
Energy Crisis in Pakistan and Thar Coal is Untapped Wealth and Solution

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Abstract

This research investigates the Energy crisis and Thar coal is untapped and solution to energy problem in Pakistan. Data were collected from various secondary sources i.e. Annual Reports, News prepared, magazine and Reports from Thar coal development authority. It was revealed that Thar coal that there is now some hope for economic uplift as its natural wealth is being tapped. Geological Survey of Pakistan (GSP), discovered huge deposits of coal in 1922 at Thar during the research program, assisted by United State Geological Survey (USGS). Exploration carried out over 356.5 sq. km. by drilling 219 holes, proved 9.715 billion tones coal deposit. Thar coalfield is spread over an area of more then, 9,000 sq. km. and posse's 175.506 billion tones of coal. It is one of the largest coalfields of the World and is sufficient to meet fuel requirements of over a hundred years, if the basic infrastructure is established. The province of Sindh is endowed with huge coal deposits, estimated at 184.123 billion tones. Out of which, Thar coal deposit comprises 175. 506 billion tones, which constitutes around 99% of total coal deposits of the country. It was further revealed that Government should developed strategic planning to develop Thar coal to resolve the issue of Energy crisis in Pakistan.

Key Words: *Energy Crisis in Pakistan, Thar Coal, And Untapped Wealth*

Introduction

Thar Desert of district Tharparkar, Sindh Pakistan lies in the southeastern zone of Sindh situated at a distance of 380 km. from Karachi. It is bound on the eastern side by the border with India, in the North by districts of Mirpurkhas and Badin. The name "Thar" is derived from Thul the general

term for the region. The land area of Thar is spread over about 4,791,025 acres, out of which 2,394,399 acres are cultivable. The south-eastern part known as Nagarparkar, consists of granite hills with plain cultivable lands, most of the desert consists of sand dunes with flat plain between them where agriculture can take place. The main occupation of people is cattle and livestock rearing, which is about 60% of their living derived. Crops are grown after rain and some handicrafts (carpet weaving, cloth weaving, embroidery, etc.) also flourish. Rain is the main source of water in Tharparkar arid region. It is very erratic and the annual rainfall varies from 0-300 mm. All agriculture and livestock activities are dependent on rainfall. The failure of monsoon would mean no agriculture crop and no fodder for the cattle and livestock. The main crop of Thar is Bajra and Gaware. In good rainy years, lentils, melons and sesame are also grown with main crop.

The Thar Desert requires seasonal showers for vegetation, crops, animals and 'Palaar' (drinking water) and 'toba' (community water pool), but drought has continuously increased the misery of its inhabitants over the last 6/7 years. About 20% of rain water is wasted through seepage and another 40% is lost due to evaporation, as the sun is merciless with temperature often rising to 41°C, migration, which used to be seasonal is now becoming permanent as famine like situations develop regularly. According to a study by an NGO Thardeep currently there is 70% food deficit and half starved animals are being sold for subsistence. It is sheer resilience, will power and the inner strength that is the hallmark of the average Thar that helps him to survive. A vast number still live in Jhuggies. Since November, 2001, Food for Work programme is being implemented by NGO Baanh Beli in over a hundred villages with the assistance of World Food Programme. This includes household water tanks at community points and 27 hand pumps provided by UNICEF. However, all this can only succeed, if the rains come. For digging as well, a man still has to be lowered by four men into a hole with a 4 ft. radius. At present some of the problems of Thar, besides rain and water are: -

- Low on political priority
- Non-dissemination of information
- Lack of communication
- Infrastructure-roads/living places/proper transport.
- Non-availability of modern technology, education.
- Non-availability of mining expertise, etc.

If De-Desertification of Thar is to be achieved through this project then the Government of Sindh with assistance from the federal government will have to do the following, which require funds, planning and commitment.

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- Increase Socio-economic activities
 - Develop communication system
 - Establish TV and Radio Station
 - Disseminate information regarding Thar coal
 - See that investment is related to profit.
 - Develop infrastructure allied business
 - Control Pseudo-expertise of technical bureaucracy in Pakistan as it is a hindrance to development.

To put it in plain words, Thar is an area mired in poverty. Since centuries the people have been waiting for economic prosperity and justice. So far all they have got from incompetent and callous governments has been lip service that and romanticizing of its inhabitants, men and animals. The embroidered shirt, silver jewellery, folk songs, the dancing peacocks and the prancing gazelle have found its way into TV plays, and thus share the fate of the other minorities. The poverty is enhanced by perennial droughts.

Coal Resources of Thar Desert

It seems that there is now some hope for economic uplift as its natural wealth is being tapped. Geological Survey of Pakistan (GSP), discovered huge deposits of coal in 1922 at Thar during the research programme, assisted by United State Geological Survey (USGS). Exploration carried out over 356.5 sq. km. by drilling 219 holes, proved 9.715 billion tones coal deposit. Thar coalfield is spread over an area of more than, 9,000 sq. km. and posse's 175.506 billion tones of coal. It is one of the largest coalfields of the World and is sufficient to meet fuel requirements of over a hundred years, if the basic infrastructure is established. The province of Sindh is endowed with huge coal deposits, estimated at 184.123 billion tones. Out of which, Thar coal deposit comprises 175.506 billion tones, which constitutes around 99% of total coal deposits of the country. The coal deposits of Pakistan (province-wise) and Sindh (coal field-wise) are as under:

Coal Deposits of Pakistan

Province	(Billion Tonnes)
# Punjab	0.257
# Balochistan	0.196
# NWFP	0.082
# Sindh	1.84.123
Total	148.658

Source: Geological survey of Pakistan

Coal Deposits of Sindh

Coal-field	(Billion Tonnes)
# Lakhra, district Dadu	1.328
# Sonda-Jherruck, district Thatta	7.112
# Jhimpir-Metting, district Thatta	0.161
# Badin	0.016
# Thar	175.506
Total	184.123

Source: Geological Survey of Pakistan

Pakistan stands to gain hugely from exploitation of its coal resources. A breakdown of the estimated value of energy resources in Pakistan in terms of US \$ in billion highlights that oil has an estimated value of 6 billion dollars, gas has 25 billion dollars, whereas, coal has an estimated value of 5,540 billion dollars.

The countries that have shown interest and can be potential partners in the development of Thar coal are China, Germany, Australia, United Kingdom and United States of America.

General Geology

The studies, conducted so far, show that the Thar coalfield rests directly on relatively shallow, rifted basement rocks of late Pre-Cambrian age. The area is completely covered by sand dunes. On the basis of drill holes data, four subsurface lithostratigraphic units have been identified.

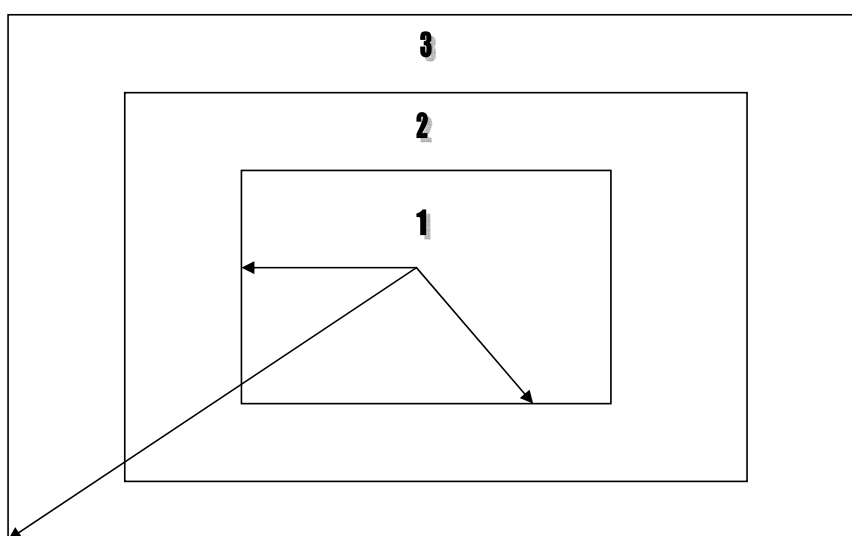
# Dune Sand (Recent)	50-90 meters thick
# Alluvial Deposits (sub-recent)	11-127 meters thick
# Bara Formation (Paleocene)	50-125 meters thick
# Basement Complex (Pre-Cambrian)	Granite Rocks

Source: Geological Survey of Pakistan

Coal Resources Assessment

The coal resources of the Thar coalfield, based on the exploratory drilling of 217 holes up to June, 2001 with a cumulative drill depth of 51,076 meters, have been assessed as under:

Resource Category	Reserves (Million Tonnes)
Measured	2,700
Indicated	9,395
Inferred	50,706
Hypothetical	112,705
Total	175,506



- ❖ Area of proved coal Resources within 400 meters
- ❖ Area of indicated Coal Resources between 400 meters and 1.2 km.
- ❖ Area of inferred Coal Resources between 1.2 and 4.8 km.

Source: Facts & Figures 2001, published by GSP, Ministry of P&NR.

Thar Coalfield (Investigated Blocks)

At present, investigations at Thar coal-field are being carried out and it has been divided in four blocks, which are mentioned below along with deposit in each block.

Block	Area (sq.km.)	Drill Holes	Reserves (Million Tonnes)
Block-1	122	41	3,566
Block-2	55	43	1,584
Block-3	99.5	41	2,006
Block-4	80	42	2,599
Sub-total	356.5	167	9,715
Rest of coalfield	8,643.5	50	165,791
Total	9,000	217	175,506

Source: Geological Survey of Pakistan

During the execution of the project (1993-2001) close-spaced exploratory drilling, geological, geotechnical and geophysical logging, coal petrography, chemical analysis of selected coal samples, palynological investigations, basinal studies and geological modeling in four specific tracts, namely Sinhar Vikian-Varivi (Block-1), Singharo-Bhitro (Block-II), Saleh jo Tar (Block-III) and Sonalba (Block-IV) and the area southeast of Islamabad have been combustion test and insitu gasification, are planned to be carried out during 2001-2002. The aim is to establish proven coal reserves of 500 million tonnes in each block to cater the need of four thermal power generation units of 1,000 MW capacity each for 30 years.

The thickest Thar coal seam is present between 150 and 203 meters depth in the four investigated blocks. The maximum thickness of the seam is 22.81 meters. The cumulative coal thickness in the blocks varies between 7.15 and 36.00 meters. the thickness of overburden varies from 114 to over 200 meters.

Blocks	Minimum	Maximum
Block-I	137.04	178.72
Block-II	123.80	164.70
Block-III	114.00	203.02
Block-IV	117.30	165.50

Water Aquifers at Thar Coalfield

- Drilling data has indicated 03 aquifers (water-bearing zones) at an average depth of 50, 120 and more than 200 meters.
 - One aquifer above the coal zone Ranges between 52.70 and 93.27 meters depth.
 - Second aquifer within the coal zone at 120 meters depth: Varying thickness up to 68.74 meters.
 - Third aquifer below the coal zone at 200 meters depth varying thickness up to 47 meters.
- Water quality is brackish to saline.

Water Analysis

Drill Hole	STP-3		STP-8	
Sample No,	1.	2.	3.	4.
Interval Tested (m)	191.6-194.6	115.9-118.9	179.9 – 182.9	88.4 – 91.4
Conductivity (Mohs/cm)	4,500	4,165	4,550	5,900
Chloride (mg/l)	2,480	2,610	2,680	4,020
Sulphate	0.24	0.28	0.25	0.48
Sodium	1,306	1,348	1,395	2,094
Potassium	30	32	33	41
Calcium	-	100	100	370
Iron Soluble	0.03	0.04	0.04	0.40
Manganese	0.44	0.33	0.25	0.04
Fluoride	1.90	1.53	1.49	1.29

Source: Geological Survey of Pakistan

Power Generation – Coal Requirements Ratio

This ratio has been worked out on the basis of actual use, as per the LCDC profile published in the year 2002 where in 6x50 MW power plant's consumption has been shown as 1,500,000 tones.

Electricity Generation	Coal Requirement (Lakhra Coal)
➤ One MW (Per day) (Per annum)	20 7,300
➤ 100 MW (Per annum)	730,000
➤ 100 MW (for 30 days)	21,900,0000
➤ 100 MW (for 30 days)	20.00 (Since quality of Thar Coal is batter than Lakhra.

Installed Power Generation Capacity in Pakistan

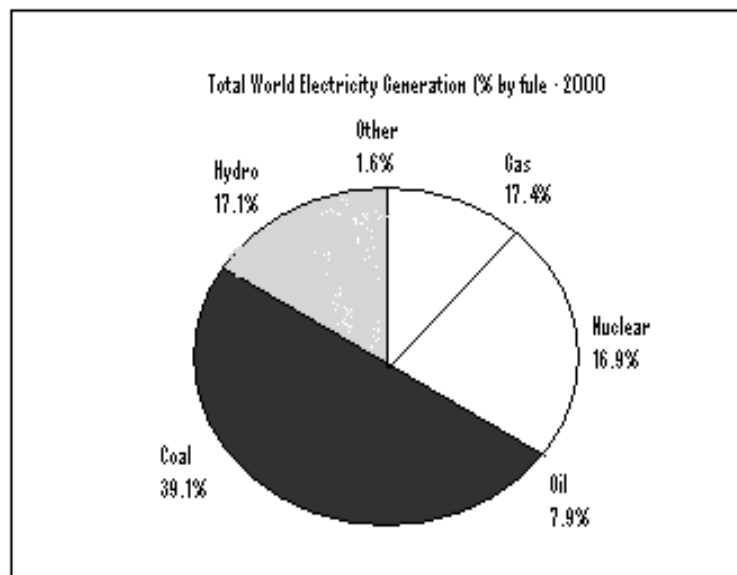
➤ WAPDA	9,949 MW
➤ KESC	1,756 MW
➤ PAEC	437 MW
➤ IPPs	5,522 MW
➤ Total	17,664 MW

Source: power Policy 2002, Ministry of Water & Power GoP.

Out of a total generation capacity of 17664 MW, installed coalfield power generation is 165 MW (150+15 MW).

Power Generation from Coal: World – Wide Scenario

Coal is the single largest fuel source for the generation of electricity worldwide currently about 39% of the world's electricity is generated from coal.



* Other includes solar, wind, combustible renewable, geothermal and waste.

Source: IED Key World Strategic: 2002 Edition.

Coal based energy generation has witnessed a rapid rise in Asia, as well.

Following Table shows the percentage of energy/electricity produced from the coal in Asia.

1980	26%
1998	45%
2020	60%

A number of countries are heavily dependent on coal for electricity, including in 2000.

Country	Power Generation (%)
USA	52%
UK	58%
Australia	77%
Germany	52.5%
China	78%
India	77%
S. Africa	88%
Poland	96%
Czech Rep.	72%
Greece	67%
Denmark	47%
Netherlands	28%
World average	39%

Source: World Coal Institute publication 'Coal – Power for Progress' December, 2002.
Share of coal in electricity generation in Pakistan is less than 1%.

Coal was the fuel used to generate largest share (51.8%) of electricity in USA in 2000 i.e 1,196.8 billion kilowatt hours. This is over one and a half times the annual electricity consumption of all US households (1,141 billion kWh.). Natural gas was used to generate 612 billion kWh (16.1%) and petroleum accounted for 109 billion kWh (3%).

The International Energy Agency has released the latest edition of the World Energy Outlook (WEO). WEO 2002 forecasts a 1.7% per year increase in energy demand from 2000-2030. Energy demand is set to increase most rapidly in developing countries, accounting for more than 60% of the increase in world primary energy demand.

Fossil fuel will remain the primary source of energy through to 2030, meeting more than 90% of the increase in demand. Coal's share in total energy

consumption is forecasted to drop from 26% in 2000 to 24% in 2010, but then average annual rate of 1.4% up to 2030. in all regions, coal use will become 90% of the increase in demand between 2000 and 2030.

World electricity demand is projected to double between 2000 and 2030, growing at an annual rate of 2.4%. The strongest growth will be in developing countries, where demand will climb by over 4% a year, tripling by 2030. Most of increase will be in India and China where large, low-cost reserves keep coal as the dominate fuel.

The Importance of Coal to Everyday Life World Wide.

- Coal is the world's most abundant, safe and secure fossil fuel it is also cost-effective and can be burnt cleanly, coal is mined in 50 countries.
- Coal is the single largest fuel source for the generation of electricity worldwide. Currently over one-third of global electricity is generated from coal.
- Coal is the safest fossil fuel to transport, store and use.

Environmental issues Related to Coal Based

Sustainable development is a challenge and has to be linked to financial success, whether undertaken by private, public or both the sectors together. There is indeed a business case for addressing sustainable development concerns, lower labour cost and health costs, improved access to financiers, lender, insurers, etc, and vital aspects pertaining to environment.

The environmental issue has assumed an importance of its own. For Thar coal project the environmental aspects were looked by Thardeep. The NGO submitted a study report in October 2002. it points out that Mining related activities involve exploration, extraction, are processing treatment, disposal, infrastructure, construction, camps etc. and that coal mining can result in hazards directly from coal mining as well as from coal processing and utilization. This may include depletion of main aquifer, destruction of vegetation, grazing grounds and agricultural land which are already sparse and contamination of air and ground water, culture, heritage, way of life, Traditions, bio-diversity, flower and fauna, too are susceptible pressures. Use of explosives, release of toxic effluents, is also health hazards. Sincere and serious efforts will be required to be planned well in advance so that implementation can take place as the mining proceeds. This of course also means that legislation and institutions should both be built up. The premier

environmental legislation here is the Pakistan Environmental Protection Ordinance 1983(PEPO). Provincially, the Sindh Environmental Protection Agency (SEPA) has been established under this ordinance. However, we have much to learn from legislation enacted by other countries like, China, U.K, India, Denmark.

Some international forums that have taken up this issue forcefully are, the 'Kyoto Protocol' on emissions, the Toronto Declaration, the World Summit on Sustainable Development (WSSD) held in Johannesburg to review the progress and implementation 2002 and the UN's setting up of global targets for elimination of poverty and promotion of sustainable development during the Millennium Summit held in September 2002.

Besides, after two years of research and consultation, the Mining, Minerals and Sustainable Development Project (MMSD) released its report "Breaking New Ground" in 2002. The report identifies how the mining sector can enhance its contribution to global sustainability. Overcoming the negative impact of past practices, social and environmental legacies, and inadequate accountability will be a major challenge. Another new well researched report prepared by Brian Price for the McCloskey Group, reviews the major environmental forces that have come into play in energy markets in recent decades. It highlights how coal – seemingly on a downward spiral for much of the 20th Century- is rising to meet these environmental challenges through scientific innovations.

The coal sector has developed a greater appreciation of the impact of past practices and the negative image that lingers. Even in developing countries, such as in China and India where coal is still the world's largest source of thermal power and its role is seemingly secure, coal is required to answer the environmental concerns surrounding its use. Steps have been taken to improve the environmental credentials of coal, not only through direct government legislation but also through the development and introduction of cleaner coal technologies.