



**Construction of a 410 MW Combined Cycle Gas
Turbine Power Unit at the existing Combined
Heat and Power Plant in Krasnodar (OAO "UGK
TSG-8" branch, Russian Federation).**

**Environmental and Social Assessment -
supplementary information pack**

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INTRODUCTION

This Environmental and Social Assessment - supplementary information pack presents the findings of an Environmental and Social Impact Assessment (ESIA) for construction of a new Combined Cycle Gas Turbine Power Unit (CCGT unit) at the existing Combined Heat and Power (CHP) Plant in Krasnodar (Krasnodarskaya CHP) Plant. This Summary has been prepared on the following basis:

- Review of the permitting and reporting documents characterizing the current environmental and social situation at the Krasnodar CHP Plant, as well as the inspection reports prepared by the relevant supervisory agencies;
- Interviews with officials of the CHP Plant and residents of the nearest residential areas;
- Review of the available design documentation (available as of 18.02.2009) “Design of Krasnodar CHP Plant expansion by installation of a 410 MW CCGT unit” (12 volumes including a volume “Environmental Protection Measures”)¹.

The Krasnodar CHP Plant is the main source of power supply in the city of Krasnodar (population of 708,000 as of 01.01.2008) and a major part of the United Power Supply System in the North-Caucasian Federal District.

The Southern Generating Company – Territorial Generating Company No.8 (further referred to as UGK TGK-8) incorporated in the LukOil Company plans to construct in 2009-2011 at the CHP Plant a new highly efficient power generating unit, i.e. a 410 MW CCGT unit.

The new facility will permit:

- An increase in the amount of generated electricity and improved reliability of power supply both for the city of Krasnodar and for other consumers in the region;
- Improvement of heat energy supply to the residential districts and industrial enterprises of Krasnodar and decommissioning of a number of small boiler stations, the emissions from which adversely affect the quality of ambient air in the city;
- Decommissioning of obsolete equipment (turbines of the non-block part) at the Krasnodar CHP Plant with substantially higher fuel requirement per unit of generated power in comparison with a planned CCGT unit; in addition old units have a high degree of wear, and as a consequence, high level of potential failure risk;
- Improvement of the working conditions for the operating personnel at the Krasnodar CHP Plant.

¹ The Project Design for Krasnodar CHP Plant including installation of a CCGT unit by OAO “UGK TGK-8” has not been yet approved. Some of the provisions proposed in the Project Design documentation are being revised/updated.

The overall environmental impacts of the Krasnodar CHP Plant, even if a number of obsolete equipment units will be decommissioned with a certain delay in relation to the start-up of the CCGT unit, will remain within the currently permitted limits. The sanitary norms for ambient air quality and other adverse physical impacts in the nearest residential areas will be complied with. This means that the implementation of this Project will meet the criteria of sustainable development of the given region.

This Environmental and Social Assessment - supplementary information pack presents key information relating to the current environmental characteristics of the Krasnodar CHP Plant and the planned installation of a new CCGT unit, as well as expected integral impact of the CHP Plant on the environmental and social situation during the construction and operation phase of the Project.

1. THE COMPANY'S POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

1.1 THE COMPANY'S ENVIRONMENTAL POLICY

The UGK TKG-8 Company has approved and implemented an Environmental Policy, which covers all of its structural divisions and production units of the Society including the Krasnodar CHP Plant.

One of the main objectives of this Environmental Policy is to minimize the environmental impacts of the Company's operations. It also requires from its subsidiaries to ensure sound and consistent use of natural resources.

The Krasnodar CHP Plant complies with the Environmental Policy Implementation Programme adopted by UGK TKG-8. Among other things the planned installation of a 410 MW CCGT unit at the Krasnodar CHP Plant complies with the above strategic environmental goals.

1.2 APPLICABLE NATIONAL AND INTERNATIONAL ENVIRONMENTAL LEGISLATION

The considered Project of the CCGT unit installation will be implemented in compliance with the applicable international and Russian legislation.

The Project Design takes into account the applicable international conventions and MFI standards regulating environmental, health and safety (EHS) aspects in the process of planning, construction and operation of the CCGT unit and the following specific features of the Krasnodar CHP Plant:

- The location of the project site at a relatively short distance from residential areas;
- Connection of the CHP Plant operations with a major watercourse of highest fishery category, i.e. the Kuban River.

The Project Design complies also with the main legislative and regulatory documents of the Russian Federation referring to EHS issues in connection with the site specific conditions for the planned project activities.

1.3 ENVIRONMENTAL APPROVALS AND PERMITS FOR PROJECT IMPLEMENTATION ALREADY OBTAINED FROM THE REGULATORS

Initially, substantiation of construction of two combined-cycle turbine power-generating (CCTP) units with a capacity of 450 MW (CCGT units) each was undertaken in 1996. In 1997 this project obtained a positive statement from the State Environmental Review Department of the Russian Federation.

However, under the conditions of the financial crisis of the mid-1990s the project was not implemented.

Since any design documentation in the RF is valid for a term of only five years, the existing design documentation became outdated and in addition it required

updating to take into account a new composition of equipment units and adjusted specifications of individual infrastructure facilities.

The Krasnodar City Administration approved in 2008 on a preliminary basis the intention of the UGK TKG-8 Company for construction of a 410 MW CCGT unit at the Krasnodar CHP Plant.

UGK TKG-8 selected the E-4 Company as the EPC contractor for design development of the CCGT unit at the Krasnodar CHP Plant. As of February 2008 the first revision of the Project Design documentation (including the Volume “Environmental Protection Measures”) had been developed and is being agreed upon between the Client and the EPC Contractor.

After approval of the Project Design by the Client it will be submitted to the fishery inspection agency of the Krasnodar Province and the Main Project Review Department of the RF for approval. No other environmental approvals of construction designs are required according to the current RF legislation.

1.4 PUBLIC RELATIONS AND PROJECT-RELATED INFORMATION DISCLOSURE

According to the RF Law “On Environmental Review” and the provisions of the Aarhus Convention of 1998 on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters, UGK TKG-8 initiated the procedure for disclosure of project-related information for the public. Nine articles related to the Project were published in 2007-2008 in regional newspapers and by news agencies.

Information about the situation with the future construction of the CCGT facilities (preparation work has been already started: dismantling of old facilities and networks, excavation work) is presented by UGK TKG-8 on its website on the Internet in interactive mode.

After the Project Design will have been approved by the Client the stakeholders will have an opportunity to familiarize themselves with the materials of the Volume “Environmental Protection Measures”.

In general, UGK TKG-8 complies with the compulsory procedures required by the Russian legislation in relation to the public involvement in discussion of the Project.

1.5 REQUIREMENTS OF POTENTIAL INVESTORS/LENDERS

In order to implement the construction of the CCGT unit at the Krasnodar CHP Plant, LukOil has conducted negotiations with leading global financial institutions about partial financing of the construction project.

For taking a decision to provide requested financing for projects, the world’s leading MFIs use the criteria laid down in the following documents:

- The Equator Principles adopted in June 2006 by a group of major financial institutions on the basis of the Policy and Guidelines of the International Financial Corporation (IFC);

- MFC Performance Standards Nos.1-8 relating to environmental, health, safety and social issues (revision of April 2006).

This Environmental and Social Assessment - supplementary information pack has been prepared in accordance with the requirements of the Equator Principles and the IFC EHSS performance standards.

1.6 ALTERNATIVES FOR THE PROJECT

The Project Design considers alternative versions for the Project implementation referring in the first line to the adopted technical solutions and a zero alternative. Alternative location of the planned facilities had not been considered, because the construction of the CCGT facilities is planned as an expansion of the existing Krasnodar CHP Plant.

It had been demonstrated that the combined-cycle power-generating unit will reduce substantially the specific fuel requirement per unit of generated energy and improve significantly the reliability of power supply for the consumers.

The CCGT facilities will be constructed at the existing Krasnodar CHP Plant site and no additional land take is required for the Project; the existing infrastructure facilities will be utilized to a maximum extent minimizing thereby any impacts outside of the Site.

2. *DESCRIPTION OF BASELINE CONDITIONS WITHIN THE AREA POTENTIALLY AFFECTED BY THE PROJECT*

2.1 *SITE LOCATION*

The city of Krasnodar is the administrative centre of the Krasnodar Province. It is located in the south-west of the Russian Federation (at a distance of approximately 1300 km to the south of Moscow, the capital of the RF). The location of the city of Krasnodar is shown on the map in Figure 1.

The city of Krasnodar occupies an area of 700 km² with a density of population of 10 persons per 1 hectare (which complies with the norm for comfortable population density of up to 15 persons per 1 ha recommended in the West).

The Krasnodar combined heat and power (CHP) plant is situated in the south-eastern part of Krasnodar (Figure 2).

The main site of the Krasnodar CHP Plant has an area of 56.2 ha and constitutes an irregular pentagon extending from south to north.

The following infrastructure facilities are located outside of the main site:

- The former ash-disposal area (currently, it is used for discharge of salt-containing wastewater from the CHP Plant). It has an area of 16 ha;
- Pump stations Nos.3 and 4 for water abstraction from the Kuban River for technological needs of the CHP Plant (water is first pumped to an oxbow lake separated from the Kuban River and used by the Plant as a water supply canal). The overall land area occupied by the Nos.3 and 4 pump stations is 6.5 ha;
- Pump stations Nos.1 and 2 delivering technological water from the oxbow lake to the CHP Plant. The total land area occupied by the Nos. 1 and 2 pump stations is 6.3 ha.

All above land plots (including the main site) are the federal state-owned property and are leased by the CHP Plant on a long-term basis.

Although the Krasnodar CHP Plant was constructed in the 1950s outside of the city boundaries, now after 50 years of the urban development the Plant is surrounded by rather densely populated residential areas (built up both with multi-story buildings and private low-story houses with attached land plots for farming). The distance from the plant to the nearest houses east and north of the site is only 50m to 70m. The location of the residential areas in relation to the borders of the CHP Plant site is shown in Figure 3.

One of the busiest streets of Krasnodar (Tramvaynaya Street) connecting the center of the city to the airport runs along the southern border of the Plant site.

The main watercourse of Krasnodar Province and source of process water for the Krasnodar CHP Plant flows at a distance of approximately 3.5 km to the south of the Plant site.

An oxbow lake is located between the main riverbed and the Tramvaynaya Street (Figure 2). It has an ellipsoidal configuration stretching for about 3.5 km from south to north. This oxbow lake has been used for over 50 years as a canal for process

water supply to the CHP Plant (the eastern part of the lake) and as a canal for release of conditionally clean heated water (the western part of the lake). The two parts of the oxbow lake are separated from each other by two dams (the solid northern dam and the southern dam with a lock), which permits both separation of fresh water stream from the heated water stream discharged from the Plant, as well as recycling of heated water during the cold season without its discharge to the Kuban River.

There are official recreational zones at the oxbow lake coast with beaches and recreational facilities. The oxbow lake is also widely used for sports fishing and there is a fish hatchery within the zone with heated water at the point where the western part of the lake is connected to the Kuban River (at the No.3 pump station).

There are no historical and architectural sites or special protected areas in the vicinity of the Krasnodar CHP Plant.

2.2 *CURRENT CONDITION OF NATURAL ENVIRONMENT AND ENVIRONMENTAL PERFORMANCE OF KRASNODAR CHP PLANT*

2.2.1 *Climate*

Despite the close location of the Black Sea and the Azov Sea (a distance of 150km to 200km from Krasnodar) the climate in the given region is rated as moderately continental.

In the area of Krasnodar, the air temperature in summer might reach +43°C and drop as low as –30°C in winter.

The duration of the heating season in Krasnodar is more than five months.

The overall evaporation from the surface exceeds the annual atmospheric precipitation rate.

Prevailing wind directions in the area of Krasnodar are easterly (up to 27% of the annual wind rose, mainly in winter) and westerly (up to 24%). Easterly winds transfer the air emissions from the Krasnodar CHP Plant toward the central districts of the city.

Calms accompanied by surface or raised inversions of temperature are rather common (up to 30% per year). Dispersion of harmful substances released to the air is hindered during such periods.

Due to the overall climatic characteristics the zone of the Krasnodar CHP Plant is rated as an area with moderate air pollution potential.

2.2.2 *Current level of air pollution in Krasnodar*

According to the 2006 data, about 124,000 tons of pollutants were released to the atmosphere. The main air polluter is vehicles (92% of the above quantity). Industrial enterprises released 9,800 tons to the atmosphere and the Krasnodar CHP Plant in those emissions accounts for the main portion of those air emissions (5,050 tons in

2008). The main pollutants in the current air emissions from the CHP Plant are nitrogen oxides (40%), carbon monoxide (37%) and sulfur dioxide (16%).

At the same time it should be taken into account that during the recent 17 years the Krasnodar CHP Plant has reduced its air emissions by a factor of 6 (in 1991 about 30,400 tons of pollutants were released to the atmosphere). In addition, air emissions from the Plant are released via high chimneys and have a relatively high temperature. These factors facilitate their efficient dispersion in the atmosphere.

The amount of pollutants released from the CHP Plant in 2008 was lower by 3,000 tons than the limit set by the regulator (the limit is 8,400 tons per annum). This means that the Plant has a substantial margin for an increase in air emissions to the atmosphere.

The concentration of the main pollutants, i.e. nitrogen oxides, in the off-gas from the CHP Plant boilers (when fired with gas) is currently as follows:

- 88 to 96 mg/Nm³ for the boilers built in 1954-1959. This complies with the relevant Russian standard (125 mg/Nm³) and insignificantly exceeds the recommended European limits (50 mg/Nm³);
- 150 to 180 mg/Nm³ for the boiler and turbine units built in 1963-1966. This exceeds both the Russian standard and the European recommendations.

There are no norms in the RF specifically for greenhouse gas emissions and it is not compulsory to keep records of GHG emissions. But in 2005 such a calculation was made for the Krasnodar CHP Plant and it was demonstrated that the total GHG emissions were 6.2 million tons (CO₂ equivalent), which accounted for 0.3% of the total GHG emissions from the energy sector in the Russian Federation.

2.2.3 *Current Ambient Air Quality in the Area of the Krasnodar CHP Plant*

The city of Krasnodar has never been among the most polluted cities of the Russian Federation.

The sanitary inspection service of Krasnodar conducted in 2006-2007 an extensive range of ambient air quality measurements in order to assess the impact of the Krasnodar CHP Plant within the area potentially affected by the Plant. It was found that the ground-level concentrations of all pollutants analyzed complied with the relevant sanitary norms (both with respect to maximum measured values and to average daily levels).

2.2.4 *Hydrological Characteristics of the Kuban River*

The Kuban River flow in the area of Krasnodar is controlled by the Krasnodar Water Reservoir located at a distance of 8 km upstream of the water intake facilities of the Krasnodar CHP Plant. Due to the fact that the Kuban River is fed to a significant degree by snow melting in the North Caucasus Mountains, the release of water from the water reservoir is maximal in summer, i.e. during the period of the highest raw water requirement of the Plant. Thus, water abstraction for the needs of the Krasnodar CHP Plant is not critical for the hydrologic conditions of the Kuban River. The situation is even less significant because the points of water abstraction

and water return from the Plant (after its use for equipment cooling) are located on the bank of the river at a distance of less than 1 km from each other.

The water in the Krasnodar reservoir, which is rather shallow, is very warm in summer and its average temperature at the water abstraction point is approximately 24°C and as high as 27°C to 28°C on some days.

2.2.5 *Current Water Quality in the Kuban River*

According to the data provided by the water monitoring service, the water in the Kuban River in the vicinity of Krasnodar is rated as contaminated. The average annual concentration of petroleum hydrocarbons in river water exceeds the regulatory limit set for fishery water bodies by 6 times (as high as 0.30 mg/l) and its maximum values exceed the limit by as much as 14 to 15 times.

Raw water can be additionally contaminated on its way from the water intake facilities along the eastern part of the oxbow lake toward the CHP Plant, because there are numerous cafes, parking lots and other potential contamination sources located on the banks of the eastern part of the oxbow lake.

Taking into account this fact, the water protection authority had approved for the Krasnodar CHP Plant a permissible limit of petroleum hydrocarbons in the heated water (the so called 'conditionally clean water') as high as 0.36 mg/l.

2.2.6 *Water Requirement and Wastewater Management*

Water of potable quality for the CHP Plant is abstracted from five artesian water wells located at the southern border of the Plant site. There is License in place entitling the Plant to use subsoil resources for potable water supply; the limits set for water abstraction are complied with; there are sufficient underground water resources available for a potential increase in water abstraction volumes in the future. The water fully complies with the applicable sanitary norms for potable water and it is not pretreated.

Industrial water is abstracted from the Kuban River and is used mainly for turbine condenser cooling and in minor amounts (after chemical pretreatment) as make-up water for heating water networks.

The limit for industrial raw water abstraction from the Kuban River has been set for the CHP Plant at a level of 676 million m³ per annum. To reduce the water requirement, and as a consequence, the fees paid for use of river water (this is a significant cost item for the Plant amounting to as high as RUR 214m or €4.7m per annum) during the cold season, the Plant uses a close-circuit water supply system including the oxbow lake.

In this way the actual water abstraction volumes have been kept during the past years at a level not exceeding 446.1 million m³ per annum.

Four types of wastewater are generated at the Plant:

- Sanitary wastewater, which is released without treatment to the municipal sewerage networks and sent further to the municipal wastewater treatment

facilities of the city. There are no problems associated with an increase in the volume of discharged wastewater from the Plant;

- Conditionally clean heated water discharged to the western part of the oxbow lake. This water is released from the western part of the lake to the Kuban River during the warm season and recycled to the Plant during the cold season by opening the sluice in the southern dam; the heated water migrates to the pump station feeding it to the CHP Plant. The volumes of conditionally clean water released to the Kuban River are not metered; its water loss is determined using a factor approved by the regulator, i.e. 1% of the abstracted water volume. Water temperature at the discharge outlet and in the oxbow lake is not monitored, although, according to the available heat balance, water released to the lake in summer might have a temperature as high as 34-35°C. An application to obtain a Permit for discharge of this type of wastewater has been filed by the Plant and is being studied by the regulator.
- Salt-containing water from the chemical water pretreatment unit is pumped via two steel pipelines about 2 km long to the Plant's former ash-disposal area and is classified by the supervisory agency as liquid waste disposed to a sludge accumulating pond. There is no prescribed limit for the volume of discharge. The actual volume is from 5,000 to 20,000 m³ per month. Actually this water partially evaporates to the atmosphere and partially migrates into the body of the former ash-disposal area and further to groundwater and surface waters. The impact of this wastewater stream on the groundwater quality is not monitored; there are no monitoring wells along the perimeter of the former ash-disposal area. The Krasnodar City Administration passed in 2007 a resolution to terminate the lease of the former ash-disposal area to the Krasnodar CHP Plant and use it for urban development. In this connection, the CHP Plant was requested to terminate discharge of salt-containing waters to the former ash-disposal area.
- The combined stream of treated oil-polluted wastewater (industrial and storm water) and conditionally clean storm water. According to an approval issued by the regulator, this wastewater stream is released to the Kalininskaya gulley. The discharge volume varies from year to year (depending on the atmospheric precipitation rate) from 1 to 1.3 million m³. Industrial and storm water runoff stream from potentially contaminated areas used for fuel and lubricant depots and transformers is sent to the local treatment facilities using the principle of pressure flotation and ensuring hydrocarbons removal efficiency of 53%, which cannot be considered to be satisfactory. Nevertheless, the combined water stream complies with the limit set by the regulator for petroleum hydrocarbons concentration (0.3 mg/l) mainly due to dilution of this stream with conditionally clean storm water runoff, which undergoes treatment in a sand trap. This limit can be made more stringent: currently an application has been filed by the Plant to obtain a new Permit for release of wastewater to the Kalininskaya gulley and is being reviewed by the regulator.

The Krasnodar CHP Plant has all required Licenses and Permits for waste handling. It complies with the Limits for waste disposal. Short-term onsite waste storage is performed in conformity with the relevant sanitary and environmental rules.

Since the CHP Plant is responsible for its former ash-disposal area, where 123,000 tons of ash and several hundreds of tons of salts have been accumulated, the Krasnodar City Administration is entitled to require in case of the lease agreement termination that the Plant submits evidence of compliance of that area with the relevant sanitary norms for soil contamination and, if the norms are not complied with, the Plant will have to carry out soil remediation.

2.2.8 *Hazardous Substances*

Significant amounts (over 1,000 tons) of asbestos have been used for thermal insulation of boilers and heating water pipelines at the Krasnodar CHP Plant. The RF legislation does not prohibit the use of asbestos, provided that appropriate measures are taken to prevent its dusting.

A hazardous toxicant (hydrazine hydrate) is used in the water pretreatment circuit. Its annual requirement is 2.5 tons. The requirements for safe storage of this chemical are not complied with.

There are over 30 transformers and over 500 oil-filled capacitors/switches in operation at the Plant. Potentially, the oils used might be contaminated with polychlorinated biphenyls (until 1988 the use of this toxicant as an additive to transformer oils was permitted in the Soviet Union). The oils used at the Krasnodar CHP Plant have not been tested to identify presence or verify absence of PCBs.

A special survey conducted at the site had confirmed its radiological safety.

2.2.9 *Topography*

The main site of the Krasnodar CHP Plant is located at elevations of 29m to 31m above sea level. It has a gentle slope southwards. Across the Tramvaynaya Street there is a natural steep slope with an elevation difference of approximately 8 m.

2.2.10 *Geotechnical Features of the Site*

A subsurface layer about 2m to 3m thick is composed of filled soils. It is underlaid by a buried soil layer about 70 cm thick followed by sandy silts. They are replaced at a depth of approximately 8 m with clays and the following deeper layer is composed by alternating sandy silts and sands.

Beneath that structure there is a layer of clays over 10m thick.

The soils of the upper horizons are prone to subsidence, which requires construction of pile foundations under buildings and constructions.

A survey carried out in 2008 showed that the soils in the northern part of the Plant site down to a depth of 3 m can be characterized as clean.

The Plant site belongs to a zone with a high level of seismic activity (up to 8 points). This has been taken into account in the engineering designs of buildings and facilities.

2.2.11 *Hydrogeological Features of the Site*

The upper soil layer is often saturated with water, also due to leaks from the Plant's networks.

Groundwater occurs in two aquifers: at a depth of 7-8m below the ground level (the water in this aquifer migrates south-eastwards) and 13-14m (the water migrates southwards).

Groundwater is protected to a certain degree against pollutants migrating from the day surface. The survey performed in 2008 indicated that the groundwater in the northern part of the Plant site at a depth of 7-8m can be characterized as clean.

The main aquifers exploited as sources of potable water supply occur at depths of 140m to 250m. They are well protected against migration of pollutants from the day surface. Systematic analyses have confirmed that the quality of water from those aquifers complies with the applicable sanitary norms in relation to both chemical and microbiological indicators.

2.2.12 *Wildlife and Vegetation*

Any natural biotopes do not exist any longer at the CHP Plant site and in its immediate surroundings. There are no habitats of any endangered animal and plant species at the site and within a reasonable range around it.

2.3 *SOCIO-ECONOMIC BASELINE OF THE PROJECT AREA*

2.3.1 *The Socio-Economic Baseline Conditions in Krasnodar*

Krasnodar is one of few Russian cities whose population considerably increased in the post-Soviet period by 80,000, or almost 15 per cent. The city is expected to be officially recognized as a million-strong city by 2012 or 2013 that will be accomplished through further incorporation of a number of nearby communities from the agglomeration and infill construction, with accelerated construction of residential housing and infrastructure in the city centre and the vacant areas.

According to authorities and experts, the key driver in the growth of the city (and the Krai) population is the inflow of economic migrants from the south of Russia, Ukraine and Caucasus who are attracted by Krasnodar's high level of development and quality of life.

The most recent statistics shows that average monthly salary in October 2008 in Krasnodar Krai was 13,934 roubles. By end of 2008, average monthly salary in Krasnodar was 18,000 roubles, a 13 percent increase compared to 2007. Monthly salary at UGK TKG-8 is about 20,000 roubles.

Krasnodar is attractive for investors. The city is a home to strong construction industry, research and development centres, education and health care.

2.3.2 Stakeholder Analysis Results

The following stakeholders and groups are potentially interested in Project implementation:

- KCHP representatives;
- Public authorities;
- Mass media and news agencies from Southern Federal District of Russia;
- Industrial companies (energy consumers);
- Local environmental NGOs;
- Potential job candidates;
- Local residents and community organisations, and
- Construction companies.

The Project would affect the following parties:

- Residents of houses located within a 900 m range from the proposed CCGT unit;
- Residents of two ten-storey houses located less than 300 m from the planned stack of the CCGT unit;
- Residents of houses close to the Staraya Kuban channel used for thermal discharges to Kuban River;
- A fish farm located on the shores of the Staraya Kuban channel;
- Social personnel of enterprises located close to the Staraya Kuban channel, and
- City residents using the Staraya Kuban channel as a recreational area.

Currently, the Company's public information and consultation work is at its initial stage (9 publications in local media and the information on the Company website have been published to date). Local residents are largely unaware of the Project. Residents of two ten-storey houses closest to the Site do not have any information about the planned construction.

As a whole, Krasnodar residents have not been socially or politically active during the past years.

2.3.3 Indigenous People

There are no traditional lands or any communities of indigenous people within the Project area.

2.3.4 *Archaeological and Cultural Heritage*

There are no sites having archaeological, cultural and historical significance as well as unique natural environmental features in the vicinity of the KCHP site.

2.4 *OCCUPATIONAL HEALTH AND SAFETY OF COMPANY PERSONNEL*

The KCHP performs annual preventive medical checks of employees exposed to the workplace hazards.

In 2008, one case of occupational illness was recorded at the KCHP for the first time for many years. Namely, an employee with 45 years' experience of work with exposure to the unfavorable work factors was diagnosed with bilateral hearing loss.

The KCHP has signed the insurance contracts to insure its employees against accidents and provide voluntary medical insurance.

The workplace assessment was carried out at the KCHP facilities and the Workplace Action Plan is being implemented.

No occupational injuries were reported at the KCHP for more than 10 years.

2.5 *INDUSTRIAL SAFETY*

From 2002 to 2006, 97 incidents were recorded at the KCHP that did not lead to fires or accidents.

For this period, energy inspection bodies issued 173 enforcement notices to the Company to address gaps in electrical safety. From 1999 to 2005, local Rostekhnadzor issued 189 enforcement notices to the Company to address gaps in industrial safety. Most of these enforcement notices were triggered by the significant wear and tear of the equipment used by the KCHP. Although the overwhelming majority of the gaps identified by state inspections are promptly addressed by the Company, continued operation of the old equipment will deepen the situation.

2.6 *ENVIRONMENTAL AND SITUATIONAL LIMITATIONS*

2.6.1 *Limitations Relating to the Status of a Sanitary Protection Zone*

The sanitary legislation of the RF provides for establishment of a sanitary protection zone (SPZ) around industrial enterprises and it is prohibited to have any residential buildings, hospitals, kindergartens and schools within an SPZ. Any enterprise should ensure compliance with the regulatory levels of any possible impacts caused by its operations at the boundary of its SPZ.

The sanitary protection zone for the Krasnodar CHP Plant has been established by the regulator within a range of 300m from the main air emission sources, i.e. smoke chimneys. Any nearest residential areas and especially sensitive facilities are located outside of this SPZ. Measurements conducted at the SPZ boundary have indicated that the permissible levels of physical impact factors (noise, electromagnetic emissions) and chemical impacts caused by the Plant are complied with.

This means that the Krasnodar CHP Plant complies currently with the status of its sanitary protection zone.

2.6.2 *Limitations Relating to the Status of Water Protection Zones*

The water legislation of the RF provides for establishment of water protection zones along the coasts of any water bodies with regulated conditions for any commercial activities within such zones.

The water protection zone established for the Kuban River is 200 m wide. The oxbow lake used by the Krasnodar CHP Plant as technical canals for water supply and removal has a 50m wide water protection zone.

It is permissible to conduct commercial activities within those water protection zones only if appropriate measures are taken to prevent penetration of pollutants (first of oil lubricating oils) into a watercourse. No such negative cases have been ever reported during the entire period of operation of the water abstraction facilities.

Thus, the Krasnodar CHP Plant complies with the status of water protection zones of the Kuban River and its oxbow lake.

2.6.3 *Limitations Relating to the Status of Water Bodies Having Fishery Significance*

The Kuban River is classified as a watercourse of the highest fishery category. This implies that:

- The water abstraction facilities of the Krasnodar CHP Plant should be provided with efficient fish protection devices. As a matter of fact, the Plant does not have efficient fish protection systems. Investigations required for their development have been conducted since more than 4 years. It is expected that in 2009 the regulator will issue a statement permitting the Plant to install the proposed fish protection systems to prevent ingress of young fish into water abstraction facilities (Nos.3 and 4);
- Conditionally clean water to be released from the Krasnodar CHP Plant to the Kuban River should meet the requirements relating to its chemical composition or temperature in accordance with the norms for fishery water bodies (or background concentrations at the water abstraction point) and such requirements should be complied with directly at the outlet of such water to the Kuban River. This implies that water from the western portion of the oxbow lake should have a temperature not higher than 28°C at the outlet to the Kuban River during the warmest month of a year or a temperature not exceeding by more than 5°C the water temperature in the Kuban River during other seasons of a year.

Until now the local regulators permitted the Krasnodar CHP Plant to deviate from these legislative requirement – the monitoring cross-section is at a distance of 500 m downstream of the heated water outlet to the Kuban River. As a result, heated water was mixed with the river water in the Kuban River and the water temperature at the monitoring cross-section (i.e. 500 m downstream) complied with the regulatory temperature level.

The oxbow lake is classified as a water body of Fishery Category II. A possibility for an increase in the temperature of its water should be approved specifically by the regulator. Currently, the Krasnodar CHP Plant does not have such an approval. It is expected that it will be obtained in the first half year of 2009 within the framework of a Resolution permitting the use of water bodies for wastewater discharge.

2.6.4 *Limitations Relating to Sanitary Protection Zones of Underground Water Supply Sources*

Water of potable quality for the CHP Plant is provided from five artesian water wells located in the south-eastern and south-western ends of the Plant site. According to the applicable Russian sanitary rules, there should be three sanitary protection belts around a water well.

Belt I (50m wide) is established at the Krasnodar CHP Plant around each water well in compliance with the regulatory requirements.

In Belt II there are no potential sources of chemical and microbiological contamination of underground waters.

But within Belt III there is a fuel oil depot with unloading racks and underground storage tanks, which are potential sources of chemical pollution of underground waters. There are no monitoring wells provided to monitor the chemical composition in the uppermost groundwater horizon. This means that the issue of compliance of the Krasnodar CHP Plant with the status of Belt III of sanitary protection zone of underground water abstraction wells remains open.

3. **BRIEF HISTORY OF KRASNODAR CHP PLANT AND DESCRIPTION OF ITS EXISTING FACILITIES AND OPERATIONS**

The initial part of the first stage of the Krasnodar CHP Plant consisting of two steam boilers and one steam turbine was put into operation in 1954. The construction of the first stage facilities (the currently existing facilities of the No.1 boiler and turbine shop) was completed in 1959.

Currently, after a number of modernization projects, the first stage facilities include six steam boilers and five steam turbines. One turbine is on standby and another one is operated at 30% of its design capacity.

In 1963-1966, power-generating units of 150 MW capacity each were put into operation; they form the second stage of the CHP Plant, i.e. the No.2 boiler and turbine shop.

The Nos.1 and 2 boiler and turbine shops have three smoke chimneys 80m to 100m high above the ground level and about 99% of all air emissions from the Plant are released via the chimneys.

Two gas turbine units in a separate shop had been operated for approximately 25 years, but they were decommissioned in 1996 and 2004, respectively. Due to this fact, a decrease in the fuel oil proportion in the fuel balance of the Plant and an improvement of the combustion process efficiency permitted a sharp reduction in release of pollutants from the Krasnodar CHP Plant to the atmosphere.

Outdoor switchgear facilities with transformers and other electric equipment required for power transmission to the external networks with preset parameters are located in the eastern part of the Plant site at a distance of about 120 m from the nearest residential area.

Coal was used as the main type of fuel during the initial period of the CHP Plant operation. An ash-disposal area was constructed at a distance of 2 km to the east of the Plant site. It was operated until 1961, when the Plant was converted to gas, with fuel oil as standby fuel.

A fuel oil depot for fuel oil reception and storage was constructed at the western border of the site; it includes several fuel oil unloading racks, aboveground storage tanks, underground tanks for fuel oil reception and installations for fuel oil preheating and feeding.

Since the time of the Plant commissioning the oxbow lake has been used as a process water reservoir for cooling water supply and for subsequent removal of heated water.

The composition and layout of the main industrial facilities of the Krasnodar CHP Plant are shown in Figure 4.

Currently, the electric capacity of the CHP Plant is 648 MW. In 2008, the electricity output of the Plant was 4,856.3 million kWh and the sales of heat energy reached 1,023,200 Gcal. The efficiency of all CHP Plant facilities involved in electricity generation and supplies is approximately 33%.

The natural gas requirement of the Plant amounted in 2008 to 1 579,8 million m³/year, and the fuel oil requirement was 37,800t/year. The proportion of fuel oil in the fuel balance of the Krasnodar CHP Plant does not exceed 1.5%.

The residual life of the steam boilers and turbines of the Plant's first stage is (as of January 2009) 2 to 6 years. This means that construction of new highly efficient power-generating capacities, such as the planned 410 MW CCGT unit, is extremely important and urgent for the Krasnodar CHP Plant.

4. *TECHNICAL AND TECHNOLOGICAL SPECIFICATIONS OF THE PLANNED 410 MW CCGT UNIT AND INFRASTRUCTURE FACILITIES*

The Krasnodar CHP Plant expansion project provides for construction of the main building for the planned 410 MW CCGT unit in the northern part of the site with its own chemical water pretreatment plant and with a smoke chimney 60 m high above the ground level.

The main building will accommodate:

- one gas turbine of M701A-303.9 type manufactured by Mitsubishi Heavy Industries (Japan);
- one gas turbine generator manufactured by Mitsubishi Electric Corporation (Japan);
- one waste heat boiler manufactured by OAO “EMAlliance” (Russia);
- one steam turbine of T-113/145-12,4 type manufactured by ZOA “UTZ” (Russia).

In addition, the following infrastructure facilities for the CCGT unit will be constructed within the outlines of the CHP Plant site:

- engineering and general amenities building;
- gas booster compressor station;
- gas treatment station;
- compressor station;
- standby diesel generator station;
- lubricating oil supply system.

It is also planned to modify substantially the following existing facilities:

- Turbine and transformer oil store;
- Diesel fuel depot.

An outdoor transformer substation will be constructed outside of the CHP Plant’s existing site on adjacent land plot having an area of approximately 2.7 hectares. The existing outdoor 220 kV switchgear facilities will be also expanded.

The layout of all main facilities to be constructed and upgraded is shown in Figure 4.

The CCGT project design provides for maximum use of the existing engineering networks and facilities, including the feed gas pipeline and the treatment facility for oil-contaminated wastewater and storm water runoff. A permit for the maximum permissible natural gas supply limit for the CCGT unit has been already obtained from OAO “GazProm”.

Cooling water for the CCGT unit will be supplied by the existing pump stations located on the Kuban River bank (No.3 and No.4) and at the northern part of the oxbow lake (No.1 and No.2). Only the No.1 pump station will be virtually

completely modified, because the existing pump station has already exceeded its design life.

The new combined cycle gas turbine unit will increase the total capacity of the Krasnodar CHP Plant by 427 MW and by 220 Gcal/hour in terms of electricity and heat energy output, respectively. The unit fuel requirement (natural gas as main fuel and diesel fuel as standby fuel) will decrease sharply in comparison with the existing power generating units of the Plant and the efficiency of electricity generation of the CCGT unit will be 57%. This complies with the world's best achievable level. A comparison of the 410 MW CCGT unit characteristics with the best technical specifications recommended for West Europe is given in Appendix 1.

After commissioning of the CCGT unit, UGK TKG-8 plans to decommission three turbines of the non-block part of the Plant with a total capacity of 84 MW. The two remaining turbines of the non-block part of the Plant will operate only in alternating mode.

Thus, the new power-generating unit will have the following advantages:

- It will be constructed only on land classified as land for industrial use and most of the new facilities will be located within the current outlines of the Krasnodar CHP Plant site;
- Its energy efficiency will meet the world's best performance standards;
- Its operation will permit decommissioning and dismantling of obsolete equipment units having low energy efficiency, requiring increasing expenses for maintenance and posing potential threat of accidents.

5. *CONSTRUCTION PROCESS ORGANIZATION*

As of February 2009, the main operations for dismantling of old facilities located within the area of the future construction site had been completed.

The following types of construction work will be performed at the site:

- Excavation of pits for buildings and facilities;
- Installation of required engineering networks;
- Pile driving and construction of concrete foundations;
- Erection of steel structures, walls and ceilings;
- Installation of equipment;
- Connection of required utilities;
- External and internal finishing of buildings.

It is expected that the construction will be completed within 34 months.

Up to 100 machines and mechanisms with internal-combustion engines can be operated at the site at a time. Electricity, hot and cold water will be supplied to the construction site from the Plant's existing networks. Meals for construction workers will be provided by the Plant's existing canteen.

All temporary facilities required during the construction phase will be located on the current site of the Krasnodar CHP Plant. The construction personnel that will reach during some periods a maximum number of 470 persons will be accommodated in the city of Krasnodar.

The Krasnodar CHP Plant' medical station is ready to provide first aid, if required, for the personnel involved in construction of the CCGT unit and associated infrastructure facilities.

Additional emissions from the construction machinery with internal combustion engines and vehicles involved in construction will be less than 1% of the current air emissions from the Krasnodar CHP Plant and will not cause any non-compliance with the emission limits set currently for the Plant. It is not expected that the sanitary norms for concentrations of pollutants in ambient air in the nearest residential areas will be exceeded due to construction of the CCGT facilities.

Potable and industrial water will be supplied from the Plant's existing networks within the limits set currently for the Plant. Biotoilets will be installed on site for construction personnel and the sanitary facilities in the accommodation camp for construction workers will be connected to the sewerage system. Storm water runoff from the construction site will be drained to the storm water drainage system of the CHP Plant for conditionally clean runoff and sent to the primary settling pond, after which it will be combined with the storm water runoff from the rest of the Plant site and released to the Kalininskaya gulley.

Thus, during the construction phase the water protection legislation will be complied with in a reliable way.

During the start-up and adjustment phase it will be required to flush the CCGT circuits and boilers with special chemical solutions. Wastewater from flushing will be collected in three accumulating tanks and subjected to neutralization; after checking its chemical composition and verification of its compliance with the requirements set for conditionally clean storm water it will be discharged to the Kalininskaya gulley.

Excessive excavated soils (about 5,000 m³) can be classified on the basis of the available survey data as non-contaminated. It has been approved by the supervisory agency that they can be disposed of in the Plant's former ash-disposal area (2km to the west of the Plant's site) and be utilized for reclamation of that area.

It is expected that the nomenclature of construction waste will be similar to the approved waste nomenclature of the current Krasnodar CHP Plant operation. However, the amounts of waste generation for the construction phase have not been calculated so far. The construction contractor should make such calculations and obtained prior to construction commencement from the relevant supervisory agencies a document specifying the limits for construction waste disposal.

To prevent soil contamination all temporary parking lots for construction machinery and vehicles and areas designated for short-term onsite waste storage should be provided with impermeable paving and with bypits for collection of potentially contaminated storm water runoff. This water will be pumped out from time to time and transported to the CHP Plant's local wastewater facility used for treatment of oil-polluted wastewater.

Thus, the environmental impact during the construction phase is expected to be rather moderate. The only outstanding issue is computation of waste generation amounts and obtaining of a permit (the Limits) for waste disposal from the relevant supervisory agencies.

The main factor affecting the local communities during the construction phase might be the elevated noise level caused by pile driving during construction of the foundation for the future CCGT main building.

The construction site of the CCGT building will be located at a distance of approximately 260 m from two 10-story apartment buildings to the north of the Krasnodar CHP Plant site. Although sound-proof screens will be installed to protect the residential buildings against noise impact during pile driving and the operations will be carried out only from 7 AM until 11 PM, it is quite likely that the level of 55 dBA (the permissible limit for noise impact for residential buildings during day hours) can be exceeded at the upper floors in those buildings in the apartments facing the construction site. In order to objectively assess the situation and, if required, develop additional protection measures, it is needed to model the noise pollution for all floors of those two apartment buildings.

No additional external access roads will be constructed for delivery of materials to the construction site. The traffic intensity will increase only insignificantly in connection with transportation of materials and personnel during the construction phase. It will not be a disturbance factor for the local communities.

Construction personnel will be recruited in the first line in the city of Krasnodar; organizations based in this city will be the main tender bidders for construction contracts. Almost 500 jobs will be created for a period of over 3 years.

Furthermore, concrete and reinforced concrete manufacturing companies and transportation companies of Krasnodar will be involved during the CCGT construction phase. This will also improve the employment situation in the city.

In general, it is expected that the construction period will have positive social effects; however, the expected noise level caused by the construction operations is subject to additional assessment and subsequent continuous monitoring. If required, additional protective actions should be taken based on the monitoring data.

7. *EXPECTED IMPACTS DURING OPERATION PHASE*

7.1 *AIR POLLUTION*

In 2008 the actual air emissions from the Krasnodar CHP Plant amounted to 5,060 tons of pollutants, which was much lower than the limit of 8,400 tons established by the supervisory agency. This means that the Plant has a significant margin (over 3,000 tons per year) for a possible increase in gross emissions of pollutants to the atmosphere.

Air emissions from the planned CCGT unit are expected to have a nitrogen oxides concentration in the order of 50 mg/Nm³ as compared with the best achievable level of 125 mg/Nm³ recommended in West Europe. The carbon monoxide concentration is expected to be 12.5 mg/Nm³, which also meets the requirements for the best achievable level. (See Appendix 1).

Only 469 tons of pollutants per annum (in terms of gross emission) will be released as a result of the CCGT unit operation. Since the nomenclature of pollutants will remain the same (nitrogen oxides and carbon monoxide will make up virtually the entire amount of regulated pollutants), it may be expected that the currently valid limits for air emissions from the Krasnodar CHP Plant will be complied with in a reliable way.

At the same time, the CCGT chimney will be located at a substantially shorter distance from the two multi-story apartment buildings than the currently existing smoke chimneys of the Krasnodar CHP Plant. Furthermore, the CCGT chimney will be higher only by 30m than the two apartment buildings.

The computations available in the civil engineering design have indicated that the ground-level concentrations of pollutants in the ambient air during the CCGT unit operation with gas firing will comply with the applicable sanitary norms for ambient air quality (even if none of the existing energy-generating facilities will be decommissioned).

But similar calculations for the upper floors of the two apartment buildings nearest to the CHP Plant have not been made. There is no assessment in place for the worst possible scenario, i.e. operation of the Plant's old equipment in case of firing with fuel oil and simultaneous operation of the CCGT unit fired with diesel fuel.

Such calculations should be made in order to assess a possibility for reducing the dimensions of the sanitary protection zone of the Krasnodar CHP Plant in the northward direction and avoid that the SPZ encompasses also the two 10-story apartment buildings (if the currently established 300m wide SPZ of the Krasnodar CHP Plant will be formally applied to the CCGT unit, then the two buildings will be located within the SPZ boundaries).

After the CCGT unit commissioning the calculated values should be verified on the basis of measurements to be made during one year: at least 50 measurements to determine nitrogen dioxide and carbon monoxide at six sampling points both at the ground level and at the level of the 5th and 10th floors of those apartment houses.

7.2 CHANGES IN THE LEVEL OF GREENHOUSE GAS EMISSIONS

No assessment of changes in the GHG emission levels has been made.

Using the data for a similar facility it may be assumed that the 410 MW CCGT unit will release to the atmosphere approximately 3.5 million tons of CO₂-equivalent. Such an increase does not appear to be critical; it accounts for only 0.3% of the quota for the Russian Federation for a possible increase in the GHG emissions up to the 1990 level, which is permitted by the applicable international agreements.

Furthermore, with decommissioning of the obsolete energy-generating installations the overall GHG emissions from the Krasnodar CHP Plant are expected to decrease by approximately 1 million tons CO₂-equivalent per annum.

7.3 WATER REQUIREMENT AND WASTEWATER MANAGEMENT

7.3.1 Water Requirement

With an increase in the Plant's personnel by approximately 80 persons after the CCGT commissioning, the potable water requirement will increase by about 20m³/day. This is much lower than the Plant's quota for additional underground water abstraction.

In summer, i.e. during the period of most intensive water abstraction from the Kuban River (the oxbow lake) for cooling of the CCGT equipment and associated infrastructure facilities, the volume of abstracted water will be 30,000 m³/hour or 23% of the total expected water abstraction from the Kuban River for the entire CHP Plant (provided that three turbines of the Plant's non-block part will be decommissioned).

The currently existing difference between the actual water consumption and the limit set by the regulator for water abstraction from the Kuban River of approximately 230 million m³ per annum is quite sufficient to allow for additional water abstraction for the needs of the CCGT unit (even without the planned decommissioning of a number of obsolete power-generating units at the Krasnodar CHP Plant).

7.3.2 Wastewater Removal

The amount of generated *sanitary wastewater* will increase by less than 20 m³/day. This will require only a formal approval by the VodoKanal Company of an insignificant increase in the existing limit for discharge of this type of wastewater to the municipal sewerage networks.

The amount of *conditionally clean heated water* discharged from the CHP Plant to the oxbow lake will be smaller than the water consumption by 0.4 million m³ per annum. In addition, about 1.5 0.4 million m³ per annum will be lost due to evaporation from the oxbow lake surface.

The main portion of thermal load will be caused by discharge of heated water from the block-type part of the Plant (an increase in water temperature in summer is expected to be by 10.6°C in comparison with the water temperature at the water

abstraction point from the Kuban River). Cooling water at the CCGT unit will be heated by only 8°C. This means that the combined stream of conditionally clean water released to the oxbow lake will have a temperature higher by 9.96°C than the water in the Kuban River. On average, the temperature of discharged water might be as high as 33.9°C during the warmest summer month (August), and on some days reach even 37°C.

Modeling of the thermal load imposed on the Kuban River taking into account not only the temperatures, but also the volumes of discharged water, has not been performed in the process of the Project design development.

It had been assumed that the oxbow lake will ensure an average reduction in the water temperature by 3°C. It had been also assumed that this, in turn, will ensure compliance with the maximum permissible water temperature in the Kuban River (28°C) at the river cross-section prescribed by the supervisory agency for monitoring (500m downstream of the heated water outlet to the Kuban River).

The issue of thermal load imposed by the Krasnodar CHP Plant on the oxbow lake and the Kuban River after the CCGT unit commissioning and its compliance with the fish protection regulations is to be additionally elaborated in the Project design documentation.

Salt-containing wastewater with a salt content of about 1100 mg/l that will be generated at a rate of approximately 470 m³/day by the new water pretreatment plant to be constructed as an integral part of the CCGT infrastructure facilities will be released, according to the Project Design, without treatment to the storm water drainage system and then, after blending, to the Kalininskaya gulley. This intention is subject to additional approval by the relevant supervisory agency, because the RF water legislation does not permit industrial enterprises to reduce concentrations of pollutants in wastewater by its dilution.

Furthermore, the Krasnodar CHP Plant should also resolve the issue of termination of discharge of wastewater with similar chemical composition to the Plant's former ash-disposal area.

In this situation it appears to be reasonable to construct local treatment facilities at the Plant for treatment of salt-containing wastewater.

According to the Project Design, *process wastewater (4.5 m³/hour) containing petroleum hydrocarbons and storm water runoff (12.5 m³/hour) potentially contaminated with hydrocarbons* from the CCGT unit and its infrastructure facilities will be sent to the local wastewater treatment facilities, which have been in operation at the Plant since a long time and designed specifically for recovery of petroleum hydrocarbons from wastewater.

This issue requires additional approval from the relevant supervisory agency because the given treatment facilities have now low efficiency, i.e. the hydrocarbons recovery is only 57%. In the future this might result in non-compliance with the regulatory limit for TPH concentration (0.3 mg/l) in the combined treated wastewater stream released to the Kalininskaya gulley.

It is required to analyze this issue in more detail; it is not unlikely that modernization of the existing local wastewater treatment facility for wastewater contaminated with petroleum hydrocarbons will be needed.

7.4 PROTECTION OF WATER BODIES

In case of the worst scenario (i.e. if decommissioning of a number of currently operating power generating units at the Krasnodar CHP Plant will be postponed) the total water requirement after the CCGT unit will be put into operation will increase by approximately 200 million m³ per annum. This will entail an increase in the flow rate of heated water at the outlet from the Plant to the oxbow lake.

No calculations have been made in the Project Design to demonstrate that the water outlet canal will be able to handle in a sustainable manner the increased hydraulic loads. Computations of the washout of bottom sediments from the oxbow lake at the outlet of heated water and the resulting changes in the concentrations of chemical substances in the oxbow lake have not been made either.

7.5 WASTE MANAGEMENT

A preliminary inventory of waste generation has indicated that during the operation phase, the CCGT unit and associated infrastructure facilities will generate only the same types of wastes, which are already included in the Limits for waste disposal approved by the regulator for the Krasnodar CHP Plant. The total annual quantity of waste generation has been estimated at 16.4 tons, of which 10.3 tons is spent turbine oils, which can be reused.

This means that there will be no risks caused by additional amounts of wastes generated after commissioning of the CCGT unit at the Krasnodar CHP Plant.

7.6 LAND PROTECTION

Construction of the CCGT unit and associated infrastructure facilities does not affect any farming land. An insignificant increase in the release of nitrogen oxides after the CCGT unit commissioning and their precipitation from the atmosphere will not impact the fertility of soils, because the chernozem soils in Krasnodar Province are highly resistant to exposure to acidic impacts.

All oil product storage facilities required for the operation of the CCGT unit will be provided with secondary containment bunding and the ground surface and slopes inside the bunding will have appropriate hydraulic insulation. This will prevent any soil contamination even in case of the worst scenario.

7.7 UNDERGROUND WATER PROTECTION

The measures described above for storage of oil products will also prevent adverse impact of the CCGT unit and associated infrastructure facilities on underground waters.

7.8 VEGETATION AND WILDLIFE PROTECTION

The CCGT unit operation will not pose any negative impacts on land-based ecosystems.

For the oxbow lake, which is classified as a water body of Fishery Category II, an essential factor of impact on fish and other aquatic organisms might be the change in the temperature conditions in summer. No calculations of water temperature in the oxbow lake for the works days are available in the Project Design. Accordingly, there is no ground to conclude now that there will be no risk of fish death due to possible overheating of water in the oxbow lake. This refers also to the fish hatchery operating in the vicinity of the water outlet from the oxbow lake to the Kuban River.

For the aquatic system of the Kuban River the impact of heated water release from the oxbow lake will be minimized due to effective dilution.

If the water abstraction rate from the Kuban River will increase in connection with the CCGT unit commissioning (this is possible in case of delay with decommissioning of some of the existing power generating units at the CHP Plant), there will be a risk that young fish will be sucked in by the Nos. 3 and 4 pump stations used for water abstraction from the Kuban River. Currently, those stations are not equipped with any efficient fish protection devices. Design development of a fish protection system for the Krasnodar CHP Plant has not been yet completed, and not approved, therefore, by the fishery protection agency.

7.9 ENVIRONMENTAL MONITORING

The Project Design provides in addition to the current system of monthly measurements of pollutants concentrations in air emissions from the existing smoke chimneys also installation of an automatic gas analyzer at the CCGT smoke chimney. It will permit real-time monitoring of concentrations of individual pollutants, in order to use the obtained data for combustion process optimization.

It is also planned after the CCGT unit commissioning to make measurements for monitoring the air pollution level and use the obtained data for justification of a decrease in the SPZ dimensions of the Krasnodar CHP Plant to avoid that two 10-story apartment buildings are covered by the current SPZ (the CCGT chimney will be located at a distance of approximately 260 m from those residential buildings, which is less than the currently approved width of the Plant's SPZ, i.e. 300 m from the existing chimneys).

No other measures are foreseen in the Project Design in addition to the Plant's current environmental monitoring system, although it is actually required to carry out continuous monitoring of water temperature at the outlet to the oxbow lake and at the outlet from the oxbow lake to the Kuban River. It also appears to be reasonable to assess the efficiency of the fish protection devices, which will be approved by the fishery protection agency for the water intake facilities of the CHP Plant used for water abstraction from the Kuban River. This assessment should be made annually during the period of young fish migration.

In order to assess in a realistic way the degree of groundwater contamination with petroleum hydrocarbons it is advisable to install monitoring wells around the fuel oil depot.

To comply with the legislation relating to waste management, it is also necessary to install monitoring wells along the perimeter of the former ash-disposal area used currently by the Plant as a sludge settling pond. The soils in the sludge disposal area

should be investigated to check whether they are suitable for potential construction of residential buildings (as it is planned by the Krasnodar City Administration after the termination of the lease agreement with the CHP Plant for its former ash-disposal area).

7.10 IMPACTS ON HEALTH AND SAFETY OF COMPANY PERSONNEL

The Project design provides for sufficient health and safety measures at the construction and operation stages.

7.11 COMPLIANCE WITH INDUSTRIAL SAFETY REQUIREMENTS

The Project design describes the fire safety requirements for the proposed CCGT unit and provides calculations indicating that in case of hypothetical accident on the gas pipeline (e.g. explosion) the areas outside the site will not be affected.

7.12 SOCIO-ECONOMIC IMPACTS OF THE PROJECT

Expansion of the KCHP and commissioning of the CCGT unit will have a number of positive impacts on the city's (and the entire North Caucasian region's) socio-economic situation. These include:

- stable and reliable heat and energy supply to customers;
- reduction of specific fuel consumption;
- improved competitiveness of the power plant in entering the electricity market;
- use of the existing site and infrastructure for the construction of the new CCGT unit that will cut the costs and reduce the environmental and social impacts during the construction stage;
- creation of new jobs both during the construction stage and operation stage, and
- provision of the employees with a safe and healthy work environment and sufficient training.

The potential adverse social impacts include:

- hypothetical accident on the gas pipeline connected to the CCGT unit resulting in gas explosion and break up of window panes in the houses located within 900 m range. Window panes may completely break out in the houses located within 600 m range.
- potential adverse impacts on health and safety of residents from explosion of hydrogen stored at the site and needed for the operation of the CCGT unit. Those adverse impacts have not been properly analysed in the Project design documentation.
- noise impacts from pile driving at the construction stage. Modeling of noise levels has not been carried out at this stage of Project design documentation development.

- installation of a new stack of the CCGT unit at a distance of 260 m from two ten-storey residential buildings. Potential health risks have not been analysed at this stage of Project design documentation development.
- increase in thermal discharges into the Staraya Kuban channel leading to increased evaporation from the channel surface and increased humidity in the adjacent areas. This may potentially impact comfort of residents living in the adjacent houses, and
- increase in water temperature of the Staraya Kuban channel that may have adverse impacts on local fisheries, recreation and community health due to the increased potential for water related communicable diseases.

8. *GENERAL CONCLUSIONS ON THE BASIS OF ASSESSMENT FINDINGS*

Electricity and heat energy generation with the use of combined-cycle turbine units is recognized worldwide as an advanced technology from the economic, environmental and safety viewpoint.

Under the conditions of the congested layout of the Krasnodar CHP Plant, the temperature and water supply conditions of the Plant operation, the planned construction of a 410 MW CCGT unit with associated infrastructure facilities and their subsequent operation will not create any significant environmental and social risks.

But some issues, which have not been elaborated in sufficient detail at this stage of implementation of the given investment intention, should be subjected to additional investigations. If required, additional measures should be proposed and implemented in order to control the risks associated with such issues.

All these additional comments and recommendations will be considered in the final version of the project document for the construction of the CCGT-410, including Volume 8 Environmental Protection Measures that will be going through the approval procedure with the State Review of the Russian Federation in the first half of 2009.

ANNEX 1. ALIGNMENT OF THE PROJECT WITH THE REQUIREMENTS OF THE EC IPPC DIRECTIVE

Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control (codified version 2008/1/EC of 15 January 2008) regulates the operations of existing and new industrial facilities in relation to prevention and mitigation of their impact on the atmospheric air, water and soils by offering an integrated approach to the environmental aspects of their operations.

Annex 1 to the Directive (Section 1 *Energy Industries*) lists the type of industrial activity potentially applicable to the KTPP, namely:

Types of operations listed in Annex 1	Applicability to the operations of the KTPP
1.1. Combustion installations with a rated thermal input exceeding 50 MW.	Net electrical capacity of the proposed CCGT is 427 MW.

Lists of best available technologies (BAT) are published in relevant reference documents (IPPC Reference Documents on Best Available Technologies, or BREFs) that contain detailed information about technologies considered to be BAT for each specific sector of industry.

The following FREF documents are potentially applicable to the operations of the KTPP:

- BREF on BAT for Large Combustion Plants (2006)
- BREF on the application of BAT to Industrial Cooling Systems (2001)

1.1 BAT FOR LARGE COMBUSTION PLANTS

1.1.1 Thermal Efficiency and Fuel Utilisation

Increase of the thermal efficiency of the plant through better fuel utilisation is BAT to reduce greenhouse gas emissions from gas-fired combustion plants. A combined cycle operation and co-generation of heat and power is considered as the first BAT option. In this regard, the planned CCGT unit complies with the BAT regarding increasing thermal efficiency.

In addition, preheating the natural gas is also considered BAT to improve the efficiency. A gas compressor will be used at the KTPP for preheating of the natural gas.

BAT associated electrical efficiency of new CCGT units is 54 to 58%. Electrical efficiency of the planned CCGT unit at the KTPP will be 57%.

1.1.2 CO и NO_x Emissions

Table 1.1. BAT Associated and Actual and Projected CO and NO_x Emissions

	Emission level associated with BAT, mg/Nm ³		Actual and projected (for new CCGT) emission levels, mg/Nm ³		Current Russian standards*, mg/Nm ³		BAT options to reach these levels
	CO	NO _x	CO	NO _x	CO	NO _x	
Existing gas boilers	30 – 100	50	35 – 146	84 - 177	300	125	Dry low NO _x burners or selective catalytic reduction
New CCGT without supplementary firing	5 - 100	20 - 50	12	50	-	-	Dry low NO _x burners or selective catalytic reduction

* GOST R 50 831 95 «Boiler plants. Thermal installations. General technical standards»

CO and NO_x emission levels from the existing gas installations at the KTHP are compliant with the current Russian standards.

Emissions from the planned CCGT unit will comply both with the current Russian standards and BAT associated emission levels.

1.1.3 Wastewater Management

BAT for prevention of surface run-off pollution is sedimentation or chemical treatment and internal re-use.

To manage wastewater from washing of boilers and turbines, the first BAT option is neutralisation and closed loop operation, or replacement by dry cleaning methods, where technically possible.

Re-use of 'conditionally clean' wastewater is possible at the KTHP only in the cold season due to the particular climatic characteristics of the region.

Oil contaminated process wastewater is discharged from the KTHP site after being treated to the regulatory levels.

Treated process wastewater or stormwater is not reused and its re-use is not planned.

1.1.4 Combustion Residues

BAT is the utilisation and re-use of combustion residues instead of depositing them in landfills.

The KТПP landfills only those types of waste which cannot be managed locally due to the lack of technical capacity in the region.

1.2 *BAT FOR INDUSTRIAL COOLING SYSTEMS*

1.2.1 Thermal Discharges

In case the cooling water is discharged in the river, recirculation in the river must be avoided. The position and design of water intake and outlet structures should be determined to eliminate the risk of recirculation.

The KТПP does not use the Kuban River for recirculation. The Staraya Kuban channel, an isolated natural arm of the Kuban River has been used by the KТПP for the last 50 years for water abstraction and cooling water discharge. In the cold season, the channel is used for recirculation without discharging the cooling water in the Kuban River.

ANNEX 2 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN FOR THE CCGT CONSTRUCTION AND OPERATION PHASES AT THE KRASNODAR CHP PLANT

No	Expected impact/ Potential issues	Proposed management / monitoring measures	Organisations responsible for solution of issue and for routine monitoring	Timeframe for implementation
Construction Phase (CP)				
CP 1. General Aspects of Environmental Management				
1.	The construction contractor should have clearly defined obligations in relation to environmental compliance during the execution of work at the Krasnodar CHP Plant site.	Include in the contract the following covenants obliging the construction contractor to: 1. Completely fulfill the requirements of the environmental legislation in the process of work execution at the CHP Plant site. 2. Obtain prior to construction commencement a Permit for emission of harmful pollutants to the atmosphere and the Limits for waste generation and disposal for the given scope and composition of construction work planned at the Krasnodar CHP Plant site	Legal department of the CHP Plant (Ensure that the relevant obligations of the Contractor be incorporated in the Contract) Environmental management department of the CHP Plant (Ensure that the Contractor obtains the required Permits/ Licenses)	Prior to conclusion of a contract with the construction contractor Prior to construction commencement

№	Expected impact/ Potential issues	Proposed management / monitoring measures	Organisations responsible for solution of issue and for routine monitoring	Timeframe for implementation
		3. Develop and have approved by the regulator an environmental monitoring programme for the construction phase 4. Ensure that environmental pollution charges for air emissions / waste generation are paid in due time during the construction phase	Environmental management department of the CHP Plant (Supervise the Contractor's compliance with the provisions of the Programme) Environmental management department of the CHP Plant (Supervise the Contractor's compliance with its obligations relating to timely payment of environmental pollution charges)	On an ongoing basis during the construction phase On an ongoing basis during the construction phase
2	Consultations with the potentially affected communities are to be conducted prior to commencement of Project implementation according to the RF legislation	Conduct public consultations	PR Service of OAO "UKG TGK-8"	Prior to submission of the final revision of the Project Design to the State Project Review Department
CP 2. Air Pollution Abatement				
1	If more than 100 units of machinery and mechanisms with internal combustion engines are in operation at a time at the CCGT construction site, elevated levels of air pollution outside of the	Organize measurements of nitrogen dioxide and carbon monoxide concentrations in ambient air at the nearest 10-story apartment buildings (located at a distance of 250m to the north of the construction site). Measurement should be	Sanitary Inspection Service of the city of Krasnodar on the basis of an agreement with the Krasnodar CHP Plant	At least 30 measurements per annum

№№	Expected impact/ Potential issues	Proposed management / monitoring measures	Organisations responsible for solution of issue and for routine monitoring	Timeframe for implementation
	Plant site are potentially possible.	made in case of southerly winds.		
2.	During summer period, earthmoving operations might cause intensive dusting by wind.	Ensure regular spraying of the site with water (roads/soil dumps) to prevent intensive dusting	Site improvement service of the Krasnodar CHP Plant	On a regular basis during warm season
CP 3. Protection of Water Bodies				
1.	Certain areas of the construction site will not be connected to the Plant's central sewerage network.	Install biotoilers in all areas, where construction work is carried out; ensure their regular maintenance.	Construction contractor	On an ongoing basis during the construction phase
2.	Water abstraction from water wells and sanitary wastewater discharge to the sewerage system will increase during the construction phase	Ensure recording of additional volumes of water consumption and wastewater removal associated with construction work and make timely payments for the additional volumes	Environmental management department/ Financial service of the Krasnodar CHP Plant	On an ongoing basis during the construction phase
3.	Migration of petroleum hydrocarbons to the storm water drainage system is possible from parking lots and areas used for fuel and lubricant storage.	Provide impermeable paving in all areas of potential contamination with petroleum hydrocarbons and bypits for contaminated runoff water collection. Remove contaminated runoff water on a regular basis to the local treatment facility.	Construction contractor	On an ongoing basis during the construction phase
CP 4. Waste Management				
1.	Basic data required for	Carry out an inventory of	Design development contractor	Immediately

No	Expected impact/ Potential issues	Proposed management / monitoring measures	Organisations responsible for solution of issue and for routine monitoring	Timeframe for implementation
	assessment of the expected waste generation amounts during construction phase are not available.	waste generation amounts for the construction phase		
2.	Soils to be excavated at the CCGT construction site can be considered as non-contaminated based on the survey data. Areas for their stockpiling have not yet been designated.	Agree with the regulator upon the possibility for removal of soils excavated at the construction site to the Plant's former ash-disposal area and use of the soils for its reclamation.	Environmental management department of the Krasnodar CHP Plant	Prior to construction commencement
CP 5. Handling of environmentally hazardous materials				
1.	Fuel and lubricants will be supplied to the site.	Develop instructions for handling of environmentally hazardous materials and ensure compliance with those instructions.	Construction contractor	On an ongoing basis during the construction phase
CP 6. Environmental aspects associated with operation of vehicles				
1.	Entrainment of dirt is possible on vehicles' wheels to outside of the construction site	Install an area for wheel washing for vehicles at the exit from the site; ensure efficient use of the prescribed wheel washing procedure.	Construction contractor	On an ongoing basis during the construction phase
CP 7. Noise pollution				
1	Elevated levels of noise levels on the residents of the 10-story buildings located at a distance of 250m from the	1. Carry out pile driving only during a period from 08 AM until 11 PM. 2. Organize noise level measurements at the nearest	Construction contractor	On an ongoing basis During the pile driving period

No	Expected impact/ Potential issues	Proposed management / monitoring measures	Organisations responsible for solution of issue and for routine monitoring	Timeframe for implementation
	construction site are possible during pile driving in the process of foundation construction.	apartment buildings. In case of non-compliance with the sanitary norm develop additional measures for noise impact mitigation.		
CP 8. General social issues				
1.	Jobs should be provided during the construction phase in the first line for residents of Krasnodar.	Workers and specialists living in Krasnodar will be recruited during the construction phase on a preferable basis.	Construction contractor	On an ongoing basis during the construction phase
2.	General services for the construction personnel should comply with the applicable sanitary norms.	Ensure general amenities, sanitation facilities, shower rooms, the Plant's canteens for the construction personnel to an extent in compliance with the sanitary requirements, taking into account the maximum number of personnel.	Construction contractor	On an ongoing basis during the construction phase
3.	The construction personnel should be provided with special working clothing and personal protection equipment in compliance with the applicable norms.	Ensure unconditional compliance with this provision of the legislation.	Construction contractor	On an ongoing basis during the construction phase
4.	The IFI requirements do not permit use of child and forced labour.	Provide relevant covenants in the contract with the construction contractor.	Legal department of the Krasnodar CHP Plant	On an ongoing basis during the construction phase

№№	Expected impact/ Potential issues	Proposed management / monitoring measures	Organisations responsible for solution of issue and for routine monitoring	Timeframe for implementation
		Check on a regular basis compliance of the contractor with the respective provisions.		
Operation Phase (OP)				
OP 1. Air Pollution Abatement				
1	There is a risk that the ambient air pollution level at the residential buildings nearest to the CCGT smoke chimney the permissible values during certain periods.	After the CCGT unit commissioning it will be required to substantiate on the basis of monitoring data the fact that the pollutants concentrations in ambient air at the residential buildings do not exceed the regulatory maximum permissible values.	Sanitary inspection service of the city of Krasnodar on the basis of a contract with the Krasnodar CHP Plant	During the first year after the CCGT commissioning
2.	The current dimensions of the Plant's SPZ (300m from the smoke chimney) cannot be complied with for the CCGT from the formal viewpoint (the nearest residential buildings are located at a distance of 260m).	Based on the monitoring data it is required to prepare and finalize an updated SPZ design.	Specialist contractor on the basis of a contract with the Krasnodar CHP Plant	During the second year after the CCGT commissioning
3.	It is feasible to install an automatic air emission monitoring system at the CCGT unit.	Introduce an automated system for monitoring of nitrogen dioxide and carbon monoxide concentrations in emissions from the CCGT unit	Krasnodar CHP Plant	On an ongoing basis after CCGT unit commissioning
OP 2. Wastewater Removal				

№№	Expected impact/ Potential issues	Proposed management / monitoring measures	Organisations responsible for solution of issue and for routine monitoring	Timeframe for implementation
1	No continuous water temperature monitoring is carried out at the Krasnodar CHP Plant at the wastewater outlets to the oxbow lake and the Kuban River.	Install an automated water temperature monitoring system at the wastewater outlets to the oxbow lake and the Kuban River.	Krasnodar CHP Plant	2010
2	There are no efficient solutions in place for disposal of salt-containing wastewater at the Krasnodar CHP Plant.	In the process of the Project Design finalizing, define and implement efficient solutions for treatment of the entire salt-containing wastewater stream that will be generated after the CCGT commissioning.	Design development contractor and Krasnodar CHP Plant	2009-2011
3.	Surface runoff contaminated with petroleum hydrocarbons are currently treated at a wastewater treatment facility having a low efficiency. Feasibility of the use of this facility for treating the entire oil-polluted wastewater stream from the CCGT unit has not been substantiated in the Project Design.	In the process of the Project Design finalizing, define and implement efficient solutions for treatment of the entire oil-polluted wastewater stream that will be generated after the CCGT commissioning.	Design development contractor and Krasnodar CHP Plant	2009 – 2011
OP 3. Noise impact				

№№	Expected impact/ Potential issues	Proposed management / monitoring measures	Organisations responsible for solution of issue and for routine monitoring	Timeframe for implementation
1	The equipment to be purchased and the structural elements of the buildings and facilities should guarantee that no harmful noise impact will be imposed either at workplaces or in the nearest residential areas. Furthermore, the RF legislation requirements that this should be confirmed by actual measurements.	Carry out a series of noise level measurements at workplaces and at the residential buildings nearest to the CCGT unit.	Sanitary inspection service of the city of Krasnodar on the basis of a contract with the Krasnodar CHP Plant	After CCGT unit commissioning
OP 4. Harmful electromagnetic emissions				
1	It is expected that after the expansion of the area occupied by the 220 kV outdoor switchgear the electromagnetic emission level at the nearest residential buildings will comply with the applicable sanitary norm. Furthermore, the RF legislation requirements that this should be confirmed by actual measurements.	Carry out a series of electromagnetic emission level measurements at the residential buildings nearest to the CCGT unit.	Sanitary inspection service of the city of Krasnodar on the basis of a contract with the Krasnodar CHP Plant	After CCGT unit commissioning

№№	Expected impact/ Potential issues	Proposed management / monitoring measures	Organisations responsible for solution of issue and for routine monitoring	Timeframe for implementation
OP 5. Soil Contamination				
1	Considerable quantities of diesel fuel and various grades of oils will be stored at the Plant site to support the CCGT unit operation.	The Project Design provides for secondary containment bunding with impermeable bottom and wall lining in all areas used for fuel and oil storage.	Construction contractor and the Krasnodar CHP Plant	From 2011
OP 6. Accidental Contamination				
1	Computations have indicated that some of hypothetical scenarios of accidents at the CCGT unit and associated infrastructure facilities might cause negative impact not only on the Plant's personnel, but also on the residents of the nearest houses.	Develop, have approved in the RF Emergency Situations Ministry and implement Emergency Response Plans. Purchase a complete set of equipment required for response to accidents. Carry out emergency response drills on a regular basis.	Krasnodar CHP Plant	After CCGT unit commissioning
OP 7. General Social Issues				
1	After CCGT unit commissioning, certain currently existing facilities at the CHP Plant can be decommissioned. It is highly desirable to keep skilled personnel operating those facilities.	Prepare and implement a personnel retraining plan in order to use the skilled personnel at the CCGT unit and associated infrastructure facilities.	Krasnodar CHP Plant	2011-2012