

Thar Coal Project - Key to Pakistan's Energy Security

2014 – "The Year of Thar"





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Pakistan's Energy Scenario



- Given the current capacity and future projects, the demand and supply gap is expected to widen unless major investments are made in the Power Sector
- Pakistan electricity problems are due to Wrong Fuel Mix & dependence on Imports

Global Coal-based Power Generation



Pakistan electricity problems are mainly due to Less Generation Capacity and Wrong Fuel Mix



Comparison of Indigenous vs. Imported Fuels

- AES Fuel Cost (Imported RFO based) has increased by 730% over 15 yrs)
 - GoP has no control on price
- Whereas, indigenous gas based Uch Fuel Cost increased by just 39% over 11 yrs). GoP has full control
- Had we accepted Shenua's Thar Fuel Cost of USc 2.7/KWh in mid 90s, it would have been USc 3.6 /Kwh now (increase of only 35% over 15 years)
 - There would be no Circular Debt in the Country!



2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012

Having an abundant Indigenous Energy Resource, going for Imported fuel is a highly risky proposition!

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2004-05

2002-03

2006-07

2008-09 2010-11



THAR COAL : "THE ONLY SUSTAINABLE INDIGENOUS SOLUTION"



Thar Lignite



 Mine Lease for **30 years** (extendable to 60 years) has been issued to SECMC for Block II

*follows Australian JORC Code Guidelines & "Australian Guidelines for Estimating and Reporting of Inventory Coal, Coal Resource and Coal Reserves"

Source:: GSP data/report – Energy equivalent is based on Shenhua report/RWE



Thar Coal Fields : Location





Thar Lignite - Comparison with World Lignite

- Thar Coal fields can be compared to many operating Open Pit Mines of the World Thar has comparatively higher heating value, lower sulphur & lower ash contents than other operational mines in the world:
- Stripping Ratio and Heating Value of Thar Block II is feasible for successful Mine Operation
- Thar Lignite can be utilized in Power Plants both at mine mouth as well as suitable locations like Jamshoro as lignite can be transported as being practised in places like India, China & Germany
 - > RWE Study confirms Thar Lignite can be transported safely via road / rail

Comparison of Thar Block II with Other International Mines								
Deposit	Heating Value (Net) (KCal/kg)	Sulfur (%)	Ash (%)	Moisture (%)	Stripping Ratio (m ³ /t)			
Thar Block II	2770	1.07	7.8	47.46	6.12			
Gujarat, India	2600-3000	3.4-5.9	9-12	38-40	9 - 14			
Hambach, Germany	1911-2747	0.2-0.4	2-5	48-52	6.3			
Maritza East <i>-</i> Bulgaria	1550	4.5	19-35	54	1.7			

By using properly designed de-sulfurizers and ash removal units, Thar coal can produce cheap electricity while meeting the most stringent international environmental standards

THAR COAL QUALITY AND ECONOMICS COMPARES FAVORABLY WITH OTHER LIGNITE MINES AROUND THE WORLD



Ownership Structure - SECMC

- SECMC was formed in 2009 as a publicprivate partnership between Govt. of Sindh and Engro Powergen Ltd. – a subsidiary of Engro Corp with the objective of undertaking coal mining and associated power project at Thar Block-II
- Government of Sindh (GoS) acting as strategic partner for:
 - Infrastructure Development
 - Government Approvals
- Management Control with Engro & Affiliates (House of Habib & HUBCO) – scope includes:
 - Conducting Feasibility Studies for both Mining and Power Plant
 - Identifying Infrastructure requirements
 - Project Management & Contracting
 - Financing, Operations & Maintenance, Coal Marketing/Distribution

Engro & Affiliates

Investors in Mining Project:



Govt. of Sindh
2nd Largest Province by Population in Pakistan
51% shareholder in SECMC

Engro



- Business include fertilizers, foods, chemical storage & handling, trading, power generation and petrochemicals.
- Investment of USD ~2B over last five years



HUBCO

House of Habib

•Businesses range from automobiles to audio media, buildings to banking and computers to chemicals; group has equity and technical collaborations with British, Japanese (Toyota Motors) and Norwegian companies

HUBCO

- Largest Independent Power Producer (IPP) in Pakistan
- growth through energy First private sector infrastructure project in Pakistan



THAR BLOCK – II : GRAND PLAN

SECMC 3,960MW PLAN to tap true potential of THAR



With expanding mine, more power plants will be added - initially smaller units of 330MW (sub-critical) & later 660MW (super-critical) units will be developed over 10 years **PHASE – I OF THE PROJECT IS ALREADY UNDERWAY**

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PHASE - II : POWER PLANTS (02X 330MW OR 01X 660MW) ARE AVAILABLE!



Promise of Thar for Pakistan



Graph shows Weighted Average Tariff at 85% Load Factor



Business Plan: PHASE - I



Mining Project under SECMC

- Set-up an initial open cast mine of 3.8 Mt/a (02x330 MW equivalent)
- Coal Supply Agreement with associated power plant
- Construction Period 38 42 Months
- Total Project Cost ~ US\$ 865Mn



Power Project under Engro/Other Partners

- 02x 330 MW units Sub-critical Mine Mouth Power Plants on Thar Lignite
- Power Purchase Agreement (PPA) with NTDC
- Construction Period 38 42 Months
- Total Project Cost ~ US\$ 1.1 Bn



TECHNICAL STUDIES



Feasibility Studies – Mining Project

- Detailed Feasibility Study for Mining Project was completed in Aug 2010 by a team of renowned International Consultants in compliance with International Standards :
 - Detailed Feasibility Study (approved by TCEB Panel of Experts) RWE, Germany & Sinocoal, China
 - Ground Water Modelling & Mitigating Strategy for ESIA RWE, Germany
 - Environmental & Social Impact Assessment Hagler Bailly Pakistan/ SRK, UK
 - Mine Design & Optimization Inner-Mongolia, China
 - Hydrological Study Northeast Coal Bureau, China
- RWE is Europe's leading lignite mine and power plant operator and owns/operates lignite mines of 78 Mt/a and 12,000MW Power Plant in Germany
- In June 2013, Review of Project Management Approach & Project Cost for the Development of Lignite Mine at Thar Block II was approved by RWE which confirmed the total Mining Project cost of USD 800 M to set up a 3.8 Mt/a mine in 3.5 years expanding to reach 6.5 Mt/a in 5 years with an additional capex of USD 120 M

FEASIBILITY STUDY CONFIRMED THAT MINING AT THAR IS TECHNICALLY, ECONOMICALLY & ENVIRONMENTALLY VIABLE



Environment Consideration – Mining Project

- Environment & Social Impact Assessment study for Mining Project has been completed by SRK UK/Hagler Bailly Pakistan which included:
 - > Environmental Impact of Mining Project & Mitigation measures
 - Baseline Stakeholder Consultation & Socio-economic Impact assessment
 - Overall Environmental Management Plan
- The ESIA fully complies with the national environmental regulations (NEQs) and best industry practice (IFC guidelines)
- A public hearing was conducted in November 2012, subsequent to which NOC was issued by SEPA for Mining Project
- Environmental management costs have been accounted for in the cost model which include:
 - Drinking water provision
 - Vulture conservation and
 - Environmental management system

ENVIRONMENTAL STUDIES INDICATE THERE ARE NO SIGNIFICANT OR UNMANAGEABLE ENVIRONMENTAL THREATS DUE TO COAL MINING PROJECT IN THAR BLOCK-II



Thar Block - II Geology



- Ground Elevation varies from 80 to 100 m Above Mean Sea Level (AMSL)
- Overburden thickness varies from 130 to 150 m
- Cumulative Lignite thickness varies from 22 to 32 m
- Main Lignite seam (2-7) has the thickness of 18 m
- 03 Aquifers are present in the area



Mine Design & Coal Quality

- Open Cast mining using conventional Shovel & Truck methodology has been selected
- Average depth of Thar Coal is ~140 m
- Mine size with a minimum box-cut width of 600m is required to remove the coal on a sustained basis
- Total estimated Overburden (OB) volume is ~ 113 Mm³
- Total 26 wells will be drilled initially across the mine for dewatering to keep the mine dry for safe mining conditions - Around 110 wells will be drilled for entire mine life
- Depending on the dewatering volumes and cone-of-depression, the number of wells will increase/decrease in the later years of mining

Thar Block-II Coal Quality					
		Average			
Calorific	GCV.ar (Kcal/kg)	3128			
Value	LCV.ar (Kcal/kg)	2767			
	Moisture.ar (%)	47.7			
Proximate	Ash.ar (%)	7.5			
Analysis	Volatile Matter (ar)	24.9			
	Fixed Carbon (ar)	19.8			
	Carbon.daf (%)	72.7			
	Hydrogen.daf (%)	5.1			
Ultimate	Nitrogen.daf (%)	0.7			
Analysis	Oxygen.daf (%)	19.0			
	T. Sulfur.daf (%)	2.5			
	Total Sulfur.ar (%)	1.1			
ar: as recived basis					
daf: dry ash free basis					

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Average dewatering rate is around 30 - 35 Mm³ /annum in initial years which will be reduced in the later years



Geotechnical Investigation

- Geotechnical investigations carried out by Sinocoal in order to ensure that the selected slope angles used for Mine design result in a stable slope system within the mine and at the outside dump - 20 holes were drilled for geotechnical investigation
- The samples were analyzed for physical/mechanical properties and the results for the basis of slope analysis for mine design purpose Stability factor for the entire slope at the excavation side is n =1.31
- It is concluded from the analysis to use a general inclination of 24° for excavation side which means a slope of 25° for the lower slope and 22° for the upper slope
- For the dumping side the general inclination should be 21°



Open Pit Slope Calculation for Slope Angle 25°/22°



Mining Area Layout





Groundwater Dewatering Plan





Feasibility Study – Power Plant

- Detailed Feasibility study completed by RWE (the most experienced lignite power plant operator in Europe)
- RWE is one of Europe's five leading electricity and gas companies and operates 12,000MW Power Plants in Germany
- DFS states that
 - initial Power Plant has to be a safe step forward CFB process has been advised as process components and units are mature proven market products
 - the detected risks do not exceed risks of similar projects in South East Europe remarkably
- Sub critical plants offers efficiency in the range of 37% and availability of 85%

FEASIBILITY STUDY CONFIRMED THAT THE FIRST MINEMOUTH POWER PLANT AT THAR BASED ON CFB TECHNOLOGY IS TECHNICALLY, ECONOMICALLY & ENVIRONMENTALLY VIABLE



Environmental Impact Assessment – Power Plant

- THARCO has conducted ESIA of Power Plant with Hagler Bailly as part of Feasibility Study – in consultation with RWE
- The ESIA cover following activities:
 - Development of site and construction of Power Plant
 - Commissioning and operation of the Power Plant,
 - Storage of coal within power plant vicinity,
 - Disposal of power plant waste, and
 - Decommissioning of Power Plant
- ESIA identified social impact, air quality impacts, and potential contamination of soil as the main potential environmental/social issues – practical mitigation measures have been proposed which will be effectively implemented
- The ESIA fully complies with the national environmental regulations (NEQs) and best industry practice (IFC guidelines)
- Approval (NOC) has been received from Environmental Authorities (Sindh Environment Protection Agency - SEPA)

POWER PROJECTS FULLY COMPLY WITH WORLD BANK STANDARDS AND NEQS!



Power Plant Configuration

- For initial plant, Circulating Fluidized Bed Combustion Technology (CFBC) is being adopted as suggested by Feasibility Study - is a robust and commercially proven coal combustion systems
- The boiler selection has been done with following considerations :
 - ➢ Fuel flexibility
 - Acceptable efficiency
 - Lower NOx generation
 - ➢ In-Situ Flue gas Desulfurization
 - Less Cost intensive coal feeding system
 - Off-the-shelf availability (Chinese market)
 - Lower Capex (For Boiler as well as for Turbine)
 - Vast Operational Experience of Sub-critical systems in Pakistan
- Sub critical plants offers efficiency in the range of 37% and availability of 85%
- After thorough due-diligence by THARCO and RWE, European designed boiler technology will be used due to its high reliability on lignite operations

Power Plant Layout





CONTRACTING AND COMMERCIAL UPDATE



Selection of EPC Contractor

- EPC contractor, China Machinery Engineering Corporation (CMEC), has been selected for both mining & power projects through International Competitive Bidding process
- CMEC is one of the top Chinese EPC Contractor -
 - Ranked among China's top 10 contractors by the business turnover and has business reach in more than 150 countries and regions
 - Involved in various projects in Pakistan as EPC contractor including Saif Power (225MW), Muzaffargarh Thermal Power Plant (320MW) and Guddu Thermal Plant (210MW involved in design, supply, and installation and commissioning)



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- LOI for Mining Project was signed for 3.8Mt/a Mining Contract on 7th June in Beijing and EPC Contract has been finalized
- All technical Annexures of the EPC Contract for both projects have been finalized
- Detailed Engineering scope has also been finalized and Geotechnical study by EPC contractor will be initiated in Sept. 2014

CMEC SELECTED AS EPC CONTRACTED FOR BOTH PROJECTS!



Framework for Integrated Thar Coal Project





Commercial Update

Agreements/LOI

- Application for LOI of Power Plant submitted to PPIB, notice to proceed from PPIB expected next week LOI guarantee already lined up by the sponsor
- PPA and IA under discussions with relevant authorities expected to be finalized in next 02 months
- CSA term sheet has been agreed and discussion on agreement underway expected to be completed by end October 2014

Tariff Update

- Thar Coal and Energy Board (TCEB) has been mandated to determine and notify price for Thar Coal which will be binding on NEPRA for use in Power Tariff
 - Coal Tariff will be determined on cost plus mechanism, which allows for guaranteed US\$ based return (as already approved by ECC) for equity holders, Cost pass through of debt servicing and Cost pass through of operational costs
 - Various meetings have been held with all stakeholders and coal pricing rules & framework are expected to be finalized by end of this month

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 For power plant, NEPRA has already announced acceptable Power Tariff for Thar coal-based power generation



LAND ACQUISITION, INITIAL MINING ACTIVITY AND INFRASTRUCTURE UPDATE



Land Acquisition and Resettlement Strategy

Land Acquisition:

- 6000 acres (24 sq. km) of land have been acquired with physical possession with SECMC - sufficient for first 8 to 10 years
- SECMC plans to acquire the entire land required for 30 years of mining within the next 2-3 years – additional 8200 acres (33 sq. km) of land (including land for resettlement of 02 villages) for which survey is being initiated

Resettlement Strategy:

- Only 2 villages will need to be relocated 'Senhri Dars' (200 Households) and Thahriyo Halepota (300 Households) – Relocation will be done during project construction phase
- Detailed Resettlement Strategy has been prepared by SECMC Plan is to construct a model village which includes provision of land, town planning Gaucher land, construction of houses and common facilities
- Resettlement Action Plan has been developed and submitted to GoS for approval



Initial Mining Activity

- Sponsors being confident that the project has reached a stage whereby physical construction activities can be initiated even before Financial Close undertook the following activities:
 - ➤ Land Acquisition
 - Initial Overburden Removal
 - Engineering/Design works
- Initial Overburden Removal activity was undertaken for the following reasons:
 - Reduce construction time for mine by 04 months to ensure completion by 4th Qtr 2014
 project has been listed as "Early Harvest Project" under CPEC
 - Restore confidence of GoP and other stakeholders
 - Learn from this experience, issues that may be faced in Overburden Removal job and hence formulating appropriate action plan

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Become use-to conditions of Thar

LOCAL CONTRACTOR HAS BEEN ENGAGED PRIMARILY TO ENSURE THAT THE MINING PROJECT IS COMPLETED WITHIN 38 MONTHS!



Mining Activity at Site

 Physical work for removal of 3Mm³ Overburden has started since 30th April 2014 using local contractor









Infrastructure Development by GoS

- All requisite infrastructure for the Mine is in advance stage of implementation:
 - Effluent Disposal Scheme: Detailed design has been completed by GoS Consultant with SECMC's consent, expected to be completed by June 2015 in line with Mining requirements – Exclusively being provided for Thar Block – II
 - SECMC is developing a back-up / contingency arrangement for ground water disposal in case of any disruptions in effluent flow due to line blockage / rupture
 - Road network: Work has started on 3 out of 6 segments for road rehabilitation from Thatta to Islamkot by GoS – Expected completion mid 2015
 - Airport: Construction of Islamkot Airport is on-going as per plan (work on Terminal Building started) and air strip is expected to be ready by mid 2015
 - Water for Power Plant: Primary source of water will LBoD scheme, which is being developed by GoS to provide fresh water supply to Plant Site; THARCO is fully involved in it's design review & construction supervision - expected to be completed as per project schedule

IA with GoS regarding availability and maintenance of critical infrastructure 33 (LBoD and Effluent Disposal Scheme) also being negotiated
 EXEMPLARY SUPPORT BEING PROVIDED BY GOS FOR DEVELOPMENT OF INFRASTRUCTURE



Infrastructure Development by GoP

- Detailed Feasibility Studies completed by SNC-Lavalin of Canada and NESPAK for 250 km long 500 kV double circuit transmission line from Thar Block-II to Matiari
- PC-I approved by ECNEC NTDC is responsible for the execution of the project
- Regular follow-up being done with GoP and NTDC for financing and timely execution of the project
- NTDC has assured timely availability of Transmission Line





RISK ASSESSMENT



Mining Project Risk Assessment

Risk	Mitigants			
Contractor related	 Entire risk of design, procument, construction and commissioning lies with a single contractor who will ensure continuity of operations and coal production Adequate Performance Guaratees and Liquidated Damages incorporated in EPC and O&M Contracts 			
Operation Level	• Engage an experienced mining consultant as Owner's Consultant and hire experienced mining professionals			
Delay in Coal Production	• Indonesian mines identified which can provide required quantity of lignite to power plant			
Dewatering/Effluent Disposal	Adequate margins in pumping system - responsibility of EPC contractorRedundant Interim disposal scheme being developed by SECMC			
Environment	SEPA NOC received - Covered through Detailed EMP			
Land Acquisition / Resettlement issues	 Land for initial 8 years acquired Relocation of 2 villages required after 8 years will be done during construction 			
Social and Law & Order Issues	 Hiring of Locals from Tharparkar will be obligation on all Contractor/Subcontractors Extensive on-job/off-job training plans will be implemented for skill enhancement and induction of the local population in the project 			
Financial	• Formal take or pay coal supply agreement will be signed with the power plant with adequate provisioning of EPP and CPP - fixed capacity payment of mine through fixed EPP portion			



Power Project Risk Assessment

Risk	Mitigants		
Shortfall in capacity and efficiency	Guaranteed output & efficiency by EPC ContractorAdequate liquidated damages and penalties		
Fuel Supply	Power plant is designed on flexible CFBC technologyInventory of coal for 21 days of full load operation maintained at mine & plant		
Plant Availability	 Plant would be operated and maintained on International Standards and prudent utility practices by reputable O&M Contractor Adequate margins are kept in the PPA to cover for forced and planned outages – coverage through business interruption insurance beyond this allowance 		
Water Supply	LBoD scheme being developed by GoS for supply of fresh waterGround water to be utilized if need arises		
Environment	 SEPA NOC received - Design meets all relevant NEQS and WB guidelines for emissions and effluents EPC contractor will be liable for the environmental performance of the project 		
Commercial	• Inflation, Currency, Interest Rate Risk, Risks related to Power Purchaser to be covered through PPA. Risks arising from political factors, force majeure events etc. to covered through IA		
Cost overrun (for both projects)	Adequate contingency kept in the systemEPC Contractor's 60% equity stake mitigates performance risk		



PROJECT FINANCING AND TIMELINE



Financing Update

Debt requirement of Phase-I

- Mining project by SECMC based on Debt : Equity ratio of 70:30 USD 605Mn being sought against Sovereign Guarantee
- Power project based on Debt : Equity ratio of 75 : 25 USD 825Mn being sought on project finance basis backed by IA/PPA and Sinosure coverage
- Almost 70% of debt needed for project is being sought from Chines banks
- Both Mining and Power project categorized as top 5 prioritized projects under EHP
- Encouraging discussions are ongoing with leading Chinese (ICBC, CDB etc.) and Local financial institutions (HBL etc.)

Equity requirement of Phase-I

- Equity commitment for both mining & power project is already firmed up
 - GoS, Engro, House of Habib, HUBCO, CMEC and banks have confirmed their equity interest to the extent of USD 300Mn for mining project by SECMC
 - Engro/Affiliates are committed to equity contribution of USD 275 million with minority stakes by House of Habib and banks

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To-date GoS and Engro have already injected equity of ~USD 30 Mn for project development of mining and power project



Project Timelines

S No.	Milestones	Target Date
1.	Ground Breaking by Prime Minister of Pakistan	Done
2.	Physical Start – Mining Project	Done
3.	Announcement of EPC Contractors after evaluation by RWE	Done
4.	Announcement of Thar coal based upfront tariff by NEPRA	Done
5.	Coal Tariff determination by TCEB	Oct 2014
6.	Finalization of Security Package	Oct-Nov 2014
7.	Financial Close	End 2014/Early 2015
8.	Completion of Transmission Line	Apr 2017
9.	Commercial Operation Date (COD) for Mining and Power Plant – Phase I as committed to Prime Minister	End 2017/ Early 2018

THAR PROJECT WILL BE AMONG THE FIRST FEW PROJECTS THAT WILL BE COMMISSIONED AMONG ALL THE PROJECTS UNDER CONSIDERATION



BENEFITS OF THAR



Game Changer for Thar

Presently Thar District ranks lowest on all socio-economic development indicators in Sindh



Development of Thar Mining & Power projects will contribute to economic and social uplift of the Pakistan:

- Thar coal project will be developed in Pakistan's most backward region of Pakistan opening up immense economic opportunities for the deprived region
 - At optimum mine capacity, mine would provide employment to around 10,000 skilled and unskilled labor
 - And will lead to creation of social assets i.e. education institutions, medical facilities, infrastructure development etc.

- > Private companies will spend 1-2% of PAT on community and social development programs
- Project will help development of the indigenous mining industry and act as a catalyst for future mining projects, which shall come on-board once this project kicks-off
- > Potential for downstream industries in Petro-chemical and Fertilizer products



2014 - The Year of Thar

- Thar dream is finally on the verge of realization
- This major breakthrough has only been made possible through the instrumental support provided at all forums by Government of Pakistan, Government of Sindh, Engro and other investors
- In the meeting with the Honorable Prime Minister on 29th Jan 2014, most of the challenges pertaining to the project were resolved
- We hope that the Federal and Provincial Government will continue to support this project with the same enthusiasm and passion
- Thar truly is the most viable power generation option for Pakistan and Development of indigenous Thar Coal Reserves offers a fortune-turning proposition for Pakistan, which will not only address the severe power shortage crisis in medium to long term but also bring energy security to the country
- The project will also bring immense socio-economic benefits for the poor people of Thar as the project will catalyze the creation of social assets medical facilities, educational institutions, and infrastructural development and job opportenities will SURELY CHANGE PAKISTAN'S ENERGY SCENARIO

THANK YOU

Thar Dream Promises Better Life Tomorrow for all Pakistanis!