Initial Environmental Examination

April 2013

UZB: Solar Energy Development

This IEE is prepared by the consultants for the Uzbekenergo of the Republic of Uzbekistan and for the Asian Development Bank (ADB)

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
Glavgosexpertisa	State Department responsible for Conducting Environmental Expertise Under SNPC
GRM	Grievance Redressing 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
Uzkomunkhizmat	–	State entity responsible for water supply and sewage water treatment

CONTENTS

Figures

Tables

1. Executive Summary

1. Setting up of 100 MW solar PV power project in Uzbekistan is first of its kind in the country which is proposed to be implemented in Pastdargom and Nurobod districts of the Samarqand province. As per the national regulatory procedures, the solar power project will be cleared by Gosekoexpertisa under the Samarqand Province Nature Protection (SPNP). The project is classified as category B as per ADB norms hence evaluation need to focus on site specific environmental concerns if any. From the regulatory and institutional perspective, The Law of nature protection (1992) created normative, economic and organizational basis for environmental protection ensuring sustainable development and determining principles, including conducting environmental surveys. State Nature Protection Committee is main state body regulating the issues of nature protection, which directly reports to the parliament. It is responsible for supervision, coordination and implementation of nature protection issues and control use and recovery of natural resources at central, province and district levels. The Project is also being evaluated as per the following policies, procedures and guidelines of the Asian Development Bank: (i) Safeguard Policy Statement of 2009 (ii) manuals F1/BP of 2010, Safeguard Policy Statement and (iii) F1/OP of 2010 Safeguard Review Process.

2. The solar power project need is assessed from demand supply gap as well as from the need to augment renewable sources of power supply as part of overall energy security of the country. The proposed solar power project is poised to be located on the territory of Pastdargom district of Samarqand province of RUz. The Project site is located near the highway on route Samarkand-Karshi. The available site area up to 4000 ha is plane surface. This area is currently used for pasture. The site is located between two streams of dried-up river. The closest residential area is located in 1.5 km from the project site. The PV power plant will be connected to Chemical Plant Substation 110 kV located 13,7 km away from electrical substation.

3. From the technology option point of view, the proposed solar power plant will have capacity 100 MW and will be based on the crystalline technology. The PV modules proposed to be used will meet the corresponding IEC PV module qualification test standards: IEC 61215 and IEC 61730 for safety qualification testing. The standard technology requirements like module mounting and tracking structure, inverters, distributed transformers, building switchgear system etc., will be part of the solar power system to be implemented.

4. From environmental resource requirement point of view part from the land, there is need for water for cleaning of the panels as well as domestic water usage of the staff of plant. The raw water source of the plant will be the wells allocated on the surrounding area. the required water in the plant includes 780 m^3/year of drinkable water & 2.475 m^3/year of demineralized water. This value can be updated during the first year of plant operation hence treatment system is proposed to meet the quality requirements of the usage and with respect to disposal of water effluent since the most common disposal system in the area is a septic tank, this septic tank can also act as homogeneisation pond.

5. The project timelines are expected to be 45 months from pre feasibility stage through detailed design to commissioning of the power plant.

6. From the pre project environmental profile standpoint the climatic conditions are sharp continental, arid which is ideally suitable for solar PV power generation. Soils of the region are stable and mainly sierozem (gray) soil. The rainfall days are expected to be between 80 to 100. In 2012 concentration of all monitored pollutants didn't exceed the allowed concentrations. The integral indicator of atmosphere pollution was equivalent 5 that characterized level of atmosphere pollution as a low. In general Samarkand province though noting the nitrogen pollution of ground waters and with other components in some areas, but mainly the quality of groundwater remains at a satisfactory level, the basic operational horizons are not contaminated and are used for drinking purposes in urban and rural settlements.

7. The main environmental concerns anticipated during construction are noise, dust, and air pollutant emission from the construction equipment and earth moving. Some construction activities such as pile driving will generate noise levels higher than 70 dBA. An increase of suspended matter in the surface water Progress canal close to the work area might occur, which impact would be caused by the drift of fine particles and particulate matter from the bare surfaces which are likely to experience washouts and landslides by run-off water from rain, determining an increase in water turbidity. 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. Flora and fauna of project site represented by scant site is an irrigated farmland with very low productivity due to lack of irrigation water. Construction of PV plant will not require cutting of trees or dislocation of wildlife life. The animal species affected by the Project are those common to the steppe ecosystem. The land will have to be reclassified for industrial use. The Project will not require any removal of trees.

8. No any significant impact on environmental are expecting during the operation phase. PV station will not produce any air pollution, noise, solid wastes. Insignificant amount of wastewater generating during cleaning of panels will be discharged on the surface. Generated wastewater will be disposed in the septic tank, solid wastes will be disposed on a municipal landfill. Operation of Samarqand PV plant will contribute decreasing of CO_2 emission in atmosphere, at the same time it will improve power supply of Samarqand province. Thus Samarqand PV plant will contribute reduction of Green House effect.

9. Public consultations have been conducted to inform stakeholders on the construction of Samarqand PV plant. Issues on location of PV station, existing environmental conditions, water availability have been discussed not only with representatives of Province and national level of State Nature Committee, makhallas, local khokimiyat, hydrogeology but also during the official public consultation was hold in May 31, 2013. If there be any grievance for the Local people especially regarding any adverse and material harm caused by the Project either during construction or operation stage of the project, they can approach Uzbekenergo office or local administration.

10. The proposed solar PV power project is environmentally benign and there is no scope of significant environmental concerns that can arise both during construction and operation stage of the project. At the end of life of the project, which is estimated to be 25 years post operation environmental concerns can be significant in terms of disposal of discarded panels, interverter and other electrical equipment hence at a later stage of the project operation a detailed EMP needs to be prepared and implemented. During construction phase the contractor has to be contractually mandated to minimize transient environmental disturbances, using known conventional methods such as water spraying to minimize dust, the imposition of speed limits on vehicles in the project site, the provision of an adequate number of bathrooms and toilets for construction workers, the proper management of domestic wastes (particularly the disposal of food wastes), and the imposition of sanitation and work safety rules and regulations. The designated project manager need to closely monitor the compliance with the environmental and safety clauses of the contracts. The ambient air and noise levels in the nearest communities should also be monitored on a monthly basis during construction phase of the project.

11. The site identified for siting of the proposed solar PV power plant is not actively cultivated and while designated as agricultural land it is used primarily as grazing land since it is infertile. As discussed earlier there are no environmental sensitivities with respect to flora or fauna in the area surrounding the project site and also there are no historical monuments or sensitive establishments like school or hospital in the vicinity of the plant site. Since the project is a environmentally sound technology option for power generation coupled with location specifications of the site it can be assumed that the project will not cause any significant environmental impacts. There are possibilities of minor and transient environmental disturbances during construction and operation phase of the project, which can be easily addressed as discussed in the earlier sections of this report. Hence it can be recommended that the project should be considered environmentally feasible. It is concluded that the project has no further environmental issues to follow up, and the adequate measures listed in earlier section, when implemented, will fully comply with ADB’s Safeguard Policy Statement (2009).

2. Policy, Legal and Administrative Framework

12. The current solar PV power project is going to be the first Solar Power Plant in the Republic Uzbekistan. The Project is proposed to be implemented in the Pastdargom and Nurobod districts of the Samarqand province. The Project falls under category III 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 will be cleared by the Gosekoexpertisa under the Samarqand Province Nature Protection.

13. As per Asian Development Bank guidance, the Project is classified category B, which means a proposed project whose impacts are site specific, few if any and which are reversible, 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 that Uzbekistan has signed and 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

14. Presidential Decree of RUz dated 3 March 2013 "On further development of renewable energy sources".

15. Construction of the proposed solar power plant is expected to be on the land that is currently being used by four farmers. Appropriate land acquisition documentations will be prepared in accordance with relevant national[1] and ADB's procedures[2]

b. Institutional Framework for Environmental Assessment

16. Since independence Uzbekistan has adopted many laws and regulations on environmental protection issues. The Law «About nature protection» (1992) created normative, economic and organizational basis for environmental protection ensuring sustainable development and determining principles, including conducting environmental surveys. The law fixed power of government authorities in sphere of regulation of legal relationships on nature protection. The following are main institutions at different levels which are involved in regulation of legal relationships in sphere of environment protection and their competence:

[1] RCM No. 146 of 25.02.2011 "Regulations on improving process of land allotment for site constructions and other non-agricultural needs"

[2] Operational Policies of the ADB, Involuntary Resettlement Policy (1995)

Oliy Majlis (national level):

- determination of main directions of state policy in the field of nature protection;
- approval of state environmental programs;
- development and adoption of legal acts in sphere of nature protection;
- announcement of territories as zones with ecological emergency situation, as environmental disasters and environmental catastrophes; establishment of legal regime of these zones and status of victims;
- coordination of control over execution of environmental legislation;
- fixation of maximum sizes of fees for use of natural resources, as well as concessions on collection of payments;
- decision of other questions stipulated by the legislation.

Cabinet of Ministers (national level)**:**

- carrying out of unified environmental policy;
- regulation of issues related to use of natural resources;
- establishment of order and ensure the state cadastre of natural resources; approval of natural resources reserves that have state importance;
- development of measures on prevention of ecological crisis situations, natural disasters and catastrophes;
- implementation of measures on elimination of consequences of natural disasters and major accidents;
- establishing procedure for payment for use of natural resources, pollution of environment, allocation of waste, other types of harmful impact, as well as limits for use of natural resources, allocation of waste;
- creation of systems of environmental education and training, ensuring its functioning;
- approval of borders of areas of special environmental management, modes of nature protection and economic activities;
- development of interstate relations in the field of nature protection and nature management;
- Implementation of other measures envisaged by legislation acts of the Republic of Uzbekistan.

Local governments (local level):

- determination of the main directions of nature protection on its territory, approval of regional (territorial) environmental programs;

- accounting and assessment of natural resources, registration of environmentally harmful facilities;
- logistic support of environmental actions;
- issuance and cancellation of approvals for right of use natural resources, storage or burial of industrial and domestic waste in accordance with established procedures;
- collection of fees for use of natural resources;
- control of nature protection, adoption of decisions on suspension, termination and change of activity of local importance objects that have harmful impact on environment;
- regulation of other issues stipulated by the legislation of the Republic of Uzbekistan.

17. According to the Law of the Republic of Uzbekistan "On nature protection" (1992) the State Nature Protection Committee of Uzbekistan (Goskompriroda), Ministry of Health of Uzbekistan, State Inspection on oversight of safe conduct of work in industry, mining and domestic sectors of the Republic of Uzbekistan, Ministry of Internal Affairs of Uzbekistan, Ministry of Agriculture and Water Resources of Uzbekistan, State Committee of Uzbekistan on Land Resources, Geodesy, Cartography and State Cadastre are especially empowered state bodies for nature protection. At the same time, the State Nature Protection Committee of Uzbekistan, as especially empowered overall departmental body, in accordance with requirements of the Regulations of the “State Nature Protection Committee", approved by resolution №232-I of Oliy Majlis dated April 26, 1996, that coordinates activity of these specially authorized state nature protection bodies, in conjunction with government bodies shall exercise the state management of nature protection and use of natural resources.

18. State Nature Protection Committee is main state body regulating the issues of nature protection, which directly reports to the parliament. The Goskompriroda is responsible for supervision, coordination and implementation of nature protection issues and control use and recovery of natural resources at central, province and district levels. Authority of the committee is based on Regulation on State Environmental Commission of the Republic of Uzbekistan (1996). The Committee implements state control over keeping by ministries, state committees, agencies, enterprises, institutions and organizations as well as individual persons the law related to use and protection of lands, bowls, waters, forests, flora and fauna, atmosphere air.

19. The structure and responsibilities of the SCNP have changed little since 2001. Overall, the tasks of the Committee include the following: pursuing state policy on environmental security, nature protection, natural resources use and reproduction; the inter-sectoral and integrated management of nature protection activities; the establishment and coordination of activities to ensure favorable environmental conditions and rehabilitation of the environment; and nature protection inspections and audits. Since the creation of the bicameral system in 2004, the SCNP reports directly to the Senate.

20. There are nine structural units in the Headquarters of the SCNP. The Department for Control over the Protection and Use of Land and Water Resources, the Department for Air

Protection, and the Department for Nature Use Economics and Management have inspectorate responsibilities (Fig.4). At the central level, there are also a number of specialized units and institutes: the State Specialized Inspectorate for Analytical Control, the Department for Air Protection, the Department for Control over the Protection and Use of Land and Water Resources and the State Inspectorate for the Protection and Rational Use of Flora and Fauna and Nature Reserves are responsible for prevention, monitoring and detection and for taking action to correct non-compliance with environmental requirements. The most recent unit is the Eco-Energy Science and Implementation Centre, which was established in 2005 to carry out both research and projects on renewable energy. There are fourteen subordinate committees under the central Committee: one in each of the twelve regions, one in the Republic of Karakalpakstan and one in Tashkent City.

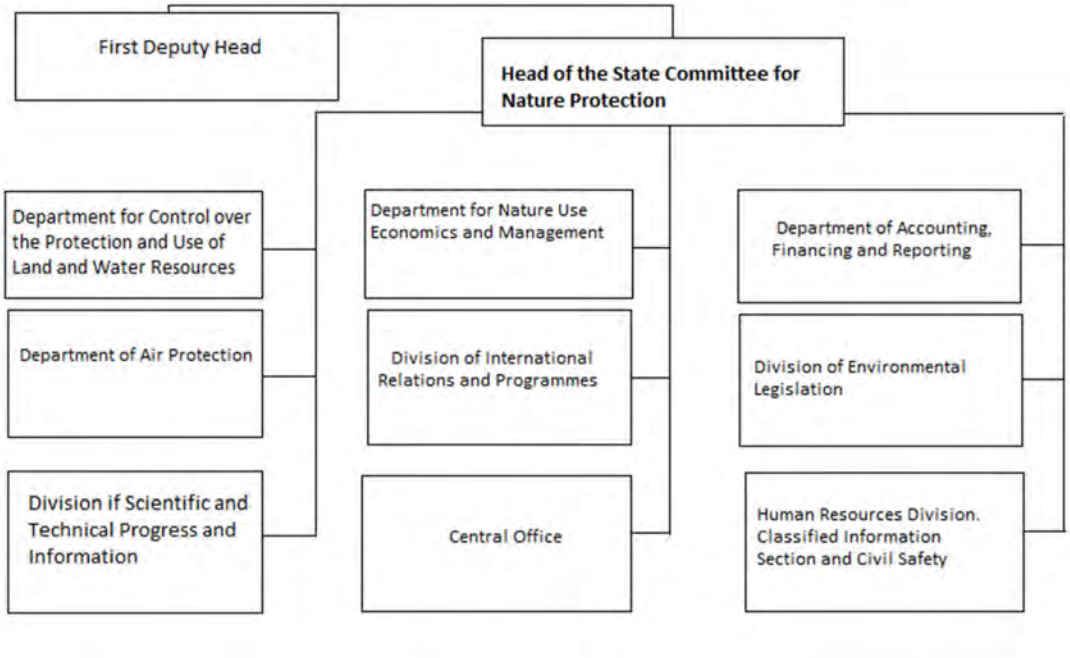

Figure 1 Headquarters of State Committee for Nature Protection

21. Main tasks of State Nature Protection Committee of Uzbekistan are:

- ensuring single policy of state in sphere of environmental safety, nature protection, use and reproduction of natural resources;
- state control over keeping by ministries, state committees, agencies, enterprises, institutions and organizations as well as individual persons the law related to use and protection of lands, bowls, waters, forests, flora and fauna, atmosphere air
- implementation of inter-branch complex management of nature protection activity;

- organization and coordination of works related to provision of favorable condition of environment and environmental sanitation.

22. By the law on “Environmental Expertise,” the SCNP is obliged to pursue the following objectives:

- Manage and monitor compliance with the State’s environmental impact assessment procedures
- Review and approve environmental impact assessments
- Monitor implementation of conditions specified in the environmental impact assessment approval

23. According to the Regulations on State environmental expertise in the Republic of Uzbekistan approved by Cabinet of Ministers’ Decree of the RUz No.491 from 31.12.2001, states that Goskompriroda on state environmental expertise is:

- Head of administration on state environment expertise of Goskompriroda (Glavgosecoexpertise);
- State environment expertise of the Karakalpakistan Republic state committee for nature protection;
- State environment expertise of Province and Tashkent city committee for nature protection.

24. Goskompriroda on state environmental expertise is uniform system of state environmental expertise, methodological guidance of which implemented by Glavgosecoexpertise. Glavgosecoexpertise undertakes the state environmental expertise on below objects:

- Pre-project and project documentations, operating enterprises and other objects effecting negative impact on environment and population health, objects with special legal status (on activities belonging to Category I and II);
- Materials of integrated monitoring of the territory for assigning the status of conserving nature territories, emergency environment situation zone, as well as environmental disaster; (Paragraph in the Cabinet Ministers’ Decree of the RUz No.95 from 01.04.2005);
- Documentation on creation new types of technique, technology, materials, stuffs, productions;
- Programs of State projects, concept, schemes of location and productive forces development in economic and social sectors;
- Town planning documents for object designing with total 50 thousand population;

- Projects of standard technical and instructional and methodological documents (technical specifications, standards, environmental standards, rules, instructions), regulating economic and other activities connected with use of nature resources.

25. State environmental expertise of the Republic of Karakalpakistan, Provinces and Tashkent city implements state environmental expertise upon the below objects:

- Pre-project and project documentations, operating enterprises and other objects effecting negative impact on environment and population health, objects with special legal status (on activities belonging to Category III and IV);
- Town planning documents for object designing with total 50 thousand population and below;
- Project of conserved nature territory management plans. (Paragraph approved in accordance with Cabinet Ministers' Decree of the RUz No.95 from 01.04.2005).

c. Environmental Laws, Regulations and Institutions

26. Legal Framework in the field of Nature Protection and Management established in Uzbekistan, provides to the citizens the rights and duties specified in articles 50 and 55 of the Republic of Uzbekistan (RUz). Uzbekistan has enacted 13 supporting laws and 55 statutes for environmental management, and is party to 13 international and regional environmental agreements and conventions, including: air pollution, biodiversity, climate change, desertification, hazardous wastes, ozone layer protection, trans-boundary water courses, and wetlands (Ramsar Convention).

27. "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.

28. "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.

29. "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.

30. “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.

31. “On protection and use of flora” (1997) – regulates protection and usage of flora growing in natural condition, as well as in cultivation and its reproduction and conservation of gene pool of wild plants. The Cabinet of Ministries of the Republic of Uzbekistan, local 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.

32. The Law "On Protection and Use of Animals", adopted on December 26, 1997, defines the legal relationship aimed at regulating relations in the protection, use, restoration and reproduction of fauna in order to ensure the conditions of its existence, preservation of species diversity, the integrity of natural communities and habitat. The choice of sites for all types of construction, pre-planning, design and project documentation, implementation of which may have impact on the wildlife or its habitat and projects unit hunting and fishing, projects, work on acclimatization and hybridization of animal protection plants, dangerous to wildlife and its habitat is subject to the state environmental assessment

33. “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.

34. “On 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.

35. Law of the Republic of Uzbekistan "On water and water use" from May 6, 1993, regulates the water relations, rational use of water by the population and economy. The law regulates the protection of waters from pollution and depletion, and prevention and liquidation of harmful effects of water, improvement of water bodies and the protection of the rights of enterprises and institutions, organizations and dehkan farms and individuals in the field of water relations.

36. The Land Code came into effect from July 1, 1998 and aims to regulate land relations in order to ensure that present and future generations have science-based, sustainable use and conservation of land, breeding and improvement of soil fertility, conservation and improvement of the environment and creating conditions for equitable development of all forms of management, the protection of individuals and legal entities' right for land, as well as strengthening the rule of law in this area. The law specifies that the system of land use management must be environmental, resource effective and provide for conservation of soil, limiting the impact on flora and fauna, geological resources and other components of the environment. Also, according to the Code, the estimate of negative impact of construction works or implementation of technologies to the state of lands and the effectiveness of measures envisaged for the use and protection of land is based on environmental impact assessment.

37. The law "On Subsoil", adopted on September 23, 1994, aims to ensure sustainable and integrated use of mineral resources to meet the needs of the mineral raw materials and other needs, protection of mineral resources, environment, safety of operations in subsoil use and protection of subsoil users, protecting the interests of individuals, society and state. According to the Law, the monitoring of subsoil, which represents a system of observations of the subsoil to timely detect changes, assess, prevent and redress the negative processes, is established (Article 18). Geological studies are permitted only after obtaining a positive opinion of the state environmental assessment (Article 25). Licenses for construction and operation of underground facilities for the storage and disposal of waste shall be issued by the State Nature Protection Committee of the Republic of Uzbekistan as a result of direct negotiations.

38. The main functioning subordinate legislations, regulatory documents approved by Government of the RUz in nature protection sector and related with the Project are:

- Cabinet of Ministers' Decree No. 491 from 31.12.2001 on "Confirmation of regulation of governmental environmental expertise in the Republic of Uzbekistan";
- 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";
- Cabinet of Ministers' Decree No.293 from 27.07.1995 on "Confirmation of tax for calculation of damage recovery caused on flora of the RUz";
- Cabinet of Ministers' Decree No.139 from 01.04.1998 on "National strategy and measures of the RUz on conservation of biological diversity".

39. Under international cooperation in the field of environment protection, Republic of Uzbekistan signed number of International Conventions, which should be undertaken by State Committee for Nature protection of the RUz. This is:

- Convention on desertification control in those countries which suffers from strong droughts and/or desertification, especially in Africa (Oliy Majlis of the Republic of Uzbekistan ratified in 1995);
- Convention on biodiversity (ratified in 1995);
- Convention on international trade of fauna and flora is being endangered species (ratified in 1997);
- Convention on protection of migrant wild animals (ratified in 1998);
- Convention on wetlands of international significance, mainly inhabitant places of waterfowl birds - Ramsar Convention (Uzbekistan jointed in 2001);
- Agreement on protection of Afro-Euroasian migrant wader birds (signed by RUz in 2003);
- Memorandum on mutual understanding of white crane protection measures (1996);
- Memorandum on mutual understanding of slender-billed curlew protection measures (1994);
- Memorandum on mutual understanding of conservation and rehabilitation the Bukhara deer (*Cervus elaphus bactrianus* Lyd) (2002);
- Memorandum on mutual understanding of conservation, rehabilitation and steady use of antelope (*Saiga tatarica* L.) (2006).

d. Asian Development Bank and International Guidelines

40. The Project will also conform to the following policies, procedures and guidelines of the Asian Development Bank: (i) Safeguard Policy Statement of 2009 (ii) manuals F1/BP of 2010, Safeguard Policy Statement and (iii) F1/OP of 2010 Safeguard Review Process.

41. 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.[3]

[3] Page 1 of the IFC Environmental, Health and Safety Guidelines for Electric Power Transmission and Distribution (2007)

3. Description of the Project

a. Need for the Project

42. Samarkand region does not benefit from own regional generating units, taking power supply from the grid. Closer Power plants are located in Navoi, Talimarjan, Bkhara and Jizzak.

43. The net average yearly consumption of Samarkand Disco for the years 2004-2008 is 2,787 GWh. Consumption shows a low growing rate of 0.5%, despite of the average GDP growth around 8% during 2006-2008, as seen in Figure 2:

Figure 2. Uzbekistan GDP growth during 2006-2008

44. One of the main reasons is the limited system power availability and technical losses of MV-LV distribution lines reaching the regional hubs. As it was analyzed in Talimarjan Power Project, the Demand/Consumption GAP is the following:

GWh	2003	2004	2005	2006	2007	2008
Domestic Consumption	2,279	2,290	2,248	2,441	2,454	2,466
Domestic Demand	2,393	2,405	2,361	2,563	2,577	2,590
Demand/Consumption GAP	5%	5%	5%	5%	5%	5%

45. Domestic demand gap is estimated in 5%. .This situation will improve in the upcoming years with expansion of Navoi and Talimarjan TPPs and achieving full commercial operation of the new Samarqand PV power plant be the year 2016. Therefore, the gap is expected to be fully absorbed by its additional straight generation as it is shown in Figure 3.

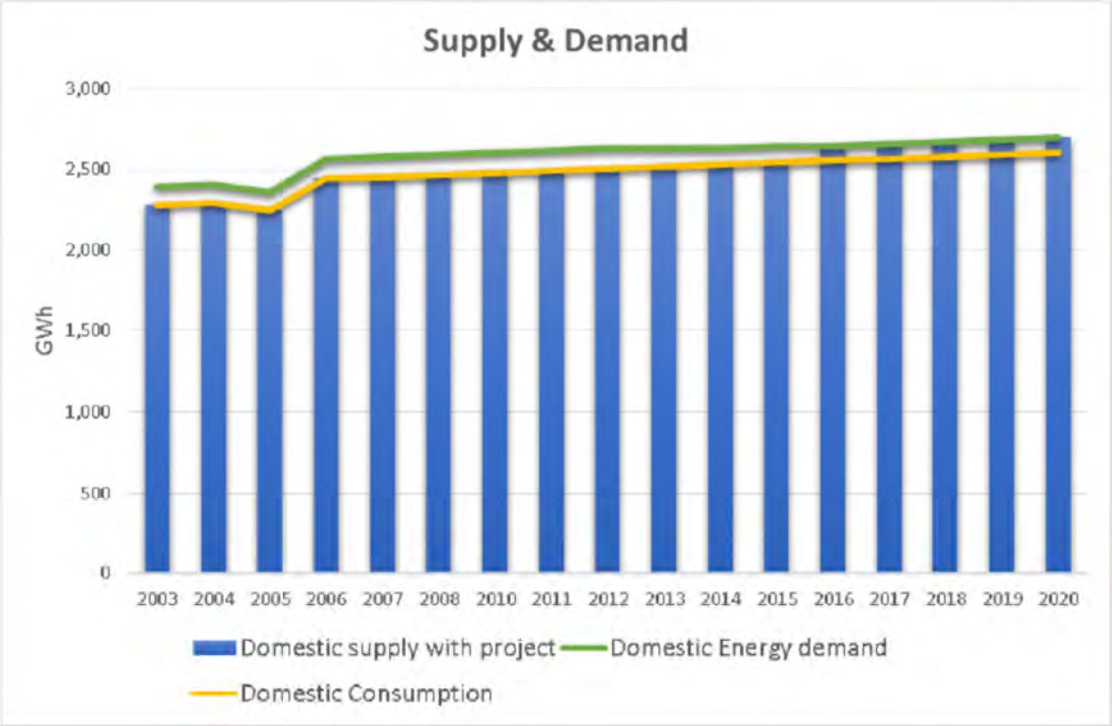

Figure 3. Forecasted energy supply and demand in Samarqand

b. Project Location

36. The Project is located on the territory of Pastdargom district of Samarqand province of RUz. The Project site is located near the highway on route Samarkand-Karshi (Figure 4).

Figure 4. Picture Location of Samarqand PV station.

37. The available site area up to 4000 ha is plane surface. This area is currently used for pasture. The site is located between two streams of dried-up river. The closest residential area is located in 1.5 km from the project site. Distance to the main gas pipeline Mubarek-Tashkent is 2.5 km. There is a neutral zone 500 m wide on each side of the gas pipeline along its length, which is prohibited for use. The distance from the site to Samarkand city is 20 km.

38. The PV power plant will be connected to Chemical Plant Substation 110 kV located 13,7 km away from electrical substation (Figure 5). The distance between project site and existing main road is 13 km. 9 km of road is in the suitable for transportation of heavy equipment conditions. But 4 km of the road is dirt road, which should be upgraded.

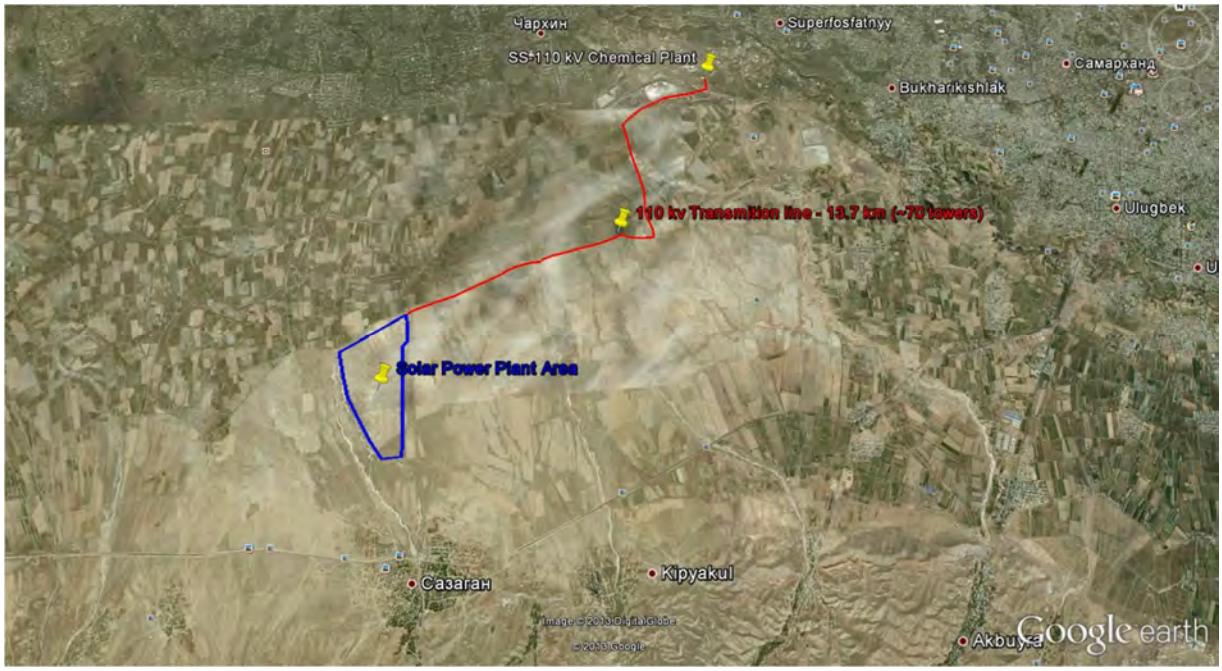

Figure 5. Location of PV station, Substation and highway

c. Project description

40. The Samarqand power plant will have capacity 100 MW and will be based on the crystalline technology. Solar PV module proposal will conform to following

41. ***Electrical requirements***:

- Solar PV module array is composed of high efficiency solar modules of crystalline silicon solar PV cells
- The solar PV module has more than 200 W_p (p means power peak a Standard Test Conditions (STC))
- The PV modules proposed to be used will meet the corresponding IEC PV module qualification test standards: IEC 61215 and IEC 61730 for safety qualification testing.
- PV modules have been guaranteed for output wattage, which should not be less than 90% after 10 years and 80% after 25 years.
- Groups of modules have been combined into independent charging sub-arrays that shall be
    - wired to the controller and disconnection for each of the groups
    - tested for each sub-group for quick fault location
    - provided with group array isolation
    - provided with metal oxide arrestors inside the array junction boxes
- All branches connected to an inverter should be connected to the ground grid field.

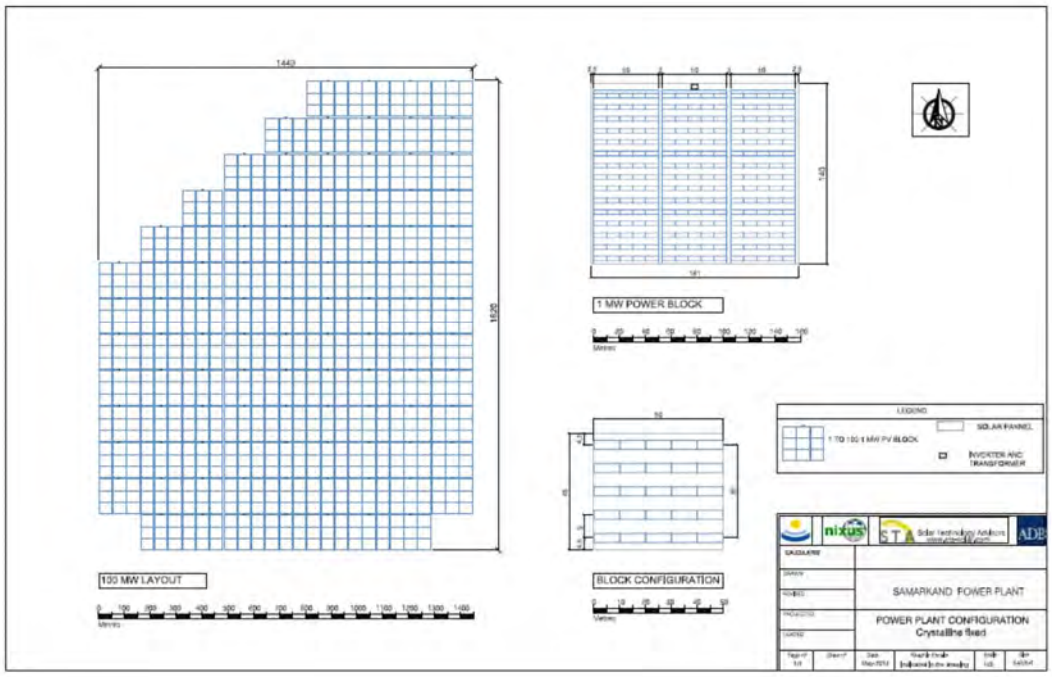

Figure 6. Power Plant Configuration

42. ***Module mounting & tracking structure.*** The modules will be mounted on mobile structures which allow to vary the tilt of the surface of the panel with respect to the horizontal plane by moving in a plane East-West (EW) longitudinal axis of the active surface of the modules at all times coincident with the solar height. The monitoring mechanism is driven by an astronomical and a gear train that drives panels. This optimizes the annual solar energy collection.

43. The field collector is composed of modules and tracking linear collectors are independent, with a span between bearings enough to not produce excessive bending structures.

44. The structural and drive components have been designed to withstand the following requests:

- All support structure design and foundation or fixation mounting arrangements should withstand minimum horizontal wind speed of 200 km/h;
- fitting fixing of clamps, saddles, nut & bolts etc. (all fasteners shall be of Stainless steel);
- the structure shall be designed to allow easy replacement of any module and shall be in line with site requirements;
- Structure have simple mechanical and electrical installation and easy maintenance;
- It shall support PV modules at a given orientation, absorb and transfer the mechanical loads to the ground properly (there shall be no on-site requirement of welding or complex machinery).
- The array structure has been designed that it will occupy minimum space without sacrificing the output from PV panels & shall withstand heavy winds.
- The array structure of the PV yard shall be grounded properly using adequate number of earthling kits and sported all lightning, thunder and earthquakes, which occur in the area.

45. ***Inverter equipment.*** The inverter is a DC to AC, which optimizes the PV generator power and adapts the voltage and phase to allow parallel operation of all of them, permits also:

- solved voltage dips
- High conversion efficiency from 25% load to full rated load. The efficiency of the inverter shall be more than 90% at full load and more than 80% at partial load (50%-75%)
- internal protection arrangement against any sustained fault
- provide input & output isolation
- indicated tripping voltage & start up voltage for the inverters & this should be perfectly.

46. ***Distributed transformation center.*** The generation field is divided into sub-fields, about of 1 MW each, to reach a voltage level intermediate (LV/MV), compound of modular transformation centers distributed throughout the field with:

- High efficiency transformers;
- general protection systems and selective isolation of faults;
- monitoring & measuring equipment;
- control and regulation systems
- Both investors and intermediate transformers are installed inside a shed from which extend three-phase power lines to the building lines of cabinets

47. The booths are equipped armored to withstand an ambient temperature of 45 ° C and the resulting feature firefighting equipment, the case is waterproof. It should be noted that in these houses there both DC and AC, so that teams are prepared to safely remove and quickly such accidents.

48. ***Building of switchgear.*** The 100 outlet lines that come from the field booths, of 1MW each, come into a switchgear per outlet line, through their protection and measurement systems and are interconnected to the medium voltage bars, all equipment within the compartmentalized building, near switch board of the plant. Since the cabin track rods, with their respective switching and protection systems and isolated by means of bars is connected to the terminals of the power transformer 100 MVA medium/high voltage in the outdoor park. The building has firefighting systems, special HVAC systems complete physical and electrical isolation.

49. ***Outdoor park substation.*** The power output of the plant to the interconnection to the aerial line to switchyard is done through an outdoor power substation with a unique 100 MVA transformer protected by a switchgear, and equipment of measurement and control. The substation is protected against short-circuits and surges on the sides, plant and network; against lightning, fire and has a collection of the coolant in case of disturbance.

50. ***Aerial line.*** The solar PV power plant is connected to the switchyard:

- Length 13,7km approximately.
- Three phase with lightning conductor
- Wires with bird protection
- Voltage 110kV
- Power 100 MVA
- LA-280 wire
- Average height 20 m
- Mean distance supports 120 m

51. ***Monitoring and control.*** The PV plant should have the capability of being remotely monitored and controlled. The Control/Office Building will be so designed, constructed and provided with a minimum number of telecommunications equipment, computer hardware and

software and other required site electrical and/or electronic facilities that support remote control and data acquisition. It is desired that standard and non-proprietary communications protocol shall be used and the system should have been able to send, among others, the real-time values of the:

- site solar insolation level horizontal and plan of array;
- site ambient temperature and humidity;
- wind speed and direction;
- incoming DC and outgoing AC kW in each inverter and transformer;
- line voltages at the low voltage AC side of the step up transformer;
- line currents at the high voltage AC side of the step up transformer; and
- total AC generation as viewed.

52. A desktop computer on-site should be able to store at least one month data and events log of the PV system and should be able to communicate with on-site electronic equipment, as well as, with remote computers at the Owner's Central Control Center.

53. ***Water requirements.*** The raw water source of the plant will be the wells allocated on the surrounding area. As a consequence, the design of the water treatment analysis will consider that raw water source has the characteristics of a groundwater source.

54. Main stages of water treatment are the following:

- Preliminary treatment (roughing)
- Filtration.
- Coagulation and Flocculation
- Biologicalal Treatment
- Reverse Osmosis
- Mixed bed treatment.

55. All these treatments may not be required depending on the raw water quality. Due to its source (groundwater), good quality water has been taken into account to develop this document. Further information is required to determine if the water process management is valid or not.

56. Finally, according to the similar water effluent discharge processes in the area, a septic tank or similar is expected to be used. Due to the limited water resources required, this septic tank will gather all the rejections from the water treatments involved, acting as a homogenization pond. The characteristics of this septic tank must be updated in next design steps to come.

57. Water required in the plant is used for two main purposes:

- Human use: Workers inside the plant will have drinkable water availability. In order to get a first estimation of the water required and according to technical model inputs, a total number of 54 workers on a 8-hour turn basis has been considered. According to typical

values (1), 40 liters per worker per day has been selected in the range of 20-60litres/worker/day suggested. This estimation leads to a total requirement of 780m^3/year for human use.

- PV panels cleaning: PV panels reduce its efficiency while dirt is deposited on its surface. To avoid this performance reduction, PV panels will be cleaned on a regular basis. The regular basis selected for the plant is to clean every panel once every two months; leading to 6 times of panel cleaning per year. However, these cleaning requirements must be checked and evaluated in order to get a better estimation of the performance losses during a year and to define the optimum cleaning schedule. Depending on the radiation and the dirt deposition on PV panels it may be stated that the cleaning schedule during different seasons of the year may not be the same.

  According to expert consultations, a value of 0,5l/m2 and cleaning process is selected, leading to an estimation of 2.475m^3/year required for PV panels cleaning. To clean the PV panels, demineralized water must be used in order to avoid harm and performance losses in PV panels.

58. In summary, the required water in the plant is:
    - 780 m^3/year of drinkable water.
    - 2.475 m^3/year of demineralized water. This value can be updated during the first year of plant operation.

59. The total water required in the plant has been calculated in order to satisfy these requirements. The intakes and effluent discharge come as a consequence of these values.

60. ***Water Treatment Process proposed for 100MW PV Samarkand project.***

Raw water supply

61. Inside 100MW PV Samarkand project, one well can be selected so that costs are minimized. However, water table levels must be checked in order to define the total amount of water available during the year and to guarantee water supply.

62. Due to the natural storage included in the wells, no raw water pond has been considered in this stage.

Roughing, filtration and coagulation & flocculation

63. Water analysis must be performed in order to obtain further data about water supply of the plant. However, in this stage, since water analysis is not available, it has been taken into account that groundwater is usually a good quality water source.

64. A general mass balance analysis on raw water supply has been performed. This analysis is a preliminary exercise to get a first estimation of water needs. In order to get a start

point, a concentration of 300ppm of global pollutants has been considered, taking into account that ground water is usually a good quality water source but no further information has been provided. However, final values on raw water can be very different from this estimation.

65. This concentration is estimated; no solid background database has been considered nor found in the bibliography. This estimation must be checked once the water analysis on site location has been performed, and anyway, mass balance must be updated with the raw water analysis to be provided.

66. If the case supposed in the present document is validated through water analysis samples, roughing, filtration and coagulation & flocculation stages can be merged in a simple filtration stage. A 96% performance has been supposed for this stage.

Biological Treatment + Reverse osmosis

67. Another typical characteristic of groundwater sources is that biological treatment is usually not necessary and the same effect can be obtained with reverse osmosis treatment. Typical performance has been settled to 75%.

68. Also water chlorination has been considered after reverse osmosis process. The performance of this process has been taken as a 100%. The objective is to obtain drinkable water to be used by workers in the plant. Also, water storage of 6,5m3 used for 3 day-supply in case of water source interrupt is advisable.

69. Finally, consumption of 2 liters/worker/month has also been considered in drinkable water usage. This includes losses of drinking, cleaning and water spills that cannot be recovered, leading to a total 95% of drinkable water considered as water rejection. This consideration means that 741m3/year must be discharged.

Electrodeionization / Mixed beds

70. Since similar performances are expected, no disambiguation has been done on the technology selection and must be carried out in a posterior analysis.

71. Usually, two stages must be used in order to get pollutant concentrations bellow 1ppm, which is deionized water quality. The performance of this stages is high accounting for a 99,6% and 99,8%.

72. Also, water storage tank of 12m2, similar to a tank truck capacity is advisable to make easier loading process of the washing truck and in case of water source interrupt.

Homogeneisation pond / Septic tank

73. Since the most common disposal system in the area is a septic tank, this septic tank can also act as homogeneisation pond.

74. Expected dumping water amount is not very high (2.027,7 m3/year), but ground permeability and correct septic tank dimensioning must be checked to validate this consideration.

Complete water balance

75. A full diagram of water balance for 100MW PV project in Samarkand is shown below:

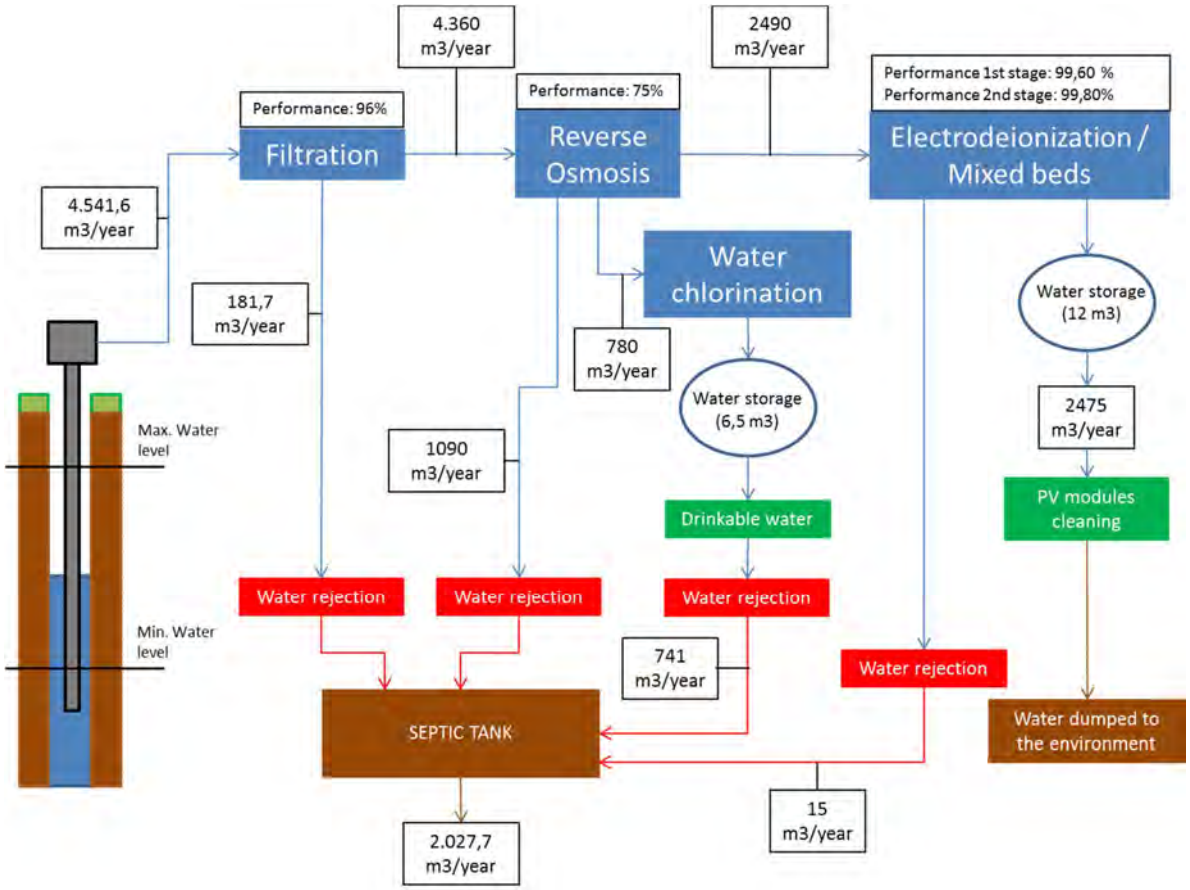

Figure 7. Water balance for proposed 100 MW PV Samarkand project

d. Description of works

76. The project implementation will cover 45 months. Activities planning within construction as presented in Table 1.

Table 1. Project Construction Schedule

Phase	Months
Feasibility	
Prefeasibility Studies, Basic Engineering Permissions	0-6
Procurement	
Detail Engineering, Specifications, Acquisitions	6-9
Construction	
Mark out of areas: collector field, lines and inter-vials; cabins and cells for inverter a transformer BT / MT; high voltage box & control building; substation	9-10
Preparation of access roads and vials and removal of vegetation cover grading	9-10
Running ditches, manholes and pipes registration for laying underground, and foundations cells LV / HV	10-12
Jacking posts and other foundations	11-15
Mounting structures and tracking mechanisms and frame for support modules	12-17
Mounting panels on structures	13-18
General field wiring to LV cells / HV and cells to control building.	15-19
Substation: foundations, ground network for electrical protection; power transformer, signal transformer and switchgear	16-19
Power line: foundations, erection of structures, laying wire	18-20
Overall connection and testing. Commissioning	20-21
Restoration field	21-23

4. Description of the Environment (Baseline Data)

a. Land Use and Forms

78. Samarqand province is located in the western part of Pamir-Alay mountains, in the middle part of Zarafshan river basin. Relief is mainly represented by Zarafshan river basin valley that falls from east (750-800 m) to west (350 m). Hills are located on both north and south sites of the valley.

b. Soil Characteristics

Soil is mainly sierozem (gray) soil. The type of soil depends on attitude. On the flat area and on the foothills up to 500 m the soil is presented by light sierozem, at 1500—1700 m attitude the soil is dark sierozem, in the steppe area - sandy soil, takyr, brown sierozems and alkali soils.

c. Climatic Conditions

79. Samarqand city locates are left branch of Zarafshan river in the central part of the Zarafshan valley. City locates at the 730m attitude (above sea level) on the vast valley with general slope from south-east to north-west and north. Relief of the city is characterized by significant rough terrain. Climate is sharp continental, arid.

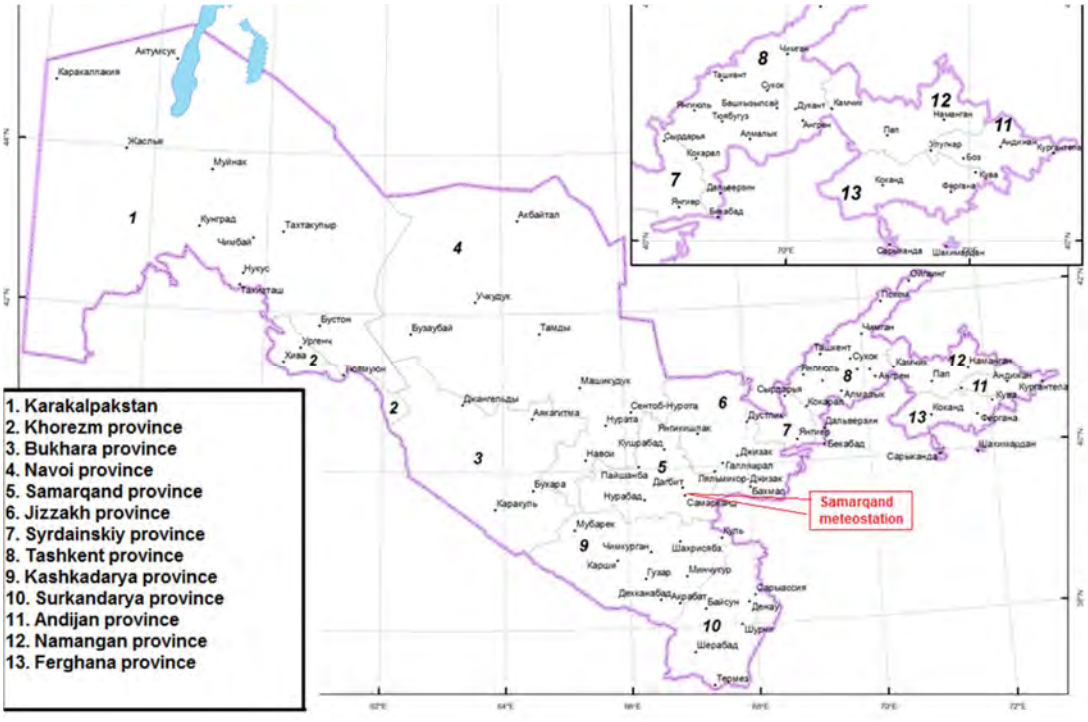

Figure 8. Location of Samarqand meteostation

80. The main meteorological data is provided in table 2.

Table 2. Meteorological data from Samarqand PV station

Annual characteristics	Lon-term	2011	2012
Precipitation (number of days)	108	89	82
Wind speed (m/s)	1.7	1,4	1.3
Repetition of winds with speed 0-1 m/s (%)	51.7	57,7	71.0
Repetition of fogs during cold period (I-III, XI-XII), %	1.0	1.0	1.0

81. Wind east and south-east prevail during a year.

d. Air Quality

82. Eight air pollutants are monitoring at the Samarqand meteo-station. Average and maximum one-time concentrations of pollutants are presented into the Table 2[4].

Table 3. Average and maximum one-time concentrations of pollutants (mg/m3)

Pollutant	2011		2012	
	Average	Maximal one-time	Average	Maximal one-time
SO_2	0,006	0,030	0,004	0,028
CO	1	3	1	3
NO_2	0,01	0,04	0,01	0,06
NO	0,01	0,03	0,01	0,03
Phenol	0,001	0,006	0,001	0,005
Solid fluorides	0,0	0,02	0,0	0,02
HF	0,002	0,009	0,002	0,009
NH_3	0,01	0,05	0,01	0,06

83. In 2012 concentration of all monitored pollutants didn't exceed the allowed concentrations. The integral indicator of atmosphere pollution was equivalent 5 that

[4] Data provided by Uzhydromet, 2012

characterized level of atmosphere pollution as a low[5]. There is a tendency to decreasing air pollution during last 5 years (Table 3).

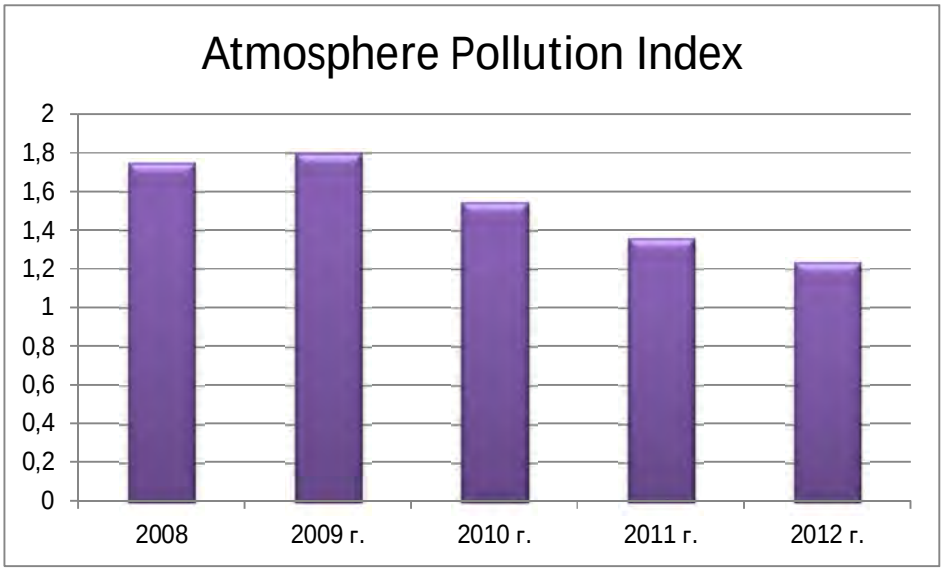

Figure 9. Atmosphere Pollution Index, Samarqand city and surround area

e. Water Quality and Flow

84. Main surface water source of Samarqand province is Zarafshan river. 193 km of river flows through territory of Samarqand province. Water from this river and Dargom. Narpay, Main magistral cannels and Kattakurgan water reservoir are used for irrigation.

85. In Samarkand province significant inflow of pollutants are coming with Siab, Hauzaksay and Taligulyan collectors. MPC in these points are high for oil (1,7 times exceed MPC in point lower Samarqand city), suspended substances (7-4 MPC), iron and nitrites (from 4 up to 6-7 MPC). Main sources of pollution of the river by nitrogen group are untreated sewers of settlements discharged into collectors, then into the river through direct discharges or filtration through ground waters. Discharges of Samarkand, Kattakurgan and Juma cities have a significant role in that because of partly connection to centralized sewage system and ineffective maintenance of sewage treatment plants.

[5]There are 5 indicators of air pollution in national classification based on an air pollution indicator (API). If API ≤1 air quality is as “pure”, and if API≥ 14 – air “is very polluted”

f. Ground Water

86. On the territory of ***Samarkand province*** groundwaters (Karadarya and Damhoja deposits) are located in the area of thinning and by litho-facies conditions of the area, virtually protected from anthropogenic pollution. The territory belongs to the area of agricultural production, where the main source of groundwater contamination are mineral and organic fertilizers, chemical plant protection products (pesticides), discharges of livestock, poultry farms and municipal wastewater. The sources of industrial pollution are emissions and discharges of industrial plants in Samarkand, and numerous waste companies processing agricultural products, motor vehicles.

87. Karadarya and Damhoja part of the deposit are characterized by an increase in groundwater nitrate levels, which in some wells up to 50-304 mg/l. The higher concentrations occur in the period of non-vegetation, lower - coincide with the period of irrigation. This is linked to the cyclical nitrogen fertilization and irrigation regime.

88. In general Samarkand province though noting the nitrogen pollution of ground waters and with other components in some areas, but mainly the quality of groundwater remains at a satisfactory level, the basic operational horizons are not contaminated and are used for drinking purposes in urban and rural settlements.

g. Biological Components

89. The territory within Samarkand province of Uzbekistan includes a fairly wide variety of landscapes with characteristic types of ecosystems. The development of irrigation and drainage has led to the formation of artificial water reservoirs and irrigation discharge lakes (IDL) in natural depressions in the landscape, which eventually acquired a certain social and environmental status, provides well-known environmental (maintenance of biodiversity) and social services (irrigation, drinking water, recreation, hunting, fishing, etc.). All these natural and man-made landscape complexes are home to various representatives of flora fauna, including endangered species listed in Red Book of Uzbekistan and the IUCN lists. The forest area in the Samarkand region constitutes 1.78%,

90. Samarkand Province the largest area is occupied by mountain forests. The main forest-forming species of sand-desert zones are saxauls - (Haloxylon) black (H. aphyllum) and white (H. persicum). Also widespread are saltworts (Salsola) of two types - Richter saltwart (S. Richteri) and Paletzkin saltwort (S. Paletzkiana), kandym (Calligonum sp.), and brushwood of tamarisk (Tamarix sp.).

91. In the Zarafshan nature reserve, located in the floodplain of Zarafshan river, there are over 300 plant species, 206 bird species, 24 species of mammals, 10 species of reptiles, ponds, canals and streams recorded 18 species of fish, 26 species of molluscs. Here, there are species of plants and animals listed in the Red Book of IUCN and Republic of Uzbekistan: 2 species of plants – the Korolkov saffron and Kesselring crocus, 2 species of fish - Turkestan barbel and

Aral studding (IUCN), 2 species of mollusks - edentates Sogdian and basket river, more than two dozen birds, including Pygmy Cormorant (IUCN), two kinds of stork, spoonbill, glossy ibis, mute swan, white-eyed Duck (IUCN), osprey, wild hawk (IUCN), imperial eagle (IUCN), the white-tailed eagle, golden eagle, bearded vulture, black vulture (IUCN), the griffon, Zarafshan pheasant and others. The number of rare and endangered species is 32.

Table 4. Protected natural territories in the Samarqand province

Name, year of organization, governing body	Location		Area, thousand Ha	The document on the organization
	Administrative	Geographic		
State Nature Reserves (conforming to IUCN category – Ia)				
Zarafshan, MAWR, 1975	Samarkand province, Jambay district	Floodplain of Zeravshan river	2 352	Decree №264 of CM UzSSR, 11.05.1975
Sanctuaries (conforming to IUCN category – IV) Areas for preservation, reproduction and restoration of certain natural objects & complexes				
Aktau, SNPC, 1992, 1997	Samarkand province	Pamir-Alai, mountain range Aktau	15,42	Decree #113-K Navoi Province khokimiyat, 21.04.1997
Karnabchul, SNPC, 1992, 1998	Samarkand province	South Kyzyl-Kum	40,0	Decree #86-К Samarkand Province khokimiyat, 08.07.1992
Koshrabat State Nature Protection Committee,1992, 1998	Samarkand province	Pamir-Alai, mountain range Aktau	16,3	Decree #86-К Samarkand Province khokimiyat, 08.07.1992
Protected Landscapes (conforming to IUCN category – V)				
Water protection zones and coastal strips				
Zaravshan river MAWR, 2002	Samarkand province	Zaravshan basin	33,499	-
Groundwater formation zones				
Modern Zarashan river basin MAWR, 2002	Samarkand province	Zaravshan basin	47,467	-
Territories for management of selected natural resources (conforming to IUCN category – VI) Forestry entities				
7 forestry entities	Samarkand	-	27.227	-

MAWR	province			

Figure 10. Location of Zarafshan reserve

92. Zarafshan reserve locates in the southeast part of Samarqand province, at 15 km away from Samarqand city and lies along the right branch of Zarafshan up to the stream till "Pervomayskaya" dam. The reserve territory is represented by two different sites (up stream part and down stream part). Total area of reservation is 2352 ha.

93. Although reservation has small size, there is a wide biodiversity on the territory of Zarafshan reservation. Biodiversity of reservation is presented by: mammal – 24 types, birds – 218 types, reptiles – 10, amphibian– 2, fishes – 18 types, invertebrate about 150 types, plants – more than 300 types. From them 2 types of mammals, 26 types of birds, 2 types of fish, included into the International and National Red Book.

h. Social, Cultural and Economic Environment

Population Distribution and Demographic Profile

94. The Samarkand province is located in the central part of Uzbekistan and the province consists of 14 rural districts -Okdaryo, Bulunghur, Jomboy, Ishtikhon, Kattakurgbon, Koshrabot, Narpay, Nurobod, Payarik, Pastdarghom, Pakbtacbi, Samarkand, Toilok, Urgut; 11 towns - Oklosh, Bulunghur, Jomboy, Juma, Ishtikhon, Kattakurghon, Nurobod, Payarik, Samarkand, Urgut, Chelak; as well as 12 town- type-settlements and 125 villages. City of Samarkand is the administrative center of the province.

95. Population of Samarqand province is more than 3 mln 299 thousand people. Population of Samarqand district is 214900 people[6]. According to the data provided by statistics agencies, as of 1 January 2011 the population density in Samarkand district was 150 people/km2. Population of Samarkand district is living in 40 684 households. The data available from Mahalla committees suggests that the total number of families were 53 628 in 2011. Thus, making the average size of a household as 5.3 persons, and the average size of the family is – 4 persons[7].

Economic Activities:

96. The economy of the province is based on well-established agriculture and industry. Heavy industry, mining, machinery, metal reprocessing, chemical and construction are the major production activities. Light industry is represented by cotton cleaning, sewing, textile and footwear enterprises. For many centuries Samarkand has been famous for its silk products. The silk processing and sewing factories are provided with local raw materials. The city is also famous for its grape products, as well.

97. Province has the best quality livestock, most particularly karakul sheep breeding. The province has a well-developed transportation network of highways and railroads, water and gas pipelines, as well as electricity lines. Almost all the major cities have access to the railroad network. The city of Samarkand is a major point on this railroad network.

98. The total length of the railroad network is 277 km. The length of automobile roads is 8,000 km. Samarkand is linked via air routes with a number of major cities throughout the nation. More than 1000 schools, gymnasiums, lyceums, musical and sporting schools, a university, four institutes and a number of colleges operate in the province. There are 4 theaters, 8 museums, and more than 800 libraries.

[6] Samarkand Province Khokimiyat Department of Statistics and Makhalla Committee as of 1 January 2011
[7] PSA, Samarqand PV Solar Project 100 MW.

Cultural and Heritage Sites

99. Samarkand is the second largest city in Uzbekistan after Tashkent in size, industrial importance and population. It is a favorite tourist destination, located on the left bank of the Zarafshon River. The city is almost on the geometrical center of the country, on the crossroads of its automobile and airline routes, a very important factor for development.

100. Famous architectural ensembles of the city are the Registan Square, which consists of three madrasah: Ulugbek, Sherdor and Tillakori; the Shokhi Zinda tombstone, which consists of 11 mausoleums; the marvelous Bibi-Khonim Mosque. The most famous building in the city is the Guri Amir , the tombstone of the great Amir Temur and his descendants. It is one of the best examples of eastern architecture of Middle Ages. The famous Ulugbek observatory is located in the northeastern part of the city. Great statesman and scientist, Mirzo Ulugbek, built it in 1428-29. The lifeless hills not far from this place are the ruins of the great city of Afrosiyob, an ancient architectural city built before Arab conquest.

101. 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.

5. Anticipated Environmental Impacts and Mitigation Measures

102. The Project's impact takes place during the preconstruction, construction, operation and maintenance and abandonment.

a. Pre-construction Stage

i. Soil exploration

102. At the pre-construction stage soil exploration works should be conducted to assess suitability of proposed site for construction PV plant. The soil exploration team will drill around 450 holes and remove soil samples for analysis in the laboratory. The impact of this activity on the environment is very minor. No mitigating measure is proposed.

103. However, 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. 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, such as snakes or spiders.

ii. Land Acquisition

104. New PV plant will be constructed on 200 ha of land. The site locates on the territory of Pastargom district of Samarqand province. This is agriculture land mostly used for dry farming and pasture. Due to lack of surface water the productivity of this land is low and land mostly is used as pasture.

105. Based on Presidential Decree of RUz dated 3 March 2013 "On further development of renewable energy sources", the resolution of Samarqand Province hokimiyat was enacted in June of 2013 by transferring 224 ha of land from agricultural type to non-agricultural for construction PV plant. Labor camp, construction materials storage places will be located on the territory of acquired land.

106. Construction of access road, transmission line will be implemented by Uzbekenergo. Temporary and permanent land acquisition procedure needed for construction of transmission line and road will be implemented in accordance with appropriate national legislation.

b. Construction Stage

107. Preparation of access roads and vials and removal of vegetation cover grading will be done to suit land for final use of Power Plant. Land preparation includes remove vegetal layer because it is not suitable for constructing foundations. Burning or using chemicals for vegetation removal are prohibited.

108. To construct PV panel soil leveling will be required. Removed during soil leveling top soil will be disposed at the place, indicated by local hokimiyat or could be used for landscaping on the surround territory.

109. Before foundation of PV Panels, underground installations shall be prepared. Cables are installed on ditches for avoiding external problems with unexpected situations. To put underground installations earth works will be conducted.

110. 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. 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.

111. The main environmental concerns during construction are noise, dust, and air pollutant emission from the construction equipment and earth moving. Some construction activities such as pile driving will generate noise levels higher than the IFC noise standards for industrial areas of 70 dBA. The table below shows the levels of sound pressure generated by the equipment during the works, which are measured at a distance of 1 m from the emission source, correlated with the equipment utilization factors. This data was obtained from measurements performed during works of similar intensity, with variations of ± 3 dB(A).

Equipment	Maximum level of noise	Utilisation factor
Air compressor	98 dB(A)	0.4
Concrete mixer	97 dB(A)	0.4
Concrete pump	100 dB(A)	0.4
Concrete vibrator	99 dB(A)	0.1
Crane	91 dB(A)	0.12
Crawler tractor	98 dB(A)	0.16
Generator	100 dB(A)	0.4
Grader	105 dB(A)	0.05
Drilling machine	102 dB(A)	0.1
Loader	92 dB(A)	0.16
Pneumatic tool	99 dB(A)	0.04
Pump	100 dB(A)	0.4
Saw	98 dB(A)	0.1
Truck	90 dB(A)	0.3
Excavator	97 dB(A)	0.2
Welding machine	90 dB(A)	0.3

Table 5. Levels of sound pressure generated by construction equipment

112. 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 construction activities could comply with the IFC level of 70 dBA in industrial and commercial areas. However for analysis consideration the nearest house is used: the nearest residential area is 00 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.

113. 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. Although there are no sensitive receptors at the surround area such as hospital, school and etc., the contractor will be required to conduct all noisy works during a daytime.

114. 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. 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 ambient 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.

115. Even the project site locates on remote distance from historical and cultural heritage places, all workers will be trained on procedure in case of discovering any finds during the earthworks.

116. During the construction phase, an increase of suspended matter in the surface water Progress canal close to the work area might occur. This impact would be caused by the drift of fine particles and particulate matter from the bare surfaces which are likely to experience washouts and landslides by run-off water from rain, determining an increase in water turbidity. 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.

117. Wastewater generated on 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.

118. Flora and fauna of project site represented by scant site is an irrigated farmland with very low productivity due to lack of irrigation water. Construction of PV plant will not require cutting of trees or dislocation of wildlife life. The animal species affected by the Project are those common to the steppe ecosystem. The land will have to be reclassified for industrial use. The Project will not require any removal of trees

119. In terms of personnel safety and health, 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.

120. The construction of the Samarqand PV station will generate employment opportunities in the area. It's planning that around 100 workers will work on construction site.

c. Operation stage

121. No any significant impact on environmental are expecting during the operation phase. PV station will not produce any air pollution, noise, solid wastes. Insignificant amount of wastewater generating during cleaning of panels will be discharged on the surface. Taking in account ground water table (deeper than 50 m) and amount of using for cleaning water, increasing of water table and occurrence of related soil salinization issues are not expected. The main impact will be related with generating solid wastes and wastewaters from personnel (around 50 workers) maintaining Solar Plant. Generated waste water will be disposed in the septic tank, solid wastes will be disposed on a municipal landfill.

122. Operation of Samarqand PV plant will contribute decreasing of CO_2 emission in atmosphere, at the same time it will improve power supply of Samarqand province. Thus Samarqand PV plant will contribute reduction of Green House effect.

123. Samarqand PV plant will be the first solar plant in Uzbekistan. New design and view of plant itself could attract attention of the tourists that will contribute grow of income from tourist sector in province budget.

d. Emergency and Accident Assessment

124. An Emergency Preparation Plan (EPP) must be developed during Detailed Engineering phase.

125. In this EPP, at least, following risks must be considered:

- Fire
- Earthquakes
- Hurricanes (high wind speeds)
- Flooding
- Terrorism

126. Usually, EPP defines different procedures of how to act and to evacuate and protect personnel from a identified risk. Whenever an emergency situation takes place within the plant, the alarm sounds with a previously defined code. This code allows workers to know which kind of emergency has taken place so that they can follow the procedure described in the EPP. Evacuation areas and paths must also defined, as well as meeting points in order to assure that all the personnel has been evacuated.

127. Most of accidents associated to PV Power Plants are related to electrical shock. Also is possible to have burns and cuts but it is less normal. Prevention is associated to correct use of protection during operation and maintenance.

128. Risks associated to jobs on PV Plants:

- Worker does not follow safety standards:
  - Worker does fail during electrical disconnection of the equipment.
  - Worker does not lock electrical equipment properly.
  - Worker uses equipment in poor condition or without proper maintenance.
  - Worker uses poor protection (or not).
  - Worker does not use personal protection equipment (PPE).
  - Equipment has a lack of grounding.
  - Equipment has an absence of signaling.
  - Worker's position with respect to the equipment is unsafe.
- Worker acts improperly.
  - Irresponsible use of the tools.

    - Distractions.
    - Ignorance.
    - Errors.
    - Games, jokes.
- Other people act improperly.
    - Periodic reviews unfulfilled
    - Incorrect surveillance
    - Repairs incorrect
    - Defects (or absence) of protective equipment
- Defects on service elements.
    - The insulation is in poor condition.
    - The coatings are defective.
    - The plugs are not in good condition.
    - Grounding is broken or defective.
- Defects in facilities.
    - Protections malfunction.
    - Failure to identify the circuit.
    - Incorrect schemes.
    - Proximity of airlines: Circulation with vehicles, use of cranes, using tools and materials.
    - Unmarked underground lines: Contacts to drill or dig.

6. Analysis of Alternatives

a. No Project Alternative:

129. As solar PV power project is first of its kind in the country and only other alternatives, which are feasible for generating equal amount of power would be either a coal based or gas based thermal power plant with all their attendant resource depleting and environmental stress contributing attributes. From renewable stand point only other alternative could be wind power which has no significant potential in this region.

b. Alternatives

Location of project site

130. Two options have been considered for location of the project. First location considered area in Samarqand district close to existing sub-station and road.

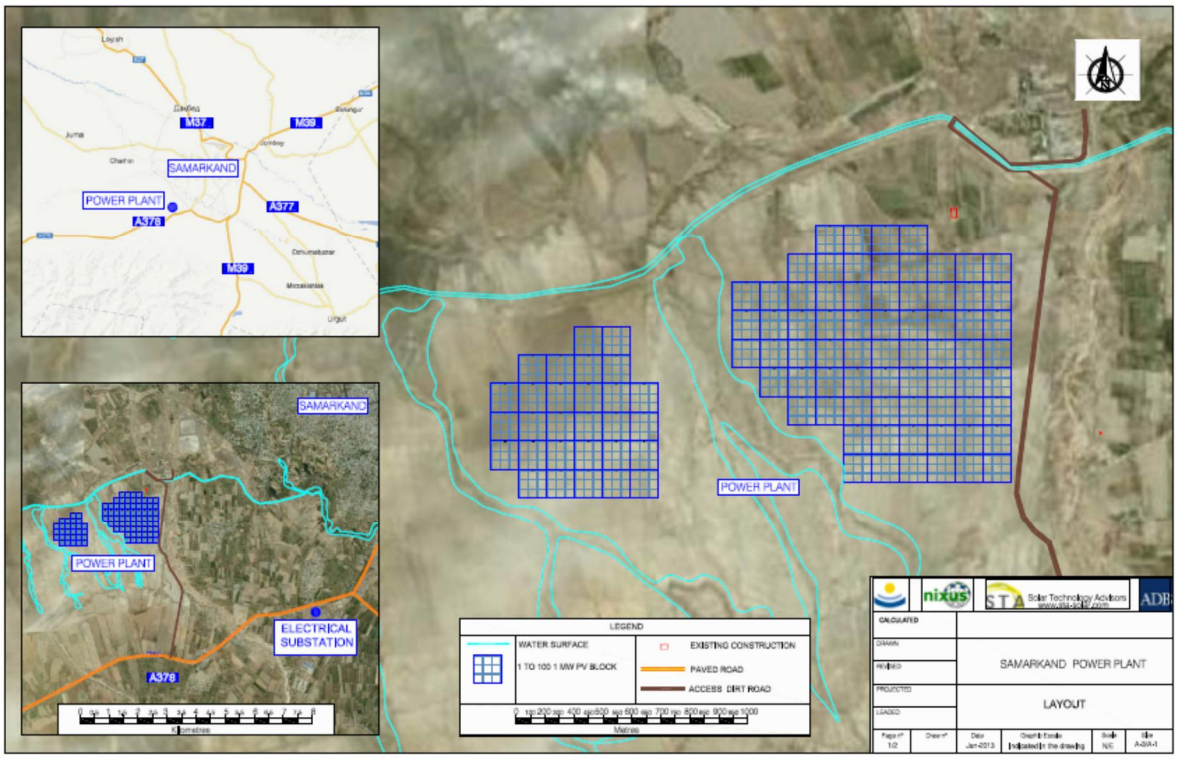

Figure 11. Samarkand PV station

Technology alternatives

131. For the implementation of a solar photovoltaic interconnection network, a high insolation site (resource higher than 1,500 kWh/m^{2}year) is required along with physical space (between 3 and 10 hectares/MW) with regular geometry and simple topography. However, different features have to be taken into account to select the optimum location:

- Soft terrain
- Indigenous people reallocation
- Interference with other uses
- Indigenous vegetation and wildlife
- Proximity to the transmission grid
- Proximity of a consumption hub
- Vehicle access
- Water availability.

132. A balanced selection of these parameters has allowed to choose the site of the SPVPP.

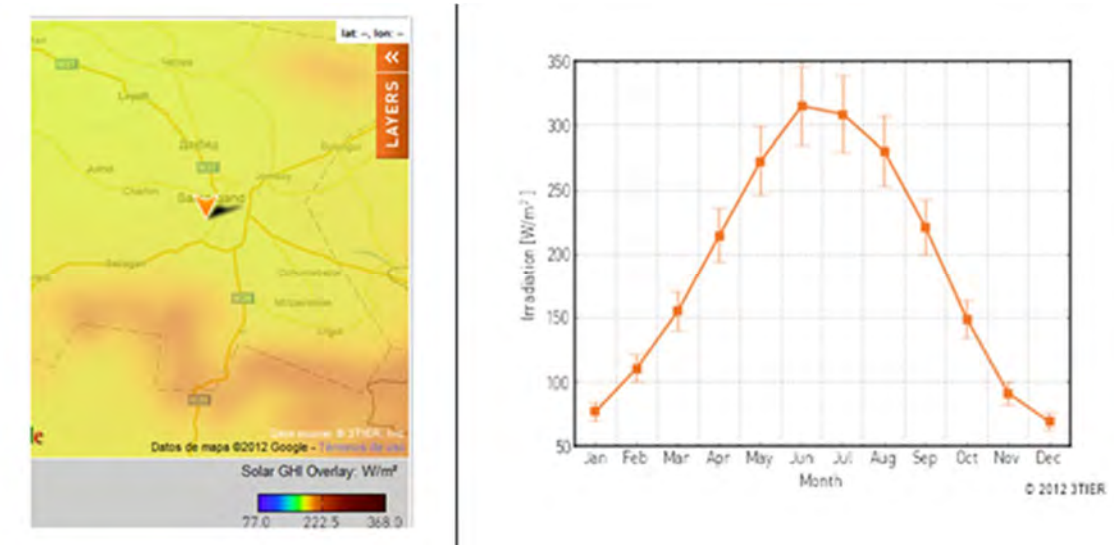

Figure 12. GHI monthly distribution. 3TIER

Month	Meteonorm	3 Tier	NASA
Jan	75	78	84
Feb	113	114	124
Mar	145	166	166
Apr	220	223	225
May	275	270	278
Jun	317	306	307
Jul	308	305	284
Aug	278	285	255
Sept	229	228	212
Oct	155	156	157
Nov	95	93	105
Dec	68	42	76
Year	190	189	190
kWh/m^{2}year	**1664**	**1653**	**1661**

Table 6. GHI data for Site 1. Meteonorm, 3Tier, NASA

133. From these parameters and the surrounding environment conditions, the plant can be designed based in a combination of different solutions. The electricity generated by the panels is of low voltage and Direct Current (DC) – it has to be inverted to Alternating Current (AC) and its magnitudes risen. This operation is performed by power inverters of medium or high size, allowing the interconnection of different groups into the bars. After two steps of transformation (6.6kV to 20kV and 20kV to 132 kV) the electricity is marshalled by a substation that controls and protects both sides. From here and through a three phasic power line of 13,7 km length, the power plant is connected to the substation located at territory of chemical plant in A-378 near km 9.

134. The panels may be of different types: crystalline silicon (monocrystalline or polycrystalline) using semiconductor wafers of 150 microns, doped (phosphorus and boron) and interconnected between them, or thin film technology (amorphous silicon, CdTe, CIGS) and various dopants. All these alternatives determine different utilization rates of land, energy produced per unit of land area.

Technology	Fixed	One Axis	Two Axes
Crystalline	100%	100%	100%
Collection Loss (PV Array)	15.1%	14.4%	14.9%
System Loss (Cable, Inverter, etc.)	5.4%	5.1%	5.0%
Produced useful energy (inverter output)	79.5%	80.5%	80.1%
Thin Film	100%	100%	
Collection Loss (PV Array)	16.7%	15.7%	
System Loss (Cable, Inverter, etc.)	2.2%	2.1%	
Produced useful energy (inverter output)	81.1%	82.1%	
Relative Efficiency (referred to Crystalline fixed)			
Technology	**Fixed**	**One Axis**	**Two Axes**
Crystalline	100%	125.8%	137.5%
Thin Film	102.3%	128.8%	-

Table 7. Assembling efficiencies according to tracking systems and technologies

Polycristalline			
	Confidence Interval (-)	Average	Confidence Interval (+)
Fixed	1444	1455	1466
1 Axis	1813	1861	1908
2 Axis	2007	2008	2008
Thin Film			
	Confidence Interval (-)	Average	Confidence Interval (+)
Fixed	1470	1483	1496
1 Axis	1852	1895	1938
2 Axes	2020	2037	2054

Table 8. Annual energy produced (kWh/kWp)

7. Information Disclosure, Consultation, and Participation

135. Public consultations have been conducted to inform stakeholders on the construction of Samarqand PV plant. Issues on location of PV station, existing environmental conditions, water availability have been discussed with representatives of Province and national level of

State Nature Committee, makhallas, local khokimiyat, hydrogeology . Official public consultation was hold in May 31, 2013.

136. During the two days (May 29 and 30) the advertisement on conducting public consultations have been announced through local media – local TV canal and radio station.

137. Official public consultation has been conducted at the Samarqand city in administrative building of local branch of “Uzbekenergo” south-west magistral networks on May 31, 2013. Minutes of public consultation, presentation given by consultants during PC and photo report are presented in annex 3.

138. The main question raised by participants during the Public consultation covered the following issues:

- General information about soar energy, constancy of its production, project input in energy supply of the districts located close to the project site;
- Economical benefits from this project, a payback period of station and a price of energy producing by station;
- Participants concerned about quality of roads that are going to be used for transportation technics during constructions site.
- Participants are interested in possibility of installation of the solar panels for individuals houses

139. This apart during the construction and operation stage of the plant the project will display vital information about the project in the local language for the knowledge and understanding of the local communities.

8. Grievance Redress Mechanism

140. Should there be any grievance for the Local people especially regarding any adverse and material harm caused by the Project either during construction or operation stage of the project, they can approach Uzbekenergo office or local administration. Uzbekenergo will address the problem as soon as possible after receiving the complaint. Uzbekenergo will depute a designated officer who is responsible for obtaining the information from the complainant to identify source of problem and verify the complaint. Once verification is carried out that the problem is due to activities of the solar power plant then he/she will initiate corrective actions to address the problem and the same will be recorded and updated to Uzbekenergo.

9. Environmental Management Plan

116. As discussed earlier the proposed solar PV power project is environmentally benign and there is no scope of significant environmental concerns that can arise both during construction and operation stage of the project. At the end of life of the project which is estimated to be 25 years post operation environmental concerns can be significant in terms of disposal of discarded panels, interverter and other electrical equipment. Hence during operation stage of the project especially after 2 decades an environmental action plan need to be prepared for addressing eventual dismantling of the plant. There are possibilities of breakage of panels during operation stage, which need to give to any dealer or waste handler authorized by environmental regulatory authorities. One of the feasible means of ensuring environmental management during construction and operation is to create standard operating procedures addressing safety and environmental concerns and ensuring that they are adhered by all personnel and monitored by project engineer. It is recommended that the project should apply for environmental accreditation through ISO14001 certification.

117. It is advised that during construction phase the contractor has to be contractually mandated to minimize transient environmental disturbances, using known conventional methods such as water spraying to minimize dust, the imposition of speed limits on vehicles in the project site, the provision of an adequate number of bathrooms and toilets for construction workers, the proper management of domestic wastes (particularly the disposal of food wastes), and the imposition of sanitation and work safety rules and regulations. The designated project manager need to closely monitor the compliance with the environmental and safety clauses of the contracts. The ambient air and noise levels in the nearest communities should also be monitored on a monthly basis during construction phase of the project. .

10. Conclusion and Recommendation

118. The site identified for siting of the proposed solar PV power plant is not actively cultivated and while designated as agricultural land it is used primarily as grazing land since it is infertile. As discussed earlier there are no environmental sensitivities with respect to flora or fauna in the area surrounding the project site and also there are no historical monuments or sensitive establishments like school or hospital in the vicinity of the plant site. Since the project is a environmentally sound technology option for power generation coupled with location specifications of the site it can be assumed that the project will not cause any significant environmental impacts. There are possibilities of minor and transient environmental disturbances during construction and operation phase of the project, which can be easily addressed as discussed in the earlier sections of this report. Hence it can be recommended that the project should be considered environmentally feasible. It is concluded that the project has no further environmental issues to follow up, and the adequate measures listed in earlier section, when implemented, will fully comply with ADB's Safeguard Policy Statement (2009).

Table 9. Environmental Management Plan for Samarqand Solar Power Plant

The proposed plan needs to be reviewed and detailed by the Contractor after detail project design will be developed

ACTIVITIES	IMPACTS	MITIGATING MEASURES	MONITORING /DOCUMENTATION	RESPONSIBLE PARTIES	COST
PRE CONSTRUCTION					
1. Soil exploration	• Trimming of shrubs, drilling holes on the ground • Occupation Hazards, accidents	• Soil sample is very small not mitigation measures needed • Provide PPE, training and supervision	• Team report and log book, field inspection	• Survey Party supervisor	
2. Land Acquisition	• Temporary and Permanent Removal of the land from the land owners and its uses	• Proper appraisal of loss income and timely compensation • On the job training for local personnel that could be hired by the project	• Land acquisition and resettlement plan	•	
CONSTRUCTION					
3. Removal of vegetation	• Removal of vegetation through using chemical could lead to land contamination and die of inhabitants.	• Using of chemicals and burn vegetation is prohibited.	• Team report and log book, field inspection, visual observation	• Contractors, Supervision Engineer	
4. Soil leveling, excavation and pilling works	• Loss of topsoil • Increase air pollution from Suspended Particulates from soil carried and left on the road by trucks used in construction • Grease and oil from leaks and spillage affecting the water quality • Noise from heavy equipment especially during piling operation • Increase air pollutants such as PM2.5, sulfur dioxide, nitrogen oxides from heavy trucks • Items of archaeological or cultural significance accidentally discovered during earth moving and construction	• Removed soil will be disposed at the area, indicated by khokimiyat or will be used for landscaping surround area • Compact and cover excavated material stock pile especially during the rainy season • 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 • 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 • Noisy equipment and activity such as piling should be done only at day time and if	• Agreement between Contractor and local Khokimiyat, team report. • Construction log book, minutes of the construction meeting, and the project engineer/consultant periodic reports to the EA and the Bank • 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 • Complains logbook	• Project Engineer and Contractor	

		it is not possible prior notice should be given to the neighboring areas • All equipment used must comply with the Uzbek emission laws • Provide personnel involved in earth moving and excavation one or two hour seminar on protocol to follow if items of possible cultural significance is discovered. Coordinate with local archeological authorities. In the meantime activities where the item is discovered is cordoned and construction acivities suspended until the experts from archaeological department has given its opinion or procedure on how to proceed with the work			
5. Delivering and installing equipment	• Increase traffic congestion in the construction area especially heavy equipment are delivered and installed • Noise from heavy equipment e	• Coordination with the local authorities to reroute traffic, put necessary sign on the road, assignment of special personnel to direct the traffic if requested	• Construction log book, minutes of the construction meeting, and the project engineer/consultant periodic reports to the EA and the Bank • Complains logbook	• Project Engineer and Contractor	
6. Life activity of workers	• Generating solid wastes and waste water from workers life activity	• Solid wastes will be disposed on the municipal landfill, waste water will collected into the septic tanks	• Construction log book, the project engineer/consultant periodic reports to the EA and the Bank •	• Project Engineer and Contractor	
7.	• Accidents, hazards and other work areas related concerns	• PPE , first aid kit, and alarm system should be provided and used in the construction activity. • Workers should be properly briefed on proper work conduct, chain of command and responsibilities, and action to take during an emergency. • Key personnel will be trained on first aid. Periodic drills will be carried out.	• Construction log book and periodic report of the project engineer to EA and the Bank	• Project Engineer and Contracto	
OPERATION					
8.	• Wildlife, particularly birds, may be	• Low reflectance and low heat-	• Attention during	• Project	

	affected by the enhanced reflectivity and light in the project site causing temporary blindness, disorientation, and disrupted predator-prey dynamics	generating panels will be utilized to minimize impact on local wildlife.	procurement of services of EPC or suppliers of equipment	head	
9.	Domestic effluent that will be discharged from the administrative building may pollute the nearby water body.	Effluent will be treated by a conventional septic tank system prior to discharge.	• Periodic monitoring for leakages if any	• Project Engineer	
10.	Potentially hazardous or toxic wastes may be generated during the operations phase. These include used petroleum, industrial fluids such as lubricants and paints, and damaged PV panels that can potentially contaminate the environment.	Damaged PV panels will be collected by the PV supplier as part of their services for reuse as solar modules or as a different product. Industrial fluids and petroleum spills will be cleaned with spill kits which also details the management plan for the proper cleanup, collection, transport and offsite disposal of wastes. These wastes can be disposed to an off-site facility through accredited third party contractors.	• Documentation and recording of damaged, replaced PV panels and agency to which it has been given	• Plant head	
11.	The Solar power plant has the potential for tourism, and therefore may attract local residents and outsiders to visit the facility.	Serves as a positive education tool for large consumers for encouraging them to use solar appliances	• Communication material and displays	• Public relations incharge	

APPENDIX 1. PRESIDENTIAL DECREE OF THE REPUBLIC OF UZBEKISTAN

ON MEASURES TO FURTHER PROMOTE THE DEVELOPMENT OF ALTERNATIVE ENERGY SOURCES

(Compendium of Laws of the Republic of Uzbekistan, 2013, No., Art. 124)

It is to be emphasized that economically developed and developing countries are rapidly developing alternative energy sources for practical use of as the most important factor for sustainable development and competitiveness of economies in the context of dwindling global hydrocarbon resources.

Uzbekistan has accumulated a wealth of experience in scientific and experimental research pertaining to application of alternative energy sources, especially solar energy, whereby developments in this area have been elaborated for decades. The country has created an unparalleled Scientific Experimental Center in Central Asia – SPA “Physics-Sun” under the Academy of Sciences, research findings of which have gained worldwide recognition.

The most intensive and efficient research and development relate to the creation of low-capacity installations for hot water supply and space heating, photovoltaic and thermodynamic transformations to generate electricity, solar energy technologies used in order to synthesize special materials and subject materials and structures to heat treatment.

Findings of ongoing studies are widely applied, in an experimental manner, across various sectors of the economy in the country. For more than ten years, the country has been producing and piloting hot water supply systems for residential houses and public facilities based on solar water heating systems. Solar water heaters are installed in the city of Tashkent, Samarkand Province and in regions to ensure hot water supply. Production of photovoltaic devices of various capacities has been put in place. Many universities and professional colleges are training of skilled personnel for this field.

The context and prerequisites created in Uzbekistan in relation to practical application of solar energy serve as basis for utilizing this region as a test ground for advanced technologies not only in the republic, but also in the entire Central Asia.

Considering the experience to date and for the purpose of promoting further research and experimental-industrial developments at a higher technical and scientific level, practical application taking into account global experience, individual solutions for using alternative energy sources in the context of Uzbekistan as well as to set up domestic production of modern equipment and technologies for this sphere:

1. Acknowledgement that Uzbekistan has created a scientific-experimental and infrastructural framework for more profound development and practical application of solar and biogas energy.

The Cabinet of Ministers of the Republic of Uzbekistan, in coordination with the Academy of Sciences and stakeholder ministries, agencies, economic associations, shall take measures, with due attention to experience at hand, to further deepen experimental and applied research in the area of using solar and biogas energy with a focus on design and implementation of pilot projects dedicated to energy generation from alternative sources, set up production of relevant equipment, components and materials and put in place maintenance in the country.

2. Approval of the proposal from the Ministry of Economy, Ministry of Finance, the Academy of Sciences of Uzbekistan, SJSC “Uzbekenergo” regarding establishment the International Solar Energy Institute in Tashkent with the involvement of the Asian Development Bank and other international financial institutions on the basis of the SPA “Physics-Sun” under the Academy of Sciences of the Republic of Uzbekistan.

The main objectives and activities of the International Solar Energy Institute shall be specified as follows:

- carrying out highly technological developments in the area of industrial application of solar energy;
- drafting proposals for the practical application of solar energy potential across various economic sectors and in the social sphere on the basis of advanced and cost-efficient technologies;
- conducting applied research related to the use of solar energy in various industries including technologies for the synthesis of special materials and heat treatment;
- coordination of the development of the documentation for major projects in the field of solar energy.

The Cabinet of Ministers shall, in one month’s time, adopt a resolution on the establishment of and financing sources for the International Solar Energy Institute.

3. Acknowledgement of agreements achieved between SJSC “Uzbekenergo” and “Suntech Power Co.” Company (Korean People’s Democratic Republic) regarding the establishment of a production enterprise to produce 100 MW photovoltaic panels on the basis of the cutting-edge technologies with financing for the development of design documentation in equal proportion within the Free Industrial and Economic Zone “Navoi”.

SJSC “Uzbekenergo” jointly with the Ministry of Economy, Ministry of Foreign Economic Relations, Investments and Trade of the Republic of Uzbekistan, other concerned ministries and agencies prior to 1 April 2013 shall develop and submit a business plan and the necessary building documents for joint production enterprise to manufacture photovoltaic panels for approval to the Cabinet of Ministers along with launch of the 50 MW first phase in October 2013 and running at full capacity in 2015. Hereby, special emphasis should be paid to the needs of in-depth analysis of demands and sales markets for product manufactured by the enterprise.

4. The proposal of the Ministry of Economy, Ministry of Finance of the Republic of Uzbekistan and SJSC “Uzbekenergo” regarding building project of a 100MW PV Solar Power Plant in Samarkand Province.

SJSC “Uzbekenergo” shall, within three months, develop and submit a feasibility study and bidding documentation for approval in due course feasibility study and tender documents having specified a concessional loan from Asian Development Bank and funds Fund for Reconstruction and Development of Uzbekistan as sources of funding.

Hokimiyat of Samarkand Province shall, until 1 July 2013, duly allot land to SJSC “Uzbekenergo” to set up a building site and deploy the power plant.

5. The Cabinet of Ministers in cooperation with the Ministry of Economy, Ministry of Foreign Economic Relations, Investment and Trade, the Ministry of Finance, the Council of Ministers of the Republic of Karakalpakstan, provincial and Tashkent city *hokimiyats*, other relevant ministries, agencies and business associations shall, within one month’s time, develop and approve a list of experimental and pilot projects involving solar and biogas

energy engaging the Asian Development Bank and other international financial institutions for this purpose.

6. The Ministry of Finance, Ministry of Economy of the Republic of Uzbekistan in partnership with international experts shall, within two months, submit proposals to encourage manufacturers and consumers of solar and biogas energy, granting tax and customs privileges and preferences based on the experience of foreign countries to the Cabinet of Ministers.

7. The Cabinet of Ministers of the Republic of Uzbekistan in coordination with stakeholder ministries and departments shall develop and create necessary arrangements to hold an international conference on alternative energy with representatives of international financial institutions, leading international experts, foreign research centers and manufacturing companies which produce process equipment in 2013 in Tashkent.

8. Ministry of Economics, Academy of Sciences of Uzbekistan, SJSC "Uzbekenergo" jointly with relevant ministries and agencies shall a draft law of the Republic of Uzbekistan "On Alternative Sources of Energy" to the Cabinet of Ministers within the first six months of 2013.

9. Oversight of the implementation of this resolution shall be entrusted to the Prime Minister of the Republic of Uzbekistan, Mr. Mirziyoev Sh. M.

President of the Republic of Uzbekistan I. Karimov

City of Tashkent
1 March 2013
No. YP-4512

APPENDIX 2. Minutes of Public Consultations

PROTOCOL # 1

Public Consultation (PC) for the project " Construction of 100 MW Solar Power Station in Samarkand Province"

Venue: South-West Main Electricity Supply Hall, Samarkand city
Date: May 31, 2013

Participants: 55 people (list of participants is attached)

- 3 representatives from Samarkand and Pasdargom Districts Khakimiyats (District Authorities),
- 3 representatives from Samarkand Land Resources Management and Cadastre Department,
- 2 representatives from Samarkand Province and District Natural Resources Protection Department
- 13 representative Electricity Engineers, Technicians from South – West Main Electricity Supply
- 22 women participants

Duration of PC: 11:00 – 13:30

Agenda of the meeting:

First part of PC Session:

1. Project introduction to the public
2. Presentation on Environmental and Ecological aspects of Solar Power Station and protection measures preconstruction and construction period.
3. Presentation on Social aspects of the project.

Second Part of PC Session (Interactive Session):

4. Participants interested questions and specialists answers

1. Opening speech was given to Mr. Sanjar Kuldoshev, Deputy Director of South-West Main Electricity Supply. He welcomed PC organizers, participants and briefly explained about project realization activities that are being accomplished collaboratively with group of people from donor, consulting organization and local authorities. He also introduced key responsible individuals of the project who are working with public.
   Later, Mr. Khojimatov Rakhimkul, the First Secretary of Deputy of Samarkand Province Khakim, spoke about developments of Solar Power Station and beneficial views of the project to Pastdargom and Samarkand districts population to moderate the growing needs for electricity. Mr. Rakhimkul Khojimatov pleased to announce to public that project is the first in Central Asia to implement and construction of Solar Power Station in Samarkand is welfare for local people. Province and local government authorities showed strong support from their sides to cooperate on successful realization of this project.

   Following, Mr. Shukhrat Khamidov, Specialist consultant of the project from "UzbekEnergo" government organization, spoke about global energy resources regarding non-renewable and renewable natural energy resources and how they

have been depleting due to human relentless consumption. He addressed to reserves of gas supply of Uzbekistan saying "..study shows that gas and coal reserve deplete if current consumption continues in about 50 years and this may impose in shortages in energy sector". He encourages considering to explore other sources of energy resources especially solar power that being investigated in developed and developing countries to incorporate it every day electricity consumption. Mr. Shukhrat Khamidov elucidated on "UzbekEnergo" accomplishments, cooperation activities and performances. He clarified the capacity of 100 MW power generation of Solar Power Station to public with simple explanations, examples to visualize the capacity of the station and called public not to consider this as an "entire region energy resolution" but just part of supply of energy source. He also mentioned that Solar Power is a daily electricity supply so night time electricity is still provided by Syrdarya Energy Supply Unit. Project pros and cons were also delivered to public concern. People listened with good enthusiasm.

2. Project specialist for environmental and ecological aspects Dr. Madina Khalmirzaeva presented about environmental concerns of the project giving detail information. She explained about construction impacts to the area, farmlands and vicinity population as well as their mitigation measures to take during construction phases of solar panels. Impacts to flora and fauna especially reflectivity of solar panels to local birds was also discussed.

3. Social aspects of the project was presented by Mrs. Nodira Azizova. She spoke about involving local people's awareness about project activities and beneficial sides of the project. People should visualize positive aspects and collaborate with project specialists if they have their interested questions. During presentation district Women Committee representatives requested to be involved in raising awareness on project performance especially among local women who constitutes significant part of area population.

4. Second Part of PC Session:
   Participants actively took part in question and answers session with their interested questions. Representatives from district authorities, Land Management and Cadastre "Uzdavyerloyiha", natural resources protection, Woman Committee members and engineers of South West Main Electricity Supply participated with questions. For their questions Mr. Shukhrat Khamidov, Dr. Madina Khalmirzaeva and Mrs. Nodira Azizova answered respectively. Questions and answers were given in the following matrix table.

Photos taken during Public Consultation

	
Manager of South-western magistral network (local branches of Uzbekenergo) Kudashev Sanjar gives open speech	Participants of PC are listening presentation
	
Representative of Samarqnd province hokimiyat explains importance of the project for local economy	Electrical engineer of PPTA team Khamidov Sh. explains technical aspects of solar plant
	
Environmental engineer of PPTA team Khalmirzaeva M. explains the main findings of Environmental assessment	Social expert of PPTA team Khalmirzaeva M. explains priciples of conducted social survey and main finding

	
Representative of Pastdargom hokimyat raises question regarding quality of roads on the territory of Pastdargon district	Representatives of Uzbekenergo asks about life of solar PV and replacement issues.
	
Electrical engineer replies on participants questions	Representatives of women committee of Pastdargom district asks about possibility to conduct another round of public consultation for makhallas located close to project site
	
Representative of State Nature Committee raises question regarding water supply and water discharge issues on the Power Plant	Social and environmental experts answer participant's questions

	
Citizen of Samarqand city interests in possibility to install solar panel for individual houses	Printed announcement about the planning Public Consultation placed at the main entrance

APPENDEX 3. List of participants in the Public Consultation

СПИСОК УЧАСТНИКОВ

ОБЩЕСТВЕННЫХ СЛУШАНИЙ ПО ПРОЕКТУ

«СТРОИТЕЛЬСТВО СОЛНЕЧНОЙ СТАНЦИИ МОЩНОСТЬЮ 100МВт В САМАРКАНДСКОЙ ОБЛАСТИ»

г.САМАРКАНД, 31 МАЯ 2013 ГОДА

№	Ф.И.О.	Должность	Подпись
1	Зияев Б.Б.	Самарқанд туман бўлими ГУ бошлиғи	[illegible]
2	Ахмедов У.А.	Пастдарғом туман хокими ўринбосари	[illegible]
3	Мухторов О.П.	Самарқанд тумани хокимият, бўлим ўринбосари	[illegible]
4	Шарофиов Т.Х.	Сам.туман ер ресурс бўлим бошлиғи	[illegible]
5	[illegible] Х.А. ўринбосари	[illegible]	[illegible] 526460
6	Туйчуродов Ф.Ш.	Пастдарғом туман ер ресурслари ва давлат кадастри бўлими	[illegible]
7	Бобоназаров С.Ф.	"Уздаверлойиха" ин-ти Самарқанд фил. бош мухандис	[illegible]
8	Исоров Ҳасан	[illegible]	[illegible]
9	Мухаммадиев Х.	[illegible] ЭТК	[illegible]
10	Рахимов Ш.М.	Пастдарғом ТТБ ўринбосари	[illegible]
11	Якубов Одил	Пастдарғом туман фермерлар кенгаши	[illegible]
12	Касимов А	вед. инженер ПТС	[illegible]
13	Исмоилзода Зиёда	Пастдарғом туман.	[illegible]
14	Нуралиев Д.У.	Самарқанд ЮЗ.МЭС	[illegible]
15	Муртозоев Ш.И.	ЮЗ-МЭС	[illegible]
16	Абдурахмонов А	зам. гл. инж. ЮЗ-МЭС.	[illegible]
17	Исабаллиева Ф.А.	Азиатский Банк Развития	[illegible]
18	Курбонова Н.	Э.З.ОХТК. техник	[illegible]
19	Ниязов У	Ж-Т. МЭТ юрист	[illegible]
20	Нуриев Д	Ж-Т МЭТ	[illegible]
21	Жураев А.М.	Ж-Т МЭТ прораб	[illegible]

№	Ф.И.О.	Должность	Подпись
22	Раимов И	Вед. инженер	
23	Байзакова М	Техник спп	
24	Набиев А	Нач. ПТС	
25	Акрамов Р	Вед. инженер	
26	Арутюнян К	инженер ПТС	
27	Николова Н	Техник ПТС	
28	Шарипова Д.	инженер ПТС	
29	Мухамедова М	эл. монтер	
30	Юсупова Н	эл монтер	
31	Камалходжаева С.М.	[illegible]	
32	Абдукаримова С	[illegible]	
33	Джабборов Ак.	диспетчер СРДС	
34	Маринцова Эльм.	ст. инспектор ОК	
35	Усмонова М.	инженер ОК	
36	Аблакулова Н.Д.	техник СРЗАИ	
37	Умфанова Л.	техник СРЗАИ	
38	Горкунова Д.В.	ст. инспектор	
39	Умарова Н.Р.	нач-к ОЭиОТ	
40	Шарейко И.В.	вед. инженер ОКС	
41	Арифова Л	техник СОТУ	
42	Саидмурадов Р.	инженер СРЗАИ	
43	Тухтаниева А	экономист ОЭиОТ	
44	Абдуллаева О.	инженер ОЭиОТ	
45	Абдуллаева Н	инженер СУПЭ	
46	Ульмасова Н	оператор СРДС	
47	Абдуллаев Нурр	Директор ОАО	
48	Дусназаров Жасур	Техник	

№	Ф.И.О.	Должность	Подпись
49	Джумакулов Иброхим Тирхонугли	Техник	
50	Азизова Нодира	Соц / консультант	
51	Мусаев Сардорбек	инженер ГИС спец.	
52	Холмиматов Рабимжон	Вилоят хокимлиги	бош мутахассис
53	Хамидов Шухрат Вахидович	консультант по проекту	
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APPENDIX 4. Presentation given during the Public Consultation