



10th WORLD

PETRO COAL
CONGRESS

INTERNATIONAL CONFERENCE & EXPO

15-17 FEBRUARY 2020 | NEW DELHI, INDIA

www.worldpetrocoal.in

International Confernece on Petroleum-Coal-Gas

Shale Gas the Unconventional Energy - Dr BS NEGI

Index

- Natural Gas Global Scenario
- Shale Global scenario- US, China, Poland, Australia and India
- Innovative approach in Shale Gas E&E
- Gas Markets – US Shale a game changer
- Learning from experience- the case studies
- Types of Shale plays
- Factors effecting Shale E&E in India
- Way Forward

Natural Gas Global Scenario

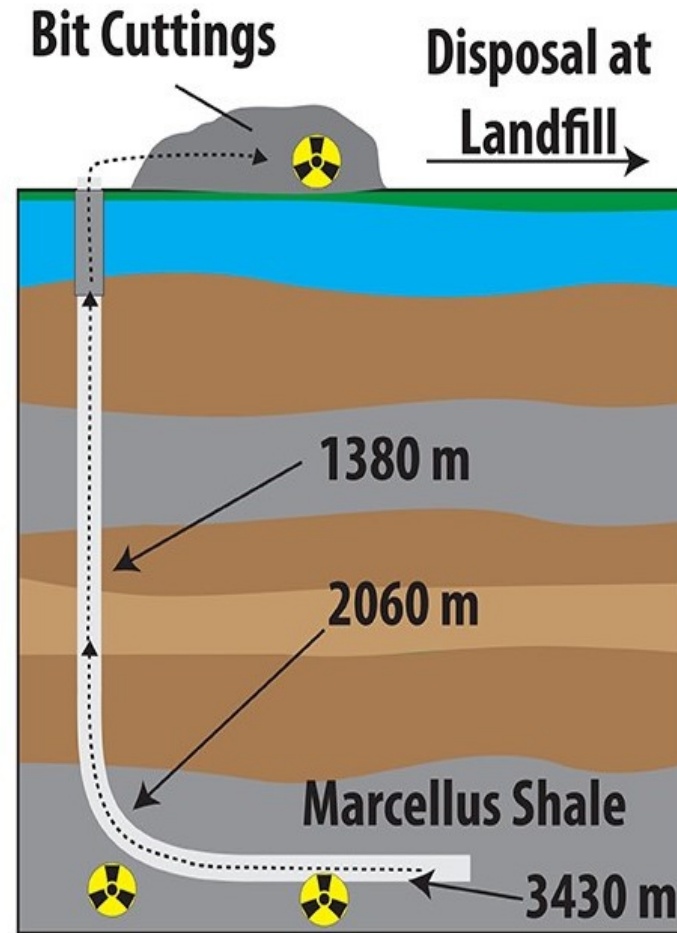
(R/P= 50.9 Years, Gas Share 23.86% of PE 13864.9 mtoe)

	2016 % Global	2018 % Global	2018 Production	2018 Consumption
Iran	18.0	16.2	1. US	1. US
Russia	17.3	19.8	2. Russia	2. Russia
Qatar	13.0	12.5	3. Iran	3. China
Turkmenistan	9.4	9.9	4. China	4. Iran
US	4.7	6.0	5. Saudi Arabia	5. Japan
Total of 5 Countries	62.5	64.4	5 countries accounts more than 50% of global for gas reserves, Production and consumption	
India	0.7	0.7	Gas Share 6.2%, primary energy 5.8% of global, 166 mmscmd, projection for 2030= 600 mmscmd, 6.4% growth needed	

Where all is Shale (EIA 2013)

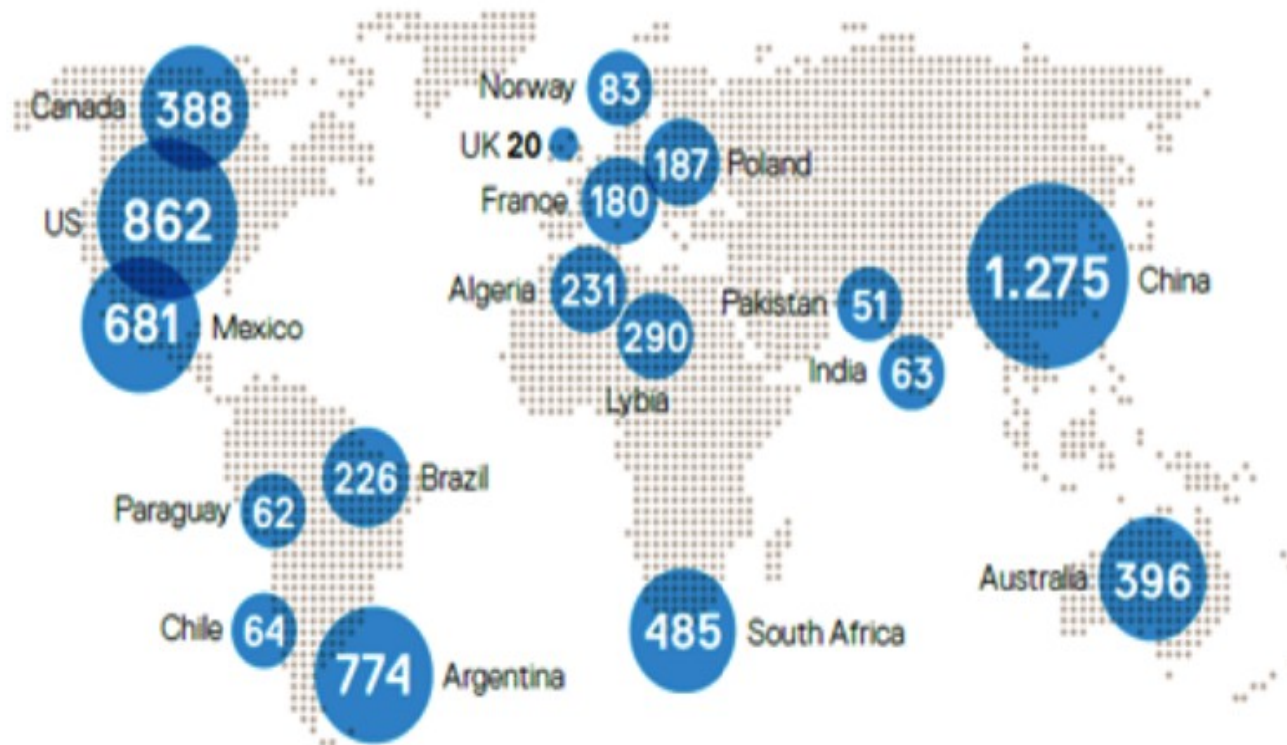
(Society of Petroleum Engineers 2006-16098 tcf)

- China
- Argentina
- Algeria
- USA
- Canada
- Mexico
- Australia
- South Africa
- Russia
- Brazil
- India



Global Shale Gas Potential

Shale gas reserves all over the world



China and the US are potentially the biggest shale gas exporters, with Argentina and Mexico not far behind. (Figures in trillion cubic feet)

Source: US Energy Information Administration



US Shale





Types of Shale Plays

- Marcellus play in New York and Pennsylvania
- Barnett plays in Texas
- Haynesville plays in Texas and Louisiana
- Bakken play in Montana and North Dakota
- Fayetteville Shale in Arkansas
- Bossier shale Texas and Louisiana



US the leader in Shale

- Shale exploitation is more than half decade old but extensive focus since 2008
- Oil production increased 11.7 mmbpd in Jan '19 to 12.8 mmbpd early Dec.'19
- US has been net energy importer since 1953
- By 2020 US to become net energy exporter
- Shale plateau by 2027
- CAPEX in Shale in deceleration since unprecedented growth seen last couple of years, yet production is increasing due to efficiency
- Number of Rigs deployed is declining
- Since 2007 to 2019 there has been 8 fold increase in gas production and 19 fold increase in Oil production



US the leader in Shale

- US became world first (Top) gas producer surpassing Russia in 2011 and Saudi Arabia + Russia in 2018 for Oil production
- Non executive Chairman of Exxon expects slower than EIA estimates
- US Shale will find a break even at \$55/bbl of crude
- There will now be a time for M&A in Shale, small players will be taken over by Exxon, Chevron etc
- Regulatory support favouring Shale gas E&E
 - 1978- Natural Gas Policy Act
 - 1985- Open Access Order
 - 1989- NG Well head decontrolm Act- conducive to increase well head gas price



Shale in China





China Shale

- China and India same footing in 2010
- China has world second largest Shale reserves (1115 tcf) recoverable Shale reserves-EIA
- Shale formations are located in mountainous terrains
- In 2010, initial contracts awarded to Coal & Power companies having no shale & fracking experience
- SINOPEC and Petrochina are main owners of blocks
- Sichuan basin is a major Shale basin in south China spread over Sichuan, Chongping, Guizhou and Unan provinces



China Shale

- Target for 2020 is 30 bcm against which only 13 to 17 bcm is expected due to slow progress in SW China project
- During 2019, average Crude oil + Condensate production 11.25 mbpd being record high
- Policy Measures:
 - April 2015- Government announced subsidy for Shale Gas production up to 2020
 - In 2018- resource tax on Shale gas was cut by 30% up to 2021



Poland Shale



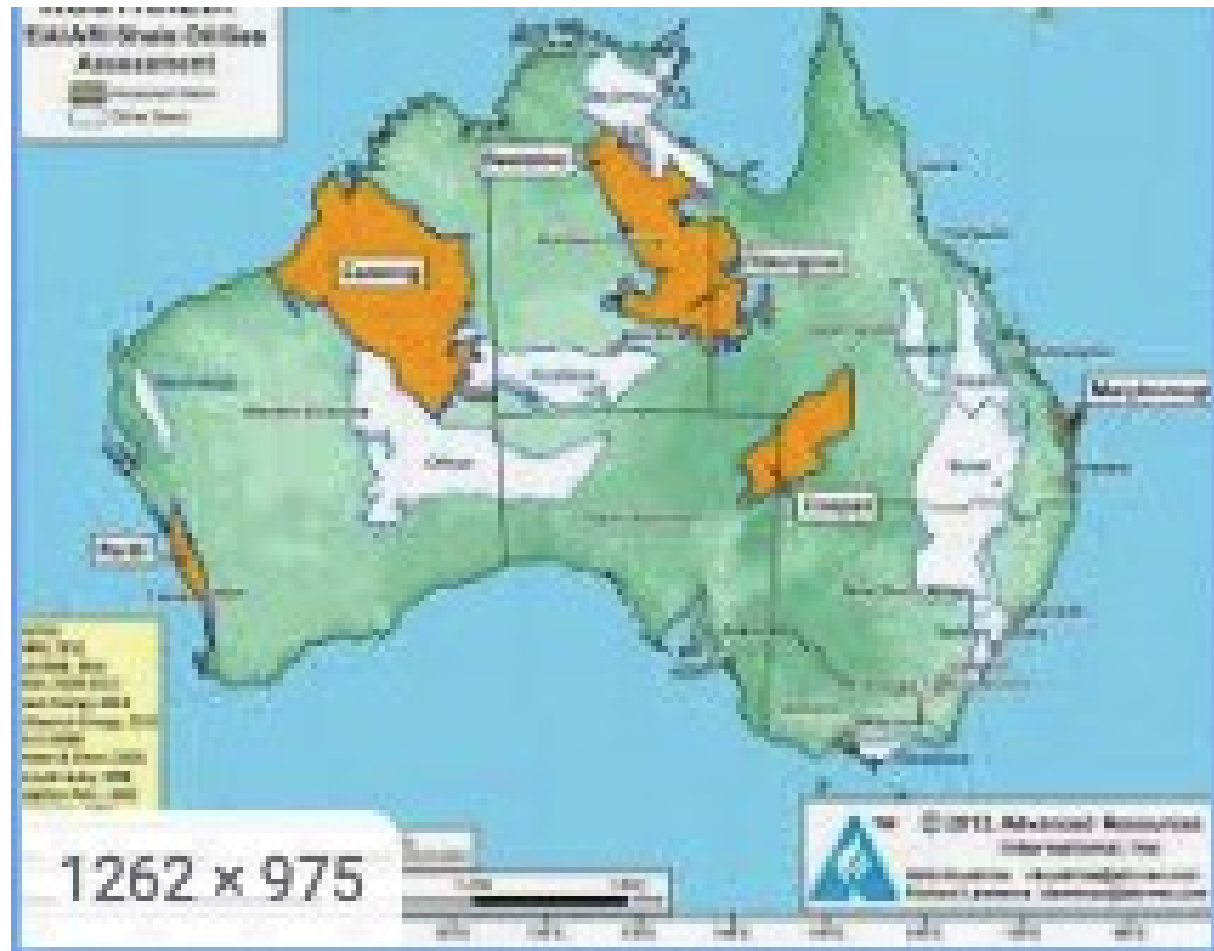


Poland Shale

- Maximum 88 concessions, now reduced to 20 because shale in Poland does not provide sufficient revenue for economic exploitation
- Reasons being:
 - Since 2007 till 2011 no legislative support by Government
 - Restriction due to Flora & Fauna
 - Geological complexity needs new technology
 - Cost goes high
 - Recoverable shale reserves declined



Australian Shale Plays



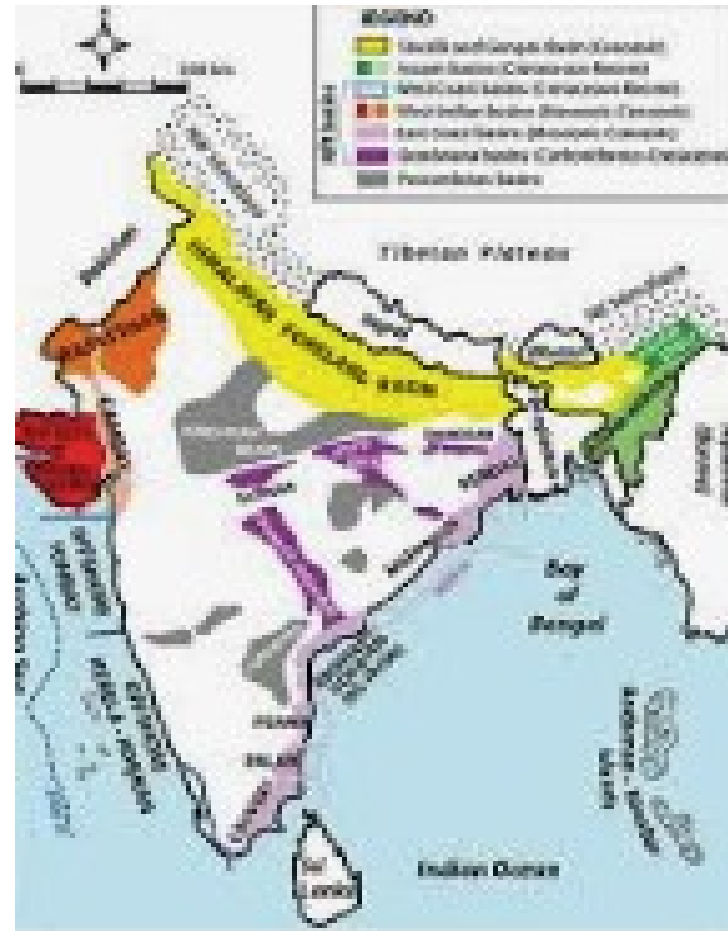


Shale in Australia

- EIA original estimate 396 tcf
- 2013- estimates 1000 tcf (recoverable shale gas)
- Prospective Shale Basin
- North South Basin- McArthur Basin
- Western Basin- Canning Basin & North Perth Basin
- Northern Basin- Beetaloo Basin (Shale similar to Marcellus & Barnett Shale) 500 tcf
- Western Queensland Basin



Shale Plays in India





Shale in India

- Set back for India
- Nov. 26, 2019- ONGC has wound up its Shale Gas exploration program stating that, India may not have enough commercially exploitable Shale resources
- India has new rocks which are elastic
- ONGC drilled 26 wells in Cambay, KG, and Assam + Arakan
- Reserves are in variance:
 - ONGC- 187 tcf
 - EIA(2013)- 584 tcf
 - EIA(2011)- 290 tcf
 - Schlumberger- 300 to 3100 tcf
- Policy Intervention:
- 14-10-2013- on land blocks on nomination to ONGC=50, OIL=6 on pre NELP and NELP blocks



Indian Shale Basin

- Cambay basin
- Rajasthan basin
- Ganges basin
- Gondawana basin
- Assam- Arakan basin
- Damodar Valley basn
- Cauvery basin
- Vindhayas basin
- Bengal basin

Innovative Approach in Shale E&E in US

- Innovation raises production, lowers cost of production
- In effect this reduces the Natural Gas market price
- Firms produce more at all price level than prior to prior to innovation, which also reduces market price
- Lower price stimulates an increase in consumption and so the increase in market demand

Natural Gas Production in US

Figure 1. Innovation in Natural Gas Production



Learning – Case Studies

- Mitchell Energy had long term contract to sell gas. It had experimented on Barnett Shale
- Mitchell Energy has expertise in using liquids and sand under high pressure to release gas from rocks
- Devon Energy having expertise in drilling horizontal wells acquired Mitchell Energy in 2000.
- The combination became expert in Hydro Fracking, an important activity in Shale E&E, which put this in commanding position

Learning – Case Studies

- New York state has not approved Shale development resulting in fall in NG production
- Leading to more import of electricity
- However GHG emission reduction has been less than that of neighboring state of Pennsylvania
- Environmental consideration is not in isolation

Factors Effecting Shale Gas E&E in India

1. Lack of Information about shale rocks in India
2. Monetization of shale gas being uncertain even after Information
3. Technology of shale gas exploration - lacked globally
4. Technology of shale gas exploration not available to India
5. Cost of production of shale gas uncertain
6. Cost of production is such that market would not have absorbed shale gas

Factors Effecting Shale Gas E&E in India

7. Government Policy, Water management, Land, Environment-
8. Opportunities for conventional E&P are available and diversified interest not pursued
9. Consortium Approach: combination of- Gas consumer, Technology provider, infrastructure provider and a service provider
- 10 Building a strong organization which can take on the unique challenges associated with Shale gas development.
- 11 Co-opting the local communities

Capabilities for Consortium Approach

- A combination of experts in key activities of Shale E&E
- Able to accommodate shorter planning and development cycle for shale gas as compared to conventional E&P.
- Operation should be modeled more on “Flexible Factory” than traditional E&P. This would involve iterative interaction between sub surface delineation, development planning and operation.
- Investment in Shale gas exploration capability to overcome the lack of sub- surface knowledge in India.
- A strong project delivery team with proven track record of delivering projects on time to ensure that the rapid and short gas supply peak of each well is monetized
- In-house capability to reduce and control well and infrastructure capital expenditure.
- Continuous innovation to reduce cost.

Way Forward

- Data collection to be done by DGH/ GOI
- Data need be reliable
- Initiative for R&D specific to Indian Shale
- Allow incentive based involvement of private players
- Rope in global experienced players with assurance for gas monetization at market price
- Stable Policy & Regulatory regime
- Co-opting the local communities:

Thanks

