Initial Environmental Examination

June 2012

UZB: Namangan 500 kV Power Transmission Project

This IEE is prepared by the consultants for the Uzbekenergo of the Republic of Uzbekistan and for the Asian Development Bank (ADB)
CURRENCY EQUIVALENTS
(as of 2 July 2012)

Currency unit – som, $
$1.00 = $1921

ABBREVIATIONS

ADB Asian Development Bank
ACL Admissible Concentration Level
CNR Construction Rules and Norms (KMK)
DHVN District High Voltage Network
EMF Electromagnetic field
EMP environmental management plan
ETEN Eastern Transmission Electricity Network
Glavgoseexpertisa State Department responsible for Conducting Environmental Expertise Under SNPC
GRM Grievance Redressening Mechanism
IEE Initial Environmental Examination
IFC International Finance Corporation
NGO Nongovernmental Organization
OSG Open Switch Gear
OHL Over Head Line
PCs Public Consultations
PFS preliminary feasibility study
PPE Personal Protection Equipment
PS Polluting substance
PMU Project Management Unit
TPP Thermo Power Plant
SCNP State Committee for Nature Protection
SNR Sanitary norms and rules
SS Substation
WHO World Health Organization
Uzhydromet Centre of Hydrometeorological Service
UE Unitary enterprise

GLOSSARY

Khokim – governor of administrative unit
Khokimiyat – regional government authority
Makhalla – a community of neighbors, which is based on full independence and self-governance.
Som – local currency
Uzbekenergo – managerial body in the electric power and coal industries, which are major structural components of the national economy
Uzhydromet – state governing body specially authorized for the solution of tasks in the field of hydrometeorology in the Republic of Uzbekistan and in its activities it is accountable to Cabinet of Ministers
Uzkomumkhizmat – State entity responsible for water supply and sewage water treatment
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Introduction

1. This report presents the findings of an initial environmental examination (IEE) of the proposed Construction of 174 km of 500 kV overhead line (OHL) from Angren, Tashkent Province to Kasansay district, Namangan Province in the Republic of Uzbekistan (“Uzbekistan”) in Central Asia. Designed to be a part of the national grid system, the 500 kV OHL will transmit electricity from various power plants to users, balance the load from various supply and demand centers, and provide alternative routes for dispatching electricity in case of failure in one segment of the grid. The Project will improve the transmission efficiency by way of reducing electricity losses, enhancing reliability of electricity supply, and minimizing voltage fluctuation.

2. During report preparation following documents were used: (i) the Environmental Assessment Report for Construction of 500 kV Substation with 500 kV OHL prepared by “Teploelektroproekt” - design institute under “Uzbekenergo”, (ii) information collected during field verification, (iii) materials of feasibility study of the project prepared by design institute, and (iv) other related project documents available in "Uzbekenergo".

3. This IEE was conducted during the Project preparation stage from May to June 2012. The objective of preparing the IEE for the Project is mainly to identify the potential environmental impacts, to recommend the mitigation measures (avoid, and minimize), and to recommend effectively implementation of mitigation measures throughout the project implementation and operation period. The main info on proposed measure is presented in Environmental Management and Monitoring Plans.

4. In accordance with Uzbek environmental legislation the Environmental Assessment should be conducted before beginning any economic activities and approval from relevant department of Goskompriroda should be obtained. Statement on approval for this Project from State Nature Protection Committee was received from November 2012. This document confirms that Project meets local environmental requirements and no additional approvals are needed. However “Uzbekenergo” has to develop and submit for to SNPC the Environmental Consequences Statement (ECS). This document should be prepared during construction phase before Substation and OHL will start to operate.
A. Executive Summary

5. The proposed project (the “Project”) involves the construction of 174\(^1\) km of 500 kV overhead line (OHL) from Angren, Tashkent Province to Kasansay district, Namangan Province in the Republic of Uzbekistan (“Uzbekistan”) in Central Asia. Designed to be a part of the national grid system, the 500 kV OHL will transmit electricity from various power plants to users, balance the load from various supply and demand centers, and provide alternative routes for dispatching electricity in case of failure in one segment of the grid. The Project will improve the transmission efficiency by way of reducing electricity losses, enhancing reliability of electricity supply, and minimizing voltage fluctuation.

6. Screening was carried out by the Asian Development Bank’s (the “Bank”) project office in accordance with the Bank’s Safeguard Policy Statement of 2009 and manuals F1/BP (2010) and F1/OP (2010). The Project is classified category B, a project with site-specific impacts, few if any of which are irreversible, and where in most cases mitigation measures can be designed more readily than in the case of category A projects. The Project will need an initial environmental examination (IEE). This initial environmental examination is to be based on data from the feasibility study, preliminary design, site visits and interviews with the technical experts in the evaluation of alternative sites, technologies, and project size.

7. All the mitigating measures are designed and expected to conform to Uzbekistan environmental laws and regulations as well as international agreements that are relevant to the initial environmental examination (IEE) that have been signed and ratified by the Uzbek government. The mitigating measures will comply with The International Finance Corporation (IFC) of the World Bank Group, Environmental, Health and Safety Guidelines – General and Specific Guidelines for Electric Power Transmission and Distribution of April 30, 2007. If the IFC guidelines and Uzbek standards differ, the stricter requirements prevail.

8. From the Angren substation the 500 kV OHL will pass through rough terrain crossing the mountain divide between Tashkent Valley and Ferghana Valley. The 500 kV OHL will be built parallel to the existing 500 kV and 220 kV lines to maximize the use of existing access roads and right of way. However, there are instances where the valleys are narrow and populated so that it is not possible to build another OHL such as the project’s OHL. In this instance, the 500 kV OHL will diverge from the existing lines and new access and right of way will be needed. In selecting the deviating alignment, consideration is given to existing roads. The mountain lands are primarily grasslands used for grazing. Some areas are eroded with exposed bedrocks or covered with pebbles and rubbles. Once the 500 kV OHL reaches the Ferghana Valley side, the terrain consists primarily of rolling hills. From the boundary of Tashkent and Namangan provinces, the land is thinly populated and again is almost all grassland until before the Pop-Chust districts in Ferghanas. At Pop-Chust and Kasansay2 districts, the land is irrigated. With proper selection of the route, only three houses are expected to be relocated\(^3\) and with further fine tuning one of the houses may not require any relocation.

9. The main impacts of the OHL construction activities are as follows: (i) construction noise; (ii) air emissions from the construction equipment; (iii) increase in suspended solids concentration in the receiving water if the excavated materials are not properly managed; (iv) disruption of the grazing activities in areas temporarily used for storage of construction materials, workers quarters, equipment depot and right of way. The noise, while of low

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\(^{1}\) The OHL length will change as more data are available

\(^{2}\) A number of places have two or more official names. Most often the letter a and o are used interchangeably. For example, Tashkent is also spelled Toshkent and Kasansay is also spelled as Kosonsoy.

\(^{3}\) Two houses may be affected in Usman Yusupov Village along the Dukentsay River and one house in Geolog Village.
intensity, may have some impacts on wildlife during the breeding season. The Project Management Unit will program the noisy construction activities in crags and sections in the mountainous areas in such a way that during the breeding season, the activities will be concentrated on the open grasslands and agricultural areas. The Project will require the contractors to maintain their equipment and ensure that the emissions from the equipment comply with the Uzbek emission and noise standards. Foundation will use precast concrete to reduce the construction period. Sulfate resistant cement will be used if the soil is corrosive to ordinary cement. The time elapsed between excavation and placement of the foundation should be so planned as to minimize the piles of excavated materials. No tower will be constructed in the middle of any stream or river. While the vehicular traffic in highway A 373, the main highway connecting Tashkent and Namangan, is very light, the users may still experience some congestion when heavy equipment and partially assembled tower structures are hauled. The Project management will inform the public at least 24 hours before such movements in the highway for travelers to properly plan their trips.

10. The construction of the Namangan substation in Kasansay district will require the acquisition of 25 hectares of land. Defined 25 ha land was previously allocated to one farmer with total lots of 54.5 hectares. Conducted within PPTA Due Diligence showed that land acquisition was carried out in accordance with the Resolution N 146 of the Cabinet of the Cabinet of Ministers of Republic of Uzbekistan. The 25 ha of land, where the Uzbekenergo has carried out initial activities, is part of the District khokimiat’s reserve land, because the person who was granted the right to use the land for agricultural activities returned it to the District Khokimiyat. The due diligence confirmed that the acquisition of the 25 Ha of Namangan substation areas will have no social impacts associated with land acquisition as described by ADB Safeguard Policy Statement, 2009 on Involuntary Resettlement. Details are given in the Land Acquisition and Resettlement Plan.

11. The impacts during construction are mostly related to construction noise, air emissions from construction equipment and vehicles, potential suspended solids from construction materials, and unsuitable soil and topsoil. The topsoil will be used to landscape and green the areas around the substation office and control room. Unsuitable soil will be used to backfill any depressed area in the 25 hectare lot that will not be used for any structure. Contractors will be required to maintain their equipment and to show proof of such maintenance in order to keep the noise and emissions well within the Uzbek standards and the IFC guidelines.

12. During construction, the project management and the contractors will secure their areas and maintain strict discipline among their workers to maintain peace and harmony with the local community. All workers will undergo seminars on personal hygiene and prevention of communicable diseases, especially sexually transmitted diseases.

13. The substation facility is designed with automatic devices to reduce potential damage from fire and other accidents. Once every 15 years or so, the mineral oil may require change. The mineral oil will be properly collected and stored for disposal in a toxic and hazardous waste facility. Equipment, soil, or other items contaminated with the mineral oil from the transformers will be collected and disposed of in the toxic and hazardous waste facility. In the design of the substation, the substation will use sulfur hexafluoride circuit breakers to reduce the humming noise. Flanks or blank walls will be used to enclose equipment that may generate noise, such as the emergency electric generator.

14. OHL and substations are normally expanded and updated. However, in the event that the OHL and substations require abandonment, the proper procedures are described in the IEE.

15. An environmental management plan (EMP) has been prepared to effectively address the project’s impacts. The EMP includes a summary of the impacts, the mitigating measures,
the estimated cost, monitoring and reporting system, and performance indicator to measure
the effectiveness of the mitigating measures. The EMP also identifies the different positions
and their authorities and responsibilities for implementation.

16. On May 28, 2012, a public consultation was done at the district hall of Kasansay. The
announcement for the public consultation was posted in 35 different public places. The
Deputy Khokim opened the meeting. The Chief Engineer who is in charge of the substation
and OHL management in Namangan then give a brief description of the Project, the
rationale for the Project and the planned activities. The local consultants for environment and
social issues presented the initial findings of the IEE and provided initial information of the
method of calculating compensation for the lands to be permanently acquired or temporarily
used by the Project. Seventy seven people attended the public consultation. The issues
raised during the consultation included (i) impacts of the construction on their daily lives if
they are close to the access roads; (ii) impacts on their health when the Project is
operational; (iii) employment of local graduates as well as skilled and unskilled workers; and
(iv) compensation for lost income and for the Kasansay area, improvement in the
productivity of the reserve land to compensate for the loss of the 25 hectares.

17. In the OHL right of way, most of the areas are empty spaces which are used by
grazers on seasonal basis. The public consultation will be an ongoing activity. The Project
Management Unit (PMU) and contractor will request the Makhalla to contact his community
members who have grazing rights in the transmission lines right of way. In the assessment
of the compensation package, the environmental information and disclosure will be included.

18. The Grievance Redress Mechanism was developed in consultation with the Project
Management Unit, the Uzbekenergo office in Namangan, and the local community leaders.
People affected by the Project may directly lodge a complaint with the Project Management
Unit during construction and to the Uzbekenergo district office during operation. The local
Makhalla has indicated his willingness to help any person who may need assistance to file a
complaint.

19. As assessed during the screening process, the project impacts could be mitigated
using established technologies and procedures. The project negative impacts during
construction are typical of those caused by any construction activity. The project impacts
during operation are mostly positive.

B. Policy, Legal and Administrative Framework

20. The Project involves the provinces of Tashkent and Namangan. As a trans-provincial
project, the Project falls under category I regardless of the magnitude of its impact in
compliance with Appendix 2 to the Cabinet Ministers’ Decree of the Republic of Uzbekistan
No. 491, paragraph 13 (December 2001). The Project was cleared by the Glavgosekoexpertisa under the State Nature Protection Committee on November 3, 2011
under clearance No. 18/936z.

21. Under the Asian Development Bank system, the Project is classified category B,
which means a proposed project whose impacts are site specific, few if any of which are
irreversible, and where in most cases mitigation measures can be designed more readily
than for category A projects. Proposed category B projects require an initial environmental
examination (IEE). The assessment complies with the Republic of Uzbekistan environmental
laws and regulations, international conventions and protocols Uzbekistan has signed and

4 A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts
that are irreversible, diverse or unprecedented. Those impacts may affect an area larger than the sites or facilities
subject to physical works. An environmental impact assessment is required.
ratified, as well as Asian Development Bank Safeguard Policy Statement of 2009. The relevant policies, laws, and administrative structure applicable directly or indirectly to this IEE are enumerated below.

a. Project Authorization and Prioritization


23. Agreement on September of 2011 by the representatives of the Ministry of Defense of the Republic of Uzbekistan, “Uzelektroset” UE and SAESP JVC on the routing of 500kV OHL to Namangan SS across the territory of the military polygon on the best possible alignment of the existing 500kV OHL and exact replication of this line.

b. Environmental Laws, Regulations and Institutions

24. “On nature protection” (1992) – states legal, economic, and organizational bases for conservation of the environment and rational use of natural resources. Its purpose is to ensure balanced relations between man and nature, protection of the environmental system, and to guarantee the rights of the population to a clean environment. According to legislation of the Republic of Uzbekistan, the Cabinet of Ministries of Republic of Uzbekistan, State Nature Protection Committee (SNPC), and local government bodies are responsible for implementing state laws on environment protection and management and the use of natural resources.

25. “On Environmental expertise” (2000) – the law specifies the purposes, objectives and types of environmental expertise. The law defines the qualifications, duties and obligations of environmental experts. The State Nature Protection Committee (SNPC) has overall responsibility for implementing this legislation through The Departments of Environmental Expertise (Glavgosekoexpertiza and Gosexpertisa which are both under the SNPC) and the Provincial branches of SNPC.

26. “On conserved nature territory” (2004) – regulates relations in organization, protection and use of conserved territories, and management of protected nature reserved or territories. In the law are given the categories and management of conserved territories such as integrated (landscape) wildlife preserves, nature parks, state natural objects, areas for protection, conversion and restoration of certain natural and manmade objects and complexes. SNPC and local government bodies are responsible for implementing state control and protection of nature conserved territory and its usage.

27. “On forest” (1999) – describes main objectives of forest regulations and state forest fund and gives mechanism of state regulations and controls in the field of forest protection, conservation, use, and reproduction. The law stipulates the order of forest management, its types and cutting conditions of tree and bush plantations. The Cabinet of Ministries of the Republic of Uzbekistan, local government bodies, SNPC and Head Department of Forestry under Ministry for Agricultural and Water Resources Management are responsible for implementing the law.

government bodies and special authorized agencies implement the law. SNPC and Head Department of Forestry under Ministry for Agricultural and Water Resources Management are the special authorized agencies in flora protection and its usage. The Cabinet of Ministries of Republic of Uzbekistan, local government bodies, SNPC and Head Department of Forestry are responsible for implementing on the national level the administration of the law.

29. “On atmosphere protection” (1996) – describes regulations on atmosphere protection and its objectives. It specifies standards, quality and deleterious effect norms, requirements on fuels and lubricants, production and operation of vehicles and other transport means and equipment, ozone layer protection requirements, obligations of enterprises, institutions and organizations toward atmospheric protection, and compensations for damages from atmospheric pollutions. The Cabinet of Ministries of the Republic of Uzbekistan, SNPC and local government bodies are responsible for implementing the law.

30. “On solid wastes” (2002) – the principal objective of this law is to prevent negative effects of solid wastes on people’s lives and health, as well as on the environment, reduce wastes generations, and encourage rational use of waste reduction techniques in household activities. The law regulates the procedures for treating solid wastes and defines the authorities of various institutions involved in solid wastes management. The law also stipulates the rules for transporting solid wastes and provides market base incentives for efficient treatment of solid wastes. The Cabinet of Ministries of the Republic of Uzbekistan, SNPC, Ministry of Health, Uzbek Agency “Uzkomunhizmat”, Agency on supervision for safe operation in the industry and mines inspectorate (hereinafter Agency “Sanoatkontekhnazorat”) are responsible for implementing the law.

31. To implement those laws, the following Council of Ministries’ decrees that are enforced: (i) Cabinet of Ministers’ Decree No. 491 from 31.12.2001 on “Confirmation of regulation of governmental environmental expertise in the Republic of Uzbekistan”; (ii) Cabinet of Ministers’ Decree No. 174 from 27.07.2004 on “Confirmation of regulations on water protection areas in water storage basin and in other water reservoirs, rivers, channel and collector mains, as well as drinking and domestic water supply sources, medical and culture and health purpose in the Republic of Uzbekistan”; (iii) Cabinet of Ministers’ Decree No.293 from 27.07.1995 on “Confirmation of tax for calculation of damage recovery caused on flora of the Republic of Uzbekistan”; (iv) Cabinet of Ministers’ Decree No.139 from 01.04.1998 on “national strategy and measures of the Republic of Uzbekistan on conservation of biological diversity”.

32. In addition, this environmental examination conforms to the following methodologies, regulations, and standards: (i) “Methodical Guidelines on Ecological and Hygienic Zoning the Territories of the Republic of Uzbekistan in order of Danger to Health of the Population”; (ii) Instruction for the inventory of pollution sources and forming the pollutants emission to the atmosphere for enterprises of the Republic of Uzbekistan (Reg. # 1553 issued by the Ministry of Justice on 3 Jan., 2006, Tashkent, 2006); and (iii) Sanitary Norms and Rules (SNR) 2.01.08-96. Noise protection (iv) SNR on the Effects of Electric Field Generated by Overhead transmission lines of alternating currents of industrial frequency (1984) (v) SNR No. 0015-94 Maximum Concentrations of air pollutants permitted in populated areas within the territory of the Republic of Uzbekistan (vi) Construction Norms and Regulations (CNR) 2.01.01-94 Environmental and Geological Design Requirements and (vii) CNR 2.01.03-96 Construction in Seismic Areas.

33. The Republic of Uzbekistan has also ratified the following international conventions that are part of this environmental examination. (i) Basel Convention on Transport of Toxic and Hazardous Wastes- small quantities of wastes materials may require transport outside of the Republic of Uzbekistan territory (ii) United Nations Framework Convention on Climate Change and the Kyoto Protocol- the Project will improve electricity transmission and result in

34. As this is an energy project, the initial environmental examination also considered the following Uzbekistan laws:

35. “On energy power” (2009) – regulates relations in the field of energy. The law stipulates critical directions of government policy in the field of electro energy and assigns authority to implement government regulations in the field of electro energy. The law describes power production, supply and distribution procedures, as well as implementation of operative-dispatch management.

36. “On rational use of energy” (1997) – regulates formation of common legal basis directed to conservation of national energy resources, efficient energy use, and improved production capacity.

   c. Institutional Framework for Environmental Assessment

37. State Committee of the Republic of Uzbekistan for Nature Protection (Goskompriroda) or SCNP is a specially authorized supreme and coordinating authority, implementing state control and inter-sectoral governance in Nature protection, which involves the use and regeneration of natural resources. Goskompriroda of the Republic of Uzbekistan is under governance of and accountable to Oliy Majlis (parliament) of the Republic of Uzbekistan.

38. Based on the “Environmental Expertise”, the SCNP is obliged to pursue the following objectives: (i) Manage and monitor compliance with the State’s environmental impact assessment procedures; (ii) Review and approve environmental impact assessments; and (iii) Monitor implementation of conditions specified in the environmental impact assessment approval.

   d. Asian Development Bank and International Guidelines


40. The Project will also conform to the International Finance Corporation (IFC) of the World Bank Group General Guidelines on Environmental, Health and Safety (2007) and specific Guidelines on Environmental, Health and Safety for Electric Power Transmission and Distribution of 2007. Where there is a difference between the requirements of the Uzbek laws and regulations with the IFC guidelines, the more stringent requirements will prevail unless there is sufficient justification to use the lower value because of specific project circumstances.5

C. Description of the Project

a. Project Location

41. The Project is located in the eastern provinces of Tashkent and Namangan in the Central Asian Republic of Uzbekistan. The Republic of Uzbekistan is a double landlocked country (a country bordered by landlocked countries) in Central Asia. Uzbekistan is bounded on the west and north by Kazakhstan, on the east by Kyrgyzstan and Tajikistan and on the south by Afghanistan and Turkmenistan. Uzbekistan has a total land area of 447,400 square kilometers and estimated population of 29,600,000 in 2012. The population growth rate has been estimated by the World Bank at 1.4 per cent. The country is located between 370 and 460 N latitude and 560 and 740 E longitude. It is 1,425 km from east to west and 930 km from north to south. Terrain varies from flat to rolling sandy desert dunes to broad and flat intensely cultivated river valleys along the Amu Darya, Syr Darya and Aral Sea. The hills and mountain areas are generally grasslands. The main mountain ranges are on the east along the borders of Tajikistan and Kyrgyzstan.

42. The urban centers are Tashkent, the capital with 2.5 million population, Samarkand with 600,000, Namangan with 378,000 and Bukhara with 350,000. Uzbekistan has a literacy rate of 99.3 per cent. Life expectancy for men is 69.5 years and for women it is 75.7 years at birth. The workforce is estimated at 15.3 million with 28 per cent employed in agriculture, 34 per cent in industry and 38 per cent in services. In terms of ethnicity, 80 per cent of the populations are Uzbeks, 5.5 per cent Russians, 5 per cent Tajiks, 2.5 per cent Kazaks, 2.5 per cent Karakalpak, 1.5 per cent Tata and 2.5 per cent from diverse ethnicities.

43. Uzbekistan is a major producer of natural gas (60 billion cubic meters in 2010), oil (3.7 million tons), gold, coal, uranium, silver, copper, zinc, tungsten and molybdenum. The major agricultural products are cotton (fourth largest production in the world), vegetables, fruits, grain and livestock. The major industries are textiles, food processing, building machineries, metallurgy, automobiles and industrial chemicals. Industrial production annual growth rate is 6.3 per cent.

44. The provinces of Tashkent and Namangan are located in the eastern section of the country. The provinces are characterized by fertile valleys and rough mountain terrain. With industrial production and population growth rate of 6.3 and 1.4 per cent, respectively, the efficient transmission and distribution of electricity has become a major developmental concern in spite of the abundance of energy resources. Uzbekenergo has to build additional substations, transmission and distribution lines to run in parallel to existing facilities. The additional substations will reduce power losses in the transmission and provide higher reliability of power supply. In addition to the 174 km 500 kV OHL, Uzbekenergo has programmed 218 km 500 kV OHL from Talimamrdjan TPP to Sogdianan, 130 km 500 kV OHL from Syrdarya to Novo Angren and 70 km of 500 kV OHL from Syrdarya TPP to Lochin substation.

45. The Project will consist of 174 km of 500 kV OHL, a new substation in Namangan and the realignment of 32 km of 220 kV OHL in Namangan. Figure 1 shows the location of the Project, alignment of the OHL, and approximate location of the various project components. The width of the project area of influence of transmission lines under Uzbek regulations is 80 m wide, consisting of 30 m buffer zone on both sides of the tower and 20 m of tower width. From the IFC guidelines the nearest house should be at least 100 m and 44 m from the conductors for 500kV and 220 kV OHL respectively. However, during construction a wider easement will be required in the vicinity of the tower construction for mobility of the construction equipment and personnel, storage of materials, and safety zone provision. The analysis is based on an area of influence of 200 meters on both sides of the transmission lines. Access to project site will be through the existing maintenance and access roads used by existing transmission lines that the Project will run in parallel. The alignment has been selected to utilize existing village roads. However, new access roads
may need to be built either to connect the towers to facilitate access for inspection and maintenance or to gain access in rough terrain where there are no existing users and roads.

Figure 1. Location of the Project and approximate location of the various project components

b. Project Components

i. Namangan Substation

46. The Namangan Substation is the terminal point for the Project’s 500 kV transmission lines. The Namangan substation is located in Kasansay District, adjacent to Namangan City. Namangan City is a major population, cultural and economic center of the province and in the whole Fergana Valley. The Namangan substation will occupy 25 hectares of land. The Namangan Substation is located at the outskirt of Namangan City to facilitate construction activities and minimize disturbance to the city as discussed later on alternatives.

47. The main components of the substation are (i) six autotransformers to bring down the voltage from 500 kV to 220 kV; (ii) open switchgears 500 kV to 220 kV; and (iii) closed switchgears 10 kV. In addition to those operational components, the substation will include a substation control building to house the instrumentations or supervisory control system.
The transformer area will be enclosed in noise barriers. Oil pans will be provided to capture any oil leaks especially when the transformers and other equipment will require oil change.

48. To support the operation of the substation the following facilities will be provided: (i) two storage tanks each with a capacity of 100 cubic meters; (ii) mineral oil storage tank with corresponding transfer mechanism; (iii) diesel oil storage tank; (iv) standby diesel generator housed in a separate building; and (v) communication system. The substation safety and security facilities include a lightning rod, watch tower, check point, fencing, ventilating hoods, base alarm system, and firefighting equipment for both electrical and non-electrical origin.

49. The substation will be manned 24 hours per day. Twenty two personnel are expected to man the substation with 12 people working on the maintenance and security, six people on the operation, and four people on supervision and management of the area. Water and sanitation facilities, kitchen, and dining facilities will be provided for the workers.

50. Open areas with equipment installation are concreted or covered with asphalt. Rain water is collected by drainage system. It is important to prevent ponding of rainwater in the switch yard. In non-sensitive open spaces, the area will be landscaped and planted with ornamental plants. Steel frames will be painted with at least two layers of protective paint, periodically inspected and repainted as needed. Due to the saline conditions of the ground, all concrete structures will use sulfate resistant concrete and buried metals will be galvanized. In addition, concrete pipes, brickworks and other surfaces installed below the ground will be covered with bitumen to reduce infiltration of sulfates and other corrosive salts.

51. The layout of the substation indicating the major infrastructure and components are shown in Figure 2.
Figure 2. Layout of the Namangan Substation
ii. 500 kV OHL

52. Alternating current electricity is transmitted from the generation site to the consumer by a network of conductors commonly known as the grid. The grid serves a number of power generators and consumers. To the layman, it is easier to visualize the power grid as a system similar to a road network. The grid is designed such that in case of failure in one section, the power could be rerouted to other parts of the grid so that the consumer will still have power even if the most direct or efficient route has been blocked or overloaded. The control of the power in the grid is called dispatching. In a road network, long distance travel is served by freeways that have much higher speed limit, then by main arteries inside the city where the speed limit is reduced from 100 to 70 km/hr, and finally by neighborhood roads with speed limit as low as 30 km/hr. Vehicles traveling in the freeway could not just leave and end at any point but only at specific points. Following the road network analogy, in power grids, the 500 kV conductors are the main transmission lines from the point of generation to areas close to the consumers where substations are situated. Electricity at 500 kV is received at the substation where the voltage is reduced to 220 kV and as low as 110 kV. In the middle of the service area is another substation that would reduce the 110 kV to 35 kV down to service transformers. Power lines with voltages in this range are known as sub-transmission lines. Distribution lines often refer to power lines with voltages of 35kV or less. Most electrical devices in households, commercial establishments and institutions are rated at 220 V. Industrial equipment may use 440 V.

53. When the demand is higher, the power losses also increase in the same way a highway could get clogged. New lines are added in parallel or in new sections to accommodate the additional demand. This is practically the rationale for the Project.

54. The higher the voltage, the higher the transmission line towers are. A 500 kV transmission tower height ranges from 40 to 60 m above the ground. The steel tower's weight ranges from 4 to 12 tons depending on the structural engineer’s analysis. The conductors are made of aluminum to reduce the weight of the conductors that have to be supported by the towers. The conductors are bare and depend on air for insulation except in critical areas such as when the tower passes over critical infrastructure, for example, main gas pipelines.

55. The transmission towers are made of steel. The steel structures are fabricated in the factory in sections that could be easily stacked and transported to the site. The prefabricated sections are assembled on site to complete the tower. As steel is a good transmitter of electricity, the conductor is separated from the steel tower by glass insulators, which are circular plates of glass hanging at the arm of the steel tower. The conductor is thus hung at the arms of the tower by insulators. At the top of the tower is attached a lightning rod to attract and transmit to the ground the electricity from lightning. Lightning, if not properly diverted from the conductors, could cause high voltage surge that could destroy the transformers. Vibration arresters or stabilizers are added to reduce the swaying of the conductor during high wind or earth movement. The vibration arresters together with proper spacing of the conductors prevent the conductors from hitting each other with potentially serious consequences to the electromechanical components of the grid.

56. The tower foundation could be made of precast concrete structural members. Precast concrete is preferred to minimize activities to be done on site. Precast concrete foundation reduces the environmental impacts such as noise, dust, and workers on site. However, in rough terrain where it is very difficult to haul large and heavy precast foundation, the contractor may decide to construct the foundation in situ. Figure 3 shows a typical 500 kV transmission tower with the various components and Figure 4 shows the typical foundation of the tower.
Figure 3. Typical 500 kV Transmission Towers and line

The OHL are often built on top of ridges of the valley. In the foreground is a 220 distribution line supplying electricity to the village.
iii. Transmission Line Route

Detailed description of the 500 kV overhead line (OHL) is given in Section D on the existing environmental conditions together with a description of the physical environment. A large portion of the transmission line runs parallel to Highway A 373 for ease in transport of materials and personnel as well as construction or in parallel to existing transmission lines to utilize the existing access roads and right of way. However, there are instances the Project may require new access roads and right of way, the tower locations were selected as close as possible to existing tracks, village roads and trails. Figure 5 shows the overview of OHL route and Appendix A are detailed maps of the route.

7 While the excavated volume is equal to the area of the base and depth, after backfilling and compaction the excess material is very small. Theoretically the excess material is equal to the volume of the foundation but it is smaller as the backfill materials are mechanically compacted to densities higher than the original density.

8 Unless specifically differentiated or defined, OHL in this report shall mean the 500 kv OHL of the Project.
Figure 5. Overview of existing and designed OHL route
iv. Rerouted Overhead Lines

58. With the new substation and 500 kV OHL, the 220 kV OHL serving Namangan will be rerouted. The existing and rerouted 220 kV lines are shown in Figure 6. To minimize interruption of the services in Namangan, the new 220 kV line will be constructed in a similar manner as the 500 kV OHL line. When the new 220 kV line is ready to be energized, the existing line will be disconnected and the power is shifted to the new 220 kV line. The old line will be checked for any potential residual current or cross connection. Once it is established that it is safe to work on the old line, the conductors are disconnected, rolled into the wooden spool and stored. The insulators, lightning rods, and other appurtenances are removed. If the ground conditions are suitable, that is, there is enough space for a crane to work on, the tower is first tied and held taut by the crane, then the tower is separated from the foundation. After the tower is free from the foundation, it is slowly guided and laid to the ground by the crane. The tower is cut to pieces and sold for scrap. The concrete foundation is demolished to at least a foot below the ground level as a protruding concrete foundation is a potential hazard to pedestrians or any mobile objects especially in the dark. Figure 6 shows the route of the new 220 kV OHL and the decommissioned line.

![Figure 6. The Rerouting diagram of the 220 kV OHL line to the Namangan Station](image)

59. The decommissioning procedure for the 220 kV will be similar to the decommissioning procedure for the 500 kV OHL if and when it is abandoned.

c. Associated Facilities

60. The Project will add 174 km of 500 kV OHL to the existing 2331 km (2010 data) of 500 KV OHL that currently meets an energy requirement of 51,935 billion kwh of electricity per year. The installed capacity of the power plants in the Uzbekistan grid is 12,472 MW consisting of 10,619 MW of thermal power plants (TPP) and 1412 MW of hydropower plants...
(HPP) that are owned by Uzbekenergo and 363 MW of hydropower outside the control of Uzbekenergo. Uzbekenergo, the power company is currently modernizing and upgrading its thermal and hydropower plants to reduce the greenhouse gas generation per unit of energy produced and to reduce the emissions of sulfur dioxide, nitrogen oxide, and particulate matter. The major modernization projects involve the 1930 MW Tashkent Thermal PP targeted for completion in 2014, expansion of the Talimardjan Thermal Power Plant through the installation of a 900 MW combined cycle power plant (CCPP), with the benefit of an estimated reduction by 1.2 million tons in annual carbon dioxide emission, scheduled for completion in 2014, new CCPP at Navoi with a capacity of 478 MW scheduled for completion in 2012, and modernization of the Angren TPP with capacity of 150 MW scheduled for completion in 2014. In addition, Uzbekenergo is improving the hydropower plants performance in Charvak, Nizne–Boznu Cascade, and Tashkent Cascade with a total generating capacity of 50 MW. The modernization of the three HPPs is expected in 2015 and 2016.

61. Uzbekenergo is installing renewable energy demonstration plants. Three solar powered centralized hot water systems are in operation. The solar powered hot water systems in Khorezm province have an installed capacity of 12 KW while the solar powered plants in Namangan and Ferghana provinces have each a capacity of 25 KW.

D. Description of the Environment (Baseline Data)

a. Land Use and Forms

i. Namangan Substation

62. The Namangan substation is to be constructed on a 25 hectare lot located in what used to be the Kasansay Nur Safet farm land in the Kasansay region of Namangan province. Although the farm land is irrigated, the yield is low because of problems in water supply and soil quality. The terrain is relatively flat. The nearest house is 100 m to the north-east of the proposed substation site as shown in Figure 7.

ii. Rerouting 220 kV OHL

63. The electricity voltage of the power delivered to the Namangan Substation by the 500 kV OHL will be reduced to 220 kV. The power will be transferred to the existing substations in Namangan. The distance between the existing substations in Namangan and the proposed substation in Kasansay is 8 km. Four 220 kV OHL are proposed for a total length of 32 km. After the new 220 kV OHL is completed, the redundant 220 kV OHL will have to be decommissioned. The new 220 kV OHL will pass through 8 km of irrigated farm lands. The conditions of the irrigated farmlands are very similar to those shown in Figure 7.

iii. 500 kV OHL

64. In Namangan province, the OHL will pass through the districts of Pap for 58.8 km, then Chust for 38.9 km, Turakurgan for 5.5 km and Kasansay for 6.7 km. In Tashkent province, the OHL will pass through 64.0 km of Akhangran district. The OHL will have 67 sections or angular turns. In between the 67 sections, the OHL runs in almost straight lines at distances of 350 to 450 m apart although when it crosses the Akhangaran River special towers and supports will be built to cover the span of approximately 600 m and at Duketsai valley with a span 1,050 m.
Point zero is the Uzbekistan Substation, located just outside the Novo Angren Thermal Power plant. From this point the OHL will go straight to angle 1 located on a flat plain behind the greenhouse of Novo Angren Thermal Power Plant and close to Akchasai River dike. From angle 1, the OHL turns right to cross the Akchasai River and will run parallel to an existing 500 kV OHL until angle 2 at the foot of Talasay ridge. From angle 2 to angle 3, the OHL will continue to run parallel to the existing 500 OHL line. The area is slightly inclined plain with elevation of 800 m to 818 m above mean sea level (amsl). At angle 3, the OHL will turn to the left to avoid the dwellings and houses located in a nameless stream up to angle 4. From angle 3 to angle 4, the OHL will pass through the saddle points of Kyrkymskaya valley. The OHL will follow the terrain moving upward from 818 to 990 amsl. The area is grasslands and uninhabited. From angle 4, the OHL moves northward to angle 7. The alignment from angle 4 to angle 7 passes through areas currently used by the Uzbek military. The exact delineation is still undefined, but is subject to final survey that will bypass infrastructures used by the military. Figure 8 shows the typical terrain; land use and land cover from angle 1 to 7.
From angle 7 the OHL will run a northeastwardly direction for 6.4 km to angle 8 along smooth graded slopes with elevation of ranging from 1060 to 1090 amsl. The route crosses a small stream and is accessible by dirt road. The area is practically grasslands. From angle 8, the OHL runs northward crossing the Karabausai River for 2.3 km to angle 9. The OHL alignment covers grasslands. At angle 9, the terrain is mountainous and rocky. However, gravel and clay loam mix soils have been uncovered at depth of 3 m. The OHL will run 4.3 km from angle 9 to angle 10. Between angle 10 and angle 11, the OHL will again cross the Karabausai river. The river in this section has a width of 50 to 60 m. The distance between angle 10 and angle 11 is 0.60 km. At this section, the Karabausai river floodplain is occupied and a number of gardens have been established by the residents. A 35 kV OHL supplies electricity to the villages along the floodplains. An asphalted road connects the Geolog village on the right bank of the river with the 35 kV line running on the other side. To avoid the dwellings and the 35 kV line, the river crossing at the back of Katagal village is selected. The terrain is gently sloping on the left side of the river and parallel to the existing 35 kV line. From angle 11, the OHL turns eastward for 1.7 km to angle 12 and then comes down on a northeast direction for 4.1 km to angle 13. The route is selected to bypass the populated sections of Karausai and Dukentsai rivers. The route is mountainous and the soil is loamy mixed with pebbles, rubble and detritus. Between angle 13 and angle 14, the OHL will cross the Dukentsai River. The Dukentsai River valley is populated on both sides of the river. The Saygazi village is located on the left side of the left slope and the Yangi-Abad village is located on the right side. The sides of the valley are steep and rocky. The OHL river crossing is selected at a point 200 to 220 m upstream of the existing 500 kV OHL to avoid passing

9 Note the 220 kV OHL in the foreground. The existing 500 kv line is on the far end. The proposed line run parallel to the existing 500 kV OHL.
through the two villages. The distance between angle 13 and angle 14 is 1.0 km. Figure 9 shows the typical terrain, land cover and uses of the area between angle 8 and 14.

**Figure 9.** Typical Environmental Conditions as the OHL ascends to the mountainous divide between Tashkent and Namangan Provinces (angles 8 to 14)

67. The distances between angle 14 and angle 15 is 6.4 km and from angle 15 to 16, 6 km. In this section, the OHL will run parallel to and at a distance some 150 to 160 m north of, an existing 500 kV OHL. This section runs through gently sloping foothills with elevation of 1350 to 1400 m amsl and most of the towers would be accessible through the Tashkent-Kokand road. There are also tractor tracks on the route used by some of the villages in the valley. The main villages in the area are Aktashsai, Turganbatisai, Ingichkasai and Chetsu. There are also existing tractor tracts used for maintenance of the existing 500 kV OHL.

68. From angle 16, the OHL diverts from the existing 500 kV OHL because of limited space. The OHL diverts to the northeast along the sloping foothills towards the source of Chetsu stream. The line alignment goes an elevation of 1450 to 1500 m amsl. The distance between angle 16 and angle 17 is 2.8 km. At angle 17, the OHL merges again with the alignment of the existing OHL up to angle 19. The distance from angle 17 to 19 is -6.5- km. The land patterns from angle 17 to 19 are small valleys along the Jiblansai and Kokasaraisai streams. The valleys are primarily grasslands.

69. At angle 19, the OHL diverges again from the alignment of the existing 500 kV OHL towards the headwaters of the Koksaraisai stream and then to angle 20 in the deep valley of Erthash stream. The area is accessible by narrow tractor roads used in the construction of the existing 500 kV OHL. The predominant land use of the area is as grassland with shrubs. The slope from angle 19 to angle 20 is downhill from elevation 1479 to 1370 m amsl. The bottom of the valley is relatively flat with elevations of 1250 to 1260 m amsl and as such the Erthash stream meanders and widens to 560 to 600 m. On the other side of the Erthash stream, the OHL ascends to angle 20, which is located at 1370 m amsl. The distance between angle 19 and angle 20 is 0.65 km. The area on the OHL right of way is mainly open
space although there are gardens and agricultural land upstream of the OHL alignment. Both sides of the Erthash stream are planted with fruit and nut trees.

70. From angle 20, the OHL turns left and rises along the watershed of the Erthash and Kyzylcha streams to angle 21. From angle 20 to 21 is a total distance of 0.5-km. From angle 21 to 23, the OHL line passes along the right side of Kyzylcha stream. The distance from angle 21 to 2310 is 2.5 km. Angle 23 was selected to bypass the farms and houses. The terrain from angle 21 to 23 is gently sloping. The land is classified as grassland. The soil consists of rubbles and pebbles. In some sections, bedrocks are exposed. From angle 23 to 24, the OHL descends to the valley floor of Kyzylcha stream and after crossing the stream at the bottom of the valley, the OHL ascends to angle 24. The Kyzylcha stream at crossing point is 250 to 260 m wide. The opposite side of Kyzylcha stream the OHL move towards angle 24 which is located at a much higher elevation than the other side. The total distance between angle 23 and angle 24 is 0.65 km. The land from angle 23 to 24 is grassland with exposed bedrocks and pockets of pebbles and rubbles. Figure 10 shows the typical terrain, land use and cover between angle 15 and 28.

Figure 10. Typical terrain and environmental conditions of the mountain sections dividing Tashkent and Namagan Provinces. (angles 15 to 28)\textsuperscript{11}

\textsuperscript{10} OHL has changed direction if the tower type is an angular tower. However, from the environmental assessment point of view if the change in direction is minor or if there is no significant changes in the land use and terrain covered by two or more angular sections the discussion for the entire range is lumped.

\textsuperscript{11} Note this is the Usman Yusupov Valley where two houses will have to be relocated. The houses are to be relocated for safety reason. Trees and shrubs will not be affected.
From angle 24, the OHL line runs along more gentle slopes on the right side of the Akhangaran river to angles 25, 26 and 27. The distance from angle 24 to 27 is 3.0 km, and the land is primarily grassland. From angle 27, the OHL will cross the valley formed by Beshkulsai stream a tributary of the Akhangaran river to angle 28. The distance between angle 27 and angle 28 is 0.6km. Angle 28 is located at the right side of the Akhangaran River and the boundary of Tashkent and Namangan provinces. The total length of the OHL from point angle 0 to point angle 28 is 64 km. Figure 11 shows the long span of the existing 500 kV OHL crossing the Akhangaran River where the Project will cross in parallel.

![Figure 11. Typical Terrain as the OHL Ascends the Dividing Range between Arkhangan Valley and Ferghana Valley (angle 29 and 30)](image)

From angle 28 to angle 39, the OHL passes through gently sloping terrain on a high mountain plateau at elevation 2200 to 2600 m amsl. The distance from angle 28 to angle 39 is 3.9 km. The soil in the area is mostly pebbles and rubbles with some loam soil in between. The soil layer is shallow at 1 to 2 meters deep before the bedrock is encountered. In summer, grasses grow, sustained by soil moisture from melting snow and spring rains. The area is normally used for grazing during summer and early autumn. The grazers usually migrate to lower valleys for the rest of the year with their livestock.

From angle 39 to 42, the OHL will run parallel to a dirt road which is in good condition. The soil types and land uses in the area are similar to those in sections 25 to 39. The distance between angle 39 to angle 42 is 6.2 km. The terrain is gently sloping with elevations ranging from 2600 to 2700 m amsl.

Note in the top of the hill the existing 500 OHL. The Project will run parallel to that line. The existing 500 Kv OHL is 1,600 m long.
74. From angle 42 to angle 50, the OHL will descend from elevation 2700 m amsl to 1350 m amsl along the steep ridges of Aktepa stream. The land form is rough with exposed bedrocks although there are sections with pebble, rubble and loam soil cover. A military unit is camped at the headwaters of Aktepa stream and they have built and maintained a road network that could be used as access to the proposed OHL alignment. The alignment could be also accessed from highway A-373 bypassing the military camp infrastructure. The distance from angle 42 to 50 is 9.2 km. The land in this section is classified as grassland and military installation.

75. From angle 50 to 52, the OHL will run parallel to the existing 220 kV OHL of the Angren-Obi Hayot II circuit. The terrain in the area is very rugged with small brooks and deep ravines that are 50 to 70 m deep. The area is rocky with exposed bedrocks all throughout the section. The land use is grassland. However, the alignment is accessible from the road built for the construction and maintenance of the existing 220 kV OHL. The total distance between angle 50 and angle 52 is 8 km. Figure 12 shows the typical terrain, land use and land cover in the mountain plateau on Namangan province side of the OHL.

![Figure 12](image_url)

**Figure 12.** Lower Portion shows the typical terrain of the mountain areas in Namangan bordering the Tashkent Province (Angles 30 to 52)

76. From angle 52, the OHL alignment will go eastward to Chadaksai valley until angle 54. Between angle 53 and angle 54, the OHL will cross Chadaksai stream and two aqueducts. The soil in the area consists of pebbles and rubbles with very shallow water table. The land is mostly grassland. The distance from angle 52 to 54 is 6.2 km. From angle 54, the OHL will turn northeast and ascend steeply to angle 55. Angle 55 is located at elevation 1061 m amsl. The area is classified as grassland and the soil structure is similar to other sections of the valley. The distance between angle 54 and angle 55 is 6 km. The terrain consists of mostly rolling hills and flat plains.
77. From angle 55 the line will run east for four km to angle 57 passing through small brook tributaries of the Kattasai and Gunesai streams. The terrain is relatively flat with elevation ranging from 1060 to 1070 m amsl. The soil is mostly pebble and rubble and very shallow. The area is classified as pebble desert and devoid of any vegetation. The distance between angle 55 and angle 57 is 16.6 km. Figure 13 shows the terrain of the area and the land cover.

![Figure 13. Typical Terrain in Namangan Province Section Near Pap Chust Border (Angles 52 to Angles 57)](image)

78. From angle 57 to 59 covers 14 km crossing the border from Pap to Chust region. The OHL will pass through undeveloped land and as well as irrigated land. From angle 59 the OHL, will run northeast between the villages of Akhacha and Aryboi and the large township of Almas. The alignment is located at a plain with elevations ranging from 730 to 760 m amsl. The land is irrigated and used for growing cotton, cereals and vegetable crops. The road network is well developed in the area. Electricity is supplied by a four 10 kV OHL and one 35 kV OHL that will intersect with the Project OHL.

79. From angle 59, the OHL will ascend eastward to the ridge dividing the valleys of Gevasai and Resaksai stream. The route from angle 60 to 61 will bypass the Karnan village. Angle 62 is located north of Shurakurgan village and angle 64 is south of Shayan village. The land is irrigated by artesian wells and is planted to cereal, cotton and vegetables. Pumps in the villages are electricity driven. The total distance between angle 59 and angle 64 is 2 km.

80. From angle 64, the OHL will move towards the Rezaksai stream and run across undeveloped lands to the border of Kasansai region at angle 65 and then downhill to Turakurgan region up to angle 66. The OHL will pass through non-arable land in Turakurgan region. The distance between angle 64 and angle 66 is 15.7 km. The land profile is rugged and crisscrossed by small streams and ravines. The small streams are dry for most of the year. At angle 66, in Kasansai valley, the OHL will bypass the villages of Kurama and Kuymazar. The bottom of the Kasansai valley is irrigated. Cereals and vegetables are grown
in the irrigated areas. Between angle 65 and angle 66, the OHL will pass through two 10 kV OHL.

81. From angle 66, the OHL will turn northeast to angle 67 or the proposed Namangan substation. The distance between angle 66 and angle 67 is 1.8 km. The alignment will pass through arable land. The irrigation system in the area is unreliable and the productivity of the farmland is low. Figure 14 shows the typical land cover and uses as the OHL approaches the Turakurgan and Kasansay districts.

![Figure 14. Typical Terrain and View from A 373 of the 500 OHL in Namangan Province (from Angle 57 to Angle 67...)](image)

**Summary of the OHL Alignment Land Forms and Uses**

82. The OHL will pass through 64 km across the Tashkent province in the piedmont and mountain part of the southern extremity of the Kuramine mountain range. The OHL will start at elevations 810 m - 818 m amsl in Angren ascending to 1450.0 m – 1550 m. amsl. The line of route mainly runs across 62 km of grassland and 2 km of gardens. Across the Namangan province the line of route will at first pass along a high-mountain upland at the elevations of 2700 m amsl going down to 1060 m and then across a flat terrace above the flood-plain of the Syrdarya river-valley. Of the 110 km alignment in Namangan Province, 2.0 km are gardens, 41.4 km are the irrigated arable lands and 64.5 km are grasslands. The OHL will cross two-110 kV OHL, nine- 35 kV OHL, twenty seven 100 kV OHL, four motor roads, 13 shallow rivers and one large river, the Akhangaran. The OHL alignment is selected and designed such that the conductors will be at least 100 m from the nearest house and on the average will be 2 km from the nearest village. Three houses may have to be relocated in Tashkent province and one house may even evade relocation. The housing developments in Tashkent province nearest to the proposed OHL are the settlements of Katagal and Saigazi. The housing developments in Namangan Province the nearest to the proposed OHL are the
settlements of Akhcha, Arikhboy, Almas, Karnan, Shurakurgan Shayan, Kurama, and Kuymazar. Most of those settlements are located near the Namangan substation.

b. Soil Characteristics

i. Namangan Substation

83. At the Namangan substation site area, the soil type is referred as irrigated gray soil. The soil layer is shallow up to 2 m thick and has high capacity to accumulate carbonates. The soil gray coloration is from early stage of coal development commonly known as coal-slats or nodules. Irrigation and intensive agriculture practices in recent years have introduced new chemicals into the soil. Irrigation water that was improperly drained and allowed to evaporate in the field has increased the soil salinity. This has resulted in a decreased productivity of the soil.

84. The soil is formed from loess deposit from the Golodnay terrace. The soil at its natural condition is salty with high concentration of chlorites and sulfate minerals. Typical pH of the soil is from 7.5 to 8.0 due to the carbonates although in the thin humus horizon of the soil, the pH could drop to the range of 7.3 to 7.6. Initially the irrigation system was intended to flush out the salt build-up but often the farmers are reluctant to release the irrigation water.

ii. OHL Transmission Lines

85. As mentioned in the previous sections, the proposed OHL transmission route from angle 57 to the substation passes through irrigated agricultural areas. The soil characteristics in the area are similar to those at the Namangan substation.

86. Further west towards Tashkent Province, the soil types are mostly pebbles and rubbles interspaced with loamy soil. The soil layer is also very shallow with bedrocks exposed in several locations.

87. In the Tashkent Province section of the proposed OHL alignment the soil is formed from the terraces above the flood plain of the Akhangaran River. The soil cover of the region could be classified into three types. For northern mountain section, dark gray soils are typical, in central and southern part of the region the typical gray soils are undergoing metamorphic processes. In flood plains of Akchasai, Shavazsai and Akhangaran rivers the flood waters create an alluvial-meadow soils primarily composed of silt, pebbles and rubbles.

c. Climatic Conditions

i. Akhangaran Valley

88. The climate in the Akhangaran valley is continental and is strongly influenced by the surrounding mountains. The valley is enclosed in the north and north west by the Chatkal and in the south by the Kurama mountain ranges. The mountain ranges effectively seal the valley and limit air circulation from outside. The winter months are chilled and the summer months are hot. The area is frost free 245 days of the year normally from March to October. January is the coldest month with minimum temperature of -17 °C and average monthly temperature of -3.3 °C. July is the hottest month with maximum temperature of 39.9 °C and average temperature of 32.6 °C. For most of the year the region is cloudless and the average solar radiation is about 4000 mj/square meter.
89. The wind pattern is affected by the orientation of the mountain ranges. The prevailing wind is from the North North East and North East for 44.5 per cent and the West South West and South West for 35 per cent of the time. The wind speed is rather low with wind speed higher than 6 m/sec (21 km/hr) taking place for less than 1.4 per cent of the time. Calm conditions with wind speed from 0 to 2 m/sec (0 to 7.2 km/hr) occur for 55 per cent of the time and wind speed of 2 to 3 m/sec (7.2 to 10.8 km/hr) for 32.8 per cent of the time. Wind speed of more than 10 m/sec (36 km/hr) has not been observed.

90. The summer months to the start of autumn are normally dry months with very little rainfall. Maximum rainfall is observed in the months of November to May. The average annual precipitation is 667 mm/yr. Atmospheric inversion is common and episodes with calm wind and a hovering inversion layer have been noted to last up to 300 hours. Accumulation of air pollutants during atmospheric episodes is a major concern of the valley residents.

ii. Fergana Valley

91. Like the Akhangaran valley, the climate in Fergana valley is continental, characterized by high summer temperatures, low relative humidity, considerable evaporation discharge and irregularity of seasonal distribution of precipitations. Fergana Valley is surrounded on all sides by mountain ranges affecting the local climatic conditions. The mountain massifs protect the territory from cold-air outbreak from north and east and hot dry air from south. Maximum air temperature in summer reaches 44°C. The average air temperature in July is 27.9°C. The annual average air temperature does not exceed 15.46°C. In winter the monthly average air temperature equals to +1.06°C, minimum winter temperature is -16.9°C.

92. A narrow “throat” connecting the valley with vast desert territories in the west facilitates strong seasonal winds. The prevailing wind conditions are from the eastern and a south-eastern (E-ESE-SE) directions that take place 39.4 per cent of the time and followed by winds from western and south-western directions (W-WSW-SW) at 23.21% per cent of the time. Wind speed of 1-10 m/sec is typical, occurring 38.23% of the time and wind speed of 2-3 m/sec takes place 36.8% of the time. Strong winds are very rare although wind speed may reach as high as 40 m/sec (144 km/hr). An average annual precipitation is 388 mm.

d. Air Quality

i. Akhangaran Valley

93. The industrial activities in the Akhangaran Valley are concentrated in Angren area. Coal is mined at the eastern section, close to a water reservoir. The Nurabad industrial enterprise is also located in the area. Due to the air movement, topography and climatic conditions, the air quality around Angren is very poor. Uzhydromet maintains three stationary monitoring stations in Angren. The results of its long term monitoring program have shown that the average total suspended particulate matter is 0.7 admissible concentration level (ACL) 13 and the maximum observed value is 8 ACL. Average annual and maximum concentrations of sulfur dioxide, benzpyrene, nitrogen oxide in the region concerned are lower than the admissible concentration levels. Outside of Angren, there is very little human activity especially along the route of the OHL as described in Section D-iii.

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13 Admissible concentration level for suspended particulate matter is 0.5 mg/cubic meter, NOx is 0.06 mg/cubic meter, SO2 is 0.25 mg/cubic meter.
94. It is only when the OHL reaches the irrigated areas in the proximity of Namangan City that some agricultural, residential, commercial and industrial activities take place. Namangan City air pollution is low and it is not listed in the Uzbek cities with high level of pollution as per World Bank report on Assessment of Environment of the Republic of Uzbekistan 2007.

**e. Water Quality and Flow**

i. **Akhangaran Valley**

95. The Akhangaran River is the major river in the OHL alignment in Tashkent province segment. The Akhangaran River starts from the south western side of the Chatkal mountain range and merges end with the Syrdarya River. Most of the flow of the Akhangaran River is used in irrigating agricultural lands along the valley. By nature, Akhangaran river is a piedmont system which is characterized by short period of high water and turbulent flow and highly turbid water. In summer, the river is very shallow, slow moving and the water is clear with very low sediment content. From late spring to summer, the water in the river is fed from an underground spring and perched water aquifers. In spring the dissolved solids in the water is almost two times higher than in winter months at 400 mg/l compared to 200 mg/l, respectively. Most of the dissolved solids are bicarbonates and sulfates. The cations are primarily calcium and magnesium. In summer considerable sodium ions are also present, normally carried by water used for irrigation and concentrated by evaporation.

ii. **Ferghana Valley**

96. The main river in Ferghana Valley near Namangan is the Chadaksai River. Chadaksai has a catchment area of 352 square kilometers and a mean annual flow of 3.58 cubic meter/second. The main river’s major flow rate takes place from March to the end of August. The Chadaksai river runoff is irregular. The main water source is from snow melt and rain. The average discharge rate of the river is 3.3 cum/sec and at the height of the flood season it may reach 6 cum/sec. The river is also extensively used for irrigation in the region around Namangan. However, during the flood season the river may contain large quantities of mud.

**f. Ground Water**

i. **Akhangaran Valley**

97. The starting point for the transmission line is characterized by loess sand and sandy loam soil with thickness up to 10 m. In some places especially in low lying areas, alluvial cones with gravel sand and pebbles subsoil with thickness of 1 to 5 meters are found. Ground water tables are often encountered at a depth of 3m. The groundwater contains high concentration of sulfates and chlorides. Calcium and magnesium are the main cations. The perched ground water or the shallow ground water is limited and unreliable. Irrigation systems and drinking water supply normally tap the groundwater below the 3 m depth. The sulphate concentration may reach 1000 mg/l in some ground water source used for drinking water.

ii. **Ferghana Valley**
98. The water bearing formation in the alluvial deposits in the Syrdarya River and its tributaries are of recent geologic age. Perched water deposits are normally found in the river and stream beds, flooded land, and the terraces adjacent to the river. The ground water levels in the areas are very shallow from 1 to 2 m below the ground surface. Quaternary alluvial deposits consisting of sand, gravel and sandy loam soil are uniformly distributed around the valley at depths of 20 to 25 m. Below this level are beds of sandy loam and sand layers from 20 to 40 m deep, which were deposited during the Upper Quaternary period. Due to geologic movement, the two layers have merged and overlapped. The general ground water movement is from the east and north east towards west and south west with an average gradient of 0.0005 to 0.01. The groundwater has high carbonate and sulfate concentration with total hardness of 1.0 milli-equivalent per liter. The groundwater is extensively used in agriculture especially in the region around Namangan.

**g. Geology**

99. The geological structure along the OHL route in Tashkent and Namangan province consists of Paleozoic sediments and Quaternary alluvial deposits. In the valleys, thick alluvial deposits are found on the valley floors in what is commonly called the Ferghana depression. The thick alluvial deposit is extensively tapped for agriculture, domestic water supply and industrial uses. Deep wells are found throughout the Ferghana depression. In the piedmont, the Ferghana complexes mainly consist of cobble round stone with sandy gravel and sandy mud fill. The structure is often consolidated and stratified. The calcium and magnesium carbonate minerals effectively cement the conglomerate and gravel stone.

100. Most of the geologic structure especially those in proximity to the mountain margins are exposed along the erosion channels of Sarvaksai, Rezaksai, and Charkesarsai streams. The formations are evident in the deep ravines described along the OHL route. Near the valley areas of Chadaksai, Charkesarsai streams are formed by washed-out rocks that are smooth and rounded and have less content of argillaceous material. Upper Quaternary deposits form level three terrace above flood-plain of the Syrdarya and Narin Rivers going up to its tributaries.

**h. Biological Components**

101. In Central Asia, the Republic of Uzbekistan has the lowest wood cover. The government has assigned the management of the forest and areas for reforestation to the State Forest Fund. About 21.3% of the territory is administered by the State Forest Fund. The state forest fund in 2007 covered 8,661.1 thousand hectares of which 3,220.8 thousand hectares are covered with trees. Currently, forest reserve is 9,462.7 thousand hectares of which 3,312.0 thousand hectares are covered with trees. In the two provinces transversed by the Project, 13.8 % and 25.2 per cent of Namangan and Tashkent, respectively, are covered by trees and bush.

102. In settled areas, the residents cultivate their own gardens for vegetables, fruits and shade. The most common trees planted are polar, mulberry, English elm, maple, acacia, and pine trees. The gardens and cultivated areas account for less than 0.8 per cent of the total land area for the two valleys. Along the irrigational channels, streams and river banks, riparian trees have grown naturally or were planted by the government and residents to stabilize the area, improve the water retention and provide shade. The common trees planted are Cyprus and pines. Reeds, cane grass, and Cuba grass are also common in the valley floor especially in areas close to streams. Most of the areas are dominated by semi-desert absinthial-ephemeral and halophytic grass.
103. The animal world of Namangan and Tashkent regions is typical for ecologically disturbed areas. While the area is sparsely populated, it has very long history of human habitation. The ancient pastoral activities in the area are nomadic in nature covering large areas of grassland for sheep and horse grazing. The area is the main crossroad in the East Asian-European trade routes commonly called the silk route. Conquest and control of the area were major strategic objectives of from pre-historic times to more recent conquerors such as Genghis Khan and Tamerlane. The conquest of the area is often done by “scorch earth”. Today the common mammals are house mouse, sewer rat, mole vole, common pipistrelle, tamarisk gerbil (dominating types), vole, eared hedgehog, small white-toothed shrews, fox, jackal, badger, and vair (secondary species). Fox, jackal, badger, and vair are still hunted and traded by nomadic herders.

104. During most of the year the common birds found in the Akhangaran and Ferghana valley are Indian and tree sparrow, mayna, crested lark, blue headed wagtail and red headed bunting. Those bird species are more common in cotton fields and close to irrigation canals and streams. In spring and summer, crows especially rook crow, jackdaw crow and hooded crow, grackle and different species of larks and sparrows migrate to the valley to nest and feed.

i. Aquatic Biology

105. In Syrdarya river’s basin, 38 species of fishes grouped into 12 families have been identified. The cyprinoid fish family is represented by 24 species including silver and bighead carp, European carp, grass and black carp, the Aral asp, the Aral and Turkestan barb, East bream, Silver Kasari and others. The other common fish species are from the loach family (of which three species have been identified namely the Tibet char, Kushakevich char and Aral studding), the catfish family, and the Ameiurus family (with the Turkestan bullhead being the common species). The other fish families are Salmon family (Amudariya char), Pike family (pike), Channel bullhead (bullhead), Perch family (pike-perch), Gambusia family (mosquito fish), Snakehead family (mudfish), Gobius family (rinogobius), and Eleotrid (mirkoperkops). Many of the fish species have commercial importance such as grass carp, Aral ash, European carp, Turkestan barbell, and salmon.

j. Social, Cultural and Economic Environment

i. Population Distribution and Demographic Profile

106. More than 20 nationalities are living in the Namangan province. 88.4 % of total population is Uzbeks, 8.9% Russians, 0.7 % Kyrgyzs and 1% other nationalities. The total population density of Namangan province is 292.8 people per square kilometer. Tashkent province consists of 15 districts, 17 large cities and 18 small cities. Of the total population of Tashkent province 60.9 per cent are Uzbeks, 8.1 per cent Russians, 14.3 per cent Kazakhs, 2.5 per cent Tatars and 2.8 per cent Koreans. The population density is 157 person per square kilometer.

ii. Education

107. There are 3 universities in Namangan province, namely, Namangan State University, Namangan Engineering University and Namangan Pedagogical Universities, 80 colleges, 9 lyceums, and 681 secondary schools. In total, there are 442,622 persons enrolled in aforementioned educational institutions. Meanwhile, 498,383 children are attending 641
kindergarten schools. There are 2 universities (Tashkent Agrarian and Tashkent Pedagogical University), 4 lyceums, 29 colleges and 897 secondary schools in Tashkent province.

iii. Health

108. There are 95 hospitals designed for 13,707 beds, 388 outpatient clinics, and 236 rural medicine entities in Namangan province. There are 96 hospitals designed for 10,361 beds, 334 outpatient clinics, 174 rural medicine entities and 11 dental clinics in Tashkent province.

iv. Economic Activities

109. Namangan region with its administrative centre in Namangan city has a history of ancient irrigation and agro based economy. Records indicate that about 72% of the total population depends on irrigated agriculture for employment and income. Namangan region produces more agricultural products than it consumes. There are at present 1,345 farms covering 91.7 thousand hectares of arable lands. Major agricultural activities are: silkworm raising, cotton growing and cultivating various fruits. Meanwhile, major industries in the area involve industrial processing of the agricultural products such as silk production, textile, and fruit juice, canning and drying. The Namangan region has good natural resource base. There are large deposits of uranium, silver, aluminum, tungsten, iron, copper, granite, and marble. At present, oil is extracted in Mingbulak district while gold and diamonds are mined in Kasansay and Pap districts. In the industrial sector, other important activities include: light industry, mechanical engineering and metal working, wood working, printing industry, and others.

110. Aside from the agriculture and natural resource base industries, Namangan region has a number of heavy and medium size industrial factories. In Turakurgan, there are a shoe factory, manufacturers of electrical and mechanical equipment, chemical industries, and car parts manufacturing. In recent years, joint venture companies with foreign capital have started operations in Namangan. At present there are seventy one joint venture companies in the province with the biggest being JV Muslim Tek, JV Silk Road, JV AsnamTekstil, JV Marvel Juice Co., JV Nestle-O’zbekiston, JV Nam-Sib, and JV Golden Fruit. Trade and service is also an important sector of the economy. At present there are 3,369 trading companies.

111. Tashkent province is a well developed industrial province in Uzbekistan complementing the economy of Tashkent city the national capital. The province produces 98 per cent of the coal, 43 per cent of the cement, 100 per cent of steel and metal products and 45 per cent of the electricity in the country. There are 190 industrial and 160 joint venture enterprises in Tashkent province. Notable industries in the province are a steel mill in Bekabad city, a mining plant in Almaliq, and thermal power plants in Yangi Angren and Tashkent City. Electrokimyosanoat in Chirchiq city, Ammofos in Almaliq city and Uzbekrezinatechnika in Angren plants are leading enterprises in the chemical industry producing nitrogen and phosphorus fertilizers and caprolactam. Uzbekkimyomash, “Transormator” in Angren manufactures machinery and supplemental equipment for agriculture.

v. Cultural and Heritage Sites
112. Tashkent and Ferghana Valley are on the Silk route, the main trading highway connecting China and Europe in the ancient world. The valley’s history stretches back over 2300 years, when its population was conquered by Greco-Bactrian invaders from the west. Chinese chroniclers date its towns to more than 2100 years ago, as a path between Greek, Chinese, Bactrian and Parthian civilizations. In the path of the Northern Silk Road, the area was converted by Muslim invaders from the west, and was home to Babur, famous conqueror and founder of the Mughal Empire in India, tying the region to modern Afghanistan and South Asia. The Russian Empire conquered the valley at the end of the 19th century, and it became part of the Soviet Union from the beginning of the 20th century.

vi. Tourism

113. In 2005, 240,000 tourists from 117 countries visited Uzbekistan. The industry earned US$30 million, which was 90.9% of forecast. Each autumn, the Uzbek travel industry holds an International Tourism Fair. At present most of the tourism areas are concentrated in Tashkent, Samarkand, Burkhara, and Khiva areas in southern part of Uzbekistan. Ferghana Valley and Tashkent province have a very high potential for tourism that at present remains practically undeveloped.

vii. Sports Facilities

114. There are around 28 stadiums, 22 swimming pools, 54 tennis courts, 2 equestrian parks, 473 sport halls and other sport facilities in Namangan province. There are 49 stadiums, 16 swimming pools, 38 tennis courts, and a number of other facilities in Tashkent province.

viii. Cultural Facilities

115. There is a theatre of music and comedy in Namangan city. Eighty five archeological monuments and historical places are located in the province, among them are the State Nature Monument Mingbulack and State Nature Monument in Chust district. There are a number of historical places in Tashkent province – the biggest ones are Zangiota memorial complex (Zangiota district) and Qizilmozor shrine (Bekobod district).

E. Anticipated Environmental Impacts and Mitigation Measures

a. Preconstruction Activities

116. The Project’s impact takes place during the preconstruction, construction, operation and maintenance and abandonment. The preconstruction activities are primarily surveying the proposed and alternative routes of the OHL and the rerouting of the existing 220 kV OHL, the Namangan substation, soil exploration and land acquisition.

i. Surveying

117. The survey activity may involve a team of five to six people. During the survey process, small branches and obstructions are removed. However, it is easier for the survey team to relocate the position of their survey equipment and carry out additional triangulation calculations than to cut large branches and trees. The cutting of small branches and minor
obstructions is a residual impact of the activity and it is very minor. The survey team will use all terrain motor vehicles to access the sites and when it is not accessible the survey team will have to walk. Effectively the survey team will walk the whole length of the proposed and alternate alignment in a process commonly called “walked the line”. The impact of the vehicle and its emission on the environment is negligible. The survey team may leave some markers along the route to facilitate relocation and identification of the tower location and boundaries. The impact of this activity on the environment is very minor. No mitigating measure is proposed.

118. However, for personnel health and safety, the surveying team must wear suitable personnel protective equipment (PPE) such as helmet, steel reinforced and slip free shoes, boots and spiked shoes. The survey team should consult the local medical practitioners for possible communicable diseases and should take the necessary precaution such as vaccination, food and water safety. The survey team should also take with them first aid kit and whenever possible proper communication equipment in case of emergency or accident. The survey team should be properly provided with safety equipment especially in scaling steep ravines, crossing rivers and creeks. Surveying team leader should be responsible in seeing to it that his members use the safety and health facilities as intended, take the necessary precaution and avoid unnecessary risks such as chasing wild animals. The team leader should report to human resources group of his company or organization any violation of the safety and health procedures especially those that endanger other members of the team.

ii. Soil exploration

119. The soil exploration team normally follows the survey team. The soil exploration team will drill and remove soil samples for analysis in the laboratory. The soil sample is very small something like 5 to 10 liters per tower site. The soil exploration team normally plugs the hole with an identifying mark to facilitate relocation.

120. From the standpoint of personnel safety and hygiene, the soil exploration team should be provided with the same personnel safety devices, procedures, communication and first aid kits as the survey team.

iii. Land Acquisition

121. The Namangan Substation will be constructed on 25 hectare of land. The land is currently an irrigated farmland. However, the productivity of the land has been seriously affected by soil salinity. Due to its proximity to Namangan town proper, it is to be reclassified as industrial land.

122. For the OHL, the land acquired will be grouped into two categories, namely, land for temporary use and land for permanent conversion. Lands for temporary use are those lands used for access road, base camps for laborers, equipment and material storage, batching and crushing plants. The temporary lands required by the OHL will be cleared and restored to its original uses subject to some constraint for lands directly under the OHL. In fact, it would be preferable if the grasslands under the OHL will be regularly grazed to control grass growth.

123. In accordance with initial data gathered from Environmental Assessment Report prepared by “Uzbekenergo” for permanent land usage for the 174 km OHL, 0.17 hectares of garden land, 4.05 hectares of irrigated farmland, and 7.2 hectares of grassland will be secured in the Namangan region. In Akhangaran region, the corresponding land required for
permanent conversion from its existing usage consists of 0.11, 0.25 and 0.36 hectares of gardens, irrigated farmlands and grasslands, respectively. In Namangan region, the land required for temporary use will come from 5.5, 98.15 and 147 hectares of gardens, irrigated farmlands and grassland, respectively. In Akhangaran, 8.0 and 139.5 hectares of gardens and grassland will be needed. No irrigated land or farmlands will be affected in Akhangaran.

124. The realignment of the 220 kV OHL will require 0.93 hectare of irrigated farmlands will to be permanently withdrawn from current uses and 48.8 hectares for temporarily use.

125. The lands to be acquired for permanent and temporary use are summarized in Table-1 below. Three houses are expected to be relocated in Akhangaran Valley although by fine tuning the design one of the house may not be affected.

126. Details of the land acquisition compensation and temporary use of the land will be provided in the Land Acquisition and Resettlement Plan (LARP) report prepared by the social team consultant.

Table 1. Representing the information on allotted lands along 500kV OHL Novo-Angren TPP - Namangan SS with 220kV tie-in connection

<table>
<thead>
<tr>
<th>№</th>
<th>Region</th>
<th>Length, km</th>
<th>Withdrawn, hectares</th>
<th>For constant use</th>
<th>For temporary use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>gardens</td>
<td>irrigated farm lands</td>
<td>grasslands</td>
</tr>
<tr>
<td>1</td>
<td>Pap</td>
<td>1.0</td>
<td>- 57.8</td>
<td>58.8</td>
<td>0.06</td>
</tr>
<tr>
<td>2</td>
<td>Cust</td>
<td>-</td>
<td>38.9</td>
<td>38.9</td>
<td>- 3.88</td>
</tr>
<tr>
<td>3</td>
<td>Kasansay</td>
<td>-</td>
<td>6.7</td>
<td>6.7</td>
<td>- 0.69</td>
</tr>
<tr>
<td></td>
<td>50kV-SS</td>
<td>-</td>
<td>- 6.7</td>
<td>6.7</td>
<td>- 25.0</td>
</tr>
<tr>
<td>4</td>
<td>Turakurgan</td>
<td>1.0</td>
<td>4.5</td>
<td>5.5</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td>Akhangaran</td>
<td>2.0</td>
<td>62.0</td>
<td>64.0</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>4.0</td>
<td>73.4</td>
<td>126.5</td>
<td>205.9</td>
</tr>
</tbody>
</table>

b. Construction Activities, Impacts and Mitigating Measures

127. The Project will construction will cover 45 months. The various construction activities are shown in Table 2.

Notes: The table is made per standards for lands allocation for 0.4-500kV electric networks (CN&S 2.10.11.97). The distance between supports makes 300-350m. The temporary allocated area for construction: the band of 15metres width, the area for one support installation – 2500m².
### Table 2. Project Construction Schedule

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>MONTHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>500kV OHL – Novo-</td>
<td></td>
</tr>
<tr>
<td>mobilization works and</td>
<td></td>
</tr>
<tr>
<td>Access roads construction</td>
<td></td>
</tr>
<tr>
<td>Construction of pits and</td>
<td></td>
</tr>
<tr>
<td>Installation of foundations</td>
<td></td>
</tr>
<tr>
<td>Installation of supports</td>
<td></td>
</tr>
<tr>
<td>Cable and wire mounting</td>
<td></td>
</tr>
<tr>
<td><strong>Materials supply:</strong></td>
<td></td>
</tr>
<tr>
<td>Precast concrete (supports</td>
<td></td>
</tr>
<tr>
<td>Supports (local and imported rolled metal)</td>
<td></td>
</tr>
<tr>
<td>Wire and rope</td>
<td></td>
</tr>
<tr>
<td>Insulators and reinforcing</td>
<td></td>
</tr>
<tr>
<td><strong>OHL delivery:</strong></td>
<td></td>
</tr>
<tr>
<td>Construction of 500kV</td>
<td></td>
</tr>
<tr>
<td>Works of preparation period</td>
<td></td>
</tr>
<tr>
<td>Facilities of main and</td>
<td></td>
</tr>
<tr>
<td>Installation and wiring works</td>
<td></td>
</tr>
<tr>
<td>Start-up and commissioning</td>
<td></td>
</tr>
<tr>
<td><strong>Supply of equipment and</strong></td>
<td></td>
</tr>
<tr>
<td>Reinforced concrete and</td>
<td></td>
</tr>
<tr>
<td>Main electrical facilities:</td>
<td></td>
</tr>
<tr>
<td>500kV open switchgear</td>
<td></td>
</tr>
<tr>
<td>220 kV open switchgear</td>
<td></td>
</tr>
<tr>
<td>10 kV switchgear</td>
<td></td>
</tr>
<tr>
<td>Power-operated auto-type</td>
<td></td>
</tr>
<tr>
<td>RP equipment, emergency</td>
<td></td>
</tr>
<tr>
<td>Cables</td>
<td></td>
</tr>
<tr>
<td>Aluminum bus rod, steel</td>
<td></td>
</tr>
<tr>
<td>Insulators and overhead line</td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td></td>
</tr>
<tr>
<td><strong>SS delivery:</strong></td>
<td></td>
</tr>
</tbody>
</table>

i. **Namangan Substation**

128. The construction of the Namangan Substation is similar to constructing a small building except that there will be extensive network of conduits to accommodate the wires and communication cables. Additional excavation and foundations will be required for the control panels and backup generator engine. Outside the control room and office, the yard will be leveled and unsuitable soil, normally the top soil will be removed. The location of heavy equipment such as the transformers, towers, water tank and oil storage tanks will be identified and the foundation excavated. Depending on the results of the geotechnical investigation, piling may be carried out to improve the soil bearing capacity to support the heavy equipment and structures. Steel reinforcement and formworks will be put in place and later concrete will be poured. Once the concrete has cured, the equipment and towers are
installed. Drainage system will be dug and at the end of the drainage line, an oil interceptor with screens will be installed to remove any oil and grease that could be carried by the rain or melting snow. Excavated materials from the foundation and drainage will be used to fill the area above the existing grade. Sand and gravel will be spread out and compacted. The road and the switchyard (the space for the transformers and switches) will be concreted. To protect the equipment from possible flooding, concreting is done from 0.2 to 0.4 m higher than the existing elevation. The area is then fenced and security monitoring cameras and alarms are installed.

129. The topsoil removed during site preparation will be piled in the area that will not be used for the building or the switchyard. When construction is completed, the piled topsoil will be used for landscaping and gardening. Of the 25 hectares allocated for the substation, approximately 2 to 3 hectares will be landscaped.

130. The main environmental concerns during construction of the substation are noise, dust, and air pollutant emission from the construction equipment and earth moving. The expected noise level from construction equipment to be used in the substation is shown in Table 3. The Uzbek noise standard is based on the noise level inside a particular structure rather than the noise level in the open area surrounding the structure. It is difficult to compare the Uzbek noise standard with the IFC guidelines as the noise level outside the structure could be very high but if the structure is well insulated the noise level inside the structure could be very low. The Uzbek standard for noise inside a residential area is 45 dBA. The operation of noisy equipment will be limited to day time. The Project Engineer will maintain a noise meter and will measure the noise level at minimum of five points in the construction site boundary before the start of the working day, at mid morning and at mid afternoon when the construction work is at full blast. The five sites will be selected by their proximity to non-industrial establishments. The result of the noise measurement will be recorded in the construction log book. If to the opinion of the Project Engineer a specific construction equipment is producing unnecessarily loud noise (i.e. much higher than those given in Table 3), the Project Engineer will measure the actual noise level of the equipment and call the contractor to correct the problem or if it could not be corrected to require replacement.

Table 3. Standard noise impact during the construction phase

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Maximum level of expected noise at distance of 15m (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete mixers</td>
<td>87</td>
</tr>
<tr>
<td>Cranes</td>
<td>86</td>
</tr>
<tr>
<td>Paint spray guns</td>
<td>89</td>
</tr>
<tr>
<td>Excavators</td>
<td>90</td>
</tr>
<tr>
<td>Welding machines</td>
<td>73</td>
</tr>
<tr>
<td>Dumpers</td>
<td>87</td>
</tr>
</tbody>
</table>

131. As a rule of thumb, the noise level decreases by 6 dBA for every doubling of the distance. For example, a concrete mixer with a noise level of 87 dBA at 15 meters from the operating equipment will have a noise level of 81 dBA at 30 meters distance and 76 dBA at 60 meters distance and 70 dBA at the 120 m, 64 dBA. The substation site is approximately 500 m by 500 meters. The construction activities could comply with the IFC level of 70 dBA in accordance with Uzbek regulation - KMK 2.01.08-96.
in industrial and commercial areas. However for analysis consideration the nearest house is used: the nearest residential area is 100 m from the site or a total distance of 600 meters from the construction site. It is estimated at this distance the noisiest equipment noise will be at 52 dBA which within IFC guidelines 55 dBA. As mentioned earlier, noisy equipment will not be operated at night time.

132. Some construction activities such as pile driving will generate noise levels higher than the IFC noise standards for industrial areas of 70 dBA. The noise level is temporary in nature and the contractor will be required to post advance notice for those activities so the neighboring areas will be properly informed and the neighboring areas could accordingly adjust their working schedule.

133. The contractor will cover all piles of soil, sand and gravel that will not be used within the next 24 hours. If the pile is exposed the contractor should wet the surface to minimize dust generation. Wheels from trucks leaving the construction site should be cleaned to prevent mud and clay contaminating the roads. The contractor should maintain a pressure washer at the entrance. If required, the contractor should present the appropriate vehicle or equipment emission test issued by the appropriate government authorities. If the Project Engineer feels a particular equipment or vehicle is emitting air pollutants higher than those allowable by law, he should call the contractor’s attention and may require an independent testing. The Project Engineer will monitor the air quality for TSP, sulfur dioxide and NOx once a month or when required by the authorities. The air quality sampler will be located downwind and upwind from the construction site to establish the additional air pollutant added by the construction activities.

134. The contractor must install a sedimentation pit close to the vehicle entrance and exit to intercept the wash water used in cleaning the tires of the vehicles. The contractor will also construct a temporary earthen pond to intercept any water seeping from the piles of sand, gravel and clay. This measure should prevent siltation of the municipal drainage system and an increase in suspended solids in the streams and creeks. The Project Engineer may take samples of the water from the sedimentation pit once a month and have it analyzed for suspended solids and oil and grease. If the sampling shows that the suspended solids and oil and grease concentration is higher than accepted by Uzbek laws, the Project Engineer may require expansion of the sedimentation tanks or other measures acceptable to the authorities to correct the problem.

135. The proposed sub-station site is an irrigated farmland with very low productivity due to soil salinity. The land will have to be reclassified for industrial use. The Project will not require any removal of trees or dislocation of wildlife life. The animal species affected by the Project are those common to the urban environment.

136. The construction of the Namangan substation will generate employment opportunities in the area. Aside from the direct economic benefits to those directly employed in the Project, indirect economic benefits could be realized from the increase in spending and consumption of those who are employed. The substation being in close proximity to Namangan City may not need any construction camp. External personnel and experts needed by the Project could rent houses in the city. Skilled and unskilled labor could be sourced in the city. The contractor may however maintain a small dormitory for personnel to rest and a meals.

137. In terms of personnel safety and health, the Project Engineer must strongly enforce a “no protective personal equipment no work rule”. All construction personnel must wear and use properly protective personal equipment such as helmets, protective shoes, etc. The contractor must train two or three personnel in first aid and make available at the construction site any equipment needed for minor accidents. Prior to hiring temporary and
casual construction workers, the contractor must arrange for one or two hour briefing by the Project Engineer on construction safety and health procedures. Wastewater generated in the construction site must be treated in a septic tank with appropriate leaching field or other methods acceptable by the Project Engineer. Solid waste will be disposed in the municipal sanitary landfill or the contractor will arrange for the municipal government to collect it.

138. Ferghana valley has a long cultural and historical significance dating back to prehistoric times. It would be difficult to determine if there are any archaeological materials of significance in the proposed sub-station site until the site grading is carried out. The Project Engineer and the contractor will identify and coordinate with, the government agency in charge of archaeology on the proper procedure to follow in the event of any archaeological item being unearthed. All operators of earth moving equipment will attend a one hour lecture on such a procedure to comply. If in the opinion of the Project Engineer an archaeological find has been uncovered, all construction activities where the find is uncovered will be stopped and the appropriate expert called to examine it.

139. The construction activities will generate additional traffic volume in the vicinity of the construction sites. The additional traffic volume is estimated at three bus loads of workers per day. Large cranes and earth moving equipment will move in and out of the construction site especially when working close to the property boundaries. Additional traffic volume will also come from the trucks delivering cement and other construction materials. The biggest potential for traffic congestion albeit short term in nature will take place when the large transformers and switch gears are delivered. The current motor vehicle traffic in Namangan especially in the area leading and out of the proposed substation site is very light. No significant traffic alteration would be required. However, when the heavy machineries are delivered, the Project Engineer should coordinate with the municipal authorities the rerouting of the traffic.

140. The construction activities including traffic congestion, noise, dust and other air emissions from the construction activities will have insignificant or no negative impact at all on the residents of Namangan. Travelers from Namangan to the west as served by highway A 373 may be inconvenienced for short periods of time when large equipment and machineries are delivered to the construction site. The Project management team should inform the residents of Namangan as well as major villages of any scheduled delivery of materials and equipment that may significantly inconvenience them for them to plan their trips properly.

ii. **500 kV OHL**

141. The construction activities for the OHL will involve excavation for the foundation of the OHL towers. If the land is soft, pilings will done to reinforce the capacity of the soil to support the weight of the tower and the conductors and to withstand the wind force and seismic activities. If the tower is located on bedrock, explosives may be used to excavate the foundation. Steel reinforcement and formworks will be installed after which concrete will be poured. When the concrete has cured, the excavation will be backfilled and tampered. The steel members will be fabricated to sizes that could be conveniently transported by trucks and hauled by cranes along the existing road network. Tractor tracks currently used by the community and for maintenance of existing over head lines will be upgraded. Some riveting and welding will have to be carried out on site to assemble the towers. After the welding and riveting works, the tower will be repainted. The conductor wire and accessories will then be installed.

142. The OHL construction will require 103 gasoline and diesel driven equipment. The equipment will be mobilized to work at different locations in the 174 km long transmission
The equipment will be working simultaneously on the average 30 km apart depending on the terrain, soil and foundation requirements.

Table 4. List of main vehicles and machinery used for construction of 500kV OHL

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Fuel type</th>
<th>Payload (capacity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>KAMAZ truck, 13 units</td>
<td>Diesel</td>
<td>8t</td>
</tr>
<tr>
<td>2</td>
<td>KRAZ truck, 13 units</td>
<td>Diesel</td>
<td>7t</td>
</tr>
<tr>
<td>3</td>
<td>Fork-lift truck, 2 units</td>
<td>Diesel</td>
<td>5t</td>
</tr>
<tr>
<td>4</td>
<td>Bulldozer, T-100, 15 units</td>
<td>Diesel</td>
<td>79kW</td>
</tr>
<tr>
<td>5</td>
<td>Bulldozer, T-130, 13 units</td>
<td>Diesel</td>
<td>96kW</td>
</tr>
<tr>
<td>6</td>
<td>Mobile compressor, ZIF-55, 5 units</td>
<td>Diesel</td>
<td>35kW</td>
</tr>
<tr>
<td>7</td>
<td>Automobile crane, KS-4501, 10 units</td>
<td>Diesel</td>
<td>10t</td>
</tr>
<tr>
<td>8</td>
<td>Crawler crane, 5 units</td>
<td>Diesel</td>
<td>16t</td>
</tr>
<tr>
<td>9</td>
<td>Pneumatic-tired crane, SMK-10, 3 units</td>
<td>Diesel</td>
<td>25t</td>
</tr>
<tr>
<td>10</td>
<td>Water-jetting vehicle, 2 units</td>
<td>Gasoline</td>
<td>6000L</td>
</tr>
<tr>
<td>11</td>
<td>Boring machine, MRK-750, 5 units</td>
<td>Diesel</td>
<td>79kW</td>
</tr>
<tr>
<td>12</td>
<td>Streamlined semitrailer, 2pcs.</td>
<td>Diesel</td>
<td>15 tone</td>
</tr>
<tr>
<td>13</td>
<td>Motor press PO-100M, 5 pcs.</td>
<td>Diesel</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Crawler-mounted shovel, 2pcs.</td>
<td>Diesel</td>
<td>0.5 m³</td>
</tr>
<tr>
<td>15</td>
<td>Crawler-mounted shovel, 2pcs.</td>
<td>Diesel</td>
<td>1.0 m³</td>
</tr>
<tr>
<td>16</td>
<td>Crawler-mounted shovel, 1 pc.</td>
<td>Diesel</td>
<td>0.25 m³</td>
</tr>
<tr>
<td>17</td>
<td>Mobile electric power stations, 5 pcs.</td>
<td>Diesel</td>
<td></td>
</tr>
</tbody>
</table>

The main impact of the construction of the OHL is on noise. The noise level would appear louder in the normally quite open field. However, the areas where the noisiest equipment, such as the boring machine, compressors, and mobile electric stations, will be used are those in uninhabited sections of the proposed OHL. As mentioned earlier those areas are characterized by exposed bedrocks, pebbles and rubbles. The areas with farmlands and gardens are located at the bottom of the valleys where the excavation for the foundations could be easily done. In instances when the soil bearing capacity is very low, which could be at the bottom of the valleys, foundation piling will have to be carried out. Piling operation noise level could reach 100 dBA. The contractor should limit the use and operation of the noisy equipment to daytime when working close to villages. If ever there is a need to work after sunset, the contractor should inform the nearest village of his intention but in no way should he operate the noisy equipment beyond 8 pm. The Project Engineer will establish a noise monitoring station in the house closest to any noisy construction activity. The monitoring equipment will preferably be with continuous monitoring data storage to facilitate for review in case of complaints.

The other impacts of the construction activities are from the fuel combustion in the equipment. The emission from the construction activities was estimated in accordance with the procedure given in “Instruction for the inventory of pollution sources and norming the pollutants emission to the atmosphere for enterprises of the Republic of Uzbekistan (Reg. # 1553 issued by the Ministry of Justice on 3 Jan., 2006, Tashkent, 2006”). The total amount of gaseous emissions during the construction of 500kV OHL is estimated at 4.089 g/sec or 25.713 t/year. The most significant gaseous emission is particulate matter, estimated at 2.124 g/sec or 13.458 t/year or 52% of the total emissions, carbon monoxide at 0.52 g/sec or 3.295 ton/year or 13% of the total emissions, nitrogen dioxide at 0.4653 g/s or 2.948 tons/year or 12% of the total emissions and hydrocarbons at 0.5448 g/s or 3.452 tons/year or 13% of total emissions by weight. The remaining air pollutant constituents mainly
composed of sulfur dioxide and partially oxidized hydrocarbons. While the cumulative emissions may be large, they are spread over the 170 km right of way such that the 25.7 tons per year of emission is equivalent to 0.4 g/m-day or 5 microgram per sec per linear meter. However, considering the distances between equipment and the high assimilative capacity of the operating environment, the emissions from the equipment will not have any detectable impact on the environment. Nevertheless, the Project Engineer should require the contractor that all equipment used in the Project will conform to the entire vehicle and equipment emission performance standard required by the Uzbek government and in the absence of any Uzbek government standard, to conform to internationally accepted practices.

145. The welding and painting operation will have large cumulative emission but considering the distances between the towers, the emission could be easily dispersed. Each tower is expected to use 100 kg of welding electrode. The welding process will generate trace quantities of nitrogen oxides, ozone and particulate matter. Each tower will require 300 liters of protective paints. The Project will specify the use of non-oil and metal base paint if it is a viable alternative.

146. In excavating for the tower foundation, the topsoil will be piled separate from the other excavated soil. On the average some 12 cum of soil will be excavated per tower foundation. Depending on the soil foundation, approximately 8 cubic meter of soil will be used to backfill the excavation, after the concrete has set in, to level 0.3 to 0.5 m above existing ground level in order to prevent water ponding around the foundation. After backfilling, compaction and leveling, the topsoil will be used to sod the area. The contractor should take precaution by covering the stored materials especially during the rainy season when rain and surface runoff could erode the stock pile and increase the suspended solids load in the stream.

147. Foundation works in Namangan area would call for special construction techniques because of very high water table. During excavation, the water will have to be continuously removed. Lagoon will be built to hold the ground water. Sulfate resistant concrete will be used for the foundation and piles as the ground water has high sulfate content. The water in the lagoon will be used for concrete mixing, concrete curing and watering the topsoil to facilitate grass growth.

148. Trees and grasses will have to be permanently removed in areas used for the tower foundations. This is a residual impact of the Project. As the Project will pass through grassland, the number of trees to be cut is insignificant. Three to four months prior to the completion of the Project, the Project Engineer will submit an inventory of trees cut and the PMU will arrange for compensatory tree planting. In connection with the inventory of trees cut, the Project Engineer will take photographs of the site prior to construction and retain it for future reference.

149. The noise generated by the piling operation, movement of trucks and construction equipment will disturb the wild animals in the grassland. The impact is temporary in nature. Prior to the start of the excavation operation for the tower foundation, the Project Engineer will inspect the site for any bird’s nest and wild animal’s breeding place. If any is noted, the Project Engineer will arrange for the transfer of the nest or breeding place.

150. The construction of the towers will not involve any construction within the river ways and will have no impact on the aquatic flora and fauna.

151. In terms of occupation health and safety, the Project Engineer will strongly enforce the use of personal protective equipment at work. All new workers will be briefed on safety procedures and the use of personal protective equipment. Fines and penalties will apply to
workers who intentionally breach safety procedures such as the non-use of hard hats, safety belts and welder’s mask, etc. The Project Engineer and contractor will also train personnel for first aid assistance in case of accidents.

152. The area excavated is very small and limited to the foundation of the towers. Nevertheless, if there is an archeological find that might be of significance the Project Engineer and contractor will enforce the “chance find” procedure discussed in paragraph 56.

iii. Rerouting of Existing 220 kV OHL

153. The construction activities for the new alignment are similar to the OHL. Once the new towers, conductors and accessories are in the place, the power is switched over to the new line. The old line is checked for any hazards such as weak structural components. The conductors and accessories are first removed. The conductor wire is wound around the empty coil container. The accessories are checked for any contamination with PCBs, especially those accessories installed prior to 1990. If there are accessories contaminated with PCBs or suspected to be contaminated, those accessories are segregated for re-evaluation and if confirmed to contain PCBs, they are sent to long term storage until such time that sufficient quantities have been accumulated from other sources to economically justify the shipment of the contaminated accessories to a special landfill or treatment facility. The steel tower is dismantled and cut to pieces that could be efficiently shipped out. The used conductor and steel tower could be re-used in other OHL installation or they may be sold as scrap metal. The concrete foundation will be demolished to at least 0.25 m below the ground level so that it will not create an obstruction and hazard if the foundation is along the roadside.

c. Operation and Maintenance

154. The major impact of the whole project on the social and economic sector is positive. With the Project, the irrigators will be in a better position to cultivate and earn more from their farms. Voltage fluctuation will reduce the useful life of electrically driven farm equipment and in some instances could even result in equipment failure. With a more reliable power source, the maintenance cost of their irrigation equipment is expected to decrease.

155. The schools and other institutions such as health facilities would be able to operate more efficiently with a reliable power source. Wear and tear of the electrical equipment and electronic devices will be reduced. The need for more backup equipment for critical and sensitive instruments will be less.

156. Industries will also be able to operate more efficiently with a more reliable power supply.

157. To a lesser extent, the air and water quality is also expected to improve as energy consumption shifts from individual power generators, gas and wooden heaters. Wastewater treatment plants, water supply and solid wastes recycling and sorting facilities could operate more efficiently with reliable power supply.

158. The Project will improve the distribution efficiency of the electricity in the grid. The Project is expected to reduce the system transmission loss that is currently estimated at 4 per cent of the total power generated. However, the impact of the new OHL on the whole transmission system would require thorough analysis of the generation and demand factors, operation and maintenance of the OHL and facilities, and the dispatching practices.
Quantitative analysis of the equivalent reduction on carbon dioxide emission would require complex modeling of the whole transmission system and is beyond the scope of this study.

i. **Substation**

159. Once the substation is operational, there is little activity that will create any environmental problem. The main concern will be the humming noise from the transformers. Sulfur hexafluoride circuit breakers, defined by low noise levels compared with air and oil circuit breakers, will be used. In addition, noisy equipment such as diesel generators will be enclosed to reduce the noise. The main activity will be in the control room as power is received and dispatched from the substation to other areas of the grid. Routine maintenance to check the structural conditions of the towers, tanks and foundations will be needed. If rust is noted in the tanks and towers, the rust will be removed and the surface painted.

160. However, once every 15 years, the oil in the transformer will be drained and replaced with new oil. The oil will be drained to the oil pan. When all the oil has drained out, the transformer is filled with new oil and the old oil is placed in drums for long term storage or sent to toxic and hazardous incineration facility for ultimate disposal. The used oil has a high heating value and nominally toxic so that incineration facilities including cement plants are willing to pay for the disposal rather than the other way around.

ii. **OHL and Rerouted 220 kV Lines**

161. The OHL and rerouted line will have to be periodically inspected for structural soundness of the foundation and towers. Special inspection may be carried out after unusual events that could affect the structures such as an earthquake, strong winds or heavy flooding. In rare instances, the conductor may break and a new conductor will have to be strung. As part of personnel safety, the electricity supply will have to be temporarily suspended until the new conductor has been installed. The area around the towers and under the conductors could be used for grazing and in fact grazing is encouraged to prevent tall weeds from growing. If bushes and tall grasses are not effectively removed by the grazing animals, the weeds and bushes may be manually removed or herbicides could be used to control them. However, if herbicides will have to be used, the herbicide used must not include those in the Stockholm Convention on Persistent Organic Pollutant list of pesticides under Annexes A and B nor on the World Health Organization listed under Hazard class I and II. Personnel involved in pesticides and herbicides application must be properly trained and provided with Personal Protective Equipment. First aid kits and antidote must be available at all times and the supervisors must be properly trained to in detecting signs of poisoning and the proper first aid measures and application of antidotes.

162. The noise of OHL is caused by corona discharge on the wires. For the Project, all conductor wires will be designed such that the tension on the wire surface will not exceed the initial tension for the corona discharge. However, irregularity on the wire surfaces from mechanical damage (burrs, scratches), pollution (grease drops, solids), and precipitation (rain, dew, snow, etc.) will increase the electric field tension. As a result, the corona discharge will occur on OHL wires in the long run especially during a downpour. In very old OHL, the corona noise could still be heard even in fair weather. The allowable noise level within residential buildings is 45 dBA (CN&S 2.01.08-96. Noise protection). The expected noise level at a distance of 100 m from OHL 500 kV is 17.70 dBA, which is well below the allowable level of 45 dBA.

163. The design of the OHL compares favorably with the IFC guidelines which call for 5000 V/m for the general public. The Uzbek standard for exposure to electric field is similar
to the IFC guidelines. For a 500 kV line, the minimum distance between the conductor and the houses is 100 m. For houses located in a valley, the transmission lines are built from one ridge line of the valley to opposite ridge. Most often the distance between the conductor and the valley floor exceeds 100 m. Of concern will be at flat terrain when the towers are at the same level as the houses. Houses will have to be at least 80 to 100 m from the transmission to conform to the IFC guidelines.

164. In general, OHL supports are not a good place for birds nesting, since the high voltage electric field could have some impacts on their physiological processes. Negative consequences such as electrocution could occur when the birds using the OHL supports for temporary rest, are flying up and touching the and inter-phase connecting rods. To prevent or minimize bird death, barbed nails, spiny three cones tridents, and springs that create noise and vibrations are installed in the OHL supports to scare the birds. These apparatus are fixed to inter-phase connecting rods’ bands with a wire or special metal cuffs. Special fencing and colored umbrellas with fixed lights have been tested in recent years to scare the birds with their bright color.

165. In terms of occupational health and safety, personnel working in the OHL should not be unduly exposed to EMF as described in paragraph 158. Personal protection equipment will be used by field personnel. All personnel will have to undergo safety and accident prevention training before they are assigned to work in the OHL. Personnel will undergo refresher courses on occupational health and safety once every five years.

d. Abandonment Procedures

i. Namangan Substation

166. Power substations are seldom abandoned. Most often the substations are expanded to meet the additional power needs of the service area. However, in the event that the Namangan substation is decommissioned, the first step will be to stop all power supply and connections are physically cut off to prevent accidental power supply while the transformers, switches, and control equipment are removed. The transformer oil is drained in a similar manner during maintenance. The transformers and other accessories that could be contaminated with oil are sealed and shipped for long storage. When there is sufficient volume, the transformers and other equipment will be shipped to special facilities for dismantling.

167. The soil in the area will be sampled for contamination of toxic and hazardous substances and if needed decontamination plan will have to be prepared and carried out. If the toxic and hazardous waste is amenable to on-site treatment, on situ treatment would be preferred. Otherwise, the contaminated soil will be removed and sent to a toxic and hazardous wastes disposal facility.

ii. 500 kV OHL and 220 kV rerouted OHL

168. In recent history, OHL are seldom abandoned. Most often additional OHL or conductor lines are added to increase the grid capacity to meet the additional power needs of the service area. If the OHL will need to be abandoned, the procedure used for

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16 The design institute and Uzbekenergo have the option a building taller towers or increasing the right of way clearance
decommissioning the existing 220 kV OHL that is rerouted and discussed in paragraph 71 will be used.

e. Emergency and Accident Assessment

i. Namangan Substation

169. The substation is protected by lightning arresters, security fence, and 24 CCTV monitor. Entry of unauthorized personnel is strictly controlled. All heating equipment used in the substation are electrical and no equipment will use gas or require open fire. The bounded perimeter of the substation is a no smoking zone. All ventilations, electrical outlets and exhausts are designed and will be built to be explosion proof. All electrical equipment will be grounded, safety interlocks are provided, insulation control warning is provided, and an alarm system is integrated to all the safety devices to call the attention of the substation personnel to the problem before it gets out of hand. All equipment will be properly labeled indicating their proper use, i.e., the equipment to use in case of fire and other emergencies and appropriate personnel response. Substation personnel will undergo proper training on the emergency procedures prior to assignment to the substation. They will also have periodic emergency and fire drills.

170. In spite of all the precautions, fire could take place for undetermined reasons. The substation is provided with an automatic fire fighting system. The firefighting equipment is designed to control all transformer fires within 30 minutes. It has spraying intensity of 0.2 liter/second per square meter and supported by two reservoirs, each containing 200 cubic meters of water. In addition, emergency access roads are built around the perimeter and the transformers for fire trucks from the municipality to be able to assist in case of emergency

ii. OHL and Rerouted 220 kV OHL

171. Possible accidents from the OHL and the rerouted 220 kV OHL can be caused by the weakening of the structural support of the tower from erosion especially for towers built close to river banks or from earthquakes and chemical deterioration of the concrete. The problem could be confounded if the tower falls over houses or exposed infrastructure such as gas pipeline or other live electrical lines. The OHL and the rerouted 220 kV OHL lines do not intersect with any gas pipeline. The closest house or building is more 100 m away. However, there are towers that will cross streams and rivers, the widest being at Akhangaran River. Based on the soil analysis, the Project will use sulfate resistant concrete. To reduce the damage from falling towers, the following safety devices are provided in accordance with the Uzbek "Regulations for Electrical Installation": (i) phase comparison protection; (ii) three stage remote directional protection; (iii) four stage directional earth fault protection; (iv) auxiliary current cut off; (v) carrier channel acceleration; and (vi) AKA-16 type automatic emergency control facilities.

F. Analysis of Alternatives

a. No Project Alternative
172. Failure to implement the Project will result in increased system losses and lower reliability and quality of electricity supply. Frequent and large voltage fluctuations will result in faster depreciation and, in extreme cases, burn out of electrical appliances. Industries and institutions requiring very high quality and reliable electricity supply such as hospitals, laboratories and food storage industries will be forced to buy their own standby electric generators that will be most likely driven by diesel engines. The diesel engines have much higher emissions per unit of electricity generated compared to centralized power plants. As Namangan and the surrounding service areas are located in a valley with low wind speed most of the time, the accumulation of air pollutants in the area would be high. The air pollution problem would be compounded if residents will be forced to use coal fired heaters during harsh winter months. Agriculture is dependent on electricity driven pumps. If electricity is not available, the irrigators will be forced to shift to gasoline or diesel driven pumps that will potentially affect the air quality.

b. Substation Alternatives

173. Location- Three alternative locations for the substation in Namangan were considered. The first location is in the industrial area at the outskirt of Namangan City. The advantages of this site are its proximity to the major users and it is already classified as industrial zone. The disadvantages are (i) the available land is limited; and (ii) during construction the traffic, noise and movement of trucks and equipment will affect the surrounding areas especially the residents of Namangan City. The second alternative site was an agricultural area on the eastern side of Namangan. City While site construction activities will not impact the built up areas of Namangan City, the movement of heavy equipment and construction materials will pass close to or cross through Namangan City. With the selected site, no equipment, materials and machinery will pass close or cross Namangan. Residents of Namangan will not be affected in any way. The only people to be affected for short period of time are those who intend to travel along A 373 when large equipment are being hauled.

174. Technology – Humming noise could be generated from the circuit breakers. The choice is between air, oil and sulfur hexafluoride circuit breakers. While sulfur hexafluoride circuit breakers are more expensive, this is the circuit breaker type to be used in the Project to reduce the humming noise to almost close to background level.

c. OHL Alternative

175. OHL alternative routes- The most economical routing would be a straight line between the substations in Novo Angren and Namangan. The route selected runs parallel to existing transmission lines to minimize land disturbance as the access road and right of way are already available. This would minimize any environmental impact due to the construction activities. The routing also considered houses and natural barriers such as steep hillsides and bypassed to the highest possible extent.

G. Information Disclosure, Consultation, and Participation

176. The Project description, initial assessment of the environmental impacts and mitigating measures were translated into the local language. A public consultation meeting was held in Kasansay district on May 28, 2012. Details of the public hearing including pictorials are shown in Appendix B. The meeting was attended by 77 persons mostly the elders of the area. The meeting was a joint presentation of the environment team and the
land acquisition and compensation team in line with the ADB’s initiative to provide clarity, coherence and consistency in articulating its safeguard policies. The joint meeting also attracted wider participation from the community as the issues were discussed were broader. This is one reason of the high attendance rate of the participant time and effort to attend the public consultation more meaningful. Major environmental issues raised during the public consultation were (i) impacts of the construction activities on their daily lives and routine especially if they are close to the access roads and construction area (ii) impacts on their health (iii) employment of local graduates, skilled and unskilled workers and (iv) compensation of loss income and in the case of Kasansay village the improvement of the reserve land productivity to compensate for the smaller land area. After the public consultation meeting, a number of participants stayed on to continue their discussion by themselves.

177. The public consultation process is an ongoing process beyond the preparation and processing of this study. Another public consultation is planned at Usman Yusupov Village in Dukentsai Valley where two houses may have to be relocated on the request of the Mahkalla. Additional public consultations will be carried out depending on the need or request from the community. Considering the transient usage of the grasslands, it is difficult to contact the herdsmen from spring to autumn when they move around with their herds. The environment team is continuously contacting the Mahkalla, Khokim and local community leaders for them to brief their constituents on the Project and if they have some concerns to inform the Project Management Unit. Address and contact details of the responsible person in the Project Management Unit has been given. The land acquisition and compensation team is making detailed survey of the affected areas and in their process of consultation with the affected person, they are also providing basic information on the environmental issues.

178. The environmental paradigm of the Project is continuously evolving in response to the dynamic nature of the environment and changes in project design during construction, operation and maintenance. Uzbekenergo will try its best effort during construction, operation and maintenance to inform the public of major environmental issues and concern related to its operation through the mass media and local community network.

H. Grievance Redress Mechanism

179. During the Project construction, operation, abandonment and emergencies affected persons could suggest relief or complain to the authorities to remove the source of their problem and to seek compensation if necessary. The Grievance Redress Mechanism has been discussed with the Project Management Unit for the procedures during the construction period and with the chief engineers of Tashkent and Namangan office of Uzbekenergo for the procedures during operation and maintenance. The local and traditional authorities were also consulted as to their role in assisting their constituencies seek redress to their problems.

180. The preliminarily information about GRM were presented to stakeholders during public consultation conducted on 28 May 2012. During the public consultation on social and environmental issues the stakeholders were be briefed on the proposed grievance redress discussed in succeeding paragraphs. The feedback from the public were: (i) all grievance/compliant received will be dealt with within two weeks upon its receipt; (ii) necessary field verification/assessment will be conducted and the decision will be forwarded to the complainant in writing within one month; and (iii) If the complainant is not satisfied he can appeal to the next level of authority which is the Regional Level of Eastern Transmission Electricity Network and (iv) finally at the Republic level “Uzelectroset” Unitary enterprise.
181. During construction, the contractor and his crew are expected to be the major cause of concern. As discussed in the impacts and mitigating measures, the major environmental concerns are (i) construction noise (ii) emissions from operation of construction equipment and movement of construction materials and personnel (iii) suspended solid contamination of the water bodies (iv) social impacts from the interactions between the local communities and migrant workers. The day to day activities of the contractors are managed by the Project Engineers. The Project Engineer conducts weekly meetings with the contractors to review their performance and one of the major items reviewed in those meetings is the implementation of the EMP. The Project Engineer, takes the precautionary approach in managing the environmental problems and issues. The Project Engineer is expected to address environmental problems and concerns before it takes or even in the absence of any complaint. The Project will appoint a Health, Environment and Safeguard Officer who also serve as a community liaison officer. He will regularly visit the Makhalla.

182. However, the project owner through their Project Management Unit has the ultimate responsibility of addressing the environmental concerns. Affected persons or persons who have some issues with the construction of the OHL and the substation could prepare and submit their complaints on their own or with the assistance of the Makhalla. The complaints could be done verbally but it is preferred the complaints are done in writing for record keeping and reference. Figure 15 shows a typical complaint form in local language and translated to English. The form is designed to provide basic information for the project to take action. The basic information needed are (i) description of the problem (ii) when the problem took place (iii) where did the problem took place (iii) a very confidential information on who were responsible for the problem (iv) how they complainant would like to the problem to be addressed.

183. The complaint will be received by the Health, Environment and Safety Officer who will acknowledge receipt and discuss the problem with the complainant. The Health, Social and Environment Officer will forward it to the Project Engineer for proper action if it involves the contractor with copies to the Project Management Unit. The contractor and the Project Engineer must addressed the problem within ten working days after receipt of the complaint. If the Project Engineer is of the opinion it is not possible for him to address the problem or they could show proof that they are in compliant with all the regulations, standards, procedure for construction activities and the EMP they will must provide proof. The Health, Environmental and Safety Officer submits a report to the Project Management Unit, and inform the complainant of the Project Engineer and Contractor's response. If the complainant is not satisfied, the Project Management Unit will organize a mediation meeting between the complainant and the contractor. The Head of the Project Management Unit will preside over the mediation. The Makhalla of the complainant district will be present to assist his constituent. The Project Management Unit may invite an independent third party. If mediation fails, or the contractor has previously agreed to address the problem and during mediation it has been established that the Contractor has no intention of complying with his obligations, the Project Management Unit will elevate the problem to Deputy director General for Capital Construction and ultimately to the Director General of Uzekelectroset for resolution.

184. The complainant may still seek redress with the courts and the ADB’s Office of the Special Project Facilitator and the Compliance Review Panel subject to the eligibility criteria and procedure of the ADB.

185. During operation, maintenance and emergencies, Uzekelectroset is directly and wholly responsible for compliance to the EMP and Uzbekistan environmental, health and safety laws, regulations and standards. Complaints may be made verbally and preferably in writing to the Head of the District High Voltage Network (DHVC) of the Eastern Transmission
Electricity Network (ETMN). The complainant could do it on their own or with the assistance of their Makhalla. The Head of DHVC will record the grievance and ensure that all complaints and resolutions are properly documented. The DHVC will conduct the necessary field visit to verify and assess the grievance or complaint, determine the validity of the grievance and resolve it within one month of receipt of the complaint. If the head of DHVC feels the complaint is beyond his capacity or for other reasons he could not act on it he should discuss and provide the complainant a copy of his assessment. The complainant could elevate his grievance to the Chief engineer and then to the Director General of Uzbekelectroset.
Figure 15. Example for complain form
The organizational structure for complaint and appeal are shown below.

Figure 16. Organization structure of Grievance Mechanism Functioning

I. Environmental Management and Monitoring Plan

a. Environmental Management Plan

Environmental Management Plan was prepared to avoid or mitigate Project's potential adverse environmental impacts. A summary of the environmental impacts, mitigating measures, responsible parties, monitoring, estimated costs, and reporting or documentation system is shown in the attached Tables 5 and 6. The EMP is presented by
following the project cycle and includes three key stages of project cycle: preconstruction or planning and design period, the construction period and the operating period.

188. It is recommended that training workshops for all parties involved in implementing EMP should be conducted to ensure that mitigation measures, regulations on environmental protection, safety, hygiene shall be fully complied with throughout the project designed, implementation, and operations.

189. Before construction works will start, Contractor must prepare site EMP based on proposed within this IEE EMP which will cover all requirements indicated in the IEE. Prepared site EMP has to be approved by Engineer and PMU.

b. Institutional Arrangement

190. Uzbekenergo, the executing agency for the Namangan 500 kV Transmission Project. SJSC Uzbekenergo has established a dedicated full-time PMU. The PMU will administer all consulting and procurement contracts on behalf of Uzbekenergo. It will be responsible for preparing project plans, bid evaluation reports, progress reports, applications for withdrawal of funds, and any other required reports to ADB. PMU will hire Safeguards Specialist who will be responsible for the following:

- (i) Ensure that project each bidding documentation and contract document particularly for construction external transmission line, sub-stations, and other civil works associated with project, includes environmental requirement as stated in the EMP;
- (ii) Work closely with contractor to update EMP if necessary, and disseminate to the relevant parties to ensure implementation of updated EMP;
- (iii) Assist to Consultant in organizing trainings on EMP implementation and topics;
- (iv) Monitor the implementation of EMP and prepare environmental monitoring reports for quarterly submission during the first year of construction activity and semiannually during the next years to ADB;
- (v) Coordinate with the nature Protection Committee, the Environmental Engineer of Nature Protection Department within Uzbekenergo, and relevant civil society organizations, if any, to undertake join monitoring at least 1 time/year during the construction phase prior to preparing the annual environmental monitoring reports.
- (vi) Work closely with Contractor’s Supervisor Company/Engineer will monitor (cross check) and supervise the contractor in implementing EMP.
- (vii) Organize conducting of air, water, soil quality analysis and EMF measurements in accordance with EMP requirements;
- (viii) Monitor implementation of GRM. Organize mediation meetings between the complainant and the contractor.

191. Uzbekenergo will recruit a Project Management Consultant (the Consultant) to review existing designs, supervise the works of the suppliers and contractors and ensure successful commissioning. The Consultant will be responsible for review of the designs and will assist the PMU in planning, as well as developing and implementing comprehensive project management plans, to ensure the most efficient, timely, and economical implementation of the project. In terms of environmental protection during project implementation the Consultant will be for the following:
(i) Ensure that the Environmental Management and Monitoring Plan (EMMP) for the project submitted by the contractors is adequate and are in accordance with the initial environmental examination (IEE)

(ii) Identify any problem areas during project implementation, proposing remedial actions, and promptly report any outstanding issues to the executing agency;

(iii) Coordinate safety measures between live components in operation and components under construction. Giving advice and, when required, provide training to the executing agency on safety planning and safety measures;

192. For this Project, the implementation of EMMP has to be carried specifically following the Project implementation schedule. Contractors and Project Engineer will be responsible for ensuring compliance with the requirements of the IEE and EMP implementation on the construction sites. The Project Engineer field books, construction log book, minutes of the weekly meetings, and periodic reports are important documentation on the implementation of the EMMP. Also Project Engineer is responsible for conducting necessary water, air, soil quality monitoring during construction site. The Bank and the project owner may field inspection team from time to time to check the implementation of the EMMP but they could not be expected to be on the construction site all the time. The Bank and the project owner may require periodic reporting on the implementation of the EMMP.

c. Reporting of Environmental Monitoring Results

193. The format for the quarterly and semiannual environmental monitoring report will be prepared during project implementation by the Safeguards Specialist (PMU) in accordance with template recommended by Consultant and approved by PMU. The format may have to be refined during implementation to incorporate all monitoring findings and lessons learned.

194. Consultant will prepare the quarterly progress reports that will include EMMP implementation status.

195. Environmental Monitoring Report should include results of measured parameters defined in EMP with indicating sampling locations, describing conducted activities on EMP implementation during construction works.

J. Conclusion and Recommendation

196. The 500 kV OHL will be constructed in parallel to the existing 500 kV and 220 kV OHL, and along existing roads and trails. The 500 kV OHL will utilize as much as possible the right of way of the existing OHL lines. The local procedure is for the electricity authorities to maintain the right of access to the OHL for maintenance purposes and during emergency. The land that will be permanently acquired for the OHL is the portion used for foundations. If the existing land use is grassland and used for grazing, continued usage in this manner is encouraged as it will reduce the need for herbicides to control undergrowth and potential fire hazards. In areas where the existing land use is for gardens, the continued use is also encouraged subject to restriction on the type of plants, height, pruning, and clearances from the conductors.

197. By proper selection of the OHL route, resettlement of existing residence is limited to three houses. During detailed design, there is a possibility this could be reduced to two.
Although there is no confirmed scientific evidence on the impacts of high voltage lines, the Project will conform to the guidelines of the International Finance Corporation on Environmental Health and Safety for Power Transmission and Distribution as a precautionary procedure. No house will be allowed within 100 m from the transmission line the conductors.

198. The OHL impact on the environment will be typical of any construction project. The major concerns are noise, dust, and air emissions from heavy equipment used to construct the foundation, install the towers and string the conductors. Potential increase in surface runoff from heavy equipment movement in right of way and excavation of the foundation could be properly addressed by compacting the soil, retaining and reusing the topsoil for sodding, and building, where necessary, of siltation basin or covering the soil stock pile or building of silt barrier. The Project construction period is estimated at 45 months and considering the project will cover 174 km, the impact on the environment is minimal.

199. The site for the substation in Namangan has been selected such that the construction equipment, materials and personnel will by-pass the built up areas of Namangan City. However, there will be expected short term interruption in the main highway connecting Tashkent and Namangan when the heavy equipment and transformers are delivered to project site. The impact could be reduced by proper notification to commuters for them to advance or delay their trips by a day or two.

200. The Environmental Management Plan has been prepared in accordance with the Bank’s SPS Policy Statement of 2009 to address the environmental concerns. The mitigating measures, monitoring requirements, responsible authorities and personnel, reporting requirements and cost are defined in the EMP.

201. During operation, the Project will reduce the greenhouse gas emission by reducing power losses in the transmission system. At present the power loss during transmission is estimated at 4 per cent of the total power generated. Reduction on power loss during transmission depends on a number of factors such as supply and demand profile, dispatching schedules and priorities, etc. that would require extensive modeling and data gathering beyond the scope of this study. The Project will improve the reliability of the electricity supply in Ferghana valley. The Project is expected to improve agricultural yield since most of the irrigation pumps in the area are electricity driven, improve the delivery of critical services such as hospitals and food storage and preservation, and improve performance of electronic equipment that are dependent on reliable electricity supply.

202. The Project’s negative impacts mostly take during construction and are manageable using standard and routine construction techniques and equipment. During operation, the Project impacts are mostly positive especially on the quality of life in the service area. The impacts during operation of the OHL are from corona noise and unconfirmed effects of electromagnetic force. Corona noise is addressed in the design of the OHL by providing proper spacing between the conductors. A precautionary approach is taken in the design to address the impacts of electromagnetic force.

203. In conclusion, it is recommended that the Project is designed, constructed, operated and maintained incorporating the EMP to minimize its impacts on the environment.

### Table 5. Environmental Management Plan for Namangan Transmission Lines

<table>
<thead>
<tr>
<th>ACTIVITIES</th>
<th>IMPACTS</th>
<th>MITIGATING MEASURES</th>
<th>RESPONSIBLE PARTIES</th>
<th>COST¹⁸</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRE CONSTRUCTION</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1. Surveying</td>
<td>• Removal of branches and other obstructions • Occupation Hazards, accidents</td>
<td>• Impact is too low, branches will re-grow, move location of survey equipment • Provide proper PPE, training and supervisions</td>
<td>• Survey party supervisor</td>
<td>Included in Project’s cost</td>
</tr>
<tr>
<td>2. Soil exploration</td>
<td>• Trimming of shrubs, drilling holes on the ground • Occupation Hazards, accidents</td>
<td>• Soil sample is very small and shrubs removed will regenerate • Provide PPE, training and supervision</td>
<td>• Survey Party supervisor</td>
<td>Included in Project’s cost</td>
</tr>
<tr>
<td>3. Land Acquisition</td>
<td>• Temporary and permanent removal of the land from the land owners and its uses</td>
<td>• Proper appraisal of income loss and timely compensation • OHL line properly selected to avoid houses and other structures • On the job training for local personnel that could be hired by the project</td>
<td>• Uzbekenergo</td>
<td>Included in Project’s cost</td>
</tr>
<tr>
<td><strong>CONSTRUCTION</strong></td>
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<tr>
<td>NAMANGAN SUBSTATION</td>
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</tr>
<tr>
<td>• Loss of topsoil • Increase in suspended solids and turbidity in receiving drainage system • Increase in air pollution from suspended particulates from soil carried and left on the road by trucks used in construction • Grease and oil from leaks and spills</td>
<td>• Conserve and stock top soil separately for use in site landscaping • Compact and cover excavated material stock pile especially during the rainy season • Add a silting basin at the end of the main drain prior to discharge. • Wet or cover the excavated soil pile and dusty construction materials such as sand, lime etc during the dry season to reduce dust • Wet the work area and other areas with exposed surfaces to reduce dust • Wash all truck wheels before leaving the site and all construction trucks should be properly covered while on transit • Periodic check up and maintenance of equipment especially oil seals, proper training and</td>
<td>• Project Engineer and Contractor • Project Engineer and contractor with participation from third</td>
<td>• Part of good practices • Ditto • Ditto • Ditto</td>
<td></td>
</tr>
</tbody>
</table>

¹⁸ Cost estimates are provided for special procurement such as monitoring, training, PPE procurement, first aid kits, etc.. Good practices during construction, operation and maintenance should be part of the contract cost and during operation and maintenance it should be part of the recurring cost.
<table>
<thead>
<tr>
<th>Spillage affecting the water quality</th>
<th>Supervision of persons operating the equipment to report leaks, add grease and oil interceptor to the silt pond</th>
<th>Project Engineer and contractor with participation from third parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise from heavy equipment especially during piling operation</td>
<td>Fence the work area. All equipment should be provided with mufflers and noise reduction equipment</td>
<td>Ditto</td>
</tr>
</tbody>
</table>

- Noise from heavy equipment especially during piling operation
- Spillage affecting the water quality
- Supervision of persons operating the equipment to report leaks, add grease and oil interceptor to the silt pond
- Fence the work area. All equipment should be provided with mufflers and noise reduction equipment

- Increase in traffic congestion in the construction area especially heavy transformers and equipment are delivered and installed.
- Items of archaeological or cultural significance accidentally discovered during earth moving and construction.
- Employment of minors and women for unsuitable task
- Spread of contagious and communicable diseases by outside workers

- Noisy equipment and activity such as piling should be done only at daytime and if it is not possible prior notice should be given to the neighboring areas.
- All equipment used must comply with the Uzbek emission laws.
- Coordinate with the local authorities to reroute traffic and assign special personnel to direct the traffic.
- Provide personnel involved in earth moving and excavation one or two hour seminar on protocol to follow if items of possible cultural significance are discovered.
- Coordinate with local archeological authorities. In the meantime, the area where the item is discovered is cordoned and construction activities suspended until the experts from archaeological department have given their opinion or procedure on how to proceed with the work.
- Proof of age will be required prior to employment. Supervisors are to check the work done by women.
- Limit outside workers by giving locals priority in employment. External workers hired must have proper medical examination prior to employment. New workers will be properly briefed on the basics of how common communicable and contagious diseases are spread, symptoms and effects. The contractor will retain a physician who could be contacted or would give the personnel regular check up.
- PPE, first aid kit, and alarm system should be provided and used in the construction activity. “NO PPE NO WORK” policy should be properly implemented.
- Workers should be properly briefed on proper

- Ditto
- Ditto
- Ditto
- Ditto
- Ditto
- Ditto

- Good practices
- Good practices
- Cost included in Project cost
- Good practices
- Good practices
- Included in Project cost
- Included in Project cost
<table>
<thead>
<tr>
<th>500 kv OHL</th>
<th>62</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accidents, hazards and other work area related concerns</strong></td>
<td></td>
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<tr>
<td>work conduct, chain of command and responsibilities, and action to take during an emergency.</td>
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<tr>
<td>• Key personnel will be trained on first aid. Periodic drills will be carried out.</td>
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<td>• Teams and personnel with good safety record will be properly acknowledged.</td>
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<td>• Structure may require sulfate resistant cement to prevent corrosion and premature failure.</td>
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<td>• Ditto</td>
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<td>• Ditto</td>
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<td>• Ditto</td>
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<tr>
<td>• Project Engineer with design consultant</td>
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<td>• Good practices</td>
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<td>• Good practices</td>
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<tr>
<td>• Included in Project cost and</td>
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<tr>
<td><strong>Noise from the excavation of the tower foundations is the most important impact. The impacts could vary depending on the soil structure. In weak soil, such as in alluvial deposits in valley beds, piling may have to be carried out. Compressor and power tools will be needed for hard rock surfaces. Heavy equipment coming and entering the area can cause noise, ground vibration and discharge of air pollutants.</strong></td>
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<tr>
<td>• Noisy operations such as piling, rock breaking using power equipment and cement mixing should be limited to daytime operation when working close to residential areas.</td>
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<tr>
<td>• Piling and rock breaking should be minimized during the spring months when birds, fish, and other animals are breeding. The noise could affect their breeding patterns as well as the survival of the young animals.</td>
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<tr>
<td>• When operating close to villages, the noisy equipment should only be operated during daytime and if it is not possible the village residents should be given advance notice of the activity. Such activity should not last longer than two consecutive days.</td>
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<td>• Ditto</td>
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<td>• Ditto</td>
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<tr>
<td>• Ditto with third party involvement</td>
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<td>• Ditto</td>
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<tr>
<td><strong>Air pollutant discharge from the equipment used during tower construction to dig the foundation, mix the cement, and weld and erect the tower is quite high at 26 tons per annum consisting of 13.5 tons of particulates, 3.3 tons of carbon monoxide, and 2.9 tons of nitrogen oxides.</strong></td>
<td></td>
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<tr>
<td>• While the cumulative emission over one year of construction work is high, when the emission is distributed over time, length of the OHL at 170 km and operating width of around 200 m, the overall impact on the air quality is negligible at a fraction of a microgram/cubic meter.</td>
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<tr>
<td>• Nevertheless, the contractor will be required that emissions and noise level of all his equipment and machinery used in the OHL construction must conform to the Uzbek environmental standard.</td>
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<tr>
<td>• Spent materials such as welding rods, empty paint containers, and solvent containers must be properly collected, packed and stored in a secure place if there are no disposal facilities for toxic and hazardous wastes.</td>
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<tr>
<td>• Contractor and project engineer</td>
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<tr>
<td>• Standard good practice</td>
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<td>• ditto</td>
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<tr>
<td>•</td>
<td>• Construction of the foundation will disturb the soil.</td>
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<td>•</td>
<td>• Construction of the foundation from Pap-Chust to Namangan would require special procedure because of the high water table. Dewatering will have to be carried out.</td>
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<tr>
<td>•</td>
<td>• The right of way for the construction equipment, personnel and materials may require clearing of the shrubs and grassland.</td>
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<td></td>
<td>• If herbicides need to be used to clean the right of way, pesticides that are classified as persistent organic pollutant under Stockholm Convention on Persistent Organic Pollutant must be avoided.</td>
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<td></td>
<td>• Workers must be properly trained on the uses of the pesticides and provided with proper PPE, and the antidote must be available. Supervisors and key personnel must undergo training on first aid procedure.</td>
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<tr>
<td></td>
<td>• Empty pesticide containers must be properly collected, and stored in a secure place for later disposal when a toxic and hazardous waste facility is available</td>
</tr>
<tr>
<td>•</td>
<td>• Occupational health and safety</td>
</tr>
</tbody>
</table>
would require personnel working in the tower construction to wear harness and when welding, proper welding protective mask, gloves, and clothes. safety, protocol, and procedures especially on the use of PPE. Supervisors must enforce strongly the "NO PPE NO WORK" requirement.
- Supervisors must constantly check that their workers are following the proper health and safety procedure and instil disciplinary measures to those who ignore it.
- Good workers who contribute to safety and health must be duly recognized.
- Foremen and key personnel may be given first aid training and a first aid kit must be available at all times in the work site.

- Ditto
- Ditto
- Ditto
- Ditto
- Cost for conducting training is included in Supervision Contract and partly covered by Uzbekenergo's health and safety practices

- Health threats from communicable and infectious diseases especially those borne by migrant workers may be a problem.
- Workers must be required to present medical and health certificates prior to employment.
- Workers must be given an hour or two briefing on personal hygiene and spread of communicable and infectious diseases and their symptoms and effects.
- The project will retain a licensed doctor to attend to the health needs of the works.

- Ditto
- Ditto
- Standard good practice
- Ditto
- $500/month

- The OHL construction work is spread over a wide distance and the workers have possibility of interacting with local communities that could result in personal conflicts and possibly impacting the project.
- Hire local residents as much as possible.
- Brief migrant workers on local customs and tradition which they must respect.
- If there are sites of important customary values, the project engineer must engage the local residents on the proper procedure for them to proceed with their work.
- Project will retain a community liaison officer knowledgeable on the local customs and traditions.

- Ditto
- Ditto
- Standard good practice
- Ditto
- $500/month

- Accidental discovery of cultural and archeologically significant objects
- Apply the chance find procedure described in the previous section in the construction of Namangan substation. Chances of finding important object in a particular tower site is low because of the very small area required for the foundations but cumulatively the area is large as it stretches some 170 km. and may involve more than 500 foundation sites.

- Ditto
- Retainer fee for expert already included in previous

- REROUTING OF 220 kv OHL
- Decommissioning the existing line
- Occupational health and safety risk
- Ascertain that all conductors to be removed have been isolated and decommissioned.
- Workers must check all conductors and
<table>
<thead>
<tr>
<th><strong>NAMANGAN SUBSTATION</strong></th>
<th><strong>Transformer and equipment noise</strong></th>
<th><strong>Use of sulfur hexafluoride circuit breakers which have low noise level compared with air or oil circuit breakers</strong></th>
<th><strong>Design engineer</strong></th>
<th><strong>Included in general Project cost</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Use of PPE</strong></td>
<td><strong>Care in handling and isolating equipment to be inspected</strong></td>
<td><strong>EA and substation management</strong></td>
<td><strong>Standard good practice</strong></td>
</tr>
<tr>
<td><strong>Contamination with PCB</strong></td>
<td><strong>Transformers and electrical equipment decommissioned must be checked for contamination with PCBs. If there are equipment contaminated, those equipment must be properly packed and sent to a toxic and hazardous disposal facility and in the absence of such facility to a secured storage.</strong></td>
<td><strong>Ditto with EA</strong></td>
<td><strong>Uncertain due to uncertainty with Kyoto Protocol extension</strong></td>
<td><strong>$1000 per year per ton</strong></td>
</tr>
<tr>
<td></td>
<td>Occupation and health safety related issues</td>
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<tr>
<td></td>
<td>Evaporation of mineral oil in transformers which is estimated at 0.11 gm/day or roughly a liter every three months is very low, lower than oil fumes generated by a smoke belching vehicle.</td>
<td>No mitigating measure</td>
<td></td>
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<tr>
<td></td>
<td>Old oil is drained to a pan to prevent spillage. Old oil is placed in drums for disposal in cement plant or toxic and hazardous waste treatment facility. Normally THW handling facilities pay for the disposal of mineral oil as it contains very high heating value.</td>
<td>ditto</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Change oil every 15 or 18 years</td>
<td>ditto</td>
<td>Standard good practices</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Installation of apparatus to scare the birds such as barbed nails, tridents, noise springs, etc</td>
<td>ditto</td>
<td>Standard good practices</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EMF in nearest residential area should not exceed IFC and Uzbek regulations.</td>
<td>Proper distance from the houses. For the 500 kv line at least 100 m from the conductor wire and for the 220 kv line at least 44 m from the conductor wire</td>
<td>EA and OHL management with third party involvement</td>
<td>Part of OM cost</td>
</tr>
<tr>
<td></td>
<td>Issues related to inspection and maintenance of the towers, foundation and conductors</td>
<td>Personnel involved in inspection and maintenance of the transmission lines must be properly trained. They must always use the proper PPE. Exercise care when working with live wires to prevent electrocution.</td>
<td>EA and OHL management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maintenance of the right of way</td>
<td>Grazing and other organic means to control grasses would be preferred. If it becomes necessary to use pesticides and herbicides, the chemicals must not be persistent organic pollutant. Personnel involved in herbicide spraying must be properly trained on the safety and use of the chemicals. Antidotes and first aid must be available at all times. Key personnel must be trained in administering</td>
<td>EA and OHL maintenance personnel</td>
<td></td>
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</table>

500 kv OHL AND REROUTED 220 kv OHL

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<td>Change oil every 15 or 18 years</td>
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<td>EMF in nearest residential area should not exceed IFC and Uzbek regulations.</td>
<td>Proper distance from the houses. For the 500 kv line at least 100 m from the conductor wire and for the 220 kv line at least 44 m from the conductor wire</td>
<td>EA and OHL management with third party involvement</td>
</tr>
<tr>
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<td>Issues related to inspection and maintenance of the towers, foundation and conductors</td>
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<td>EA and OHL maintenance personnel</td>
</tr>
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</table>

Cost for conducting training is included in Supervision Contract and partly covered by Uzbekenergo’s health and safety

$200 per first aid kit and antidote supply including
<table>
<thead>
<tr>
<th><strong>ABANDONMENT</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>NAMANGAN SUBSTATION</strong></td>
<td></td>
</tr>
<tr>
<td>• Occupation Health and Safety</td>
<td>• Disconnect power to major equipment</td>
</tr>
<tr>
<td></td>
<td>• Substation management</td>
</tr>
<tr>
<td></td>
<td>• Standard good practices</td>
</tr>
<tr>
<td>• Removal of Mineral Oil and Disposal</td>
<td>• Drain transformer oil, store for long term storage if toxic and hazardous wastes disposal facilities are not available.  Consider using cement plants for THW disposal subject to Uzbek laws and regulations.</td>
</tr>
<tr>
<td></td>
<td>• UZ environmental authorities, cement plant owners and EA management</td>
</tr>
<tr>
<td></td>
<td>• $1000 per year per cubic of storage  Zero to some income</td>
</tr>
<tr>
<td>• Soil Analysis and Decontamination</td>
<td>• Soil in the area will be sampled for contamination from hydrocarbons, other common chemicals used in the substation that could be insignificant on day to day basis but with long operation of the substation could accumulate in the soil, such as trichloroethylene (TCE).</td>
</tr>
<tr>
<td>500 kv OHL AND 220 kv OHL</td>
<td></td>
</tr>
<tr>
<td>• Removal of Conductors</td>
<td>• Similar to decommissioning of the 220 kv OHL prior to relocation</td>
</tr>
<tr>
<td></td>
<td>• EA management</td>
</tr>
<tr>
<td></td>
<td>• Standard good practice</td>
</tr>
<tr>
<td>• Removal of Towers and Foundation</td>
<td>• Similar to the decommissioning of the 220 Kv OHL prior to relocation</td>
</tr>
<tr>
<td></td>
<td>• EA management</td>
</tr>
<tr>
<td></td>
<td>• Standard good practice</td>
</tr>
<tr>
<td><strong>EMERGENCY AND ACCIDENT</strong></td>
<td></td>
</tr>
<tr>
<td><strong>NAMANGAN SUBSTATION</strong></td>
<td></td>
</tr>
<tr>
<td>• Fire</td>
<td>• Fire and smoke sensor, fire fighting equipment, use of fire proof outlets, ventilation equipment  • Grounding of equipment, provision of interlock, and automatic power cut off  • Equipment are properly labeled and procedures defined in case of fire such as isolation of other equipment  • External support such as the local fire department and civil defense offices  • Drills and exercises to test personnel preparedness for fire and other emergency</td>
</tr>
<tr>
<td></td>
<td>• Standard design practice  • Ditto  • Ditto  • Ditto</td>
</tr>
<tr>
<td>500 kv OHL AND 220 kv OHL</td>
<td></td>
</tr>
<tr>
<td>• Tower collapse from weakening of structure such as erosion of foundations</td>
<td>• Periodic examination of the tower foundation and structure  • If needed remedial measures to improve the</td>
</tr>
<tr>
<td></td>
<td>• Extent of damage not</td>
</tr>
<tr>
<td></td>
<td>• Standard good practices</td>
</tr>
<tr>
<td></td>
<td>• Extent of damage not</td>
</tr>
<tr>
<td>ACTIVITIES</td>
<td>Mitigation Measure</td>
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<td>---------------------</td>
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</tr>
<tr>
<td><strong>PRE CONSTRUCTION</strong></td>
<td></td>
</tr>
<tr>
<td>4. Surveying</td>
<td>• Impact is too low, branches will re-grow, move location of survey equipment</td>
</tr>
<tr>
<td></td>
<td>• Provide proper PPE, training and supervisions</td>
</tr>
<tr>
<td>5. Soil exploration</td>
<td>• Soil sample is very small and shrubs removed will regenerate</td>
</tr>
<tr>
<td></td>
<td>• Provide PPE, training and supervision</td>
</tr>
<tr>
<td>6. Land Acquisition</td>
<td>• Proper appraisal of income loss and timely compensation</td>
</tr>
<tr>
<td></td>
<td>• OHL line properly selected to avoid houses and other structures</td>
</tr>
<tr>
<td></td>
<td>• On the job training for local personnel that could be hired by the project</td>
</tr>
<tr>
<td><strong>CONSTRUCTION</strong></td>
<td></td>
</tr>
<tr>
<td>NAMANGAN SUBSTATION</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Loss of topsoil</td>
</tr>
<tr>
<td></td>
<td>• Conserve and stock top soil separately for use in site landscaping</td>
</tr>
</tbody>
</table>

¹⁹ Cost estimates are provided for special procurement such as monitoring, training, PPE procurement, first aid kits, etc.. Good practices during construction, operation and maintenance should be part of the contract cost and during operation and maintenance it should be part of the recurring cost.

Table 6. Environmental Monitoring Plan
<table>
<thead>
<tr>
<th>ACTIVITIES</th>
<th>Mitigation Measure</th>
<th>MONITORING DETAILS</th>
<th>RESPONSIBLE PARTIES</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Increase in suspended solids and turbidity in receiving drainage system</td>
<td>• Compact and cover excavated material stock pile especially during the rainy season</td>
<td>• Samples the silt basin for suspended solids, grease and oil at least once a week</td>
<td>• Project Engineer and Contractor with participation from third parties</td>
<td>• Cost for air, noise and water measurement equipment is included in Supervision Contract, cost for staff is included in Government part of Supervision Activity (GPSA). Portable noise meter at $500 each may need 6 pieces for the whole project</td>
</tr>
<tr>
<td>• Increase in air pollution from suspended particulates from soil carried and left on the road by trucks used in construction</td>
<td>• Add a silting basin at the end of the main drain prior to discharge.</td>
<td>• Set up a noise monitoring station at two areas located at the boundary of the construction site, and one site to a sensitive receptor with one km from the project site</td>
<td>• Project Engineer and contractor with participation from third parties</td>
<td>• Standard good practice</td>
</tr>
<tr>
<td>• Grease and oil from leaks and spillage affecting the water quality</td>
<td>• Wet cover the excavated soil pile and dusty construction materials such as sand, lime etc during the dry season to reduce dust</td>
<td>• Construction log book and periodic report of the project engineer to EA and the Bank</td>
<td>• Project Engineer and contractor with third party involvement</td>
<td>• Cost for air, noise and water measurement equipment is included in Supervision Contract, cost for staff is included in Government part of Supervision Activity (GPSA)</td>
</tr>
<tr>
<td>• Noise from heavy equipment especially during piling operation</td>
<td>• Wet the work area and other areas with exposed surfaces to reduce dust</td>
<td>• Ditto</td>
<td>• Ditto</td>
<td>• Cost for conducting training is included in Supervision Contract and partly covered by Uzbekenergo's health and safety. $200 per training and $300/month retainer for expert</td>
</tr>
<tr>
<td>• Increase air pollutants such as PM2.5, sulfur dioxide, nitrogen oxides from heavy trucks</td>
<td>• Wash all truck wheels before leaving the site and all construction trucks should be properly covered while on transit.</td>
<td>• Ditto</td>
<td>• Ditto</td>
<td>• Ditto</td>
</tr>
<tr>
<td>• Increase traffic congestion in the construction area especially heavy transformers and equipment are delivered and installed</td>
<td>• Periodic check up and maintenance of equipment especially oil seals, proper training and supervision of persons operating the equipment to report leaks, add grease and oil interceptor to the silt pond Fence the work area. All equipment should be provided with mufflers and noise reduction equipment</td>
<td>• Ditto</td>
<td>• Ditto</td>
<td>• Ditto</td>
</tr>
<tr>
<td>• Items of archaeological or cultural significance accidentally discovered during earth moving and construction</td>
<td>• Noisy equipment and activity such as piling should be done only at daytime and if it is not possible prior notice should be given to the neighboring areas. All equipment used must comply with the Uzbek emission laws. Coordinate with the local authorities to reroute traffic and assign special personnel to direct the traffic. Provide personnel involved in earth moving and excavation one or two hour seminar on protocol to follow if items of possible cultural significance are discovered. Coordinate with local archaelogical authorities. In the meantime, the area where the item is discovered is cordoned and construction activities suspended until the experts from archaeological department have given their opinion or procedure on how to proceed.</td>
<td>• Ditto</td>
<td>• Ditto</td>
<td>• Ditto</td>
</tr>
<tr>
<td>• Employment</td>
<td>• ditto</td>
<td>• ditto</td>
<td>• ditto</td>
<td>• ditto</td>
</tr>
<tr>
<td>ACTIVITIES</td>
<td>Mitigation Measure</td>
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<td>----------------------------------------------------------------------------</td>
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<td></td>
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<tr>
<td>of minors and women for unsuitable task</td>
<td>proceed with the work.</td>
<td></td>
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</tr>
<tr>
<td>• Spread of contagious and communicable diseases by outside workers</td>
<td>• Proof of age will be required prior to employment. Supervisors are to check the work done by women.</td>
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</tr>
<tr>
<td>• Accidents, hazards and other work area related concerns</td>
<td>• Limit outside workers by giving locals priority in employment. External workers hired must have proper medical examination prior to employment. New workers will be properly briefed on the basics of how common communicable and contagious diseases are spread, symptoms and effects. The contractor will retain a physician who could be contacted or would give the personnel regular check up.</td>
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<tr>
<td></td>
<td>• PPE, first aid kit, and alarm system should be provided and used in the construction activity. &quot;NO PPE NO WORK&quot; policy should be properly implemented.</td>
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<td></td>
<td>• Workers should be properly briefed on proper work conduct, chain of command and responsibilities, and action to take during an emergency.</td>
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<td></td>
<td>• Key personnel will be trained on first aid. Periodic drills will be carried out.</td>
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<tr>
<td></td>
<td>• Teams and personnel with good safety record will be properly acknowledged. Structure may require sulfate resistant cement to prevent corrosion and premature failure.</td>
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<td></td>
<td>• Ditto</td>
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<td></td>
<td>• Ditto</td>
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<tr>
<td></td>
<td>• Engineering with design consultant</td>
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<tr>
<td>• 500 kv OHL</td>
<td>• Ditto</td>
<td></td>
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<td></td>
<td>• Ditto</td>
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<td>• Ditto</td>
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<td></td>
<td>• Ditto</td>
<td></td>
<td></td>
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<tr>
<td>Construction log book and work schedule</td>
<td>• Project Engineer and contractor</td>
<td></td>
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</tr>
<tr>
<td>• Noise from the excavation of the tower foundations is the most</td>
<td>• Ditto</td>
<td></td>
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<td>important impact. The impacts could vary depending on the soil structure.</td>
<td>• Ditto with third party involvement</td>
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<tr>
<td>In weak soil, such as in alluvial deposits in valley beds, piling may have to be carried out. Compressor and power tools will be needed for hard rock.</td>
<td>• Good practice</td>
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<td></td>
<td>• Noise meter cost cost already included</td>
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<td></td>
<td>• ditto</td>
<td></td>
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<tr>
<td></td>
<td>• ditto</td>
<td></td>
<td></td>
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<td>ACTIVITIES</td>
<td>Mitigation Measure</td>
<td>MONITORING Details</td>
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<tr>
<td>surfaces. Heavy equipment coming and entering the area can cause noise, ground vibration and discharge of air pollutants.</td>
<td>activity. Such activity should not last longer than two consecutive days.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>• Air pollutant discharge from the equipment used during tower construction to dig the foundation, mix the cement, and weld and erect the tower is quite high at 26 tons per annum consisting of 13.5 tons of particulates, 3.3 tons of carbon monoxide, and 2.9 tons of nitrogen oxides.</td>
<td>• While the cumulative emission over one year of construction work is high, when the emission is distributed over time, length of the OHL at 170 km and operating width of around 200 m, the overall impact on the air quality is negligible at a fraction of a microgram/cubic meter.</td>
<td>• Equipment registration and certification of passing air emission tests</td>
<td>• Contractor and project engineer</td>
<td>• standard good practice</td>
</tr>
<tr>
<td></td>
<td>• Nevertheless, the contractor will be required that emissions and noise level of all his equipment and machinery used in the OHL construction must conform to the Uzbek environmental standard.</td>
<td></td>
<td></td>
<td>• ditto</td>
</tr>
<tr>
<td></td>
<td>• Spent materials such as welding rods, empty paint containers, and solvent containers must be properly collected, packed and stored in a secure place if there are no disposal facilities for toxic and hazardous wastes.</td>
<td>• Construction log book and inventory of stockpile materials</td>
<td>• ditto</td>
<td></td>
</tr>
<tr>
<td>• Construction of the foundation will disturb the soil.</td>
<td>• Topsoil will be segregated to sod and restore after backfilling the foundation area.</td>
<td>• Construction log book, minutes of construction meeting and engineers report to the EA and the Bank</td>
<td>• Project engineer and contractor</td>
<td>• standard good practices</td>
</tr>
<tr>
<td></td>
<td>• Other excavated materials must be stored in a pile, properly compacted and wetted regularly to reduce any dust.</td>
<td>• Ditto</td>
<td>• Ditto</td>
<td>• Ditto</td>
</tr>
<tr>
<td></td>
<td>• Most of the excavated materials will be used to backfill the foundation and any excess will be used to raise the ground level around the foundations.</td>
<td>• ditto</td>
<td>• ditto</td>
<td>• ditto</td>
</tr>
<tr>
<td>• Construction of the foundation from Pap-Chust to Namangan would require special procedure because of the high water table. Dewatering will have to</td>
<td>• The water removed during excavation must be pumped to a silt pond after which the water is then discharged to the drainage or irrigation canal only when the water has cleared.</td>
<td>• Test the silt basin once a week or more frequently if it has difficulty meeting the Uzbek standards for SS</td>
<td>• Project Engineer, Contractor and third party involvement</td>
<td>• Cost for water measurement equipment is included in Supervision Contract, cost for staff is included in GPSA</td>
</tr>
<tr>
<td></td>
<td>• Foundation may require sulfate resin cement to prevent corrosion and premature failure.</td>
<td>• Construction logbook, periodic reports of the project engineer to EA and</td>
<td>• Project Engineer and contractor</td>
<td>• standard good practices</td>
</tr>
<tr>
<td>ACTIVITIES</td>
<td>Mitigation Measure</td>
<td>MONITORING DETAILS</td>
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</tbody>
</table>
| • The right of way for the construction equipment, personnel and materials may require clearing of the shrubs and grassland. | • Grasses and shrub will be cleaned manually.  
• If herbicides need to be used to clean the right of way, pesticides that are classified as persistent organic pollutant under Stockholm Convention on Persistent Organic Pollutant must be avoided.  
• Workers must be properly trained on the uses of the pesticides and provided with proper PPE, and the antidote must be available. Supervisors and key personnel must undergo training on first aid procedure.  
• Empty pesticide containers must be properly collected, and stored in a secure place for later disposal when a toxic and hazardous waste facility is available | • Construction engineer log book, minutes of regular construction meeting and periodic reports of the project engineer to the EA and the Bank  
• Ditto  
• Ditto  
• Ditto  
• Ditto | • Project Engineer and contractor  
• Ditto  
• Ditto  
• Ditto  
• Ditto | • Good practice  
• Ditto  
• Ditto  
• Cost for conducting training is included in Supervision Contract  
• $500/per year for secured storage country has no THW facility |
| • Occupational health and safety would require personnel working in the tower construction to wear harness and when welding, proper welding protective mask, gloves, and clothes. | • Workers must be properly briefed on construction safety, protocol, and procedures especially on the use of PPE. Supervisors must enforce strongly the "NO PPE NO WORK" requirement.  
• Supervisors must constantly check that their workers are following the proper health and safety procedure and instill disciplinary measures to those who ignore it  
• Good workers who contribute to safety and health must be duly recognized.  
• Foremen and key personnel may be given first aid training and a first aid kit must be available at all times in the work site. | • Construction log book, minutes of constructions meeting and periodic reports of the project engineer to EA and Bank  
• Ditto  
• Ditto  
• Ditto | • Ditto  
• Ditto  
• Ditto  
• Ditto | • Standard good practices  
• Ditto  
• Ditto  
• Cost for air, noise and water measurement equipment is included in Supervision Contract, cost for staff is included in Government part of Supervision Activity (GPSA) |
<table>
<thead>
<tr>
<th>ACTIVITIES</th>
<th>Mitigation Measure</th>
<th>MONITORING DETAILS</th>
<th>RESPONSIBLE PARTIES</th>
<th>COST</th>
</tr>
</thead>
</table>
| • Health threats from communicable and infectious diseases especially those borne by migrant workers may be a problem. | • Workers must be required to present medical and health certificates prior to employment.  
• Workers must be given an hour or two briefing on personal hygiene and spread of communicable and infectious diseases and their symptoms and effects.  
• The project will retain a licensed doctor to attend to the health needs of the works. | • Ditto                                                                 | • Ditto                | • Standard good practice |
| • The OHL construction work is spread over a wide distance and the workers have possibility of interacting with local communities that could result in personal conflicts and possibly impacting the project. | • Hire local residents as much as possible.  
• Brief migrant workers on local customs and tradition which they must respect.  
• If there are sites of important customary values, the project engineer must engage the local residents on the proper procedure for them to proceed with their work  
• Project will retain a community liaison officer knowledgeable on the local customs and traditions | • Ditto                                                                 | • Ditto                | • Standard good practice |
| • Accidental discovery of cultural and archeologically significant objects | • Apply the chance find procedure described in the previous section in the construction of Namangan substation. Chances of finding important object in a particular tower site is low because of the very small area required for the foundations but cumulatively the area is large as it stretches some 170 km. and may involve more than 500 foundation sites | • Ditto                                                                 | • Ditto                | • Retainer fee for expert already included in previous |
| • REROUTING OF 220 kv OHL                                                   | • Ascertain that all conductors to be removed have been isolated and decommissioned.  
• Workers must check all conductors and accessories for live load prior to handling them.  
• Personnel must wear appropriate PPE and supervisors must strictly enforce the safety procedure. | • Ditto                                                                 | • Ditto                | • Standard good practice |
<p>| • Contamination with PCB                                                  | • Transformers and electrical equipment decommissioned must be checked for contamination with PCBs. If there are equipment | • Ditto                                                                 | • Ditto with EA          | • $1000 per year per ton   |</p>
<table>
<thead>
<tr>
<th>ACTIVITIES</th>
<th>Mitigation Measure</th>
<th>MONITORING DETAILS</th>
<th>RESPONSIBLE PARTIES</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>• During constructing the new 220 kv OHL mitigating measures are similar to the construction of the new OHL</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>• See new OHL monitoring and mitigating cost</td>
</tr>
<tr>
<td>• Overall the project will have beneficial impacts on climate change</td>
<td>• Project carbon dioxide reduction may qualify for credits, but existing rules for accreditation is uncertain with the expiration of the Kyoto Protocol on December 31, 2012</td>
<td>• Uzbek Designated National Authority, UNFCCC</td>
<td>• Certification, monitoring, and registration are subject to the procedures and requirements of the UNFCCC</td>
<td>• Uncertain due to uncertainty with Kyoto Protocol extension</td>
</tr>
<tr>
<td>• Beneficial impacts on agricultural productivity as irrigation in the area is dependent on electricity supply</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>• Beneficial impact on institutions such as hospitals, and businesses, such as storage facilities, that are dependent on a continuous and reliable power supply for heating, cooling, and operation of sensitive equipment</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>• Beneficial to the air quality in the service area as large businesses and institutions will close down their own boilers,</td>
<td>• No mitigating measure</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>ACTIVITIES</td>
<td>Mitigation Measure</td>
<td>MONITORINGN DETAILS</td>
<td>RESPONSIBLE PARTIES</td>
<td>COST</td>
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</tr>
<tr>
<td>generators and engines</td>
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</tr>
<tr>
<td>• Beneficial to residents, businesses and commerce who could enjoy amenities dependent on a reliable power supply</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• NAMANGAN SUBSTATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Transformer and equipment noise</td>
<td>• Use of sulfur hexafluoride circuit breakers which have low noise level compared with air or oil circuit breakers</td>
<td>• Design engineer report and specification</td>
<td>• Design engineer</td>
<td>• Included in</td>
</tr>
<tr>
<td>• Routine maintenance to check the condition of the towers, structures and equipment</td>
<td>• Use of PPE</td>
<td>• Operators logbook and periodic report to management</td>
<td>• EA and substation management</td>
<td>• Standard good practice</td>
</tr>
<tr>
<td>• Occupation and health safety related issues</td>
<td>• Construction of flanks or blank blind to contain the noise</td>
<td>• Operators logbook and periodic report to management</td>
<td>• EA and substation management</td>
<td>• Standard good practice</td>
</tr>
<tr>
<td>• Evaporation of mineral oil in transformers which is estimated at 0.11 gm/day or roughly a liter every three months is very low, lower than oil fumes generated by a smoke belching vehicle.</td>
<td>• No mitigating measure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Change oil every 15 or 18 years</td>
<td>• Old oil is drained to a pan to prevent spillage. Old oil is placed in drums for disposal in cement plant or toxic and hazardous waste treatment facility. Normally THW handling facilities pay for the disposal of mineral oil as it contains very high heating value.</td>
<td>• Operators logbook and periodic report to EA management</td>
<td>• ditto</td>
<td>• standard good practices</td>
</tr>
<tr>
<td>• 500 kv OHL AND REROUTED 220 kv OHL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Corona noise from the conductor especially after a rain,</td>
<td>• Proper design of the wire tension to prevent corona discharge</td>
<td>• Measure noise level at least once a year preferably during a rain in areas close to villages</td>
<td>• EA with third party involvement</td>
<td>• Standard good practices</td>
</tr>
<tr>
<td>ACTIVITIES</td>
<td>Mitigation Measure</td>
<td>MONITORING DETAILS</td>
<td>RESPONSIBLE PARTIES</td>
<td>COST</td>
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</tr>
<tr>
<td>natural deterioration of the conductor or premature deterioration of the conductor wires from pollution</td>
<td>Replacement of worn conductors</td>
<td>EA and management</td>
<td></td>
<td>Part of OM cost</td>
</tr>
<tr>
<td>• Bird kill in transmission lines</td>
<td>Installation of apparatus to scare the birds such as barbed nails, tridents, noise springs, etc</td>
<td>Design engineer and acceptance report</td>
<td>EA and OHL management for maintenance of the apparatus</td>
<td>Standard design of OHL</td>
</tr>
<tr>
<td>• EMF in nearest residential area should not exceed IFC and Uzbek regulations</td>
<td>Proper distance from the houses. For the 500 kv line at least 100 m from the conductor wire and for the 220 kv line at least 44 m from the conductor wire</td>
<td>Monitor EMF at least once a year in areas close to villages</td>
<td>EA and OHL management with third party involvement</td>
<td>Cost measurement equipment is included in Supervision Contract, cost for staff is included in Government part of Supervision Activity (GPSA)</td>
</tr>
<tr>
<td>• Issues related to inspection and maintenance of the towers, foundation and conductors</td>
<td>Personnel involved in inspection and maintenance of the transmission lines must be properly trained. They must always use the proper PPE. Exercise care when working with live wires to prevent electrocution.</td>
<td>OHL management and supervisors report</td>
<td>EA and OHL management</td>
<td>standard good practice</td>
</tr>
<tr>
<td>• Maintenance of the right of way</td>
<td>Grazing and other organic means to control grasses would be preferred. If it becomes necessary to use pesticides and herbicides, the chemicals must not be persistent organic pollutant. Personnel involved in herbicide spraying must be properly trained on the safety and use of the chemicals. Antidotes and first aid must be available at all times. Key personnel must be trained in administering the antidote and identifying symptoms of poisoning.</td>
<td>OHL periodic report to EA management</td>
<td>EA and OHL maintenance personnel</td>
<td>standard good practices</td>
</tr>
<tr>
<td>• ABANDONMENT</td>
<td>• NAMANGAN SUBSTATION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Occupation Health and Safety</td>
<td>Disconnect power to major equipment</td>
<td>EA substation abandonment plan</td>
<td>Substation management</td>
<td>Standard good practices</td>
</tr>
<tr>
<td>• Removal of Mineral Oil and Disposal</td>
<td>Drain transformer oil, store for long term storage if toxic and hazardous wastes</td>
<td>Ditto</td>
<td>Substation management</td>
<td>$1000 per year per cubic of storage</td>
</tr>
<tr>
<td>ACTIVITIES</td>
<td>Mitigation Measure</td>
<td>MONITORINGN DETAILS</td>
<td>RESPONSIBLE PARTIES</td>
<td>COST</td>
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</tr>
<tr>
<td>Soil Analysis and Decontamination</td>
<td>• Soil in the area will be sampled for contamination from hydrocarbons, other common chemicals used in the substation that could be insignificant on day to day basis but with long operation of the substation could accumulate in the soil, such as trichloroethylene (TCE)</td>
<td>• EA substation abandonment plan</td>
<td>• Substation management, and third party participation</td>
<td>$1000/sample</td>
</tr>
<tr>
<td>500 kv OHL AND 220 kv OHL</td>
<td>• Similar to decommissioning of the 220 kv OHL prior to relocation</td>
<td>• EA OHL abandonment management plan</td>
<td>• EA management</td>
<td>Standard good practice</td>
</tr>
<tr>
<td>Removal of Conductors</td>
<td>• Similar to the decommissioning of the 220 kv OHL prior to relocation</td>
<td>• ditto</td>
<td>• EA management</td>
<td>Standard good practice</td>
</tr>
<tr>
<td>Removal of Towers and Foundation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMERGENCY AND ACCIDENT</td>
<td>NAMANGAN SUBSTATION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire</td>
<td>• Fire and smoke sensor, fire fighting equipment, use of fire proof outlets, ventilation equipment</td>
<td>• Periodic report by substation management to the EA</td>
<td>• OHL management</td>
<td>Standard design practice</td>
</tr>
<tr>
<td></td>
<td>• Grounding of equipment, provision of interlock, and automatic power cut off</td>
<td>• Ditto</td>
<td>• Ditto</td>
<td>Ditto</td>
</tr>
<tr>
<td></td>
<td>• Equipment are properly labeled and procedures defined in case of fire such as isolation of other equipment</td>
<td>• Ditto</td>
<td>• Ditto</td>
<td>Ditto</td>
</tr>
<tr>
<td></td>
<td>• External support such as the local fire department and civil defense offices</td>
<td>• Memorandum of understanding with local authorities</td>
<td>• OHL management and local authorities</td>
<td>Ditto</td>
</tr>
<tr>
<td></td>
<td>• Drills and exercises to test personnel preparedness for fire and other emergency</td>
<td>• Periodic reports to EA management</td>
<td>• OHL management</td>
<td></td>
</tr>
<tr>
<td>500 kv AND 220 kv OHL</td>
<td>• Periodic examination of the tower foundation and structure</td>
<td>• OHL management report to EA</td>
<td>• OHL management</td>
<td>Standard good practices</td>
</tr>
<tr>
<td>Tower collapse from weakening of structure such as erosion of foundations</td>
<td>• If needed remedial measures to improve the foundation support; erosion control</td>
<td>• OHL management inspection report</td>
<td>• Ditto</td>
<td>Extent of damage not known</td>
</tr>
<tr>
<td></td>
<td>• Use of materials that are less susceptible to erosion, degradation or rusting</td>
<td>• OHL design engineers report</td>
<td>• OHL design engineers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Clear the road right of way for emergency crew</td>
<td>• OHL emergency management plan</td>
<td>• OHL emergency management plan</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• OHL MOU with local officials in charge of land use</td>
<td>• OHL MOU with local officials in charge of land use</td>
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<td></td>
<td></td>
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<td>• OHL management</td>
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<td>• OHL management</td>
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<td></td>
<td></td>
<td>• OHL management</td>
<td>Standard good practices</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Extent of damage not known</td>
<td>Ditto</td>
</tr>
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<tr>
<td>ACTIVITIES</td>
<td>Mitigation Measure</td>
<td>MONITORING DETAILS</td>
<td>RESPONSIBLE PARTIES</td>
<td>COST*</td>
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<tr>
<td></td>
<td>• Prevent houses and other incompatible land uses from being built near the transmission lines right of way.</td>
<td>• OHL emergency management plan</td>
<td>• ditto</td>
<td>Ditto</td>
</tr>
<tr>
<td></td>
<td>• When tower collapses, immediately terminate power supply.</td>
<td>• ditto</td>
<td>• OHL management and EA top management</td>
<td>Ditto</td>
</tr>
<tr>
<td></td>
<td>• Isolate the collapsed section so that the loads are not shifted to the other towers that may result to failure of those towers.</td>
<td>• OHL post emergency assessment report</td>
<td></td>
<td>Ditto</td>
</tr>
<tr>
<td></td>
<td>• Establish the cause of the failure and reroute the replacement OHL to a more stable site.</td>
<td></td>
<td></td>
<td>Ditto</td>
</tr>
</tbody>
</table>
References

In addition to the laws, regulations, policies, and guidelines cited in Section B, the following references were consulted in the report:


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Annexes
Annex 1. 500 kV OHL Route
kent Region

ANGREN
500 kV Substation
NAMANGAN
Kuyumazar

Baymak
Kurang

220 kV Breakouts

Koson
Semzlepa
Itlikak

Bustan
Kukumbay

Turakurgan
Annex 2. Public Consultation

Figure B-1. Chief Engineer of Namangan Uzelectroset Explaining the Project

Figure B-2. Attendees to the Public Consultation Listening to the Chief Engineer’s Presentation
Figure B-3. ABD Environmental Consultant Explaining the Environment Impacts and Mitigating Measures

Figure B-4. Concerned Participant Asking Clarification on Project’s Impact on their Daily Routine during Construction
Figure B-5. Chief Engineer and Environmental Consultant Replying to the Participant’s Question

Figure B-6. Land Compensation and Acquisition Consultant Explaining the Procedure for Compensating Affected Persons
28.05.12

1. Муслонов Г. Зан. дир. Вестон. МБС
2. Мамадалиев С. Хакий, бошчи
3. Файзуллаев Р. Нам.хот. эм.урушун
4. Ходиев Б. Нам.хот. эм. д.ч.м.к.н.дор.
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6. Хамидова М. Нудимов 1.ф.и. фарм.ф.
7. Назаров С. Набабош 1.фт. и комес.
8. Умаров А. Нукунов 1.фт. и менек.
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10. Абдуллаев И. Нукунов 1.фт. и менек.
11. Назаров С. Нам.хот. дун.н.
12. Маматов А. Насонов 1.фт. и менек.
13. Насибов С. Нукунов 1.фт. и менек.
14. Абдуллаев Р. Набабош 1.фт. и менек.
15. Абдуллаев Р. Набабош 1.фт. и менек.
16. Насибов С. Нам.хот. дун.н.
17. Шохсуров С. Нам.хот. дун.н.
18. Насибов С. Нукунов 1.фт. и менек.
19. Насибов С. Нукунов 1.фт. и менек.
20. Насибов С. Нукунов 1.фт. и менек.
21. Насибов С. Нукунов 1.фт. и менек.
22. Насибов С. Нукунов 1.фт. и менек.
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28. Насибов С. Нам.хот. дун.н.
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30. Ушакова Н. 
31. Монарехин В. 
32. Меланович Н. 
33. Фаддеев М. 
34. Иванов В. 
35. Иванов О. 
36. Иванов О. 
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“Янги-Ангрен ИЭС – Наманган НС” оралигида 500 кВ юкори куchlанишили электр тармоғи ва Наманган НС да 2 та бир халқаля 220 кВ юкори куchlанишили электр тармокларини бириктириш билан “Наманган” 500 кВ НС курилиши”

Коносой-2012

Лойиха амалга ошириш учун асос

Кутилаётган натижалар

• Фаргона водийсида электртаъминоти яхшиланади
• Худуднинг электртаъминотида узилишлар камайди
• Электртамокда энергияни йукотишлар камайди
• Экологияга ижобий таъсир курсатилади

Лойиҳа доирасида амалга ошириладиган тадбирлар

➢ Намангандан 500 кВли нимстанцияни куриш
➢ 137 км «Янги-Ангрен» Иссиклик Электрстанция — «Наманган» нимастанция йуналишда 500 кВ Юкори Вольтли Тармокни (ЮВТ) куриш
➢ 32 км 220 кВ ли тармокнинг йуналишни узгартириш
Электртамокнинг йуналиши

Электртамокнинг йуналиши (Наманган вилоятидаги кисми)
Экологик бахолаш учун мъерий хужжатлар

➤ Убекистон Республикасининг «Экологик экспертиза» (2001й) тугрисидаги конун
➤ УзРнинг Табиатни мухофаза килиш кумитасидан 2012 йилда апрел ойида ижобий хулося олинди - 18/844z,
➤ Осиё Тарракиёт Банкининг мухофаза килиш сиёсати дастури асосида экологик бахолаш утказилиши зарур (SPS 2009)

Атроф мухитга таъсирларни бахолаш

➤ Лойиха амалга ошириш натижасида атроф мухитга таъсирлар
➤ Таъсирларни камайтириш буйича чора-тадбирлар
➤ Таклиф этилган чора-тадбирларни назорат килиш ва хисобот бериш

➤ Лойихалаш боскичида
➤ Курилиш боскичида
➤ Фойдаланиши (эксплуатация) боскичида
Нимстанцияни курилиши

- Мухофаза девори
- Ахолидан хафвсиз масофада жойлашиш
- Техника хафвсизлиги
- Атмосфера, су, тупрок ресурспарига таъсири
- Шовкин-сурон

550 кВли ЮВТ курилишида

- Хафвсизликни таъминлаш
- Ерларни ажратиш
- Тупрокка таъсир
- Хайвонот ва усимлик дунёсига таъсир
- Шовкин-сурон
- Тогли худудларда минораларни урнатиш
# Экологик бошкарув режаси

"Жизг-Амур" ИЗС - Намган ИС" ёрдамида 500 кВ жерсия кўplashли электр тароати ва Намган ИС да 2 та бар ташкили 220 кВ жерсия кўplashли электр тароати барарлик балоа "Намган" 500 кВ ИС ёрдамида бошланган амалга оширилди Экологик Бошкарув Режаси

<table>
<thead>
<tr>
<th>Тадбир</th>
<th>Таскириги типи</th>
<th>Салбий таскирии камайтирүү</th>
<th>Зурукун (Лохжактириш)</th>
<th>Масалулар</th>
<th>Нарм</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Таркимлар уйлами</td>
<td>Декоративчи ирки мен ишга куйилмай ҳаракат илмий</td>
<td>Астонийка илмий</td>
<td>Тонкин дарёлар ва қуқун, тонкин солинг ва сарин қондир, Таркимлар уйлами, ҳаракат мен илмий</td>
<td>Қизматчилар қуқундир, ҳаракат илмий</td>
<td>Қизматчилар қуқундир, ҳаракат илмий</td>
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<tr>
<td>2. Гургозаниб уйлами</td>
<td>Булган жисм, овоздаморлик кунраб</td>
<td>Куннинг илмий</td>
<td>Қизматчилар қуқундир, ҳаракат илмий</td>
<td>Қизматчилар қуқундир, ҳаракат илмий</td>
<td>Қизматчилар қуқундир, ҳаракат илмий</td>
</tr>
<tr>
<td>3. Ъқомлар тароати</td>
<td>Булгамон манзираси ва бироктар ўйлами, ўқтома</td>
<td>Ъқомлар тароати, қуратин ва ҳаракат илмий</td>
<td>Ъқомлар тароати, қуратин ва ҳаракат илмий</td>
<td>Ъқомлар тароати, қуратин ва ҳаракат илмий</td>
<td>Ъқомлар тароати, қуратин ва ҳаракат илмий</td>
</tr>
</tbody>
</table>

# Мулокот учун контактлар

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