

# 7<sup>th</sup> Coal Summit 2018

## CONFERENCE & EXPO

“Can India Grow Sustainably without Green Coal?”

5th & 6th September, 2018 • Hotel The Ashok, New Delhi

# Souvenir

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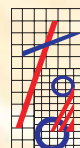
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# 7<sup>th</sup> Coal Summit 2018

## *“Can India Grow Sustainably without Green Coal?”*

5th & 6th September, 2018 • New Delhi

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**Mahanadi Coalfields Limited**

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# Section-2

## *Messages*

INDIA  
**ENERGY**  
F O R U M





# Turning coal into eco-friendly fuel for a fuel-efficient India



India's largest\* coal beneficiation company

\*Source CRISIL Research Review and Outlook on Power and Coal, September 2014

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सचिव  
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**AJAY BHALLA**  
Secretary  
Government of India



सप्तमेव नयते  
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August 30, 2018



## Message

I am glad to learn that Mining Geological and Metallurgical Institute of India (MGMI-DC) in association with Indian School of Mines Alumini Association, Delhi Chapter (ISMAADC) and India Energy Forum (IEF) is organising 7th Coal Summit & Expo on 5<sup>th</sup> & 6<sup>th</sup> September 2018 at Hotel Ashok, New Delhi on the theme “Can India Grow Sustainably without Green Coal?”.

Keeping in view the environmental consideration, there is a lot of thrust to step up generation from solar, wind, bio-fuel etc. Per capita consumption of power in India is quite low and Ministry of Power is committed to fulfil the Hon'ble Prime Minister's target to supply adequate power to each and every household even in the far off villages of the country. Coal will continue to play important role in the next three-four decades to come and we have about 300 billion tons of coal resources mostly in eastern and central parts of the country. Proper rail connectivity needs to be in place in order to transport coal from these areas. This will minimize import of coal. All these are complex issues which can be deliberated upon in this conference.

I wish the Conference a great success.

  
( A.K. Bhalla )



अनिल मुकीम, भा.प्र.से.  
सचिव  
Anil Mukim, I.A.S.  
Secretary



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E-mail : [secy-mines@nic.in](mailto:secy-mines@nic.in)  
Website : [www.mines.gov.in](http://www.mines.gov.in)

New Delhi, dated the 28<sup>th</sup> August 2018.



## Message

It is heartening to know that India Energy Forum (IEF), Mining, Geological, Metallurgical Institute of India (MGMI-DC) & Indian School of Mine Alumini Association (ISMAA DC) are organizing 7th Coal Summit & Expo on 5th–6th September 2018 at Hotel The Ashok, New Delhi on the theme “Can India Grow Sustainably without Green Coal?”.

World has acknowledged that India is amongst the fastest growing economies and to sustain a growth trajectory, India needs reliable and affordable Energy. Despite the increasing dependence on green energy like Solar & Wind Power and Gas based Plants in view of global concern for environment, it is certain that dependence on Coal will remain for few more decades. India is rich in its coal resources which need to be exploited by eco-friendly & cost effective mining techniques. I am sure, this conference will address all such issues effectively.

I congratulate Organisers of the Conference for their commendable effort by deliberating on the relevant issues in various sessions of the Summit.

I wish the conference great success

(Anil Mukim)

---

कमरा नं. 320, 'ए' विंग, शास्त्री भवन, डॉ. राजेन्द्र प्रसाद रोड, नई दिल्ली 110 001  
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अनिल कुमार झा  
अध्यक्ष-सह-प्रबंध निदेशक  
Anil Kumar Jha  
Chairman-Cum-Managing Director



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(A MAHARATNA COMPANY)  
A Govt. of India Enterprise  
"COAL BHARATI"  
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## Message

In the Indian context coal is far ahead of other energy sources in sustaining the Nation's energy requirement. Coal contributes to around 57% of the country's total primary commercial energy and is expected to be the dominant energy fuel in the foreseeable future as well with availability of abundant reserves. The country's planners are alternatively exploring to shift from being a largely fossil driven energy economy to one that is powered by clean and renewable forms in tune with the Paris Agreement for greener environment.

Against this background the two-day 7<sup>th</sup> Coal Summit Conference & Expo "*Can India grow sustainably without green coal?*", jointly organized by Mining Geological and Metallurgical Institute Delhi Chapter, Indian School of Mines Alumni Association Delhi Chapter and India Energy Forum on 5-6 September 2018 at New Delhi, raises challenging and an important question. The fact that the Summit is supported by Ministries of Coal, Power, Mines, Steel, Railways, Environment Forest & Climate Change and NITI Ayog underscores its importance.

India cannot do away with coal at this juncture. As base fuel for power and in the overall energy scenario as well, coal is expected to retain its position and is irreplaceable. This being the reality, it becomes not only a statutory requirement but primarily, a moral obligation on part of coal companies to reduce the negative impact on environment and restore the Mother Nature to her original pristine condition to the extent possible. Besides, clean coal combustion technologies and new coal extraction technologies also have to be pursued diligently.

The Summit bringing on to a single platform eminent mining engineers, policy makers, planners, entrepreneurs, decision makers, senior government officials and academician is sure to be enlivening and informative. While offering my Best Wishes for the success of the Summit I wish the learning's from the same would be put to practical and productive use.

**Anil Kumar Jha**



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Established 1906

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### **Dr. Narendra Kumar Nanda**

President, MGMI &

Director (Technical), NMDC



## Message

I am glad to know that Mining Geological and Metallurgical Institute of India, MGMI (DC) with Indian School of Mines Alumni Association, Delhi Chapter and India Energy Forum (IEF) are organising 7<sup>th</sup> Coal Summit "Can India grow sustainably without Green Coal"

Coal has been main source of Energy in India for sustainable supply of Electricity in the country.

We are also going in a big way to generate Power from Solar & Wind but they can only supplement to fill up the gap between supply and demand with more and more thrust on use of renewable energy in the cut off or isolated placed, I observe from the theme of the conference on the focus of alternate use of coals to tap our vast coal reserves.

I wish the summit all the success.

(Dr. Narendra Kumar Nanda)



**राकेश कुमार**  
**RAKESH KUMAR**  
 अध्यक्ष और प्रबंध निदेशक (अतिरिक्त प्रभार)  
 Chairman and Managing Director (Addnl. Charge)  
**NLC India Limited**  
 (formerly Neyveli Lignite Corporation Limited)  
 ("Navratna" Govt. of India Enterprise)  
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## Message

I am very happy to learn that Mining Geological and Metallurgical Institute (MGMI), Delhi Chapter jointly with Indian School of Mines Alumni Association (ISMAA) and India Energy Forum (IEF) is organising the 7th Coal Summit on 5th & 6th September 2018 at New Delhi and planning to release a souvenir in commemoration of the event.

Coal is the major fuel source to produce about 60% of the total electricity generated in India. On the other side, this demands for more reliable supply of Coal/ Lignite for power generation. At the same time, Govt of India's firm commitment in lowering Carbon Footprints call for more on Green Energy sources and accordingly Clean Coal Technology Method and other similar methods are being adopted to mitigate the environmental impact of Coal Energy Generation. A situation has now reached for drastic curtailment of usage of Coal to ensure clean Atmosphere. Despite this, the usage of Coal will continue to remain large in the Energy Basket Still.

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In the light of the above, the theme of 7th Coal Summit viz "Can India Grow Sustainably without Green Coal?" is gaining importance and appropriate one and the discussion on this topic will enlighten the steps to be taken to augment the situation.

I hope this summit will provide a platform for deliberation of a suitable change in the policy and find ways and means to meet the challenges in a sustained manner for alternate use of coal and lignite.

I wish the conference a Grand success!

(RAKESH KUMAR)  
 Director (Finance) & C.M.D. (Addl. Charge)

शेखर सरन  
अध्यक्ष-सह-प्रबन्ध निदेशक

Shekhar Saran  
Chairman-cum-Managing Director



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## Message

I am indeed very happy to know that Mining, Geological, and Metallurgical Institute (MGMI) and Indian School of Mines Alumni Association Delhi Chapter (ISMAA-DC) in association with India Energy Forum are organizing COAL SUMMIT ON 5<sup>TH</sup> & 6<sup>TH</sup> September 2018 in Hotel The Ashok at New Delhi with theme **"CAN INDIA GROW SUSTAINABLY WITHOUT GREEN COAL"**.

In India we have vast opportunities in coal industry with enormous reserves of coal which needs to be exploited addressing environmental concerns and other technological, coal evacuation, quality constraints etc. India must seek clean combustion technologies like use of super and ultra super critical boilers for power generation thereby reducing consumption of coal and its emission.

Much have been achieved in recent past in economic reforms bringing legislative changes to facilitate the growth in coal mining industry to meet a target of 1 billion tone by 2019-20. Coal being available in abundance as compared to other source of fuel energy provide a ready answer to have sustained power generation apart from other non conventional resources.

I am sure that deliberations in the coal summit will come out with relevant recommendation for the sustainable growth in energy sector.

I wish the coal summit a grand success.

(Shekhar Saran)

Chairman-cum-Managing Director

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## Message

One of the important parameters of assessing growth of economy is per capita consumption of Electricity. Per capita energy consumption in India is less compared to developing countries and is expected to be doubled next 5 years. Coal is the major contributor to fulfil the energy requirements fuelling the growth engine of the nation. Though thrust has been given for building the generation capacity through renewable energy sources to the tune of 175 GW, coal will continue to remain as the major source of power generation. The share of coal in energy mix may marginally go down, however, coal will remain as primary source of energy for 2 to 3 decades or till cost effective large capacity electricity storage systems are established. Thus coal production will remain as one of the main contributors for the sustainable growth of Indian economy.

I congratulate the organisers 'Mining, Geological, Metallurgical Institute of India (MGMI -DC), ISM Alumni Association (ISMAA – DC) and India Energy Forum (IEF)' for selecting the topic "Can India Grow Sustainably without Green Coal?", an appropriate theme of 7th Coal Summit being held on 5th& 6th September 2018 at Hotel The Ashok, New Delhi.

I wish the conference a great Success.

Dt : 01-09-2018  
Hyderabad

(N.Sridhar)

राजीव आर. मिश्र  
अध्यक्ष-सह-प्रबंध निदेशक

**Rajiv R. Mishra**  
Chairman-cum-Managing Director



**वेस्टर्न कोलफील्ड्स लिमिटेड**  
(भारत सरकार का मिनरी रत्न - श्रेणी I उपक्रम)  
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## Message

India is one of the fastest growing economies of the world, to fulfil desired goal of "24x7 Power for all", Power Sector will continue to depend on Coal as major source for next 3-4 decades.

The Coal has to develop technologies for eco-friendly means to reduce emissions - a challenge before the Coal Sector. This is the focus of the conference as can be seen by its theme "Can India Grow Sustainably without Green Coal?". It is imperative to keep track of technological advancements taking place in the mining industry world over and their applicability in Indian conditions.

I am sure the deliberators in the 7th Coal Summit on Green Coal will give suggestions/ recommendations for the sector.

I wish that 7th Coal Summit a great success.

(Rajiv R. Mishra)



## ACB (INDIA) LIMITED

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### Message

It gives me immense pleasure to learn that The Mining Geological and Metallurgical Institute (MGMI) of India, Delhi chapter jointly with Indian School of Mines Alumni Association (ISMAA), Delhi Chapter and India Energy Forum (IEF) are organizing the 7<sup>th</sup> Coal Summit 2018 (Conference & Expo) with a theme " **Can India Grow Sustainably without Green Coal?**" during 5-6<sup>th</sup> September, 2018 at New Delhi.

The Coal Mining industry in India is growing at a fast pace with increased level of Mechanization and Modernization resulting in mining of lower grade coal. The theme chosen for the conference by the MGMI certainly will show a new path to coal industry especially when the protection of Environment has become area of concern while using coal as a fuel for various consuming industry. Therefore, at most care must be given to ensure that the extraction of coal and minerals which are absolutely essential for sustaining growth of the Nation, should be environmentally acceptable and green.

In view of the above I hope that the 7<sup>th</sup> Coal Summit will address the core issues of coal business and give opportunity to the Govt., mine planners, coal producers, coal beneficiators and consumers all through this platform of the Summit to draw an urgent program of Greening the coal by washing, reducing/capturing and sequester the Green House Gases.

I wish the 7<sup>th</sup> Coal Summit a grand success.

Capt. Rudra Sen Sindhu  
Chairman and Managing Director  
ACB (India) Limited

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**SATISH PAI**  
MANAGING DIRECTOR



27<sup>th</sup> August 2018

## Message

I am happy to note that the Mining, Geological and Metallurgical Institute of India, Delhi Chapter, jointly with the Indian School of Mines Alumni Association, Delhi Chapter and India Energy Forum are organising the 7<sup>th</sup> Coal Summit on 5<sup>th</sup> and 6<sup>th</sup> September 2018 at New Delhi. The topic is very relevant, “*Can India Grow Sustainably without Green Coal?*”

Today, coal is the main source of prime energy in our country. There is going to be more and more emphasis on generating power with the help of renewable resources like solar and wind due to environmental concerns. However, with the country’s thrust on stepping up power generation, to achieve the target of “24x7 Power for All” by 2019-20, coal has to continue playing its dominant role, at least for the next few decades.

I am sure during this Conference, there shall be, among other key topics, meaningful deliberations on extracting and using coal in the most environmental friendly and responsible manner by adoption of technology and practices. This will assure the Industry of utilising India’s huge coal reserve gainfully towards economic progress and prosperity.

Please accept my sincere best wishes for a successful Summit!



Satish Pai  
Managing Director

Hindalco Industries Limited

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 MANAGING DIRECTOR  
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ADITYA BIRLA GROUP



## Message

I am glad to be associated with the Mining Geological and Metallurgical Institute (MGMI), Delhi Chapter, Indian School of Mines Alumni Association (ISMAA) and India Energy Forum (IEF) for taking the initiative to organize a seminar on the development of coal sector. Coal sector contributes to major part of the primary energy requirement of the country and is also entrusted with the responsibility to provide the same with due regard to environment for sustainable growth. However, globally use of fossil fuel is being debated and many countries have pledged to reduce and eventually do away with fossil fuels for meeting energy requirement to maintain a habitable global environment.

The situation in India is bit complex, as it is required to provide affordable power to a burgeoning population. The Government is pursuing an ambitious program of creating 175 GW of renewables-based generation capacity, but India is expected to be dependent on coal for major share in the energy basket. Simultaneously, it also needs to ensure that it abides by its Paris commitment of reducing Energy Intensity per unit of GDP by 30% over the 2005 level.

The importance of Green Coal becomes apparent for meeting the above requirements. This has been correctly focused as the theme of the Coal Summit this year - "Can India grow sustainably without Green Coal?" The Green Coal is basically containment of the Green House Gas emissions caused by Coal Combustion from getting into atmosphere.

The geological characteristics of Indian coal calls for beneficiation before usage to reduce its adverse impact on environment and the consumers like power plants have to ensure that they adopt High Efficiency Low Emission (HELE) technologies in future to contain emissions from coal combustion.

I wish the organizers' effort will develop a common manifesto for all stake holders connected with Coal – its "Production and Utilization" to come out with best possible solutions.

I wish the conference a great success!

  
 (Tuhin Mukherjee) • 30/8/18

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## Ganesh Chandra Mrig

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Former CMD: Bharat Coking Coal Limited (BCCl) & South Eastern Coalfields Limited (SECL) (GDI U/T)

Former Promoter-MD: ACEB (India) Limited

President: ISMAA Delhi Chapter

Vice President: India Energy Forum



## Message

It is indeed a great pleasure that India Energy Forum, MGMI & ISMAA Delhi Chapter are jointly organising the 7<sup>th</sup> Coal Summit & Expo, scheduled to be held during 5<sup>th</sup> and 6<sup>th</sup> September 2018.

The theme of this year "Can India Sustainably without Green Coal" is well timed and considering the Environmental Protection before the Country or in the Global Scenario, it needs to be addressed on a very large scale.

I am confident that together we can address the challenges ahead.

I wish the conference a grand success!



Ganesh Chandra Mrig

Place: Gurgaon

Date: 25/08/2018



## INDIA ENERGY FORUM

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**Anil Razdan**  
President, India Energy Forum  
Former Secretary, Ministry of Power  
Government of India



28<sup>th</sup> August 2018

## Message

The 7<sup>th</sup> Coal Summit & Expo 2018 is a flagship event of the India Energy Forum. It has evoked keen interest from energy experts, domain specialists and commercial establishments connected with the coal sector. The Summit will deliberate on Policy Perspectives, Coal Resources and their Exploration and Production, Clean Coal Technologies for the Power Sector, the Versatility of coal as a Green Energy Source, as well as Safety and Infrastructure Issues related to mining.

Coal has been a stellar energy resource for India, and its role in the economic development of the country can never be understated. It is one of the largest wage employers of the country and its potential role in providing cleaner domestic fuels and chemicals needs to be harnessed. Its future will depend on the technological foresight of the country's economic planners. The vision of the methanol economy is within reach.

The India Energy Forum is thankful to the Mining, Geological and Metallurgical Institute of India – Delhi Chapter and the Indian School of Mines Alumni Association – Delhi Chapter for their collaboration in this event.

I wish the 7<sup>th</sup> Coal Summit and Expo great success!

A handwritten signature in blue ink that reads "Anil Razdan".

**Anil Razdan**



# SINGARENI COLLIERIES COMPANY LIMITED

(A Government Company)

In The Service of Nation.....

With Production of Coal and Thermal Power



Adopting modern technologies in Mining



Produced 62.02 MT of coal and 9,575 Million Units of Thermal Power (2017-18)

Partnering in progress of the Nation and the State



Sri N.Sridhar IAS., C&MD, SCCL  
receiving the  
**Outstanding Global Leadership Award - 2018**  
from Dynasty of United Arab Emirates



Sri N.Sridhar IAS., C&MD, SCCL  
receiving the  
**Asia Pacific Entrepreneurship Award - 2018**  
from Sri V.K. Singh, Union Minister of State,  
Ministry of External Affairs

## Section-2

# *About 7th Coal Summit 2018*



ADITYA BIRLA



www.esselmining.com



# Committed

To give them back a life full of quality.

EMIL a part of Aditya Birla Group has over 5 decades of proven track record in the mining business at Odisha. Apart from Iron Ore mining, EMIL is engaged in Noble Ferro Alloys, Wind Power Generation and Coal Mining (as the largest MDO in India). EMIL has always committed a life full of quality to the people in the tribal dominated districts of Keonjhar and Sundergarh in Odisha. It has a dedicated team working towards Corporate Social Responsibility(CSR) in bringing social transformation through initiatives in education, sustainable livelihood, healthcare, social causes and infra structural development. The company's commitment and passion towards the cause clearly reflects in the upgraded quality of life in the region.



Regd. Office: 18th Floor, Industry House, 10, Camac Street, Kolkata - 700 017.  
Phone: 033-30518300 / 302, email: [esselmines@adityabirla.com](mailto:esselmines@adityabirla.com), Visit: [www.esselmining.com](http://www.esselmining.com)

Mines & Marketing Office:  
P.O:- Barbil, Dist:- Keonjhar, Odisha - 758035.  
Ph: 06767-275224, 275422, Fax: 06767-275367, email: [emilbbl@adityabirla.com](mailto:emilbbl@adityabirla.com)

## 7<sup>th</sup> Coal Summit 2018

### *“Can India Grow Sustainably without Green Coal?”*

5th & 6th September, 2018 • New Delhi

#### **Introduction**

Fossil Fuels - Coal, Oil and Gas have been the primary energy source globally over centuries. A situation has now reached for drastic curtailment in their usage to ensure that the Universe continues to remain habitable in future.

It is for this reason that a global campaign has been launched for phasing out coal which is the dirtiest among the Fossil Fuels.

Situation in India is however, different - even now our per capita emission is one of the lowest in the world and almost 1/3rd of India's population which is going without electricity connection has to be provided electricity which is reliable and yet affordable. For achieving this mammoth task the country has already launched an ambitious programme of creating 175 GW of Renewables -based generation capacity. But despite this it will continue to remain largely dependent on Coal though its share in the energy basket will go down marginally over the years. Simultaneously the country has also to ensure that it abides by its Paris commitment of bringing down Energy Intensity per unit of GDP by 30% over the 2005 level.

This can be achieved by “Greening” the Black Coal. Realistically speaking, Black Colour can be transformed only into Green in oil paintings or through modern day laser lights. The fact however, remains that the Black Coal is the product of Green Trees and Vegetation and though the process of Coal formation is irreversible, the Basic objective of greening can be achieved by containing the Green House Gas emissions caused by Coal Combustion, into the atmosphere .

No doubt the Paris commitment made by us is ambitious but it is achievable. What is needed is a total review of the production as well as utilisation systems for Coal across the entire value chain. We have not only to ensure that the Coal produced from a mine is the cleanest possible but have also to clean it further before it is made available to the consumption centre. At the consumption centre combustion technologies have to be improved so that emission level is reduced to the minimum and then steps have to be taken to capture and sequester the Green House Gases so that their impact on the Environment is reduced to the minimum.

This requires well-planned and well-coordinated efforts on the part of Govt, Mine Planners, Coal Producers and Coal Consumers . While Govt. have to formulate policies which are implementable, the mine planners have to plan the mining system in a manner that Coal that comes out from the mine is not contaminated. Going forward, it has to be realised that Indian coal is basically poor in quality and for reducing its adverse impact on environment it has to be cleaned and then the consumers like power plants have to ensure that they adopt High Efficiency Low Emission (HELE) technologies to contain emissions from coal combustion. This is to be followed with Carbon Capture and Sequestration Technologies so that the entry of Green House Gases that are emitted on account of coal combustion, into the atmosphere is reduced to minimum.

Both Coal and Power Sectors have covered lot of ground in this direction but lots more remains to be done. Need of the day is to take a review of what has been achieved so far so that the Road Map for future can be prepared.

It is with this objective that the theme for the Coal Summit being organised jointly by India Energy Forum, MGMI, Delhi Chapter and Indian School of Mines Alumni Association, Delhi Chapter has been selected as “Can India Grow Sustainably without Green Coal”?

While India Energy Forum (IEF) is a premier Think Tank in the country on Energy Issues, MGMI is the oldest organisation of Earth Scientists in India and Indian School of Mines Alumni Association has been active in the field of disseminating knowledge about advancement of Mining Science and Technology. These three organisations together have been organising a Biennial Summit on Coal for more than a decade now.

In view of the current situation and on-going developments in the Industry, it has been decided to devote the 7th Coal Summit due this year to the theme of "Can India Grow Sustainably without Green Coal?". This Summit will be organised on 5th and 6th September 2018 at Hotel The Ashok, New Delhi.

Challenges in Coal Sector are many and so are the obstacles which are varied in nature. The objective of the Summit would be to identify them and take a comprehensive look there at and chalk out strategies to meet them. The entire gamut of Coal Mining activities starting from Exploration and including Mining and Coal Beneficiation technologies, improvement in Infrastructural facilities, upgrading of Mining Equipment and facilitation of clearance processes particularly those related to Environment and Forest and Land Acquisition and R&R and most importantly Mine safety will have to be addressed.

Relevant issues to be dwelt upon have been identified as under:

1. Environmental considerations in Coal Exploration
2. Mine Planning for Quality Improvement of Coal
3. Environment Friendly Coal Mining systems in India
4. Coal Beneficiation in India
5. R&R in Coal Sector
6. Coal & Forest in India
7. Coal Gasification in India
8. CBM in India
9. Environment friendly Coal Combustion technology for Power Generation
10. Making affordable Power from Green Coal

Successful organisation of an Event of this nature and magnitude will require the active support of all the stakeholders in Coal Sector like Coal Producers, Coal Consumers, Regulatory Authorities in general and that of Ministry of Coal, Ministry of Power, Ministry of Environment and Forests, Ministry of Steel, Indian Railways, concerned State Governments in particular. This support has already been sought and assured.

## About Organisers

### India Energy Forum



The Forum is a unique NGO, which promotes energy sector as a whole. Most major players in Power, Oil & Gas, Coal and Renewable are our members. These include NTPC, NHPC, Power Grid Corpn., Power Finance Corpn., PTC, Tata Power, ALSTOM, ONGC, IOCL, CIL, Neyveli Lignite Corporation, Vestas RRB,



JP Group, Bhilwara Group and about 110 eminent energy experts. In addition, it has MOUs with leading regional chambers and specialized organizations including Bombay Chamber, Bengal Chamber, Bangalore Chamber, Madras Chamber, PHD Chamber, Observer Research Foundation, IRADE, INWEA, MGMI-DC, ISMAA-DC & FIPI and work closely with them.

### *MGMI - Delhi Chapter*



MGMI is one of the oldest professional Institutes of its kind in Asia having being founded in 1906. It has been organizing conferences and seminars on issues impacting the mineral sciences. MGMI is a unique, independent, non-profit organization and represents professionals of the mineral sector as a whole. It is manned by highly qualified and experienced mining engineers, geologists and metallurgists and energy experts.

### *Indian School of Mines Alumni Association (ISMAA)-Delhi Chapter*

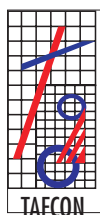


The ISM Alumni Association continues to provide yeoman service to the mineral industry in India as well as abroad with complete dedication and commitment to the mineral industry. In appreciation of the fact that the prime pre-requisite for industrialisation in India will be a sound Mineral Sector, Govt of India way back in 1926 set-up a world class Mining Institution at Dhanbad which was named Indian School of Mines and Applied Geology. This was formally inaugurated by his Excellency Lord Erwin the then Viceroy on 9th December 1926. Now named as Indian School of Mines, it has become a full -fledged University and the Captains of Indian mineral Industry take pride in calling themselves the Alumni of this world class Institution. ISM Alumni Association works as a think tank for Mineral Industry in India and coordinates with ISM Alumni abroad for updating and upgrading mineral science in the country.

### **Awards**

An important feature of the 7th Coal Summit would be Presentation of 8 Awards – 4 by MGMI-DC and 4 by ISMAA-DC.

### **Summit and Expo**



The proposed Summit provide an ideal forum for Mine Operators, planners and policy makers to discuss the various issues affecting the coal mining and allied industries across the globe. The Summit will be a unique platform for Entrepreneurs, Decision Makers, Senior Government Officials, Investors, Industry Members, Traders, Equipment Buyers & Suppliers, Academia, Miners, Engineers and Trade Delegations to congregate, brainstorm, showcase and forge meaningful partnerships for business development.

Concurrent with the 7th Coal Summit 2018, an International Expo - Coal Summit Expo 2018 is being organized by TAFCON under the aegis of the Organisers at Hotel The Ashok, New Delhi.

The Expo will provide an excellent business opportunity for coal mining and allied industries to showcase their new initiatives, technologies, products and services to the global audience.

## PROGRAMME

### Day I – Wednesday, 5th September 2018

8:30 – 9:30 a.m.	:	<b>Registration and Networking Tea</b>
9:30 – 10:30 a.m.	:	<b>INAUGURAL SESSION</b>
<i>Welcome Address by</i>	:	<b>Shri Anil Razdan</b> , President, India Energy Forum & Former Secretary, Ministry of Power, Government of India
<i>Address by</i>	:	<ul style="list-style-type: none"> <li>• <b>Dr N K Nanda</b>, National President, MGMI India and Director, NMDC</li> <li>• <b>Shri U Kumar</b>, ISMAA-DC and Former CMD, SECL &amp; NCL</li> </ul>
<i>Introduction of Theme by</i>	:	<b>Shri Anil K Jha</b> , Chairman, Coal India Ltd
<i>Guests of Honour</i>	:	<ul style="list-style-type: none"> <li>• <b>Dr Inder Jit Singh</b>, Secretary, Ministry of Coal</li> <li>• <b>Shri Ajay Kumar Bhalla</b>, Secretary, Ministry of Power</li> </ul>
<i>Inaugural Address by the Chief Guest</i>	:	<b>Shri Ashwini Kumar Choubey</b> , Hon'ble Minister of State for Health and Family Welfare
<i>Vote of Thanks by</i>	:	<b>Shri NN Gautam</b> , Convenor, Organising Committee
<i>Inauguration of Exhibition by the Chief Guest</i>		
10:30 – 10:45 a.m.	:	TEA
10:45 - 12:00 noon	:	<b>TECHNICAL SESSION I</b> <i>“Policy Perspective”</i>
<i>Chairperson</i>	:	<b>Shri C Balakrishnan</b> , Former Secretary, Ministry of Coal
<i>Co-chairperson</i>	:	<b>Shri R R Mishra</b> , CMD, WCL
<i>Session Coordinator</i>	:	<b>Shri Ashok Mehta</b> , Former CMD, WCL
<i>Distinguished Speakers</i>	:	<ul style="list-style-type: none"> <li>• <b>Shri P S Bhattachayya</b>, Former CMD, CIL</li> <li>• <b>Dr Anindya Sinha</b>, Advisory (Projects), Ministry of Coal</li> <li>• <b>Shri Binay Dayal</b>, Director (Tech), Coal India Ltd.</li> <li>• <b>Shri Sunjoy Joshi</b>, Director, ORF</li> <li>• <b>Mr. Manoranjan Hota</b>, Advisor, MoEFCC</li> </ul>
12.00 – 1.15 p.m.	:	<b>TECHNICAL SESSION II</b> <i>“Coal Resources, Exploration and Exploitation/Production”</i>
<i>Chairperson</i>	:	<b>Shri Alok Perti</b> , Former Secretary, Ministry of Coal
<i>Co-chairperson</i>	:	<b>Shri N Sridhar</b> , IAS, CMD, SCCL
<i>Session Coordinator</i>	:	<b>Shri V K Sehgal</b> , Former CMD, SECL
<i>Distinguished Speakers</i>	:	<ul style="list-style-type: none"> <li>• <b>Shri Shekhar Saran</b>, CMD, CMPDI</li> <li>• <b>Shri R N Jha</b>, Acting CMD, &amp; Director (Tech), MECL</li> </ul>

		<ul style="list-style-type: none"> <li>• <b>Shri B Bhaskara Rao</b>, Director (P&amp;P), SCCL</li> <li>• <b>Shri Partho Mukherjee</b>, Head-Mining Equipment Business, L&amp;T</li> </ul>
1:15 – 2.00 p.m.	:	LUNCH
2:00 – 3.15 p.m.	:	<b>TECHNICAL SESSION III</b> <i>“Clean Coal Technologies – Power Sector”</i>
<i>Chairperson</i>	:	<b>Shri S K Chowdhary</b> , Former Chairman, CIL
<i>Co-chairperson</i>	:	<b>Shri S N Prasad</b> , Director (Marketing), CIL
<i>Session Coordinator</i>	:	<b>Shri S K Grover</b> , Former GM (Fuels), NTPC
<i>Distinguished Speakers</i>	:	<ul style="list-style-type: none"> <li>• <b>Shri P K Mahapatra</b>, Director (Technical), NTPC <i>“Carbon Capture and Sequestration”</i></li> <li>• <b>Mr. Richard A Horner</b>, Director, Special Projects &amp; Emerging Technology, School of Energy Resources, University of Wyoming <i>“Green Coal - A Reality and Not Just a Possibility”</i></li> <li>• <b>Shri Subir Gupta</b>, Founder Partner, Sustainability Advisors</li> <li>• <b>Ms Vartika Shukla</b>, Engineers India Ltd <i>“Coal Gassification”</i></li> </ul>
3.15 – 3.30 pm	:	TEA
3.30 – 4.45 p.m.	:	<b>TECHNICAL SESSION IV</b> <i>“Exploiting Versatility of Coal”</i>
<i>Chairperson</i>	:	<b>Shri Gurdeep Singh</b> , CMD, NTPC
<i>Co-chairperson</i>	:	<b>Shri Shekhar Saran</b> , CMD, CMPDI
<i>Session Coordinator</i>	:	<b>Shri P S Upadhyaya</b> , Former Director (T), NMDC
<i>Distinguished Speakers</i>	:	<ul style="list-style-type: none"> <li>• <b>Shri Rajesh Jha</b>, MD &amp; CEO, Adani Vizhinjam Port Pvt. Ltd.</li> <li>• <b>Dr A K Balyan</b>, CEO (Oil &amp; Gas), ADA Group <i>“Coal to Oil”</i></li> <li>• <b>Shri Devender Prasad</b>, TS to Director, CIL <i>“Coal for Fertiliser”</i></li> <li>• <b>Mr. Robin Eves</b>, USA <i>“Environment Friendly and Economical use of Coal/Lignite through Technology”</i></li> </ul>
6.00 p.m.	:	<b>Cultural Programme</b> at IIC Auditorium
7.30 p.m.	:	Cocktail-Dinner

**Day II – Thursday, 6th September 2018**

- 9:30 – 10:45 a.m. : **TECHNICAL SESSION V**  
*“Coal as a Green Energy Source”*
- Chairperson** : **Capt R S Sindhu**, CMD, ACB India Ltd
- Co-chairperson** : **Shri Vinay Prakash**, CEO, Adani Enterprises
- Session Coordinator** : **Shri A K Tooley**, Former Director, WCL
- Distinguished Speakers** :
  - **Ms Lydia Powell**, ORF
  - **Shri G.M. Mustafi**, CEO, Macnally Bharat Engineering Co. Ltd.  
*“Coal Washeries – General Scenario in India”*
  - **Shri Sunil Yadav**, Director (Tech), Galacon Infrastructure & Projects Pvt Ltd.  
*“Recent Advances in Washing”*
  - **Dr R R Sonde**, Executive Vice President, Thermax Ltd  
*“Reject utilization”*
- 10.45 – 12.00 Noon : **TECHNICAL SESSION VI**  
*“Environment”*
- Chairperson** : **Shri P S Mishra**, CMD, ECL
- Co-chairperson** : **Shri P K Sinha**, CMD, NCL
- Session Coordinator** : **Shri M N Jha**, Former CMD, SECL & CMPDI
- Distinguished Speakers** :
  - **Dr R N Saxena**, Former PCCF, Bhopal
  - **Shri Rajinder Malhotra**, Head Coal Business, EMIL
  - **Dr S K Dube**, Senior Fellow, TERI - SO<sub>x</sub>/NO<sub>x</sub>
  - **Shri P N Hajra**, Former Head Regional Laboratory, ONGC
- 1200 - 12:15 p.m. : TEA
- 12.15 - 1.30 p.m. : **TECHNICAL SESSION VII**  
*“Safety”*
- Chairperson** : **Dr P K Sarkar**, DGMS (confirmed)
- Co-chairperson** : **Shri A K Singh**, CMD, BCCL
- Session Coordinator** : **Shri P R Mandal**, Former Advisor, Ministry of Coal
- Distinguished Speakers** :
  - **Shri O P Singh**, Director Technical (P&P), MCL
  - **Dr A K Sinha**, Dy DG, Ranchi
  - **Shri Vivek Mishra**, Sr. Vice President and Head Chhatisgarh Coal Mine, Hindalco
  - **Shri Om Prakash**, former CMD, SECL and Professor IIT (ISM)  
*“Drone Technology in Mining”*
- 1:30 – 2:15 p.m. : LUNCH

- 2:15 – 3:30 p.m. : **TECHNICAL SESSION VIII**  
*“Infrastructure”*
- Chairperson* : **Shri D K Hota**, CMD, BEML
- Co-Chairperson* : **Shri V Thanga Pandian**, Director (Power), NLC India Ltd
- Session Coordinator* : **Shri Peeyush Kumar**, MoC
- Distinguished Speakers* : • **Shri Shashi Bhushan Shukla**, Member (Traffic), Inland Waterways Authority  
• **Shri Rajneesh Kumar**, Director (Planning), Railway Board  
• **Shri Uma Shanker**, Adani Mining  
*“Infrastructure Development for a Green Coalfield Mine”*  
• **Shri S. Simha**, Chief General Manager, Marketing HQ, BEML  
*“In-house development of Higher Capacity Mining Equipment”*
- 3.30 – 4.00 p.m. : TEA
- 4.00 – 5.00 p.m. : **VALEDICTORY SESSION**
- Chief Guest* : **Shri Amitabh Kant**, CEO, NITI Aayog
- Chairman* : **Shri Gopal Singh**, CMD, CCL
- Panelists* : • **Dr MP Narayanan**, Former Chairman, Coal India Ltd.  
• **Shri U Kumar**, Advisor (Coal), EMIL  
• **Shri IP Wadhwa**, Managing Worker, TAFCON
- Presentation of Draft Recommendations* : **Dr MM Seam**, Former Adviser, Essar Minerals
- Presentation of the Awards for Best Company in* : • Production and Productivity  
• Project Implementation  
• Safety Management  
• Best Mine in Environmental Management  
• Presentations of Best Exhibitors Awards
- 5.00 pm : **Vote of Thanks**

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Ranchi

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Chhatisgarh Mineral Development Corpn

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Managing Director  
GMDC

**Shri Manohar Dubey**  
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The Madhya Pradesh State Mining Corpn.

**Mr Pramod Unde**  
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**Shri Rajiw Lochan**  
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**Shri K K Jha**  
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**Shri S K Grover**  
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**Dr M M Seam**  
Former Advisor, Essar

### *Co-Convenors*

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J P Group

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Former VP, JSPL

**Shri Ashok Mehta**  
Ex CMD, WCL

**Shri AK Tooley**  
Ex Director (T), WCL

**Shri V K Sehgal**  
MD, Global Coal & Mining

**Dr M M Seam**  
Former Advisor, Essar Mining



## Glimpses of Previous Conferences



## Glimpses of Previous Conferences



# Section-3

## *Recommendations*

INDIA  
**ENERGY**  
F O R U M





# SEGL

**Largest Coal Producing Subsidiary of Coal India Ltd.**

• **Technology** • **CSR** • **Environment**

**South Eastern Coalfields Limited**

(A Subsidiary of Coal India Limited)

Secapat Road, Bilaspur - 495006 (C.G.) Tel/Fax : 07752-246338



## 6th Roundtable Conference on Coal

### *Theme : Indian Coal – Today and Tomorrow*

20th September 2017

Hotel Le Meridien, New Delhi

### RECOMMENDATIONS

The entire gamut pertaining to Coal Mining Industry in India was discussed at 3 Technical and 1 Valedictory session and the following recommendations have emerged:

- Coal Demand and Supply :** The healthy Coal Production trend in 2014-15 and 2015-16 created a situation of Coal surplus in the country which continued till the first half of 2017-18 when all of a sudden a shortage situation developed again. Analysis has revealed that low off-take of Coal in first half of 2017-18 was on account of adequate stocks at Power Stations and this prompted Coal India Ltd to peg down production at certain mines with the result that when the coal demand picked up in the 2nd half of the year the shortage situation re-appeared. It is therefore, recommended that a protocol should be worked out so that the Power Stations lift their pre-determined coal quotas month after month and if they fail to do so, Coal India should be compensated monetarily for keeping the Coal in their stock on behalf of the defaulting power stations.
- Transport Logistics :** Bulk of the increase in coal production is to come from new or else under-developed Coalfields. As it is, rail connectivity in major coalfields like Korba, North Karanpura, Talcher and IB Valley is in-adequate, the same in developing/to be developed Coalfields like Mand-Raigarh and Hasdeo Arand is practically non-existent. It is therefore, recommended that expansion of rail connectivity in these 6 coalfields should be taken up on mission mode.  
  
Simultaneously eco-friendly transportation systems like Coal Slurry Pipelines, Riverine transport of Coal and Coastal Shipment should also be encouraged.
- Coal Quality :** Considering the fact that Indian Coal is inherently of poor quality steps should be taken for incentivising coal washing . As a major step in this direction MOEF's mandate that the washery rejects must be utilised for power generation should be given a fresh look. Instead Stress should be on improving the quality of washing so that the Heat Value in the Rejects is reduced to the minimum and only those Rejects should be mandatorily used for power generation wherein the Heat Value is more than 2200 K/Cal/Kg.
- Land Acquisition and Reclamation :** There was unanimity on the fact that going forward land acquisition would become more and more difficult. It was therefore recommended that instead of outright acquisition of land, the fact that the mines have limited life should be taken advantage of and land should be taken on lease with handsome lease rent being paid to the land owners and non -forest land being reclaimed to Agricultural quality as far as possible. Since this

will entail additional expenditure which the industry in its present financial position is not able to afford, the funds collected by way of clean environment cess should be made available for subsidising this activity.

Further, an agency in the Govt should be created for taking up reclamation of all old mining sites to make them fit for agriculture/ afforestation and the expenses should be met out of Clean Environment Cess.

5. **Coal Exploration :** About 4000 sq kms of Coal bearing area has not been even regionally explored so far. Further, out of about 310 billion tons of Coal Resources only about 130 billion tons are in "Reserves" category. Exploration activities should be intensified to cover the un-explored 4000 sq kms and to convert all the Inferred/Indicated Coal Resource into "Reserve" category.

It is also recommended that there should be no restriction on no of bore holes to be drilled as part of Coal Exploration provided no trees are cut. In other cases a minimum of 10 bore holes per sq km should be permitted.

6. **Coal Mine Development Plan :** Time frame specified for achieving different mile stones for Mine development should be made more realistic.
7. **Underground Mining :** It was noted that atleast 40% of the Coal Resources in the country are located in depth range of +300 mtrs and are therefore amenable only to U/G Mining. On the other hand the industry's performance on U/G mining front has not been very encouraging. It is recommended that a broad-based committee consisting of U/G Mining experts from both Govt and non-Govt sectors should be constituted for ascertaining the reasons for this poor performance and recommending appropriate measures.
8. **Up-gradation of Mining Equipment :** It was noted that with the introduction of MDO concept the progress made towards up-gradation of O/C Mining equipment has taken a U Turn and construction equipment are now being used as Mining equipment. This militates against safety as well as environment and should be discouraged.
9. **U/G Mining Equipment :** It was noted that one of the factors which has stood in the way of U/G production has been lack of Indigenous capacity for manufacturing U/G equipment appropriate for Indian conditions. It was recommended that a task force should be constituted for studying the U/G Mining conditions in India and suggesting appropriate designs for U/G equipment which should be manufactured by BEML and MAMC which is being revived.
10. **Tax Burden on Coal :** It was noted that Tax burden on Coal is very high – much higher than anywhere in the world and this together with high rail freight makes Indian coal costly at distant destinations despite the fact that Pithead cost of Indian Coal is by far the lowest in the world. The comparative chart showing the taxation structure on Coal in India and in certain major coal producing countries abroad is enclosed as Annexure I.

It is therefore recommended that tax burden on Indian coal should be rationalised.

11. **Coking Coal :** It was noted that the country was dependent for its coking coal supply almost to

the extent of 80% on Imports. With an ambitious target of 300 mill tons of steel production to be achieved by 2030 the import volume of Coking Coal will shoot up. On the other hand washery Grade III and IV Coking Coals were being used in the country for power generation. It was recommended that these Coals should be subjected to deep-washing for getting as much metallurgical coal as possible and only the Midlings should be used for power generation.

Further, the existing practice of charging an additional Rs 630/- per ton as Recovery Charges from Power Plants being forced to use Washery Grade III and IV should be stopped.

12. **CBM/CMM** : It is recommended that CBM Blocks allotted more than 5 years but not made operational so far should be deallocated and reallocated to serious players.
13. **Commercial Mining** : The Round table welcomes Govt decision for opening Coal Sector to Commercial Mining. It recommends that the Blocks allotted for Commercial Mining should be capable of supporting large production volumes so that the investment required to be made on transport logistics can get justified.
14. **Alternative Usage of Coal**: It was noted that Coal is a very versatile commodity and can be used for producing items having higher value addition than power generation. It is therefore recommended that while Coal should continue to fuel the power generation, its alternative usage for coal gasification, coal liquefaction and production of Methanol, DME and Ammonia etc should be examined and encouraged.
15. **Skill Development** : Going forward level of mechanisation in both O/C and U/G Mining will increase. The mechanisation will however, yield the desired results only if machines are operated and maintained by competent persons. It is therefore recommended that manpower requirement for future growth in Coal Industry should be assessed and a comprehensive skilling programme should be designed with creation of required infrastructure.
16. **R&D**: Following R&D activities pertaining to Coal should be given priority attention:
  - i. Coal Gasification
  - ii. **Coal Bed Methane**: CBM Cells should be created in CMPDI and in subsidiaries of CIL and CBM activities in the area should be treated as independent projects.
  - iii. Coal to Liquid
  - iv. Coal utilisation by switching to Super Critical and Ultra Super Critical Technologies for Power Generation
  - v. Gainful utilisation of Fly Ash and Washery Rejects
  - vi. Wider application of FBC Technology for utilisation of Inferior Grade Coal/ Washery Rejects
  - vii. Carbon Sequestration Technology
  - viii. Slurry Transportation

## 6th Coal Summit

### *Theme : Indian Coal –Sustaining the Momentum*

6-7 September, 2016

Hotel Le-Meridian, New Delhi

### RECOMMENDATIONS

1. **Coal Supply:** It is recommended that in view of increase in Coal Production by Coal India Ltd & drop in Coal demand from Power Sector the Coal Distribution/ Marketing philosophy of CIL should be reoriented so as to meet the entire Coal requirement of all sectors in full.

For this purpose, the FSAs should be modified to provide for the full requirement of the consumers being met on administered price.

**Justification:** It was brought out at the conference that Demand for Coal in India had gone down drastically particularly because the financial condition of the Discoms is not healthy and they don't have money to pay for the Coal.

On the other hand, Cement and Sponge Iron Plants are facing difficulties in meeting their Coal requirement. Further there are quite a few power plants which are ready for commissioning but are not able to do so for non-availability of assured coal supply.

In this situation it should be possible for Coal India Ltd to meet the unsatisfied demand of all sectors without the necessity for different types of restrictions & curbs.

2. **Coal Transportation:** It is recommended that a comprehensive programme should be prepared and implemented for extending Railway Sidings to the Pitheads and wherever possible Road Transportation should be replaced by Belt-Conveyors.

In case road transportation is totally unavoidable, a crash programme should be launched for improving the road surface and ensuring that coal is transported only in covered trucks.

**Justification :** It was noted that very large quantity of coal is being transported in different Coalfields by Road for reaching the coal to the Railway Sidings or to the Consumers' Plants.

Road transportation of Coal is the prime reason for Dust pollution in the Coalfields as well as in the areas in which coal transportation roads are located . Such transportation has become necessary since proper Coal evacuation infrastructure has not been developed.

It was also brought out that road transportation of Coal involves transportation of Low energy Fuel like Coal by burning high energy fuel like Diesel which is against the Law of Economics and in effect, very inefficient and illogical.

Incidentally, this switch from road transportation to Rail/ Conveyor will also bring down the Oil Import Bill.

As an alternative CIL should encourage execution of Mine specific FSA with the rider that Coal off taken will set-up infrastructure for evacuation through belt conveyors for such other eco-



friendly systems. Till date the policy provides for such contracts being executed only if the off taker agrees to pay a premium over the notified Coal Price. The scheme does not appear to have taken of possibly because of premium acting as a dis-incentive.

For encouraging eco-friendly Coal evacuation the premium should be done away with.

Utilisation of funds generated from Clean Environment Cess:

- (i) It is recommended that an Empowered body should be created for undertaking the reclamation of old unreclaimed opencast mines and this operation should be funded from out of the funds generated through Clean Environment Cess.

**Justification:** It was brought out that the annual receipt from this cess would be of the order of Rs 25000 to Rs 30000 crores. Though this entire money would be coming from Coal, Coal Sector was getting no benefit out of this fund.

On the other hand, Coal Industry is facing severe adverse criticism arising out of a large number of old Opencast Mines having been abandoned without proper reclamation.

Quite a few of these Mines date back to pre-nationalisation days and the concerned subsidiaries of Coal India Ltd. in whose command area they are located do not have the legal obligation for their reclamation.

Some of these subsidiaries may not also be well placed financially to meet the expenses on such reclamation.

### 3. Coal Distribution Policy

It is recommended that for ensuring that Indian Coal price remains competitive despite the drop in International Coal price, the current Dual Pricing Policy as per which different prices for Coal are charged from Regulated and Non-regulated sectors should be given a fresh look.

**Justification:** For several years now, Dual Coal Pricing Policy has been followed in our country. As per this policy, the Non-regulated sector which covers major Coal consumers like Steel and Cement Industries have to pay much higher price than what the Regulated sector like power industry has to pay. This is based on the perception that Non-regulated sector has the freedom to fix the product prices and they would therefore be able to recover the extra cost paid for coal from the consumers.

This policy however, requires a fresh look in consideration of the fact that International Coal prices have gone down, Railway freight in India has increased and on this account competitiveness of Indian Coal has been hurt. It has also to be kept in mind that the Non-regulated Sector also has to face International Competition & the perception about their freedom to fix their product prices is therefore not totally correct. In this situation, Coal consuming industry in non-regulated sector may opt for imported Coal resulting in loss of market for domestic Coal and all the attendant consequences.

#### 4. Underground Mining

It is recommended that for the sake of improving Underground production, a High Powered Committee consisting of both Govt and non-Govt Experts should be constituted for ascertaining reasons for country's failure on Underground Mining front, examining the success stories and identifying Deposits to be taken up for Underground Mining through appropriate Mass Production Technology.

It is also recommended that an Incentive Scheme should be evolved for making Underground Mining Cost Competitive and this Incentive money should come from the proceeds from Clean environment Cess. In this connection Cross subsidy for Underground Mining from Opencast Mining could also be examined.

**Justification :** It was noted with concern that despite the noble intentions and ambitious programmes in the various Five -year Plans, Underground production has continued to decline. Underground Mining needs a boost on account of the following:

- a. Large Valuable Coking Coal Reserves in Jharia Coalfield are blocked in developed pillars which are not amenable to Opencast Mining and must be worked by Underground Mining Method
- b. On account of Land Acquisition problems and environmental concerns, time is fast coming when it will not be possible to extend, the depth of Opencast Mines beyond a certain point. The balance Coal Reserves will therefore have to be worked by Underground Mining Methods.
- c. Underground Mining Methods, for being cost -competitive and capable of delivering the volumes will have to be oriented towards Mass Production Technologies mastering of which takes time & it may become too late if the country introduces these technologies after opencast mining has already reached the plateau.

Now is therefore the time to act, tomorrow may be too late.

#### 5. Opencast Mining

It is recommended that in the Interest of both safety and environment, the progress made towards upgradation of Opencast Equipment should be maintained and should not be allowed to get diluted by deploying small -sized construction industry equipment in mines.

**Justification:** Opencast Mining Technology has made considerable progress in India and large Opencast Mines are now operational with large equipment like 42 Cub Mtr Bucket capacity Shovels and 240 Tonner Trucks.

Unfortunately, a retrograde trend consisting in use of very small construction- Industry equipment like 1.2 cub mtr Excavators and 10 Tonner Trucks is also getting more pronounced by the day.

These equipments are not appropriate for large- scale mining operations and their deployment leads to heavy congestion on the working faces as well as Haul Roads which poses a serious safety hazard.

Also, as it is, the coal Industry is facing acute shortage of trained manpower and deployment of small equipment results in huge requirement of such trained manpower which is not available in the market. As a result the Operators who are deployed to run these equipment are generally untrained or not fully trained which again becomes a safety hazard.

## 6. Coal Washing

It is recommended that MOEF should be approached to amend its notification in respect of use of Rejects to the extent that Power Generation from Rejects should be insisted upon only if the GCV in Rejects is higher than 2200 K/Cal/Kg. Simultaneously MOEF should also insist on introduction of modern coal washing technologies so as to ensure that GCV in Rejects is less than 2200 K/Cal/Kg.

It is, further recommended that Rejects-based power plants if required to be installed on account of the Rejects having + 2200 K.Cals/Kg GCV should be subsidised from out of the funds generated from Clean Environment Cess to make them economically viable.

**Justification:** It was noted with concern that on the one hand MOEF has been reducing the cut-off distance for use of washed coal by Power Sector and on the other even the existing washing capacities are not being fully utilised.

One of the reasons for this contradiction is the insistence of MoEF on utilisation of Washery Rejects for Power Generation through FBC Route.

It was brought out that such power generation can be an economically viable activity only if the GCV in Rejects would be higher than 2200 K/Cal/Per Kg.

It has got to be appreciated that utilisation of Rejects for Power Generation with FBC Technology can be economically viable only if the Rejects have Heat Value adequate for generating more power than is required for grinding of the Rejects.

Further, if Rejects have to be used for power generation, the total polluting effect remains the same as would have been the case if Raw Coal would have been utilised in the Power Plants. All that will be achieved is that the source of pollution instead of being limited to a single location which is the main power plant will get distributed over two locations namely the main power plant and the Rejects based Power Plant.

The objective of cutting down on Green House Gas Emission by improving the quality of Coal by washing therefore gets completely defeated.

## 7. Taxation on Coal

It is recommended that the taxation regime on Coal in India should be re-examined to align it with the rates obtaining in major Coal producing countries.

**Justification :** It was noted that Indian Coal is the most heavily taxed in the world. The taxation rates for Coal in different countries is given below:

- Effective Tax Rates (ETR) which is the combined effect of all taxes on Coal in different countries is as under:

Name of the Country	Effective Tax Rate (%)
Mongolia	31.3
Canada (Quebec)	34.0
Chile	37.6
Indonesia (Sulawesi)	38.1
Canada (NWT)	39.5
Australia	39.7
South Africa	39.7
Namibia	44.2
Indonesia (West Papua)	45.5
India (New Mines)	59.8
India (Existing Mines)	64.0

The manner in which the tax burden on Indian Coal has gone up on account of increase in Royalty, Imposition of District Mineral Fund (30% of Royalty), Imposition of NMET (2% of Royalty) and increase in Clean Energy Cess (now Clean Environment Cess) from Rs 50/- per ton in financial year 2013 to Rs 100/- in financial year 2014 , Rs 200/- in financial year 2015 and Rs 400/- in financial year 2017 will be evident from the following:

Year	Tax burden as percentage of Coal Price
2007	9
2012	14
2013	15.5
2014	17
2015	24.8
2016 and 2017	30.42 - which will go as high as 46.94 % if Auction Commitment is taken into account.

On the other hand, International Coal Prices have gone down and a situation has now come when Indian Coal is gradually becoming uncompetitive. In fact Coal India Ltd. has already been compelled to cut down the price of Superior Grade coal on this account.

For maintaining the cost competitiveness of Indian Coal and ensuring the survival of Indian Coal Industry, it is necessary that the tax rates are brought in line with those obtaining in major Coal producing countries.

## 8. Augmenting Coking Coal Supply

It is recommended that all Washery Grade III and Grade IV Coals should be washed for generating Metallurgical Coal, and the implementation of plans prepared earlier for rehabilitating abandoned Coking Coal Mines and starting new Coking Coal Projects should be fast tracked.

**Justification:** It was noted with concern that on the one hand, the volume of import of Coking Coal was going up and the other hand Inferior Grade Coking coal of Washery Grade III and Grade IV is being utilised for Power Generation . It was noted with satisfaction that CIL has planned about 6 mill tons new Washing capacity for Inferior Grade Coking Coal for generating Metallurgical Coal. This would however, still leave more than 20 mill tons of such Coal which will continue to be used for Power Generation. It was hoped that in due course Coal India would set up new Washeries to ensure that these 20 mill tons of Washery Grade III and Washery Grade IV Coals would also be washed for generating Metallurgical Coal.

It was however, felt that pending the construction and commissioning of these washeries, these coals could be supplied to the washeries belonging to integrated steel plants which have surplus washing capacity. The Metallurgical Coal obtained from such washing could be utilised by these Integrated steel plants and the Middlings obtained could be used as substitute for power grade coal for which they have the linkage. In case the quantity of Middlings goes in excess of the Power Grade Coal linkage, this excess could be supplied by these Integrated Steel plants to the Power Stations having linkage with proportionate reduction in the said linkage.

About 8 years back, Coal India had prepared plans for rehabilitating some abandoned Coking coal Mines which had workable reserves left therein but where operations had been stopped on account of Geological / Safety problems. For various reasons, however, no progress was made in this direction.

Some of these Mines could be reopened and it would be desirable to get the possibility examined by appointing a multi-disciplinary Committee for the purpose.

One of the Coking Coal projects which has been hanging fire for close to 50 years is Damodar River Diversion Project in East Bokaro Coalfield where large Coking Coal Reserves are available. This project could not progress on account of Land Acquisition problem. It is felt that it can be made operational by enlisting the co-operation of Jharkhand Govt.

## 9. Recovery Charges

It is recommended that the existing practice of imposing additional burden of Rs. 630/- per ton as Recovery Charges on Power Plants being forced to use Washery Grade III and Grade IV Coal should be stopped and instead these Coals should be washed for generating Metallurgical Coal.

**Justification:** It was noted that Coal India was charging Rs. 630/- per ton as Recovery Charges on supply of washery Grade III and Grade IV Coal to Power Sector.

It was felt that this is not logical since such Coal is being supplied to the Power Plants not because Power Plants are asking for it but it is being done for Coal India's convenience.

It was also felt that the loss of revenue by stopping this Recovery charge could be made up to very large extent by washing these coals for generating Metallurgical Coal which sells at a very high price.

#### 10. Dry Beneficiation of Coal

It is recommended that one or 2 mines producing Power Grade Coal should be identified for trial of Dry Beneficiation Technology.

**Justification:** One of the negatives associated with washing of Power Grade Coal is the additional Moisture that Clean Coal acquires in the process of washing.

It was also noted that China had made good progress with Dry Coal beneficiation.

#### 12. CBM/CMM

It is recommended that CBM Blocks allotted more than 5 years back but not made operational so far should be taken away from the Allocatees and should be given to those who have firm plans for down-stream End-Use Plants.

It is recommended that the current status in respect of CBM Blocks should be reviewed in totality. There are cases where the development of Coal resource is held up since no progress is being made towards exploitation of CBM resource.

In such case unless it is clearly established that the exploitation CBM reserves is economically viable development of coal extraction should be permitted to proceed.

Further in several foray projections made about CBM potential in India has been questioned of scientific basis.

As a policy matter therefore, development of a Core Blocks should not be made hostage to development of CBM.

**Justification :** It was noted with concern that though India had substantial CBM/ CMM potential, not much had been achieved on harnessing them - the reason being absence of firm programme for setting up of End Use Plants by the Block Allottees.

First CBM block was allotted in the year 1993-94. Since then till 2011 total 32 Coal Blocks have been allotted through auctioning. Out of all these blocks possibly only 2 are operating commercially that too in a much lower scale than was earlier planned. Nine blocks have been surrendered. The basic reason for such dismal performance in CBM sector is very low Methane availability in the rank of coal in India (barring possibly 3-4 areas. Even in these areas no major commercial contract could be signed as the promoters are not sure about the quantity and quality of gas to be produced). In most cases it is not economically viable both in quantity and qualitative terms to extract the gas and that is why even after 22 years of initiating the CBM operations, it is not gaining any momentum. In all the allotted blocks the planned development programme have gone haywire and its not achievable.

### 13. Commercial Mining

It is recommended that while identifying Blocks for Commercial Mining care should be taken to ensure that it would be possible to connect them to the Coal Evacuation infrastructure in an economically viable manner.

**Justification:** It was noted with satisfaction that Govt had taken a decision for permitting Commercial Mining. It was hoped that advent of Commercial Mining would create conditions for deployment of Modern Mining technologies and practices and would go a long way in improving the productivity of Indian Coal Industry. It was however, noted with concern that the demarcation of captive coal Blocks in particularly Talcher Coalfield in Odisha, had earlier been done in such a manner that some of the Blocks could not even be approached without intruding on the adjacent Blocks.

Also in a large number of cases, the Block- sizes were such that it was not financially feasible to connect them with facilities like Rail and Road links.

For making Blocks identified for Commercial Mining attractive to the investors, smaller Blocks should be merged together to form larger Blocks and this would be so demarcated that they are naturally bounded by non-coal bearing areas to create economy of scale for Commercial Mining.

The Blocks should be allotted through a transparent QCBS model that gives due weightage to competence in mining.

### 14. Efficiency Parameters

It is recommended that the time frame specified for different Efficiency Parameters should be closely examined and made realistic

**Justification :** A table consisting of "Efficiency Parameters" forms a part of the Coal Mines Development and Production Agreement executed between the Nominated Authority under the Coal Mines (Special Provisions) Act 2015 and the successful bidder of the auction process. For various mile stones listed as Efficiency Parameters specific time frames have been given and any failure in achieving these mile stones results in Invocation of Performance Guarantee to the relevant extent. These time frames are rather unrealistic against some of the parameters like the one related to obtaining Prospecting License. Time allowed for this activity has been specified as 4 months. As things stand the minimum time required for obtaining this license is 18 months and in case Forest Land is evolved, it may take several years.

## 5<sup>th</sup> Roundtable Conference on Coal

### Theme : Energising Coal Sector - The Eco-Friendly Way

30th October, 2015

Hotel Le Meridien, New Delhi

### RECOMMENDATIONS

Future Projections of Coal requirement in India show that even going forward, Coal will continue to occupy the dominant position in Energy Security scenario of the country. This will also be borne out from the fact that a very ambitious Coal projection target of 1580 mtpa to be achieved by 2020 has been fixed by the Govt.

Various issues connected with Coal were deliberated upon at the 5th Round Table Conference held at Hotel Le-Meridian, New Delhi on 30.10.15.

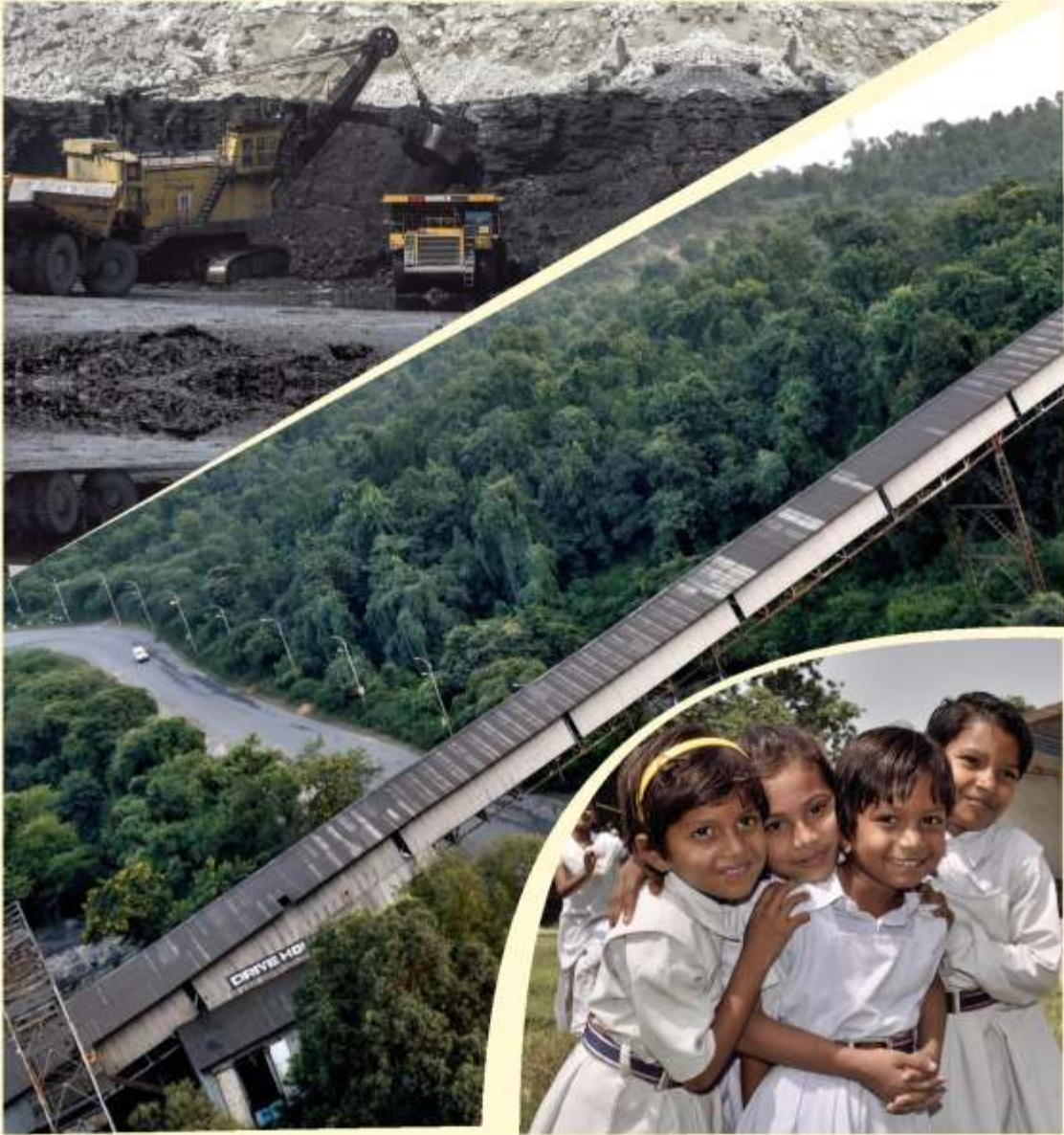
Following recommendations are made based on the results of the deliberations:

1. **Exploration** : Exploration for Coal has got to be intensified further for ensuring that adequate Proved Reserves are available for meeting the ever increasing requirement of the country. For this purpose, the problem caused by the restriction of drilling only, 3 Boreholes per sq km in Forest Land has to be resolved so that atleast 10 Bore Holes per sq km are permitted. This is necessary since Proved Reserves cannot be established on the strength of 3 Bore Holes per sq km and investment decision cannot be taken unless adequate Proved reserves are established.
2. **Mine Planning** : Eco-friendly measures have to be integrated in all spheres of Mine Planning as well as Mine operation and post- mine- closure activities. Effective monitoring system has to be put in place for ensuring that the eco-friendly provisions in the Mining Plan/ Mine Closure Plan are conscientiously implemented.
3. **Land Acquisition and Reclamation** : It was felt that Leasing of land should be made a Parallel Route for meeting the land requirement for mining projects. Reclaimed land should be returned to the erst while owners and this aspect should be kept in mind while deciding on the compensation to be paid to the land owners for acquisition/ leasing of their land.
4. **Coal Beneficiation** : Considering the heavy polluting effect of Coal burning and the fact that larger and larger quantities of Coal will be utilised going forward, It is recommended that all Coal except that used for Power generation at pithead should be beneficiated and the current mandate for use of Coal having less than 34% Ash in Power Stations located more than 750 kms from the Mine and those located in critically polluted and environmentally sensitive areas should be rigidly implemented.
5. **R&D** : Following R&D activities pertaining to Coal should be given due attention:
  - i. Coal Gassification
  - ii. **Coal Bed Methane** : CBM Cells should be created in CMPDI and in subsidiaries of CIL and CBM activities in the area should be treated as independent projects.



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- iii. Coal to Liquid
  - iv. Coal utilisation by switching to Super Critical and Ultra Super Critical Technologies for Power Generation
  - v. Gainful utilisation of Fly Ash and Washery Rejects
  - vi. Wider application of FBC Technology for utilisation of Inferior Grade Coal/Washery Rejects
  - vii. Carbon Sequestration Technology
  - viii. Slurry Transportation
  - ix. Use of Non-Coking Coal for Steel Making
6. **Mining Equipment** : The projection prepared by Coal India Ltd for future equipment requirement should be made available to Equipment manufacturers in the country and they should take steps for manufacturing these Equipment so that import dependence can be reduced.
  7. **Manpower Requirement** : Manpower requirement in the Industry as a whole keeping in view, its future growth should be assessed and a comprehensive policy together with infrastructure should be created for “skilling” for meeting this requirement.
  8. **Rationalisation of Coal Linkage** : The steps initiated by Govt in this direction were appreciated and it was recommended that the entire linkage structure should be re-examined so that use of imported Coal in Industries located inland is totally stopped. While imported Coal should be used in coast-based Industries, indigenous Coal linked to these Industries should go to Inland Industries .

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# Section-4

## *Future of Coal – Go Green*

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## Future of Coal – Go Green

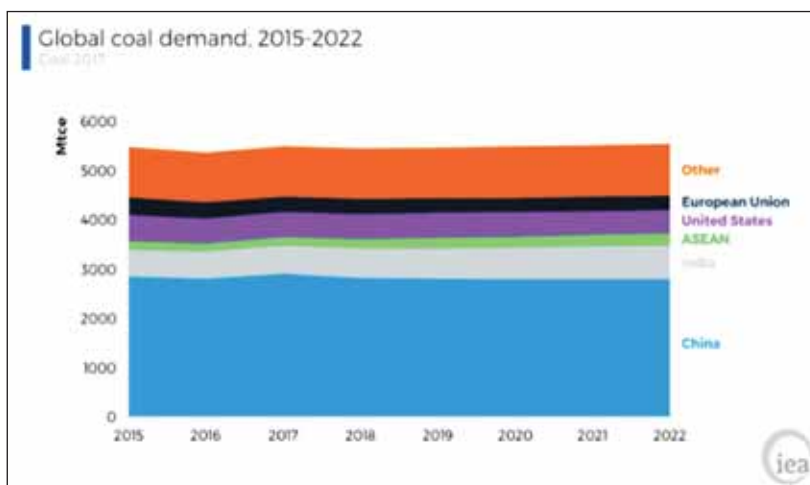
– S K Grover\*, Kapil Dhagath\*\*

### 1.1. Global Energy Scenario vis-à-vis Indian Coal Perspective

#### 1.1.1. Global Energy Scenario

A recent BP Study report says that carbon emission from energy consumption has increased by 1.6% after three years of little or no growth. This is the current status despite the continuing energy transition from fossil fuels to renewables. Such a dramatic change in carbon emission shows that energy transition is not happening at the required pace and dependence on fossil fuel continues. Recently, rising coal use in India and other Asian countries was unable to offset large declines in the United States, China (where demand dropped for the third consecutive year) and in the United Kingdom (where demand dropped by more than 50%). In the United States, coal's dominance in the power sector has been eroded by low gas prices. Unlike Europe's gradual withdrawal from Coal, a recent effort of US Administration to support dyeing Coal Industry in America is to bring more eco-friendly mining operations, sustainability and to encourage Clean Coal Usage. As a result of these contrasting trends, global coal demand is expected to be around 5530 Mtce in 2022, which is only marginally higher than current levels of around 5400 Mtce. Although coal-fired power generation increases by 1.2% per year in the period 2016-22, its share of the power mix falls to just below 36% by 2022.

Renewables grew at a rapid rate of 16.6% in 2017. Natural gas was the largest source of energy growth last year. Major coal consumer China is continuing to switch from coal to gas. Still, it consumed marginally more coal in 2017, after continuous decline during the previous three years. The rate of decline in coal consumption in OECD countries last year was insignificant. As a result, coal consumption grew last year (up by 0.7%) - the first rise in four years. India alone accounted for 76% of the increase in world coal consumption because of its larger dependence on Coal. In Europe, the transition towards Non Renewables is much faster as compared to other parts of the World. As per the recent findings on the global power sector, the share of coal in meeting power needs in 2017 was exactly the same as in 1998, despite everyone now being aware of the harmful impact of using coal. This was because the growth in renewables could not compensate for the reduction in the share of nuclear power.

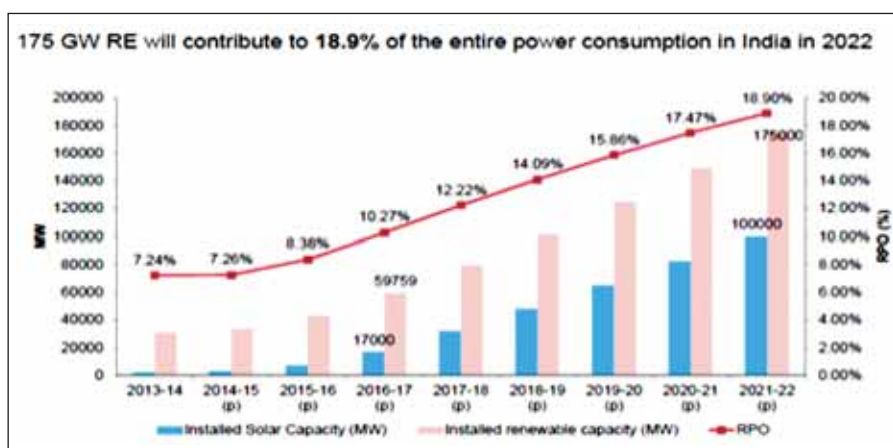


\*Former GM, NTPC

\*\*Former Executive Vice President, JSPL

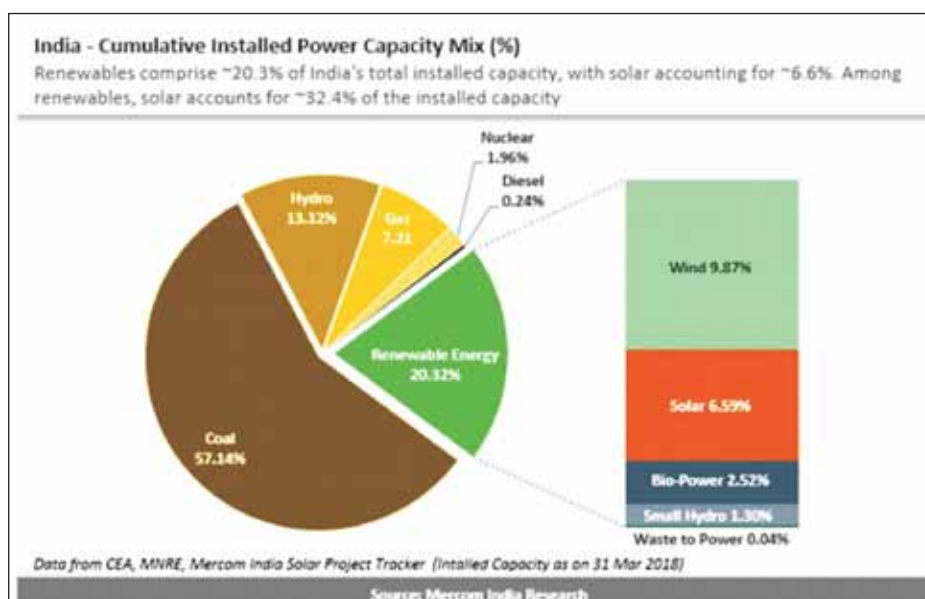
1.1.2. Indian Energy Scenario:

India's energy scenario continued to differ considerably from that of the rest of the world in recent times. Its total Installed capacity stands at 344 GW with coal based share at 197 GW. India is now developing renewables faster than it did a few years ago. As compared to the earlier regime which added about 2,728 MW of solar generating capacity during its last three years, the present Govt has added 15,757 MW during its first three years.

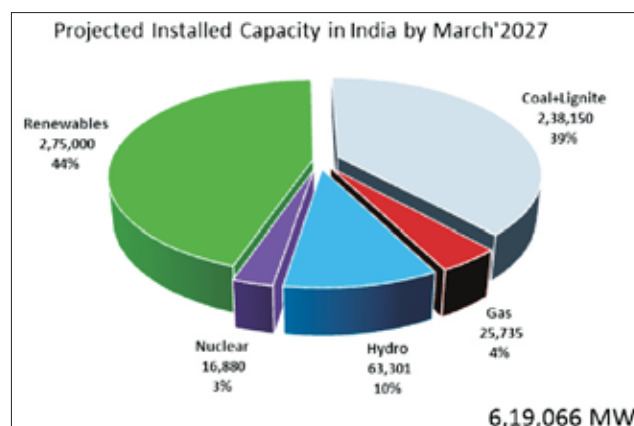
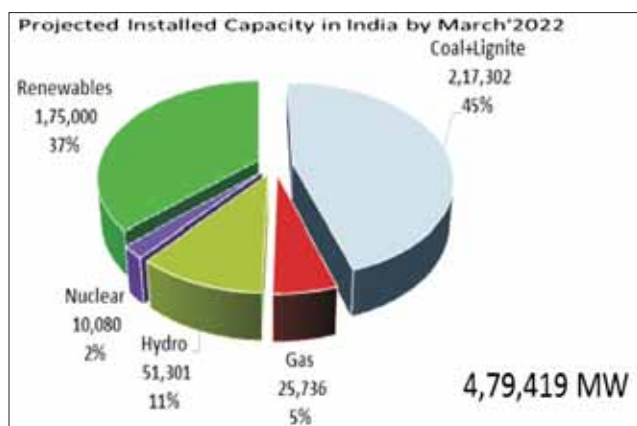


Total Installed Capacity of Power Generation in India - 344 GW,  
Thermal: 223 GW & RES 69 GW

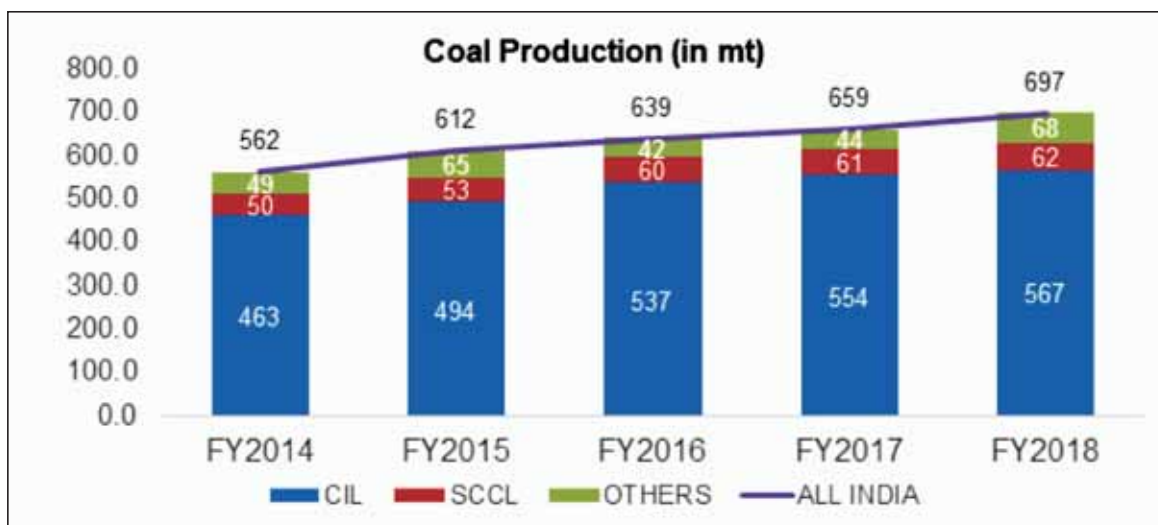
As compared to the earlier regime which added about 2,728 MW of solar generating capacity during its last three years, the present Govt has added 15,757 MW during its first three years.



Coal will remain as a dominant source of energy in India with gradual inter-sectoral changes towards Renewable Energy Source. The existing coal based thermal power plants having a residual life of 10-30 years will continue to depend upon coal. As envisaged by Power Ministry, old power stations shall be replaced by Super Critical and Ultra Super Critical Thermal Power Plants having better efficiency, lesser Specific fuel consumption and emissions of SO<sub>x</sub>/NO<sub>x</sub>. The coastal based power stations will continue to depend upon imported coal. It is expected that coal based power generation in India will rise to 217 GW and 238 GW in the year 2022 & 2027 respectively.



In India, Coal consumption has not only increased by 4.5% in 2017 but also continues to have a large energy share of 56.3%, against a world average of 27.6%. India produced 697 Million tonne of coal during 2017-18. Coal India Limited, the major producer of coal in India and the largest coal producing company in the World, has contributed 567 Million tonnes of coal to meet the majority of demand coming from Indian Power, Steel, Cement & Other Sectors which stood at 908 Million tonnes. About, 212 Million tonne of coal, including Coking Coal (about 37 Million tonne) meant for Steel Sector, was imported from various countries like Indonesia, Australia and South Africa. CIL has set an ambitious target of 652.25 Million tonnes for 2018-19 with an annual growth of about 15% as compared to average 4.5% growth in last 5 years.



India is rich in its Coal Resources which stand at 319.02 Billion tonne (as on 1.4.2018), 5th largest in the World, with a proved category of reserves being 148.79 Bt (46.6%). Ministry of Coal has advised the Exploration agencies to expedite detailed exploration to convert Indicated Reserves into Proved Category at a much faster rate. Out of current Proved Reserves of 148.79Bt, the recoverable reserves are about 65 Bt which can survive for about 100 years with the current rate of mining (650 MTPA).

## 1.2 Coal to Go Green - for its survival

### 1.2.1 *Global Scenario*

Globally coal is expected to experience sluggish growth through 2022. Up until this decade the coal continued to be a fuel as source to generate energy in many countries like China, India, Japan, South Korea, USA. Coal has only been fossil fuel which generally has been used as unprocessed one except for its beneficiation by reducing ash to some extent. Crude oil had been gaining more and more market as fuel for energy primarily due to the fact that crude oil has been refined & re-refined with constant research day in and day out. Being more environment friendly product has been capturing the market.

From environmentally consideration Coal is being branded as a dirty fuel resulting into its sluggish growth globally. Time has come to focus on use of coal in environmentally friendly manner and this may turn out to be techno-commercially more attractive offer in the present soaring oil price.

### 1.2.2 *Indian Scenario*

As we are aware India has good resource Coal Resources but generally inferior quality and Indian problems get multiplied and need extra strategy for **India Coal to Go Green**.

The signals are very clear that after 2040 or so onwards a stage may come when coal demand may get stagnated or even start showing downwards trends. It is an awakening call for coal Industry internationally and more so for India Coal Sector.

It is right time to start focusing on working out alternate use of coal such as Coal to Liquid (CTL), Coal to Gas (CTG), Coal to Chemicals (CTC) etc

India's intended Nationally Determined Contribution (INDC) at Paris to reduce emission intensity at its GDP by 33 to 35% in 2030 from 2005 level and its commitment to achieve about 40% cumulative electric power installed capacity from non-fossil fuel based energy source by 2030, leads to a logical conclusion to shift its base load significantly to nuclear power generation.

Indian energy security for some decades will continue to be coal. It has to be used efficiently and in compliance with environmental norms. Existing power stations also have to be retrofitted to meet environmental norms. The power sector is already financially stressed and power distribution companies can not look at increasing power tariff beyond closing the revenue gaps in existing tariffs. Coal companies will also have to deploy coal washeries. All these costs of power plant retrofit and new diversifications should justifiably be met from the nearly Rs. 40,000 Cr. Annual collection from Coal Clean Energy Cess at Rs. 400 a tonne.

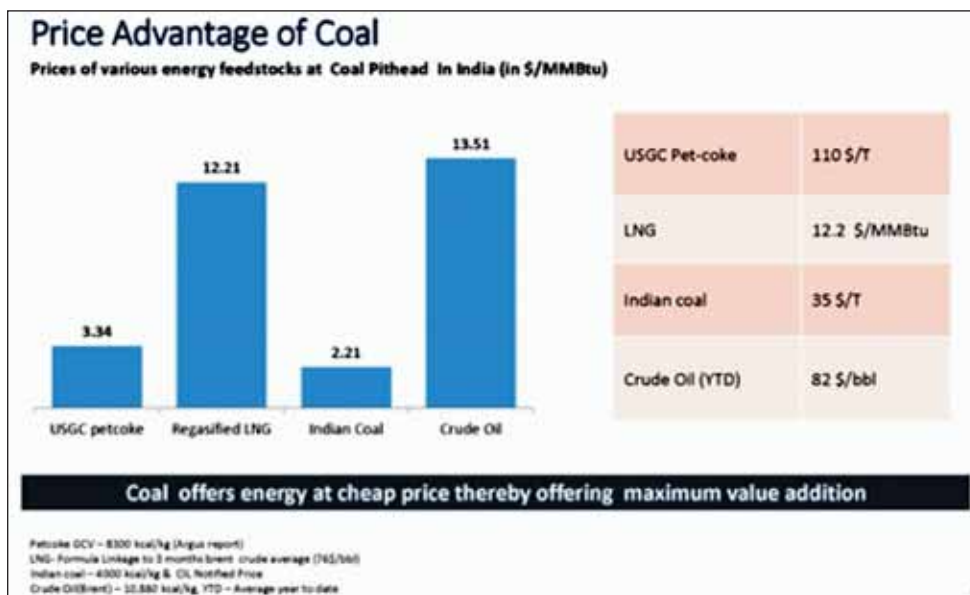
Gradually more and more efficient ways of use of coal by way of replacing existing old units by Super Critical and Ultra Super Critical Thermal Plants need to done so that with the same level of emissions of So<sub>2</sub>/Nox more generation of power is put into the system. In the foreseeable future interest in Oxy-fuel firing for coal fired power generation essentially combustion with integrated carbon capture has to grow. Combustion of coal in oxygen rich environment produce energy,



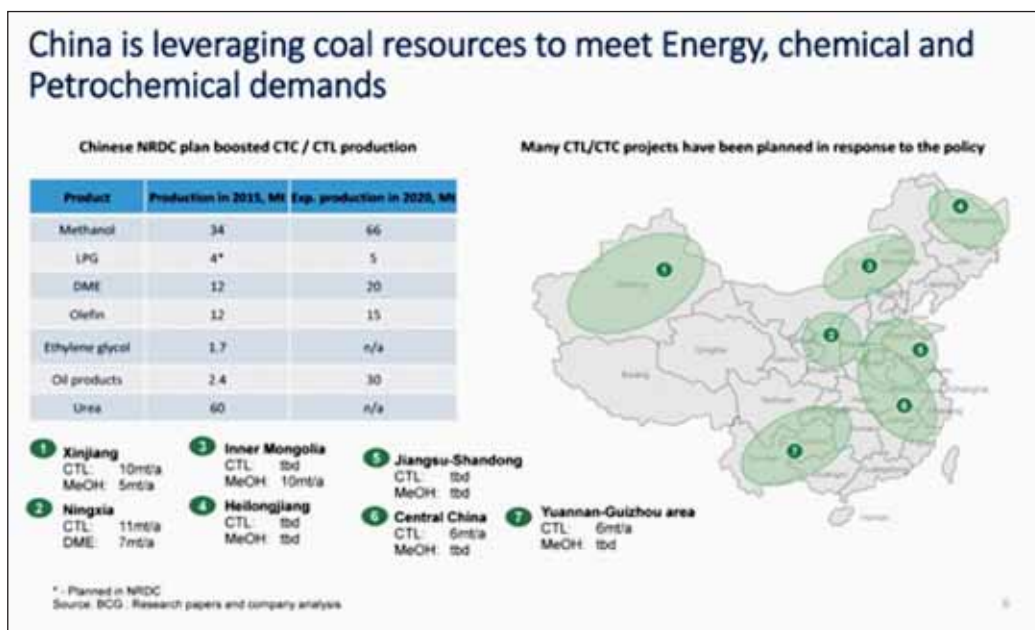
pure Co2 and a little water. The pure Co2 streams produced from Oxy-fuel combustion process can be sold.

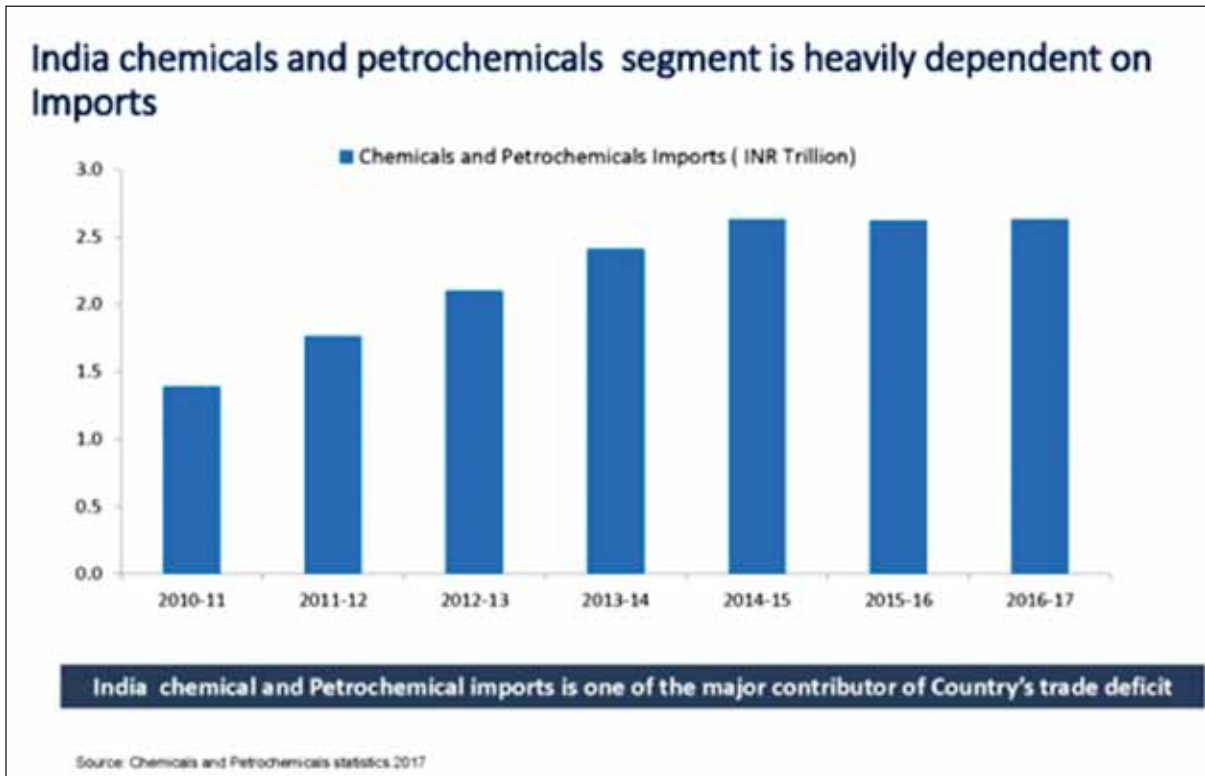
Taking a one from China, India need to utilize coal resources for the production of Valuable Chemicals & fertilizer

The dream of producing 1 billion tons can be achieved by adopting chemical/fertilizer production through coal gasification



China is leveraging Coal Resources to meet Energy, Chemical and Petro-Chemical demands projected as under:





### Exploitation of coal for Indian Chemical demand

Key Chemicals	Demand gap by 2025 (MMTPA)	Coal required for chemical production (MMTPA)
Acetic acid	1.1	7
Methanol*	6.6	32
MEG	1.4	8
PVC	3.7	11
Poly-Olefins	7.0	87
DME*	2.3	4.8
<b>Total</b>	<b>22.1</b>	<b>150</b>

**Coal to Chemicals sector could be frontrunner in utilisation of untapped coal reserves**

Coal requirement calculation is based on Indian Coal of GCV 3300 Kcal/kg and 45% Ash. Demand supply gap taken from ICS database.  
 \*Assumed 15% of Methanol blending with petrol and 10% of DME blending with LPG will be by Govt.  
 18 MMSCMD of SNG would be generated through slipped methane (FSOB) along with above products

### Revenue of coal to chemical clusters

Key Chemicals	Total capacity of three clusters (MMTPA)	Price (\$/T)	Revenue generation ( Million USD)
Acetic acid	1.1	400	440
Methanol	6.6	350	2310
MEG	1.4	750	1068
PVC	3.7	1000	3663
Poly-Olefins	7.0	1100	7700
DME	2.3	420	945
SNG*	38	8	3485
Other by -products	4.2	310	1296
<b>Total Revenue Generation</b>			<b>~21000</b>

**Coal to Chemicals can save import bill to the tune of 21 Billion USD per Annum**

SNG - generation is in MMSCMO, Price is \$ per MMbtu

### Steps required to catalyse Coal gasification projects in India

#### Ensuring Feedstock Security:

Continuous and consistent quality coal supply from a single source to be ensured for Coal to Chemical projects.

For Indian Coals this is a bigger challenge and since we know that use of coal for power fetches minimum profit for coal and use of coal for alternate uses is more attractive option and it is also expected that by 2025 about 150 million tes of coal can be used for coal to Chemical and also save import bill to the tune of \$ 21 Billion per annum, any amount spent on research for processing coal for it to be of consistent quality with less ash acceptable for use of coal for Alternate use is worth.

It is also time to put lignite also into alternate use by reducing moisture from lignite to produce a stable low ash, low moisture product ideally suitable for much better use.

**In conclusion, while Green Coal may not be reality to-day but a **Green future of Coal** is visible in the horizon as there are sufficient evidence to reveal it is conceivable may even be at a commercial scale. This is going to arrest the downward trend of coal industry underlined for better use.**

WCL... beyond mining



# WCL... beyond mining

Mining coal to provide for the Nation's energy needs is WCL's mandate. We also empower people among whom we work - by providing for their vital needs like clean air, water, health and hygiene, education and skill-building. We are committed to it.

An enlightened national entity WCL !



**Western Coalfields Limited**

"A Miniratna Category-1 Government of India Enterprise"  
"A Subsidiary of Coal India Limited"

Coal Estate, Civil Lines, Nagpur-440 001  
<http://westerncoal.gov.in>

# Section-5

## *Abstracts & Technical Papers*

INDIA  
**ENERGY**  
FORUM



# Breaking new ground with cutting edge technology



## **NMDC - Striding towards the Future**

Ranked amongst India's topmost companies in terms of its robust financials, NMDC's eco-friendly, scientific and safe mining operations have earned recognition for it not just as the world's lowest cost producer of iron ore, but also as the leader in its category. In step with the changing times, NMDC Ltd., has shifted from being a single commodity, single customer and limited mining operations to supplying multiple commodities to several customers across distant geographical locations.



**NMDC Limited**  
(A Government of India Enterprise)



## TECHNICAL SESSION-III



**SUMMIT & EXPO**  
WED 5<sup>th</sup> - THU 6<sup>th</sup> SEPT. 2018  
Hotel The Ashok, New Delhi, India

**'Green' Coal – A Reality  
Adoption of a  
Revolutionary Approach**

Richard A. Horner  
*Director Special Projects and Emerging Technology*  
School of Energy Resources  
University of Wyoming



UNIVERSITY OF WYOMING

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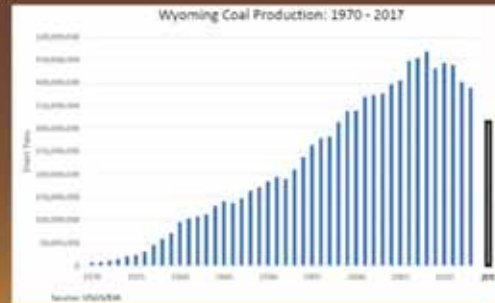
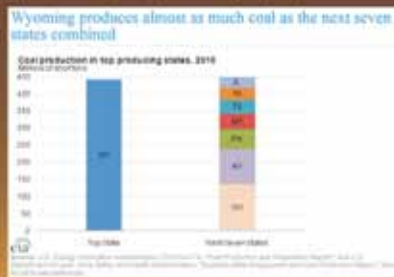
### Outline

- Wyoming Coal Resources
- Advantaging the Chemistry of Coal
  - Powder River Basin sub-bitumous coal
- Wyoming Carbon Engineering Initiative
  - New Markets & hidden value
- The Coal Refinery
  - Thermo-chemical coal processing
- Achievements
- Concluding Remarks

## Wyoming Imperative for Coal

- Wyoming is the most prolific coal-producing state in USA
- Surface mines are the most efficient in USA
  - ca 92% recovery factor & cheapest to mine too
- Ten coal companies operate 16 coal mines, most in the powder river basin (PRB).

Coal Productivity Continues to decline



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## Wyoming Imperative for Coal (iii)

- Abundant (Powder River Basin)
  - Largest deposits of low sulfur sub-bituminous coal in the world
- Between 50 to 150 years production left.
- Cheap relative to other coal reserves in USA

Coal commodity regions	Week ending 04/13/18	04/29/18	04/27/18	05/04/18
Central Appalachia 12,500 Btu, 1.2-5.0% S	\$61.45	\$61.45	\$60.40	\$60.40
Northern Appalachia 13,000 Btu, < 3.0% S	\$45.05	\$45.05	\$44.30	\$44.30
Illinois Basin 11,800 Btu, 1.2-3.0% S	\$32.70	\$32.70	\$32.70	\$32.70
<b>Powder River Basin 8,800 Btu, 0.8-3.0% S</b>	<b>\$12.45</b>	<b>\$12.45</b>	<b>\$12.45</b>	<b>\$12.45</b>
Windy Basin 11,500 Btu, 1.2-3.0% S	\$42.05	\$42.05	\$41.70	\$41.70



Figure 1. Location of individual coal assessment areas in the Powder River Basin, Wyoming and Montana. From Alaska and others (2015)

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## Coal Perspective Existing & New Market Opportunities

### Existing Markets

- Coal Beneficiation
  - Changing Supply side Availability
    - Shortage in metallurgical & coking coal
    - Increasing price differentials making 'upgrading' low price coal attractive

### New Markets

- Use coal as source for manufacturing non-metals and chemicals
  - Captures value beyond coal's btu value
- Rising Demand for carbon based chemicals & materials > GDP Growth Projections
  - Light-weighting
  - Substitution for metals (Existing Markets)
  - Superior functional performance of carbon materials over metals
  - New Markets for (carbon) material classes
- Coal to chemicals plants are being built or planned in:
  - China, Germany & India
    - Generally, chemicals made through the syngas conversion route

China's chemical market values by region and GDP (\$ billion)

China's chemical market will soon represent one-third of global demand

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## Increasing the Calorific Value of Sub-bituminous coal

- Technology pilot plant tested (batch processing) in Alabama at Coal Fired Power generation Site
- Shortly will be commissioned in Wyoming to operate 24/7 on PRB coal
- Engineering development ongoing

Average weekly coal commodity spot prices (Wholesale per short ton)


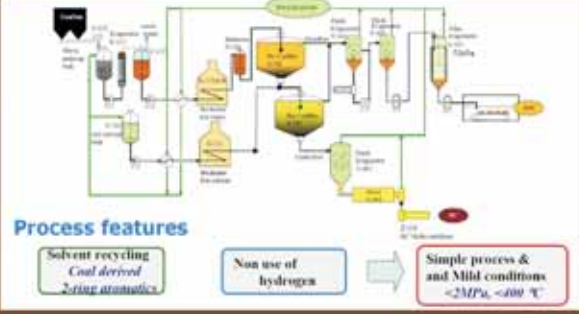
Coal commodity	Week ending	08/27/18	08/20/18	08/13/18	08/06/18
Central Appalachia (13,000 Btu, 12.5% S)		\$61.45	\$61.45	\$60.45	\$60.45
Eastern Appalachia (13,000 Btu, 12.5% S)		\$61.00	\$60.00	\$60.00	\$60.00
Western Appalachia (13,000 Btu, 12.5% S)		\$61.00	\$60.00	\$60.00	\$60.00
PRB (14,500 Btu, 11.5% S)		\$51.45	\$51.45	\$51.45	\$51.45
PRB (14,500 Btu, 11.5% S) - Beneficiated		\$61.00	\$61.00	\$61.00	\$61.00

Powder River Basin Coal

Sample	Proximate Analysis (%)				Ultimate Analysis (%)						
	Moisture	Volatile matter	Fixed carbon	Ash	C	H	O	N	S	Ash	HHV (BTU/lb)
PRB (ROM)	27.42	31.65	36.43	4.5	50.23	3.41	13.55	0.65	0.22	4.5	8,800
Beneficiated	4.92	42.31	46.97	5.8	69.52	4.71	13.55	0.89	0.3	6.13	11,546

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## De-ashing Low Rank Coal

**Process features**

- Solvent recycling  
Coal derived  
Strong aromatics
- Non use of hydrogen
- Simple process & mild conditions  
<23MPa, <400 °C

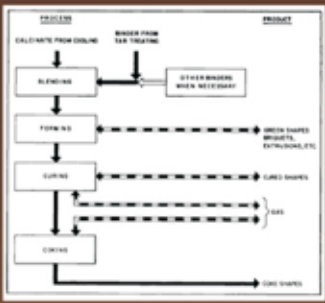
- Developed between 2001-2007
- Turns low-grade thermal coal into coking coal (low ash)
- Solvent extracts ash and insoluble at 380 deg C.
- Proven to emulate coking coal in practice
- Treatment cost is \$100/mt !
- Very coal quality dependant


Coal	Product	ash [wt%]db	VM [wt%]	C [wt%] (daf basis)	H [wt%]	N [wt%]	S [wt%]	Qnet [MJ/kg]	Fuel ratio	Heat value [kcal/kg] gross
MO	Raw coal	12.2	41.3	82.9	5.5	2.0	0.6	9.1	1.4	6920
	HPC	<1	44.7	84.9	5.5	1.8	0.6	7.2	1.2	8630
NS	Raw coal	11.4	35.9	80.9	5.5	1.9	0.6	11.1	1.8	7230
	HPC	<1	52.9	86.6	5.9	1.7	0.6	5.1	0.9	8550

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## Transforming Wyoming Kemmerer Sub-bituminous coal into coke for steel making

- The FMC Coke Process

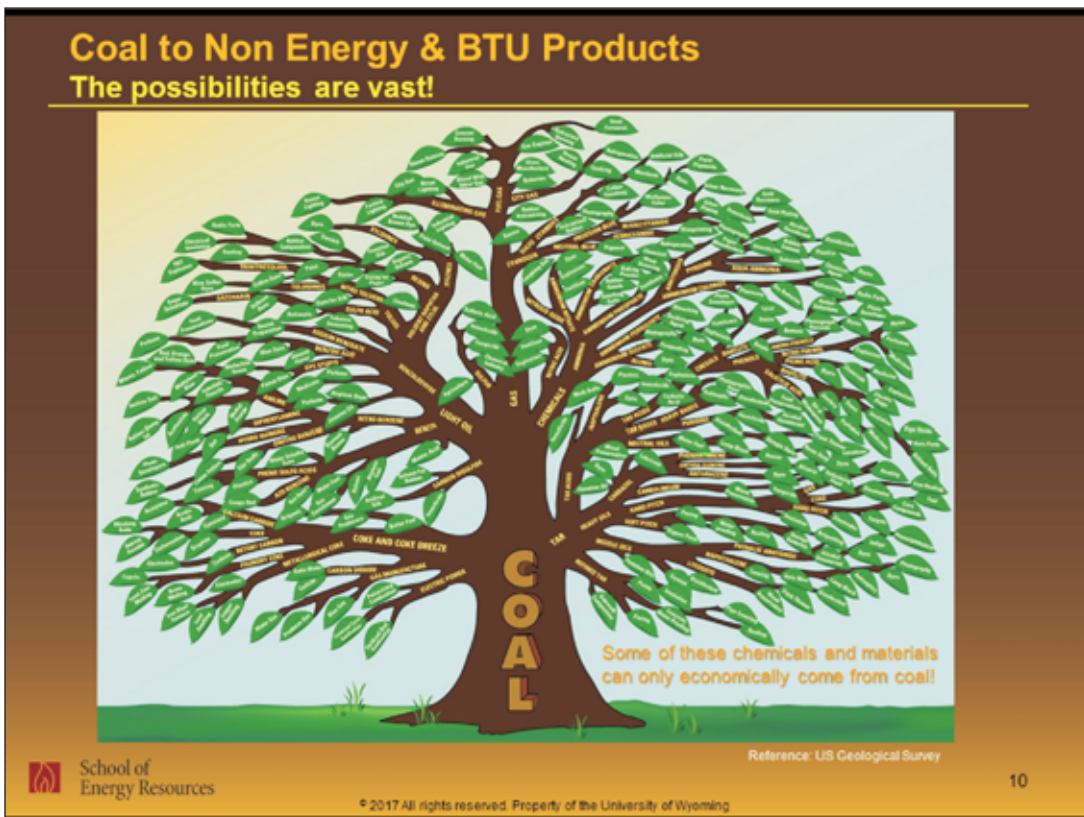
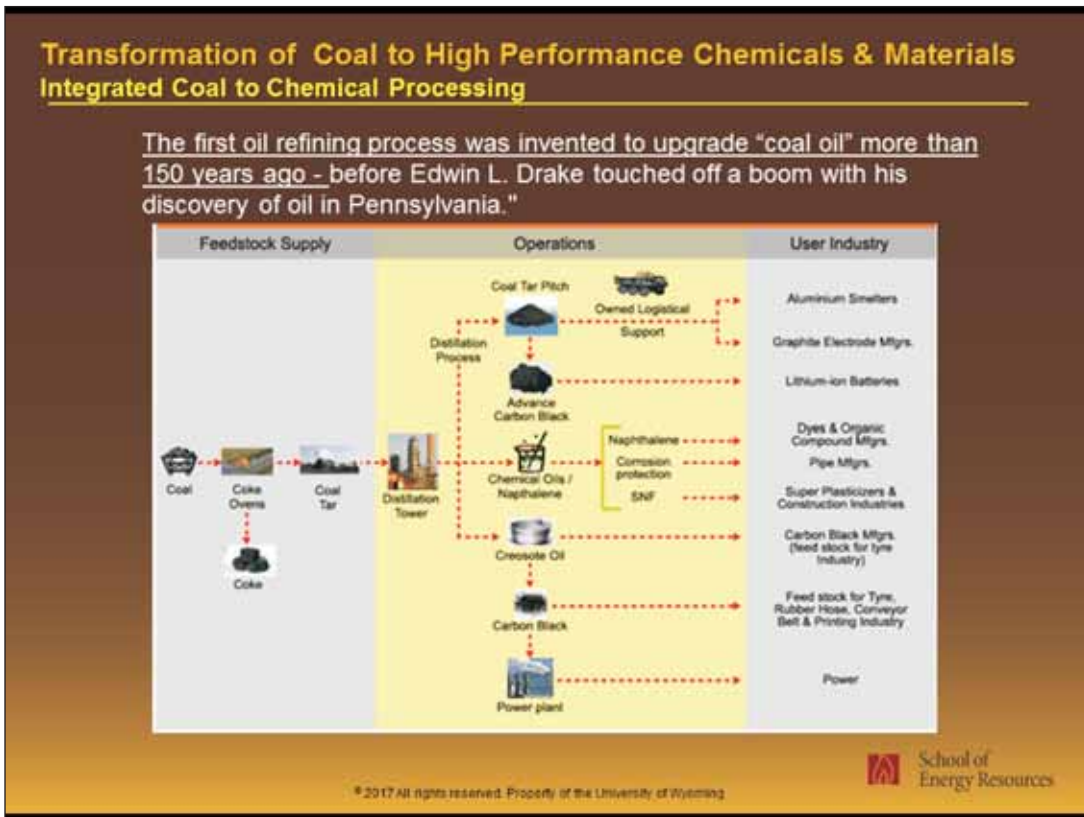


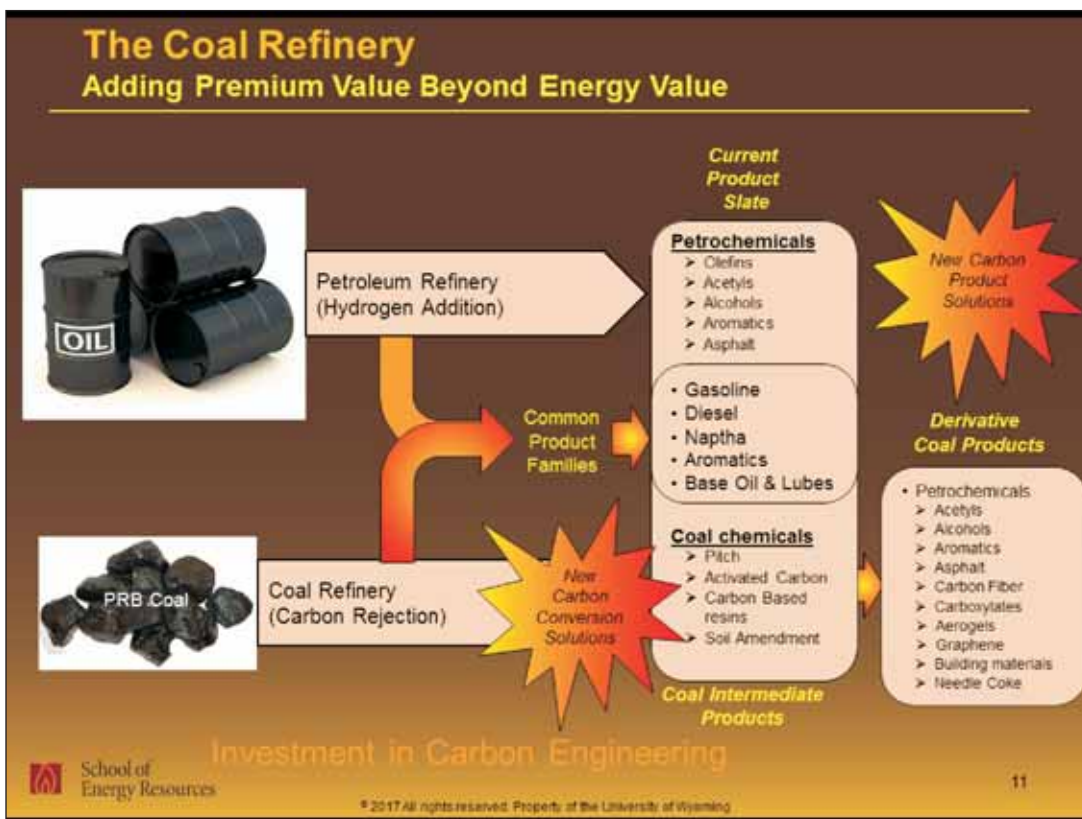


Kemmerer Plant showing Calciner & Cooler

Coal	Springfield Mo. Adirons	Bethuna	Majest Japan	Ekol	V Day	Texas Lignite
Mixture (as received), %	2.5	0.0	1.0	18.0	2.0	23.2
Dry basis						
Volatiles matter, %	26.7	38.2	45.5	43.8	44.2	49.9
Fixed carbon, %	69.2	54.2	52.9	52.9	51.4	54.7
Ash, %	11.1	7.5	6.7	7.5	12.4	12.4
FC - VM, %	2.33	1.42	1.30	1.20	1.68	0.79
Oxygen M.A.P., %	6.2	6.6	8.0	12.1	11.6	12.8
Coke, dry coal	72.5	78.4	82.5	77.9	77.1	82.5
T coal as wt% of coke	1.28	1.51	1.46	2.14	1.28	2.58
FC coke - FC coal, %	95.2	120.9	125.0	125.0	121.0	125.0
PMO coke						
Dry basis						
Volatiles matter, %	2.1	4.7	3.1	3.4	3.7	3.2
Fixed carbon, %	84.4	85.2	85.8	81.5	78.5	74.7
Ash, %	12.5	10.1	12.8	5.1	16.8	20.1
Crushing strength, psi	3590	4420	3620	3700	4194	3200

[Journal of Metals, May 1966]      © 2017 All rights reserved. Property of the University of Wyoming





### Summary of Coal Conversion...TODAY

- Some specialty chemical products today are derived only from coal
- Unlike crude oil, coal is not readily fractionable.
- Coal constituent polycyclic hydrocarbons readily react and polymerize.
- We know how to destruct coal and how to break it down into smallest molecules to build it up again (gasification and XtoL).
- Understanding conversion behavior – thermal impacts on molecular chemistry is crucial to exploit coal's 'hidden' value

BITUMINOUS COAL			
GAS		TAR	
OILS LIGHTER THAN WATER		OILS HEAVIER THAN WATER, CREOSOTE	
		PITCH	
DISTILLATION LIMITS AND GENERAL NATURE OF THE AROMATIC CONSTITUENTS			
LIGHT OILS HIGH IN PARAFFINS	NAPHTHALENES	CONSTITUENTS OF AN ANTHRACENE NATURE	
LIQUID AT ROOM TEMP.	SOLID AT ROOM TEMP.	LIQUID AT ROOM TEMP.	SOLID AT ROOM TEMP.
200°C	250°C	300°C	350°C

School of Energy Resources

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## Coal Differences - Technical

Ultimate Analysis	HV Bituminous	Sub-Bituminous	Lignite
Wt% Dry	Illinois #6, IL	PRB, WY	Beulah-Zap, ND
Carbon	71.72	69.21	61.88
Hydrogen	5.06	4.70	4.29
Nitrogen	1.41	0.89	0.98
Sulfur	2.82	0.30	0.98
Chlorine	0.33	0.03	0.00
Oxygen	7.75	18.67	16.44
Ash	10.91	6.20	15.43
Moisture, wt%	11.72	27.42	36.08

NETL. Detailed Coal Specifications, January, 2012

- High Oxygen in PRB
  - Liquid and solid products have significant oxygen
  - Can make oxygenated products such as phenols, xylenols, etc.
  - Investigating how to keep oxygen in liquids and solids rather than expel it as CO<sub>2</sub>
  - New Opportunities !!!

## Existing Approaches

### Classical Pyrolysis

Coal is converted using high temperature decomposition.

Advantage: (1) Can aggressively and deliberately breakdown coal into intermediate liquids and solids that are convertible into valuable products

Disadvantage: (1) Reduced O<sub>2</sub> atmosphere – needs H<sub>2</sub> or CH<sub>4</sub> gasses

### Gasification

Coal is blown with oxygen and steam (water vapor), while heated (pressurized).

Advantage: (1) Turn coal into multi-use feedstock i.e. syngas

Disadvantage: (1) Managing – separating the CO<sub>2</sub> is costly  
 (2) Converting to chemicals is energy intensive & costly  
 (3) Requires air separation unit for pure oxygen

### Coal Liquefaction

Coal converted to liquids by hydrogen addition

Advantage: (1) Multiple Product Yields  
 (2) Possible – Hedge Against crude oil

Disadvantage: (1) Qualities generally poor for chemicals  
 (2) CO<sub>2</sub> production challenge  
 (3) Consumes large volumes of water and hydrogen

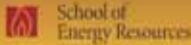
## Evaluating Coal Conversion Approaches

**Two ways to convert coal to extract 'hidden' value**

- **Thermally**
  - Pyrolysis, gasification and liquefaction
- **Chemically**
  - Solvent extraction (Single phase, Low temperature)

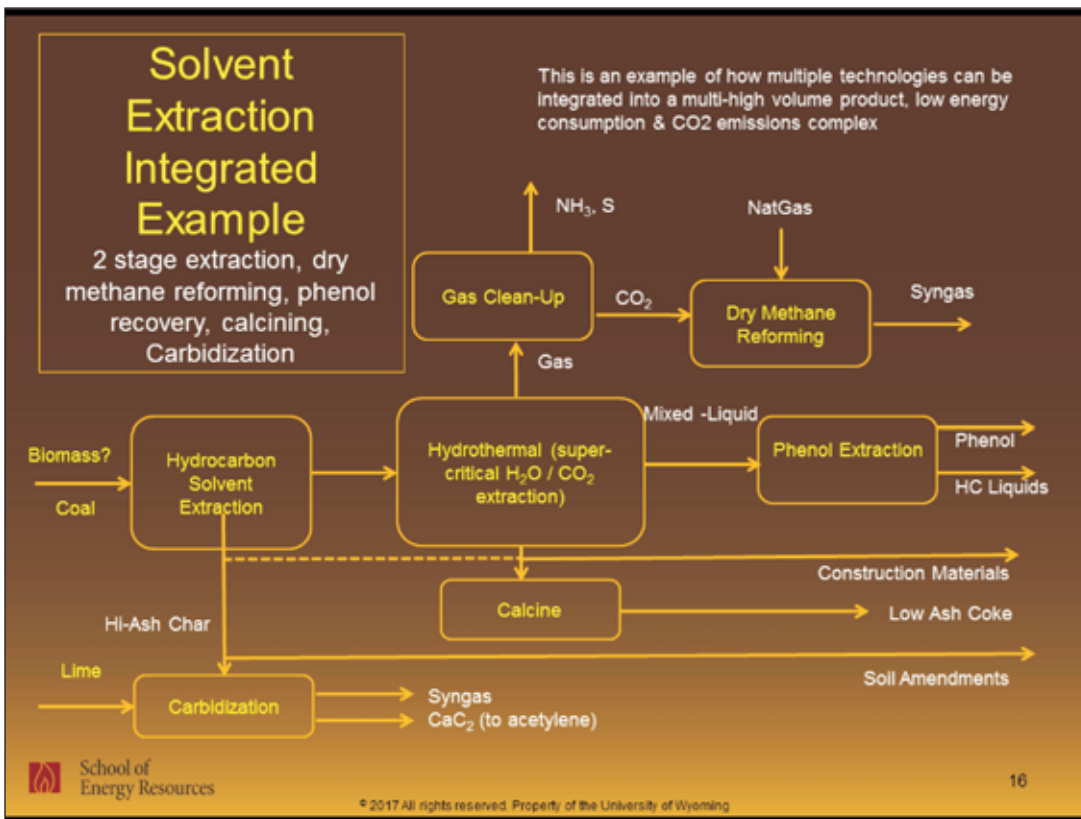
**Factors determining coal conversion approaches to pursue**

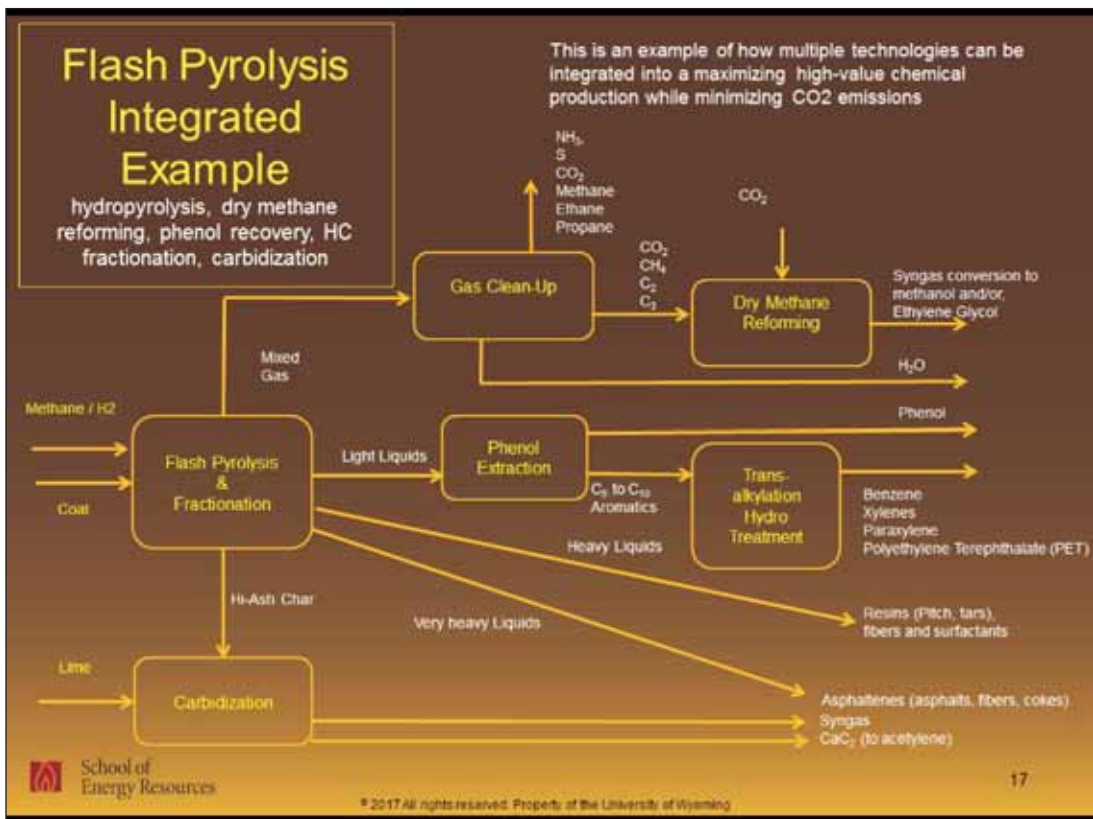
- **Considerations**
  - oxygen in liquids/solids
    - Somewhat unique to PRB Coal
  - Using complementary feedstocks with coal (e.g. natural gas), to diversify the portfolio of products that can be manufactured
    - Wyoming natural resource strength
  - managing CO<sub>2</sub>
    - Challenge for coal generally



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### Green Building Materials from Wyoming Coal

**Objectives**

- Develop green building material formulations for coal derived intermediate products
- Evaluate performance of coal based materials against building product specifications
- Identify performance improvement additives and chemistry changes
- Perform field trials

Wyoming PRB Coal → Coal extracts (solvent) → Heat-treatment (~500 deg. C) → Calcination → Coal derived 'Green' Building Products

(a) yellow fine textured geopolimer,  
 (b) geopolimer bricks,  
 (c) red ash fiber glass,  
 (d) coal ash silica aerogel,  
 (e) red glass

[ Ref: Fan Research Group, Department of Civil & Architectural Engineering, University of Wyoming ]

### Manufacture of Carbon Fiber and Silicon Carbide Fiber Products from coal derived Precursors

**Objectives**

- Derive & characterize coal tar and solid coal extracts to make fiber products
- Understand relationship between chemistry and product performance
- Make fiber products and determine mechanical and physical properties
- Validate application of products in high performance composite material duties

Wyoming PRB Coal → Supercritical CO<sub>2</sub>-ethanol Extraction → Filtration for Liquid/Solid Separation → Rotary-evaporation for solvent removal (to recovery) → Solid residue → Coal tar derivative → Silicon Carbide? / 100% Coal Derived Carbon Fiber

New Process (Under development) → Silicon Carbide?

[ Ref: Fan Research Group, Department of Chemical engineering, University of Wyoming ]




## Manufacture of High-performance composite-resin systems and coatings from coal


### Objectives

- Derive high temperature resin systems from coal extracts
- Extract and transform coal solid-derivatives into performance enhancing additives
- Design and validate coal derived composite material solutions
- Validate application of products in extended performance product duties


Wyoming PRB Coal

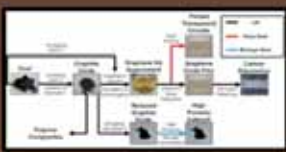


Diamond films produced directly from coal




Polyurethane resin systems





Graphitic Products

Raw Materials



Products

[ Ref: Jullian's Research Group, Department of Chemical Engineering, University of Wyoming ]

## Manufacture of Carbon Fiber Mats from coal derived precursors for electrical and thermal applications

### Objectives

- Derive & characterize coal tar and solid coal extracts to make fiber mats for electrical duties
- Understand the relationship between chemistry and product performance
- Make fiber mats with superior electrical performance
- Validate application of products in energy storage applications

Wyoming PRB Coal



Coal (solvent extracted) liquid Extract



Solvent Recovery



Electro-spinning



Heat-treatment



Elastic coal-based carbon fiber mat



Capacitance Characterization



High Performance Supercapacitor



[ Ref: Li Research Group, Department of Chemical Engineering, University of Wyoming ]

### Next Steps Immediate Plan

- Define coal conversion schemes
  - Validate techno-economic viability of Wyoming located coal refineries
    - 4 possible sites identified – Actively working with 3 owners
- Preserve and Protect Intellectual property
  - ~ 23 Patents filed provisionally or in process in FY 2017-18
  - ~ 3 or 4 awards made to date

School of Energy Resources

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### Synthesis of Carbon Materials from Coal Derived Precursors For oil field applications

**Objectives**

- Derive & characterize coal tar species based on solubility and adsorption behavior
- Understand structure-function relationships
- Synthesize carbon materials using bottom up and top-down techniques
- Validate application of products in enhanced oil recovery and oil spill cleanup

Wyoming PRB Coal

Direct Coal Liquefaction

Soxhlet Extraction

Sol-Gel Chromatography

Bottom-up Synthesis of Carbon Materials

Graphene Oxide  
Graphene  
Binders & additives

[Belt Coal Research Group, Department of Petroleum Engineering, University of Wyoming]

## Additive manufacturing of Polymer Derived Ceramic Matrix Composites

### Objectives

- Understand the application of 3D printing to manufacture ceramic products
- Understand relationship between chemistry and product performance
- Make products and determine mechanical/ physical properties/fitness for purpose
- Validate application of products in arduous & high performance duties

Wyoming PRB Coal

SIC whiskers for reinforcement and (a) laser scanning confocal microscopy intensity image of the SIC whiskers where the dimensions of SIC whiskers can be measured.

2 mm

Pyrolysis  
1000°C

Image of 3D printed pre-ceramic polymer & subsequent pyrolysed material at 1000°C ceramic using the bar resin.

Examples of polymer-derived ceramics parts fabricated via 3D printing and a close up of an inverse FCC structure highlighting the resolution capable with this method.

Prof. Farig & Frick Research Group, Department of Mechanical Engineering, University of Wyoming



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- Remote sensing surveillance and monitoring
- Specialized Services in the field of Clean Coal Technology like CBM, CMM, Shale gas, etc.



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# Carbon Capture Utilisation and Storage (CCUS): The State of Play

– Subir Gupta\*

Today I am going to talk about coal and climate change. Yes they are in conflict however one of the solutions to the conflict is a topic that I will be covering today.

The world is running out of its carbon budget. By some estimates the carbon budget will get exhausted within the next 20 years if the addition of carbon continues at the current rate.

The demand for energy is continuing to grow at a phenomenal pace. The largest contribution to this demand growth - almost 30% - comes from India, whose share of global energy use rises to 11% by 2040 (still well below its 18% share in the anticipated global population).

Even with rapid expansion of renewables coal-based power would continue to be part of the energy mix over at least the next 15 to 20 years. In this scenario it is extremely important that we look at all options to decarbonise the energy sector as a whole. While renewables with storage should continue to be a major thrust area the coal sector also needs attention.

The increase in energy-related carbon dioxide emissions in 2017 after a three- year gap is a strong warning for renewed global efforts to combat climate change and demonstrates that current efforts are insufficient to meet the objectives of the Paris Agreement.

One of the critical technologies that can be used for rapid decarbonisation is carbon capture utilisation and storage (CCUS). CCUS is a climate game-changer. It is one of the few technologies able to adequately displace CO<sub>2</sub> from coal and gas-fired power stations and the only technology capable of reducing large-scale emissions from a variety of industrial sources (*source: The Global CCS Institute*).

## The State of Play of CCUS Around the World

- 2017 was a year of "major advances in CCS deployment."
  - ◆ Petra Nova Carbon Capture in Texas came online just before the end of the year and is now the world's largest post-combustion capture facility at a power plant with a capture rate of 1.4Mtpa;
  - ◆ Key projects under construction include the Yanchang CCS facility in China, the Gorgon project in Australia and two facilities in Alberta, Canada; and
  - ◆ Major advances were also made in Norway, Canada and Brazil.

(Global CCS Institute, The Global Status of CCS: 2017, October 2017)

- There are currently 18 large-scale CCS facilities operating globally, with a further three coming online in 2018. Together, they will have a CO<sub>2</sub> capture capacity of 37 Mtpa;
- China has this month also opened the Jilin CCS facility, the world's 18th large-scale facility in operation with a storage capacity of 0.6 million tonnes of CO<sub>2</sub> per year;

- 20 large-scale CCS projects are currently in the pipeline. According to the Global CCS Institute, five projects are in the construction phase, four are in advanced development and a further eleven are in the early development phase;
  - ◆ Seven of these projects are in the power generation sector. They include four facilities in China, two in South Korea and one in the United Kingdom.
- In India, UK based Carbon Clean Solutions Ltd (CCSL) opened a first of a kind carbon capture and utilisation project
  - ◆ CCSL led a first-of-a-kind carbon capture and utilization (CCU) project in Chennai, India where it helped capture emissions, converting the emitted CO<sub>2</sub> into soda ash.

According to the Global CCS Institute, to reach the Paris 2°C target, 2,500 CCS facilities must be operational by 2040, and 14% of cumulative emissions reductions must be derived from CCS technology.

#### **Author's brief Introduction**

#### ***Mr. Subir Gupta***

Mr. Gupta is the Founding Partner at Sustainability Advisors and is also Senior Advisor at ERM. Earlier he was Chief Executive - India at ERM.

A Chemical Engineer with 35+ years experience. More than 20 years of these have been in managing the India business of one of the world's leading sustainability consulting firms engaged in providing Environmental, Social, Health & Safety, Risk and Climate Change Services and has made significant contributions- in developing the regulatory framework for hazardous chemicals management, hazardous waste management; in developing National - level Guidance Manual for Responding to Man-made Disasters, streamlining the regulatory environmental clearance process, and in developing the Sustainable Development Framework for the mining sector.

Mr. Gupta is a Senior Member of the American Institute of Chemical Engineers (AIChE). He is a member of the All India Management Association, and a Fellow Member of the Institute of Directors.

Mr. Gupta has earlier worked with Tata Sons and with Shriram Foods and Fertilizer Industries, New Delhi, (formerly DCM Chemicals).

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## TECHNICAL SESSION-IV

# Coal Gasification- An opportunities to meet Chemical and Petrochemical Demand

– Rajesh Jha

### Abstract

Coal - the majority stake holder in the Indian energy basket is facing major challenge in the years ahead from environmental perspective. So far coal is being used largely as a primary fuel and more so for use in thermal power generation, where level of harmful emissions are high. However, the advent modern coal gasification technologies have paved the way for use of coal into more value adding chemical and petrochemical products in cost effective and environmentally sustainable manner. This is particularly important for India, much of whose growth aspiration hinges upon the best use of its cheapest major primary fuel source i.e. Coal. The country has 136 years of reserve lying untapped. If even fraction of this untapped resource is utilized for production and therefore replacement of imported chemicals and petrochemicals through use of coal gasification technology, India can save annually USD 20 billion. Not only this saves valuable foreign exchange, but also it can improve India's energy security manifold. However this being a nascent concept in India, Govt of India needs to initially support this industry through suitable policy initiatives.

### Author's brief Introduction



#### ***Mr. Rajesh Jha***

Mr. Rajesh Jha is currently the MD&CEO of Adani Vizhinjam Port Pvt Ltd. Mr. Jha is also the Director of Mundra Solar PV Ltd.

Mr. Jha is a B.Tech in Metallurgy from IIT Roorkee and was also the Executive Senate Councillor of the Students Association from 1985-86 to 1987-88.

Mr. Jha started his career with Tata Steel. His previous assignment before Adani Group was with Utkal Alumina International Ltd. (Aditya Birla Group) as MD&CEO. He was the Vice Chairman of CII Odisha for the Year 2013-14.

Mr. Rajesh Jha is serving as a member of Surface coal gasification committee of NITI Aayog for the last two years.

# Coal to Liquids: Opportunity for India - A Critical Analysis

– Dr A. K. Balyan\*, Paritosh Sharma\*\*

## Abstract

Coal to Liquids technology, CTL as normally referred, converts coal into liquid hydrocarbons. CTL is a subset of CTX where 'X' is for different forms of hydrocarbon that can be produced from coal. The technology primarily involves gasification of coal in a reducing environment to produce Synthetic Gas (Syngas) and further second stage conversion of Syngas to produce value added products such as fuel, feedstock, fertilizer etc or for generation of power. CTX has been in use across the world since decades as an alternate to crude oil/natural gas as source of energy/feedstock.

In recent years CTL has gathered renewed interest particularly among emerging economies which have coal reserves to compliment/substitute the fuel imports for their energy needs. CTX has been found as successful technology by China and it has set up a number of CTX plants utilizing domestic coal to produce fuel, fertilizer, chemicals and other value added products in last two decades.

India has abundant coal reserves to the tune of 315 billion tons and a good amount of value could be unlocked by utilizing a part of these reserves by producing value added products through coal gasification route. Commercially, Coal gasification technology was introduced in India with the development of coal gasification based fertilizer plants in 1970s and since then not much development has taken place here.

The aim of this paper is to investigate the potential value and sustainability of the products produced through CTX route in India. CTX has three main routes of producing value added products, 1) Fischer Tropsch (FT) Liquids, 2) Methanol and 3) Ammonia. Owing to good domestic demand, FT Diesel, Methanol and Urea have been chosen for comparative evaluation with the conventional process.

Coal characteristics have major impact on the gasification process and thus define the type of technology to be used. Out of the three technologies (Fixed/Moving Bed, Fluidized Bed and Entrained flow), only Fixed/Moving Bed and Fluidized Bed gasifiers are considered suitable to gasify the high ash Indian coal. The paper evaluates the cost of production of FT Diesel, Methanol and Urea from typical Indian coal. The following has been considered for the study:

- SES U-Gas gasifier technology - Due to its high efficiency and suitability for Indian coals,
- An 'F' Grade coal with GCV of 3800 Kcal/Kg coal with 30% ash

The study is divided into two parts viz. 'Coal to Syngas' and 'Syngas to Product'.

Coal to Syngas : For this part, economics of a coal gasifier plant capable of producing 5 million metric cubic meters per day (mmscmd) natural gas equivalent Syngas has been considered.

Syngas to Product: For the second phase of converting Syngas to products, economics of a plant capable of producing 1 million tons per annum (MMTPA) of each product has been considered.

Based on some realistic assumptions, conversion efficiencies, prevailing price benchmark, logistics and taxation rates, the broad economic evaluation suggests that the production costs of CTX based



liquids/products are in a comparable range to the conventionally produced liquids/products. Although this analysis has multiple cost inputs and assumptions, it is felt that coal to liquids makes a good case for serious consideration in India for utilizing abundant low rank domestic coal.

It is time that India should consider pursuing the development of such Coal based technologies which can accrue the benefit of reduced dependence on energy imports and thereby enhancing Energy Security. As a way forward, it is recommended that Government must support CTL/CTX by initiatives like PPP model based projects, liberalized technology imports, lower taxation, obligatory use and soft funding.

### Author's brief Introduction



### *Ashok Kumar Balyan*

- Presently working with Reliance Infrastructure Limited a group company of RELIANCEADA GROUP as CEO, Oil & Gas from July 2015.
- MD & CEO in Petronet LNG Ltd., New Delhi from July 2010 to July 2015. Successfully commissioned Kochi LNG Terminal, Fast Tracked Expansion of Dahej LNG Terminal from 10 mmtpa to 15 mmtpa and further to 17.5 mmtpa to one of the biggest LNG Terminal in the world.
- Worked in ONGC E&P Group from 1976 till 2010.
- Director (HR) & Business Development in Oil & Natural Gas Corporation Ltd., New Delhi from 2003 to 2010.
- Research Officer in Shri Ram Institute for Industrial Research, Delhi from Dec. 1972 to Oct. 1976.

### Experience

- About 45 years of experience in Oil & Gas business in Upstream, LNG and Downstream Petrochemicals, Renewable Energy Sectors.

# Surface Coal Gasification - A Case Study of Talcher Fertilizer Project

– Devendra Prasad\*

## Abstract

Coal, though of varying quality across different geographies, is available in abundance in India. For over half a century, it has given momentum to growth of our country by satiating its energy requirement. Breaking the traditional perception of being an energy product, coal can also mark its existence as a 'chemical feedstock' through coal gasification route. Surface coal gasification has also emerged as a cleaner way of utilization of coal with minimum environmental impacts. This paper introduces the reader to the Indian coal mining industry and coal gasification technologies in general. This paper summarizes the experiences in the gasification sector from the Talcher fertilizer project of TFL (a JV of CIL, RCF, GAIL and FCIL) and the prospects for future. This paper makes an attempt to showcase the strength and opportunities that lie in coal gasification sector which can be harnessed by taking meaningful policy decisions and fiscal support.

## Author's brief Introduction



### *Shri Devendra Prasad*

Shri Devendra Prasad was the Director on Board of Talcher Fertilizers Ltd. (TFL) and Hindustan Urvarak & Rasayan Limited (HURL), the two JV companies of CIL in Fertilizer Sector. Shri Prasad graduated in Mining Engineering in 1983 from Indian School of Mines (ISM), Dhanbad. He has also obtained 1st Class Mine Manager's Certificate of Competency from Directorate General of Mine Safety (DGMS).

Shri Prasad who joined CIL as Junior Executive Trainee in 1983, has over three and a half decades of experience in the entire coal mining value chain. While working in various echelons in the opencast (OC) & underground (UG) mines of CCL and BCCL, Shri Prasad demonstrated outstanding achievements in the fields of production planning and dispatch of coal. As Project Officer of Dakra OC project in CCL, he was responsible for before time completion of Diversion of Sonadoba Nalla in 9 months instead of 36 months thereby releasing coal reserve locked underneath the nalla, for which he later received appreciation from CMD, CCL in 2005. This feat steered Dakra OCP from a loss making unit to a profit making unit. As Project Officer of Ghanoodih OCP of BCCL in 2006-07, Shri Prasad achieved a record production of 14.5 Lakh tonnes of high grade coal and thus achieved the place of highest profit making project of BCCL by recording a profit of Rs 117 Crores. As the General Manager of Govindpur area of BCCL, he showed exceptional decision making abilities by introducing innovative growth strategies in Block IV and Akash Kinari OC mines, implementing Intermediate Technologies for operation of UG mines and taking up the closure of Maheshpur UG mine, a high loss making unit. These crucial actions were key factors behind turned around of Govindpur Area, a constantly loss making area of BCCL, to a profit making one by recording a profit of Rs 62 Crores. As the General Manager of Kusunda Area of BCCL in 2016 -17, he recorded coal production target of 55.61 Lakh tonne and thereby earning a profit of Rs. 404 Crores. While working at corporate headquarters of CIL as Head of the Corporate Communications & Public Relations Division, he showcased remarkable abilities in brand and image marketing of CIL at the time of its IPO.

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## Technology for Reduction of Moisture from High Moisture Coal & Lignite

– Robin T. Eves\*, Aiden Neary\*\*  
S K Grover\*\*\*

For decades Coal has internationally been the most important fossil fuel for generation of electricity and had been nicknamed as 'Black Diamond', but it is considered as dirty fuel. With more & more thrust on environment aspects, Renewable Resources of Energy is emerging as strong competitor for Coal. Coal is the only fuel which generally is not refined before use. Crude oil is not only refined but lot of research work continues in this sector for finding environmental friendly use of products out of Crude Oil.

It is with this back ground CCTI has developed a technology of reduction of moisture from high moisture coal & lignite to a level even below inherent moisture in coal. In coal beneficiation or its washing, ash is reduced to some extent, but none of inherent pollutants such as excess moisture, organic sulphur, & mercury get reduced. Such pollutants in Coal are emitted during Coal Combustion.

In CCTI Technology these pollutants are removed post combustion. CCTI has patented Pristine™ & Pristine MTM. CCTI Technology upgrades high moisture low Rank Coal (LRC) & Lignite by increasing their heat value and reduces their moisture & Volatile Matter (VM) to limited extent. The process operates continuously at atmospheric pressure and utilizes the lighter gases to provide supplementary process heat, while the heavier gases are condensed and captured as a liquid by product for sale to a secondary market.

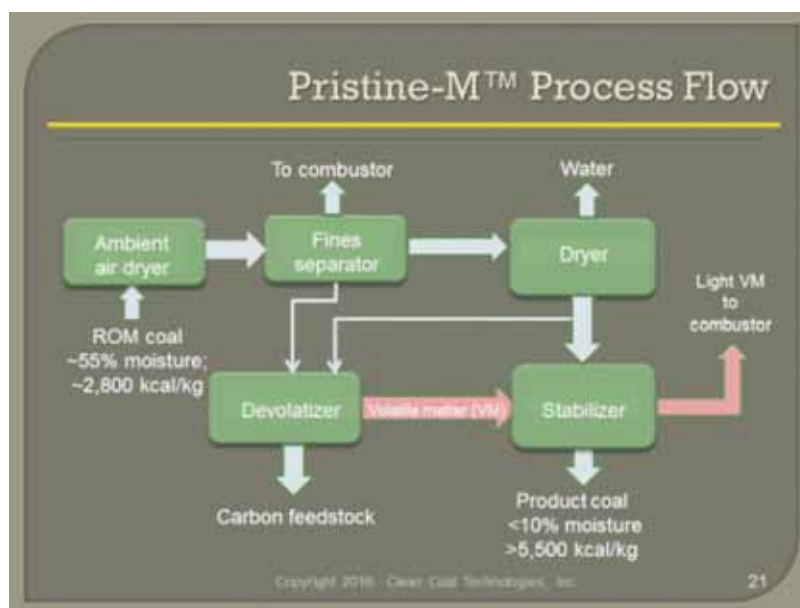
In brief the entire coal is heated in inert atmosphere at temperature of about 110° in a Chamber named Drier. The final moisture content of the products may be anywhere from 5 to 15% depending coal characteristics, customer's requirement and from techno-commercial considerations. From Drier part stream is passed on to a Chamber titled Devolatilizer and main stream of Coal is passed to a Chamber called Stabilizer. In Devolatilizer coal is heated to a temperature of about 450°. In Devolatilizer the mid range of hydrocarbons in VM produce gases & vapours. These vapours in hydrocarbons are allowed to condense on the cooled demosturised coal in the Stabilizer Chamber and in the process the vapours of lighter hydrocarbon penetrate into the pores of demosturised coal and get condensed. The heavier hydrocarbons that got condensed are sprayed on the surface of coal particles. On further cooling these hydrocarbons solidify and seal the coal from ingress of water thereby preventing any moisture reabsorption, spontaneous combuston and any tendency to disintegrated. It also helps to aggloncreate fines getting into the system.

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\*CEO - CCTI

\*\*CFO - CCTI

\*\*\*Adv (Tech) - CCTI



Quite a few coals were tested in Pilot Plant of 3tph at Shady Point Oklahoma. The Schematic layout is as under:

Based on further interaction with School of Energy Resources Dept of University of Wyoming USA further modification by introducing of Rotary Kiln between Devolatilizer & Stabilizer is being introduced to produce more consistent, reliable & cost effective process.

We can sum up by stating that high moisture lower rank coals/lignite with GCV of about 2800 K.Cal/Kg on ARB with moisture of about 50/55% can be upgraded to produce coal/lignite with GCV of >5500 K.Cal/Kg (ARB) with 10% Moisture.

### Author's brief Introduction



#### **Mr. Robin T. Eves**

President and CEO of Clean Coal Technologies Inc. 2010 - Present.

Global Energy expert with 40 years of senior management positions around the world focusing initially on Oil but more recently on coal.

Has been a managing Director at Cargill, Synergy International SA and the investment Bank UBS.

He has lived in London, Paris, Geneva, Abu Dhabi and Singapore and travelled extensively around the world especially in India, where he was born, Indonesia, Russia and the Middle East.

Mr. Eves is a major supporter of coal as an energy feedstock and a producer of valuable by products, he passionately believes that Technology is the answer to the sustainability of coal for many years to come.



***Mr. S.K. Grover***

- Graduated in Mining from Indian School of Mines, Dhanbad in 1962.
- Over three decades of rich experience in coal mining operations, coal transportation and logistics and ash utilization while working with companies like National Coal Development Corp (NCDC), Coal India Limited (CIL) and NTPC Ltd.
- Associated with Videocon Industries Ltd. from 2007 to Aug 2011 as CEO and succeeded in acquisition of coal concessions in Indonesia.
- Until 2016, he was associated with Tata Power as Consultant
- Achievements include deputation by Govt. of India to Australia as a delegate to attend ISO meeting on coal.
- Was also member of committees for studying use of beneficiated coal, member of technical group on grading of coal and as well as member action groups constituted under Planning Commission to look into development of coal mines, their coal preparation plants vis a vis coastal power plants and coal transportation system by rail-cum-sea from mines to the proposed coastal plants for the country.
- Since Nov 2017, associated with CCTI as Advisor (Tech).

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## TECHNICAL SESSION-V

# Coal as Green Energy Source

– Lydia Powell

Industrial society rejected green energy from wind and water saying that it is 'inconsistent, uncontrollable, costly and scattered up and down the country-side' and chose coal that was cheap, urban, controllable and consistent (Karl Marx). Post-industrial societies who want 'green' energy assume that the inconsistent and uncontrollable nature of wind and solar can be regulated by intelligent information and storage systems (batteries).

Electricity (generated from Coal or renewable energy) is a heterogeneous good along time, space, and lead time. The economics of electricity is shaped through physics. Laws of electromagnetism constrain storage, transmission and flexibility. In this context, different sources such as coal and solar produce different goods with different heterogeneity and marginal value. The main message of the presentation is that the focus must shift from fuels that generate electricity (coal/solar/etc) to electricity and what consumers are willing to pay for values such as (greenness, reliability and efficiency) in electricity. This will decide the relative merits of fuels such as coal and renewable energy.

Electricity is regarded as an essential good with no real substitutes across majority of the services it provides (lighting, appliances, information technology). Electricity is also a network industry. This means that it is impractical for consumers to have different levels of reliability or greenness. Even if technically achievable the transaction costs of letting individual consumers decide their own level of value preference (greenness/reliability) may be too high.

Electricity markets are not technology neutral. They are designed around costs and operating characteristics of particular technology options which in the Indian case is coal. The technology of 20th century electricity systems were designed to most efficiently reflect the industry's costs and prices. Consumer preferences (such as their degree of 'greenness' or degree of reliability) were given low priority. This meant that the systems fell into a 'merit order' approach with low marginal cost and inflexible plants like nuclear at the bottom, high marginal cost flexible plants like open cycle gas turbines (OCGT) at the top and workhorse coal plants in the middle.

This approach of kWh pricing based on merit order approach electricity markets have promoted operational efficiency by ensuring that the lowest marginal cost plants at any particular time are those called to operate.

The policy thrust on low carbon energy (green) has meant that electricity market prices have ceased (or in the process of doing so) to perform their main functions of providing incentives for efficient operation and investment, remunerating energy resource providers and providing effective price signals for consumers.

Many believe that capacity markets are the answer to the woes of fuels such as coal in the context of the growth in renewable energy. However with capacity markets decision making is transferred to government suppliers. Their decisions may be arbitrary at best or politically motivated at worst.

Global energy transitions in the past were not driven by cost competitiveness. Diffusion of technologies at the demand end with consumers wanting convenience and cleanliness drove the shift to refined petroleum and grid based energy forms (natural gas and electricity). India's low carbon transition could also be driven by consumer preference for decentralized clean energy rather than by substitution at the supply end as it is envisaged today.

#### **Author's brief Introduction**

#### ***Ms Lydia Powel***

Ms. Powell has been with the Observer Research Foundation for over 18 years working on policy issues in energy, water and the environment in the Indian context. Her current interests include energy security, energy access, carbon constraints and its impact on India's energy security, clean coal for energy and environmental security, regional cooperation for environmental security (India and Bangladesh) and Federalism and its impact on Indian energy policy. She contributes commentary and analysis on the Indian energy sector regularly. Her most recent paper was a book chapter on India's Energy Transitions. Ms. Powell has also worked for Norsk Hydro and for Orkla, two of Norway's largest conglomerates whose interests include energy. Ms. Powell has three Post Graduate Degrees - two on Energy from Norway and one in Solid State Physics from India.

## Coal Washeries - General Scanario in India

– Gurudas Mustafi\*, Sushil Kr Dubey\*\*

### Abstract

The demand for Low ash coal has increased drastically in the last few years and is likely to remain on a stable high production level for years to come. With the decline of existing and known low ash coal resources, the coal industry focuses on the import of coal from other countries to meet its requirement for electricity for all and to use coal as a green energy source.

This paper discusses how we can utilize the advanced technology to cater our need with green environment. Beneficiation/washing of inferior coal will produce green coal which will meet the environmental regulations and quality stipulation of the end users, for which we are now dependent on foreign nation.

This paper also discussed on major deterrents involved in coal washing and also suggests the way out to meet our future demand as per our Government of India VISION 2030.

**Keywords:** Coal washing, Green energy, Coal VISION 2030.

### Author's brief Introduction



#### *Mr. Gurudas Mustafi*

CEO & Director, MBE Coal and Mineral technology India Private Limited (Formally McNally Humboldt Wedag Minerals India Pvt. Ltd.) Mr. Mustafi after his graduation in Science from Calcutta University completed his 5 years Mechanical Engineering from the prestigious Indian Railways Institute of Mech.& Elect Engineering with distinction. He has an experience of more than 30 years in Marketing & Sales, Business Development, Manufacturing, Project Management & Execution, Operation Management & Corporate Planning

having served in Government, Multi National & professionally managed companies in different locations.

Widely experienced in coal & mineral beneficiation technology & having set up in India a number of coal Washeries with different processes for both Public & Private Sectors, he is a well acknowledged figure in this field.

He is a member of the Coal Preparation Society of America & a Life Member of the Coal Preparation Society of India and an active participant in the International Coal Preparation Congresses besides having chaired & presented a number of technical papers on mineral beneficiation in different seminars in India & a broad.

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\*Wholetime Director & C.E.O, MBE Coal and Mineral Technology India Pvt. Ltd.

\*\*Senior Process Engineer, MBE Coal and Mineral Technology India Pvt. Ltd.



## Pressure Filtration to Increase the Economic Value of Fine Coal

– Sunil Yadav

Today the Indian Coal is washed upto minus 10mm because of the fear of adding moisture to the final product. As a result 25-30% of the coal is unwashed and mixed directly with the product. The overall effect is that there is a loss of yield. Further the washery operations suffers considerably during the monsoon months, 4-5 months in year, when it is very difficult to dry screen the coal at 10 mm.

With the use of pressure filters it is now possible to wash all the coal down to zero to maximise the clean coal production with the required moisture level throughout the year.

The paper elaborates the process adopted for cleaning the Indian Clean Coal.

### Author's brief Introduction



*Mr. Sunil Yadav*

#### Experience

- Sunil Yadav is an Independent Consultant in the field of Coal & Mineral Processing with more than 38 years of Industrial Experience gained through working with Metso Mineral, Svedala Industries and Triveni Engineering.
- Has done Chemical Engineering Degree from Birla Institute of Technology and Science, Pilani, in the year 1980.
- Exposure to all Product Lines from Crushing, Screening, Grinding, Separation (Gravity/Magnetic/Flotation), Thickening, Dewatering, Filtration, Drying, Pyro Processing
- Some of the jobs handled are
  1. 700 TPH Non Coking Coal Washery for Jindal Power at Tamnar in Raigarh.
  2. 350 TPH Coking Coal Washery for Electrosteel Casting Ltd at Parbatpur in Bokaro.
  3. 1 MTPA Coarse Coal Washeries for Aryan Coal , Global Coal , Gupta Coal ( 2 nos ), Bhatia Coal.
  4. 1 MTPA Small Coal Non Coking Coal Washery for ESPL.
  5. 350 TPH Non Coking Coal Washery for Global Coal.
  6. 200 TPH Coking Coal Washery for Jindal Steel & Power Ltd.
  7. Coal Flotation Plants at Dugda-1, Dugda-2 and Gidi Coal Washeries of Coal India.

## TECHNICAL SESSION-VI

# Statutory & Non-statutory Reforms for Sustainable Coal Mining, Forest, Wildlife & Environment Perspective Coal Mining Plan – 2025 & 2032

– Ravindra Nath Saxena\*

India is one of the 12 mega biodiversity rich country, harbouring a wide variety of flora and fauna. The country is home to 5100 species of vascular plants and about 6800 species of wildlife; but we have witnessed extinction of 21 species and large list of "red data book". The forest area of the country is 7,57,740 sq.kms., which is 23.41% of the geographical area. The country is having 3,99,919 sq.kms of "reserve forests" (not burdened with privileges) and 2,38,434 sq.kms. of "protected forest" (communities are having traditional privileges for Nistar). There are 602 national parks, wildlife sanctuaries, conservation reserves and community reserves covering area os 1,55,678 sq.kms. Among these protected areas an intricate web of wildlife corridors are situated along with Important Bird Areas (IBAs), wildlife activity areas, CITES sites, sites covered under international conventions etc. The forest land is having heterogeneous origin and sometimes come under blanket notifications. These blanket notifications were the need of hour in 1940s to 1960s; but with the passage of time reforms have not taken place due to lack of vision. In nutshell the situation is extremely complicated.

It is a great cause of worry that international price of petroleum crude is moving up steeply (Brent crude crossed 76US\$/B recently). Looking to the trade war, sliding of INR versus US\$ and political instability among USA - China - Russia - Iran, future of "energy security" is uncertain. Consequently achieving GDP growth rate of 8-10% will be a difficult, distant dream. To achieve the target production of 2600 million tonnes by 2032 (of Integrated Energy Policy), the country is required to open about 300sq.kms of Sal (*Shorea robusta*, family Dipterocarpaceae) forests, may be the country have to realign some of the "wildlife corridors" to develop coal infra-structure; with meticulous "Mitigation Planning" to reduce adverse "ecological damages". To achieve these radical targets, the country is required to have the "Perspective Coal Development Plan, 2025" and "Perspective Coal Development Plan, 2032" to take the care of visionary planning and guidelines for Forest Appraisal Committee (FAC) and Expert Appraisal Committee (EAC), GoI.

### I. Integrated Energy Policy, 2020 provides

The Integrated Energy Policy, 2020 provides that the country is required to produce / import 2600 million tonnes of coal to generate 8,00,000 M.W. of thermal power. Even in "best case scenario" (BCS), India is required to depend on domestic coal to the tune of 55-58% for energy requirements. The alternative resources of energy can account for 11% only by 2032. Thus the country has to develop coal sector to achieve and maintain GDP growth rate of 8-10% per annum.

### II. Constitutional & Statutory Provisions

At the time of promulgation of the Constitution of India, subject of "forests" was kept in the "State List". There was no entry of "wildlife". "Forests" transferred to the "Concurrent List", List-III as Entry-17A

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\*Former Principal Chief Conservator of Forests, Madhya Pradesh

and "Wildlife" as the Entry-17B by the 42<sup>nd</sup> Constitutional Amendment Act, 1976. Article-251 & 254 of the Constitution provides that state statutes cannot be repugnant to Central Acts. If there is any repugnancy, state statutes automatically becomes "null & void".

### **III. Barrier Analysis to Forest (Conservation) Act, 1980 and Environment (Protection) Act, 1986**

Intricately woven "forest clearance" and "environment clearance", but impact assessment carried by different departments of State Government & MOEF, and two different committees - FAC and EAC examine project proposals. Land is having heterogeneous origin - forest, revenue forest, dictionary meaning conforming forests, blanket notifications. Frequent modifications of constitution of committees. Absence of specifications of "parameters of impact assessments" in FCA and EPA. Parameters of "impact assessment" modified frequently by committees without any justification. Same parameter assessed by two committees. Cumbersome, lengthy case assessment at several levels. No well established co-relation between "forest clearance" & "environment clearance". Move to amend Indian Forest Act, 1927 and make it Panchayatiraj Extension to Scheduled Areas Act, 1996 and Scheduled Tribe & Other Forest Dwellers (Recognition of Forest Rights) Act, 2007 compliant - shall lead to lots of local socio-political interference in coal mining operations.

### **IV. Coal Blocks, transportation, infra-structure and forest resources**

There are 584 coal blocks, 17 CBM blocks (all in Sal forests, area more than 600 sq.kms.) in the country, almost all are situated in forest areas. About 30-40 small coal blocks are located in Teak forests, rest approximately 524 coal blocks situated in Sal forests. Forest (Conservation) Act, 1980 & Environment (Protection) Act, 1986 (EIA Notification, 2006) provides for assessment of the cases; but parameters for assessment are not defined. Artificial & complicated parameters adopted by FAC, EAC, Standing Committee of NWB etc. Parameters change with the modification in composition of committees. Root cause of delay. Amendments in Forest (Conservation) Act, 1980; Wildlife (Protection) Act, 1972; Indian Forest Act, 1927; Environment (Protection) Act, 1986 are not required for reforms. The target production (Integrated Energy Policy and Coal Policy) of 2600MT by 2032 is not possible without development of indigenous, green field coal resources. Diversion with effective mitigation planning is possible (about 11.3% of opencast production cost). Alternate wildlife corridors [Section-38O(g) of Wildlife (Protection) Act, 1972] can be developed, fragmentation & porosity can be taken care-off. Indigenous coal still much cheaper than imported coal. All factors are under the control of GOI.

Important States - Madhya Pradesh, Chhattisgarh, Jharkhand, Uttar Pradesh, Jharkhand, Odisha, Telangana and Maharashtra - most of the minerals available except petroleum. Coal rich districts are having 40-55% forest cover, hence minimal adverse impact on "regional ecology".

### **V. Forest Resources, "Forest & Environment Clearances" & Mitigation Planning**

Resisting forest area diversion is impossible - develop "Mitigation Planning Techniques" - Greenbelt Plan, Safety Zone Plan, Cluster Approach in Mining, Reclamation Planning, Landscape Plan, Biodiversity Indexing, Wildlife Habitat Management Plan, Wildlife Rehabilitation & Resettlement Plan, Ecological Risk Analysis, Corporate Social Responsibility (CSR) Plan, Tree Transplantation Plan, etc.

- Large scale crop dried and died after *Phoenix sylvestris* infestation in Nagri & Sihawa (Dhamtari district, CG) and Narharpur, Keskhal, Korar, Pharasgaon Ranges (Kanker & Kondagaon district, CG) in 1980s. Sal Regeneration absent except Kanha National Park, MP. "Sal seed collection", huge threat to Sal regeneration. Critically small "germination period" of 7 days. Monsoon is shifting to July and August. Genetic incompatibility.
- Submit only one FCA proposal consisting of coal mine, transmission line, demand additional forest area for placing first over-burden dump (OBD), hydro-structure, water linkage for thermal power plant, water pipeline, tram / conveyor belt / railway etc.
- Submit "Mitigation Planning Techniques" - Greenbelt Plan, Safety Zone Plan, Cluster Approach in Mining, Reclamation Planning, Landscape Plan, Biodiversity Indexing, Wildlife Habitat Management Plan, Wildlife Rehabilitation & Resettlement Plan, Ecological Risk Analysis, Corporate Social Responsibility (CSR) Plan, Tree Transplantation Plan, etc.
- Resettlement & Rehabilitation Plan.
- "Forest Crop Assessment" - Stratified sampling statistical design, use technical data of working plan to analyse longevity of forest crop, senescence issues, at least 5% of crop assessment, sample plot size 100MX100M, photographs and video of sample plots, Biodiversity Indexing of sample plots; separate enumeration of timber, half sound and firewood trees, coppice should be recorded as one tree.
- Use State Volume Table to assess "growing stock", Basal Area Assessment of sample plots, Rare, Endangered & Threatened (RET) species found in the diversion area, status of regeneration.
- Depending upon fault lines, the coal mining area may be divided into 5-6 phases to reduce ecological foot prints.
- "Coal Mine Plan" - Once it is approved by the Ministry of Coal, GoI; this issue should not be reopened by Forest Appraisal / Expert Appraisal Committee.
- Diversion with effective mitigation planning is possible (11.3% of opencast production cost).
- "Wildlife Impact Assessment, Wildlife Habitat Management Planning"; assessment of nocturnal wildlife, alternate wildlife corridors [Section-38O(g) of WLPA] can be developed, fodder plots, water holes, etc. Submit separate "wildlife proposal" to CWLW, State Wildlife Board and Standing Committee of the National Wildlife Board. Fragmentation & porosity can be taken care-off. Indigenous coal is still much cheaper than imported coal.
- Most of the coal / CBM blocks require 600-2000ha. for sustainable mining for 30 years and operation of thermal power plant for 45 years. The FCA clearance can be accorded in one stroke and forest felling can be carried-out in 5-6 phases to reduce adverse ecological impact. The safety zone should be increased to 20 to 50 meters along perennial streams / nallahs with adequate "soil moisture conservation measures" to reduce pollution of water bodies. The reclamation should be carried-out in phased manner, it would reduce cost of reclamation operations and ecological foot-print as well.

- The trees upto 60 cms girth classes can be transplanted without much problems. The fruit bearing species like Mahua, Achar, Bel, Aonla, Sitaphal, Tendu etc. should be transplanted on the rehabilitation sites of oustee families. This would reduce drudgery of oustees families to a considerable extent. Definitely reduce intervention by Left Wing Extremism (LWE).
- All the project proponents should be forced to collect seeds from the mature trees, likely to be felled due to the project. The seeds from these mature trees should be sown in the local forest nursery to conserve "gene pool" for propagation in the adjoining area.
- The Corporate Social Responsibility (CSR) should start as pre-operational project activity. The provision of Section-135 of Companies Act, 2013 is topsy turvey, which entail that the company should spend 2% of profit after tax (PAT) on CSR. Suppose the company is unable to achieve profit, then rural & tribal communities shall suffer due to damage to natural resources.
- The sanctioned mining plan can be used after Stage-I sanction for preparing "Reclamation Plan". The Reclamation Plan can be submitted before issuance of Stage-II under FCA. Most of the mining companies are not carrying-out "technical reclamation" of the mined-out site and doing "biological reclamation" of the site or skipping all reclamation operation at all. Root cause of PILs and bringing bad name to the mining companies. No Guideline has been issued for the preparation of "Reclamation Plan".
- The FAC and EAC should develop, their own libraries for "site assessment operations" (including working plans, forest stock maps, data of wildlife impact assessment, biodiversity indexes; Red Data Books of International Union for Conservation of Nature, Wildlife Institute of India, Zoological Survey of India and Botanical Survey of India). Forest satellite maps of Forest Survey of India should be compulsorily made available to FAC and EACs. Mostly absence of relevant data causes inordinate delay in processing of cases.
- The FAC and EACs are not preparing "cause list" of the cases for hearing; the project proponent is not invited to make presentations about the case. The proceeding of the FAC and EAC should be made available outside the room for public view. After the proceedings are over and the cases have been decided finally, the videos of the proceedings should be made available on the website of MOEF, GOI.
- That, at present there is no proceeding sheet on the case, this lacuna is suppressing the identity of the officer(s) responsible for delay in processing of the cases. The objections raised by the assessing officers should be made available to evaluate, whether the project proponent has been harassed or not.

## VI. Recommendations

To achieve these ambitious targets of the Integrated Energy Policy, the country is required to have the "Perspective Coal Development Plan, 2025" and "Perspective Coal Development Plan, 2032" to take the care of visionary planning and guidelines for Forest Appraisal Committee (FAC) and Expert Appraisal Committee (EAC), Standing Committee of the National Wildlife Board, National Tiger Conservation Authority (NTCA), GoI and the Judiciary.

**Author's brief Introduction****Mr. Ravindra Nath Saxena****Specialisations:**

- Policy issues, legislative functions and legal aspects of national environment, forest, mining and biodiversity statutes. Legal, administrative and technical aspect of Indian Forest Act, 1927; Forest (Conservation) Act, 1980; Wildlife (Protection) Act, 1972; Biological Diversity Act, 2002; Panchayati Raj Extension to Scheduled Areas Act, 1996; Scheduled Tribe & Other Forest Dwellers (Recognition of Forest Rights) Act, 2007; Environment (Protection) Act, 1986; Water (Prevention and Control of Pollution) Act, 1974; Water (Cess) Act, 1977; Air (Prevention and Control of Pollution) Act, 1981; Public Liability Insurance Act, 1991 and National Green Tribunal Act, 2010.
- Management of natural resources - expert of Sal (*Shorea robusta*), Tiger (*Panthera tigris*) and Asiatic Elephant (*Elephas maxima*) the 3 species most crucial for the development of mining sector in India.
- Sustainable mining development in forest areas - "Wildlife Impact Assessment" (WIA), Wildlife Habitat Management Plan, obtaining "wildlife clearance" under the Section-38O(g) of Wildlife (Protection) Act, 1972. Wildlife corridor planning. Rehabilitation & Resettlement planning of displaced wildlife.
- Coal Bearing Areas (A&D) Act, 1957; Mines & Minerals (D&R) Act, 1957-2015: Mining infrastructure, Reclamation of mined out areas, tailing ponds, safety zone, landscape planning, compensatory afforestation planning. Cluster in mining development.

**Hallmarks of legislative skills (before/ after retirement)**

That I have been appointed members / Chairman to the following committees:

- Member of Second "Committee for Drafting Amendments in Indian Forest Act, 1927" appointed by the MOEF&CC, GOI;
- Member of "Core Committee on United Nations Forum on Forestry (UNFF) appointed by the MOEF&CC, GOI",
- Member of "Committee for Drafting Sandalwood Bill" appointed by the MOEF&CC, GOI;
- Member of "Committee for PESA Harmonisation of Central Acts" appointed by the Ministry of Legislative Affairs, GOI".
- Member of "Technical Committee of MOEF&CC" appointed by the MOEF&CC, GOI;
- Member of "Committee for Drafting National Agro-forestry Policy" appointed by the Ministry of Agriculture, GOI".
- Member of the "Committee for Drafting Arunachal Pradesh Forest Act".
- Chairman "M.P. State Forest Policy Drafting Committee, appointed by the Govt of M.P."
- Member of "M.P. State Geological Board".
- Member of "Standing Committee" of "State Biodiversity Board of Madhya Pradesh".
- Member of Third "Committee for Drafting Amendments in Indian Forest Act, 1927" appointed by the MOEF&CC, GOI in 2017 (after retirement).

# **Environmental Challenge : Present Preparedness and Constraints of Indian Power Sector for the Implementation of New MoEF&CC Emission Norms vis-à-vis Expansion of Generation Capacity**

– S. K. Dube

## **Abstract**

The present paper discusses the present scenario of power generation capacity of India. The power generation capacity has to be matched with the new MoEF&CC Emission Norms and it is true that this is a big challenge. This requires lot of funding and power sector is under stress. This paper also discusses the Present Preparedness and Constraints of Indian Power Sector for the Implementation of New MoEF&CC Emission Norms vis-à-vis Expansion of Generation Capacity. Impact of New MoEF&CC Emission Norms on tariff and time lines has also been discussed. The various scenarios have been discussed with the thermal power stations of Uttar Pradesh, Madhya Pradesh and Delhi-National Capital Region. Recent developments are also presented for the Implementation of New MoEF&CC Emission Norms. Emphasis has also been given on the constraints such as unavailability of correct measurements and difficult regulatory norms.

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\*Senior Fellow, TERI

## Coalbed Methane (CBM) Scenario in India

– P.N. Hajra & N. N. Gautam

### Abstract

CBM policy was formulated in 1997 and 1<sup>st</sup> round of global bidding process started in 2001. Initial estimate of CBM resources of the country was placed at 2.6 TCM in the coal mining free areas of 26,000 sq.km. Through 4 rounds of bidding, during 2001 to 2010, 33 blocks with 17,326 sq. km. area having an estimated resources of 1.8 TCM were awarded. In last 15 years only 22% (400BCM) has been converted to in-place reserves. On critical examination of the work carried out in last 15 years it has come out that CBM prospect of the country will be restricted only in 4 blocks in Damodar River Valley and 3 Blocks in Son River Valley. It is unlikely that CBM prospect can extend beyond these two river valleys.

The 6 Blocks (4 in Damodar Valley and 2 in Son Valley) are in different stages of development by the 4 Operators viz. RIL, ESSAR, GEECL and ONGC. Though 1<sup>st</sup> Commercial production started in 2008-09, today after 9 years total production of the country stands at around 2MMSCMD only. The reasons for such slow progress and measures recently taken by GoI are discussed in this paper.

### Authors' brief Introduction



#### *Mr. P.N. Hajra*

Former General manager in ONGC was intimately involved in VCBM exploration of the company for almost 20yrs. He was awarded ONGC Chairman's award in 1997 and was recognised as a pioneer in CBM work through National Mineral Award by Ministry of Coal, Govt. of India for 2000 awarded in 2002. As Block Manager, CBM (Kolkata and Bokaro) he was responsible for entire CBM exploration strategy, planning and execution in ONGC. During the last phase he was Head, Centre of Delivery, CBM and was posted in New Delhi. At present he is working as a freelance consultant as an expert on CBM and associated with

ONGC Energy Centre, New Delhi, CSIR-CIMFR, Dhanbad, OIL, DGH etc

#### *Mr. N.N. Gautam*



Passed Mining from ISM in 1962, Worked for a British Coal Company, Bengal Coal for 11 years in deep, gassy and mechanized under ground Coal mines.

Worked for 20 years in Coal India Ltd. In various capacities up to Chief General Manager. Worked with Road Headers, powered support longwall, faces for 10 years as well as large mechanised open cast mines.

Worked for over 6 years as Director (Technical) and Advisor (Projects) in Ministry of Coal, Government of India, Worked for 9 years in UNDP as full time National Advisor to the UNDP/GEF- GoI, Coal Bed Methane Recovery and Commercial Utilization Project.

Now working as Advisor, ACB (India) Ltd.

Past Chairman of the Delhi Chapter of MGMI. Currently Chairman of the Coal group of India Energy Forum, an NGO of energy experts and Secretary General of ISMAA Delhi Chapter.

Got ISM Dhanbad Distinguished Alumni Award in 1963.

Got Life time Achievement Award from Energy and Environment Foundation.



## TECHNICAL SESSION-VII

# Improvement of Safety in Mines of MCL through Safety Management Plan (SMP) - An overview

– O. P. Singh\*

### Abstract

Mining is a hazardous profession. It has been proven worldwide that the risks of mining can be controlled through effective safety and health management systems- as an integral part of management system. SAFETY is the state of being "safe" (from French word sauf), the condition of being protected against physical, social, spiritual, financial, political, emotional, occupational, psychological, educational, or other types of consequences of failure, damage, error, accidents, harm, or any other event that could be considered.

Safety Management Plan is a "Risk Management" through hazard identification, Risk Assessment, Risk prioritization, mitigation and control. This is a dynamic rolling management plan for safety and health.

Mine specific SMPs are in vogue in all the mines of MCL with the grass root level communications of innovative ideas and conceptions. In overall management of safety in a strategically planned manner, this system has incorporated regular auditing, feedback and continual improvisation of such plan which yielded favourable results in the matter of accident prevention. In this paper, special mention has been made on development and implementation of SMP in MCL.

**Key words:** Mining, Safety Management Plan, Hazard Identification, Risk Assessment, Risk Prioritization.

### Author's brief Introduction



#### *Mr. Om Prakash Singh*

Mr. Om Prakash Singh has taken over the charge of Director (Technical), Mahanadi Coalfields Limited (MCL), a leading subsidiary of Coal India Limited, on 1<sup>st</sup> September, 2016.

Mr. Singh is Bachelor of Engineering (Mining) from Ravishankar University, Raipur and holder of First Class Mine Manager's Certificate of Competency under Mines Act (Directorate General of Mines Safety, Dhanbad. Shri Singh has also acquired Master degree in Business Administration (Marketing Management) and Post Graduate Diploma in Computer Applications. He comes with a rich work experience spanning 32 years in the field of mine planning (9 years in CMPDIL), production, management supervision, direction and control of underground as well as open cast coal mines.

After joining Coal India Limited in August 1984, he rose rapidly and has handled various senior positions like General Manager of different Areas at SECL and heading different departments at Corporate Office i.e. Environment, Production and Planning.

He has also undergone training programme on project management and other general management courses. Also attended a Conference "Mining Indaba-2017" held at Cape Town, South Africa for the period from 6<sup>th</sup> Feb. to 9<sup>th</sup> February, 2017 regarding annual professional conference dedicated to the capitalization and development of mining interests in South Africa.

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## TECHNICAL SESSION-VIII

# Railways Projects for Coal Evacuation

– Rajneesh Kumar

There are 84 number of capacity creation projects on IR for facilitating smooth coal evacuation. Of these, 15 are of New Lines, 66 for Doubling/Tripling/Quadrupling and 3 for Gauge Conversion. 9,259 is the total length of route kms which will be added consequent to completion of these projects with a total cost of Rs 98,977 crores. IR has already incurred an expenditure of Rs 19,470 crores upto 31-03-2018 and Rs 70,717 crores would be required for balance works.

Ministry of Railways and Ministry Coal have identified 14 critical projects for monitoring at PMO level. These projects are categorized on the basis of mode of funding, namely funded by coal companies, through SPVs and funded by IR. Their current status shall be explained in detail.

### Author's brief Introduction



#### *Mr. Rajneesh Kumar*

Mr. Rajneesh Kumar, IRTS Officer-1999 batch. MSc in Environmental Sciences from JNU, New Delhi. Worked in various capacities in Traffic Transportation and Traffic Commercial departments of Western, North Western and Northeast Frontier Railways. Presently posted as Director (Planning), Ministry of Railways, Railway Board, New Delhi.

# Green Coalfield - Sustainable Development of Singrauli Coalfield with due regards to Environment and Ecology

– Prabhath Kumar Sinha<sup>1</sup>, Satish Jha<sup>2\*</sup>,  
Diwakar Srivastav<sup>3</sup>, Pradeep Kumar<sup>4</sup>

## Abstract

India is growing fast. Energy is central to achieving India's development ambitions, to support an expanding economy, to bring electricity to those who remain without it, to fuel the demand for greater mobility and to develop the infrastructure to meet the needs of what is soon expected to be the world's most populous country. India has been responsible for almost 10% of the increase in global energy demand since 2000. Its energy demand in this period has almost doubled, pushing the country's share in global demand up to 5.7% in 2013 from 4.4% at the beginning of the century. While impressive, this proportion is still well below India's near 18% current share of global population, a strong indicator of the potential for further growth. Currently installed capacity of coal based thermal power plants has share of 57% whereas in actual power generation, the share is 71.6%. As per future predictions, the share of coal in power generation is expected to be decreased in view of increase in share of renewable energy. However the demand for coal will continuously increase. Opencast mining has major share in coal production in India and will remain. Coal mining has a direct impact on the environment, disturbing large areas of land and, in the case of opencast mining, potentially contaminating surface and groundwater. Clean coal technology is a collection of technologies being developed to attempt to help lessen the environmental impact of coal energy generation and to mitigate worldwide climate change. In present work, the various environmental issues associated with opencast mining and the best practices i.e. Environment Management Plan, Technical and Biological Reclamation, Ecological Restoration, Air and Water pollution control system, Dust Suppression System, use of belt pipe conveyor for coal transportation, deployment of surface miner in both coal production and overburden removal, new coal handling plants, standard benchmarking for mining operations etc. being followed by Northern Coalfields Limited, Singrauli have been discussed. It has been observed that specific emission reduced by 14.6% over the baseline year due to implementation of various energy / environment improvement initiatives taken up by NCL and the total emission reduction for NCL was 126712 Tonnes of CO<sub>2</sub> for 2017-18 as compared to 2016-17.

**Keywords :** Clean Coal Technology, Opencast Mining, Carbon Footprint, Technical and Biological Reclamation.

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1 Chairman-cum-Managing Director, Northern Coalfields Limited, Singrauli, 486889, India

2 General Manager, Corporate Planning Department, Northern Coalfields Limited, Singrauli, 486889, India

3 General Manager, Environment Department, Northern Coalfields Limited, Singrauli, 486889, India.

4 Asst. Manager, Technical Secretariat of CMD, Northern Coalfields Limited, Singrauli, 486889, India.

\*Corresponding author

**Author's brief Introduction*****Mr. Prabhat Kumar Sinha***

Shri P K Sinha has joined as Chairman cum Managing Director, NCL since 22rd Dec 2017, and is functioning with ultimate responsibility of the company's performance, people and ventures, including development and execution of company's business strategies. Born in January 1962, Shri Sinha graduated in Mining Engineering from Raipur Engineering College – Raipur in the year 1982. He completed his post graduation in “Mine Planning & Design” from ISM – Dhanbad in the year 1988. Shri Sinha is a seasoned professional with 36 years of experience in Opencast and Underground mining activities encompassing Operational, Man, Material & Project Managements of Coal India Ltd.

Shri Sinha has worked as head of production unit in opencast and underground mines of SECL, WCL and NCL, with achievement record more than 100% Target in consecutive yrs. He has also worked in science and technology department of CMPDIL – HQ. He has added a no. of colors in his career, during his tenure as Project manager and project head at NCL from the year 2007 to 2016, such as he has motivated his team to produce highest production of 2.05 L. Tes. on a single day, and also the highest ever annual production of 15.5 MT in the year 2010-11, which is a record in the history of Jayant Project(10MTY). He spearheaded an aggressive process-reengineering program at Jayant and Amlohri OCP of NCL, that improved its productivity at reduced cost.

Shri Sinha was appointed as Director (P&P), SECL on 3rd Aug. 2016 and during his tenure of One year and four months, he has achieved physical possession of 752.459 Ha land, Secured TOR for 08 mines and EC for one mine from MoEF&CC , Secured Stage II clearance of 383 Ha of Forest Land and introduced Slope Stability Radars for monitoring of dump slopes in SECL.

Shri Sinha has represented Indian Coal Industry in the World Mining Congress at Poland in the year 2008 and at Istanbul (Turkey) during the year 2011. He also visited Sweden, Switzerland and Germany for training in Advanced Management Development Programme during the year 2014. He was a part of International MinExpo-2016 at Las Vegas, USA during September 2016. He also have the honor of representing the Technology Mission, under the MOU between CIL/CMPDI and CISRO, Australia, during the period 16-25 June, 2017.

His competence is also expressed in his technical paper entitled “Dump Slope monitoring at Jayant - the new perspective” presented at 4th Asian Mining Congress, held at Kolkata in the year 2012, technical paper entitled “ Effect of production blast on dump stability in open pit mines” presented in the “FRAGBLAST-10” held in November 2012 at New Delhi and technical paper entitled “Environmental Sustainability Analysis in SECL” – presented at NxGnMiFu2017 Conference - New Delhi during 15-17 Feb`17.

He is honored with many prestigious awards viz. Excellence In Environment Management, as Project head, from MPCCB-Bhopal for the year 2010-11 and Best Mines Manager at HB Ghosh memorial award hosted by MGMI at Kolkata for 2 consecutive yrs (2012, 2013). He has a professional affiliation with Mining, Geological and metallurgical institute (MGMI) and Indian Mine Manager's Association (IMMA).

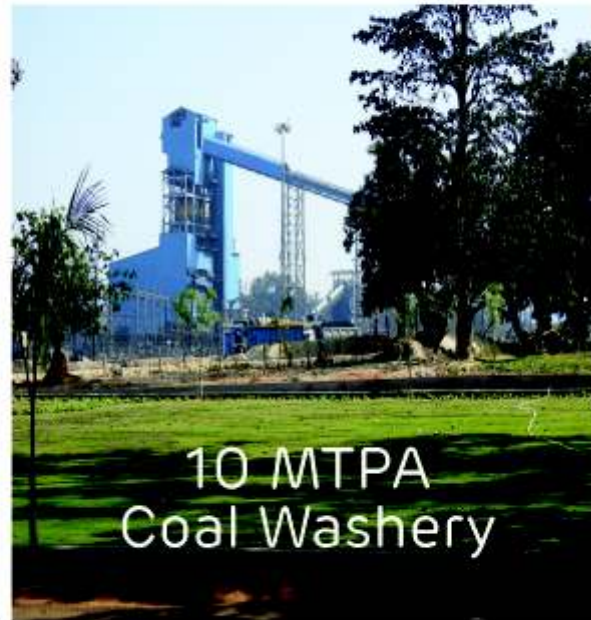
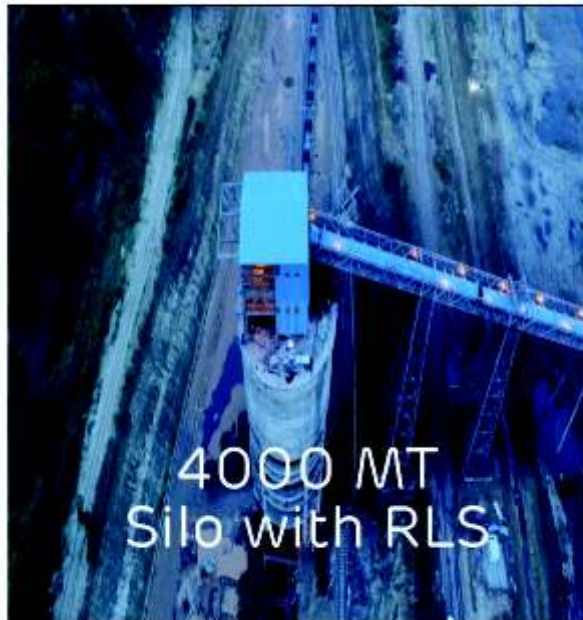
Shri Sinha uses his multi-fold experience in the work to become an able strategist for steering the organization in the most profitable direction and for succeeding in crisis management. He executes his leadership skills through open communication, teamwork and a positive moral in the organization.

# Section-6

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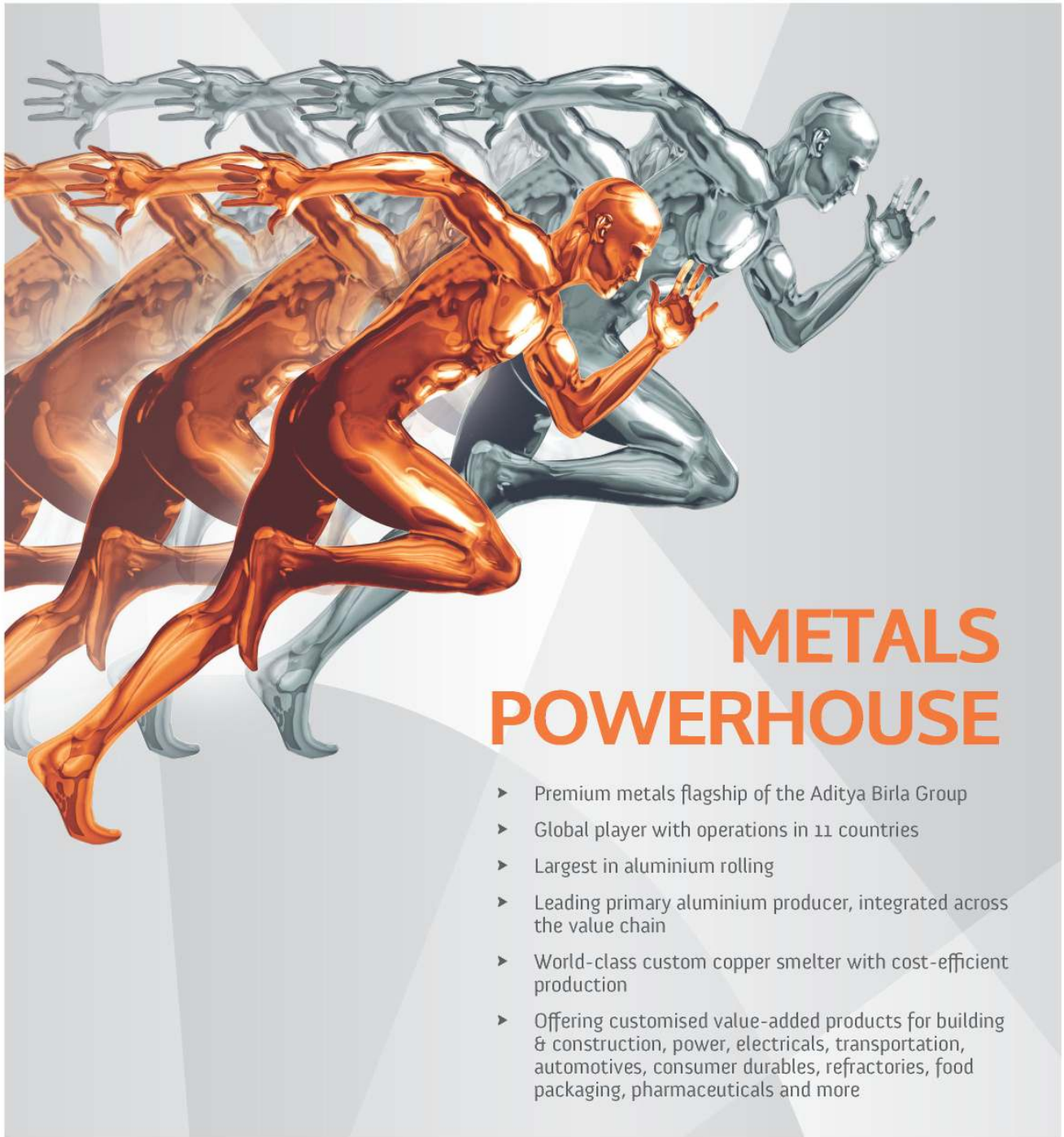
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