INDIA'S FIRST PLANT ON LIGNITE GASIFICATION

NLCIL
LIGNITE TO METHANOL PROJECT

Lignite / Coal- Vast possibilities thru Gasification

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- PM Vision on Gasification
- Benefits of Gasification
- Global scenario
- Technologies
- Options in Gasification
- Gasification suitability to Indian CXoal
- Market for Methanol

PM Vision -100MMT Gasification-LNG import Bill reduce by Rs 42000 CR(Approx)

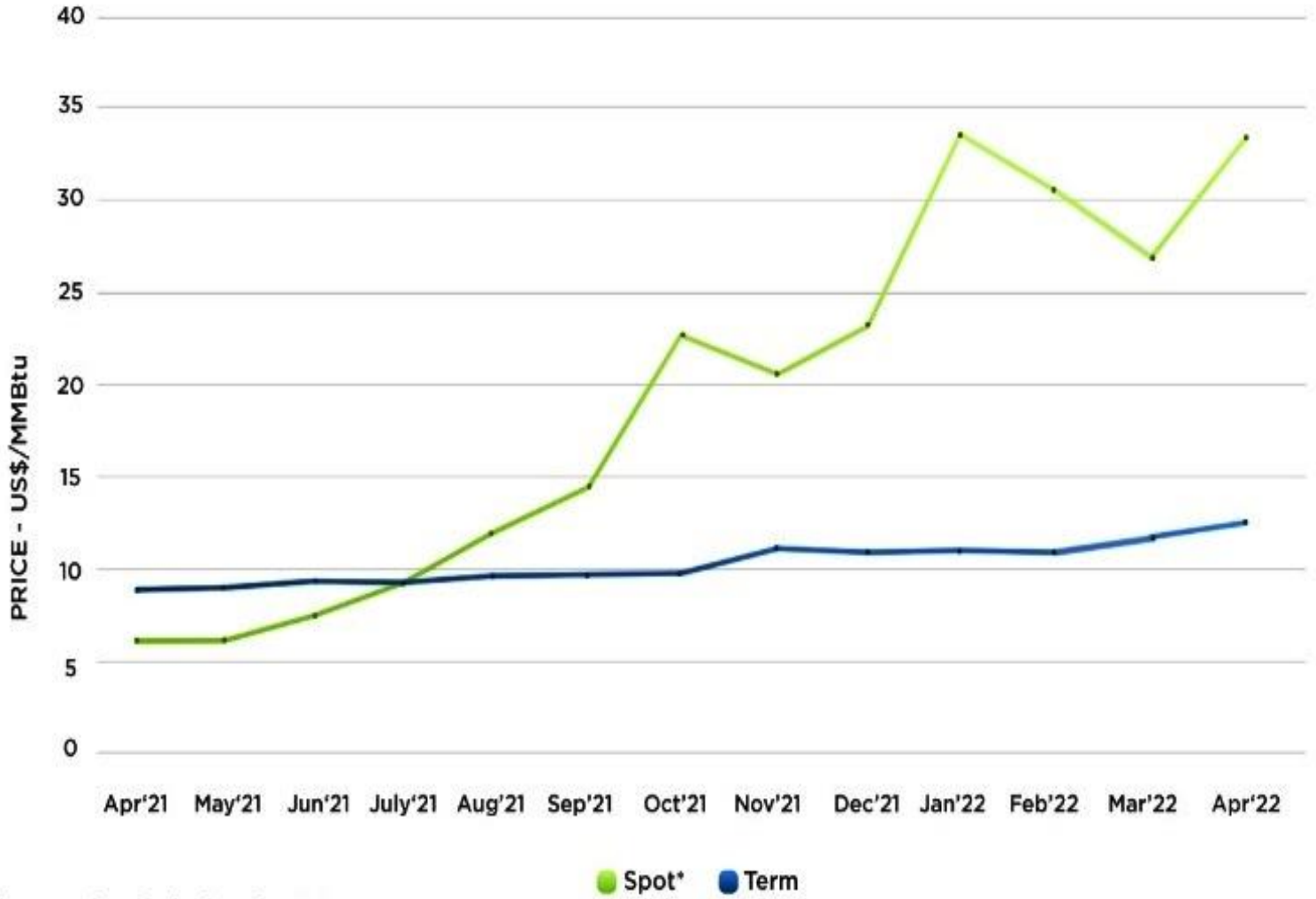
GASIFICATION	Coal/Lignite ,MMT	Eqivalent LNG MMSCMD	LNG Import Bill saving ,Rs Cr
Talcher Project-Ammonia ,Urea	3.6	2.5	1600
NLCIL -Methanol	2.4	1.5	1000
Annual SAVING	6MMT	4 MMSCMD	2600 Cr
Projected Saving	100	66	42000
India Import	-	80	55000

Crude Oil –Volatility

LNG-Spot -All –Time High

Russia Supply concerns sends North Asia LNG spot price to record high

Domestic Spot RLNG Trend (2021-22)



*Spot volumes also includes short-term cargoes

Spot LNG prices continued its higher trajectory. The average price of spot LNG imported into India during the month of Apr'22 was US$33.2/MMBtu.

Source : www.henergy.com

Benefits of Lignite Gasification to NLCIL

1. Continue to utilize large reserves of Lignite in an Environment friendly manner.
2. Gasification of lignite supports India's commitment at Glasgow Climate Agreement.
3. Environment Benefits-about 50% reduction in CO2 emission & 100% reduction in NOX, SOX ,90% Ash into inert Slag as compared to direct coal fired boiler.
4. 1200 TPD Methanol will replace 1.5 MMSCMD Natural Gas and will annually save Rs.1000 Cr (approx) of LNG import with indigenous source.
5. This initiative of NLCIL will support Prime Minister's vision to achieve a target of 100 MT Coal Gasification by 2030.

Global Scenario - Coal/Lignite Gasification

- Currently More than 250 plants/ Gasifiers are operating worldwide and mostly in China
- More than 70 projects on Methanol and Ammonia in China
- Inner Mangolia in China has maximum Gasification units on Lignite Gasification on mine pit heads.
- China has more than 14 projects on Coal Gasification to Synthetic Natural Gas (SNG) to produce 50MMSCMD gas with planning to increase to 200 MMSCMD.
- Dakota, USA Still processing 16000 MTPD Lignite into SNG, Ammonia and Integrated Gas Combined Cycle (IGCC) power
- Czeck Republic had 26 Lignite based Gasifiers for SynGas fired Power Generation since 1969 till 1993. Later restarted few in 1995.
- Europe is developing Gasification projects from Bio-waste .

World wide Lignite Based Gasification plants

Sl.No	Plant	Country	Capacity	Technology	Gasifiers	Year	Product
1	Dakota Gasification	USA	16000 MTPD	Lurgi-Fixed Bed	14	1984-Contd	Ammonia, SNG,SYN GAS,IGCCPower
2	Versova, Sokolov Coal Corp	Czec-Rebublic	*	Lurgi- Fixed Bed	26	1969-1993,1995-	IGCC Power
3	Schwarze	Germany	720	Choren – Entrained Bed		1985-2006	Town gas,Metanol,IGCC
4	Datang DuolunMTP-Inner Mangolia,China	China	Shengali Lignite Fields 30MMT	*	3	2011-Contd	Methanol 1.7MMT, PP 230X2 KTA
5	Datang Keqi SNG – Inner Magolia	China	4bnm3/annu	Entrained Bed	48	2013-contd	SNG -4bnNm3/anum
6	Boyuan-Inner Mangolia	china	*	HTL-Entrained Bed	*	Running	Balance information being checked
7	Sinchem Jilin Changshan	China-inner Mangolia	*	HTL-Entrained Bed	*	Running	Balance information being checked
8	Hulunbeier New Gold ChemicalCo,(JINXIN) Inner Mangolia	Inner Mangolia, China	900TPDx3	SHELL/AP-Entrained Bed	3	2014-Contd	Chemical

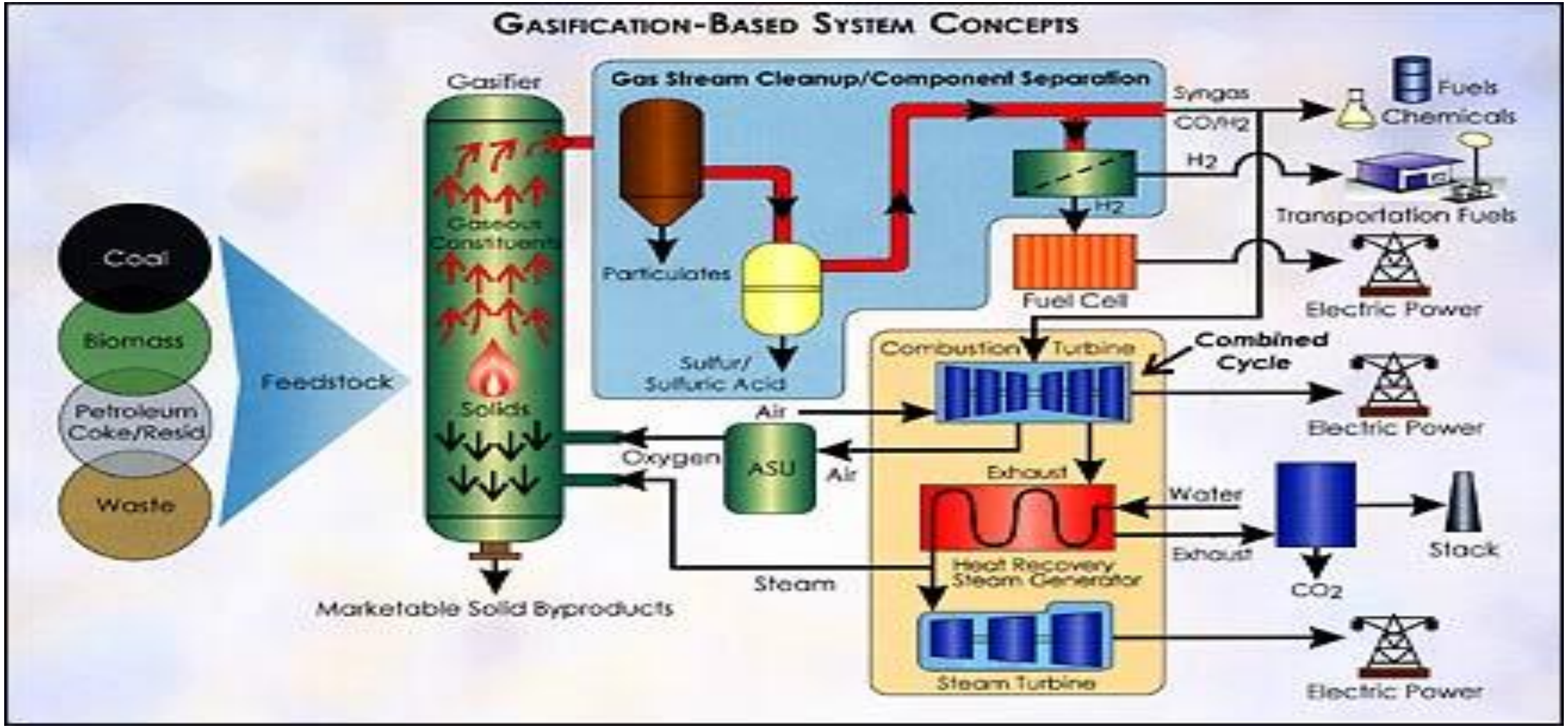
Technology for Gasification

Following technologies are adopted worldwide for gasification

- **Dry feed bottom quench entrained technology (Most Advanced & commonly used for Lignite)**
- **Fluidized bed Technology**
- **Fixed bed**

Dry feed bottom quench entrained technology has been shortlisted after floating Global Expression of interest and due evaluation.

Gasification-Based System Concepts
A Clean Coal Technology



Comparison of Coal –Lignite is easy to Can be Easily Gasify Maghreta Coal Best suited –Higher Syngas Production

A		Lignite	Marghrita Coal	Talcher Coal
	Moisture	50 – 56	2.57-2.7	5
	Ash	2 – 5	15-19	43
	VM	24 – 26	37-38	26
	Fixed Carbon	19 – 24	42-53	26
	GCV (Kcal./Kg)	2600 – 2900	6100	3200
	Sulphur wt%	0.82	5-7	0.7
	Oxygen	16	10	12
B	Reaction –Partial Oxidation	C+ H20= CO+H2		

Higher Sulphur Of Magreta will be recovered in Sulfur Recovery Unit and will be sold as By product

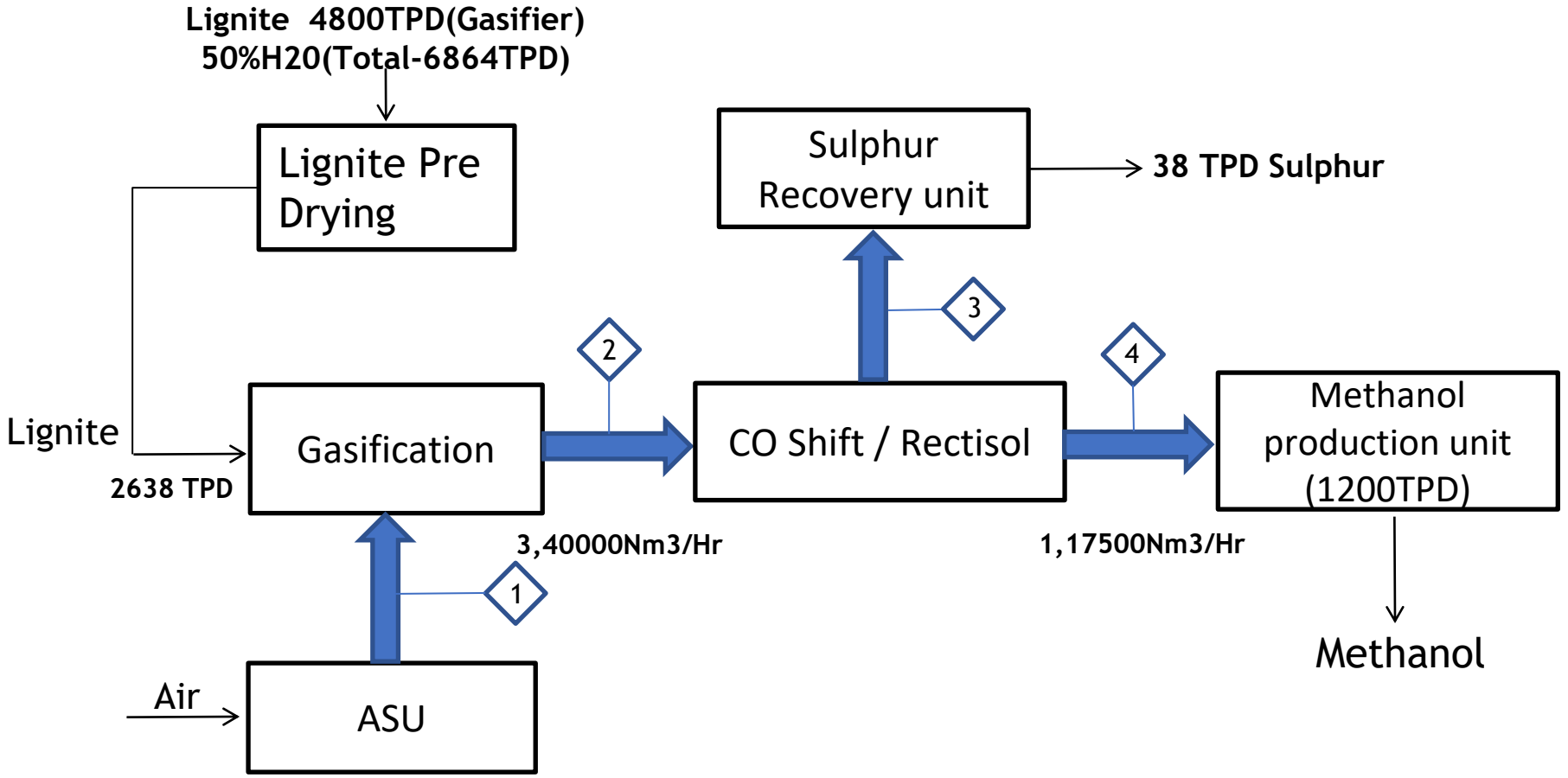
Marghrita Coal High Quality coal for Gasification ---

…High Fixed Carbon ---- Low Moisture and Ash- High volatile –More Syngas

…Lignite Easy to Gasify – Low Ash- High Volatile –High Oxygen

Lower Cpax by 200 Cr For Lignite and Magreta Coal Due to low Ash as compared Talcher

Methanol Production Process Diagram



Reactions:

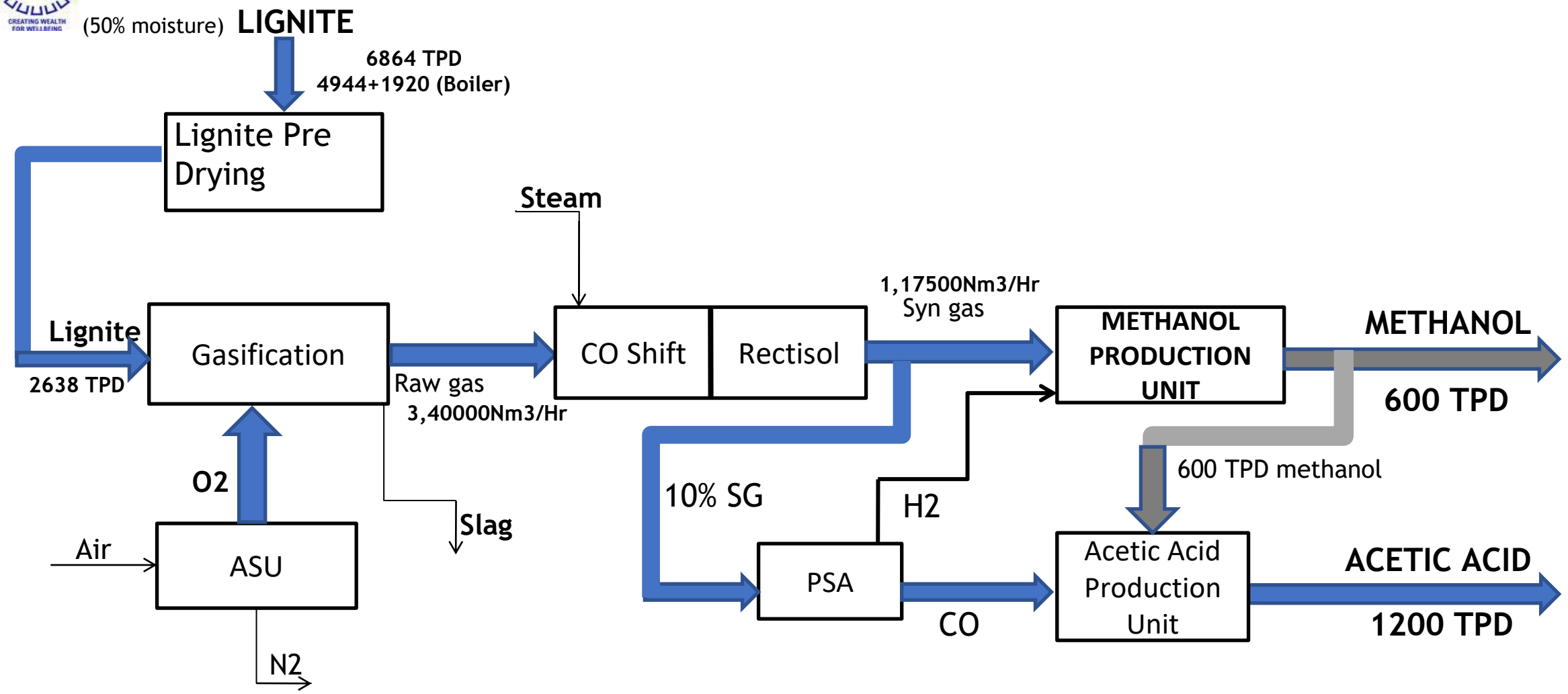
Partial $C+H_2O = CO+H_2$

Shift $CO+H_2O = H_2+CO_2$

Methanol $2H_2+CO = CH_3OH$

Off – Site Units

ACETIC ACID PRODUCTION FROM METHANOL FLOW DIAGRAM



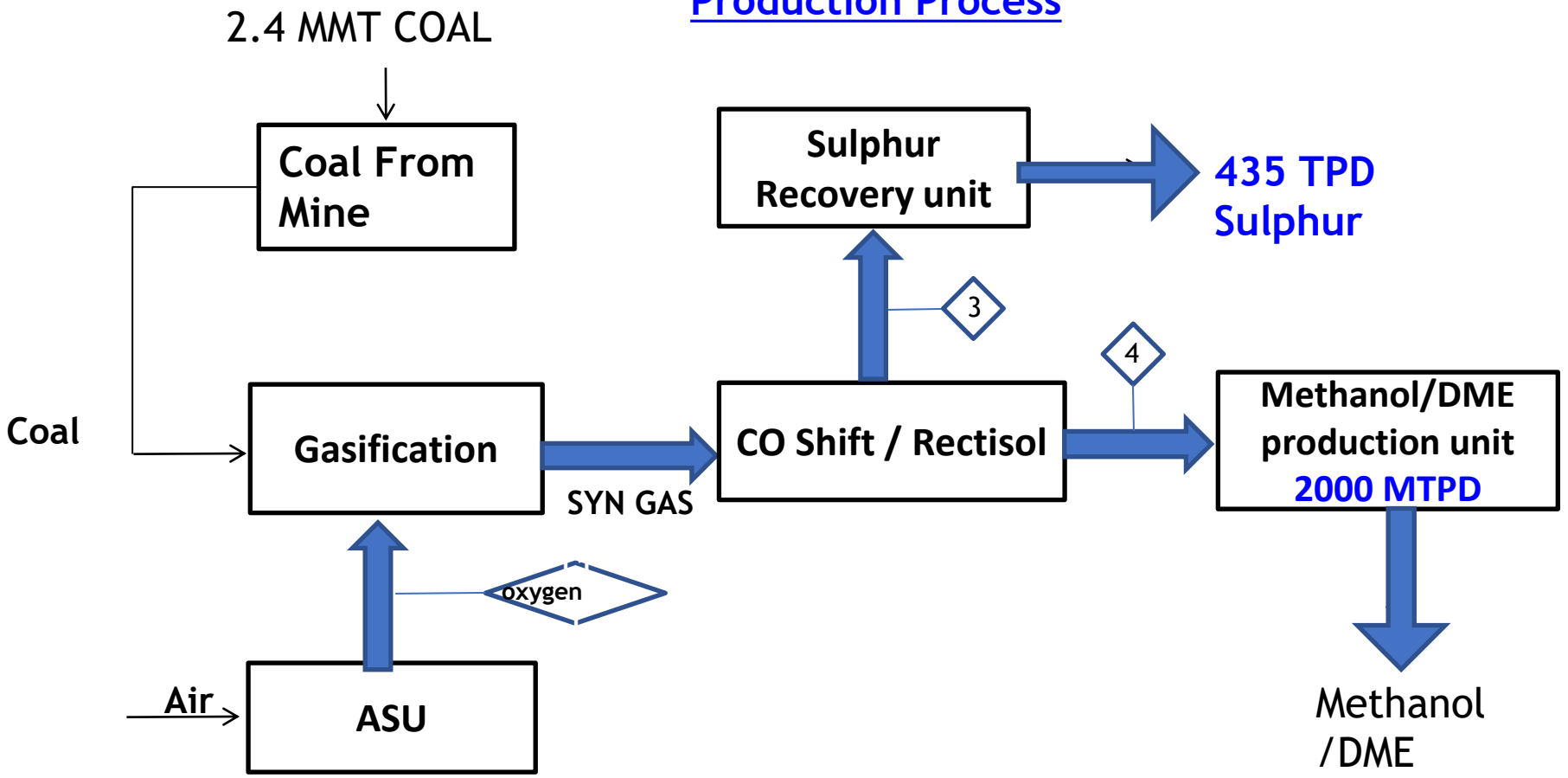
Cap Ex – 2000 Cr
Annual Profit – 600 Cr
Pay back – 4 Yr

COP = Rs. 25000/T
SP = Rs. 40000/T
Profit = Rs. 15000/T

Reactions:

$CH_3OH + CO = CH_3COOH$

Proposal-Margherita CoaL Gasificaion- Methanol/DME Production Process



Reactions:

Partial C+H2O = CO+H2

Shift CO+H2O = H2+CO2

Methanol 2H2+CO = CH30H

Off – Site Units

Capax-7000 Cr
48 months construction

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Lignite To Methanol Project – Features&Viability

Project Technical Details	**Two Gasifiers ,2X2,400 TPD Gasifiers**
Project Capacity-Methanol **Raw Syn Gas Capacity**	**1,200 MTPD, 3,96,000 MTPA** **1,20000 Nm^3/hr (CO+H2) Methanol Syn gas**
Project Cost	**Rs. 4,500r**
Feed Requirement	**2.26 MMTPA Lignite, 6,864 MTPD**
Project Schedule, Manpower	**42 Months, 180 personnel**
Cost Of Production: **Lignite @1876 Rs/Tonne**	**Rs. 26000/MT**
Debt : Equity	**80:20**
Pay back period	**8yrs**
Viability of Gasification	**Lignite based plants are more profitable when Natural Gas price goes above 7.3 $/MMBTU.** **As current NG price is more than 30$/mmbtu, most of domestic plants stopped their operations due to high cost of productions.**

Methanol Market

Domestic Production & Installed Cap	2 Lacs, 5 Lacs
Demand	25 Lacs
GAP/Import -80% Demand thru import	20 Lacs /annum Iran,China
Demand South and west	90%
Annual Demand in South	7 Lacs South 29%
Production unit in South	NIL
Growth	4%
Uses	Pharma: 30%, Paints: 7%, Formaldehyd: 20%, Acetic Acid: 4%, Chloro Methane & Methyl Amine: 10%, Misc + Pesticide: Balance
Pricing	Rs.30 /Litre to Rs.40/Litre (Highly volatile)

As the policy of blending Methanol with fuel is under active consideration of GOI, the demand for methanol is expected go up substantially..

Niti Aayog Review

Niti Ayog 4th technical standing committee Chaired by Dr V K Sarswat, Member, Niti Aayog reviewed project on 29th Sept 2021 and made following observations.

1. **NLCIL to proceed ahead with current project and try to complete with in 36 months on LSTK (Lum some Turnkey) bases.**
2. **Project is encouraging and should be finalised in a mission mode and should be placed board at the earliest**
3. **Also take benefit of fixed cost of mining by improving mining capacity based on add on Lignite consumption for Methanol Project**
4. **As a next add on step for value added project, DME or/ Acetic acid to be explored and work out proposal**

THANK YOU