

Adoption of Gas & LNG in India: All About Price?

FLAME: Global Gas Pricing Forum

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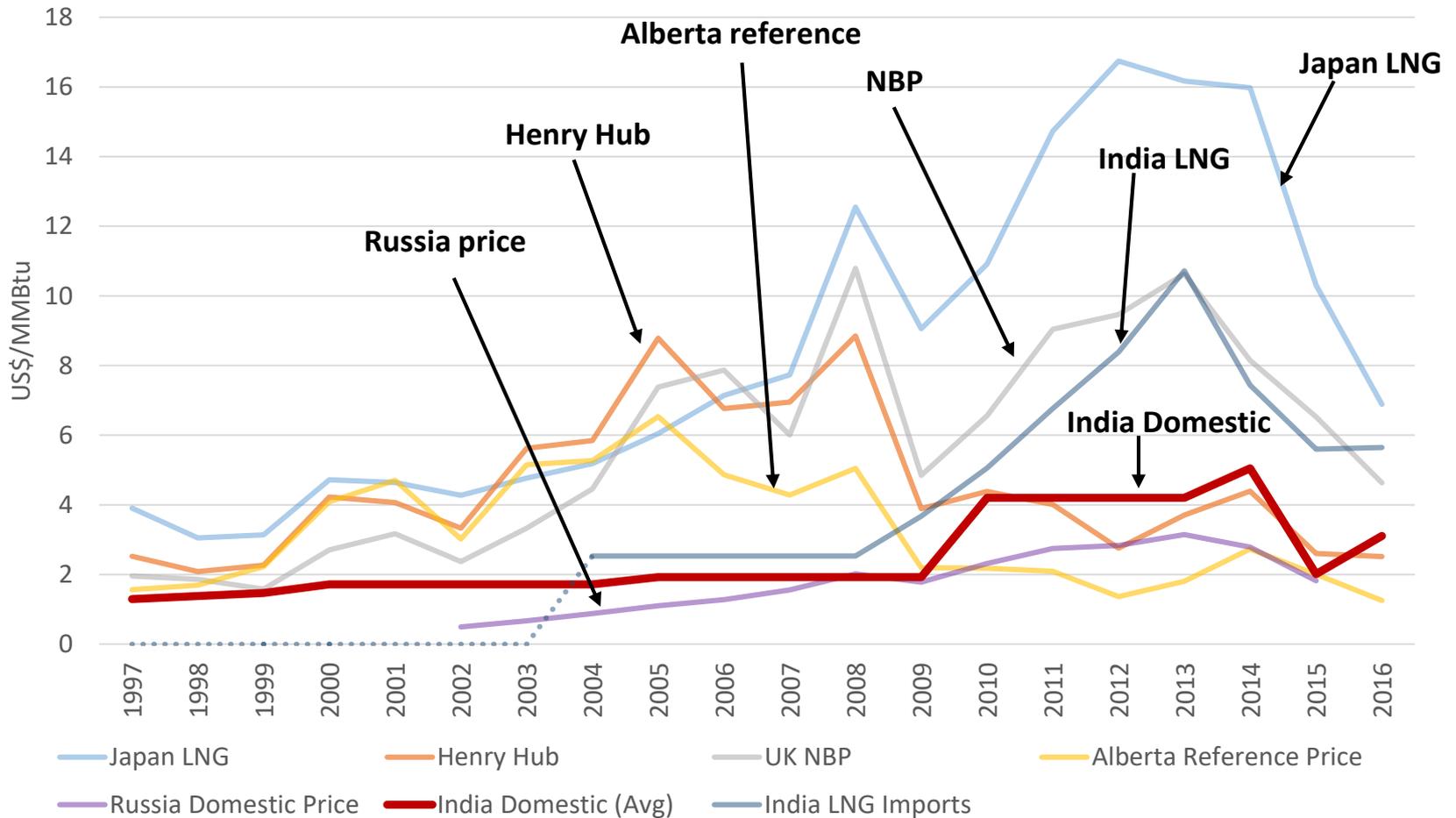


How are gas prices set in India? Recent Reforms

TYPE	START/END DATE	DETAILS
Nomination Regime	Ended early 1990s	NOC legacy fields; \$2/MMBtu
Discovered Fields Regime (Pre-NELP)	Ended 1998	NOC carried interest; \$3.5-\$5.7/MMBtu
New Exploration Licensing Policy (NELP)	Ended October 2014	'Liberalised' upstream regime; prices linked to Brent; \$4.20/MMBtu
Volume-weighted international average benchmark (Hydrocarbon Exploration Licensing Policy or 'HELP' bidding round to be launched in July '17)	Since October 2014	12 month volume-weighted trailing average (with one quarter lag) of: US Henry Hub, UK NBP, Alberta reference price & Russia domestic price; adjusted biannually; currently \$2.48/MMBtu
'Premium Price' for Deepwater, Ultra Deepwater & High temp- high pressure fields (HELP, July '17)	Announced April 2016; not yet implemented	Linked to landed prices of imported fuel oil, naphtha and LNG; \$5.56/MMBtu
LNG Imports	Since 2004	Driven by spot market dynamics or LTC terms.



Indian gas prices relative to international benchmarks

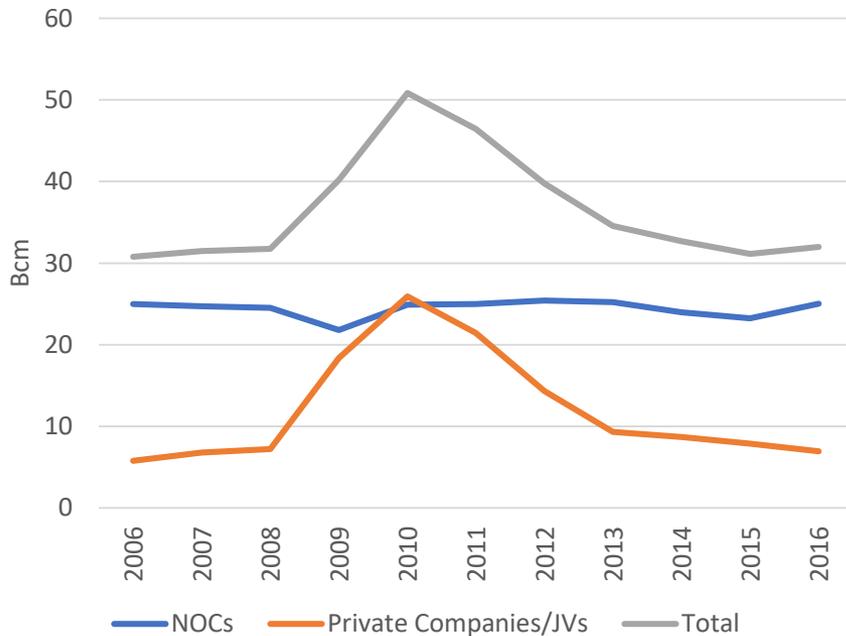


Source: BP Statistical Review (2016); Government of India (2013; 2016); Gazprom IFRS Financial Reports (2002-16); Alberta Energy (1997-2017); Platts (2016)

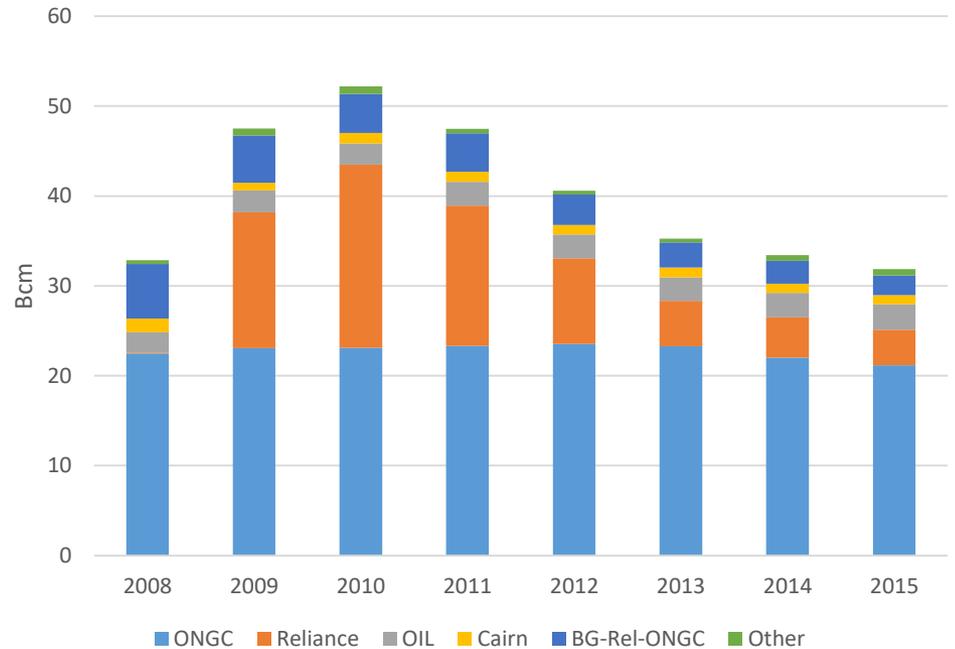


How has domestic production responded?

Production by sector, 2006-17



Production by Company, 2008-15



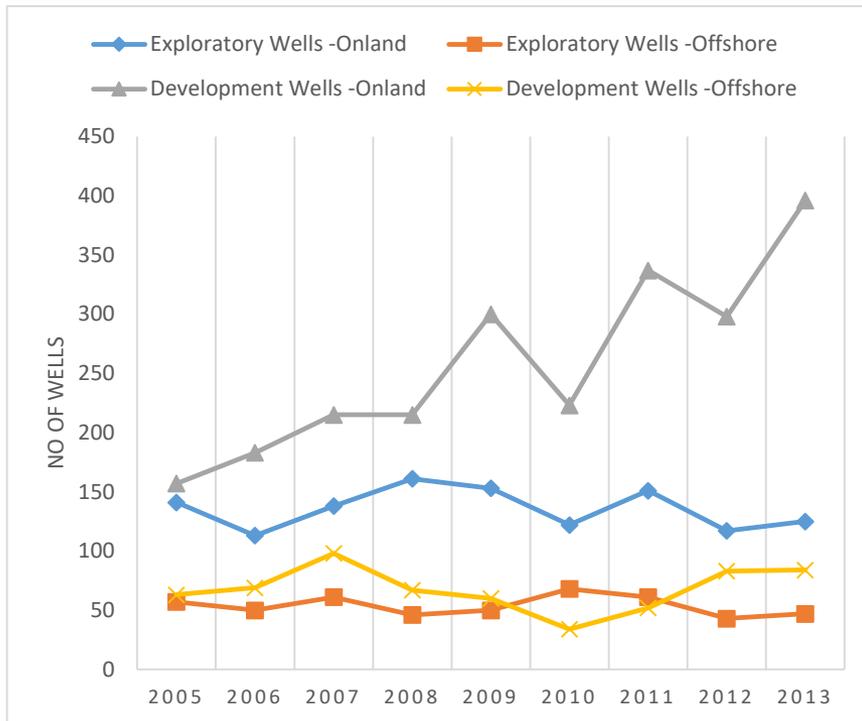
Source: Petroleum Planning and Analysis Cell, 2017; Directorate General of Hydrocarbons, Government of India, 2015

- Pricing reforms have failed to stem the decline in domestic production

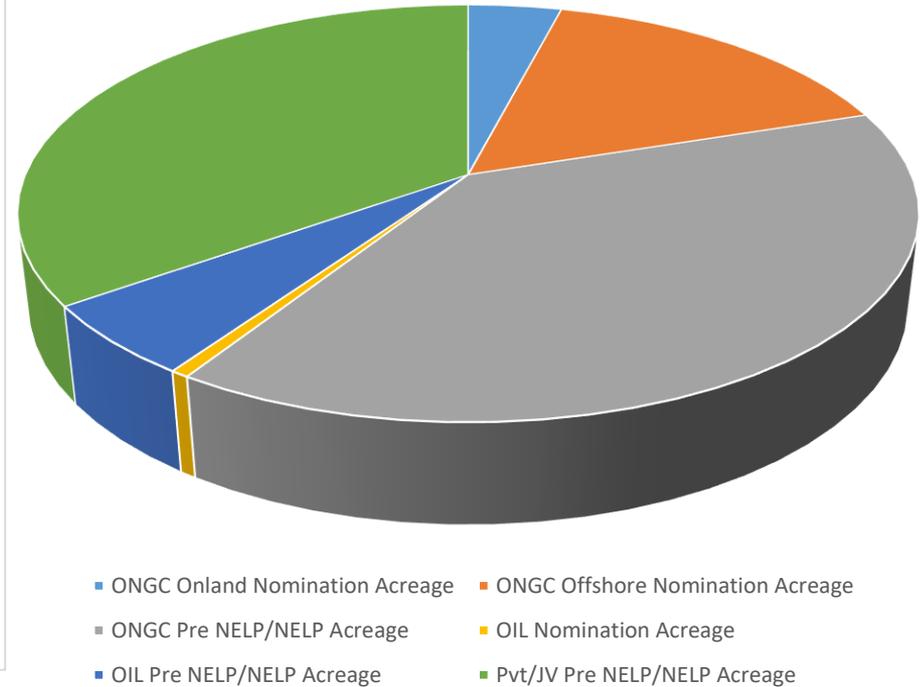


What about upstream investments?

Number of Wells Drilled, 2005-13



Holdings of Exploration Acreage (%)



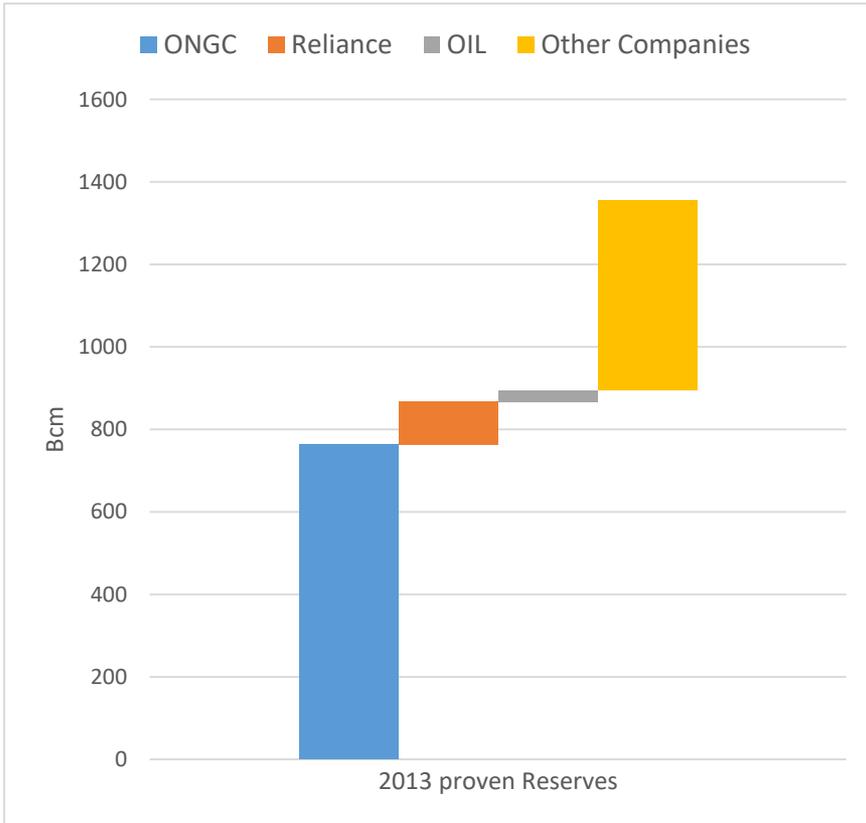
- NOCs account for majority share of acreage
- New bidding round for acreage to take place in July 2017 under new fiscal regime

Source: Directorate General of Hydrocarbons

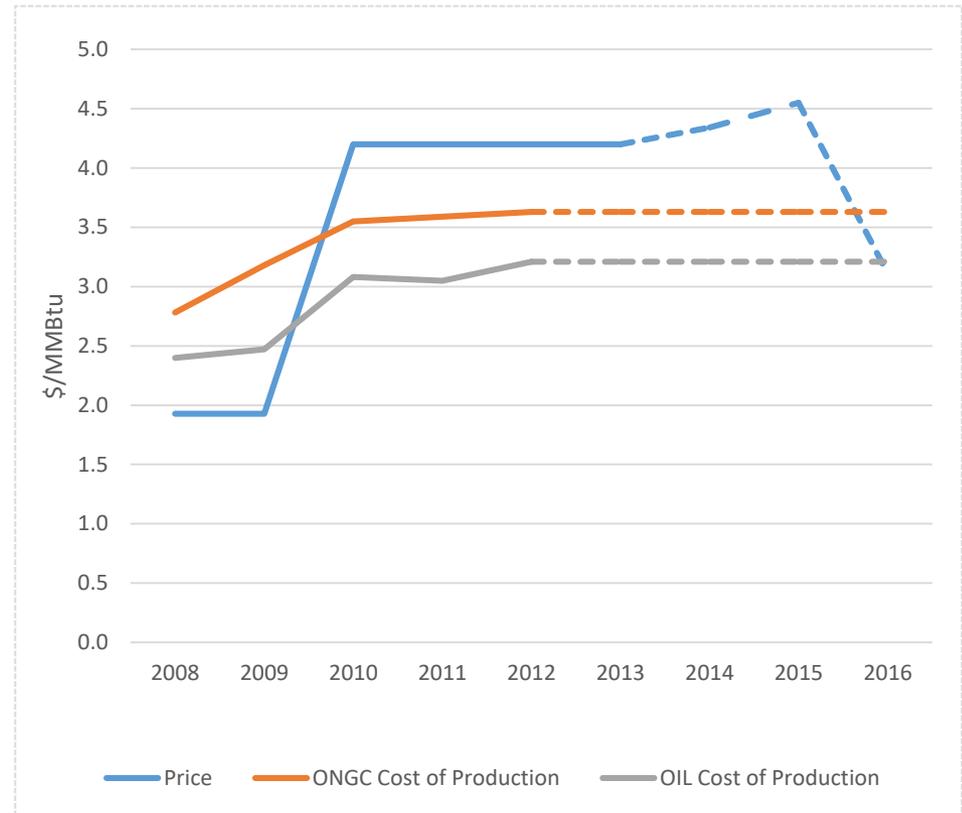


NOCs – still in the driving seat...

Proven Reserves by Company



Avg. Cost of Prod. of Indian NOCs vs Domestic Price

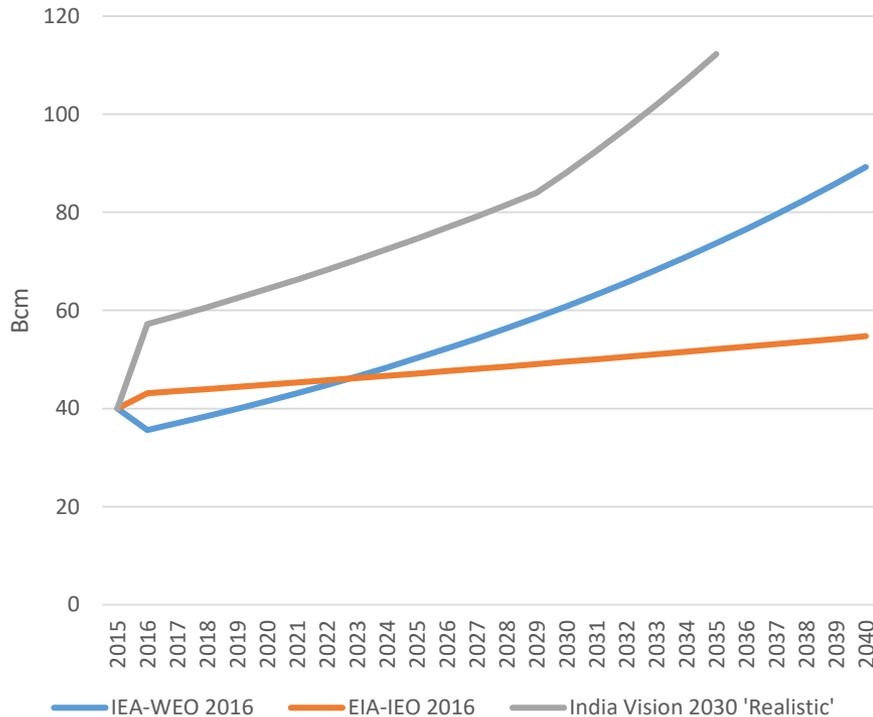


- ...but unable to develop legacy assets/proven reserves, due to low price

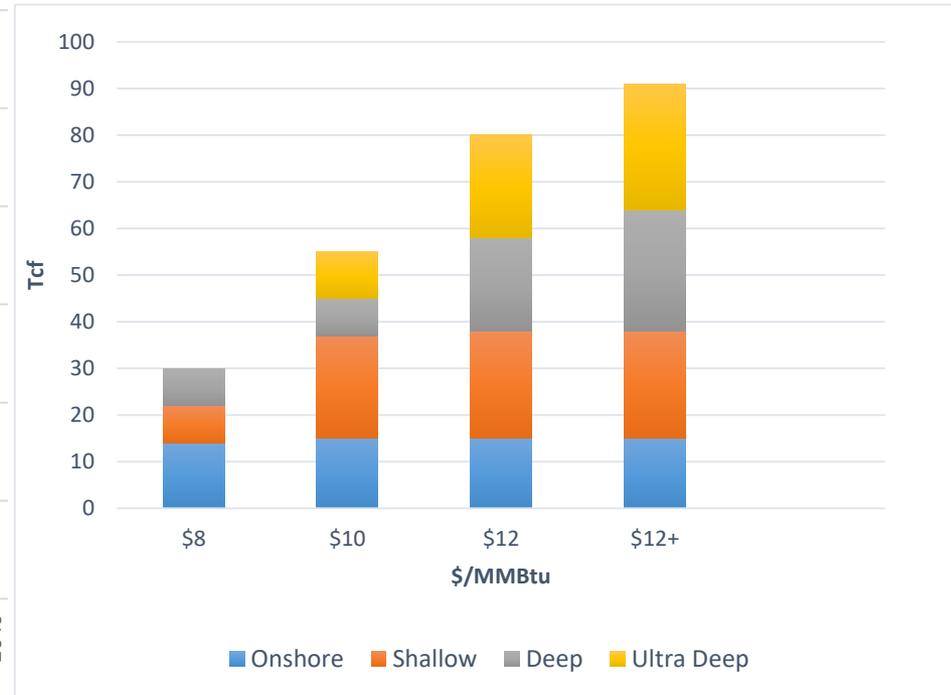


Outlook for domestic supply

Uncertainty in domestic production



Prices required for commercial production



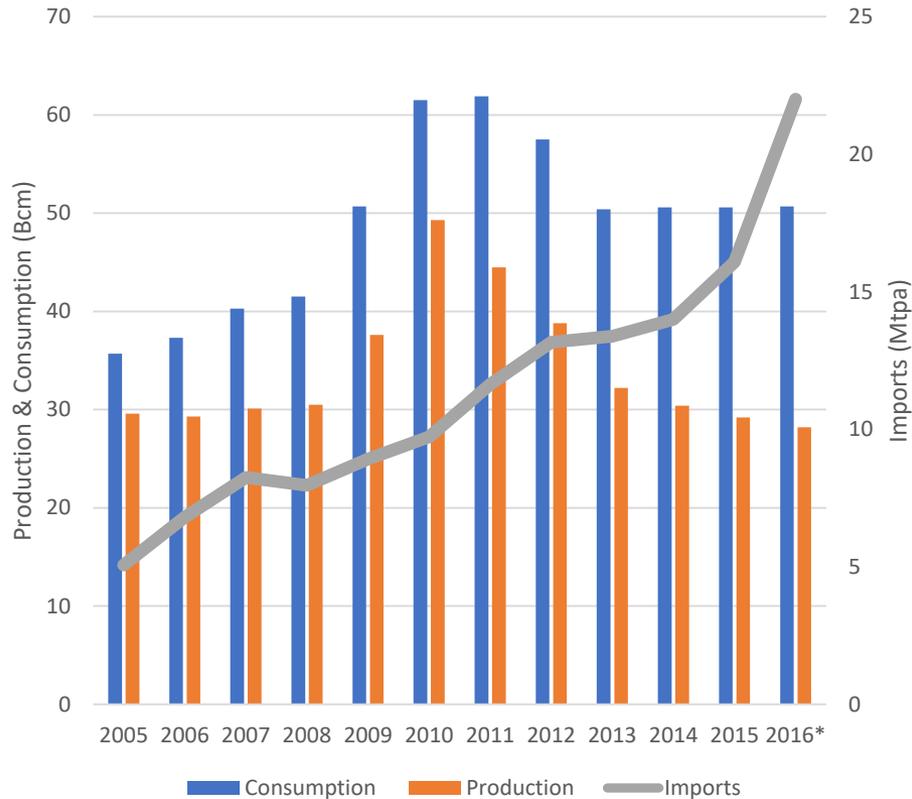
Source: IEA; EIA; Gol; Petrofed (2014); IHS Press Release (2014); compiled by author from publicly available reports

- Wide divergence of forecasts
- Minimum \$8/MMBtu est. to incentivise new domestic production



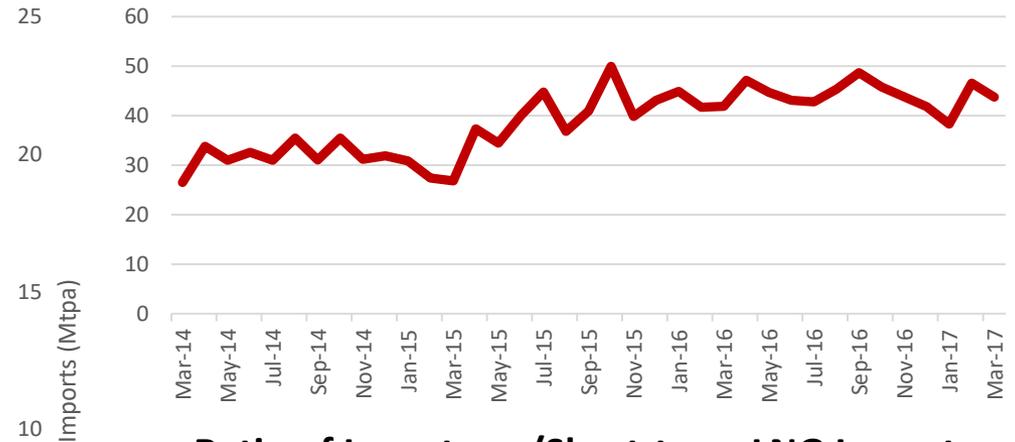
What has been happening to LNG imports?

Consumption, Production & Imports

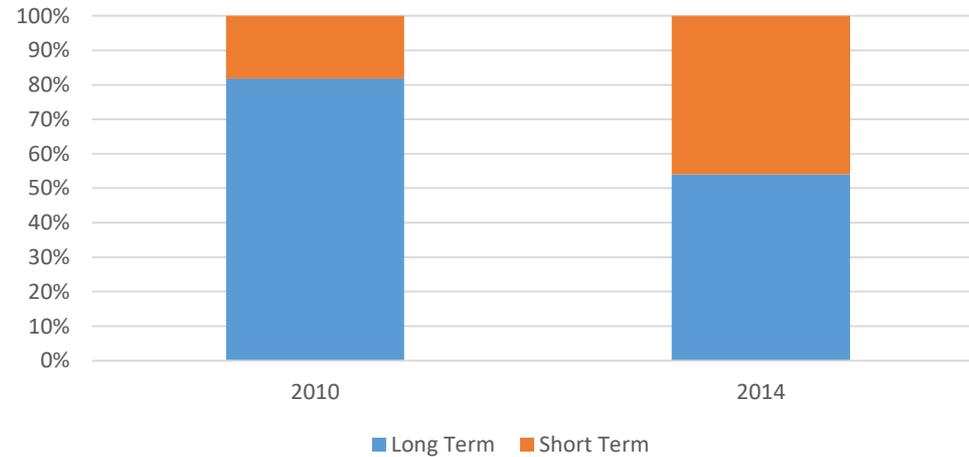


Source: PPAC (2017)

Import Dependency (% of consumption)



Ratio of Long-term/Short-term LNG Imports



- LNG imports upsurge over 2015/16; composition of ST/LT imports changing



What is the main constraint to future LNG imports?

Regasification Terminals: Existing and Planned (behind schedule)

Regas. Terminal	2012-13	2016-17	2021-22	2026-27	2029-30
Dahej	10	15	15	15	15
HLPL Hazira	5	10	10	10	10
Dabhol	5	5	5	5	5
Kochi	2.5	5	10	10	10
Ennore	-	5	5	5	5
Mundra	-	5	10	10	10
Kakinada (FRSU)	-	5	5	5	5
Gangavaram	-	3	3	3	3
East Coast Terminal	-	2.5	5	10	10
West Coast Terminal	-	-	5	10	10
Total Capacity Mtpa	22.5	55.5	73.0	83.0	83.0
At 70% Utilisation Mtpa	15.8	38.8	51.1	58.1	58.1

Source: Indian Petroleum and Natural Gas Regulatory Board

- **Main constraints to LNG imports: infrastructure, and the ability of buyers to contract supplies**



FSRUs a solution to infrastructure? Too early to say?

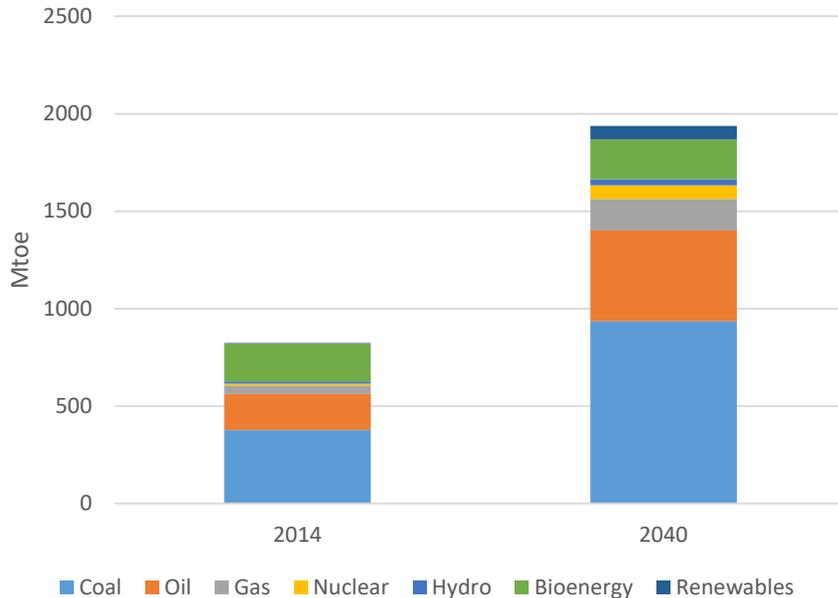
Location	Capacity
Pipavav (Gujarat) , West Coast	5 Mtpa from 2018
Karwar (Karnataka), West Coast	7.6 Mtpa
Kakinada (Andhra), East Coast	5 Mtpa jetty-moored
Kakinada (Andhra), East Coast	4 Mtpa
Digha (West Bengal), East Coast	8Mtpa
Krishnapatnam (Andhra), East Coast	5 Mtpa
Kolkata (West Bengal), East Coast	4 Mtpa
Jaigarh (Maharashtra), West Coast	4 Mtpa

Source: Author's compilation from public sources; subject to further verification

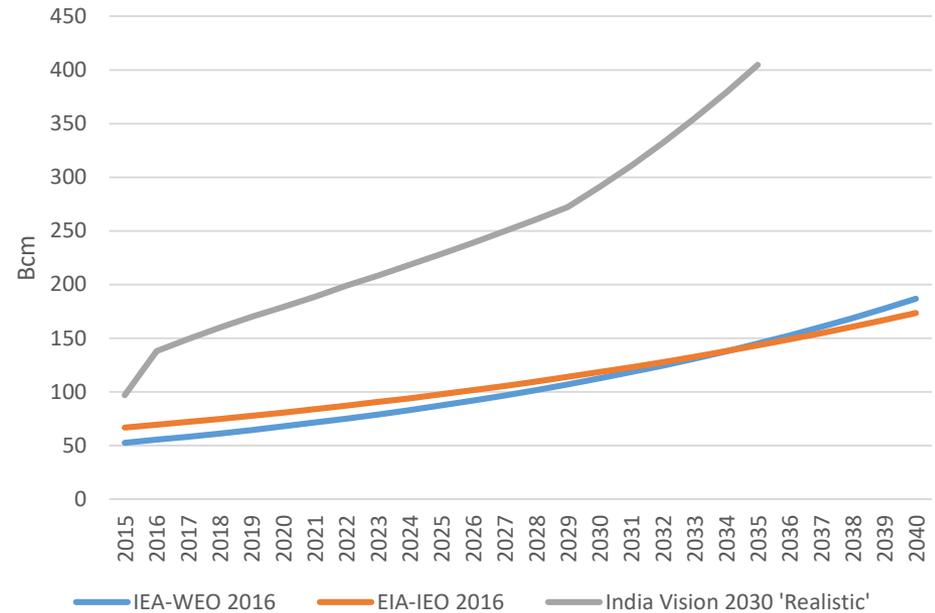


What about the Demand Side?

Proportion in Primary Energy Demand



Projections of Gas Demand



- India's gas 'market' comprised of two moving parts: one part has prices and quantities set by the government; the other part can afford to purchase gas at market (LNG import) prices
- Government aims to increase share of gas in energy mix from 6.5% to 15%; timeline for this is unclear



Structure of Demand Determined by 'Gas Utilisation Policy'

Domestic Supply

- **Tier 1**
 1. City gas for households & transport
 2. Fertiliser plants
 3. LPG extraction plants
 4. Grid connected power plants



- **Tier 2**
 1. Steel, refineries & petrochemical plants
 2. City gas for industrial & commercial consumers
 3. Captive and merchant power plants
 4. Other consumers, feedstock & fuel

Composition of consumption , pre-2014

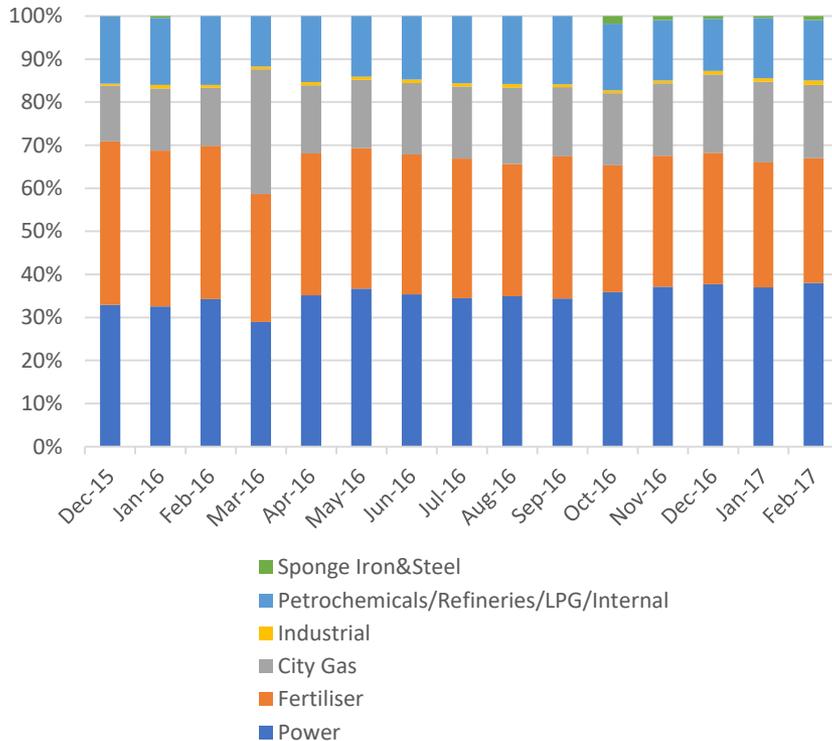
Domestic Gas: 86%
LNG Imports: 53%

Domestic Gas: 10%
LNG Imports: 40%

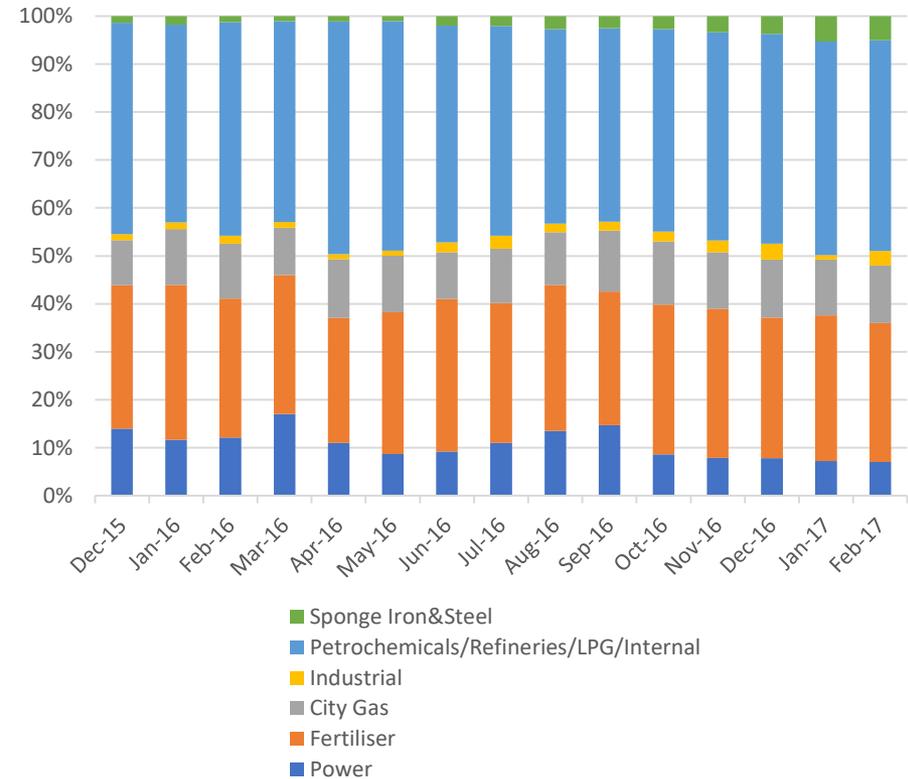


Gas consumption by sector: 2014-2017

Domestic Gas



LNG Imports



Source: Author's compilation from PPAC reports.

- Incremental LNG (imports) over 2014-17 absorbed by industry, fertilisers and city gas.
- Fastest growth in LNG consumption in city gas, then industry and fertilisers.
- Power sector's consumption of LNG not as high as originally perceived.



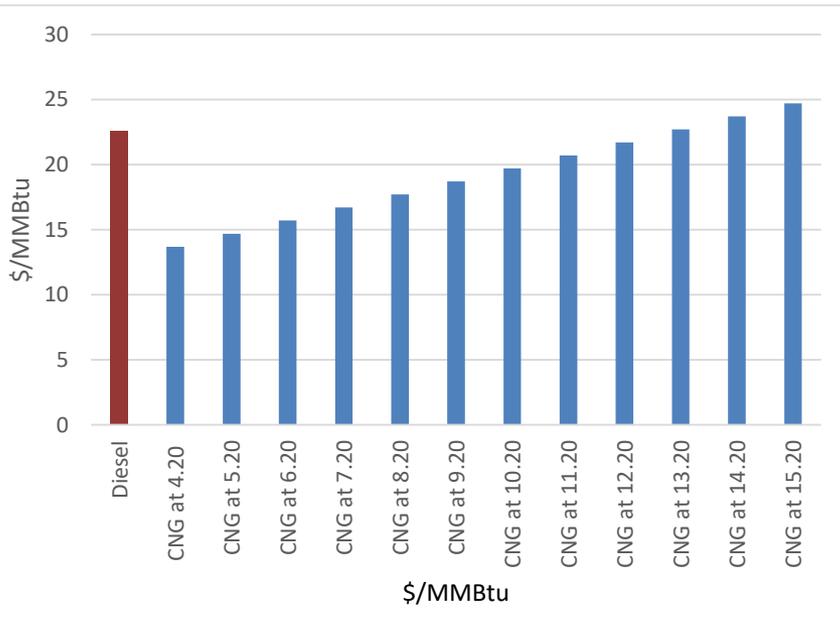
Drivers of demand in main consuming sectors

- **Industry**
 - Target to increase share of manufacturing in GDP from 15-25% by 2022
 - Refineries, petrochemicals, LPG shrinkage, sponge iron & steel
- **Fertilisers**
 - Main competing input: naphtha
 - Target to cease fertiliser imports in next 5 years & expand gas-based fertiliser production
 - Subsidy on gas sold to fertiliser plants & on retail price of fertiliser to farmers through 'direct cash transfers'
- **City gas**
 - Replacement of public transport fleet with CNG
 - Piped natural gas to households
 - Competing inputs: diesel (CNG) ; LPG (PNG)
 - Main constraint: infrastructure
- **Power**
 - Time limited subsidy to gas-fired power generators (now ended)
 - Competing fuel: coal; Added constraint: infrastructure

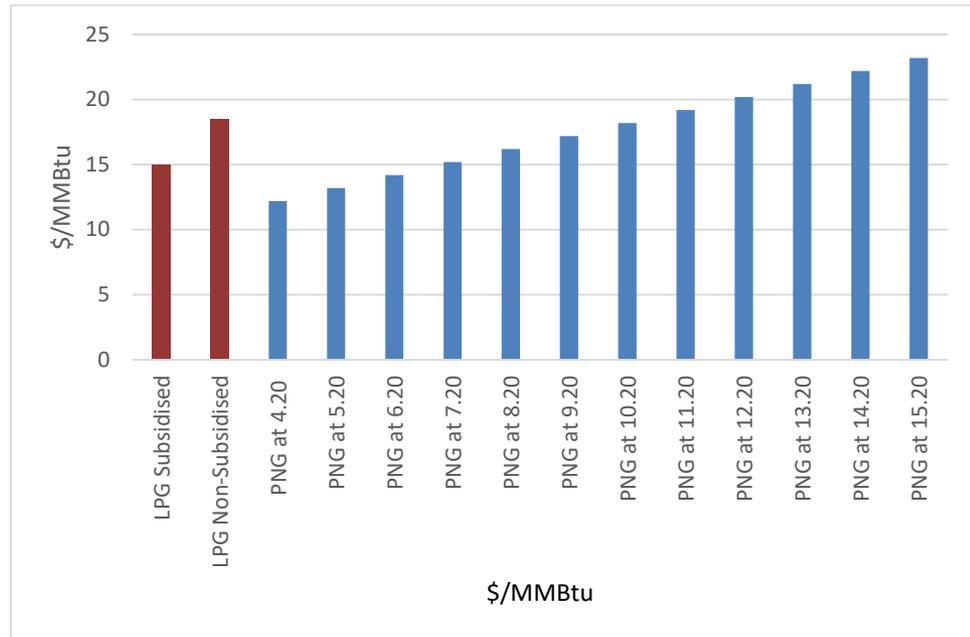


Competitiveness of Gas & LNG Imports in City Gas Sector

Transportation: Estimated price of CNG versus Diesel



Households: Estimated price of piped natural gas versus LPG



- How much gas can this sector absorb?
- Main constraints: infrastructure; lack of anchor customers; land; regulatory issues

Source: Author's estimate; Note: Figures are estimates and subject to further updating



CNG Infrastructure & Coverage

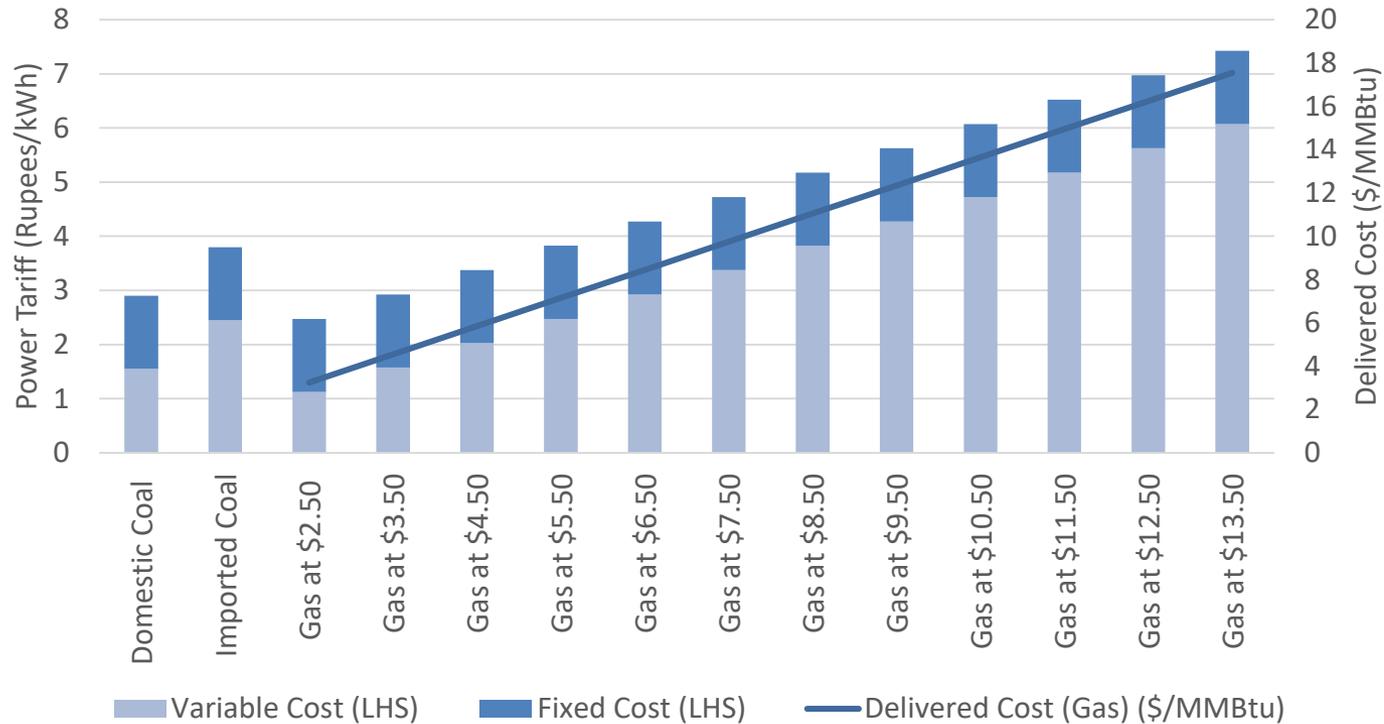
CNG Stations & Vehicles as on 30.09.2016			
State	Company Name	No. of CNG Stations	No. of CNG Vehicles
Gujarat	Adani Energy Ltd., Gujarat Gas Ltd.,(An amalgamated entity of Gujarat State Petroleum Corporation Gas Company Ltd. and Gujarat Gas Company Ltd., Sabarmati Gas Ltd., Hindustan Petroleum Corporation Ltd., Vadodara Gas Limited (JV of GAIL Gas Ltd. and Vadodara Mahanagar Seva Sadan), Charotar Gas Sahkari Mandali Ltd.	371	984684
Delhi / NCR	Indraprastha Gas Ltd. (IGL), New Delhi	418	923276
Maharashtra	Mahanagar Gas Ltd.(MGL),Mumbai, Maharashtra Natural Gas Ltd.,(MNGL), Pune, GAIL Gas Ltd.	230	618718
Andhra Pradesh / Telangana	Bhagyanagar Gas Ltd.(BGL), Hyderabad., Godavari Gas Pvt. Ltd.	34	39054
Rajasthan	Gail Gas Ltd.	3	4872
Uttar Pradesh	Green Gas Ltd. (Lucknow), Central UP Gas Ltd.(Kanpur), Siti Energy Ltd., Adani Energy Ltd., GAIL Gas Ltd., Sanwaria Gas Ltd.	47	111981
Tripura	Tripura Natural Gas Co. Ltd.,Agartala.	5	8590
Madhya Pradesh	Avantika Gas Ltd. (Indore), GAIL Gas Ltd.	22	22352
Haryana	Haryana City Gas Ltd, GAIL Gas Ltd., Adani Gas Ltd.	28	128197
West Bengal	Great Eastern Energy Corporation Ltd.	7	2882
Karnataka	GAIL Gas Ltd.	2	10
All India		1167	2844616

Note : The no. of CNG Vehicles for Gujarat Gas Ltd (GGL) and Vadodara Gas Limited are based on average no. of vehicles filled at company's CNG stations per day.

Source : CGD Companies



Competitiveness of Gas & LNG Imports in Power Sector



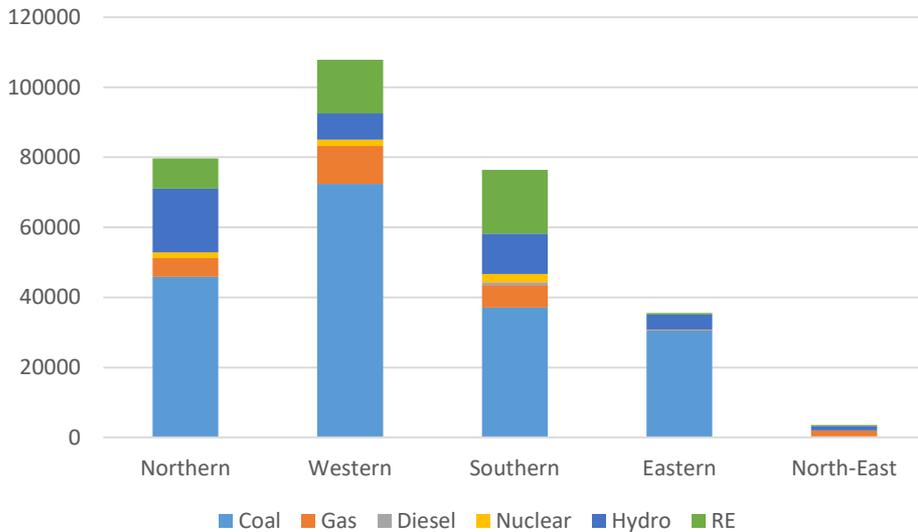
- Gas will struggle to compete with coal in the power sector unless coal is actively discouraged

Source: Author's estimate; Note: Figure subject to further updating

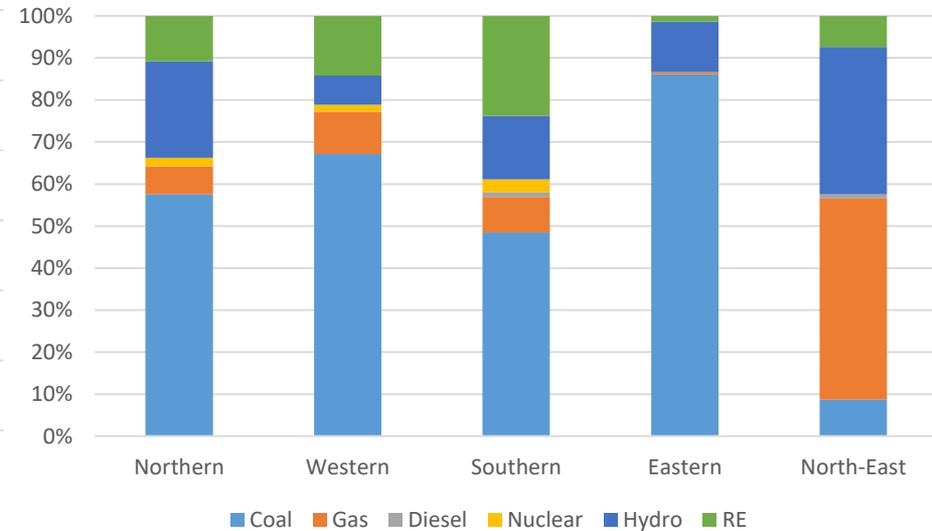


The added infrastructure constraint for gas in power

Installed Capacity by Fuel (Megawatts)



Installed Capacity by Fuel (as % of Regional Totals)



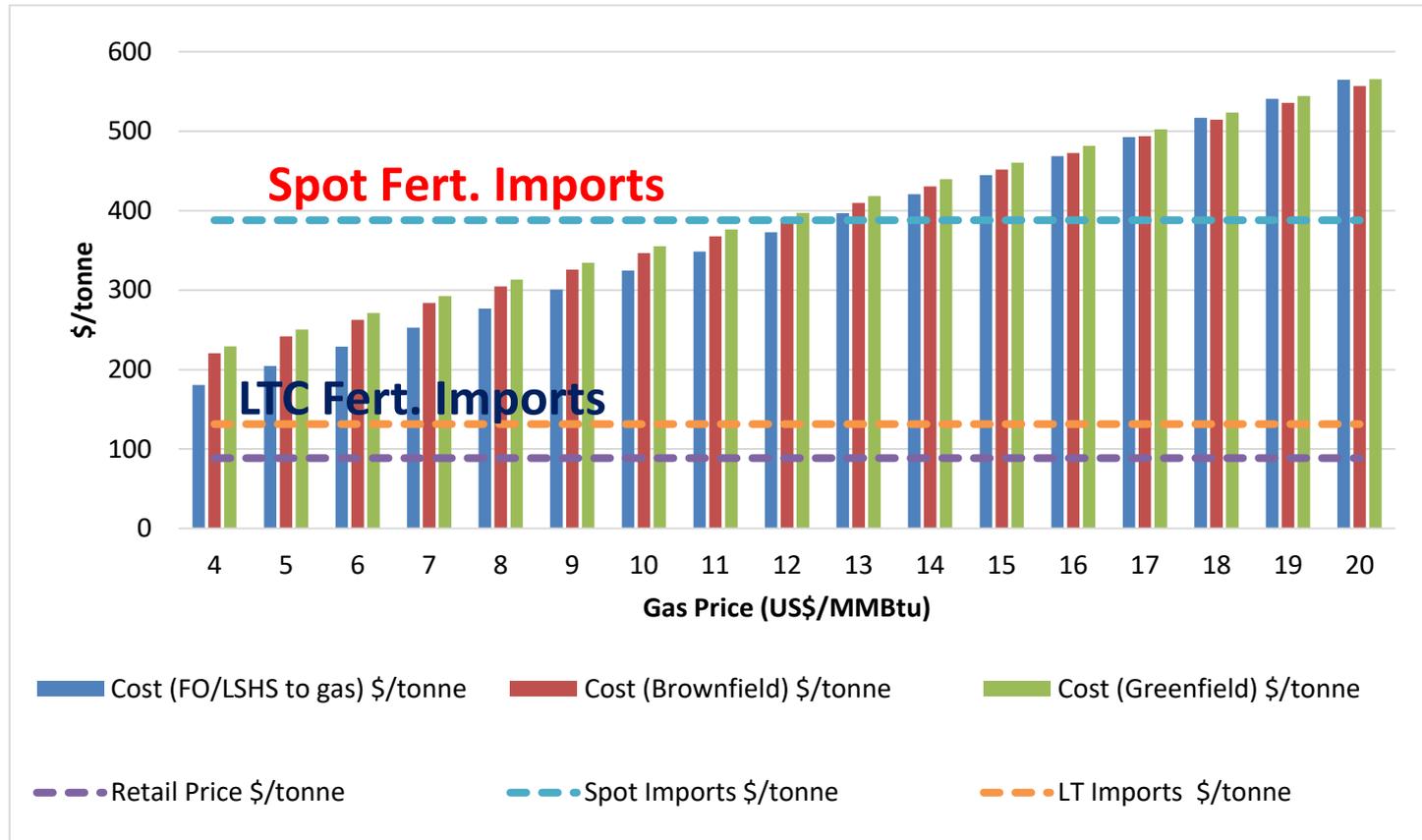
▪ Regional imbalances in gas power infrastructure

Source: Central Electricity Authority, 2016



Latent Demand for Gas in Fertilisers?

Comparative Costs of Gas-Based Fertilisers with Spot/LTC Urea Imports



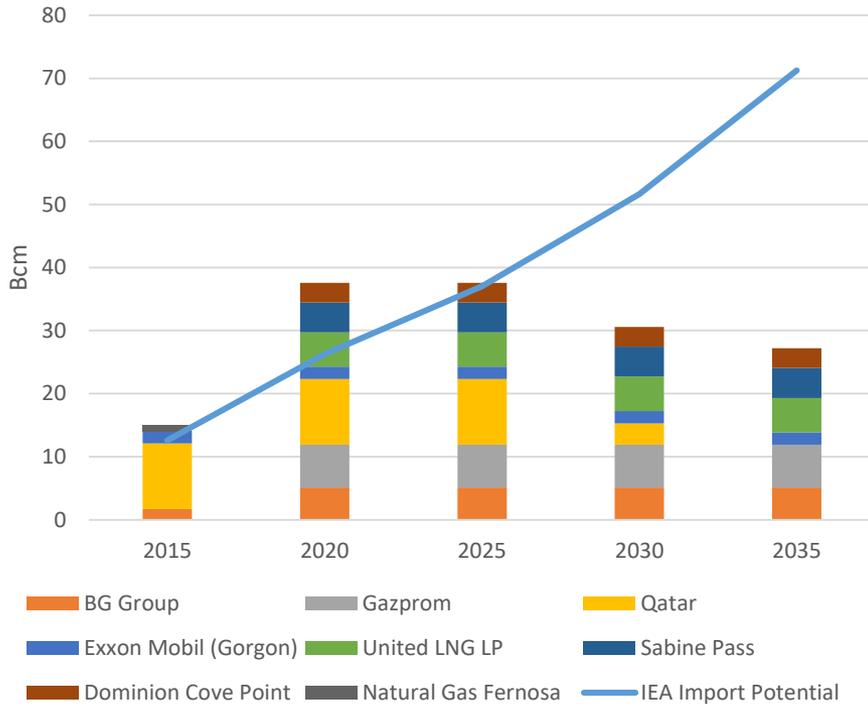
- Gas consumption in fertilisers driven by government policy & the subsidy bill

Source: Author's estimate; Note: Figure subject to further updating

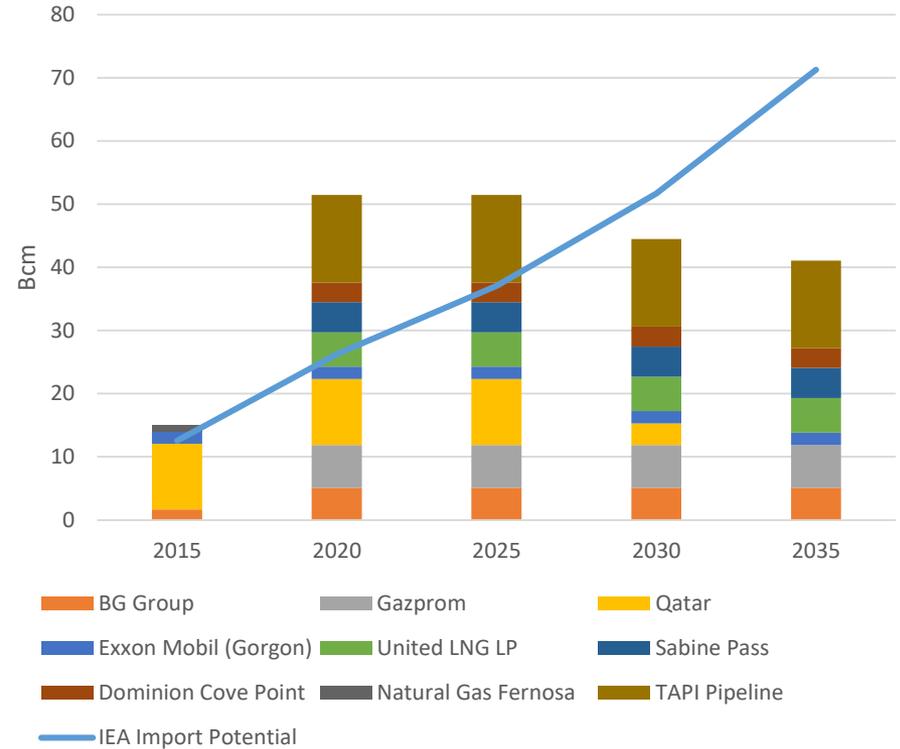


Potential for LNG imports: 'reference' scenario

Import Potential w/o TAPI Pipeline



Import Potential w. TAPI Pipeline



▪ 'Reference scenario' is already changing! Price renegotiations on LTCs.

** Subject to publicly available data Source: Author estimates; subject to updating



Could COP21 make a difference for gas in India?

- **Ratification of the COP21 agreement**, with targets on increasing the share of “non-fossil-fuels” to 40% of total installed electric capacity and reducing the emissions intensity of GDP by 33-35% over 2005 levels by 2030.
 - Achievable target as includes hydro.
- **A domestic non-binding target** to increase the share of renewables to 175 GW by 2022 from 50 GW at present.
 - Would guarantee achievement of COP21 target but needs ~20 GW added/year.
- **National Electricity Policy (NEP) goal to cease new coal power plant investments until 2027** beyond those already under construction (50 GW) & expected to come online during 2017-2022; retirement of plants over 25 years old (25%) and some fleet replacement (11 GW).
 - Stricter regulations on coal plant emissions & water usage from 2017.
- **Tax on production of coal @ \$6/tonne.**
- Drive to **curb air pollution** in Indian states and cities.



Three potential 'scenarios'

1. Short-term, high probability, 'certain' outlook

- Continuation of status quo; driven by industry, fertilisers & city gas; marginal role for power sector

2. Long-term 1, high probability, 'uncertain' outlook

- Gas could play a transformational role in the power sector, assuming ~ 70 GW of the renewables target is met & no new coal fired power plants constructed between 2022 and 2027.

3. Long-term 2, low probability, 'certain' outlook

- Gas could again play a significant role in power sector, assuming the coal tax is scaled up to the extent required for gas to begin competing with coal in power generation. At a price of \$5.56/MMBtu, the current tax on coal production would have to be around 4.5 times higher than present level (back-of-envelope basis). Amounts to ~30% tariff increase.



Conclusions

- **All about price?**
 - Yes!
 - Environmental issues could gradually become an important driver, but the growth story has more immediate currency.
- **Pricing reforms have progressed but have not stemmed decline in domestic production**
 - Linkage to competing fuels in the Indian economy more accurate approximation
 - However, coincided with global gas price downturn
 - New production unlikely to come online in the short to medium term even with higher price
- **The most likely ‘demand’ scenario is the short-term one, driven by industry, and followed by fertilisers & city gas.**
 - LNG will continue to play the role of meeting incremental demand over next 4-5 years.
- **India’s COP21 goals could change the future of gas in its energy mix depending on how several factors play out over the next few years:**
 - Infrastructure, renewables target & policy on coal.

Thank you for your attention!

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