Budget Webinar : Energy for Sustainable Growth

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Coal Gasification: Enabler for a Clean Energy Future

Dr V K Saraswat
Member
NITI Aayog

Coal Resources in India & Coal as Major Source of Energy Mix

- **326 Billion Tons** of coal resources is estimated by the GSI up to a depth of 1200 meter.

- **G9 – G14 grade** coal resource is around **170 Billion Tons**.

- In the current financial year **(April – January 2022)**, total production of coal in India is in tune of **672 Million Metric Tons.**

- As per BP Energy Outlook, **Coal will dominate with 48%** in the projected share in the **primary energy consumption in 2040.**

- According to the **NITI Aayog's anticipated coal demand projection** for 2030, coal usage will be **1192–1325 MT**.

Products from Coal, Coal Resources, Ash and Byproducts

1. **Coal can be used to produce number of products using clean coal technologies**

   1. Hydrogen
   2. Methanol
   3. Fertilizers

   } ***Through Coal Gasification***

   4. Carbon Fibers
   5. Plastic composites
   6. Carbon Nanomaterials

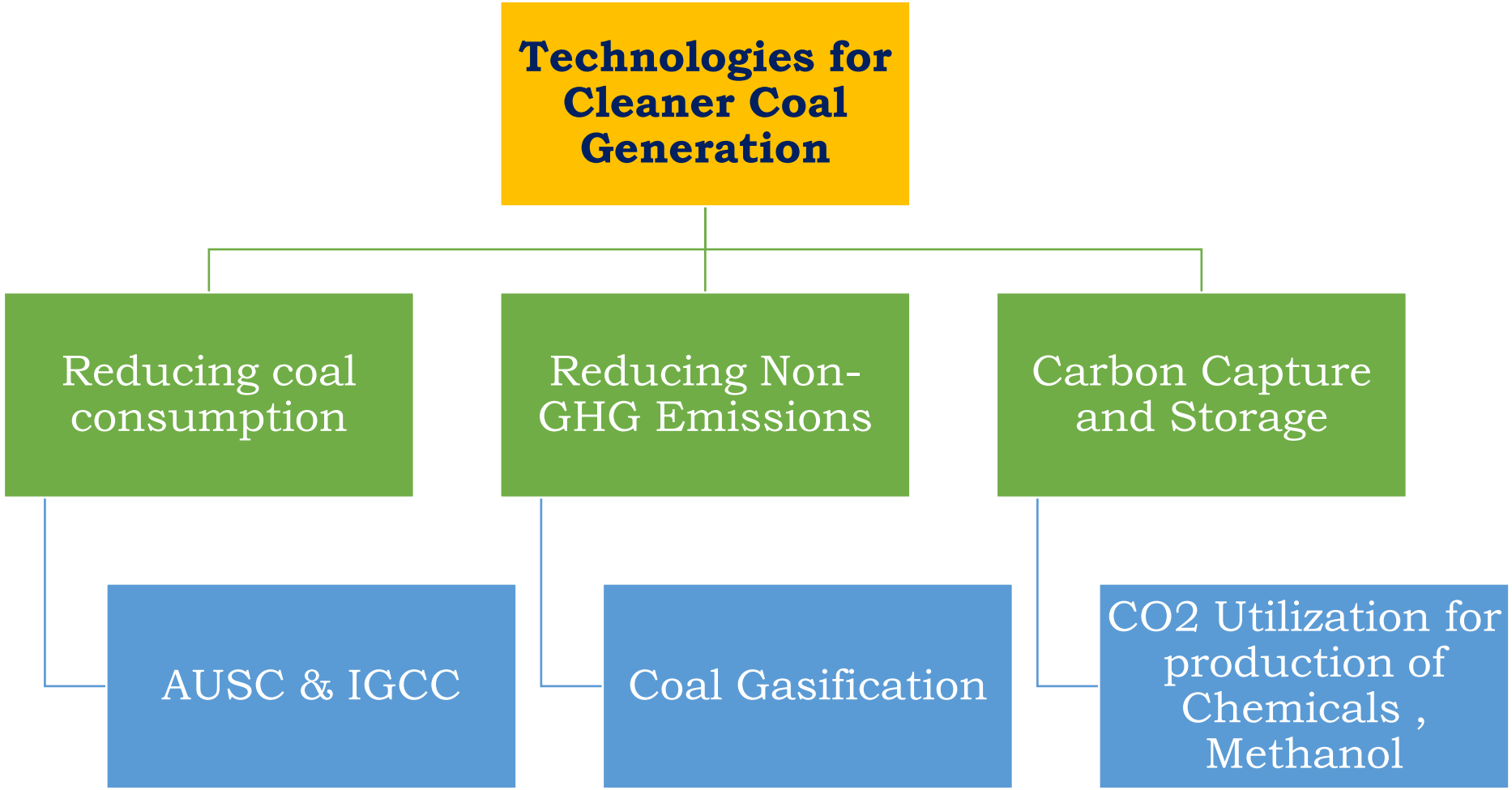
   } ***Using ash/ residue of the coal power plant/ gasifier***

2. **The shale clay mine drainage and sludge leachate can be utilized to extract**

   1. Rare Earth Elements
   2. Critical Minerals
   3. Quantum Dots

Clean coal technologies are a key step towards near zero emissions from coal

- Focus on technologies to reduce both Green House Gases and Non – Green House Gases (Nox, SO2, Particulate Matter) emissions



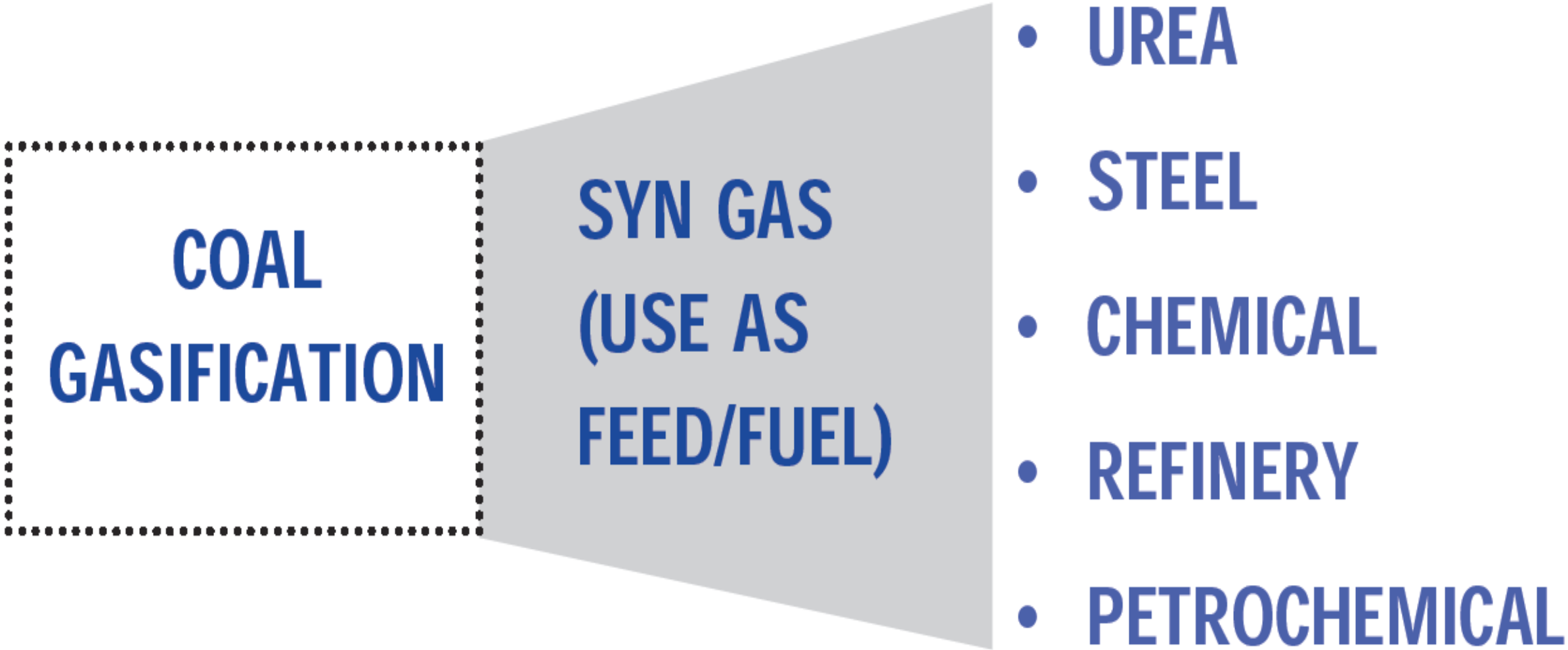
THRUST AREA: CLEAN COAL TECHNOLOGIES (CCT)

- Major problems associated with the current coal based technologies are lower efficiency, environmental loading and consequent damages thereof.

- Clean coal technologies are becoming popular due to high efficiency and lower environmental impacts.

- Coal gasification has been internationally accepted as one of the most viable and effective clean coal technology for production of synthetic fuels, chemicals, various thermal applications & power generation. It also offers a practical means of utilizing coal for meeting stringent environment requirements.

- Bulk coal reserves in India (about 73%) are of inferior grade non-cooking coals, with ash contents 45-50%, having moderately high reactivity & high ash fusion temperature. These coals can be successfully utilized for gasification


COAL GASIFICATION
SYN GAS (USE AS FEED/FUEL)
• UREA
• STEEL
• CHEMICAL
• REFINERY
• PETROCHEMICAL

Types of Gasifiers

	Fixed Bed Gasifiers	Fludized Bed Gasifiers	Entrained Flow Gasifiers
Advantage	• Flow of solids is independent of the flow of gas • Minimal pretreatment of feed coal • High thermal efficiency	• Uniform Particle Mixing • Uniform Temperature Gradients • High char recycling rate • Less gas cleanup • less capital costs	• Ability to handle practically any feed • Syngas is free of oils and tars • Low methane production, suitable for synthesis gas products
Disadvantage	• Product gas contains Tars, oils, and heavy hydrocarbons • High methane content in Product gas.	• Particle Entrainment • Lack of Current Understanding • Pumping Requirements and Pressure Drop	• High energy consumption • High temperature and pressure • Slagging - maintenance shutdown of units

WHY FLUDIZED BED GASIFIER IS SUITABLE FOR INDIAN COALS?

- Suitable for high ash Indian coals.
- Better heat and mass transfer in the bed.
- The amount of tar and phenol formation is low or negligible.
- A large variety of fuels can be handled.
- The technology does not involve moving parts.
- Moderate gasifier temperatures: low Heat loss through bottom ash.
- The large fuel inventory provides safety, reliability, & stability of the process.
- Product composition is steady due to uniform conditions in the bed.
- Better turn down ratio.
- Due to in situ sulphur capture, FBG is futuristic efficient clean coal technologies.

Research and Development Activities in development of Indigenous Technology for gasification of high ash Indian Coal

	BHEL R&D, Hyderabad	IIT Delhi & Thermax Ltd., Pune	CSIR-CIMFR, Dhanbad
Type of Gasifier	Advanced Pressurized Fluidized Bed Gasification	Oxy Blown Gasifier	Oxy Blown Pressurized Fluidized Bed Gasification
Gasification Pressure	3 Bar	4 – 6 Bar	10 Bar
Gasifier Coal Handling Capacity	1.2 TPD	3 – 4 TPD	1.5 TPD
Methanol Production Capacity	0.25 TPD	1.0 TPD	0.25 TPD
Status	Operational for more than 10000 hours	Methanol production started. Testing going on	At TRL 6 stage

Coal Gasification Projects in India

Talcher Fertilizer Limited

- New Coal based Ammonia-Urea Complex as a Joint Venture Company (JVC) promoted by GAIL, CIL, RCF and FCIL with a total estimated CAPEX of INR 13,277 cr
- The project will have an output of 1.27 MMTPA of 'Neem' coated prilled urea using coal as feedstock.
- The unit will utilize about 2.5 MMTPA coal from Talcher Mines

Subsidiary	CIL	ECL Sanctoria	WCL Nagpur	SECL Bilaspur	CCL Ranchi
Mines/ Location	Dankuni Coal Complex	Sonepur Bazari Mine	Niljai Mines	Mahamaya Mines	Ashoka Mines
Product	Methanol (0.67 MMTPA)	Methanol (0.66 MMTPA)	Ammonium Nitrate (0.66 MMTPA)	Ammonia (0.72 MMTPA)	Ammonium Nitrate
Coal (MT)	1.5 MMTPA	1.35 MMTPA	0.8 MMTPA	1.35 MMTPA	-
PFR Status	Approved. Tender Floated for Build-Own-Operate Basis (BOO)	Approved	Approved	Approved	**Under Preparation

Way Forward

1. Setting up demonstration plants to scale up Indigenous technology

    1. Promoting public private partnership with provision of VGF for production of methanol, ammonia and hydrogen
    2. Setting up plants to produce methanol in tune of 300–500 TPD.
    3. Introducing PLI scheme for setting up Coal Gasification Plants

2. Accelerate the projects planned by the Coal India Limited and subsidiaries preferably through EPC approach for production of chemicals & fuels.

3. Accelerate the project by NLC India for lignite gasification (2 x 2400 TPD gasifier) for production of 1200 MTPD methanol.

4. Rationalizing the pricing of coal for gasification on the following parameters:

    1. Taxations
    2. State Cess
    3. Transportation and handling charges

THANK YOU

Contact Details :

vk.saraswat@gov.in

Phone. 23096566/67
Fax. 23096603