Thar Coalfields Block VI
2x330MW Coal-Fired Power Plant

Non-technical summary (NTS)

March 2017

Oracle Coalfields PLC
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# Issue and Revision Record

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1 Introduction

1.1 What is this document?

This document is a non-technical summary (NTS) which presents the findings of the environmental and social impact assessment (ESIA) completed for a new coal-fired power plant to be developed in the Thar coalfields in the province of Sindh, Pakistan. The power plant will provide 2 x 330 megawatts of electricity using lignite coal.

An ESIA and supporting documents, including an environmental and social management and monitoring plan were prepared to assess the potential environmental and social impacts of the project and any measures that would be needed to reduce or eliminate any significant impacts. The ESIA was carried out in accordance with national legislation and where applicable, international methodologies have been used to assess whether the project met the relevant environmental and social standards.

1.2 Who is developing the project?

Pakistan currently imports much of its fuel to produce electricity to power homes and businesses. Electricity demand outweighs supply in Pakistan and so the Government of Sindh is considering all available options for power generation. The Government of Sindh is keen to pursue coal to power generation as it is believed to be one of the least costly options for Pakistan. To address the need for new power infrastructure, Oracle Coalfields PLC (‘the Developer’) has been appointed to develop the project.

1.3 Where can I find more information on the Project?

The ESIA process has been informed by consultations, which set out the proposed approach for the assessment and then to inform interested groups of what the potential environmental and social impacts of the project may be and how these impacts would be managed.

This NTS represents Volume I of the overall ESIA, which comprises four volumes in total:

- Volume I: Non-technical summary (this volume)
- Volume II: Environmental and social impact assessment
- Volume III: Technical appendices
- Volume III: Environmental & social management and monitoring plan
2 Summary of the Project

2.1 Where is the Project to be located?

The Project will be located in the south-east corner of the Sindh Province, which is in south-eastern Pakistan. This area is known as the Thar Desert and part of the locality has been identified as a zone for development, divided into plots known as Blocks. The Project will be constructed in Block VI located in the southern part of the Thar Coalfield adjacent to Block II. Block VI covers an area of approximately 66 square kilometres (km) and is situated approximately 380km north-east of Karachi, 20km north-east of Islamkot, and 77km east of Mithi.

More specifically, Block VI is situated within the district of Tharparkar which is a sub-district of Mithi. Two main villages, Ranjho Nun and Kharo Jani are located within Block VI, with other smaller villages located in and around the area. The area is accessed by a road which extends from Karachi to Singharo and goes through the towns of Badin and Mithi. Figure 1 shows the project setting, Figure 2 shows the location of Block VI, and Figure 3 shows the regional setting.

Figure 1: Project setting
Figure 2: Location of Block VI

Source: Mott MacDonald

Figure 3: Regional location of Block VI

Source: EIA for Block VI Lignite Mining Project, Hagler Bailly, Pakistan, 2013
2.2 Why is the Project needed and what alternatives were considered?

The development of the Thar Coalfield and the associated establishment of coal to power projects are major objectives of the Government of Sindh, to achieve increased power production, with associated economic growth to ultimately reduce poverty in the country.

The key aspects considered as alternatives for the Project as follows:

- No project alternative
- Location of the Project
- Options and alternatives for key technical and process aspects of the Project

Pakistan's energy demand continues to grow, and as such, the “no project” alternative is not considered feasible. The Project will generate 660 megawatts of electricity, which will contribute towards bridging the gap between electricity supply and demand, with coal to power generation being one of the least costly options. The Project will be developed within a designated strategic area for lignite/coal to power generation. The chosen location provides access to infrastructure being developed by the government and has easy access to a lignite/coal. Circulating fluidised bed boiler technology has been selected as it is very efficient and significantly reduces releases of nitrogen dioxide pollutants into the atmosphere as a result of low temperatures at which combustion takes place. Other technology alternatives considered relate to the power plant cooling system and the emission of small particles and sulphur oxides. Coal/lignite is the most appropriate fuel for the Project given its abundance in the Thar region.

2.3 What will the Project consist of?

Thermal power plants generate electricity by burning fuel (in this instance lignite), which heats water to generate high temperature, high pressure steam, that is subsequently used to drive a steam turbine. At one end of the steam turbine is a condenser. As steam passes from the boiler to the condenser, it passes through the steam turbine causing the turbine blades to rotate and electricity to be generated.

The key components of the Project within Block VI include:

- Coal storage yard and coal conveyor
- 2 x 330 megawatt generation units
- A substation that will connect to an existing 500 kilovolt transmission line
- One 210 metre exhaust stack
- Cooling water system
- Ash yard (temporary storage)
- Ash disposal area
- Access roads
- On-site accommodation, office facilities fire station, workshop and open materials storage area

Figure 4 provides an illustration of the Project once constructed. The coal stockyard is in the foreground with a conveyor delivering coal to the boiler in the centre and the 2 x 330 megawatt units. The two cooling towers will be located to the rear of the main plant.
Figure 4: 2 x 330MW power plant conceptual view

Source: SEPCO
3 Managing Environmental and Social Issues

3.1 What project activities could affect the environment and people?

It is recognised that a project of this scale and duration has the potential to affect the environment and the community, both in a beneficial and an adverse way. The activities that could cause the most important impacts include:

- Direct impacts on air quality from emissions from the power plant
- Noise and vibration from the power plant, heard and felt by nearby residents
- Contamination of environments due to leakage and spillage of wastes
- Contamination of environments from the disposal of waste materials including ash
- Impacts on landscape features
- Direct and indirect impacts on ecology
- Social impacts (some positive, some negative) associated with:
  - Physical and economic displacement of people and their livelihoods
  - Employment generation
  - Provision of electricity and heating
  - Workers well-being
  - Community health, safety and well-being

3.2 How was the Project assessed?

A thorough assessment has been undertaken for potential impacts arising from the development of the Project, including the above issues. The results of the assessment are presented in the ESIA and a summary of the key issues is given in this non-technical summary. The assessment included:

- Establishing the baseline as it relates to a range of environmental and social aspects in order to understand the current conditions at and around the proposed Project site.
- Prediction of impacts using internationally recognised methods and techniques.
- Identification of mitigation measures to be included in the design, construction and operation of the Project and which will reduce impacts.

The assessment was supported by local consultation undertaken to ensure that the developer understands and incorporates the thoughts and concerns of local people from the surrounding communities into the process.

The significance of an impact is described based on a combination of the sensitivity of people or the environment affected by the Project and the scale of impacts. Where the ESIA found that the Project could cause moderate to major significant impacts, then mitigation measures have been developed to avoid, reduce or otherwise mitigate the impacts and reduce their significance to an acceptable level.
A summary of the key findings and the main mitigation measures identified for the social and environmental impact as set out in this section. The ESIA assessed the impacts of the Project in the following areas:

- Air quality
- Greenhouse gases
- Noise and vibration
- Waste and materials management
- Hydrology, hydrogeology and flood risk
- Landscape and visual
- Ground conditions
- Biodiversity and ecology
- Social impact assessment

3.3 How will people and the environment be affected?

Whilst environmental and social issues can interact, the findings of the ESIA broadly cover the following themes:

- Impacts on people
- Impacts on the natural environment and resources

3.3.1 Impacts on people

3.3.1.1 Resettlement

A major impact on people is the change in use of land resulting in the physical resettlement and economic displacement of households that live on or near the Project site. The Government of Sindh developed a resettlement policy/strategy in 2013 for the entire Thar Coalfield, which encompasses all developments in Block VI. Based on this strategy, the Government of Sindh then produced a resettlement policy framework in 2015 which sets out the approach to be taken for resettlement of communities within Thar Coalfield. An interim resettlement action plan was developed in 2013 and updated in 2016 to conform with the requirements of the government of Sindh’s resettlement policy framework. The interim resettlement action plan outlines all the land acquisition and resettlement activities to be conducted in Block VI, which are as a result of the mining activities. The village of Kharo Jani with a population of 1,200 across 160 households, and much of its cultivated land, is the only village to be displaced. The resettlement process is currently ongoing as part of the Block VI lignite mining project. This Project will not result in any resettlement.

3.3.1.2 Employment

The Project is expected to require 1,000 workers at the peak of the construction phase. The generation of employment is a beneficial impact of the project; this provides opportunities for local people to access jobs and to undertake training to develop new skills, as well as improve the livelihoods of local communities. Given the existing skill base of the local population, these positions are likely to be limited to unskilled labour jobs and more skilled positions are likely to be taken by more skilled migrant workers. During operation, many of the positions will be skilled roles and it is not known at this stage how many local community members have the required skills to access these opportunities.
3.3.1.3 Population influx

The simultaneous construction of the coal power plant in Block II (adjacent to Block VI), the open pit mine in Block VI and this Project means that there it is likely there will be many non-local workers coming into the area. The expected influx may bring about significant cultural changes, an increased risk of disease, insecurity and overburdening of existing yet limited social services. A worker code of conduct will be developed for non-local workers to adhere to and will raise awareness of cultural norms and customs of the local community.

3.3.1.4 Traffic

At this stage, exact numbers of construction vehicles are not known and the routes that they will take are not defined; during peak construction, vehicle movements are expected to be less than 200 per day. Increased traffic will result in increased noise, dust, vehicle emissions, potential disturbance of habitats and potential contamination caused by fuel/oil leaks. Increased traffic volumes during construction phase may result in road safety risks and can affect the already vulnerable population in adverse ways.

To control negative impacts, measures will be in place including water spraying to minimise dust and the use of modern, well-maintained vehicles to reduce emissions and noise. To further reduce negative impacts on people, the project will conduct a traffic awareness programme to improve local understanding, signage will be installed and speed restrictions will be in place.

3.3.1.5 Landscape and visual

During construction, the presence of machinery, compounds, a large number of workers and construction traffic on local roads will affect the local landscape character and decrease levels of tranquillity. The local landscape character will be significantly affected due to construction activities, which are temporary in nature. Construction activities will be prominent in the view up to 2km away and less visible but prominent up to 5km away, as well as being visible during the day and night. Existing residential areas may be affected by light emanating from the Project at night. As a result, the Project will implement a number of measures designed to reduce the impact by minimising the amount of land required for construction, maintaining strict requirements for vehicles to remain on roads at all times through a traffic management plan, reinstating vegetation where construction areas and access tracks are no longer required and restricting site lighting outside normal working hours.

During operation, the Project will affect the local landscape of the site and its surroundings as the project includes some very large buildings, extensive adjacent land use and a 210m high stack. Residents in nearby properties within 2km and receptors located further to the north and south of the project will have their views dominated by the power plant. To lessen the effect, lower parts of the project buildings and secondary structures will be painted in neutral colours of the surrounding landscape – shades of sandy browns and greys. Where possible, the scale of the project will also be reduced by accommodating facilities into smaller buildings rather than single larger units. External lighting will only be installed where necessary and will be down-lit and shielded to reduce the impact.

3.3.1.6 Dust

During construction, most dust will be raised through excavations and earth moving and measures will be taken to minimise and suppress dust to avoid negative impacts. During operation, the handling and movement of coal in the storage yard, coal handling facilities and conveyors has the potential to generate dust which has the potential to impact locations within 500m, which can have a negative impact on human health. The project will implement
measures to minimise the impact from coal dust which have been included in the design of the plant, for example enclosure of the coal conveyors and installation of wind fences.

The project will monitor dust concentrations close to the site to confirm that the mitigation measures are working and these will be reviewed if the monitoring shows that they are not. The assessment has demonstrated that these impacts are not predicted to be significant.

3.3.1.7 Air Emissions

During operation, the project will emit pollution from its stack as a result of the combustion of lignite coal. Having carried out air quality modelling for when the power plant is operating at full capacity, no significant negative impact is predicted although ground levels of air pollution will be slightly elevated in nearby locations. Technology including low nitrogen oxides burners, limestone injection and electrostatic precipitators will be used to remove pollutants and help emissions to air meet the guaranteed limits, which are below the legal national limits. The stack will be 210m high to ensure effective dispersion of emissions. Air quality will be monitored during operation to ensure emissions remain acceptable throughout the project lifetime.

3.3.1.8 Noise

During construction, which will last about 40 months, noise impacts will mainly be associated with the operation of machinery, with the highest noise levels predicted to be during excavation and foundation works. At the Yusuf Ji Dhani residential area long-term night time work could be an issue and so noisy works will be scheduled during the day and where night time work is necessary it will only be for periods of less than a month.

No significant negative impacts due to noise are predicted during operation.

3.3.1.9 Local Community Benefits

The community will benefit from some short term employment during the construction phase. A local content strategy and a recruitment and skills development policy will be in place to enable local people to benefit from the creation of employment. Job opportunities will be disclosed in communities, an employment liaison forum will be in place to engage local populations and there will be a focus on skills development in the local workforce.

A community investment plan will be developed to identify how project benefits are shared with local communities and how the effects of in-migration are controlled. Input from local and regional government authorities, local leaders, non-government organisations and civil society bodies will be used to deliver the plan with potential improvements in agriculture, livelihood diversification, education, and health and community infrastructure.

3.3.2 Impacts on the natural environment and resources

The project is expected to generate some adverse impacts on the local natural environment.

3.3.2.1 Water use

In the Thar Desert surface runoff occurs only during the monsoon season and the rains are very variable from year to year. The Thar Desert is underlain by three groundwater sources – the Top, Middle and Deep aquifers – all of which are too saline to meet drinking water standards. Local communities depend on wells in the Top aquifer for domestic use, including their drinking water because there is no better alternative. Traditional water capture structures have also been built in natural depressions to extend the period before the monsoon rainfall is lost to evaporation and seepage into the Top aquifer.
During construction, water will be needed for the workforce, for the concrete batching plant and for dust suppression. In operation, the main water use is for cooling and the requirement has been minimised by the selection of a natural draft closed cooling system. The construction quantities are small in comparison to the water needed during operation when 15 million m$^3$ per year will be required.

### 3.3.2.2 Water availability and discharge

The Government of Sindh is preparing a water management plan for the Thar Coalfield. These studies will establish the baseline for all water resource across the whole area and then will model all new developments to assess the cumulative changes in water use and potential impacts on water resources both quantity and quality. The water management plan will contain all the measures to be taken to minimise potential impacts area-wide.

To extract coal safely the open pit must be kept dry (dewatered). The project is designed to utilise the groundwater pumped from the mine dewatering system to meet most of its needs, with water also being sourced via a 15-20km water pipeline from the Vejhiar Reservoir which is being developed by the Government of Sindh.

The Government of Sindh is working with developers in the Thar Coalfield by providing infrastructure for the disposal of waste water from all blocks. The arrangements for disposal of waste water for Block VI are yet to be determined, however all water will be treated by the Project before disposal to minimise impacts on water quality. The treatment will be designed to meet the relevant Sindh Environmental Quality Standards for disposal.

### 3.3.2.3 Ground conditions

During construction, impacts include vegetation loss and compaction, soil loss and erosion and dust in the air, which could lead to impacts on human health. These impacts would be in relation to earthworks and spillage of hazardous materials; if best practice construction is implemented then no negative impacts are expected. Similarly, during operation, given common best practice measures will be used, no harm to people or the environment is expected.

### 3.3.2.4 Biodiversity and ecology

The Rann of Kutch is an important bird area and wildlife sanctuary located over 22.5km south of the area affected by the Project, which is considered too far from the site for there to be any significant negative impact. The habitats and plants in the area affected by the Project are of low conservation value. Mammals, lizards, amphibians, and invertebrates in the Project area are also of low conservation value. The habitats in the Thar Desert are important for the survival of several globally threatened raptor species of birds, namely, the white-rumped vulture, the Egyptian vulture and the Indian vulture.

During the construction phase, working areas will be kept to the minimum to reduce habitat loss, and where possible a phased vegetation clearance will be undertaken, to ensure animals can escape the works area during construction. Noise and disturbance will be minimised through good practice measures, such as the installation of noise control devices during construction and operation. Vegetation clearance will be done outside of the main bird nesting period to the extent possible. If clearance is done within this period, checks will be done and if any breeding birds are discovered work will be postponed in that area. In addition to this, a number of best practice measures will be in place to limit impacts on ecology and biodiversity wherever possible.
3.3.2.5 Greenhouse gas emissions

Construction emissions are estimated to be approximately 370,000 tonnes of carbon dioxide equivalent (tCO$_2$e). Once operational and operating at full capacity for 7,000 hours per year, the plant will emit approximately 4 million tonnes of carbon dioxide equivalent (tCO$_2$e) and these emissions mainly arise from burning coal to produce electricity. Emissions will represent approximately 1% of national greenhouse gas emissions, however the emission rate for this Project is higher than the average rate.

During construction, efforts to minimise greenhouse gas emissions include the re-use of materials on-site, the use of recycled materials and the sourcing of construction materials from the local area to reduce traffic related emissions. Although coal-fired power plants lead to elevated greenhouse gas emissions during operation, coal is an indigenous fuel source and is less expensive; as such it is important for Pakistan to use local resources in meeting increasing electricity demand. The circulating fluidised bed technology to be used is highly efficient compared with other technologies, thus minimising greenhouse gas emissions.

3.4 Construction of associated facilities

3.4.1 What infrastructure will be required to support the Project?

To support the development and operation of the Project, additional infrastructure will need to be constructed. Table 1 provides a description of each of the associated facilities for the Project.

Project developers of the associated facilities will be encouraged to undertake construction in accordance with good international construction practices to ensure that potential environmental and social impacts are adequately reduced, managed and/or avoided where possible.

Table 1: Associated facilities and supporting infrastructure for the Project

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<thead>
<tr>
<th>Associated/ supporting components</th>
<th>Summary</th>
<th>Detail</th>
<th>Responsible party</th>
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<tbody>
<tr>
<td>Transmission line</td>
<td>Power will need to be exported from the power plant to the national grid.</td>
<td>A new transmission line is proposed which will connect the power plant to the existing 500kV Jamshoro substation. The transmission line will be approximately 160km in length. The transmission line will largely traverse rural areas and is being designed and developed by the Government of Sindh</td>
<td>Government of Sindh</td>
</tr>
<tr>
<td>Substation</td>
<td>To export the electricity generated at the Plant.</td>
<td>A new substation will be developed at Block VI. The substation will connect the Project and the transmission line to the national grid.</td>
<td>National Transmission and Dispatch Company</td>
</tr>
<tr>
<td>Access road</td>
<td>Permanent paved access roads required for construction and operation vehicle and plant access</td>
<td>To facilitate access to the mine and power plant, the Government of Sindh have commissioned construction of an 8km access road, which will be connected to a local highway to the south of the Project.</td>
<td>Government of Sindh</td>
</tr>
<tr>
<td>Wastewater discharge pipeline</td>
<td>Any wastewater which cannot be reused in the process will be discharged</td>
<td>The detailed route of the wastewater discharge pipeline is yet to be determined.</td>
<td>Government of Sindh</td>
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### Supporting Infrastructure

<table>
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<th>Summary</th>
<th>Detail</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Landfill site</strong></td>
<td>No appropriate waste disposal facilities are located in the area. The developer has a duty of care to ensure that the waste is disposed of in an environmentally sound manner and in compliance with relevant legislation and regulations.</td>
<td>Details of the landfill site have not been provided; however, it is expected that the landfill will be developed within the mine.</td>
<td>The developer</td>
</tr>
<tr>
<td><strong>Ash disposal facility</strong></td>
<td>Ash disposal facility required to dispose of fly and bottom ash generated during operation.</td>
<td>Details of the ash disposal facility have not been provided; however, it is expected that the landfill will be developed within the mine.</td>
<td>The developer</td>
</tr>
<tr>
<td><strong>Raw water supply pipeline</strong></td>
<td>Government of Sindh will be responsible for providing a water supply source (in addition to the dewatering undertaken at the mine) to the site, which is sourced from the Vejhlar Reservoir.</td>
<td>The detailed route of the water supply pipeline is yet to be determined.</td>
<td>Government of Sindh</td>
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### 3.4.2 Will associated facilities have any impacts on people and the environment?

General construction activities from the development of all the associated facilities may generate some nuisance impacts for nearby houses including a reduction in air quality from dust being generated by construction activities and noise and vibration caused by earthmoving, construction traffic and foundation works. Other impacts such as soil contamination, loss of land and disturbance of animals and plants may occur. These impacts will be managed and mitigated by the responsible party with good practice construction techniques to ensure that the impacts to people and the environment are reduced to an acceptable level. The responsible party must ensure measures are taken to minimise potential health and safety risks associated with these developments.
4 Managing Environmental and Social Impacts

4.1 How will environmental and social impacts from the Project be managed?

Whilst the Project has been designed to minimise potential environmental and social impacts, there will be some impacts that cannot be avoided solely by the design of the power plant. The developer has therefore established an environmental and social management and monitoring plan (ESMP) that is based upon the management and mitigation measures which have been identified in the environmental and social assessments to reduce potential impacts.

The main objective of an ESMP is to protect the environment, site staff and the local population from project activities that may cause harm or nuisance. Contained within the ESMP are a number of framework processes, plans and procedures that will be developed further by the developer and its contractors, which set out the minimum environmental and social requirements necessary for the protection of the environment and communities.

These framework plans and procedures provide mitigation measures, which have been designed in accordance with international best practice and detail how these mitigation measures will be monitored, by whom and over what timeframe. Listed below are examples of the types of plans included in the ESMP to manage environmental and social impacts:

- Air quality management plan to try and make sure that emissions from the plant during operation are within the required national and international limits.
- Traffic management plans for the management of traffic routing, vehicle and road inspection, as well as driver training and pedestrian awareness.
- Waste management plans for the handling, transportation and disposal of waste during construction and operation phases.
- Ash management plan for the handling, transportation and disposal of ash during operation, as well as ongoing monitoring requirements for groundwater and soils.
- A corporate social responsibility (CSR) programme in which the developer will promote and invest in initiatives for local community improvement.
- Community grievance mechanism which is a process by which community members can express or raise any concerns about the project.

The ESMP also sets out strategies to help develop the community in which the project operates. For example, the plan includes local recruitment measures which look for opportunities to provide local people with jobs; or skill development measures to help develop the skills of the local workforce.

Prior to construction or operation these framework documents will be developed into stand-alone, practical, live documents which will be used on site for both the construction and operation phases where relevant. Responsibilities for development and implementation are outlined in the ESMP and fall to either the developer or its contractors.
The Developer will establish an environmental and social management system, which is a set of policies, tools, and procedures to protect against environmental and social impacts and is a way by which any potential improvements can be identified over the lifetime of the Project.