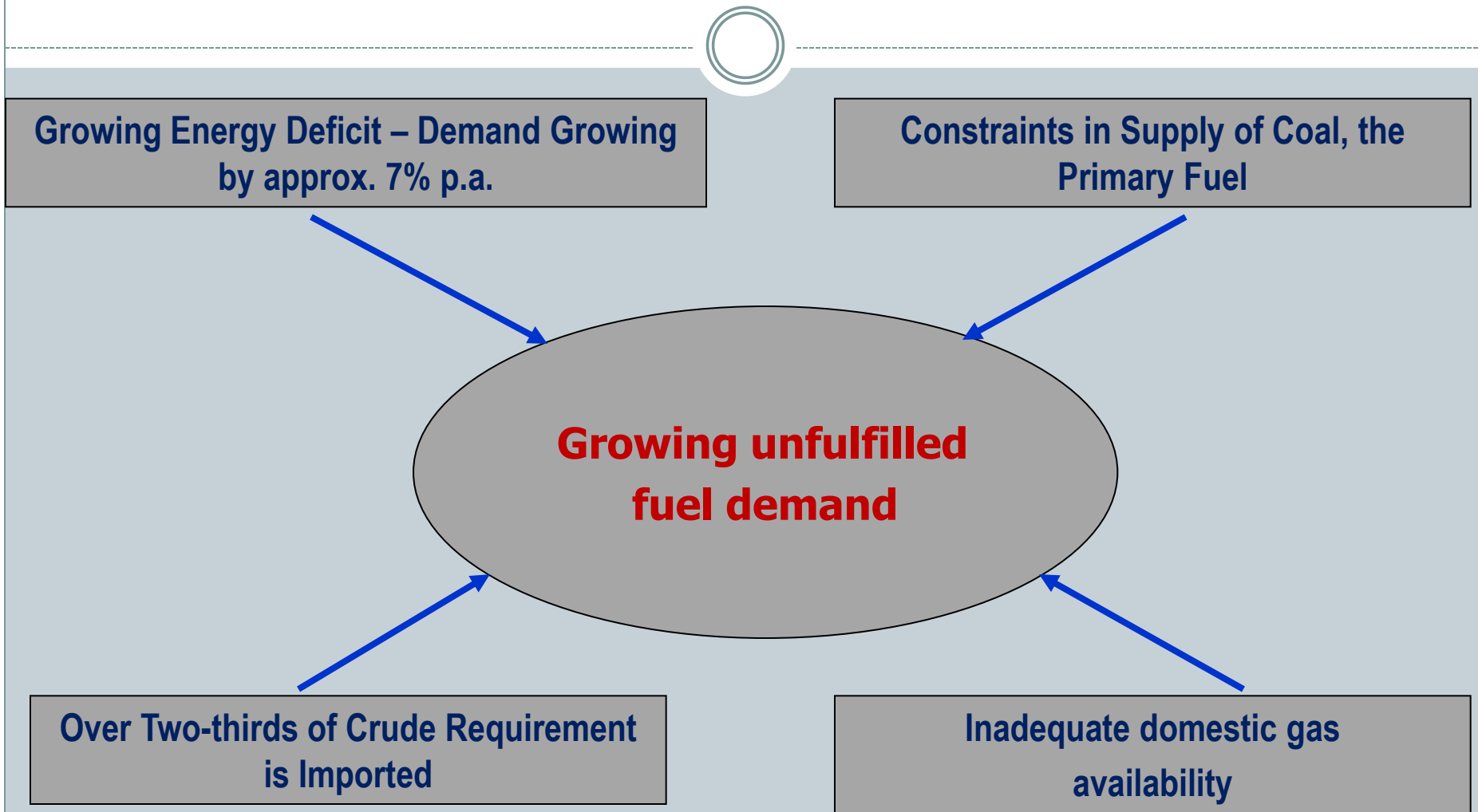


CHALLENGES OF LNG & ECONOMICS OF ITS USE



SURESH MATHUR
MAY, 2015

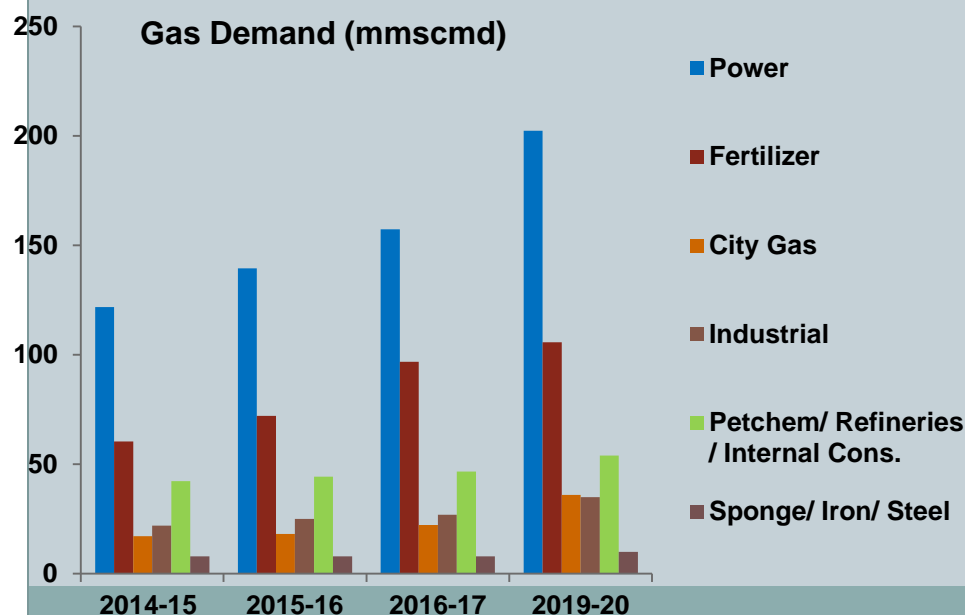
INDIA – GROWING AND DEFICIT MARKET



INDIA – A MAJOR GAS/LNG CONSUMER

- 15th largest gas consumer – 51bcm (~138 mmscmd)
- 4th largest LNG importer – 18 bcm (~48 mmscmd)
- Economy growing at CAGR of about 6% with similar growth in Energy Consumption
- Share of Natural Gas in Indian Energy basket to increase from 9% to 20% by 2025
- Despite increase in domestic gas production- dependency on imported gas to increase substantially
- Pipeline network- developing into a national grid- needs to grow faster, connecting new markets

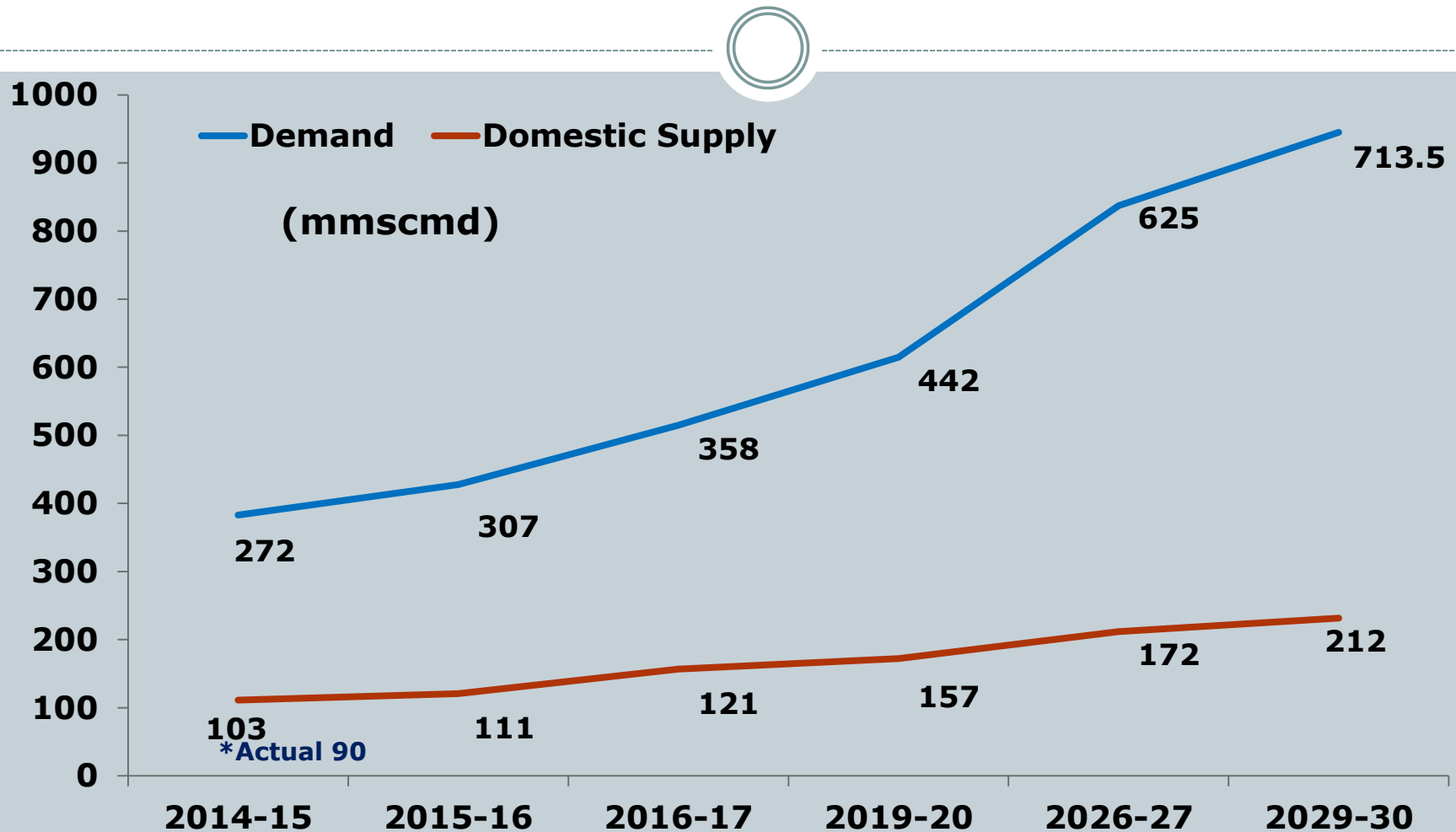
SECTOR WISE PROJECTED GAS DEMAND



Sector	2014-15	2015-16	2016-17	2019-20
Power	122	139	157	202
Fertilizer	60	72	97	106
City Gas	17	18	22	36
Industrial	22	25	27	35
Petchem/Refineries/Internal Consumption	42	44	47	54
Sponge Iron/Steel	8	8	8	10
Total Realistic Demand	272	307	358	443

Source : BP Statistical Review June 2014 & Vision 2030, Natural Gas Infrastructure in India

CURRENT GAS DEMAND & DOMESTIC SUPPLY SCENARIO



Large demand for gas – but extremely price sensitive

LNG IN INDIA



- 'Hydrocarbon Vision 2025' envisaged a GDP growth of 5-6% for the E&P sector along with demand supply scenario of oil & gas in the Country
- Current GDP growth of 6-7% translate into overall energy demand growth at CAGR of 7.00%
- Given India's growing energy requirements & unlikelihood of matching increase in the domestic supplies, despite some significant oil & gas finds recently, the import dependence is only going to accentuate sharply in the coming years
- LNG Regas Capacities
 - Presently, India's LNG import capacity around 23 mmtpa through 4 terminals & meeting approx. 35% of total gas supply of the country

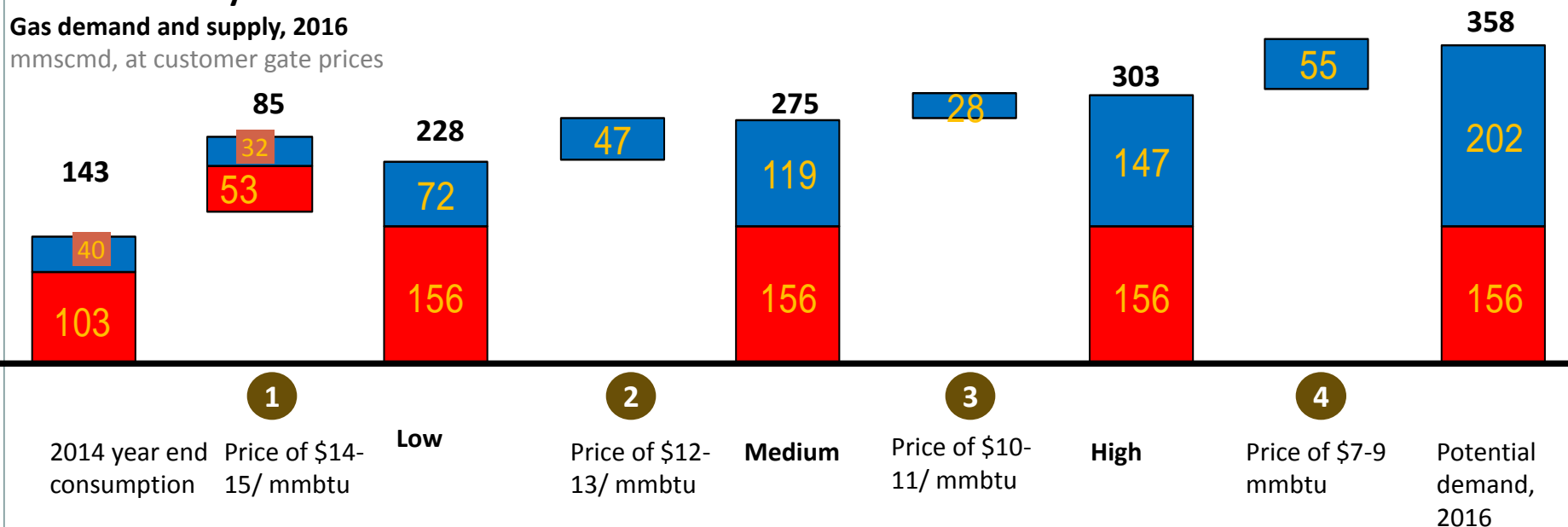
LARGE DEMAND BUT SENSITIVE TO PRICE

PETRONET ANALYSIS-2015

Petronet Analysis 2015

Gas demand and supply, 2016

mmcmd, at customer gate prices



Sectors with demand

- Industries
- CNG (transport)

- Refineries
- Industries
- New fertilizer plants

- Peaking power plants

- Base load power

Imports

Domestic supplies

Prices at Crude of \$ 65/Bbl

PRICING AND AFFORDABILITY OF NATURAL GAS



➤ **India a complex gas market:**

- Multiple price based on field/source
- Domestic Gas price determined by Government
- Allocation of domestic gas by Government based on Gas Utilization Policy
- Inadequate gas transmission network with High cost of transportation
- Many areas devoid of pipelines
- Dependability on imported Gas like LNG and transnational pipelines
- Pricing of LNG linked to Crude on term basis

➤ **Affordability of Natural gas:**

- Affordability of natural gas varies across consuming sectors
- Competition vis-à-vis alternates fuels
- Needs to look into pricing of Energy considering quality of life, cost of production, fuel replacement opportunities
- Focus on cleaner and sustainable forms of Energy

LNG PRICING REGIMES

- LNG pricing regime can be divided into three categories based on the regions



Importer

Japan, Korea,
Taiwan, China & India

France, Belgium
& Spain

America and
Mexico

Exporter

Malaysia, Indonesia,
Brunei, Australia and
ME

Algeria, Nigeria
& Trinidad

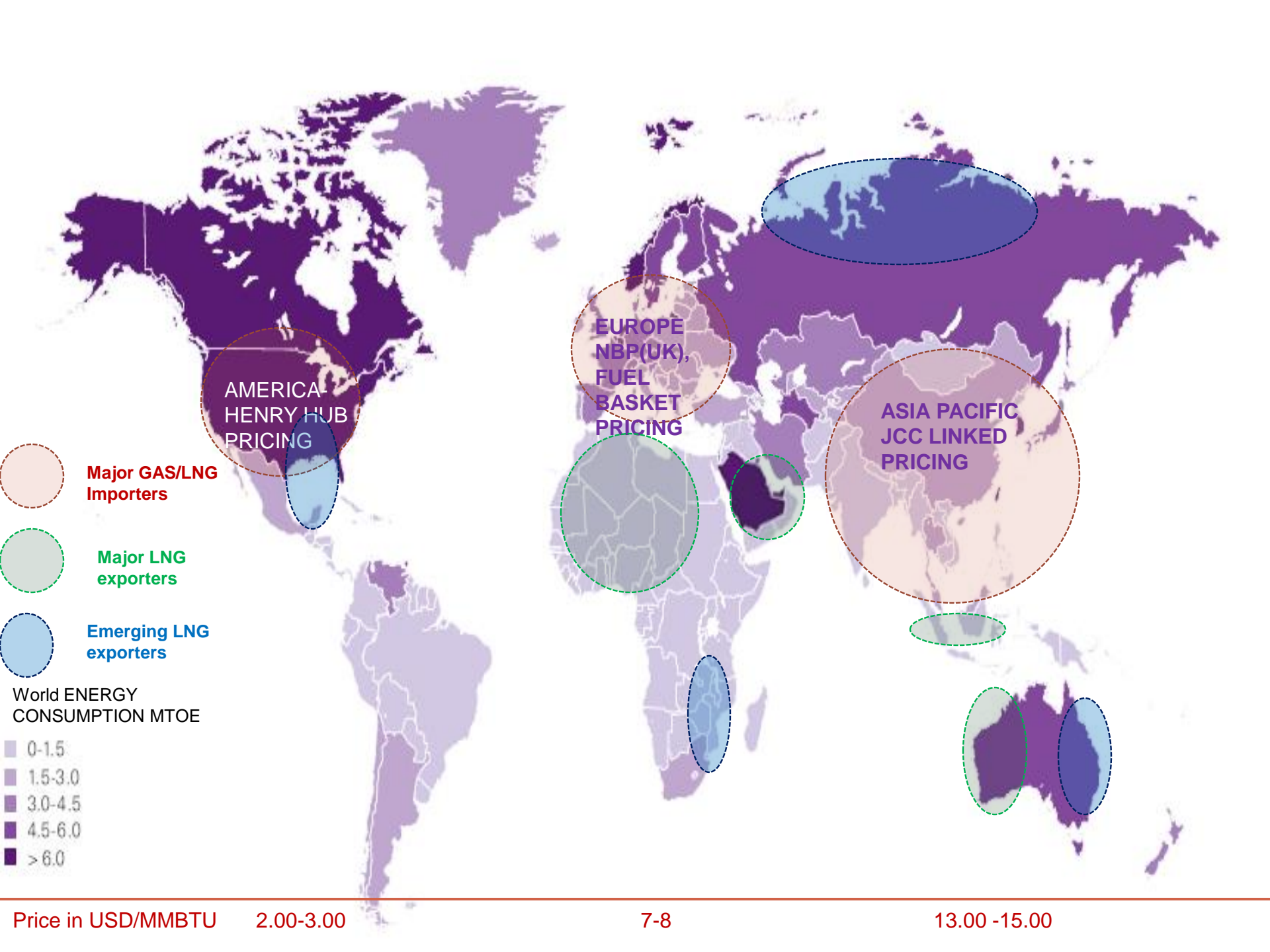
Algeria and
Trinidad

Price
Linkage

Japanese contracts
typically linked to
Crude oil prices
(JCC)

Pipeline supply
contracts with prices
linked to fuel oil and
gasoil (NBP)

Prices linked to
market
price(Henry
Hub price)

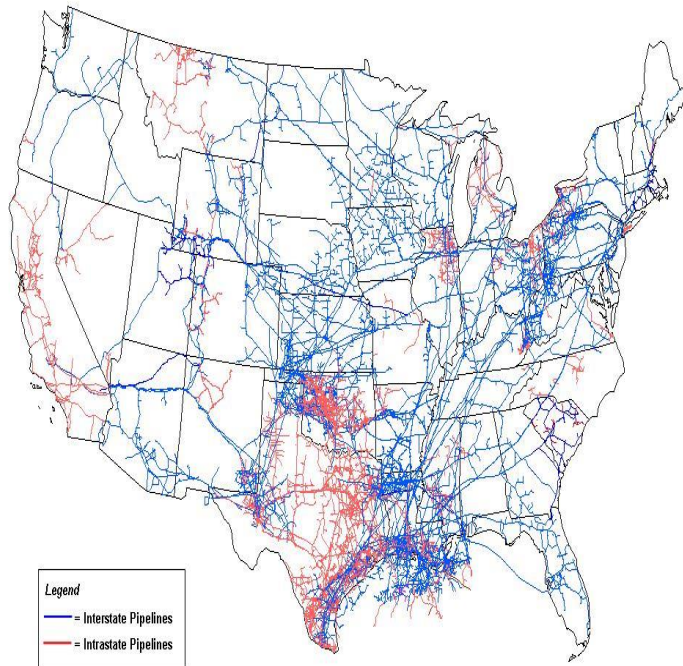


NECESSITY OF GAS GRID

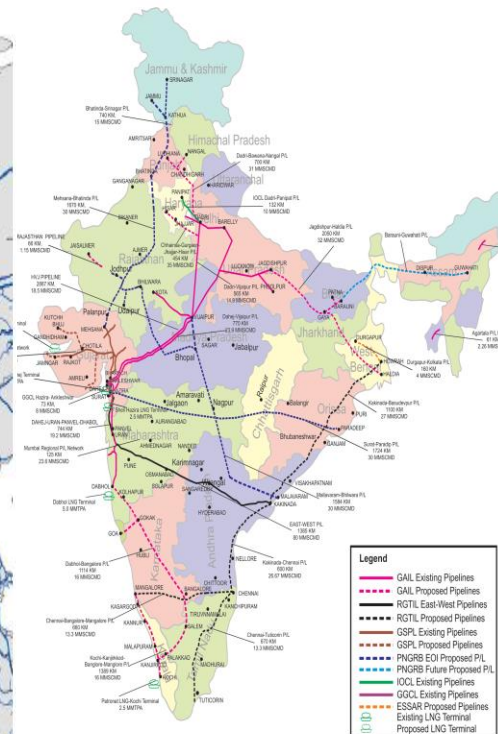
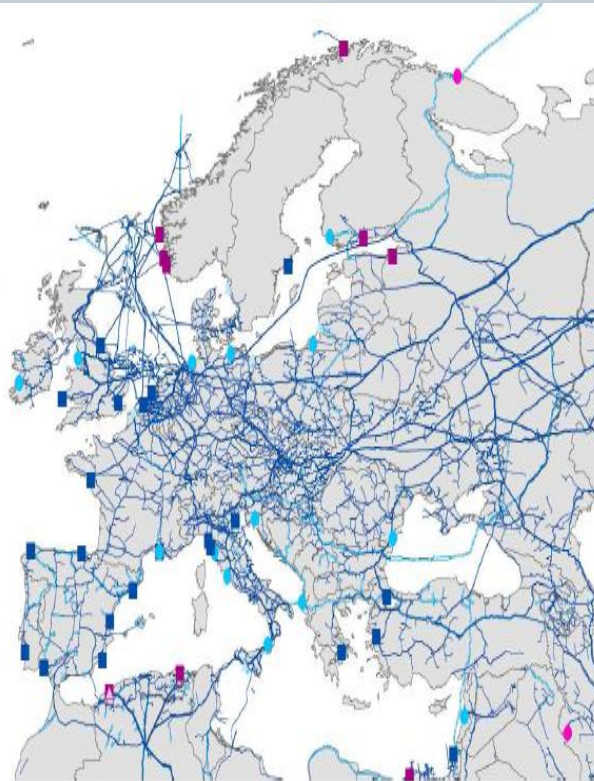
USA

EUROPE

INDIA



Source: Energy Information Administration, Office of Oil & Gas, Natural Gas Division, Gas Transportation Information System



•Not to the Scale
•Pipelines Route are Indicative in Nature
•Authenticity of indicated P/L may be ascertained from PNGRB

KEY ISSUES IN LNG SOURCING

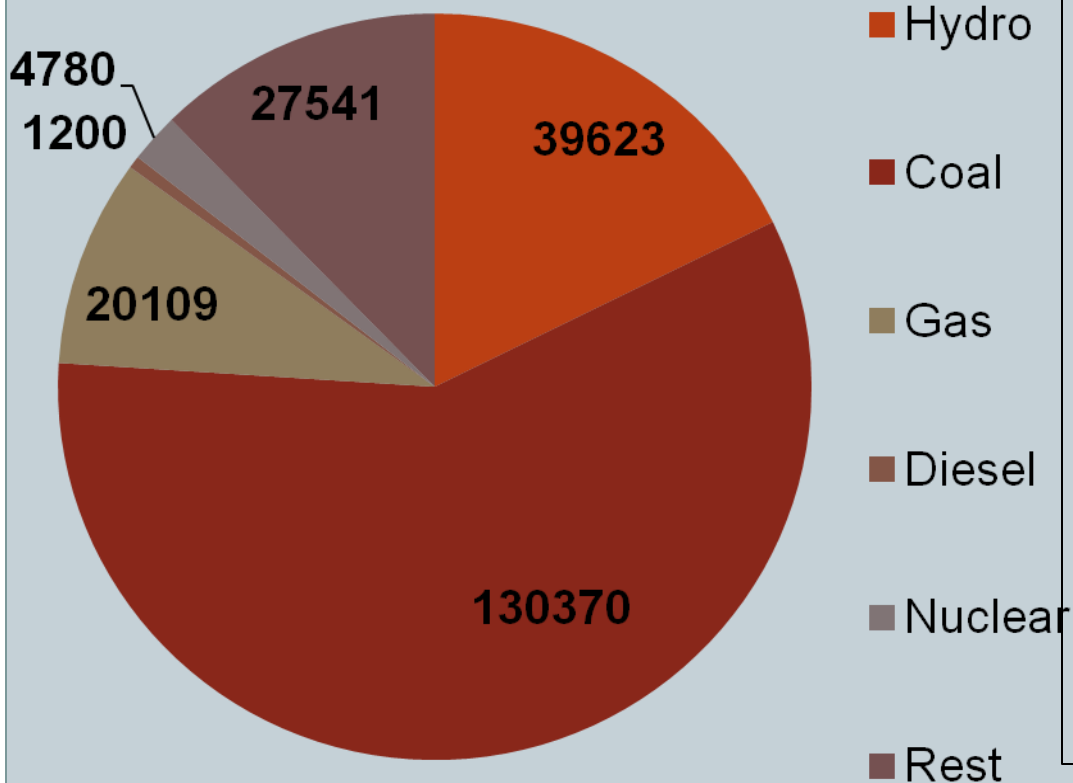


- Large appetite with high Price sensitivity and competition with alternate fuel
 - Regulated power and fertilizer end use prices
 - 5th largest coal reserves
 - Large consumption of liquid fuels like Diesel, FO
 - Pricing of Gas domestically
- Development of Infrastructure
 - LNG terminals
 - Domestic and transnational pipeline networks
 - Gas storage
- Competition from Far East markets
- Multiplicity of Indices like JCC, JKM, HH

LARGE DEMAND FOR LNG BUT CHALLENGES REMAIN

NATURAL GAS IN POWER SECTOR

Total Installed Capacity as on 30.04.13 223625 MW



- Gas contributing approx 9% of total power generation capacity
- During 12th FYP (2012- 17), plan of additional 25000 MW gas based.
- Demand of 157 MMSCMD by the end of 12th FYP.
- Role of LNG in Power Sector:
 - Complementing domestic gas usage
 - In peaking and merchant Power

ROLE OF GAS & LNG IN POWER GENERATION



- A segmentation of prices within consumers
- Natural gas & LNG to play role in mitigating demand-supply gap for new under construction combined cycle (base load) capacities
- R-LNG can serve as top up fuel for base load plants thereby augmenting the PLF and providing solution for meeting the PEAKING POWER DEMAND
- Increased tariff and comparable with global standards to help generation of more electricity based on Natural gas/LNG

ROLE OF GAS & LNG IN FERTILIZER



- India is third largest producer of nitrogenous fertilizers in the world after China and USA.
- Presently, there are 30 large size units besides about 80 small and medium scale units
- Fertilizer consumes 42 MMSCMD split between 26 MMSCMD domestic supply and 16 MMSCMD R-LNG
- Total Fertilizer production 23 Million Tons
- 3.75 Million Tons extra production expected thereby resulting in additional gas demand of approx 7 MMSCMD

REGASIFIED LNG Vs. DOMESTIC GAS



(\$/mmbtu)

Producer	RLNG Ex Dahej terminal before regas i.e. FOB+ Shipping + Customs duty	Regas Charge	Base Price	Central Sales Tax (2%)	Transmission Charges incl. Service tax	Total Price
RLNG (Term Contract)	14.34	0.63	14.97	0.30	0.67	15.94

Producer	Expected Land Fall Price	Marketing Margin	Base Price	Central Sales Tax (2%)	Transmission Charges incl. Service tax	Total Price
ONGC/Oil APM (incl. Royalty)	4.66	0.17	4.83	0.10	0.67	5.60

Transmission based HBJ tariff of GAIL outside Gujarat
RLNG Price (March 2015)
ONGC Price on GHV basis

AVERAGE POWER TARIFFS INTERNATIONALLY



Country	\$/Kwh
Brazil	0.11-0.15
China	0.08-0.11
France	0.17-0.20
India	0.06-0.08
Japan	0.22-0.30
UK	0.23-0.25
USA	0.10-0.11

IMPACT ON GAS PRICING BY POOLING

	Domestic Gas (\$/mmbtu)	Long term R-LNG (\$/mmbtu)	Spot RLNG for power sector (\$/mmbtu)
Basic Cost	5.18	12.80	7.00
Import Duty	NA	0.67	0.00
Regas Charges	NA	0.65	0.65
Marketing Margin	0.09	0.18	0.18
Pipeline Tariff	0.34	0.34	0.34
Service Tax	0.04	0.04	0.00
VAT	1.01	2.20	0.00
Total Cost	6.66	16.88	8.17
Apprx. Power cost/Rs. Kwh	4.10	8.70	4.78

- Difference between the domestic gas and long term LNG is more than \$10/mmbtu. However minimal difference with spot prices after fiscal incentives
- Pooling with domestic gas will increase LNG affordability coupled with low spot and declining long term prices

WAY FORWARD



- Indian market has appetite for large volumes at “RIGHT” prices
- Development of regional LNG/GAS index to cater growing demand of emerging economies/ Indian sub continent
- Robust growth in Infrastructure development
 - LNG Terminal
 - Gas Storage
 - Gas Pipelines on national & transnational basis
- Participation by global players in India’s infrastructure development
- Sector reforms like
 - Power tariff review, day of time tariff
 - Tax effective Swaps in Gas industry, entry & exit tariff
- Gas Pooling
- Government support & creation of Sovereign fund to handle stiff global competition enabling acquisition of overseas upstream assets
- Rationalization of taxes
- Consumers mindset in pricing, supply security needs to undergo change :
Market driven



THANKS