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## COAL: STILL AN IMPORTANT SOURCE OF ENERGY IN INDIA

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“The Indian coal industry aspires to reach the 1.5 billion tonne (BT) mark by FY 2020. In 2016, the industry will naturally need to focus on building on the success of 2015, and be on track for reaching the FY 2020 goal.”

Energy has been universally recognized as one of the most important inputs for economic growth and human development. There is a strong two-way relationship between economic development and energy consumption. On one hand, growth of an economy, with its global competitiveness, hinges on the availability of cost-effective and environmentally benign energy sources, and on the other hand, the level of economic development has been observed to be reliant on the energy demand.

Energy represents the ability to produce action. Energy comes from different sources that can be found naturally as well as man made. Energy can be classified into several types based on the following criteria:

### **Primary and Secondary energy:**

Primary energy sources are those that are either found or stored in nature for example coal, oil, natural gas, wind, sunlight, moving water and uranium. Primary energy sources are mostly converted in industrial utilities into secondary energy sources.

### **Commercial and Non commercial energy:**

The energy sources that are available in the market for a definite price are known as commercial energy. By far the most important forms of commercial

energy are electricity, coal and refined petroleum products. Commercial energy forms the basis of industrial, agricultural, transport and commercial development in the modern world. The energy sources that are not available in the commercial market for a price are classified as non-commercial energy. Non-commercial energy sources include fuels such as firewood, cattle dung and agricultural wastes, which are traditionally gathered, and not bought at a price used especially in rural households. These are also called traditional fuels. These are often ignored in energy accounting.

## Renewable and Non-Renewable energy

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Renewable energy is energy obtained from sources that are essentially inexhaustible. Examples of renewable resources include wind power, solar power, geothermal energy, tidal power and hydroelectric power. Non-renewable energy is the conventional fossil fuels such as coal, oil and gas, which are likely to deplete with time

## Literature Review

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In India's energy sector, coal accounts for the majority of primary commercial energy supply. With the economy poised to grow at the rate of 8–10% per annum, energy requirements will also rise at a reasonable level. Coal will continue to be a dominant commercial fuel two decades from now and beyond, despite nuclear energy programme, development of

natural gas supplies, increased hydropower generation, and emphasis on renewable.

Coal is a hard, black coloured rock like substance. It is made up of carbon, hydrogen, oxygen, nitrogen and varying amounts of sulphur. Coal is burned to produce energy. Coal is a fossil fuel formed through geological processes that occurred over millions of years. It is formed from decayed vegetation that is compressed at high temperatures beneath layers of sediment rock and sand. It is usually found in layers known as coal beds or in veins called coal seams. The age they were formed is called the Carboniferous Period. It was part of the Paleozoic Era. Carboniferous gets its name from carbon, the basic element in coal and other fossil fuels.

Classification depends on the nature of the original vegetation, its biochemical experiences, the length of the coalification process and most

importantly the depth that the coal seam was buried. The types include:

- Lignite Coal
- Bituminous Coal
- Subbituminous Coal
- Anthracite Coal

There are many compositional differences between the coals mined from the different coal deposits world wide. The different types of coal are most usually classified by rank which depends upon the degree of transformation from the original sources. The method of ranking coals is based on a number of parameters obtained by various prescribed tests which are:

- Heating Value
- Volatile Matter
- Moisture
- Ash
- Fixed Carbon.

#### World Primary Energy Mix (2013) (Mtoe,%):

|                           |    |
|---------------------------|----|
| Coal                      | 44 |
| Biomass and waste         | 23 |
| Petroleum & other liquids | 23 |
| Natural gas               | 6  |
| Nuclear                   | 1  |
| Hydroelectric             | 2  |
| Other renewable           | 1  |

Source: EIA Energy Conference 2016

The statistic shows the primary energy consumption in India between 2010 and 2015, by fuel type.

#### Primary energy consumption in India between 2010 and 2015, by fuel (in million metric tons of oil equivalent)

| ENERGY           | 2010  | 2011  | 2012  | 2013  | 2014  | 2015  |
|------------------|-------|-------|-------|-------|-------|-------|
| OIL              | 156.2 | 163   | 173.6 | 175.3 | 180.8 | 195.5 |
| NATURAL GAS      | 55.7  | 55    | 52.9  | 46.3  | 45.6  | 45.5  |
| COAL             | 270.8 | 270.6 | 302.3 | 324.3 | 388.7 | 407.2 |
| NUCLEAR ENERGY   | 5.2   | 7.3   | 7.5   | 7.5   | 7.8   | 8.6   |
| HYDRO            | 25    | 29.8  | 26.2  | 29.8  | 29.6  | 28.1  |
| RENEWABLE ENERGY | 7.6   | 9.2   | 10.9  | 12.5  | 13.6  | 15.5  |

Source: The Statistics Portal

## Data and Method

The data required for the case study was obtained from multiple sources like the official websites of the Ministry of coal, Published documents of the Coal India Limited, other published sources including performance and financial audits reports of coal controller. The case study method which is an appropriate research method for this type of study is used. It is commonly used when the study involves a single organisation with unique characteristics.

“Case study is an ideal methodology when a holistic, in-depth investigation is needed ” Feagin, Orum, & Sjoberg,1991. To gauge the performance and importance of coal as a unique energy source, the data has been examined for the period between 2010 to 2016 so as to facilitate the analysis in the current decade.

## An overview of the Coal as an important source of energy

### Why Coal as Fuel:

Indian energy sector is largely dependent upon coal as prime source of energy.Coal is the most important primary source of commercial energy throughout

the country.Even with the advent of alternative fuels-oil, gas or nuclear, coal continues to be the fuel of choice for almost all major sectors. Coal dominates the energy mix of India. Indian energy sector is largely dependent on coal as prime source of energy .Coal fulfils about 52% of India’s primary energy need. India is the largest coal producing country next to China and USA.

### Some Notable Points:

India now ranks third amongst the [coal](#) producing countries in the world. Being the most abundant fossil fuel in India till date, it continues to be one of the most important sources for meeting the domestic energy needs. It accounts for 55% of the country’s total energy supplies

### Coal Consuming Sectors:

- .Thermal power plants accounting for nearly 68% of the total coal off-take.
- Steel plants, cement plants, railway, fertilizer plants etc accounting for over 14% of the total coal off take.
- Textiles, refractory’s, foundries, paper mills, chemical industries etc. Numbering over 20000 units.
- Over a 100000 brick-kilns, tobacco growers, tea garden and millions of households.

**Off-take of Raw Coal in India in 2014-15 by Sector**

| Sector            | Off-take [MT] |
|-------------------|---------------|
| Power (Utility)   | 418.489       |
| Power (Captive)   | 51.227        |
| Steel             | 22.285        |
| Steel (Boilers)   | 0.365         |
| Cement            | 11.362        |
| Fertilizers       | 2.294         |
| Sponge Iron       | 14.676        |
| Other basic-Metal | 0.257         |
| Chemical          | 0.399         |
| Pulp & Paper      | 1.541         |

|                          |                |
|--------------------------|----------------|
| Textiles & Rayons        | 0.419          |
| Bricks                   | 0.113          |
| Others                   | 84.203         |
| Total Despatches         | 607.630        |
| Colliery Own Consumption | 0.576          |
| <b>Total Off-take</b>    | <b>608.206</b> |

**Source: Provisional Coal Statistics 2014-2015**

Indian coal generally has a high ash content and low calorific value. Coal deposits are mainly confined to eastern and south central parts of the country. The states of Jharkhand, Odisha, Chhattisgarh, West Bengal, Madhya Pradesh, Telangana and Maharashtra account for 99.08% of the total coal reserves in the country. The State of Jharkhand had the maximum share (26.44%) in the overall reserves of coal in the country as on 31st March 2015 followed by the State of Odisha (24.72%). As on 31.03.15, the estimated reserve of coal was 306.60 billion tonnes, and addition of 5.04 billion over the last year. There has been an increase of 1.67% in the estimated coal reserves during the year 2014-15

with Chattisgarh accounting for maximum increase of 4.53%. Coal production in the country during the year 2014-15 was 612.44 million tonne (MTs) as compared to 556.77 MTs during 2013-14, registering a growth of 8.25%.

In spite of abundant coal reserves the coal is also imported from many countries. As per the present Import policy, coal can be freely imported (under Open General Licence) by the consumers themselves considering their needs based on their commercial prudence.

Details of import of coal and products i.e. coke during the last six years is as under:

\*Import upto May, 2016

| Coal                     | 2011-12       | 2012-13       | 2013-14       | 2014-15       | 2015-16(Prov.) | 2016-17*     |
|--------------------------|---------------|---------------|---------------|---------------|----------------|--------------|
| Coking                   |               |               |               |               |                |              |
| GDF                      | 31.80         | 35.56         | 36.87         | 43.72         | 43.50          | 5.83         |
| G.kCoal                  |               |               |               |               |                |              |
| Non-Coking Coal          | 71.05         | 110.23        | 129.99        | 174.07        | 156.38         | 29.26        |
| <b>Total Coal Import</b> | <b>102.85</b> | <b>145.79</b> | <b>166.86</b> | <b>217.78</b> | <b>199.88</b>  | <b>35.09</b> |
| Coke                     | 2.37          | 3.08          | 4.17          | 3.29          | --             | 0.80         |

**Source: Ministry of Coal (Production and Supplies)**

The importance of Coal as source of energy is emphasised by the Supreme Court also in many of its judgements. "Coal is king and paramount Lord of

industry is an old saying in the industrial world. Industrial greatness has been built up on coal by many countries. In India, coal is the most important

*indigenous energy resource and remains the dominant fuel for power generation and many industrial applications,"* a bench headed by Chief Justice R M Lodha said.

*"Coal is an extremely important element in the industrial life of developing India. In power, iron and steel, coal is used as an input and in cement, coal is used both as fuel and as an input. It is no exaggeration that coal is regarded by many as the black diamond,"* the bench said. It is said that a number of major industrial sectors, including iron and steel production, depend on coal as a source of energy and coal's potential as a feedstock for producing liquid transport fuels is huge in India.

Coal is important because it is a reliable and an affordable source of energy in many countries. Coal is a crucial ingredient in manufacturing industries. Energy sector is one of the basic infrastructure sectors. Energy demand in agriculture, industrial, commercial and household sectors has increased tremendously and placed enormous pressure on its resources. The depleting resources and increasing pollution of environment due to energy use has necessitated optimum use of its resources; which in turn requires proper energy planning to achieve energy security. For proper planning to optimize its use, an integrated and updated database of production and consumption of different sources viz. coal, crude petroleum, natural gas and electricity is needed. Good energy statistics will allow monitoring of energy generation from various sources, its use in different sectors, losses and damages done to environment by various processes.

## Conclusion

Coal plays a pivotal role in India's sustainable development. The demand for coal is increasing enormously since a large portion of electricity generation in India is dependent upon coal-based power plants. Despite huge allocation of coal reserves in the country, it is required to import it from other countries. Thus, it becomes necessary for the government to explore advanced technologies

for enhanced extraction and processing of coal. Also, the environmental problems caused due to coal-related activities are serious issues and, thus, needs to be checked. Therefore, it is critical for policy makers not only to consider and implement technologies that meet the near-term needs of the country, but also to set the coal-based power sector on a path that would allow it to better respond to future challenges. Also the coal mafia has had a negative effect on Indian industry, with coal supplies and quality varying erratically. Higher quality coal is sometimes selectively diverted, and missing coal is replaced with stones and boulders in railway cargo wagons. A human corpse has been discovered in a sealed coal wagon. Many energy bodies, including the International Energy Agency (IEA), are urging India to put greater efforts into the development of green-energy solutions, including wind and solar power, to meet the growing demands.

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