrenergo
General Designer: Ukrenergomerezhproekt (Kiev Branch)
External Consultant: ERM (German Office, Frankfurt/Main)
Executive Summary

1. Project Background and Rationale

Power for the Greater Odessa region is supplied from the Usatove and Adjalyk 330 kV substations. Ukrenergo-Southern Power System, Odessa on behalf of Ukrenergo, Kiev is planning to construct a new, second 330 kV transmission line to connect Usatove and Adjalyk substations.

The objective of this Project is to increase the reliability of power supply to consumers in the Odessa supply region and to decrease dependency from the unstable power supply from Moldova. The centre of Odessa Oblast is connected to Pivdenno-Ukrainska Nuclear Power Plant (NPP) (PUAES) – the main source of power in the Southern Energy System – by only one transmission line which is the 330 kV Adjalyk-Usatove line. Due to this, the line is significantly loaded.

In case of outage of the 330 kV Adjalyk-Usatove line, it is necessary to limit the number of consumers in Odessa Oblast to maintain the voltage within the limits in the 110 kV networks supplied from 330 kV substations Usatove and Novoodesska. Also if the 330 kV network of the centre of Odessa Oblast is disconnected from Moldova, the outage of the 330 kV Adjalyk-Usatove transmission line will result in an almost complete disconnection of consumers in this region.

In order to increase reliability of power supply in the centre of Odessa Oblast, it is necessary to strengthen the 330 kV grid connections with the United Power System of Ukraine (OES). This requires to construct the second 330 kV transmission line from Adjalyk to Usatove.

The Project is being designed by Ukrenergomerezhproekt (Kiev Branch), which is the state-owned design, survey and research institute of energy systems and networks. The European Bank for Reconstruction and Development (EBRD), London is considering to finance the project investment.

The environmental study and report works of Ukrenergomerezhproekt and the EIA process were assisted by ERM (German office, Frankfurt/Main) as Consultant on behalf of the EBRD.

Environmental Impact Assessment (EIA) and Public Consultation and Disclosure are part of the Ukrainian project planning and permitting procedures as set out in the Ukrainian EIA implementation regulation (State Construction Standard DBN A.2.2.-1- 2003).

The EIA and licensing process for the Project is under the competence of the local Odessa Oblast authorities of the Ministry of Environmental Resources and local State Sanitary and Epidemiology Service of the Ministry of Public Health.

The EIA report is to serve as a main input for project permitting by the competent Ukrainian regulatory authorities and the environmental appraisal of the project by the EBRD for funding decision.

Furthermore, the study shall form 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 the Project will be in an environmentally acceptable manner.
2. Project Description

Salient Features of the Project

The Project includes:

- construction of Adjalyk-Usatove 330 kV Overhead Transmission Line (124 km length);
- extension of Adjalyk substation equipment; and
- extension of Usatove substation equipment.

Transmission Line

The planning of the Transmission Line was carried out in 2 stages:

- Route selection for the transmission line incl. consultation with statutory stakeholders on principal routing alternatives, in 2003.
- Detailed alignment and tower spotting incl. consultation with affected landowners in 2004

Route selection and tower spotting was in general governed by the approach to avoid environmental and land use conflicts.

The new transmission line from Usatove to Adjalyk follows the technically proven state standard design criteria (GOST). The new line is characterised as follows:

The total length of the new transmission line is 124 km.

The route passes through the territories of Kominternivka, Ivanivka, Rozdilna and Bilyaivka Rayons of the Odessa Oblast.

The landscape belongs to the Pre-Black Sea lowland and presents a slightly rolling plateau area between Kuyalnik and Hadjibei estuaries.

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

For the new transmission line 596 towers will be erected. It is intended that suspension towers will be double concrete poles with a horizontal steel cross beam and tension towers will be lattice steel towers, similar to the design of the presently existing 330 kV lines. Altogether 464 suspension towers and 132 tension towers will be needed. Average tower height is 27 metres. Land requirement for a suspension tower is 52 m², average land requirement for a tension tower is 81 m². The width of the sanitary zone is 20 metres, the width of the safety zone (for long term exposure to electromagnetic fields) is 30 metres from the outer conductor. For navigable surface water the distance amounts to 100 m. Together with the 16 m wide footprint of the line, the sanitary zone will be 56 m wide and the safety zone 76 m. The land beyond this area can be used for agriculture purposes. Minimum span length between towers is 270 metres.

Substations

The existing substations will receive additional equipment (hermetically sealed SF6 gas-insulated switches and transformers and other switch yard installations) to connect the new line. All substation works will be carried out within their present perimeter fence and no extra land is needed.

Construction

The overall construction period is foreseen to be 8 months.

The temporarily working strip needed for tower construction will be 20 m wide, the width of a temporary strip for conductor unwinding is 14 m. In addition, a construction site will be necessary with the size of 250 m² for each suspension tower and 550 m² for each angle tower.
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.

Several temporary construction facility sites and storages for material and equipment with a total area of 230 m² will be established and will be located in the vicinity of villages along the line route.

A total area of 185.5 hectares will be necessary for the construction of the line.

Mostly prefabricated units and elements will be used, incl. for towers and foundations.

All materials for concrete generation and backfill with gravel and sand etc will come from existing licensed operations nominated by the responsible agency OJSC “Odessabudmaterialy”.

Construction machinery will comprise trucks, cranes, excavators, tractors and other vehicles for transport of materials, foundation and erection works.

3. Project Alternatives Considered

Usatove and Adjalyk substations are about 33 kilometres distance apart and are at present interconnected by a 330 kV and a 110 kV line. As part of the route selection process 4 alternatives were developed to connect Usatove and Adjalyk substations with a second 330 kV transmission line. The first alternative looked at the possibility to build the new second 330 kV line within the same corridor of the existing 330 kV and 110kV lines. However it was found that land use and urban built-up constraints require to develop a different routing approach which is to pass through the hinterland to the North of Odessa. For this reason, 3 further alternatives incl. local routing options were developed. The alternatives are shown in the overview map.

For route selection the comments and recommendation of the various statutory stakeholders and administration authorities were considered in the line route decision. A number of environmental features sensitive to a transmission line project were pointed out, incl. forest areas, nature reserves and a landscape park. These sensitive areas are avoided by the selected alignment. Also the line is passing settlements only in the periphery. Where possible routing is in parallel with existing 110 kV lines already existing in the area.

Based on the comments and suggestions which were received by Ukrenergo and their planners Ukrenergomerezhpoeekt from the consultations with statutory stakeholders, the principal routing of Alternative IV (passing around the limans) was selected as preferred alternative. This was used as base for detailed alignment planning. After local modifications of sections and further detailing, the final alignment with a length of 124 km was determined.

As a result, almost the longest route has been chosen for establishing a second high voltage power circuit between Usatove and Adjalyk. However, in view of Ukrenergo’s plans for the electricity grid development in the future this second line will form part of a larger network extension. At a later stage the long loop between Usatove and Adjalyk will be cut open at the Northern end and extended with a double circuit line to the planned Primorskaya substation to the North, so that one branch will lead from Primorskaya to Usatove and the second from Primorskaya to Adjalyk. In this way the new 124 km long transmission line will be integrated into the future supply system for the Odessa region.

4. Environmental Baseline Conditions

Geology and Geomorphology

The Project area is located in the western part of the pre-Black Sea Lowland which is a slightly rolling plateau area between Kuyalnik and Khadzhibei estuaries, with terrain elevations between of 5-95 metres.

The crystalline foundation lies at a depth of 1200 to 1300 m and bears a thick layer of sediment consisting of chalk, Palaeogene, Neogene and quaternary deposits.
There are no geological deposits of commercial interest within 1 kilometre from the line route or the substations.

**Soil and Subsurface**

There are two main types of soil in the project area which comprise regular, weak, low-humus, lime saturated and low-clay black soils, so-called Chernozems, and Lime-clay and low-loam Southern Chernozems. The soils are used for cultivation of various crops (sunflower, wheat, corn, vegetables, etc.).

There is no known soil contamination in the line corridor and the substation sites.

**Groundwater**

There are two main aquifers in the project area.

The aquifer of estuary deposits spreads in the form of narrow strip on estuary banks, while the aquifer of wind deluvial deposits sporadically spreads on watersheds and stream valley sides, most often on reddish-brown clays.

There is no groundwater protection zone in the area traversed by the line.

**Surface Water**

The route of the 330 kV transmission line crosses the Egorov distributary of Khadzhibei estuary, flood-lands in upper reaches of Kuyalnik and Khadzhibei estuaries, and also 10 gullies and small rivers.

**Climate and Ambient Air Quality**

The climate in the project area is temperate continental. Winter is mild, snow is scarce, the weather is overcast and foggy. The average air temperature in January ranges from -4 °C to +6 °C. Summer is hot and dry, day temperatures are +24 to +26°C. Dry winds are common, rains are infrequent and of short duration, usually with thunderstorms and winds.

Since the project area is close to the sea, the air masses are periodically (depending on winds) saturated by salts.

**Flora, Fauna and Habitats**

In the project area forest occurs only sparsely. Natural vegetation cover is found on the slopes of riverbanks and gullies. Small patches of forests and woodland are scattered on divides, in river valleys and gullies. In general around villages larger areas of gardens, orchards and vineyards around villages are found.

The steppe parts of the line route are almost completely under cultivation. The vast fields are bordered by wind shelter belts composed of trees and bushes. Large areas around rivers and firths (limans) are covered with reed.

In the mostly agriculturally dominated area no wildlife is of specific note.

None of the plant and animal species found in the project area are listed in the Ukrainian Red Book or require specific protection pursuant to Ukrainian and international agreements.

The line passes the landscape reserve Verkhny Lys. at about 150 m distance.

The Kujalnitzki Liman has habitat functions for bird life and is internationally listed as Important Bird Area, IBA site No. UA090 (http://www.birdlife.org). The Liman at present has no formal national or international protection status with respect to bird life conservation. Among the birds breeding there, the Kentish Plover (Charadrius alexandrinus) is listed in the Ukrainian Red Book, none of the bird species of the liman is included in the IUCN international Red list of species.

**Land use and Physical Planning**

All settlements along the overhead transmission line are typical agricultural settlements. There is no industry that may interact, with the planned overhead transmission line.

The Usatove Substation is located in an industrial area, in the north-western fringe of the city of Odessa. Adjalyk substation is located at distances of 1 and 3,5 kilometres from the next villages.
Cultural heritage and Archaeological Sites

The route of the overhead transmission line 330 kV passes industrial, agricultural and residential-civil facilities. There are no monuments of architecture, history and culture within the corridor of the overhead transmission line construction or in the wider vicinity of the alignment.

However, according to information of The Directorate for Protection of Cultural Heritage Objects of the Odessa State Oblast Administration, The transmission line is passing through a region were a larger number of archaeological sites can be expected. The Directorate informed that, According to archive research data, there are 27 known archaeological objects, including 24 mounds and 3 settlements in the line area.

Landscape and Scenery

The landscape in the Project area comprises the steppe flat landscape with vast agricultural fields separated by wind shelter belts with trees, the wavy landscape dominated by pastures and gardens, the limans and their a rim of wetland vegetation, river valleys and gullies. On slopes of the valleys, forest plantations and natural woodlands can be found. Settlements and infrastructure elements such as motorways, roads and railways are part of the scenery.

5. Environmental Impacts and Mitigation Measures

Impacts on Geology and Geomorphology

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

Impacts on Soils

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 vehicles and machinery used for construction will have similar impact magnitude to agricultural vehicles.

The risk of erosion is limited to the spots were towers are assembled and installed on slopes.

At construction sites, the fertile soil layer will be removed in advance and stored for re-vegetation and planting after erection of towers or improvement of less fertile soils at other locations). Slopes of tower foundations will be secured by sowing grass.

Adoption of good construction practices and site management will avoid impacting soil and groundwater water from pollution with accidental spills from fuels and lubricants from construction vehicles.

No impacts on the soil are expected during operation and maintenance of the new facilities.

Contamination of the soil from transformer oil leaking from autotransformers and transformers installed at Ajalyk and Usatove substations is not possible because the substations are equipped with emergency oil catchers that direct oil leaks to a hermetically sealed oil collector.

Impacts on Groundwater

No significant impacts on groundwater are anticipated. Even in areas with relatively high groundwater table, construction works will comprise only small spot foundations for the towers. No extensive groundwater pumping for draining of excavation pits will be necessary.

No impacts on groundwater are expected from operation and maintenance of the transmission line.
Impacts on Surface Waters

The line route directly crosses several surface waters. Construction areas will be located in a distance of at least 10 m from the nearest surface water.

The towers of the overhead transmission line will not have adverse direct impact on the regime and quality of water resources, or on water bodies.

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

Adoption of good construction practices and site management will avoid impacting surface water such as silting of water bodies from erosion run-off.

Impacts on Air and Climate

The physical structure which will be erected for the transmission line or the extension of the substation due to their limited physical extend do not influence wind fields or local air flow.

During operation of a transmission line no contamination of the atmosphere (with gases, aerosols etc.) will occur. The corona effect might lead to insignificant production of Ozone (O$_3$) around the conductors.

Adoption of good construction practices will avoid dust emission during construction phase.

Appropriate handling of the SF6 gas will be implemented in the substations according to manufacturer’s instructions and international best practice guidelines.

Impacts on Flora, Fauna and Habitats

The transmission line route is located in the agricultural zone. The route of the overhead transmission line avoids lands of natural preserves, national parks or other objects of the Natural Reserve Fund. In the line route no rare and endangered species of plants and animals or species under protection are known to be present. The route of the overhead transmission line does not pass within forest plantations, fruit orchards or vineyards.

Due to the careful detailed line routing, there will be limited need for clearing and trimming of vegetation to establish the required safety zones.

The 330 kV overhead transmission line will not have significant adverse impact on the fauna, will not interfere with seasonal migrations of fauna and in particular birds.

Main bird migration paths are 30 to 50 km northward of the project area. The height of the migrational paths is 2000 to 7000 m.

The planned transmission line passes by the Kuljanitzki Liman which is an Important Bird Area (IBA) and has important habitat functions for bird life. None of the bird species in the IBA is on the IUCN international or Ukrainian red list, except the Kentish plover which is included in the Ukrainian Red Book. Until present, no notable problems regarding birds electrocution or collision with the already existing 110 kV overhead transmission lines in the project area has become known. As the new line has a relatively slim and low tower design, and the line keeps a distance of more than 1.8 km to the Kuljanitzki Liman, no impact on the IBA site is anticipated.

Impacts from Operation and Maintenance

It is not planned to carry out periodic inspection with helicopters, therefore no noise nuisance will occur on sensitive species.

Mitigation Measures

Generally danger for bird collision or electrocution can be minimized by design.

Devices to prevent electrocution when birds sit or perch on the towers consist of twisted wires preventing birds from sitting on the structures near the conductors and will be installed.
To prevent collision of birds with the line, especially the relatively thin and thus not well visible earth wire, marker devices can be attached to the wires. In practice this only done when major bird migration routes are passed by a line. However, this is not the case for the project.

It is recommended to monitor potential bird collision within the first year in the northern part of the transmission line close to the Kuljanitzki Liman. In case, significant increased collision incidents are observed (esp. with the Kentish Plover listed on Ukrainian Red Book), applicable marker devices to prevent collision should be installed on the line section passing through the valley bottom.

Respective monitoring arrangements will be agreed between Ukrenergo and the Odessa Oblast nature conservation authorities.

In order to avoid habitat disturbance during construction, cutting of trees and removal of vegetation shall be done in winter before breeding season of birds (which March to July). In particular no construction activities shall be scheduled and carried out during the breeding season of birds in the vicinity of the water bodies. This applies in particular to the northern reach of the Kuljanitzki Liman.

Sites disturbed during construction will be re-vegetated. The total re-cultivation area is 3.36 hectares.

**Impacts on Landuse**

An area of 185.5 hectares will be temporarily necessary for the construction of the line. For the towers, a total area of 3.36 hectares will be permanently lost for other use.

This comprises 2.32 hectares agriculture lands, 0.83 hectares grazing lands, and 0.21 hectares forested lands.

The area under the transmission line can still be agriculturally used. There is no need to limit the present agricultural use.

Construction on the arable land is scheduled, as a rule, after harvesting. After completion of construction all temporary roads and earth stockpiles will be removed, the land will be re-vegetated and micro-relief restored.

**Property issues, Impact on Income**

It is anticipated that the line will have negligible impact on the agricultural production process and income and earnings from agriculture as line runs generally along the borders of fields, spans are wide (270 metres), the plots required for the tower locations are very small compared the large scale fields, and finally present agricultural practise in the area can be continued under the line.

Due to this no measurable effect on income generation for the affected farmers and agricultural firms will be notable.

An overview by Rayon on the number of owners, length of line sections traversing public and private land plots and respective size is provided in the following Table.

Permanent losses of land and trees or other assets, and any construction or line maintenance or emergency repair related damage of harvest will be compensated within the pertinent Ukrainian regulations.

Ukrenergo will make respective land acquisition and easements contracts with each land owner before the Project can start.
Ownership of Lands affected

<table>
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<th>Rayon</th>
<th>Ownership [number of owners]</th>
<th>Traverse length and land requirement for towers</th>
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<tr>
<td></td>
<td>Public</td>
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</tr>
<tr>
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</tbody>
</table>

Impacts on Visual Amenity and Scenery

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.

The new transmission line will cause visual change of the existing landscape and scenery to limited extend. Due to the relatively slim design of the suspension towers which account for three quarters of the line, the general large scale of the landscape, the routing principle of parallel alignment with existing structures incl. forest belts which provide visual shielding, and the mostly large distance to settlements these effects are in general expected to be low.

Notable visual change will occur only where the line is crossing.

The line of sight in the valley bottoms and towards/from the estuaries and where it is traversing the slopes.

After erection of the towers, perennial herbs will be sowed under the towers. Planting of trees and greenery should be planned to minimise the impacts near villages in particular Blieka.

Public and Occupational Health and Safety

Transmission Line

The working design has been prepared to meet effective norms and rules which ensure safe operation of the designed transmission line

Substations:

A reconstruction plan for 330 kv Ajalyk and Usatove substations has been prepared in compliance with the effective respective Norms for Technological Design, including explosion and fire safety rules.

Impact from electric and magnetic Fields (EMF)

The Ukrainian standard has defined Sanitary safety zones for protection of the public from long term exposure. Outside for these zones the above EMF limits will not be exceeded. The extend of the sanitary safety zone depends on the Voltage level. For the Project a sanitary safety zone of 30 metres outside of conductors to both sides of the line is applicable.

This regulation applicable in Ukraine is well within the range of international planning practices and with established international planning guides derived from ICNRP exposure limits.
Impacts and Mitigation

The planned transmission line is routed as such that on all sections the sanitary safety zone will be realized. The closest approximation to residential houses or sensitive community infrastructure is at Blieka.

Impact from Noise

Construction typical noise effects will be inevitable. However the construction activities will be neither extremely noise intensive nor of long duration. Overall it is anticipated that the noise impact and possible disturbance can be compared with noise from agricultural machines such as tractors and harvesters. Construction works at the substation do not constitute a relevant impact, as the substations are located off side from potential sensitive noise receivers in designated industrial areas. Besides, the nature of construction works to be carried out within the present substation premises constitute no major noise sources.

The physical structures of the Project are no source of noise emission.

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. As the line is at great distance to sensitive receivers (it is not approaching houses closer that 100 metres) corona noise is a negligible effect.

The extension of the existing substations will in general not alter the present operational noise conditions of the existing substations. Due to the lack of sensitive receivers in the neighbourhood of the substations, there is no environmental noise issue to be considered in this respect.

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

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 incl. the holiday houses and recreation area east of the Xadzibeyski Liman, and Blika village on the northern tip of Kuljanitzki Liman.

Impacts on Cultural Heritage

Southern Energy System will requests the Department of South Western Black Sea Coastal Territories Archaeology of the Institute of Archaeology of the Academy of Sciences of Ukraine to carry out an archaeological survey of the line corridor prior to commencement of the construction in order to prevent destruction of or damage to archaeological objects. Construction may only be commenced after a positive conclusion is reached based on results of the said survey.

In case archaeological finds are identified during tower foundation, the construction process will be stopped and representatives of the competent authority will be contacted in order to make the necessary decisions on the handling of the finds.

6. Environmental Risks and Hazards

Transmission Line

The transmission of electrical energy lines pose potential risks and hazards to the environment and persons due to the energised conductors and the high voltage of the electrical current. However, the pertinent safety regulations and proven standard designs including protection systems minimise potential risks and hazards, and make transmission lines reliable and safe infrastructures.

The established Ukrainian regulations about electrical safety rules and sanitary safety zones, distances applicable for the line and land use restrictions within these zones prevent the conflicting of energised conductors on other objects.
Specialised laboratories inspect and certify workplaces of the Southern Power System for labour safety compliance every five years. The inspection includes metering of electric field strength of the existing 330 kV overhead transmission lines and substations. The results of the inspections are kept in the Odessa Main Power Networks Department of the Southern Power System. Electric field strength is metered with an INEP-2 type meter.

Towers and foundations are designed according to applicable norms. This will guarantee reliable and safe operation of the structures.

The extension of the substations will pose no additional risks or hazard to the existing installations and devices. The greatest risk in substations is fire.

Pursuant to the Ukrainian Guidelines, the substation is equipped with fire prevention and fire response equipment and procedures.

### 7. Environmental Management

An Environmental Management Plan will be implemented during construction and operation of the transmission line and the substations.

The environmental management section contained in the EIA main report details as far as possible at the present stage of planning the mitigation, monitoring measures and institutional responsibilities to be taken during project implementation. This includes subsequent project implementation preparation activities, construction and operation.

It will be the task of the appointed contractors to further detail the issues addressed according the increasing level of planning detail until construction (e.g. detailing of material storage, transport access paths, tower assembly sites).

It is advised that the environmental issues addressed in the EIA Report are used for detailing of the environmental specifications in the tender documents for the construction contractor(s).

In addition any requirements which arise as part of the permitting process, in particular obligations imposed by the permit will need to be included in the final construction documents.

The detailed design and construction provisions for environmental protection and mitigation will be agreed by Ukrenergo South System with the competent authorities.

The construction contractor(s) will be contractually bound to follow a good management and environmental practices during all construction work activities and to keep damage to vegetation, soil, groundwater, surface water, landscape as well as disturbance to settlements and local communication to a minimum.

Environmental requirements will be binding part of the contract conditions of the contractors. It is recommended that contractors(s) are required to implement an integrated Health & Safety and Environmental Management System which is in accordance with EN ISO 14001. A Health & Safety and Environmental Coordinator should be designated by the appointed contractor(s) to ensure compliance with applicable legislation and the targets of their Management System.

To ensure the effective implementation of the EMP Ukrenergo South System will designate staff to undertake environmental supervision and monitoring during the construction. Key responsibilities will be to ensure that the environmental management measures, controls, and specifications are properly implemented as per the terms and conditions of the approvals and permits. This includes coordination with Odessa Oblast authorities and agencies involved (e.g. for the archaeological survey).

Environmental management during operation of the new transmission lines and extended substations in general will comprise the monitoring of efficiency of the measures implemented in design and monitoring of operational performance. Operation monitoring and management will be organised by Ukrenergo South System.