

Executive Summary

Introduction

Essar Oil Ltd (E&P division), a subsidiary of Essar Group has been awarded the CBM Block : SP (NE)-CBM-2008/IV by the Ministry of Petroleum & Natural Gas (MoP&NG), Government of India, for Coal Bed Methane (CBM) exploration & production. The CBM block is located in the Sohagpur coal fields of Madhya Pradesh & Chhattisgarh. Essar Oil Ltd (EOL) has 100% ownership in the CBM block and as Operator has signed a Production Sharing Contract with the Government of India on 29th July 2010. EOL has also applied for Petroleum Exploration License (PEL) to Directorate of Geology & Mining, Madhya Pradesh and Chhattisgarh on 23rd Sep'10 and 22nd Sep'10 respectively for carrying out exploratory and test production operations within the block.

The CBM block: SP (NE)-CBM-2008/IV covers an area of 339 sq.km and encompasses the districts of Sahdol in Madhya Pradesh and Koriya in Chhattisgarh. EOL intends to carry out exploration and test production activities within the allocated area. SENES India has carried out the Environmental Impact Assessment (EIA) for this project using scientific methodology of assessing environmental and social impacts for the project and then arriving at a site specific Environment Management Plan (EMP). The EIA study involved scoping, site visits, environmental monitoring, intensive desk analysis and acquiring project details in close consultations with EOL representatives.

Project Description & Activities

The proposed project activities are detailed in the following table.

Phase-I: Exploration & Test Production.	
Coreholes Drilling & CBM related studies.	25 nos.
Test Wells Drilling and test production of CBM gas & water Production rates.	3 nos.
Phase-II: Pilot Assessment of CBM production & Market survey.	
Pilot Wells Drilling	25 nos.
Four Support wells from pad of each pilot well (25x4=100)	100 nos.
Gas Gathering Station	4 nos.
Main Compressor Station	1 no.
Interconnecting and Transportation Pipeline	6"-16" dia
Carry out Market survey & obtain market commitments.	

Source: Final Prefeasibility Report

As per the final Prefeasibility Report (PFR) EOL as part of the Phase I program plans to undertake drilling of 25 coreholes and 3 test wells in the CBM block area. In Phase II, EOL plans to drill 25 pilot wells to a target depth of ~ 2000m within the block area to establish

commercially exploitable CBM reserves. The pilot wells will be drilled vertically in clusters with a gas gathering facility provided for each cluster. In addition to this, 4 supporting wells will be drilled at each pilot well site to augment the production, depending on the strata formation and the land availability. It is anticipated that approximately 5000 m³/day of CBM gas is likely to be produced from each pilot/test well. Construction of 4 Group Gathering Stations (GGS) and 1 Main Compressor Station (MCS) and laying of inter-connecting and transportation pipeline network for the purpose of CBM gas collection and transportation will also be developed. Coal bed methane generated during dewatering of coal seams will be separated from produced water and routed through pipelines to the group gathering stations for compression. The compressed gas will be transported from GGS to MCS and then from MCS to the customer.

The primary activities associated with exploration and test production project involves well site preparation, strengthening of access roads, pipeline laying, construction of GGS and MCS. Site closure and decommissioning activities are involved in case well is found to be economically not viable for the CBM production. It is estimated that approx 0.5 acres will be required for corehole drilling and 1.5-2.0 acres will be required for test /pilot well drilling. These wells will be drilled in the form of pads. One well pad can accommodate up to 5 nos. of pilot wells. Land required for installation of each GGS/MCS will be approx 4-5 acres. The coreholes, test wells, pilot wells and other surface facilities like GGS and MCS will be located on non-forest land. The land required for the proposed project will be either permanently acquired or obtained on temporary lease basis from the concerned landowner. For core hole drilling the land will be taken on short term lease (3-4 months) while for the test /pilot wells it will be taken on lease for long term basis viz. 25 to 30 years.

The pilot wells will be drilled to a target depth of approximately 2000m with a combination of low capacity rigs for the surface section and higher capacity rigs for the coal bearing section. Compressed air and/or water based mud will be used as the drilling fluid for production well drilling. The drill cuttings generated will be collected and separated using a solid control system and temporarily stored on-site in HDPE lined pits. Produced water generated during coal seam dewatering will be separated from CBM and temporarily stored in an onsite HDPE lined pit. The produced water will be reused primarily for drilling/construction and hydro-fracturing activities. Further it is also envisaged that the excess produced water will be used for irrigation or discharged to natural drainage channels after adequate treatment through appropriate water treatment scheme. All such discharge or usage of produced water will be made in compliance with CPCB general discharge standards or BIS irrigation standards depending on disposal methodology..

Project Utilities & Resource Requirements

The power requirement for core hole drilling operation will be met by 20 kVA DG set while test/pilot well drilling will be carried out by 125 and 950 kVA DG sets. Construction of GGS/MCS will require 180 kVA DG sets. Test/pilot well testing will be carried out by 40

kVA DG or GG (Gas Generator) sets while GGS/MCS will be operated by 1330 kVA DG/GG sets.

The water requirement for each corehole and test/pilot well drilling is estimated to be approx 50 KL/m³/corehole and 75 KL/m³ /test or pilot well respectively. The water will primarily be utilized to meet domestic water needs and preparation of water based mud and will sourced through approved local suppliers. Nearly about 1.5 KLD of High Speed Diesel (HSD) will be required to operate the DG sets and will be supplied onsite by mobile tankers. 4 MT of Bentonite mud Powder, 0.5 MT Polymer, 0.1 MT of CMC Powder, 0.025 MT Caustic Soda, 0.4 MT Mud Lube and other micro-additives in small quantities will be required for the preparation of drilling mud for each well. Beside that approximately 10 & 35 MT of cement will be required for core hole plugging and casing cementing of the test/pilot wells respectively. During construction phase it is anticipated that approx 180-200 nos. of contractor workers and site personnel (both permanent and contractual) will be deployed for the proposed project. During corehole and test well drilling it is estimated that 9-10 workers will be available onsite on 12 hour shift basis; however during the perforation and hydro-fracturing of test/pilot wells the workforce strength may increase up to 20 per shift. The drilling personnel will be housed in porta-cabins to be provided onsite.

Baseline Environmental Status

An understanding of physical, biological, socioeconomic environment was gathered through various studies (both primary and secondary) and stakeholder consultations in the area. The environmental settings of the block were outlined to understand the project needs and environmental characteristics of the area and at the same time to assess the existing environmental quality and impacts of the proposed project.

The baseline studies reveal that the levels of particulates (PM₁₀ and PM_{2.5}) were found to be below the stipulated standard of National Ambient Air Quality. Oxides of nitrogen, sulfur dioxide, carbon monoxide were also in compliance to the NAAQM standards. The average values for methane hydrocarbons generally varied in the range of 1.41 – 2.06 ppm while that of non-methane hydrocarbon generally varied within 0.41 – 0.81ppm which is characteristic of the rural set up of the study area. The noise monitoring data reveals that all the areas are within permissible limit

Bijawar Series, Lower Vindhyan series, Gondwana group and Super group, Lametas sediments are common hydro geological features of the block. The western portion of the block is characterized by Gondwana hydrogeological formations with ground water occurring in both confined and unconfined conditions. The eastern portion of the CBM block falling in Koriya district is primarily characterized by Barakar formation comprising of sandstone, shale, carbonaceous shale with coal seam lithological components. Pre monsoon depth to water level was reported to vary between 5.02 to 12.22 meters below ground level (m b.g.l) while post monsoon depth to water level was found to vary between 3.0 and 8.92 mbgl.

Soils in Koriya district have wide variations and most of the district area is covered with yellowish to reddish alfisols. These soils are derived from weathering of crystallines and

metamorphic rocks. About 10% of the area in the district in eastern parts is covered by Ultisols in the form of laterites. The remaining part of the district is represented by light grey and shallow black inceptisols. The texture of soil samples collected from the monitoring locations was characterized at the textural class sandy loam, silty loams, clay loam and loam.

Primary soil monitoring indicates low soil fertility characteristics in terms of soil nutrients with no heavy metal contamination observed.

The Shahdol district drained by Son River and its tributaries falls in the Ganga Basin. The river Son flows due north till the northern extent of the district, marking the western boundary of the district Shahdol with Umaria District. The important tributaries of the Son River are the *Kunak Nadi* and the *Chuwadi nadi*. The Son River draining the south eastern parts of the district through its important tributaries like *Tipan*, *Chandas* and *Bakan* flow in the north-west direction with a dendritic pattern, draining the central plains of the district. The drainage of the western portion of the block area is characterized by *Kunuk River* and its tributaries viz. *Nagbandh Nala*, *Ghordewa Nala* and *Khaparkurt Nala* which are non-perennial in nature. The western portion the eastern half of the block is drained by seasonal nalas flowing from north to south vertically bisecting the block.

The water quality of surface water bodies within the block conforms to CPCB Water Use criteria Class A (Drinking Water Source without conventional treatment but after disinfection) and Class B (outdoor bathing organized). The ground water quality at few of the villages within the block was found to be exceeding the limits of IS: 10500 standards with respect to turbidity, iron, copper, nitrate and coliforms.

The block is not characterized by any identified sensitive ecological habitat. The CBM block has reserve forests, protected forest and unclassified forest. However, these PFs have not been characterized as sensitive in terms of their ecological significance.

The socioeconomic profile of the area matched with general data of the district and the common problems identified in the area were the drinking water facility, lack of secondary schools, electricity, irrigation and medical facilities.

Environmental Impact Assessment

The potential impacts of the project on different components of the environment was systematically identified and evaluated for significance. The principal concerns that emerged are:

- Disturbance in top soil structure because of construction activity and well site preparation
- Noise disturbance and moderate air quality impacts to communities and nearby sensitive receptors.
- Potential for depletion of deep ground water aquifers (below the aquifers used for local potable purpose) during dewatering and hydraulic fracturing of corehole, test wells and pilot wells.

- Potential impact on soil fertility and structure near the project site due to discharge of CBM produced water as it is expected to contain high sodium, TDS etc.
- Potential impact on land use due to change in land use pattern resulting from well site and GGS/MCS construction.
- Potential impact on soil quality due to disposal of drill cuttings.
- Potential impact on occupational and community health and safety.
- Potential loss of floral – faunal habitat, migratory paths and habitat fragmentation due to drilling well construction and operation.

However, considering the temporary nature of the exploratory and test well drilling and appropriate mitigation measures likely to be adopted by EOL such impacts are assessed to be of minor significance. The project if successful will be useful to the region and some likely benefits are listed below:

- Potential improvement of some basic facilities for the local communities;
- Job and business opportunities for the local people. Preference will be given to local people based on the qualification.
- Availability of clean fuel in the form of methane gas for commercial & industrial uses.
- Minimize pollution at local level due to use of methane for domestic and transport needs thereby contributing to better health of local people.
- Reduction of spontaneous fire experienced in local coal mines.

Environmental Management Plan

A site-specific Environment Management Plan (EMP) to prevent and mitigate significant adverse impacts and accentuate beneficial impacts will be implemented by EOL for the proposed project. The key management measures include:

- Proper removal and storage of top soil to maintain its quality for use during restoration program.
- Use of appropriate engineering controls at the source to minimize impacts of air emissions and noise disturbances to the receptors;
- Management of drill cuttings, hazardous and other wastes in accordance with regulatory standards and guidance documents, thereby reducing risk of pollution / contamination in receiving water-bodies and other environmental media;
- CBM produced water will be pre-treated and reuse/discharge to surface water bodies will be made in compliance with CPCB discharge standards at all times.
- Periodic analysis of produced water parameters (viz. SAR and EC) and ensure compliance with the CPCB standards pertinent to treated water discharge/reuse method .
- Periodic monitoring of ground water quality and levels will be carried out for village wells located outside the project boundary to assess the level of ground water contamination and depletion, if any.
- Reinstatement of the site area before being handed over to the land owners;

- Implementing disaster and occupational Health & Safety management plan to prevent and mitigate individual and societal risks that may result from project emergency situations viz. well blow out, accidental release of flammable methane gas from pipeline leaks/rupture or from storage cylinders during transportation etc.
- Implementing the Wildlife Management Plan (WLMP) to protect ecological resource of the area which is applicable for and encompasses both construction and operational phase activities for the proposed project which has the potential to adversely impact the wildlife species at the block and their habitat

The EMP has been designed with flexibility, so that it can be monitored and adapted to future changes in project design, scope or the environment.

Project Investments

The overall cost involved in exploration and Test production phase & Pilot Test production phase of CBM gas in SP (NE)-CBM-2008/IV block is estimated to be about INR 1220.48 (Rs 143.75 Crore during Phase-I & Rs 1076.73Crore during Phase-II).