Alchevsk Steel CCGT Facility

Environmental Statement

Non-Technical Summary

July 2006

Alchevsk Steel CCGT Facility Environmental Impact Assessment

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Non-Technical Summary

Introduction

Alchevsk Iron & Steel Works (AMK) is an iron and steel production company based in eastern Ukraine. The steelworks is large and produces around 10% of the total output of steel in Ukraine. AMK is carrying out an intensive refurbishment program of the steelworks to increase its competitiveness within the national and international markets and to reduce its environmental impact on the city of Alchevsk.

To this end ISD is planning to invest USD 2.2 billion in the complete modernisation of the Alchevsk works. This investment is being supported by the IFC. The steelworks modernisation programme includes:

- two slab continuous casters (the first came on-stream In August 2005 and the second is expected to be installed in 2006-2007);
- replacement of the open hearth furnaces with two Basic Oxygen (BOS) converters (to start operation in 2007);
- construction of a new sinter plant; and
- reconstruction of Blast Furnaces and rolling mills.

In addition to improving production efficiencies and reducing the overall environmental impact the planned improvements will increase the steelmaking capacity at AMK from 3.4 Mtepa (million tonnes per annum) to 7.6 Mtepa. Rolled product capacity should also increase to 6.4 Mtepa.

The environmental impact of the steelworks modernisation is being assessed by the IFC (in compliance with their own policies and procedures) as well as by as series of environmental impact assessments (OVOS) undertaken by AMK to satisfy local development controls and Ukrainian environmental Regulation.

As part of the modernisation program AMK plans to construct a Combined Cycle Gas Turbine (CCGT) electricity generation facility, using coke oven, blast furnace and basic oxygen converter gases as fuel. The European Bank for Reconstruction and Development (EBRD) has been asked to provide a loan to finance this facility.

The EBRD is considering this request and in line with its Environmental Policy and Procedures an Environmental Impact Assessment (EIA) has been undertaken for the CCGT facility. The Environmental Statement documents the outcome of the EIA and is a detailed, technical report. The Non-Technical Summary captures the key elements of the Environmental Statement for those who do not wish to read the detailed document.

The primary purpose of this Environmental Statement is to assist the Bank in its decision as to whether they should provide financial support to the construction of the CCGT facility. **It is essential that the reader notes that this Environmental Statement relates to the CCGT facility only and does not include the much broader, extensive re-development of the AMK site as a whole.** Whilst the primary purpose of this Environmental Statement is to assist the Bank, the findings of the EIA will also contribute to the OVOS being

undertaken by AMK to support the local Ukrainian requirements for development permissions and operating permits

In summary, the Environmental Statement:

- provides a description of the proposed facility and the existing environmental conditions at the proposed development site;
- assesses the impact of the proposed development on the existing environment;
- recommends measures to limit these impacts (the mitigation measures); and
- describes the extent of the residual environmental impact following the implementation of the proposed mitigation measures.

Obtaining copies of the Full ES

In accordance with EBRD policy and requirements the Environmental Statement will be made publicly available on the EBRD web pages (http://www.ebrd.com/).

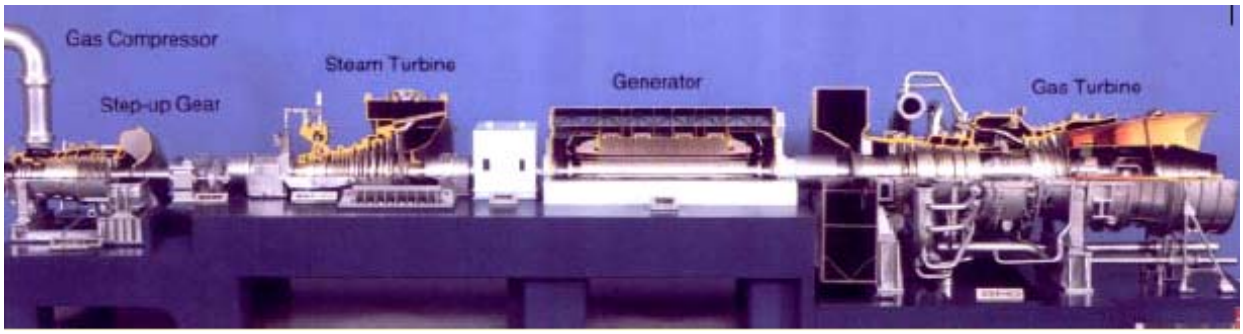
Paper copies of the Environmental Statement will be made available at the Alchevsk Town Hall, and at the AMK site, care of Mr Yuri Popov, Head of Environmental Department , AMK: +38 06442 938 44.

What is a combined cycle gas turbine?

A combined cycle gas turbine (CCGT) plant consists of both a gas turbine and a steam turbine. The combination improves the overall generating efficiency of a gas turbine unit by using the energy from the turbine's exhaust gases.

Within the gas turbine, fuel, in the form of a hydrocarbon gas is burned in compressed air to produce a stream of hot gas. This is allowed to expand through the turbine against a series of rotor blades, and in so doing turns the turbine's rotor producing mechanical power. The hot waste gas from the gas turbine is passed through a heat recovery boiler where it is used to generate high pressure steam. The steam is then expanded through the steam turbine, once again against a series of rotor blades, to produce a mechanical power output via the turbine's rotor.

In the case of the CCGT unit proposed for Alchevsk gas turbine, generator, steam turbine and fuel gas compressor are coupled on a single shaft, as shown in the figure below. Both turbines are therefore used for the generation of electrical power.



Why is the CCGT Facility Needed?

The purpose of the new CCGT facility is to:

- produce electrical power for the whole AMK site, and to
- reduce the emissions to air by using process off-gases as a fuel.

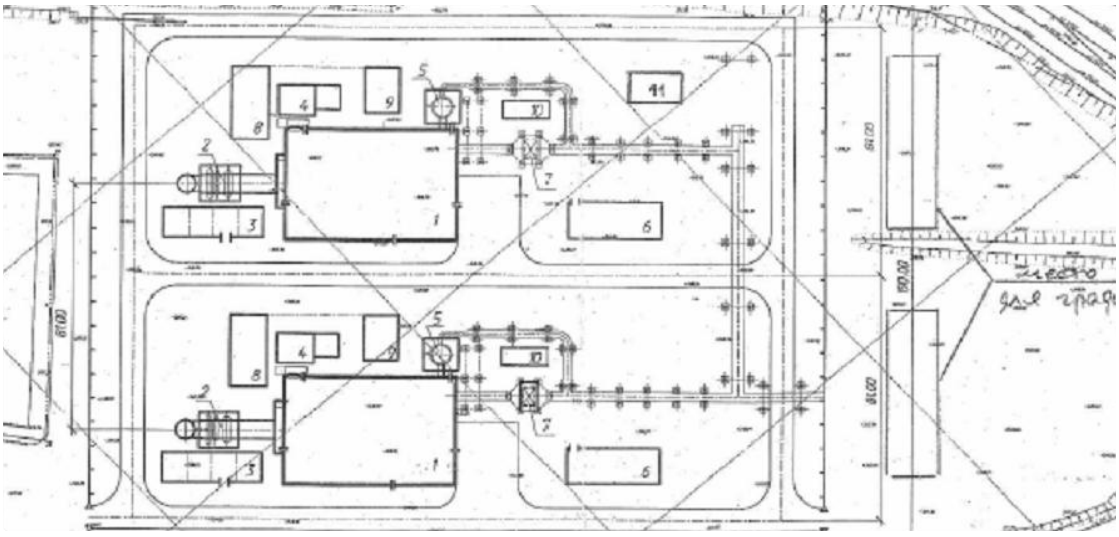
Currently, blast furnace and coke oven process off-gases are used in the mills and workshops as well as the existing boilers as fuel gas, although inefficiently. In the future basic oxygen converter gases would be fully flared without the CCGT in place.

The collection and use of the waste process gases within the proposed CCGT will provide improvements in local air quality. The main advantages of the CCGT project are:

- an overall reduction in electricity costs at the steelworks;
- more effective use of blast furnace and coke oven process off-gases and reduce the flaring of converter gas;
- increase of energy efficiency in terms of energy used per unit of steel production;
- reduction in the volume and intensity of carbon dioxide emissions in terms of mass emissions per unit of steel production.

What will the New CCGT Facility include?

It is proposed that the power generation plant will consist of two CCGT units each of 150MWe, with a reserve space for an additional unit of 150MWe to be added in the future should the need arise. The exact layout of the proposed units on the site had not been finalised at the time of the EIA but an indicative layout is provided in the Figure below.



Proposed Layout of the New CCGT Units

The units will be run independently of each other and are to be fitted with low NOx burners. The emissions will comply fully with the EU standards for new power stations (defined within the EU Large scale Combustion Plant Directive), i.e. emissions requirements of better 120mg/Nm^3 for NOx (for fuel gases other than methane - at 15% oxygen as is the

measurement norm for gas turbine emissions). The dust emissions are planned to be below 1g/Nm^3.

The combustible fuel gases that are to be used in the CCGT generally need to be cleaned-up to make them acceptable for combustion in a gas turbine at high temperature (gas turbine blades are sensitive to excessive levels of particulate matter, acid gases and other chemical components (e.g. chloride).

Should the additional gas turbine be required it will be located immediately adjacent to the proposed gas turbine building on disused ground.

What design standards will be used for the CCGT facility?

The CCGT facility will be designed to meet international standards and will comply with the full requirements of Ukrainian Regulation and EU Directives from the outset. The most important EU Directive in relation to environmental control is the Integrated Pollution Prevention and Control (IPPC) Directive. IPPC is a regulatory system that uses an integrated approach to the control of environmental impacts from industrial sites.

The IPPC Directive is not based upon fixed emissions limits but involves the determination of appropriate equipment design and operation to protect the environment through the application of "Best Available Techniques". This means that emissions to air, water (including discharges to sewer) and land, plus a range of other environmental impacts must be considered together. Operators have to assess emissions to all environmental media in the design of the whole plant using 'clean technology' rather than relying on 'end-of-pipe' techniques.

To assist the operators of such facilities the EU has produced a number of BAT Reference notes (BREF notes or guides) that describe BAT for each sector within IPPC. The BREF Guidelines for the power generation sector published by the European Commission is the "*IPPC – Reference Document on Best Available Techniques for Large Combustion Plants (May 2005)*".

Although the IPPC Directive does not apply in Ukraine, the guidance provided by the Large Combustion Plant BREF has been used as a benchmark standard the EIA. The BREF not only contains information about the basic design of the facility but also how it should be operated, suggested Emission Limit Values and how the facility should be monitored.

IPPC also includes the restoration of sites when industrial activities cease. These requirements have been taken into account in the consideration of the future closure of the Alchevsk CCGT facility.

The EIA has concluded that the design of the proposed CCGT facility will comply with the general requirements of the EU BREF note. Where insufficient design information was available the EU BREF note has been used to establish the recommended mitigations and future Environmental Monitoring Plan.

Where will the CCGT facility be located?

The proposed CCGT project will be located in the centre of the south-western part of the AMK site on brownfield land which formerly housed a coke plant and coke battery. The

battery ceased operation some 20 years ago and the site has since been cleared. It is near the oldest part of the Alchevsk steel plant and adjoins the blast furnaces, sinter plant and some of the coke gas cleaning facilities.

The CCGT Project site will occupy an area of 8.6 hectares.

Proposed Location of the CCGT Facility

What is the condition of the existing environment?

The AMK site is a large industrial complex, covering over 850ha that has dominated the city of Alchevsk for the last 100 years. The existing environmental condition reflects this prolonged industrial use.

The AMK site is surrounded by an air pollution Protection Zone the purpose of which is to provide a buffer between the steelworks and the residential areas Alchevsk town. The extent of the Protection Zone was established in 1990 by air dispersion modelling and the enforcement of legally prescribed distances between polluting processes and potential receptors (it is for this reason that the zone has an irregular shape).

Ukrainian national air quality standards apply within Alchevsk town. However, within the Protection Zone the environmental regulator has set “derogation limits” for air quality. These limits are set at higher levels than the national standards.

Information on air quality in and around the steelworks is limited to sampling data which have been recorded by both AMK and the state Hydro-meteorological Laboratory during 2004 and 2005. Ambient concentrations of sulphur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO) and dust were measured at a total of eleven locations within the Protection Zone and within the town.

The samples taken within the town exhibit concentrations of SO_2, NO_2, CO and dust in excess of the Ukrainian national standards. Whilst levels of NO_2 and CO are only marginally in excess of the standards, the levels of SO_2 and dust are substantially greater (500% plus). On the basis of this limited data set it can thus be concluded that air quality within the town is poor.

Absolute levels of pollutants within the Protection Zone are similar to those measured within the town. Indeed, there is no particularly obvious relationship between measured pollutant concentrations and the distance of the sampling station from the steelworks. However, the Ukrainian air quality standards set specifically for the zone are substantially greater than that generally applicable elsewhere, and the samples show no breaches of the zone limits.

Due to the previous industrial nature of the proposed site (which includes the now demolished coke works) it is highly likely that the land beneath the proposed site is heavily contaminated. Any contamination present may have polluted the groundwater, given the lack of protective overlying strata. It has been recommended that soil and groundwater samples are taken and analysed for heavy metals and organic contaminants as part of geotechnical ground investigations prior to construction.

Due to the long history of industrial activity on the AMK site there are no areas of ecological value within or in the vicinity of the AMK site, nor are there any designated sites in the vicinity. The nearest designated site is a botanical site 7km south-east of the AMK plant in a ravine; there is no surface hydrological link between the AMK site and the river that flows through the ravine.

There are no background noise measurements for the AMK site; however, background noise levels on the CCGT site are likely to be high due to the amount of continuously-operating heavy industrial plant that surrounds the CCGT site.

What alternatives have been considered?

In the context of the forthcoming changes to the AMK site there is one principal alternative to the CCGT Project, and that is not to install the CCGT units but to expand the existing thermal power plant, and increase the amount of electrical power imported from the grid. This is illustrated by reference to the following three scenarios.

- Scenario 1 – Current Configuration (2006) – represents the AMK site (or those parts of the site associated with the CCGT Project) as it is today.
- Scenario 2 – Without CCGT (2010) – represents the site as it would be after implementation of site expansion proposals, and were the existing thermal power plant to be expanded. This is, effectively, the project alternative.
- Scenario 3 – With CCGT (2010) – represents the expanded AMK site, but after implementation of the CCGT Project.

What will be the impacts during construction?

Construction activities can generate dust that can cause a nuisance to local residents and cause a health risk to construction workers. As the nearest residential receptors are over 700m away, the main risk is considered to be the exposure of workers on site. Dust control measures, together with the use of appropriate personal protective equipment will be used to mitigate this impact, however it should also be noted that the whole AMK site is a dusty

environment. The impact of emissions of vehicle exhaust gasses on air quality is considered negligible.

Water on the construction site can become polluted as a result of existing contamination present in the ground being mobilised and/or as a result of escapes of materials used during construction. These risks will be reduced by removing any areas of gross contamination as they are found for appropriate disposal at suitably engineered off-site hazardous waste disposal sites. Potentially polluting materials will be carefully stored in suitable containment in order to reduce the risk of pollution incidents from spills and leaks.

Due to the nature of the surrounding industrial setting, the transitory visual impacts of construction works are expected to be negligible to minor adverse from areas to the east of the site. The visual impact from other viewpoints is expected to be less as direct views of the site are interrupted and partially to completely obscured by other elements of the AMK plant and intervening buildings.

The effects of the traffic generated by the construction phase are likely to be negligible when considered within the context of the large volumes of traffic that enter and leave the AMK plant daily.

Due to level of industrial activity on the AMK site background noise levels are likely to be fairly high and any noise associated with construction activities such as piling are likely to have negligible impact. Measures to be employed to reduce construction noise levels will be included in the EMP.

Overall, construction activities are transitory, and are considered likely to have a minor adverse impact on dust levels and visual impact.

What changes will there be to the local air quality?

Air dispersion modelling of the CCGT Project was undertaken to evaluate the likely change in air quality resulting from its implementation. The modelling addressed the impacts of those facilities linked to the CCGT either in terms of fuel supply or which will be subject to changes in operation as a consequence of implementation of the Project. These facilities included the site's thermal plant, its open hearth furnaces, the CCGTs themselves, and the converter flares. The modelling did not include the changes to all air emission points as a consequence of the modernisation of the steelworks as a whole as this was outside the scope of this EIA. The modelling evaluated the expected changes to the concentrations of nitrogen dioxide, sulphur dioxide and carbon monoxide both within and outside the protection zone. The modelling evaluated the impact of SO_2, NO_2, and CO both within and outside the Protection Zone.

The modelling showed that, following implementation of the CCGT Project and the expansion of the AMK site (part of a separate project associated with increased steel production), the maximum levels of SO_2 attributable to the CCGT-associated plant will decrease to between 27% and 37% of their present levels outside the Protection Zone, and 27% to 48% within the Protection Zone. Similarly, levels of NO_2 will decrease to between 26% and 37% of their present levels outside the Protection Zone, and 23% to 27% within. Levels of CO will decrease to around 54% of their present levels outside the Protection Zone, and between 67% and 100% within the Protection Zone.

The results show that the implementation of the CCGT Project *together with other associated plant changes* will result in an improvement in air quality around the AMK steelworks. However, no conclusion can be drawn with regard to the absolute levels of SO_2, NO_2, and CO which are likely to prevail following site expansion because these will be dependent upon atmospheric emissions from other steelmaking plant outside the scope of this study.

What changes will there be to the emission of Greenhouse Gases?

The AMK site is currently undergoing an expansion to increase steel production from 3.4 Mte per annum to 7.6 Mte. The expansion, which will include the implementation of the CCGT Project, will increase the total CO_2 emissions from the steelworks from the present level of 7.6 Mte per annum to 9.3 Mte by 2010. If the CCGT is not implemented the levels of CO_2 emissions would be substantially greater. It is estimated that this hypothetical case would generate approximately 14.7 Mte per annum of CO_2 (i.e. the CCGT is not implemented and the increased power demand of the steelworks would be met by overhead electrical power supply and an increase on the capacity of the steelwork's thermal plant).

The CCGT Project will result in a substantial reduction in greenhouse gas emissions. It is concluded that the implementation of the CCGT project will result in an annual CO_2 emissions saving for the expanded site of 5.4 Mte.

The benefit of the CCGT Project is also illustrated by the change in carbon intensity – i.e. CO_2 emissions per unit of steel production – of those plant items associated with the CCGT units. Presently, these plant items produce approximately 2.2 te of CO_2 per te of steel. Following implementation of the CCGT Project and expansion of the site this figure will drop to 1.2 te of CO_2 per te of steel.

What other operational impacts will there be?

The positive changes to local air quality represent the greatest operational impact of the proposed CCGT facility. Many of the other environmental impacts of the proposed facility are considered to be negligible when placed within the context of the AMK steelworks as whole. These other operational impacts are summarised below:

- Noise
  - (i) Noise levels at the nearest residential receptors have been calculated, based on target noise levels contained in the gas turbine specification (90 dBA at 1m). Predicted noise levels from two turbines at the nearest noise sensitive receptors are 36dBA; this is below the World Health Organisation noise limits for residential areas.
  - (ii) The noise from the turbines will exceed EU limits for noise levels at the workplace. As a result of this, a noise exposure assessment will have to be carried out, and appropriate control measures put in place before workers operate in the area.
- Landscape and visual
  - (iii) The CCGT development will appear as two large profiled steel clad industrial buildings, 25m high and 54m long, with two 50m high stacks and a collection of smaller industrial buildings housing the ancillary plant and equipment.

(iv) The development will be most visible from receptors to the east of the CCGT in the Protection Zone. The CCGT development will appear as a relatively small part of the wider AMK plant. Other plant items will be visible behind and around the new development and the CCGT development will become part of the industrial elements that make up the view across the AMK site. The CCGT stacks will form discrete visual elements, which will join the existing stacks and other vertical elements that form the AMK plant skyline.

(v) Overall the visual impact of the CCGT development, from viewpoints to the east, is considered likely to be rated as negligible to minor adverse impact. Views from other viewpoints are rated as nil to negligible impact.

- Materials use and waste management

  (i) Wastes generated by the operation of the CCGT plant are expected to be similar in type and volume to the waste currently generated by the thermal power plant. Waste disposal routes are also likely to remain the same, with the majority of inert waste being landfilled on the AMK site; general and hazardous wastes will be disposed of at appropriate off-site facilities. Due to this no increase in waste transport is anticipated.

- Ecology

  (i) There is no surface hydrological connection between the AMK site and the botanical site in the Selezniovskaya ravine.

  (ii) Air dispersion modelling was carried out to predict the maximum increments to annual average concentrations of oxides of nitrogen and sulphur dioxide due to the operation of the CCGT plant at the Selezniovskaya ravine. The predicted increments due to the CCGT are lower than the predicted increments due to both the current case operations and the future case without CCGT. In all cases, the increment is insignificant compared with the EU annual limits for the protection of vegetation.

- Water and Wastewater

  (i) The CCGT project will use the existing water supply infrastructure at the AMK site. Current water use by the existing thermal power station is at a similar level to that predicted for the CCGT. Compared with the future alternative case without CCGT, the CCGT will result in a net reduction in water use of 500 m^3/hour.

What will be the impacts during decommissioning?

No assessment of environmental impacts associated with decommissioning can be made at present. In broad terms, the process of decommissioning is likely to give rise to impacts similar to those experienced in the construction phase. The methods and techniques selected are expected to be in accordance with national and international standards prevailing at the time of decommissioning. Decommissioning is expected require the:

- Removal of all surface equipment and units;
- Potential removal of hardstanding and surface cover;
- Abandonment of sub-surface utilities or filling and abandonment as appropriate;
- Reinstatement of the site and all project areas to pre-construction conditions.

Good practice is to develop a site closure plan during detailed project design and maintain the plan throughout the life of the development. The plan should include arrangements for decommissioning the plant in a manner which avoids any pollution and return the site to an acceptable state.

Overall, decommissioning activities are transitory, and are likely to be similar in magnitude to construction impacts.

What will be the impact of the CCGT facility on jobs and housing?

The AMK plant is surrounded by a designated sanitary Protection Zone, which contains some 650 private houses. The possible need for re-settlement is being considered as part of the main AMK development. **There will be no need to re-settle any residents as part of this CCGT project**.

Currently, 307 staff are employed that the thermal power plant. The development of the CCGT will result in a reduction from 6 boilers to 1, which will result in the number of employees reducing to approximately 100. AMK estimate that 50 jobs will be created in the CCGT plant and that these positions will be filled by staff redeployment. Overall no job losses are foreseen as a result of the CCGT development.

No detrimental effects on employees or local resident health are predicted from the CCGT development, relative to the current situation. Air dispersion modelling results indicate that the CCGT plant will result in an improvement in local air quality, and air quality is also likely to improve as a result of the current improvement programme underway across the AMK plant. Overall, the predicted social impacts of the CCGT operation are positive for local people, the region and the economy.

Summary

The existing Alchevsk Iron and Steel Plant has a substantial environmental impact, with air pollution being a key issue. An air pollution Protection Zone surrounds the AMK site due to the poor air quality. The parent company is carrying out an extensive refurbishment program of the steelworks (with financial support from the IFC) to increase its competitiveness and to reduce its environmental impact on the city of Alchevsk. As part of the modernisation program AMK plans to construct a Combined Cycle Gas Turbine electricity generation facility (with financial support from the EBRD), using coke oven, blast furnace and basic oxygen converter gases as fuel.

The EIA has concluded that the design of the proposed CCGT facility is of high quality and will comply with the requirements of Ukrainian law and the EU BREF note. The EU BREF note has also been used to establish the recommended mitigations and future Environmental Monitoring Plan.

The EIA has shown that the operation of the proposed CCGT facility (together with other associated plant changes) will result in a general improvement in air quality. The implementation of the CCGT project will also result in an annual CO_2 emissions saving for the expanded site of 5.4 Mte.

The following tables provide a summary of the environmental impact of the proposed CCGT facility and the proposed mitigations. The mitigation plan is intended to ensure compliance

with Ukrainian regulations, EU BREF Guidance and international best practice. The Environmental Monitoring Plan is also presented (following the impacts tables).

Summary of Construction Phase Impacts

CONSTRUCTION IMPACTS			
Environmental Impact	**Proposed Mitigation**	**Residual Impact**	**Residual Impact Rating**
Landscape and visual impact due to the use of cranes and other equipment (construction)	None proposed due the surrounding industrial landscape and the limited duration of construction.	Not altered	Minor adverse (from east of site) Negligible/Nil (from other directions)
Air quality - dust generation during construction work	Develop procedures for water-spraying roads, surfaces prior to being worked, and material stockpiles to minimise dust raising, as required. As required, vehicles carrying dusty materials are sheeted on leaving the CCGT site to prevent materials being blown from the vehicles whilst travelling	Impact substantially reduced	Negligible/Nil
Water pollution from the possible spillage of oils, fuels and chemicals during construction	Provision of dedicated storage areas, with spillage protection, for potentially polluting materials. Develop work instructions to ensure that these materials are handled correctly.	Risk of impact substantially reduced	Negligible/Nil
Generation of wastes during construction (building materials)	Develop a waste minimisation programme for wastes. Develop waste storage and control procedures to ensure wastes are correctly identified, stored securely, re-used or recycled where possible, or are sent to appropriate disposal sites.	Volumes of waste requiring disposal is reduced	Negligible/Nil
Soil quality – baseline survey	Soil baseline survey to be undertaken prior to construction within the CCGT development site, by an approved organisation.	Risk of impact substantially reduced	Negligible/Nil

Removal of contaminated soils during ground excavation	Any areas of gross ground contamination to be removed and disposed of to an appropriately licensed waste disposal site. Contaminated soils to be isolated to prevent generation of dusts and the loss to surface water drains / water courses.	Minimise impact on the water environment	Negligible/Nil
Contamination of soil or water from oil & chemical storage	Provision of dedicated storage areas, with spillage protection, for potentially polluting materials such as oils, fuels and chemicals. Develop work instructions to ensure that these materials are handled correctly.	Risk of impact substantially reduced	Negligible/Nil
Transport	Develop traffic management plant, to control times and routing of vehicles. The plan should include consideration of rail for transport.	Risk of impact substantially reduced	Negligible/Nil
Noise	Develop noise control plan. This may include: ♦ Switching off plant and equipment when it is not in use; ♦ establish site working hours; ♦ programme works to minimise working outside normal working hours; ♦ brief all workers on noise control measures; ♦ use of temporary noise screens or partial enclosures around particularly noisy activities.	Risk of impact substantially reduced	Negligible/Nil

Summary of Operational Phase Impacts

OPERATIONAL IMPACTS			
Environmental Impact	**Proposed Mitigation**	**Residual Impact**	**Residual Impact Rating**
Reduction of pollutant levels (SOx, NOx and CO) from current levels (attributable to CCGT-associated plant) in Protection Zone	Beneficial effect - no mitigation required	Reduced air pollution levels in Protection Zone from CCGT-associated plant	Minor Beneficial
Savings of 5.4 Mte CO_2 per year compared with option of site expansion without the CCGT development	Beneficial effect - no mitigation required	Reduced emissions of greenhouse gasses, lead to lower contribution to global warming.	Moderate Beneficial
Waste generation	CCGT will generate significantly less waste than alternative enlarged thermal power plant. Develop a waste minimisation programme for wastes. Develop waste storage and control procedures to ensure wastes are correctly identified, stored securely, re-used or recycled where possible, or are sent to appropriate disposal sites.	Reduced waste generation and increased re-use and recycling compared with existing thermal power plant	Minor beneficial
Raw water consumption	CCGT has significantly less water demand than alternative enlarged thermal power plant scenario	Water consumption 500 m^3/hour less than alternative future scenario	Minor Beneficial
Ecology	None as the proposed site has no ecological value	Reduced incremental air pollutant levels from CCGT implementation.	Ni to negligible (beneficial)

Landscape and visual impact (operation) – receptors to east of CCGT site	None proposed as the building is small when considered within the surrounding landscape	CCGT plant visible in setting of wider industrial setting	Nil to negligible – minor adverse
Noise at residential receptors	No mitigation proposed as predicted noise limits are below WHO limits.	Noise levels below WHO limits. Background noise levels are not known, although likely to include industrial noise from the existing plant	Nil to negligible
Noise exposure of workers	Carry out noise assessment of employee operational noise exposure and establish appropriate controls (including provision of Personal Protective Equipment).	The controls put in place will reduce noise exposure to or below statutory levels.	Nil to negligible
Visual impact (operation) – receptors to north, west and south of CCGT site	None proposed as the building is small when considered within the surrounding landscape	CCGT plant totally or partially obscured by other industrial plant.	Nil to negligible
Process effluent discharges to surface waters	Effluents will be settled in CCGT site settlement pits, before onwards treatment in main AMK settlement ponds.	No change in receiving surface water quality expected	Nil to negligible
Contamination of soil or water from materials storage	Provision of secondary containment around any storage containers or equipment containing potentially polluting materials such as oils, fuels and chemicals. Develop work instructions to ensure that these materials are handled correctly.	None expected	Nil to negligible

Contamination of soil or ground water from effluent drains or pits	Newly constructed pits and drains will contain the effluent. Effluent is low risk as it contains low concentrations of contaminants.	None expected	Nil to negligible
Traffic generated by site operation	None proposed as staff numbers are expected to be small (less than 50).	Amount of traffic generated is similar to that generate by the existing thermal plant	Nil to negligible

Summary of Decommissioning Phase Impacts

DECOMMISSIONING IMPACTS			
Environmental Impact	**Proposed Mitigation**	**Residual Impact**	**Residual Impact Rating**
Dust from decommissioning and demolition.	Develop procedures for water-spraying roads, surfaces prior to being worked, and material stockpiles to minimise dust raising, as required As required, vehicles carrying dusty materials are sheeted on leaving the CCGT site to prevent materials being blown from the vehicles whilst travelling	Impact substantially reduced	Negligible/Nil
Contaminated land – dust escaping from site	Use of dust control measures identified above.	Risk of impact substantially reduced	Negligible/Nil
Spread of existing land contamination to air or water	Dust controls as for air section above. Any areas of gross ground contamination discovered to be removed and disposed of to an appropriately licensed waste disposal site.	Risk of impact substantially reduced	Negligible/Nil
Contamination of soil or water from oil & chemical storage	Provision of dedicated storage areas, with spillage protection, for potentially polluting materials such as oils, fuels and chemicals. Develop work instructions to ensure that these materials are handled correctly.	Risk of impact substantially reduced	Negligible/Nil
Waste generation (decommissioning)	Develop a waste minimisation programme for wastes. Develop waste storage and control	Reduce waste generation/ increase recycling	Negligible/Nil

	procedures to ensure wastes are correctly identified, stored securely, re-used or recycled where possible, or are sent to appropriate disposal sites.		
Landscape and visual impact (decommissioning)	None proposed due to the expected short duration of the activity and the surrounding industrial context.	Risk of impact substantially reduced	Negligible/Nil
Transport (decommissioning)	Develop traffic management plant, to control times and routing of vehicles. The plan should include consideration of rail for transport.	Risk of impact substantially reduced	Negligible/Nil
Noise (decommissioning)	Noise reduction measures to be included in Decommissioning Plan; similar to measures employed in construction phase.	Risk of impact substantially reduced	Negligible/Nil

Construction Phase Environmental Monitoring Plan

CONSTRUCTION PHASE			
Environmental Impact	**Proposed Mitigation**	**Monitoring**	**Method/Schedule**
Air quality - dust generation during construction work	Develop procedures for water-spraying roads, surfaces prior to being worked, and material stockpiles to minimise dust raising, as required As required, vehicles carrying dusty materials are sheeted on leaving the CCGT site to prevent materials being blown from the vehicles whilst travelling	Visual inspection to determine dust levels, use of water suppression and sheeting of loads.	Weekly inspection during seasons where there is no snow Records to be maintained of inspections.
Water pollution from the possible spillage of oils, fuels and chemicals during construction	Provision of dedicated storage areas, with spillage protection, for potentially polluting materials such as oils, fuels and chemicals. Develop work instructions to ensure that these materials are handled correctly.	Visual inspection of all materials (including fuels) storage areas. Records to be maintained of inspections. Check that work instruction has been developed at the start of the construction phase	Monthly inspections. Suitable preventive and corrective action to be taken if required Check work instruction is in place at start of construction.
Generation of wastes during construction (building materials)	Develop a waste minimisation programme for wastes. Develop waste storage and control procedures to ensure wastes are correctly identified, stored securely, re-used or recycled where possible, or are sent to appropriate disposal sites.	Establish that waste minimisation programme and work instructions have been established. Visual inspection of waste storage, collection and disposal areas. Records to be maintained of inspections Waste Register to be established recording quantities of wastes generated, and their disposal route.	Establish that waste minimisation programme and work instructions are in place Monthly inspections of storage facilities and waste register. Suitable preventive and corrective action to be taken if required

Removal of contaminated soils during ground excavation	Any areas of gross ground contamination to be removed and disposed of to an appropriately licensed waste disposal site. Contaminated soils to be isolated to prevent generation of dusts and the loss to surface water drains / water courses.	Visual inspection of dust controls as specified above. Waste register to be used to record any contaminated soil taken off-site.	Weekly inspection during seasons where there is no snow Monthly inspection of waste register. Records to be maintained of inspections.
Soil quality – baseline survey	Soil baseline survey to be undertaken prior to construction within the CCGT development site, by an approved organisation.	Analytical suite should include volatile hydrocarbons (benzene, toluene, ethyl benzene and xylene), PAHs (polyaromatic hydrocarbons), phenol, oil, solvents; cyanides and arsenic, as well as a full heavy metals suite. A targeted sampling approach should be used; this should be developed in consultation with the regulators.	Records of baseline survey to be retained.
Contamination of soil or water from oil & chemical storage	Provision of dedicated storage areas, with spillage protection, for potentially polluting materials such as oils, fuels and chemicals. Develop work instructions to ensure that these materials are handled correctly.	Visual inspection of all materials (including fuels) storage areas. Records to be maintained of inspections. Check that work instruction has been developed at the start of the construction phase	Weekly inspections. Suitable preventive and corrective action to be taken if required Check work instruction is in place at start of construction.
Transport	Develop traffic management plant, to control times and routing of vehicles. The plan should include consideration of rail for transport.	Audit to ensure traffic management plan has been developed, is maintained, and is being followed.	Monthly inspections. Suitable preventive and corrective action to be taken if required

Noise	Develop noise control plan. This may include: ♦ Switching off plant and equipment when it is not in use; ♦ establish site working hours; ♦ programme works to minimise working outside normal working hours; ♦ brief all workers on noise control measures; ♦ use of temporary noise screens or partial enclosures around particularly noisy activities.	Audit noise plan to ensure it has been developed, is maintained and is being implemented. Boundary noise measurements to be undertaken by competent person using standard methodologies with approved and calibrated equipment: Baseline study prior to construction Day-time measurements Night-time measurements	Monthly inspections. Suitable preventive and corrective action to be taken if required Suitable monitoring locations to be established near receptors. One-off survey prior to site works to obtain background. Monthly day time boundary measurements. Monthly night time boundary measurements.
Communications	-	Compile and maintain register of environmental communications including complaints	Suitable preventive and corrective action to be taken if required. Actions to be recorded in register.
Accidents/ Incidents	-	Compile and maintain register of environmental accidents and incidents	Suitable preventive and corrective action to be taken if required. Actions to be recorded in register.
Water pollution	Visual inspection of construction waste water drainage systems and reservoirs. Records to be maintained of inspections	AMK & Contractor	Monthly inspections. Suitable preventive and corrective action to be taken if required

Operational Environmental Monitoring Plan

OPERATIONAL PHASE			
Environmental Impact	**Proposed Mitigation**	**Monitoring**	**Method/Schedule**
Air emissions - emitted concentrations	Beneficial effect- no mitigation required	Continuous emissions monitoring of exhaust gases for NOx, SO_2, CO.	Continuous emissions monitoring techniques, standards and programme to be developed to meet the requirements of Ukrainian legislation, World bank guidance and EU BREF. Results to be continuously recorded.
Air emissions – ambient air quality monitoring	-	Measurements of air quality parameters: NOx, SO_2, CO. Measurements to be undertaken at currently used monitoring locations	Monitoring techniques used should be reviewed with the regulators to determine whether they can be extended to allow comparison with EU and World Bank standards.
Air emissions – fuel analysis	-	Spot monitoring of fuel supply contaminants to ensure they are within specification.	Weekly spot monitoring, to be agreed with regulator and plant operational requirements.
Savings of 5.4 Mte CO_2 per year compared with option of site expansion without the CCGT development	Beneficial effect- no mitigation required	Calculated CO_2 emissions.	Calculated and recorded annually (and reported to EBRD).

Waste generation	CCGT will generate significantly less waste than alternative enlarged thermal power plant. Develop a waste minimisation programme for wastes. Develop waste storage and control procedures to ensure wastes are correctly identified, stored securely, re-used or recycled where possible, or are sent to appropriate disposal sites.	Establish that waste minimisation programme and work instructions have been established. Visual inspection of waste storage, collection and disposal areas. Records to be maintained of inspections Waste Register to be established recording quantities of wastes generated, and their disposal route.	Establish that waste minimisation programme and work instructions are in place Monthly inspections of storage facilities and waste register. Suitable preventive and corrective action to be taken if required
Water consumption	CCGT has significantly less water demand than alternative enlarged thermal power plant scenario	Meter readings	Weekly records maintained by CCGT site.
Noise at residential receptors	No mitigation proposed as predicted noise limits are below WHO limits.	Day and night-time noise measurements at boundary and near sensitive receptors to be undertaken by competent person using standard methodologies with approved and calibrated equipment.	Monthly day and night-time boundary measurements. Measurements at sensitive receptors if measures noise levels could give rise to a nuisance/ in the light of complaints.
Noise exposure of workers	Carry out noise assessment of employee operational noise exposure and establish appropriate controls.	Audit noise controls to ensure a noise assessment has been carried out, that it is maintained and is being implemented.	Monthly inspections. Suitable preventive and corrective action to be taken if required
Process effluent discharges to surface waters	Effluents will be settled in CCGT site settlement pits, before onwards treatment in main AMK settlement ponds.	Spot sampling of effluent leaving CCGT site. Sampling of effluent discharged to rivers from AMK site	Methods, frequency and parameters for CCGT site effluent monitoring to be agreed with environmental regulator. Existing AMK discharge monitoring to continue unchanged.

Contamination of soil or water from materials storage	Provision of secondary containment around any storage containers or equipment containing potentially polluting materials such as oils, fuels and chemicals. Develop work instructions to ensure that these materials are handled correctly.	Visual inspection of all secondary containment and containers or equipment containing potentially polluting materials. Records to be maintained of inspections.	Monthly inspections. Suitable preventive and corrective action to be taken if required
Contamination of soil or ground water from effluent drains or pits	Newly constructed pits and drains will contain the effluent. Effluent is low risk as it contains low concentrations of contaminants.	Visual inspection of above-ground pipework. Periodic CCTV or pressure testing of underground pits and pipes.	Monthly visual inspections. Records to be maintained of inspections. Records of CCTV surveys and pressure testing retained.
Traffic generated by site operation		No monitoring proposed.	
Accidents/ Incidents	-	Compile and maintain register of environmental accidents and incidents	Suitable preventive and corrective action to be taken if required. Actions to be recorded in register.

Decommissioning Environmental Monitoring Plan

DECOMMISSIONING PHASE			
Environmental Impact	**Proposed Mitigation**	**Residual Impact**	**Residual Impact Rating**
Dust from decommissioning Contaminated land – dust escaping from site	Develop procedures for water-spraying roads, surfaces prior to being worked, and material stockpiles to minimise dust raising, as required As required, vehicles carrying dusty materials are sheeted on leaving the CCGT site to prevent materials being blown from the vehicles whilst travelling	Visual inspection to determine dust levels, use of water suppression and sheeting of loads.	Weekly inspection during seasons where there is no snow Records to be maintained of inspections.
Spread of existing land contamination to air or water	Dust controls as for air section above. Any areas of gross ground contamination discovered to be removed and disposed of to an appropriately licensed waste disposal site.	Visual inspection of dust controls as specified above. Waste register to be used to record any contaminated soil taken off-site	Weekly inspection during seasons where there is no snow Monthly inspection of waste register. Records to be maintained of inspections.
Contamination of soil or water from oil & chemical storage	Provision of dedicated storage areas, with spillage protection, for potentially polluting materials such as oils, fuels and chemicals. Develop work instructions to ensure that these materials are handled correctly.	Visual inspection of all materials (including fuels) storage areas. Records to be maintained of inspections. Check that work instruction has been developed at the start of the construction phase	Weekly inspections. Suitable preventive and corrective action to be taken if required Check work instruction is in place at start of construction.
Waste generation (decommissioning)	Develop a waste minimisation programme for wastes. Develop waste storage and control procedures to ensure wastes are correctly identified, stored securely, re-	Establish that waste minimisation programme and work instructions have been established. Visual inspection of waste storage, collection and disposal areas.	Establish that waste minimisation programme and work instructions are in place Monthly inspections of storage

	used or recycled where possible, or are sent to appropriate disposal sites.	Records to be maintained of inspections Waste Register to be established recording quantities of wastes generated, and their disposal route.	facilities and waste register. Suitable preventive and corrective action to be taken if required
Transport (decommissioning)	Develop traffic management plant, to control times and routing of vehicles. The plan should include consideration of rail for transport.	Audit to ensure traffic management plan has been developed, is maintained, and is being followed.	Monthly inspections. Suitable preventive and corrective action to be taken if required
Noise (decommissioning)	Noise reduction measures to be included in Decommissioning Plan; similar to measures employed in construction phase.	Audit noise plan to ensure it has been developed, is maintained and is being implemented. Day and night-time noise measurements at boundary and near sensitive receptors to be undertaken by competent person using standard methodologies with approved and calibrated equipment.	Monthly inspections. Suitable preventive and corrective action to be taken if required Monthly day and night-time boundary measurements. Measurements at sensitive receptors if measures noise levels could give rise to a nuisance/ in the light of complaints.
Communications	-	Compile and maintain register of environmental communications including complaints	Suitable preventive and corrective action to be taken if required. Actions to be recorded in register.
Accidents/ Incidents	-	Compile and maintain register of environmental accidents and incidents	Suitable preventive and corrective action to be taken if required. Actions to be recorded in register.
Water pollution	Visual inspection of construction waste water drainage systems and reservoirs. Records to be maintained of inspections	AMK & Contractor	Monthly inspections. Suitable preventive and corrective action to be taken if required

Atkins is one of the world's leading providers of professional, technology based consultancy and support services. In recent years, it has expanded from its historical base in traditional engineering, management consultancy and property services into related technological consultancy and the management of outsourced facilities. With over 14,000 staff worldwide, Atkins has enormous expertise, providing both breadth and depth of knowledge in an extremely diverse range of disciplines.

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