

Mission Energy Foundation

Seminar on Thermal Power O&M Coal based Power – 28th June 2019 Use of Eco-Friendly Coal To Make – India - A 5 Trillion Economy

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RQP:- Recognized Qualified Person by G.O.I

Preamble

A. India's Energy Sector:

- i. Total Installed Capacity: 356.8 GW
- ii. Share of Thermal: 222.9 GW
- iii. Share of Renewables: 74 GW
- iv. Share of Nuclear: 6.7 GW
- v. Share of Hydro: 45 GW

B. Thermal Power:

- i. Total Installed Capacity: 222.9 GW
- ii. Coal Based: 191 GW
- iii. Gas Based: 25 GW
- iv. Lignite Based: 6.2 GW

*One Country – One National Grid for Installed Capacity of 356
GW*

Where We Stand

Energy Consumption Per Capita In 2014

| S. No | Country | Quantity (GJ.) |
|-------|---------|----------------|
| 1 | Ethopia | 22 |
| 2 | India | 28 |
| 3 | Nigeria | 31 |
| 4 | China | 93 |
| 5 | Japan | 144 |
| 6 | Russia | 219 |
| 7 | USA | 294 |

Ownership of Power Generation

| S. No. | Sector | Figures (%) |
|---------------|----------------|--------------------|
| 1 | Private Sector | 46 |
| 2 | State Sector | 30 |
| 3 | Central Sector | 24 |
| Total | | 100 |

The Paris Deal (COP 21) and Coal

Paris Agreement

- Accord reached in December 2015
- Touted as the most ambitious climate change pact
- Lays out plan to curb GHG emissions and climate change
- Accelerates actions and investments needed for low carbon future
- Coal takes center stage

195 countries participated to commit to reduce emissions

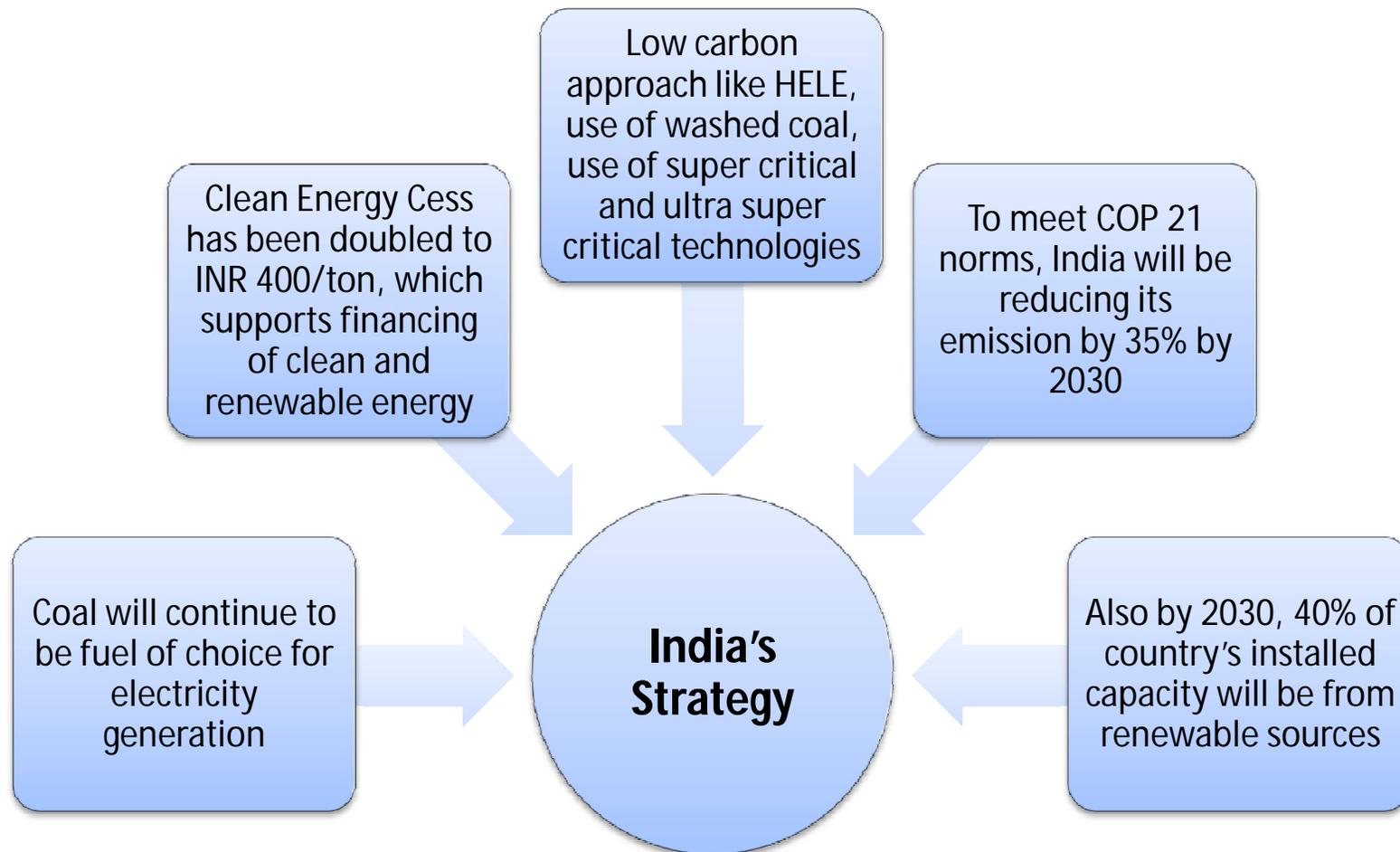
Developed world having already achieved pinnacle of growth are now looking to move away from coal despite the following:

- Over 40% of world's electricity and 70% of steel is coal dependent
- Employs millions if not billions
- Most abundant fossil fuel
- Lack of other fossil fuels in emerging economies

Coal

- Coal can't be done away with
- Important fossil fuel for countries like China, India and other developing countries
- HELE (High Efficiency Low Emission) coal fired thermal power plants could be an answer
- Coal usage in form of gas via SCG, UCG, CTL & CTG.

India's take on Coal post Paris Agreement



Why Washing of Coal is necessary for India's Power Sector

The way forward to reduce emissions

- ❖ Indian coals have high ash content which leads to inefficient combustion and adds to pollution
- ❖ Washing helps in reducing ash content and improves heat value, efficiency of combustion and reduces CO₂ emissions per KWh of electricity
- ❖ Washing also helps in reducing freight, less coal consumption and reduces ash handling
- ❖ In totality, washing coal helps in improving the combustion efficiency and environmental performance of coal in the electricity chain

Why Washing of Coal is necessary for India's Power Sector

- ❖ Adoption of 17 grades based on GCV system instead of 7 grades as per erstwhile UHV system.
- ❖ Now, there is limited scope of product differentiation, and the buyer can select the suitable grade corresponding to the most appropriate requirement based on station heat rate and economics of conversion of Coal Energy to Power.

| Grade | GCV Range in Kcal/kg |
|-------|---------------------------------------|
| G1 | Exceeding 7000 |
| G2 | Exceeding 6700 and not exceeding 7000 |
| G3 | Exceeding 6400 and not exceeding 6700 |
| G4 | Exceeding 6100 and not exceeding 6400 |
| G5 | Exceeding 5800 and not exceeding 6100 |
| G6 | Exceeding 5500 and not exceeding 5800 |
| G7 | Exceeding 5200 and not exceeding 5500 |
| G8 | Exceeding 4900 and not exceeding 5200 |
| G9 | Exceeding 4600 and not exceeding 4900 |
| G10 | Exceeding 4300 and not exceeding 4600 |
| G11 | Exceeding 4000 and not exceeding 4300 |
| G12 | Exceeding 3700 and not exceeding 4000 |
| G13 | Exceeding 3400 and not exceeding 3700 |
| G14 | Exceeding 3100 and not exceeding 3400 |
| G15 | Exceeding 2800 and not exceeding 3100 |
| G16 | Exceeding 2500 and not exceeding 2800 |
| G17 | Exceeding 2200 and not exceeding 2500 |

General Illustration of Coal's Supply Chain w.r.t. TPP

Face The Reality:-

Domestic coal is procured via Coal India subsidiaries, either via Linkage (long term FSA) or via Spot auctions.

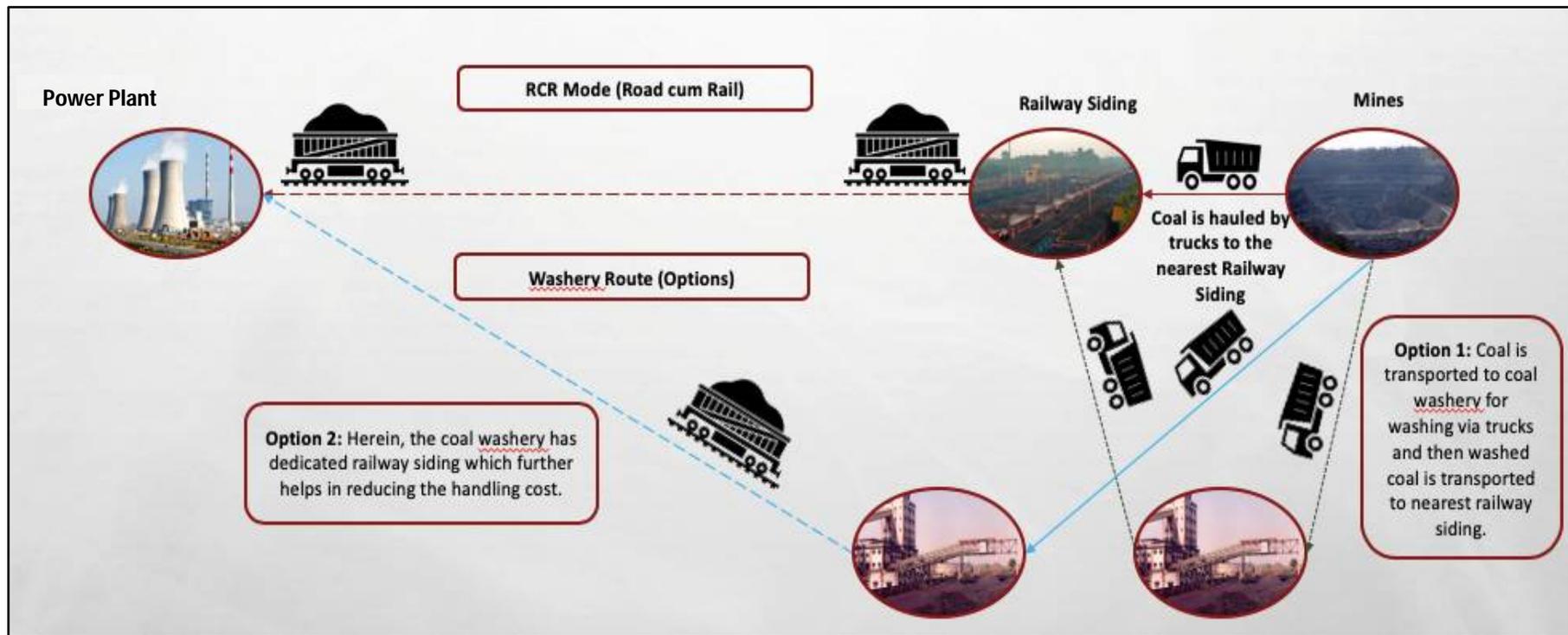
Cost of Coal:

1. Basic Price (Linkage)
2. Basic Price + Auction Premium (Spot Sales)
3. Taxes & Levies

**If the cost of coal is x the final ex-mine price is usually 2x.*



Coal's Supply Chain & Impact on Fuel Cost



Coal's Supply Chain & Impact on Power Cost

*Considering Station Heat Rate of 2500 kCal/kWh



Various Strategic options to reduce cost of generation

Coal India - The Stupendous Task & the Challenges

- ❖ Coal India looking to increase production to a level of around 1 billion tonnes by 2025-26 from 567 million tonnes in 2017-18 is no doubt a stupendous task.
- ❖ Most of the increment will come from MCL and SECL, which mainly produce thermal coal of G12 to G15 grades. The bulk of coal washeries shall have to be established in those areas.
- ❖ Objectives:
 - ❑ 100% coal crushing achieved by now.
 - ❑ Ash to be lowered to 34% for all coal moving more than 500 kms
- ❖ Main challenges which Coal India is facing now despite surplus coal availability scenario are:
 - ❑ **Coal Grade Slippage:** It varies from 1 to 2 grades in SECL and MCL, but it may be even 3 grades in ECL & BCCL
 - ❑ **Declining %age of UG Mining:** Current production levels are highly skewed towards the O/C mining due to cost. Almost 96% of Coal India's coal comes of O/C mining.

Coal Washing in India

- ❖ Currently, Indian coal washing capacity is 122 million tonnes per annum only, out of which Private sector contributes majority of it (around 75 million tonnes per annum).
- ❖ By 2020, additional 256 million tonnes per annum washery capacity is required to be created.
- ❖ Washery product having GCV of less than 2200 kcal/kg is washery reject. Ash + Moisture may be around 65%.
- ❖ These rejects can be used for power generation using CFBC boiler technology near washery sites.
- ❖ However, the attempt of new tech technology should be to maximize washed coal percentage by recovering fine and ultrafine coal by HHS process, which has been successfully tried in the US.

HHS Technology

- ❖ Indian coals are difficult to wash as mineral matter is finely disseminated in the organic coal matrix. Hydrophobic-Hydrophilic Separation (HHS) Process is capable of removing both mineral matter and surface moisture simultaneously.
- ❖ In HHS process recyclable oils are used to obtain low ash products at low oil consumption rate.
- ❖ Reducing the top size of the coal to be washed liberates the mineral matter, cleaning fine coal is the focus area of HHS technology.

Mining Technology

❖ Productivity in Indian Coal mines is matter of concern. We need economical mechanical mining of mineral matter at a cheaper cost with due considerations for:

- i. Safety
- ii. Conservation
- iii. Productivity
- iv. Eco-friendly

In pit crushing and conveying is the answer

❖ Surface miner has become popular in Indian Coal mines.

Facts to be Faced

- ❖ High inherent ash content in Indian coals
- ❖ Continued dependence on coal for electricity generations and other primary manufacturing sectors like iron and steel, cement, etc.
- ❖ Limited Hydrocarbon resources
- ❖ Domestic coal is easily available in abundance and is economical to use
- ❖ India's coal mining sector also provides employment to millions both directly and indirectly
- ❖ With COP 21, there will be push to use clean coal technologies including coal washing, use of low emission electricity generation technologies
- ❖ There will issues like incremental cost of fuel for power generation, which may impact the power tariffs

Concluding Remarks

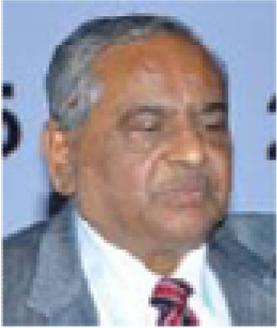
Conclusion:

- ❖ India is undergoing fast changes with respect to energy security and demand is slated to keep rising.
- ❖ Coal will play an important role in India's energy sector and is expected to lead the power generation till 2050.
- ❖ Use of clean coal is not only beneficial for the thermal power plant operation but also reduces the impact on the environment in adherence with COP21.

Need for R&D:-

- 1. As coal is India's main stay for power generation, there is need to promote coal gasification, coal to gas, coal to liquid. Development of hydrogen fuel cell from coal deserves highest priority.**
- 2. Vast collection of clean energy cess at the rate of Rs 400 per ton, provides Rs. 35000 Crores to national exchequer for research on efficient use of coal.**

About Speaker



R.B. Mathur

Mr. Mathur has served the coal industry for 39 years, with 11 years as a Chairman of PSUs like CMPDI, WCL, BCCL. He was a member of the Board of Directors of Coal India Ltd. and also Advisor (Coal) to SAIL and NTPC.

He continues to be active both on the coal front as well as on the productivity front. He is also past President of Mining, Geological and Metallurgical Institute of India (Delhi Circle). Furthermore, he is a fellow of the Institution of Engineers and also he has been granted fellowship by World Confederation of Productivity Sciences.

Besides above, he is also Chartered Engineer. In private sector, he has worked with the prestigious companies like Essar, JSW, JSPL, Monnet, Lanco, etc.

Ministry of Coal, Government of India has conferred the status of Recognized Qualified Person (RQP) on him, in recognition of his services rendered to the Coal industry.

Mr. Mathur is a graduate in Mining Engineering from IIT (BHU) and he also holds the First Class Mine Manager's certificate. He is also a recipient of Distinguished Alumni from IIT (BHU).

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**Thank You
&
We welcome your queries...**