Non-technical summary

for the "PAVLODARENERGO" JSC's investment projects

on environmental impact assessment

«PAVLODARENERGO» JSC has been implementing long-term investment program aimed on energy complex modernization for the purposes of the equipment economic life extension, electric and thermal power increase, environmental emissions reduction, and energy preservation. The investment program is implemented on power sources within the annual bilateral Investment Liabilities Agreement with Ministry of Industry and New Technologies of the Republic of Kazakhstan in accordance with the law. The company undertakes investment liabilities for the purpose of its technological park modernization within the Order №465 dated 3 July 2015 of Minister of Energy of the Republic of Kazakhstan "On ceiling tariffs approval for electric energy and service of maintaining readiness of electric power".

I. Current practice of the investment projects' environmental impact assessment

The "PAVLODARENERGO" JSC's policy covers quality, energy management, environmental management and occupational health and safety. It identifies principles, goals, tasks, and objectives of the company's environmental protection and safety activities. Execution of respective law and regulations related to ecology, improvement of technological energy generation processes, as well as information availability and accessibility to all stakeholders are the key policy liabilities.

Within the process of developing technical projects, which implementation may directly affect the environment and citizens' health, the company mandatorily develops the "Environmental Impact Assessment" (EIA) volume. Within the environmental impact assessment of the project decisions in accordance with "Guidelines on assessment of environmental impact of projected economic or other activities within the pre-plan, pre-project and project documentation development" (Astana, Ministry of Environmental Protection of the Republic of Kazakhstan, 2007), the company assesses atmospheric effects, impact on surface and underground waters, soil and subsoil, plant and animal life, physical environmental impact, as well as that on socio-economic sphere. After the project development, in order to comply with the Art.57 of Environmental Code of the Republic of Kazakhstan requirements in terms of observing transparency principle of the government ecological expertise and involve public into decision-making processes, the company announces public hearings through mass media. For providing clear and reliable information on forthcoming works and the company's environmental impact, public hearings involve all interested parties: representatives of local authorities (Akimat), environmental protection authorized agencies, mass media, motivated community members, citizens. The events are protocoled, covered by mass media, and the projects are eventually submitted to respective authority for the government ecological expertise.

Following the "PAVLODARENERGO" JSC's adopted additional investment program for reconstruction and technical re-equipment for long-term period of 2010-2015, and the "PAVLODAREERGO" JSC's investment liabilities on Pavlodar CHP-3, CHP-2 and Ekibastuz CHP reconstruction and modernization for 2015, the company developed the "Environmental Impact Assessment" (EIA) projects and had the following investment projects ecologically expertized:

- conclusion # KZ06VCY00014817 dated 13.08.2014 on environmental impact assessment for the "Ekibastuz CHP. Construction of section 2 of ash dump in the Tuz lakebed" Project;
- conclusion # KZ65VDC00030038 dated 28.22.2014 on environmental impact assessment for the «Restoration of line 1 of the «PAVLODARENERGO» JSC's CHP-3's ash dump» Project;
- conclusion # KZ90VCY00016409 dated 24.10.2014 on environmental impact assessment for the «Installation of cooling tower # 5 at CHP-3» Project;
- conclusion # KZ52VCZ00025548 dated 22.05.2015 on environmental impact assessment for the «Installation of PT 65,75-130-13 turbine unit #2 at CHP-3» Project;
- conclusion # KZ86VCY00019260 dated 03.04.2015 of «Construction of chimney №2 on CHP-3";
- conclusion # S 01-0018/15 dated 11.09.2015 "Reconstruction T-100,120-130-3 turbine unit #4 with changes generator on CHP-3 "PAVLODARENERGO" JSC";

The following investment projects are in implementation phase:

- "Ekibastuz CHP. Construction of section 2 of ash dump in the Tuz lakebed";

The following projects are in ecological expertise phase:

"1st stage of recultivation the ash dump on CHP-2" project.

II. Description of implemented and continuing investment projects

In 2015 construction works on CHP-2 and CHP-3 were finished. New ash dump construction with the use of special geomembrane liner provides 100%-hydro-insulation. It is resistant and durable water-tight screen, protecting surface and underground waters from pollutions, and therefore eliminating underground waters' chemical pollution thanks to the chemical components contained in water. This measure's technical effect is expressed by the company's ability to support production load, as electric power generation and thermal power dispatch are impossible without an ash dump.

In order to increase electric and thermal power dispatch from CHP-3 for current and future consumers' needs, as well as enhancement of security of electric, steam and thermal power supply to consumers, the "Installation of ПТ-65/75-230/13 turbo generator at the CHP-3's station 2"

Project was implemented, stipulating integration of cutting-edge automatic system of technological processes management.

Replacement of previously demolished ПТ-60-130USSR generator (1970-project) by turbo generator within the 2012-project serves for reducing gross heat rate for 500-900 kWh/Gcal, depending on the turbo generator's operation mode, therefore decreasing specific reference fuel consumption for 3-5 g/kWh, and eventually reducing emissions in the city atmosphere. In 2015, the turbine unit PT-65 / 75-130 / 13 st.#2 is included. With the commissioning of turbine unit #2 the installed electric capacity on CHP-3 increased by 5 MW and became 525 MW, respectively the installed heat capacity increased by 72 Gcal/h and became to 1098 Gcal/h.

The 1st stage of recultivation the ash dump on CHP-2 was finished. In order to prevent the ash dump surface dusting at worked-out section within the project the work of creating protective layer by dint of sandy clay, planning grass, access ramp arrangement was conducted. Filled section was covered by protective quarry-sandy-clay layer of 0.5 m-thickness, laced with 10%-vegetable soil in upper layer of 0.2 m, which complies with 1.04-14-2003 sanitary regulations and norms of the Republic of Kazakhstan "Toxic industrial wastes deactivation and burial areas". During the recultivation was performed of activities on reducing environmental impact of the CHP-3's ash dump restoration works: using developed lands, territory and roads sprinkling, covering the dump trucks' skips with tents when transporting crumpling and dusting materials. After recultivation, the land will be commissioned to local executive body in 2016. Ecological expert conclusion # 09/14 dated 07.03.2014 was issued by the «GN Energy» LLC, stating the working project meets respective industrial safety requirements, and complies with applicable norms and specifications of the Republic of Kazakhstan.

Implementation of the "Installation of cooling tower at the CHP-3's station 5" (irrigation area 1,600 m^2) serves for reducing impact on the atmosphere around CHP-3 – first, due to drop entrainment decrease (does not exceed 0.005% of water consumption per cooling tower), second – to employment of polymeric materials recommended for the cooling towers. Water-retaining facilities at the cooling tower decrease drop entrainment for 100%. Using in water distribution system and irrigation polymeric materials, resistant to up to 60°C-temperature, highly resistant to caustic, acids, fats, oils, UV radiation, will allow to reduce impact on the atmosphere. In order to reduce the noise pollution level in the course of the cooling tower exploitation, louver shutters will be installed (for the purpose of reducing the air streams in winter), which will reduce the noise level for 2-3 dB. Polymeric irrigators also serve for adjusting the skeleton's supporting structures' weight to irrigator, based on polymeric irrigators' weight. Technical decisions of the project comply with cutting-edge technologies, practiced by European countries and the Republic of Kazakhstan. In 2015, cooling tower №5 on CHP-3 was put into operation. With the commissioning of the cooling

tower # 5 in the summer time, electric load operation on CHP-3 in condensing mode has increased by 50 MW and became 310 MW.

The «Construction of TP-3's stak # 2" working project was implemented in 2013. Stack to be installed serves for rejecting fuel gas from existent and being installed boilers, it does not emit any pollutant substances. 180-meter stack will improve the emissions dissemination and decrease the pollutant substances surface concentration. This working project will result in eliminating draft restrictions on boiler units serving the stack 1 without stopping CHP, and therefore enhancing thermal power supply to the city consumers.

After finishing, 2nd stage of design the ash dump in the bed of lake Tuz on Ekibastuz CHP the project works was began. Ash dump is a construction for disposal of industrial waste like ash. Compliance with the laws of the Republic of Kazakhstan in the field of environmental protection creation of new capacity for the storage of ash waste would prevent pollution with production ash waste and ensure the stable operation ECHP.

Reconstruction of BKZ-420-140 st. №2 with installation of Automated process control system was performed in 2015. The main purpose of the introduction of automated process control system is fully automated boiler combustion processes, providing guidance and specialist purposes rapid, reliable and trouble-free information on the state of the process, improve the efficiency and safety of the boiler and process control efficiency of the boiler, the coal consumption savings.

The introduction of automation systems to meet all energy requirements of existing regulations, will lead to a significant expansion of the functional capabilities of the system, increase the level of reliability of process equipment and automation, reduce labor costs for maintenance and repair,

increase boiler efficiency by 5.2%, reduce overspending on coal 34407 tons / year, will provide a reduction of ash emissions by 72 tons / year of sulfur dioxide by 475 tons / year and on release ash 15137 tons / year. Due to the absence the construction of the need to pass environmental review of the project was missing.

III. Environmental impact assessment

The projects play important economic and social role, measured by scope and share of electric and thermal power generation in Pavlodar load center. Approved technical decisions on the investment projects lead to the following conclusions on environmental, economic and social impact:

1. Atmosphere air

All projects stipulate activities on preventing (reducing) pollutant substances emissions to the atmosphere.

In the course of construction and assembling operations on turbo generators, boiler units reconstruction, and cooling tower, ash dump construction, environment is mostly affected by: motor and construction vehicles' engines, construction machinery charging with combusting and lubricating materials, soil, stones, clay gravel, sand and gravel mix, sand transfer, welding and cutting, painting and hydro-insulating works, asphalt concrete depositing, etc. Turbo generators exploitation itself does not result in environmental emissions. Increase in emissions, resulting from the fuel combustion within this project, is not expected, as the boiler units' capacity and coal consumption per hour all over the station stay the same. The boilers' steam production capacity stays at the same level. According to current maximum permissible emissions allowance for TTP-3 project (MPE), maximum fuel consumption for the entire company is adjusted to all boiler units' typical operation mode. Total station's pollutant substances emissions after putting turbo generators in operation will not exceed MPE, set up for CHP-3. Calculations of dissemination for the period of the equipment reconstruction and operation proved surface concentrations of all ingredients to not exceed 1 maximum permissible concentration on the company's sanitary protective zone boundary.

Development of the "Kuat" and "Zhyly su" sites, as well as construction of new ash dumps, reconstruction of the earth water-retaining facilities of ash collectors, restoration of worked-out ash dump's line are accompanied by the emissions of polluting substances into the atmosphere from stripping and mining works, as well as dusting of the work site and roads due to construction machinery and motor vehicles traffic.

In order to prevent dusting, roads in dry summer days will be sprinkled.

Calculations of dissemination demonstrated maximum surface concentrations of no pollutant substances exceed maximum permissible concentration.

In the course of operation of the ECHP's ash dump's section 2 in the Tuz lakebed, in order to prevent the ash-and-slag blowing-out, the project stipulates irrigation of ash-and-slag beaches in case of their drying-up with the help of ДД-80 sprinkler system; water to sprinklers will be delivered through projected dust catching-water line coming from the dust suppressing pumping station.

Use the polymeric materials on the water distribution system and sprinkler, that are resistant to temperatures up to 60 ° C, with high resistance to alkalis, acids, greases, lubricants, UV radiation which will allows to decrease the impact on the air deployment on area of CHP-3.

The project implementation "Installation the cooling tower on st.5 of CHP-3" (Irrigation area of 1600m2) will to decrease the impact on the air deployment on area of CHP-3 in first time thanks to reduction in droplet carryover (no more than 0.005% of the water flow in the cooling tower), and secondly by using polymeric materials recommended for cooling tower installation. The water

catchers that used in cooling tower decrease the droplet carryover by almost 100%.

Storage of ash on the 2nd line of ash dumps CHP-2 and CHP-3 is carried out hydraulically, that is the water layer. In connection with this, at observance of the technical regulations for the storage of ash, the impact on air pollution is excluded, there are no emission sources.

2. Water resources

The projects stipulate measures on preventing and reducing impact on water resources.

Underground water and surface stream pollution in the course of mining works on the «Kuat» and «Zhyly Su» sites will be prevented by dint of the following activities:

- collecting wastes in locations, complying with sanitary norms and regulations, their timely disposal for proper allocation and utilization;
- charging vehicles and mechanisms with combusting and lubricating materials in the manner, preventing oil products' leakage.

For the purpose of the underground waters monitoring, observation wells network will be created.

Within the project on the turbo generator reconstruction, water for cooling will be delivered from return technical water supply system. Consumption of fresh water, feeding the return water supply system, will be measured by respective device currently in use. Water from the condensators cooling and additional turbo generators' facilities enters the return water supply system of CHP-3. Steam condensed water will be directed to the hydraulic ash sluicing system (HAS). Water consumption in the course of the object's construction and operation will not result in exceeding the limits. There is no any surface water bodies close to the projected object, therefore they can not be directly effected.

In the course of restoration of line 1 of the CHP-3's ash dump, water will be also used for irrigation, protective layer compaction and grass sprinkling. There is almost no risk of polluting underground waters, as they underlay rather deep (18.8 m).

In order to prevent impact on underground waters within all projects, activities will be implemented on preventing mastic, resolvents, combusting and lubricating materials used for construction purposes and vehicles and machinery exploitation, from entering soil and underground waters; preventing wastes and garbage improper and illegal dumping. In case of the construction regulations compliance, ground waters are not going to be polluted.

The project on construction of section 2 of the ash dump at ECHP in the Tuz lakebed does not stipulate the watter source to be changed; water consumption does not increase. In order to protect environment and reduce the ECHP's ash dump's impact on hydrosphere, protect surface and

underground waters from pollutions, reduce fresh water consumption, the return system of the water supply of the hydraulic ash sluicing facilities will be employed. The HAS will be fed by the ECHP's sewage waters; no fresh water will be used for this purpose.

The water catchers that used in cooling tower decrease the droplet carryover by almost 100% and decrease the use of fresh water in the technological cycle.

To decrease the harmful effects of ash dumps CHP-2 and CHP-3 to a minimum, protection of surface and groundwater pollution, reducing consumption of fresh water at the project for construction of the 2nd stage of ash dumps was provided for a set of measures, which include:

- full hydraulic ash removal system cycle

- impervious screen device of geosynthetic materials on the bottom and slopes of the projected section;

- interception and return the seepage water to the cycle of hydraulic ash removal of pumping station drainage water

- collection and return the seepage water to the cycle of hydraulic ash removal in the implementation section via dewatering drainage;

- new drainage pumping station.

3. Soil. Wastes

The projects stipulate the reduction of impact on the soil mantle.

Turbo generators and boiler units being generated will be located within the company's actual land allotment; the soil fertile layer is not to be removed, as the reconstruction sites are located within the entity's main building.

The land for construction of section 2 of the ash dump in the Tuz lakebed was given to the "PAVLODARENERGO" JSC on the basis of using at a charge.

The "Kuat" site development was conducted within the company's mining allotment of 64.51 hectares, "Zhyly Su" – within the mining allotment of 15.49 hectares. In order to reduce the wastes negative environmental impact, they are properly collected, stored and disposed to respective locations.

For the purpose of preventing pollutions by production and consumption wastes, the projects stipulated the following activities:

- furnishing sites with wastes containers;
- collecting utility and production wastes in different containers, their regular disposal;

- reparing motor vehicles only in specially allotted places, which prevents the soil pollution with wastes and oil products.

Wastes of all kinds, generated in the course of reconstruction, are transefered to respective enterprises under agreements for their allocation or treatment.

To protect adjacent land from flooding with the project for the construction of the 2nd stage of ash dumps on CHP-2 and CHP-3 provides: anti filtration screen, drainage ditch with pumping to return filtered water back into the ash dump. During the operation of the ash dump as the main measures to protect the land cover from dusting of ash is provides the waste ash content beaches wet.

4. Subsoils

No new lands are withdrawn for the projects' purposes (excluding the one in the Tuz lakebed), which prevents:

- building on sites with useful mineral deposits;
- destroying rare geological outcrops, mineral formations, paleonthological objects and subsoil sites, announced conservation areas, natural sanctuaries, history and culture monuments.

Technology of mining works on the «Kuat» and «Zhyly Su» sites, adopted by the project, conditions maximum possible fullness of the minerals take-out. In order to rationally use and protect subsoils, the following administrative and technical activities are covered:

- control over the minerals take-out fullness;
- keeping records of mining works and products;
- complying with the technical development project.

Upon termination of the mining works on the «Kuat» and «Zhyly Su» sites, restoration works will be performed.

5. Plant and animal life

Analysis of the flora and fauna on the territories, being exploited within long periods, proves plant and animal life structures to be simplified due to the long-term anthropogenic impact, resulting primarily from the displacement factor. Reconstruction of the boiler unit and turbo generator therefore will not result in destroying the technical landscape, plant and animal life structures.

The vegetation mantle at the “Kuat” and “Zhyly Su” sites, as well as ash dumps construction sites’ zones, is characterized by absence of any phytocoenosis and poor flora diversity. There is no any rare or red-book plants, nor red-book animals’ habitats around the “Kuat” and “Zhyly Su” sites, nor ash dumps construction sites.

6. Physical impact on environment

All projects stipulate activites on reducing physical impact on environment.

Turbo facilities and accompanying equipment being installed cause the following physical impact: noise, vibrations, thermal and electromagnetic emissions. In order to reduce the projects' impact, the following activities are to be implemented:

- employing cutting-edge facilities, conditioning noise and vibrations no to exceede permissible allowance;
- constructing separate equipment understructures;
- covering the turbines cylinders, high-temperature equipment and pipleline by special thermal acoustic evaporate insulation, allocating equipment in special rooms and fencing it (cages, mantles);
- using silencing heads, flexible connections (clutches), elastic gaskets, flexible supports and suspensions on the equipment being installed.

Physical impact of the objects being reconstructed is eliminated through the above mentioned activities within the entity's main building and site. Upon the engineered objects' being put in operation, physical impact level will not increase, as old-fashioned equipment will be replaced by turbo generators.

The cooling tower's thermal impact is caused by the vapor-air mixture emission to the atmosphere. According to the results of the similar objects assessment, vapor-air mixture will not enter the surface atmosphere layer (about 2 m above the earth surface), and its emission will not have any thermal impact on the atmosphere. To decrease the noise level during operation the cooling tower provided the blinds (to decrease the flow of air in the winter) which decrease the noise level by 2-3 dB.

In the course of the «Kuat» and «Zhyly Su» mining sites exploitation and ash dump construction the atmosphere is affected by the equipment processing noise. But due to the sites being located far away from residential area, there will not be any noise negative impact. There is no any thermal nor electromagnetic radiation sources on the “Kuat” nor “Zhyly Su” sites, nor on the ash dumps construction sites.

The project for the construction of the 2nd stage of ash dumps CHP-2 and CHP-3 provides for measures to decrease the noise: placing pumps in the building; on the door of the pump arranged sound-absorbing pads; internal walls and partitions are recommended with stitches filling the entire thickness (without empty seams)

7. Social and economic environment

Environmental and local population's health risks, as well as social and economical impact, are being assessed within all projects.

Recontruction of the CHPs' facilities does not result in any social nor economical consequences for the local population, nor affects its labor activities nature. Implementation of the investment projects on the CHPs' facilities reconstruction serves for improving the stations' territories' sanitary and epidemiological conditions, due to the non-organic dust gross emissions in the atmosphere.