

PROCEEDINGS OF Report Release and Webinar
**Analytical Study to Assess the Potential of Gas/LNG for Regional
Energy Cooperation in BBINS Region**
27TH JULY 2021 | 4:30 PM - 6 PM (IST)



PROCEEDINGS OF

Report Release and Webinar: Analytical Study to Assess the Potential of Gas/LNG for Regional Energy Cooperation in BBINS Region

USAID's South Asia Regional Initiative for Energy Integration (SARI/EI) program has prepared a Report on the **Analytical Study to Assess the Potential of Gas/LNG for Regional Energy Cooperation in BBINS (Bangladesh, Bhutan, India, Nepal, Sri Lanka) Region** in consultation with the stakeholders from all the BBINS nations. The Report was released by the Hon'ble Secretary, Ministry of Petroleum & Natural Gas, Government of India on 27th July 2021, in which the Secretary addressed the panelists and the audience. This was followed by a panel discussion with representatives of the BBINS countries. The Concept Note and Agenda is given in **Annexure - I**, the list of panelists is given in **Annexure – II** and the list of attendees is given in **Annexure – III**. The Proceedings of the Report Release Event and Webinar is presented below. Integrated Research and Action for Development (IRADe), a leading South Asian think tank, is the implementing partner of the current phase of the SARI/EI program.

Dr. Jyoti Parikh, Executive Director, IRADe gave the Welcome Address. She welcomed all the participants from the BBINS nations, especially Mr. Tarun Kapoor, the Secretary, Ministry of Petroleum & Natural Gas (MoPNG), Government of India, for sparing his valuable time to address the gathering. She pointed out the importance of Gas, to assist the intermittent renewable energy. She stated that a Gas Hub provides a platform for all buyers and sellers in South Asian countries, for trading in natural gas, through standard contracts, which is moving in the direction of the market, from only long term contracts. She also informed that there exist multiple products for spot deliveries and derivatives for hedging of risk.

Mr. Tarun Kapoor, Secretary, MoPNG, India who attended as the Chief Guest, gave the Keynote Address. He expressed his delight to be a part of the event and welcomed participants from Bangladesh, Bhutan, Nepal and Sri Lanka. He stated that cooperation among South Asian countries is important and that clarity on energy transition towards cleaner energy will be helpful in the long run. He pointed out that while the report will bring out more ideas, there are already some efforts and thought process. He added that Nepal has huge potential for Hydro which can be used in India. In Bangladesh, a pipeline is already under construction and there is scope for building a gas pipeline, which GAIL (India) is considering. Indian Oil Corporation is also considering building gas pipeline into Nepal. In India, steps are being taken towards increasing usage of Natural Gas in the energy mix, from 6% to 15% by 2030, as per the Indian Prime Minister's announcement. Mr. Kapoor remarked that this involves building infrastructure and linking all the parts of the country with gas pipeline, that is progressing very well, with almost 19000 km of pipeline already functional. 24000 km of trunk pipelines have been planned and a huge distribution network is coming up, to connect major towns or locations around urban areas, as well as every household and industry. With that, the demand for gas is going to increase.

He summed up that as the demand for Natural gas goes up, other types of infrastructure will be developed, such as regasification facilities and LNG terminals. Putting proper regulations and good policies in place will allow free trade in the country. Several initiatives have already been taken, such as unification of gas tariff, making the gas exchange functional, moving towards setting up of TSO (Transmission System Operator) and bringing in rules to make trading easier. He explained that if this

happens in India, then the whole region can benefit. If the private sector looks at the markets beyond India, then the adjoining countries would certainly stand to benefit due to high volumes. Unlike crude oil, where contracts don't extend beyond a year, contracts in the case of LNG are long-term and the volumes are immense. Thus, the neighbouring countries would certainly benefit if there is cooperation with India, for getting infrastructure and systems in place for the whole region. Mr. Kapoor appreciated that the government companies in India have the expertise and experience, and they have done a lot of work- they have the knowledge of international trading, infrastructure building and maintenance, and on how and which users can be serviced best by using Natural Gas. He concluded that this report will give more opportunities to interact on services and then recommend a good solution for the entire region. He gave his good wishes to all the participants and to all those who worked on this report.

Dr. Jyoti Parikh and Mr. Tarun Kapoor then unwrapped and released the report.



Mr. Pankaj Batra, Project Director and Mr. Swami Dayal Prasad, Senior Consultant, SARI/EI, IRADe presented the key findings of the Gas Report.

Mr. Batra recapitulated on the basics of Natural Gas and highlighted the advantage of it being a clean source of energy. He said it can also be used as an excellent fuel for peaking plants, because of its quick ramping up and ramping down capability, by using the available domestic gas optimally. He stated that globally as well, Liquefied Natural Gas (LNG) has been quite prominently used. The compounded annual growth rate globally for the liquefaction capacity was around 7% from 2016 to 2018, and 11% in 2019. The growth in LNG shipping capacity was about 8% in 2019 and growth in regasification capacity was also about 8% globally. He summarised the three parts to trading of gas: liquefaction (where the Natural Gas is liquefied); transportation through ships; and finally, re-gasification at the receiving station. The major contribution to the global growth in Natural Gas is expected from the Asian markets, which constitute 74% of the growth in LNG demand from 2019 upto 2040, as per Shell Energy Outlook 2020. In India, gas accounts for about 6% of the energy basket, and is expected to rise up to 15% by 2030. Bangladesh has about 60% contribution in the energy basket, whereas, for Sri Lanka,

Nepal and Bhutan, it is almost nil. At present, India consumes about 170 mmscmd (million metric standard cubic metres per day). Bangladesh, the other country among the BBINS nations consuming gas, consumes about 70 mmscmd.

He stated the advantage of regional cooperation is to be able to exchange gas in the short-term among the BBINS countries. Even though Sri Lanka is not connected to any other nation, there can be exchange through LNG vessels. He informed that gas exchange has recently come up in India where the granularity of trading of natural gas is of a single day and a minimum of 100 MMBTU (Metric Million British Thermal Units). Mr. Batra informed that there are three hubs in India, that would be very useful for the whole of South Asia, as it will help in dictating the prices of gas in the region, as well as result in economical purchase for South Asia due to bulk procurements.

Mr. Prasad, the author of the report, under the overall supervision of senior officers of SARI/EI, gave a detailed presentation. He shared the context, which originated from the fact that South Asia was a net importer of petroleum products and Natural Gas (as LNG). Natural Gas has the potential to offer economic as well as environmental benefits, as compared to petroleum products. He also presented the findings of the global gas markets as well as the analysis of demand-supply gaps in the respective countries of the BBINS. He also presented the key trade options in the region and the potential in terms of economic benefits to all the BBINS countries. His presentation on the Gas Report is shared in **Annexure IV**.

The **Panel discussion** was moderated by Mr. Pankaj Batra, where each country representative was invited to share their views on regional cooperation in Natural gas.

Key points made by the BBINS country representatives:

Md. Moniruzzaman, Dy. Secretary, Department of Energy and Mineral Resources, Government of Bangladesh

Regional cooperation is important to Bangladesh and the country is working to achieve that. The country is already importing power from India and is open to import of LNG/Natural Gas. The nation has high demand for gas. It has signed MoUs with two Indian entities, H-Energy and IOCL, for cross-border trade. He informed that their indigenous production is going down. Primary energy supply is not adequate and LNG / Cross-border imports will benefit both the power sector and the industry. The LNG import terminals commenced operations in 2018 and consumption went up from 500 MMSCFD (Million Metric Standard Cubic Feet per Day) to 850 MMSCFD. To meet its demand, Bangladesh may import gas from India, since the demand is high in view of the high growth. As regards other sectors, he was of the view that CNG and residential piped gas supplies are not the existing priorities.

In reply to a question about the sectors where they are encouraging use of gas, he stated that they are going to get out of CNG vehicles, which would use autogas, so supply can be made to the focus sectors, i.e. industry and power generation. They would also not like to expand on the piped natural gas for cooking. A regional gas hub in the BBINS region will be advantageous if a country goes for fixed term contracts and price volatility may be adjusted. He agreed that there is upcoming gas demand in the Khulna region (CCGT Power plants at Khalishpur etc and other consumers) and the Government of Bangladesh is examining all aspects for LNG/Natural gas imports.

Ms. Rinchen Lhazom, Officiating Director General, Department of Trade, Ministry of Economic Affairs, Government of Bhutan

Ms Lhazom stated that Bhutan is dependent on gas imports for its energy needs. It neither produces any gas nor it has any potential. However, bilateral or regional cooperation will be of immense benefit from the perspective of cost reduction and supply reliability for a small importing country like Bhutan.

Bhutan uses LPG and its demand has been increasing in the country. It imports LPG as well as commercial gases from India. Despite having abundant and cheap electricity, there is high demand for LPG. Bhutan may not have much potential for gas imports, as is also mentioned in the report, but it sees the benefits from both economic aspects as well as from political dynamics. A study has been carried out for Natural Gas benefits to Bhutan on a small scale. When asked specifically if Bhutan foresees switch from Diesel and Commercial LPG to the cheaper piped natural gas, she responded that as per the study, pipeline costs would be high and not economical and the virtual LNG too needs to be examined for costs. She also stated that Bhutan has surplus electricity and the country has a policy to transition to Electric Vehicles in transportation, rather than CNG.

Mr. Ram Prasad Ghimire, Director General, Department of Mines, Geology, Ministry of Industry Commerce and Supplies, Government of Nepal

Mr. Ghimire expressed optimism towards regional cooperation, stating that Nepal, along with Bhutan, can contribute to Hydro power for regional cooperation, as well as for other energy sources, such as LNG.

He informed the audience that a 300 mcm (million cubic metres) Natural Gas reserve has been discovered in Kathmandu valley and a pilot project for residential supply has already been carried out. As of now, Nepal does not have any gas infrastructure to receive Natural Gas. Out of the three options suggested in the Report, the virtual LNG supply through trucks provides the best option for Nepal. Not only does it have less greenhouse gas emissions, it would also be economical and it also has low investment risks and can be supplied in remote areas.

Nepal is optimistic of regional gas cooperation for providing competitive supplies where gas can be utilized in some of the sectors in Nepal, mainly industrial and residential. All aspects like energy security, price volatility along with the competitiveness, comfort and compatibility of consumers needs to be examined.

While LPG is used for cooking, but due to climate change, Nepal has experienced severe adverse effects and clean energy would be beneficial. He stated that Nepal is dependent on its domestic hydropower, but during the recent floods in Nepal, hydropower plants were shut and many regions witnessed long periods of 'blackout'. Gas -based power plants may be helpful in overcoming such eventualities. Industrial sector is the main sector where LNG is envisaged to be used.

Mr. Surat Ovitigama, Director General, Petroleum Resources Development Secretariat, Sri Lanka

He thanked and congratulated the team for the report and its usefulness.

Although Sri Lanka has been lagging behind in adopting Natural Gas in the past, there is now a firm commitment from the Sri Lanka Government towards utilising Natural Gas. He said that volume gain

perspective is of interest to Sri Lanka as they need clean, cheap and reliable energy for its people. And they look forward to be a part of this forum.

He also shared that LNG imports and the domestic exploration & production programs can be pursued together. Regional hub and connectivity would therefore benefit Sri Lanka in the long run.

He also stated that Sri Lanka is planning to introduce Natural Gas/ LNG as a transition fuel. The country plans to be free from fossil fuels by 2050 and in the intermediate period they plan to reduce share of fossil fuels to just 30% by 2030. Mr Ovitigama reiterated that Sri Lanka stands firmly committed to Natural Gas as transition fuel and then move towards Hydrogen and renewables, becoming free from fossil fuels.

In the power sector, the country plans to phase out coal as well as oil. Gas utilization master plan is being drafted / prepared for various sectors like- transport, industrial and fertiliser and would be in place soon.

To a specific query, Mr Ovitigama informed that they are planning to upgrade their existing refinery. They are also considering to establish two refineries at Hambantota and Trincomalee, purely for export.

He also reiterated that a gas hub will be beneficial to Sri Lanka.

Dr. Kirit Parikh, Chairman, IRADe

Dr. Parikh stated that the discussion points have been very useful and reiterated that energy cooperation across BBINS countries will help in reaping various benefits.

Ms. Monali Zeya Hazra, Regional Energy Manager and Clean Energy Specialist, IPO, USAID/India

Ms. Hazra delivered the vote of thanks at the webinar. She pointed out the benefit of this cleaner form of energy which has huge potential, especially in the transportation sector. She added that various new technologies, such as hydrogen, are coming up in the region. She looked forward to collaborations and taking forward regional energy cooperation. She thanked the key speakers, specifically Shri Tarun Kapoor, Mr. Ovitigama, Ms. Lhazom, Mr. Moniruzamman and Mr. Ghimire, and the SARI/EI team for preparing the Report.

About SARI/EI

The US Agency for International Development (USAID) initiated the South Asia Regional Initiative for Energy (SARI/E) program in the year 2000 to promote Energy Security in the South Asia region, working on three focus areas: Cross Border Energy Trade (CBET); Energy Market Formation; and Regional Clean Energy development. The program covers the eight countries in South Asia, viz. Afghanistan, Bangladesh, Bhutan, India, The Maldives, Nepal, Pakistan and Sri Lanka. The fourth and current phase of the program, called South Asia Regional Initiative for Energy Integration (SARI/EI), is aimed at advancing regional grid integration through cross border power trade. This phase is being implemented by Integrated Research and Action for Development (IRADe), leading South Asian Think Tank. SARI/EI program was recently extended to 2022 and is a key program under USAID's Asia EDGE (Enhancing Growth and Development through Energy) Initiative. In its extended phase, SARI/EI will focus on moving the region from bilateral to trilateral and multilateral power trade, and establishing the South Asia Regional Energy Market (SAREM).

About USAID

The United States Agency for International Development (USAID) is an independent government agency that provides economics, development and humanitarian assistance around the world in support of the foreign policy goals of the United States. USAID's mission is to advance broad-based economics growth, democracy, and human progress in developing countries and emerging economies.

To do so, it is partnering with governments and other actors, making innovative use of science, technology, and human capital to bring the profound results to a greatest number of people.

About IRADe

IRADe, located in Delhi, is a non-profit and fully autonomous institute for advance research. IRADe's multidisciplinary research and policy analysis aid action programs. It is a hub for a network of diverse stakeholders. Established in 2002, the institute is recognized as an R&D organization by the Department of Scientific and Industrial Research and Ministry of Science and Technology of the Government of India. The Ministry of Urban Development has accorded IRADe the status of Centre of Excellence for Urban Development and Climate Change. Through the SARI/EI program, IRADe is pushing the envelope for sustainable energy access through experts and members from South Asia.

For more information, please visit the SARI/EI project website:

<https://sari-energy.org/>

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Concept Note

Report Release Event

**Analytical Study to Assess the Potential of Gas/LNG for Regional
Energy Cooperation in BBINS Region**

Concept Note

Report Release Event

SARI/EI Report “Analytical Study to Assess the Potential of Gas/LNG for Regional Energy Cooperation in BBINS Region”

Overview

Home to one-fifth of the world’s population, the South Asia region is also one of the fastest growing economies in the world. This drives the Region’s demand for energy, a critical component for economic and sustainable development.

While electricity trading is already underway in South Asia, especially within Bangladesh, Bhutan, India and Nepal (BBIN), Gas/ LNG also needs to be seen as a potential area for cooperation for energy security in the region. As per International Energy Agency, the demand for natural gas grew 4.6% globally in 2018, its fastest annual pace since 2010. Gas accounted for almost half the increase in primary energy consumption worldwide. Its demand world-wide is expected to rise by more than 10% over the next five years, reaching more than 4.3 trillion cubic metres (Tcm) in 2024.

Gas/ LNG consumption is also expected to rise in South Asia. In Bangladesh, India and Pakistan, the industrial sector is the main contributor to growth in the gas sector. Recently, the Indian Prime Minister in his address at the inauguration of the 450-km long Kochi-Mangaluru Natural Gas Pipeline in Karnataka, India, mentioned that the share of natural gas in India's energy basket will be more than doubled from existing 6.2% to 15% by 2030, energy sources diversified and the country will be connected with one gas pipeline grid to help bring affordable fuel to people and industry.

Since 2000, USAID’s South Asia Regional Initiative for Energy (SARI/E) program has worked towards advancing regional energy cooperation and energy security through the promotion of cross-border energy trade and the formulation of a regional energy market. The program is currently in its fourth phase, called South Asia Regional Initiative for Energy Integration, and is being implemented by Integrated Research and Action for Development (IRADe) since 2012. In its extended phase, SARI/EI is also looking at trade of other energy resources, including natural gas.

About the Report

Recognizing the importance of Gas/LNG as an important constituent of the South Asia's energy basket, SARI/EI has undertaken a study on assessing the potential for exploration, production and trade of gas in the BBINS (Bangladesh, Bhutan, India, Nepal, Sri Lanka) region.

The report assesses the potential of Gas/ LNG for Regional Energy Cooperation in BBINS region, covering the issues and factors for:

- Dependability on LNG and affordability on a long-term basis
- Economic value that Natural gas / LNG offers over other fuels to the consumers in the region
- The potential and opportunities for regional cooperation.

Through a detailed analysis, the Report explains the gas demand/supply position globally and in the BBINS countries, including the trends in demand for the next 20 years. It explains how having a gas grid connecting the BBINS countries to the extent feasible, will result in optimizing of the gas transportation and LNG terminal infrastructure. This is likely to lead to reduced prices of gas, so that all the nations can meet their energy demand at a more affordable price. It also discusses the possibility of having a gas exchange and gas trading hub in the South Asia region for short term exchanges, and greater say in dictating natural gas prices. The draft Report was circulated to senior Government officials, decision-makers and other experts in the Gas sector in the BBINS countries. The feedback from these consultations have been incorporated in the report.

Objective of the Webinar

To release the report in the virtual presence of policymakers, Heads of Public Sector undertakings in the Petroleum Sector, and officials from the Petroleum and Natural Gas sectors from across the BBINS nations. Through this webinar, the findings of the report will be disseminated to the key stakeholders.

Agenda

16:30 - 16:35	Welcome Address	Dr. Jyoti Parikh Executive Director, IRADe
16:35 - 16:40	Special Address	Ms. Karen Klimowski, Mission Director (A), USAID/India
16:40 - 16:50	Keynote address Report Release (Virtual)	Mr. Tarun Kapoor Secretary, MoPNG, India
16:50 - 17:20	Key finding of SARI/EI Gas Report	Mr. Pankaj Batra, Project Director, and Mr. Swami Dayal Prasad, Senior Consultant, SARI/EI, IRADe
17:20 - 17:55	Panel Discussion (Moderator - Mr. Pankaj Batra)	Representatives of BBINS countries. Each country representative will be invited to share their views on regional cooperation in natural gas
17:55 - 18:00	Vote of Thanks	Ms. Monali Zeya Hazra, Regional Energy Manager and Clean Energy Specialist, IPO, USAID/India

Annexure - II

Details of Panellists for Gas Report release webinar on 27.07.2021				
Sl. No.	Name	Designation	Org. name	Country
1	Dr. MD. Moniruzzaman	Deputy Secretary (Dev-2)	Energy and Mineral Resources Division	Bangladesh
2	Ms. Rinchen Lhazom,	Offtg Director General of Department of Trade	Ministry of Economics Affairs	Bhutan
3	Mr. Tarun Kapoor	Secretary	Ministry of Petroleum and Natural Gas.	India
4	Mr. B.N. Reddy	Joint Secretary (International Cooperation & Admn)	Ministry of Petroleum & Natural Gas	India
5	Ram Prasad Ghimire	Director General	Department of Mines and Geology	Nepal
6	Mr. Surath Ovitigama	Director General	Petroleum Resources Development Secretariat	Sri Lanka

Annexure - III**List of Attendees of the Gas Report release webinar on 27th July 2021**

S. No.	Name	Organization Name	Country
1	Sathish Nanjappa	Honeywell Advances	India
2	Abhishek Agrawal	SARI/Ei-IRADe	India
3	Pradeep khandelwal		India
4	Anuj Mathur	Indian Gas Exchange Ltd	India
6	Gagan Diwan	CERC	India
7	Mohammad Ali	BAPEX	Bangladesh
8	Amitabh Kumar	American Chamber of Commerce in India	India
9	Kevin Kabamalan	Energy Exemplar	Singapore
10	Fady FARAH		Lebanon
11	Lydia Powell	Observer Research Foundation	India
12	Janaka Wickramaratne	CEB	Sri Lanka
13	Avanthika Satheesh	CES Ltd	India
14	Dilli Ghimire	Nepal Energy Foundation	Nepal
15	Vijay Kumar	CRISIL	India
16	Dr. Saravanan Vasudevan	Arunai Engineering College	India
17	Mohammad Anwarul Islam	Tetrattech	Bangladesh
18	Pramod Deo		India
19	Gagandeep Singh	Energy Exemplar	Singapore
20	Mahesh vishwanathan Iyer	GAIL	India
21	Samiksha Shrivastava	ICF International	India
22	Purva Jain		India
23	S.K. Munir Ahmed	Powercell	Bangladesh
24	Shayan Shafi	USAID	Bangladesh
25	Ahammed Kabeer	Alenso Energy	India
26	Mohamed Usamah		India
27	Rajitha Herath		Bangladesh
28	Megha Singh	Manav Energy Pvt Ltd	India
29	Dr. Mohammad Tawhidul Alam		Bangladesh
30	Rajeev Kumar Yadav	Deloitte	India
31	Sturle Pederse	INDO CENTER OF EXCELLENCE IN HYDROGEN	Norway
32	Ananth Chikkatur	Deloitte Consulting	Vietnam
33	Mohammed Mahmud	Tetrattech	Bangladesh
34	Rasika Jayawardane	CEBEE	United State

35	Atiq Rahman		Bangladesh
36	Md. Rafiqul Islam	RPGCL	Bangladesh
37	Andrew Smith	Deloitte	United State
38	Muhammad Wahidur Rahman	IDCOL	Bangladesh
39	Md. Abu Bakar Siddiq	Tetrattech	Bangladesh
40	Diksha Rohra	Manav Energy Pvt Ltd	The United Arab Emirates
41	Rajesh Mediratta	Indian Gas Exchange Ltd	India
42	Rajiv Ratna Panda	SAREP	India
43	Maitreyi Karthik	SARI/Ei-IRADe	India
44	Phani	Gujarat State Petronet Ltd	India
45	Jayanta Bora	Deloitte	India
46	Pranjul Kulshrestha	Gujarat State Petronet Ltd.	India
47	Sunil Kumar		India
48	Amrita Modi	Gujarat State Petronet Ltd.	India
49	Pugazenthi Dhananjayan	ICIMOD	India
50	Devendra Adhikari	ICIMOD	India
51	Shalini S Prasad	GAIL	India
52	Nikita Choudhary	GSPC	India
53	Mollah M Amzad Hossain		United States
54	Payal Goel	Deloitte	India



Gas Market Study



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About the Report

Assessment of the potential for exploration, production and trade of natural gas for regional cooperation in the BBINS region (Bangladesh, Bhutan, India, Nepal, Sri Lanka).

Following have been covered

- **Global scenario of gas :**
 - Long-term availability
 - Long-term dependability on LNG imports
- **Country-wise analysis**
 - Upstream E&P and Gas supplies (domestic & imports)
 - Infrastructure
 - Prevailing policies/regulations/prices
 - Consumer perspective
 - Demand (segment-wise growth)
- **Opportunities for trade / cooperation in the region**
 - Key enablers for trade in gas in the BBINS countries.
 - Potential of developing gas exchanges / hubs for trade.



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Background on Natural Gas perspective for South Asia

- **GDP of BBINS nations** has been growing consistently at **5-8%** in the **pre-Covid years**.
- The region has a share of **about 35%** in the **growth of global population**.
- The urbanization in the region is **less than 35%**, way behind the **78-80%** in **OECD countries**.

These are key pointers for growth in energy needs of these South Asian countries.

Background : Potential of Gas in BBINS region

Share of fossil fuels in the Primary Energy Consumption in all the nations in BBINS region

Share of Fossil fuels in Primary Energy (Excl. Biomass) in BBINS region (2018)					
Source	India	Bangladesh	Sri Lanka	Nepal	Bhutan
Petroleum/ LPG	29%	20%	67%	61%	34%
Natural Gas	6%	67%	0%	0%	0%
Coal	55%	8%	17%	16%	26%

- India : Imports 85% of crude and 50% of its gas
- Bangladesh : Imports 95% of its oil and 20% of gas
- Sri Lanka imports : 100% of its Petroleum/LPG, and coal
- Nepal & Bhutan : 100% of Petroleum/ LPG is imported from India

Natural Gas provides economic and environmental benefits over petroleum products.

It can reduce dependence on import of crude oil / petroleum products and help to diversify the import basket

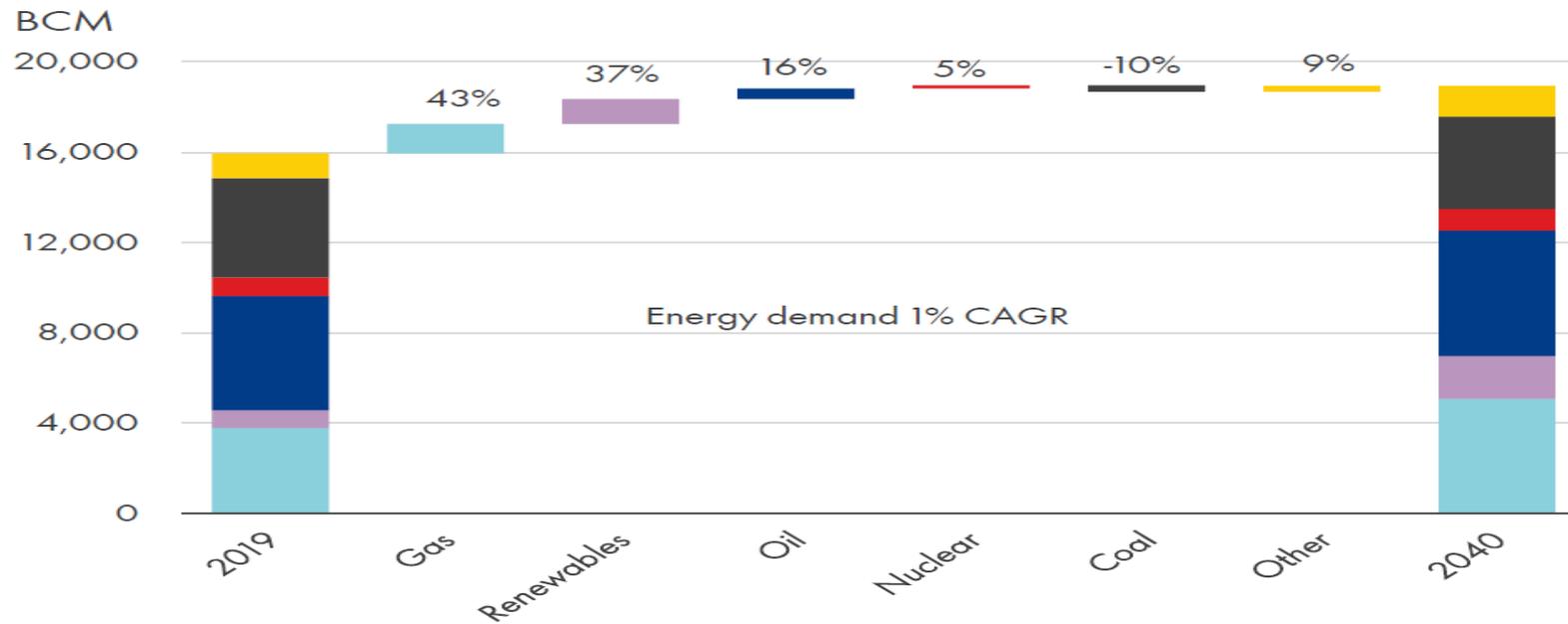


Analysis of Global Demand

- **Gas to have a share of 43% in the growth of energy demand till 2040 (*Shell / Woodmackenzie*)**
- **Demand - Supply gap in 2040 : About 250 MTPA (*Stated Policies Scenario of IEA –WEO 2019*)**
- A significant share of demand till 2040 shall be generated from Asia
- As per a study on affordability by Oxford Institute of Energy Studies (Ref : OIES Paper NG 142), the LNG from Qatar, Nigeria, Mozambique, Russia can be supplied at around an **affordability benchmark price of 6 \$/mmbtu, for the Low Income markets in South Asia.**

Global Gas Market Scenario

Share of different sources in 2019 (H1) and growth and share in 2040



Source: Shell interpretation of Wood Mackenzie H1 2019 data

CAGR - Compound annual growth rate



Is LNG a dependable in long-term : Future ???

A) LNG Liquefaction capacity overview (end of 2019)

- **Global Trade - 355 MTPA, Global Liquefaction Capacity(GLC) - 430.5 MTPA,**
- **101.3 MTPA** is under construction
- **70.6 MTPA of new LNG plants** achieved FIDs (Financial Investment Decision) in 2019
- **907 MTPA** of Liquefaction capacities in the Pre-FID

B) LNG Shipping

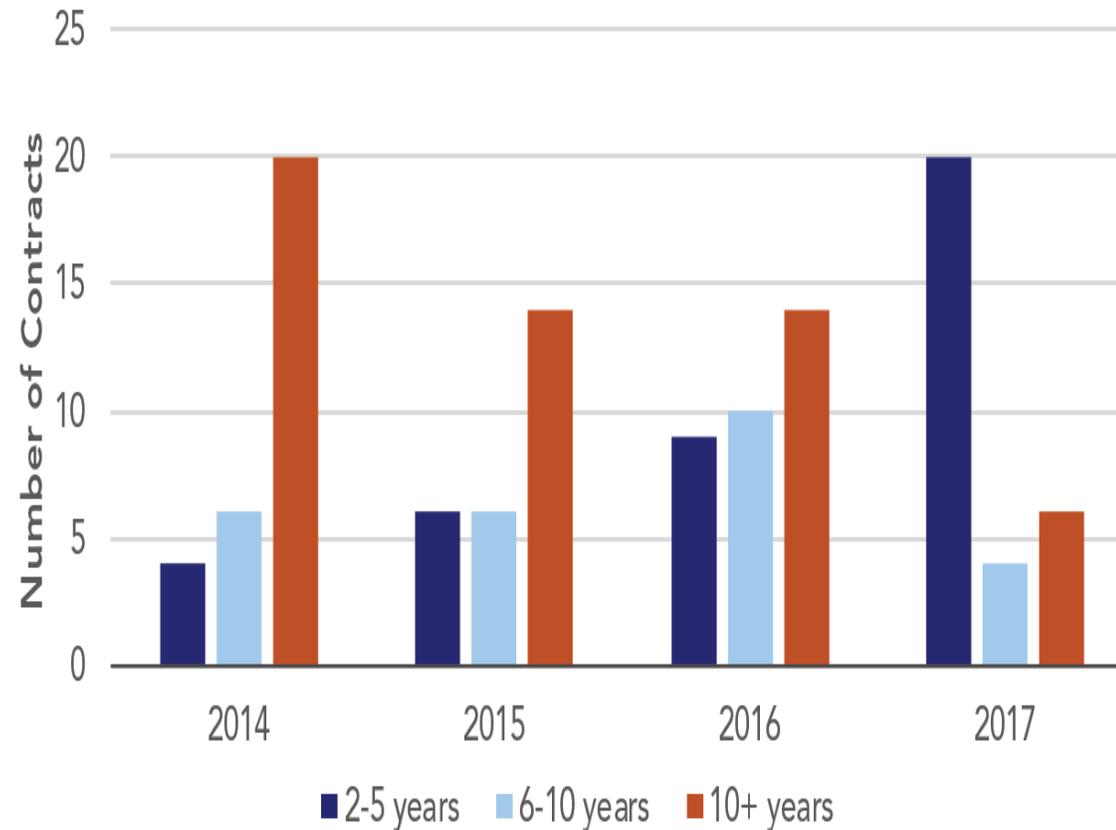
- **Reduction in prices of LNG Vessels :**
- **Fleet size : 541 vessels catering to 132 odd ports**
- **Healthy Order books: 126 vessels. Mostly without any firm ship charters** to cater to short-term / spot cargoes

C) LNG Contracts & pricing : Consumer-friendly trends

- Growth of short-term and mid-term trade, Availability of 'Spot Cargoes have increased
- Pricing & Indexation : Lowering of price parity with crude (11%) and Gas-on-gas and Hybrid price indexing

Key shifts in LNG Contracts & Pricing

Number of contracts for short, medium and long term from 2014-17

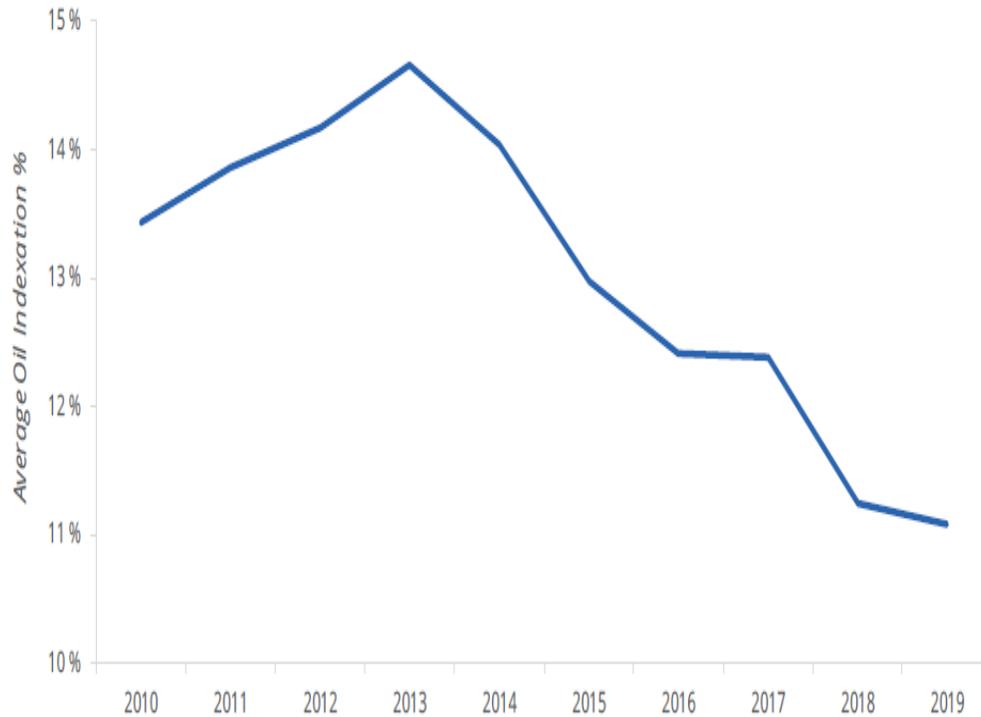


Source : Poten Partners



Key shifts in LNG Contracts & Pricing

Oil Indexation in LNG Sale Purchase Agreement (SPA) over the years



Source : Rystad Energy



Key conclusions from the Global study

- **Long-term availability:**

- Adequate proven reserves and significant Liquefaction capacity addition is under execution by USA, Russia, Qatar, Mozambique and other countries
- Nearly 900 MTPA capacity, mostly in North America, is in Pre-FID stage
- The above augers well for long-term availability of LNG.

- **Long-term affordability :**

- Growth of mid-term and short-term trade (Sale-Purchase),
- Evolution of LNG Shipping fleet to facilitate multi-destination and short-term & spot chartering
- Lowering of price parity with crude (10-11%) for long-term
- Flexible terms & conditions in Sale-Purchase Agreements
- Gas-on-gas and Hybrid price indexing

In terms of availability and affordability, LNG is fairly dependable in the long-term



Supply Chain innovations : Emergence of ‘Virtual / Small Scale LNG’

- 'Virtual' or 'Small scale LNG' ,utilizes road tankers / barges etc, equipped with cryogenic storage technology, can be used along with vaporizer / regasification units at receiving end.
- Virtual / SS LNG offers the following benefits :
 - Access demand not served by pipelines
 - Low capital cost : lesser risk for capex exposure
 - Lower gestation period – about 2 -3 years
 - Options of scalability, as demand picks up
 - Flexibility to source from multiple players
 - Lower contractual risks
 - Boil-off losses can be utilised as fuel for the lorries.
 - **Operational costs are higher**



Country Analysis - India

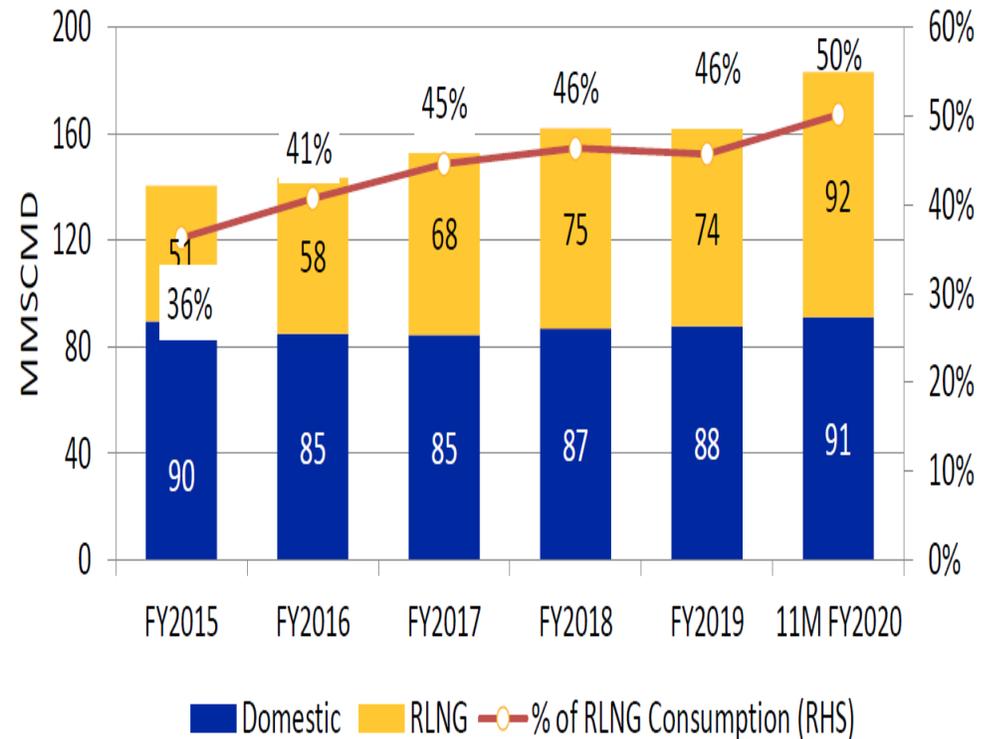
- Government plans to increase its share of gas in India's energy basket from 6% to 15% by 2030.
- Strong policy support from the government / upstream regulator (DGH) to encourage E&P
- Present gas consumption -170 mmscmd (domestic plus Re-gasified LNG).
- **6 RLNG terminals are in operation** and another **4 terminals are under construction.**
- **Gas Pipelines** : Existing network - 17,000 kms of trunk pipelines. **There are sixteen on-going pipeline projects measuring about 15,000 kms.**
- **City Gas Distribution** : With support from the downstream regulator (PNGRB), successful bidding of 136 Geographical Areas was carried out in 2018 & 2019. Nearly **70% of country's population** and **all major industrial and commercial belts will have access to gas in the coming years.**

India : Gas supplies : Domestic

Domestic supplies in 2019 were 88 mmscmd.

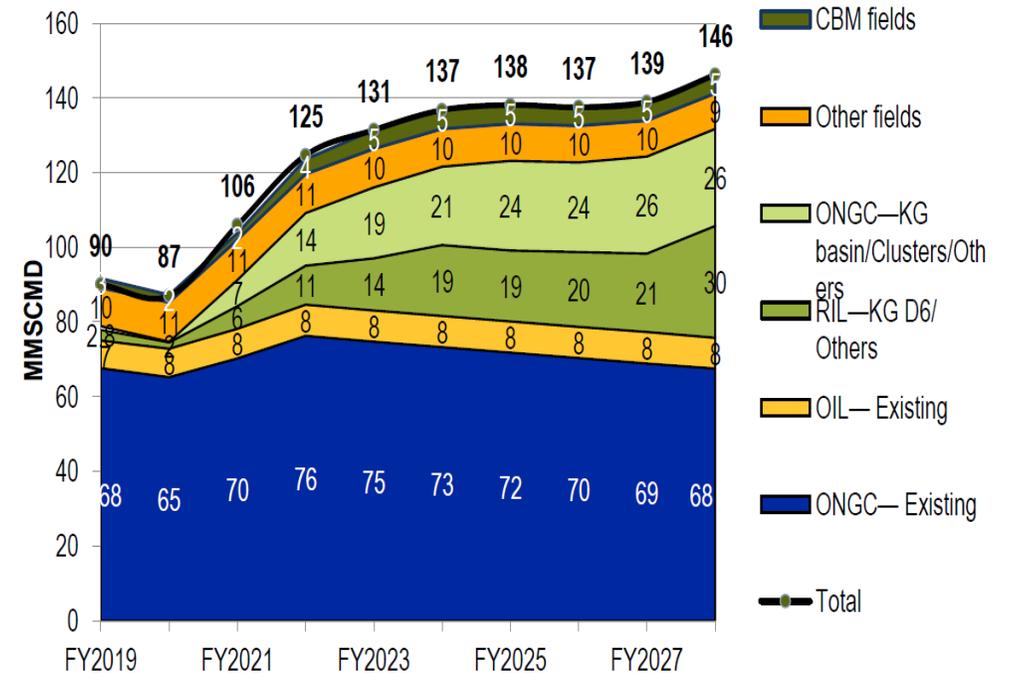
As per the industry sources indigenous gas supplies are likely to reach about 147 mmscmd by 2027

Share of Domestic Gas & RLNG (MMSCMD)



Source: PPAC, ICRA research

Gas Supply Projections (MMSCMD)



Source: ICRA Research



India : Gas Supplies : RLNG

A capacity of 41 MTPA (about 150 MMSCMD) is expected to be available by FY 2021.
By 2025, the capacity is expected to reach 66.5 MTPA (about 240 mmscmd).

Company Name, Location (MMTPA)	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25
PLL, Dahej	15	15	15	16.2	17.5	17.5	18.1	20.0	20.0
PLL Kochi – Effective	0.4	0.5	0.5	0.5	2	2.5	2.5	2.5	2.5
Shell, Hazira	5	5	5	5	5	10	10	10	10
RGPPL, Dabhol	3	3	3	3	3	5	5	5	5
GSPC-Adani, Mundra				0.5	5	5	5	5	5
IOC, Ennore				0.7	5	5	5	5	5
H-Energy-Jaigarh port, Ratnagiri					4	4	4	4	4
Adani Enterprises, IOC and GAIL - Dhamra						2.5	5	5	5
Swan Energy, Jafrabad						5	5	5	5
HPCL, Shapoorji Pallonji - Chhara							2.5	5	5
Total LNG Capacity (MMTPA)	23.4	23.5	23.5	25.9	41.5	56.5	62.1	66.5	66.5



India : Gas Supply Scenarios- Domestic + Imported LNG

Reference Scenario						
Source		2019	2020	2025	2030	2040
RLNG	In MTPA	23.5	25.9	66.5	76.5	96.5
	Terminal Utilization in %	87	85	85	80	80
	Gas (in mmscmd)	74	79	203	220	278
Domestic Gas	(in mmscmd)	90	87	138	154	155
Total Gas (in mmscmd)		164	166	341	374	433



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India : Gas demand : Segment-wise

Segment – wise demand analysis

- **CGD** : Growth at 15% till 2027 and 10% thereafter
- **Refineries** : Growth driven by higher gross margins on gas and commensurate with pipeline connectivity due to substitution of fuel for self consumption.
- **Industry** : Driven by tighter emission norms, price arbitrage over diesel and connectivity in almost all important industrial belts by 2023.
- **Fertilizers** : Organic growth as per the domestic requirement, least dependence on imports
- **Power** : Demand potential depending on LNG prices. As per our analysis, Gas-based power offers lower-priced power than Battery system



India : Demand-Supply Gap & Analysis

Demand- Supply Gap : Reference Scenario (Low Crude, Soft LNG , High Demand)				
	2020	2025	2030	2040
Demand	197	278	382	530
Supply	166	341	374	433
Gap	31	(-)63	8	97

Demand- Supply Gap : Conservative Scenario (High Crude / LNG prices, low demand)				
	2020	2025	2030	2040
Demand	197	262	359	507
Supply	166	341	374	433
Gap	31	(-)79	(-)15	74

Indian Gas Exchange : Market Model & Physical Trading hubs

Physical Trading Hubs (3 Delivery points)

Dahej	Ex terminal, after regas	Launched
Hazira	Mora interconnection point	Launched
KG Basin	KG Basin network	Launched

5 Contracts

Daily | Weekly | Weekday | Fortnightly | Monthly

Day-ahead (PLANNED)

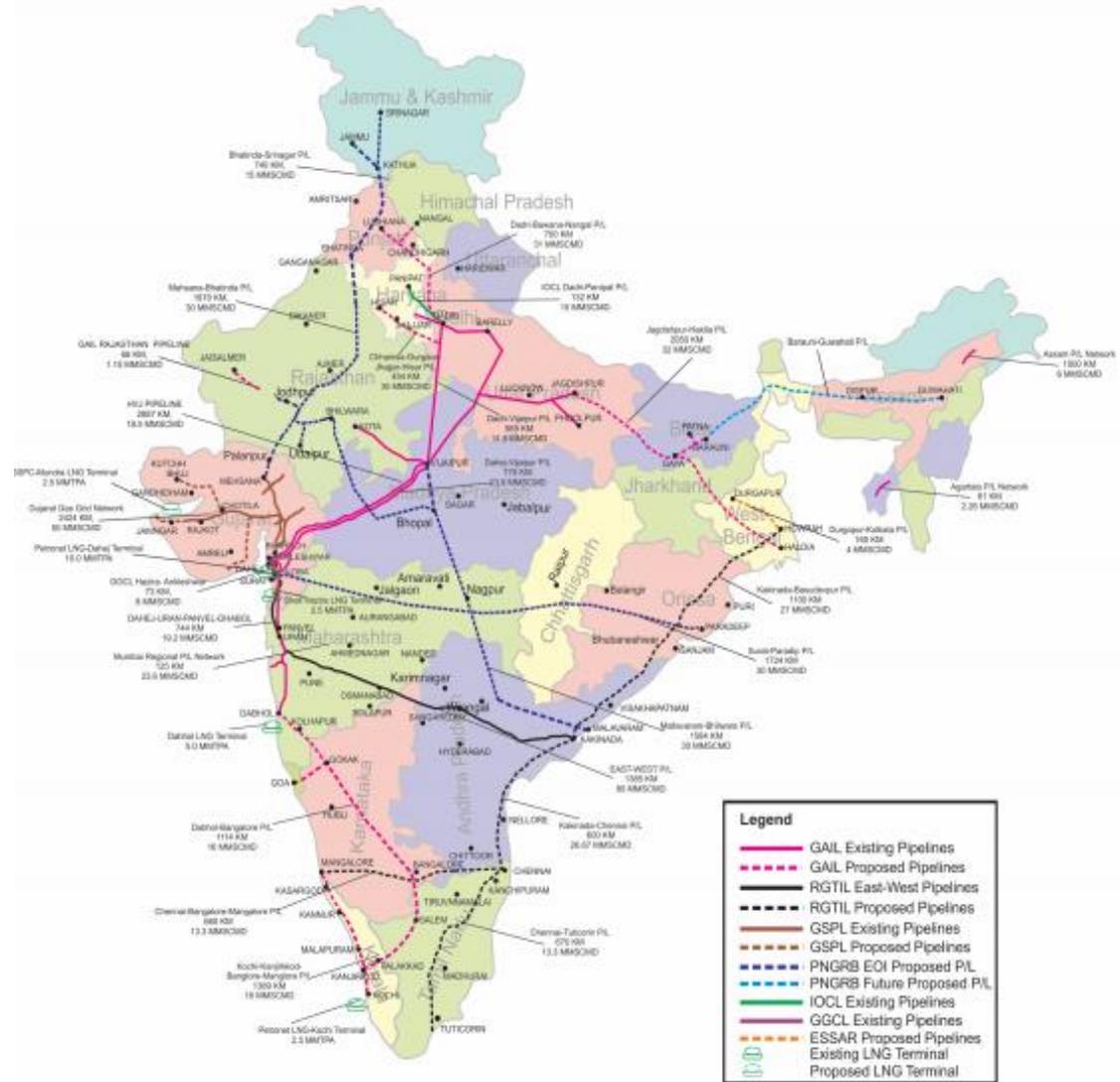
Double-sided Closed Auction

Ex-hub : Delivery by Buyer

Delivered : Delivery by Exchange

INR Contracts (not USD)

Lot size 100 MMBTU/day



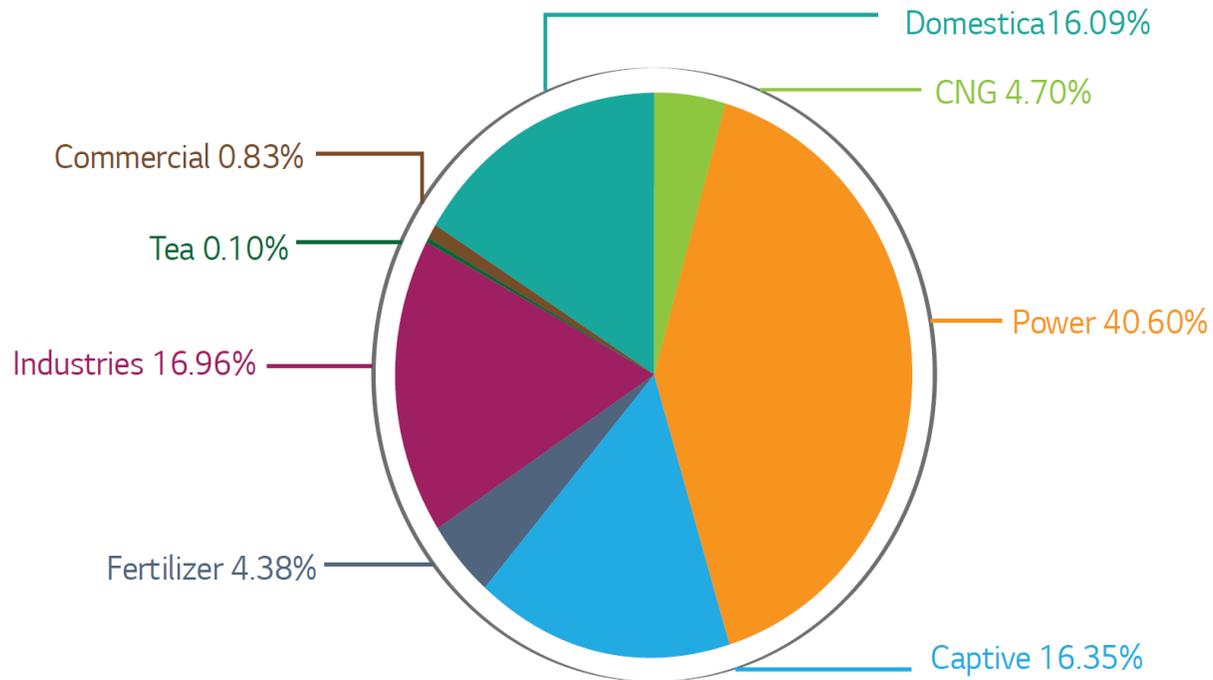


IGX Trade Details

S.N	Trade Date	Contract	Delivery Period	Trading Hub	Transaction Type	Trade Quantity (mmbtu)	Trade Price (Rs./ MMBtu)	Buyer Sector
1	15-Jun-20	Daily	19-Jun-20	Dahej	Ex-hub	100	309	Glass
2	22-Jun-20	Daily	26-30 Jun-20	Oduru (KG Basin)	Ex-hub	9,500	429	Power
3	22-Sep-20	Fortnightly	1-15 Oct 20	Dahej	Delivered	3,000	400	CGD
4	14-Oct-20	Weekly	1-7 Nov 20	Dahej	Ex-hub	4,900	450	Chemical
5	16-Oct-20	Fortnightly	1-15 Nov 20	Dahej	Ex-hub	1,500	460	Glass
6	28-Oct-20	Daily, Weekly, FN & Monthly	4 Nov – 31 Dec	KG Basin	Delivered	54,000	380	Glass
7	5-Nov-20	Daily	15-Nov-20	KG Basin	Delivered	1,600	380	Glass
	Total					74,600		

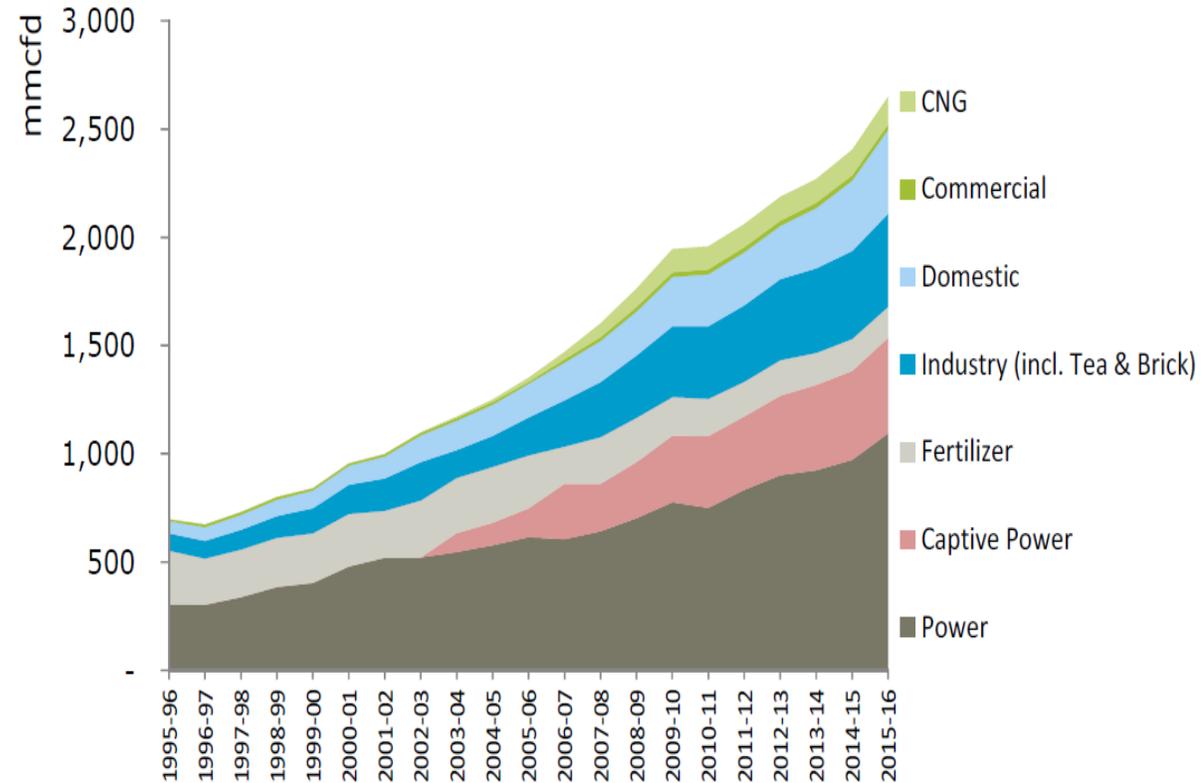
Country Analysis : Bangladesh

Gas Supplies & Sector-wise gas consumption



Total: 982 BCF

*Petrobangla, Annual Report 2018-19



*Petrobangla AR

Bangladesh : Growth plans in power and gas

- **Power System Master Plan (PSMP) 2016**

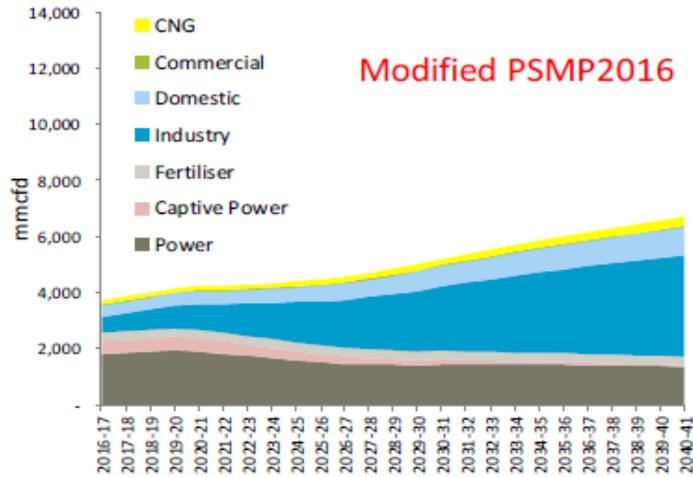
- Prepared by Bangladesh Government / BPDB in cooperation with JICA
- Segment-wise growth and decline in gas production.
- ***The Reference PSMP 2016*** scenario advocates more coal-based capacity

- **Gas Supply Master Plan (GSMP) 2017**

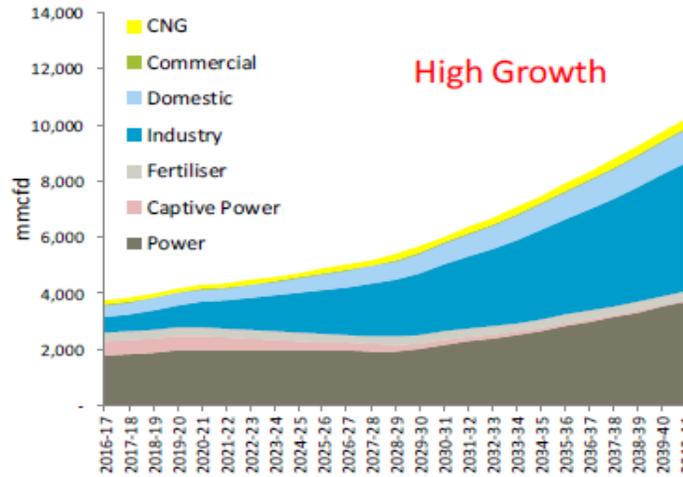
- Prepared by Bangladesh Govt / Petrobangla in consultation with Ramboll after PSMP 2016
- Takes into account the delays in implementation of coal based capacity, and projects three scenarios,
 - ***Modified PSMP (Scenario A)***,
 - ***High Growth (9%GDP)(Scenario B)***, and
 - ***Climate Change scenario (Scenario C)***.
- ***Demand in Scenario C is considered as a more likely scenario.***
- ***Actual demand projections shall be progressively fine-tuned by BPDB & Petrobangla.***
- **Two domestic gas supply scenarios are projected after considering the unexplored reserves and projects**

Gas Demand in the three scenarios in GSMP (Gas Sector Master Plan)

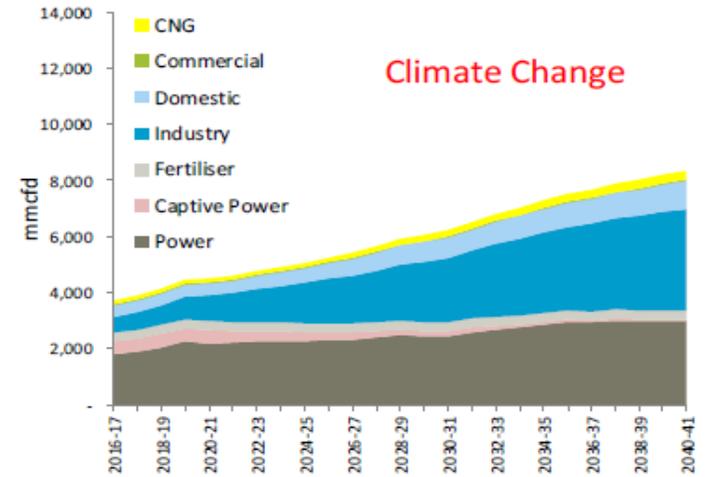
Bangladesh Gas Demand Forecast by Sector - Scenario A



Bangladesh Gas Demand Forecast by Sector - Scenario B



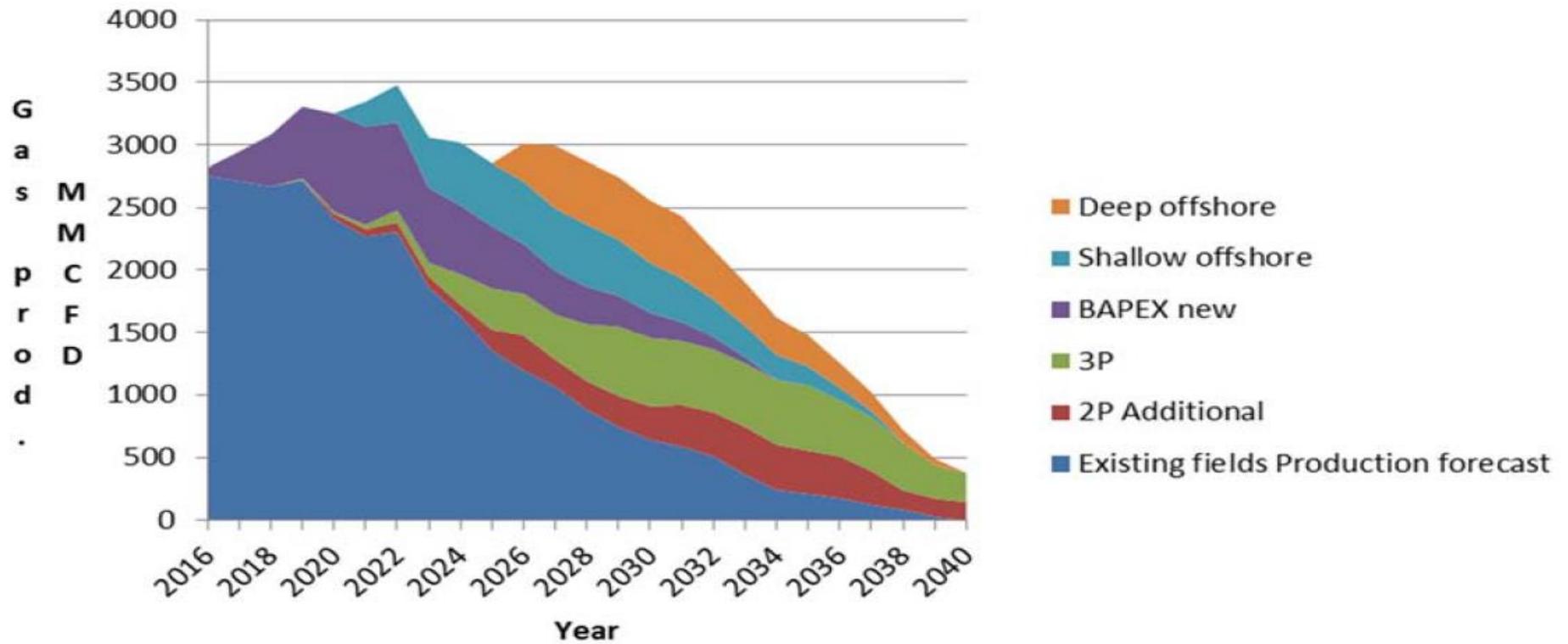
Bangladesh Gas Demand Forecast by Sector - Scenario C



Gas Demand in mcf (as per GSMP 2017)			
Year	Scenario A	Scenario B	Scenario C
2025	4467	4876	5257
2030	5207	6012	6228
2040	6713	10208	8346



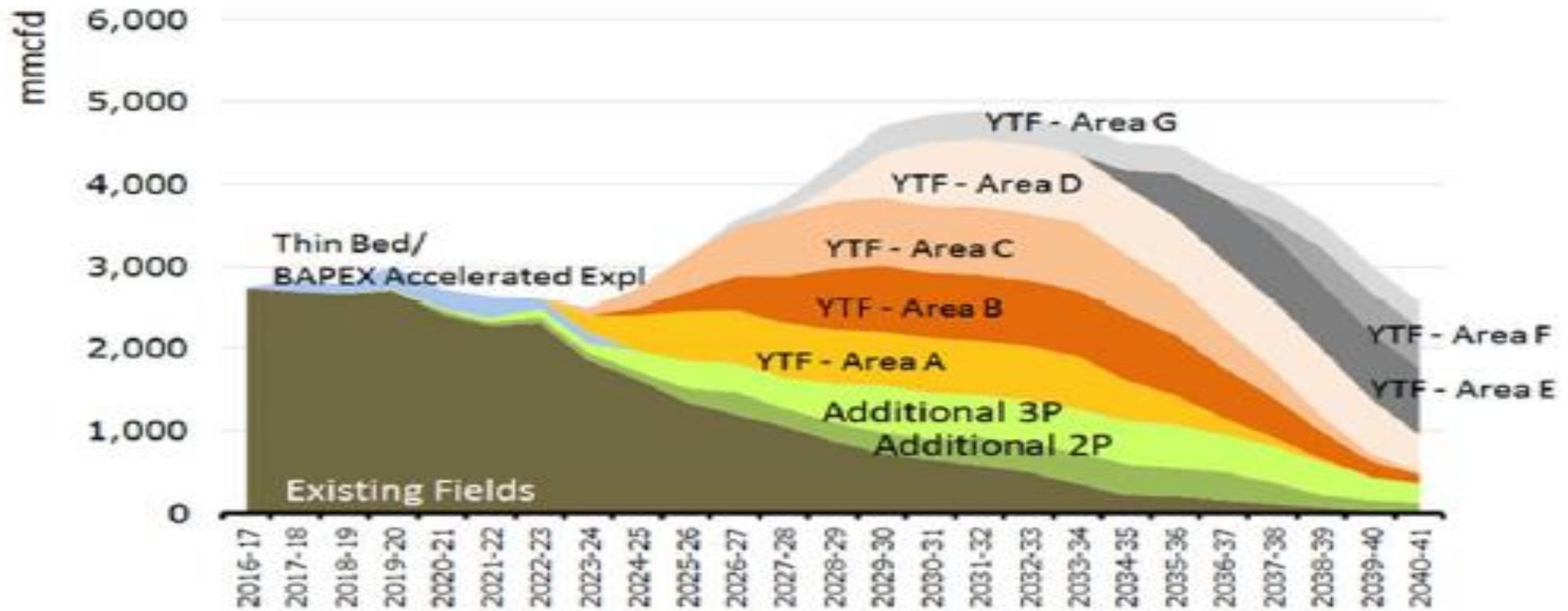
Realistic Gas Production Scenario – Proven, Probable, Possible (3P) + 6.4 tcf of YTF(Yet to find) reserves



Source: GSMP 2017



High Production Scenario – Proven, Probable, Possible(3P) and 34 tcf of YTF



Source: GSMP 2017



DEMAND – SUPPLY GAP ANALYSIS

- Scenario 1 : Demand as per 'Climate Change' and Supply as per Realistic (3P + 6.4 tcf of YTF)
- Scenario 2 : Demand as per 'Climate Change' and Supply as per High Exploration (3P + 34 tcf of YTF)
- Scenario 3 : Demand as per Modified PSMP and Supply as per Realistic (3P + YTF of 6.4 tcf)
- Scenario 4 : Demand as per Modified PSMP and Supply as per High Exploration (3P + YTF of 34 tcf)



Demand - Supply Gap Analysis									
	Year 2025			Year 2030			Year 2040		
	Demand	Supply	Gap	Demand	Supply	Gap	Demand	Supply	Gap
Scenario 1	5250	3000	2250	6250	2500	3750	8300	500	7800
Scenario 2	5250	3000	2250	6250	4750	1500	8300	2500	5800
Scenario 3	4450	3000	1450	5200	2500	2700	6700	500	6200
Scenario 4	4450	3000	1450	5200	4750	450	6700	2500	4200



Country Analysis : Sri Lanka

Upstream Oil & Gas : E&P

- It has three sedimentary basins : Mannar, Cauvery and Lanka basins.
- In 2012, Cairns made **two discoveries of gas in Mannar Basin, the ‘Barracuda’ and ‘Dorado’** reservoirs, estimated to have the ‘Gas Initially in Place’ (GIIP) **reserves in excess of 2 tcf**, but it relinquished these blocks.
- Sri Lanka has planned to develop **a multi-client data repository**, which can be offered to developers.
 - From 2016 onwards, Sri Lanka has tied up **with Total SA, Schlumberger and Bell Geospace** for collecting more exploratory and seismic data.
 - It claims to possess about **18,000 kms of Magnetic and Gravity data** and about **19,000 kms of 2D Seismic data** in its repository and has invited prospective E&P companies to commercially exploit its reserves.



Sri Lanka : Policy shift to Gas

- In its '***National Energy Policy & Strategies 2019***', gas is the fuel of preference
- A '***National Policy on Natural Gas (NPNG)***' has also been drafted. The share of gas in the energy mix is targeted to grow to a third by 2030.
- In the ***Energy-mix policy***, approved by the Sri Lanka government, two thirds of electricity generation is to be met by firm energy capacity mix comprising of LNG (30%), Coal (30%), Fossil Fuels (15%) and Large Hydro (25%).
 - ❖ The policy is the basis for the generation mix in the Draft 20-year ***Long Term Generation Expansion Plan (LTGEP) 2020 – 2039***.



Estimation of LNG Prices

A). Crude Prices (in \$/bbl)	40	50	60
B) DES at Crude Parity 12.5% (in \$/mmbtu)	5	6.25	7.5
C) Regasification and Other cost	2	2	2
D) Pipeline Transportation Costs (Bulk or Trunk)	1	1	1
E) Bulk Consumer Costs (B+C+D)	8	9.25	10.5
F) Retail Distribution Costs	5	5	5
G) Retail Consumers Costs (E+F)	13	14.25	15.5

1. Term contract prices are negotiable and downward prices can be explored
2. Liquefaction, Pipeline and Distribution costs can be higher if consumption is low

Comparison of cost benefit in LNG (Crude @ 50 \$/bbl) for Petroleum products in Sri Lanka

(Source : Author / Industry data)

Fuel	Price	Unit	Price In SL Rs/1000 Kcals	Price In USD/mmbt u	Price of LNG for Retail		Price of LNG for Bulk	
					Crude @ 50 \$/bbl	Benefit	Crude @ 50 \$/bbl	Benefit
LPG Cyl 12.5	1493	Rs/Cyl	10.04	13.68	14.25	-4%	9.25	44%
Petrol 92	137	Rs/Litre	16.57	22.58	14.25	37%	9.25	80%
Petrol 95 Oct	161	Rs/Litre	19.47	26.54	14.25	46%	9.25	89%
Auto Diesel	104	Rs/Litre	11.32	15.43	14.25	8%	9.25	55%
Diesel (Euro 4)	132	Rs/Litre	14.37	19.59	14.25	27%	9.25	72%
HFO	96	Rs/Litre	8.57	11.68	14.25	-22%	9.25	28%
Industrial Kerosene	110	Rs/Litre	12.39	16.88	14.25	16%	9.25	62%

Notes

1. Densities(in Kg/litre) : Petrol - 0.745, Diesel 0.835, HFO - 0.95

2. Exchange rate is 1 USD = 185 SL Rupees

3. Landed price of LNG as per the estimates of author

4. Prevailing prices as per CEYPETCO as on 1st April 2020



Sri Lanka : LNG Demand Summation in Different Scenarios

LNG demand Summation (in MTPA)					
	2020	2025	2030	2035	2039
Scenario 1 : Ref LTGEP	0.0	0.8	1.1	1.3	1.5
Scenario 2 : Ref LTGEP + Other segments	0.0	1.4	3.2	3.8	4.9
Scenario 3 : 25% Shift from Coal to Gas in reference LTGEP + Other segments)	0.0	1.7	3.6	4.4	5.6



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Sri Lanka : Exploring LNG Trade options : Hambantota LNG Hub

- In Aug 2020, Sri Lanka's Board of Investments inked an agreement with Pearl Energy (Pvt) Ltd to launch an FSRU-based LNG trade terminal at Hambantota.
- Hambantota is a deep sea port, strategically located, mid-way in Asia-Pacific and Gulf sea trade route, and is also on the sea trade route between Asia-Pacific and Europe
- The IMO 2020 regulations restrict the sulphur content in bunker fuels, and, there has been a spate of new orders for vessels with propulsion systems that include LNG also.
- The terminal can have multiple use, refuelling vessels, help to meet Sri Lanka's future gas demand, and also offer sourcing options for LNG terminals in India & Bangladesh and vice-versa.



Country Analysis – Nepal

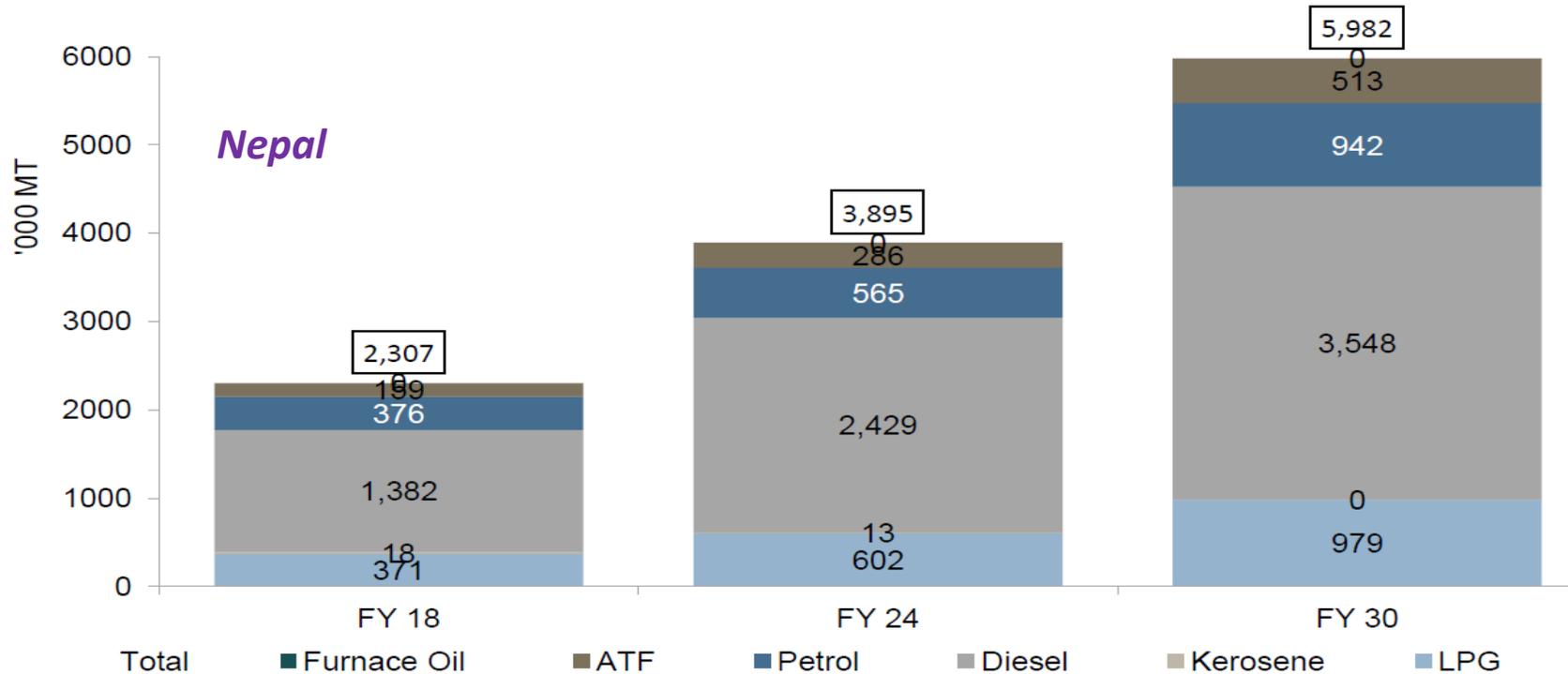
- Petroleum products comprise about 61% of Nepal’s commercial energy basket.
- A major chunk of its population and industrial activity is in four provinces bordering India.
- The bordering areas in India are already awarded to entities under CGD bidding rounds of 2018 & 2019, and will have access to gas in a few years.
- Three gas supply options were considered
 - Option A : Trunk pipeline from India
 - Option B : Multiple ‘small-diameter short-distance’ pipelines’ from India’s adjoining CGD network
 - Option C : ‘Virtual’ or ‘Small-scale LNG’
- Landed cost was worked out and Virtual LNG was preferred as its cost and gestation time is least.
- Later on, once penetration sets in, multiple small diameter and short distance pipelines can be laid connecting via the various entities of CGD in the bordering areas.



Nepal : Landed price of gas and comparison with other fuels

Specific cost of thermal energy in Coal, Petroleum products with Natural Gas in Nepal						
Fuel	Price	Unit	GCV	Unit	Price In NRs/1000 Kcals	Price In USD/mmbtu
LPG (14.2 kg Cylinder)	1375	NRs/Cyl	11,900	Kcals/Kg	8.1	17.1
Petrol	96	NRs/Litre	8269	K cals/litre	11.6	24.4
Diesel	85	NRs/litre	9185	Kcals/Litre	9.3	19.4
Coal	15	NRs/kg	4000	kcal/kg	3.8	7.9
Option A: Regasified LNG by dedicated Pipeline						15 to 17.5
Option B: Regasified LNG by multiple short links with Indian CGD Network in adjoining GAs						13 to 15.5
Option C: Virtual LNG Supply Chain (By Road)						13 to 15.5

Nepal : Growth of Petroleum Products





Nepal : Gas Penetration in Energy Consumption

	2018	2025			2030			2040		
	Consumption	Quant ity	Level of Substi tution	Eq Gas Quant ity	Quantity	Level of Substituti on	Eq Gas Quantity	Quantity	Level of Substi tution	Eq Gas Quantity
A) Petrol	376	585	10%	59	942	20%	154	2,034	20%	334
B) Diesel	1,382	2,429		334	3,548		720	7,840		1,419
a) Transport	1,106	1,943	5%	80	2,838	15%	349	6,720	15%	827
b) Industry	152	267	75%	164	390	75%	240	648	75%	398
c) Others	124	219	50%	90	319	50%	131	473	50%	194
C) LPG	371	602	15%	90	979	30%	294	2,193	30%	658
D) Coal	1,198	1,892	5%	47	2,985	10%	149	6,444	10%	322
Total				530			1,318			2,732
Notes										

Petrol & Diesel in thousand KL, Coal in thousand MT, LPG in thousand MT, Gas in thousand MT

The estimated gas consumption has factored in the equivalent gas for different types of fuels.



Country Analysis – Bhutan

- Hydropower forms the bulk of energy source
- Petroleum products comprise about 34% in the commercial energy basket.
- Coal's share is about 26%, but mostly for its steel sector and substitution by gas may not be feasible.
- Like Nepal, all the bordering areas with India are covered under CGD bidding rounds of 2018 & 2019, and will have access to gas.
- Like Nepal, landed cost of three options were worked out.
- Laying a trunk pipeline was not found to be techno-economically feasible.
- **'Virtual' or 'Small-scale LNG' was found to be more economical.**
- **At the estimated landed cost of gas, retail petrol and subsidized LPG may not benefit in switch to gas at the prevailing price / taxes.**
- **Penetration opportunities do exist in bulk consumers of HSD and commercial LPG (Bhutan's quota of subsidized LPG from India is limited).**



Bhutan : Landed price of gas and comparison with other fuels

Comparison of cost of thermal energy in Petroleum products and Natural Gas in Bhutan	
Fuel	Price In USD/ mmbtu
14.2 kg LPG Subsidized	12.0
14.2 kg LPG -Non Subsidised	18.0
19 Kg LPG Comml	19.6
Petrol	20.5
Diesel	17.3
Natural Gas in Option A: Regasified LNG by dedicated Pipeline	20 - 22.5
Natural Gas in Option B: Regasified LNG by multiple links with Indian CGD Networks	19 - 21.5
Natural Gas in Option C:Virtual LNG Supply Chain (By Road)	16.5 - 19

Bhutan : Likely demand for LNG by Fuel Switch in Bhutan

Fuel	Growth Rate	2017	2018	2025		2030		2035		2040	
				Expected Demand	Switch Over						
Petrol	9% till 2030, 5% post 2030	0.02	0.04	0.07	0.00	0.11	0.00	0.14	0.00	0.18	0.00
Diesel	6.7% till 2030 and 4.5% thereafter	0.12	0.14	0.21	0.01	0.29	0.02	0.36	0.05	0.44	0.06
LPG	7.3% till 2025, 6% thereafter	8	9.30	14.19	1.35	18.99	2.71	25.42	4.83	34.01	8.08
LNG Demand					0.009		0.025		0.046		0.059

The demand for Petrol and Diesel is in Million MT, for LPG in Kilo MT

Notes

- 1 Petrol switch over to LNG : Nil
2. Diesel switch over to LNG : 5% IN 2025, 10%-2030 and 15% thereafter
- 3 LPG switch over to LNG : 10% IN 2025, 15%-2030, 20% IN 2035 and 25% thereafter
4. Conversion of equivalent quantities of Liquid Fuels to LNG on thermal energy basis as per industry norms.



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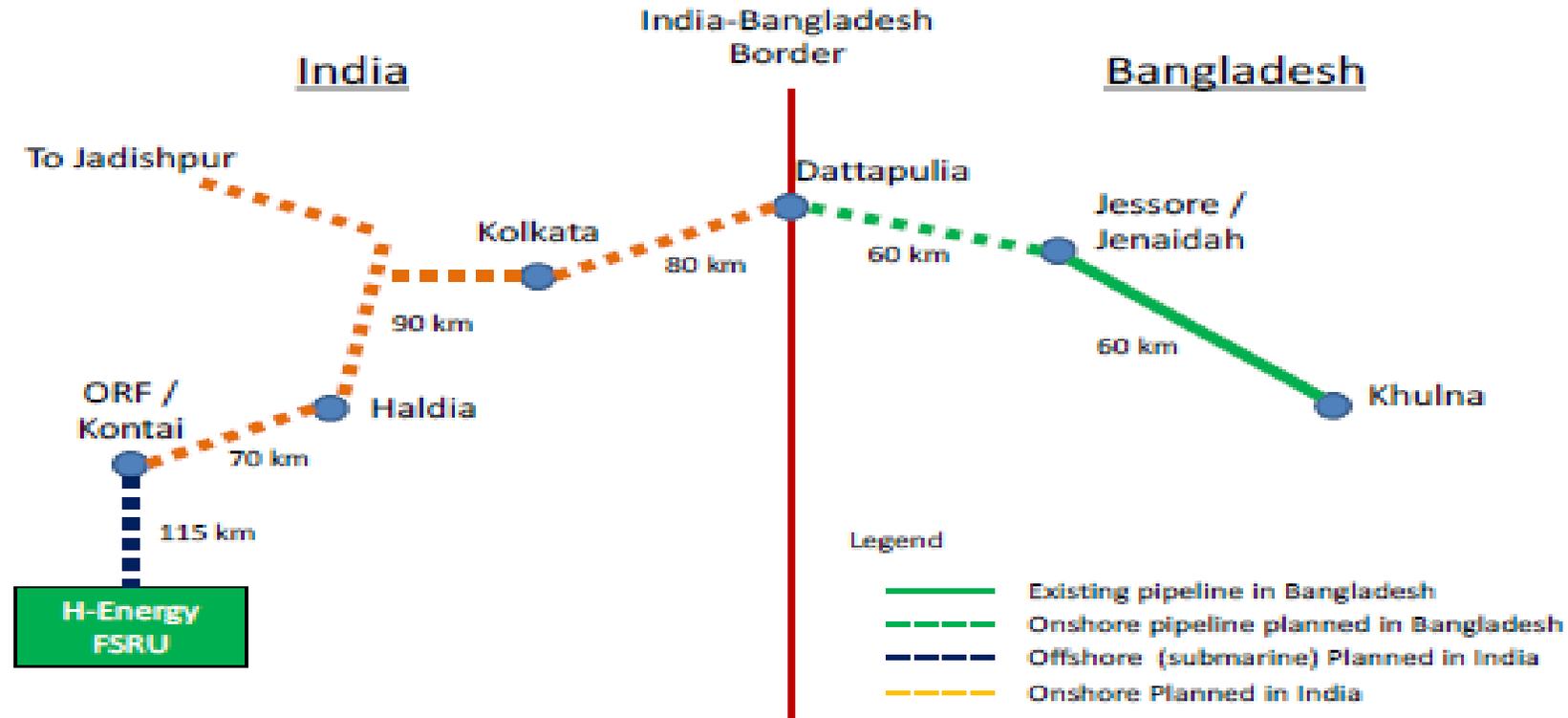
Way forward :

Regional cooperation for gas in BBINS nations

Bangladesh - India : Key Drivers

- Bangladesh is facing decline in gas production and dependence on LNG imports
- LNG terminals are in deep south in Cox Bazaar area. There are pipeline constraints in meeting demand on its north, central and in particular, the western areas near Khulna, where the 800 MW Rupsha CCPP is already under construction.
- India is likely to have surplus volumes in 2024 to 2030.
- PSMP 2016 and GSMP 2017 include proposals of several cross-border pipelines to meet Short/mid-term shortages.
- India has several pipeline projects in close proximity with Bangladesh :
 - Kanai-Chata – Shrirampur : Authorised by PNGRB to H-Energy in July 2019 (completion by 2021). Connectivity is proposed near Satkhira. Can help Bangladesh access Dhamra (Adani), Kukrahati Terminal of H-Energy near Haldia.
 - Jagdishpur – Haldia : Pipeline is under construction by GAIL, already commissioned upto Durgapur in West Bengal .
 - Barauni – Guwahati : Under construction by GAIL, and its completion is targeted in 2021.
 - Indradhanush Gas Grid : Under construction, would be upto Agartala, (30/60 kms from Brahmanbari/ Comilla)
- Indian Companies are also working closely with Bangladesh Government for supplies of RLNG across the Panitar-Satkhira border.

Interconnecting Pipeline link with India as proposed in PSMP 2016



Source: NWPGL

Figure 8-11 Cross-border LNG Schematic Diagram

Source PSMP 2016

Interconnecting Pipeline link with India as proposed in GSMP 2017

Short-term Plan

Langolbad – Gopalganj Kutumbopur – Meghnaghat
We recommend constructing a 36" pipeline on this route to prepare for the future and for flexibility. We also recommend continuing the pipeline to Khulna to complete the first step of the transmission backbone.

500 MMCFD capacity connection with India. Necessary for supply for Western franchise areas and stability of the system.

Moheskali – Dhaka
Demand requires additional transmission capacity we recommend either a 36" offshore pipeline (option 1) or a 48" onshore pipeline (option 2)

In total 1500 MMCFD available from 2 FSRUs. Current transmission capacity not enough to transport this further. Need for option 1 or 2.

Gas Transmission Company Limited (GTCL)
(A company of Petrobangla)
Gas Transmission Network

Regions: PGCL, TGTDC, JGTDSL, KGDC, SGCL, BGDCL, Option 1, Option 2

Long-term Plan

Further strengthening of the connection. Additional connection to India at Rengpur allowing for Iran/Turkmen/Indian LNG + potential transit from Myanmar to India.

Strengthen connection between the Dhaka region and PGCL region

Potentially an additional connection from Moheskali dependent on the outcome of the E&A programs.

Gas Transmission Company Limited (GTCL)
(A company of Petrobangla)
Gas Transmission Network

Regions: PGCL, TGTDC, JGTDSL, KGDC, SGCL, BGDCL



Sri Lanka – India - Bangladesh : Opportunity for collaboration

- **The proposed FSRU-based LNG trade terminal at Hambantota provides opportunities for meeting short-term volatility in demand for India, Bangladesh.**
- **Vice-versa, it can source LNG from India, Bangladesh to meet any demand volatility.**
- **Mutual cooperation (like ‘swapping’) can help to mitigate risks in fulfilling contractual obligations.**
- **Opportunity for optimising utilization of LNG terminals in the region .**

This terminal offers potential to catalyse and foster regional cooperation for LNG



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Nepal - India : Potential of gas trade

- **'Virtual LNG' supply chain can be implemented.**
- **Economic benefits are in substituting diesel, LPG, thermal coal and petrol.**
- **At least four of the seven provinces of Nepal can benefit. These provinces are the most populous ones.**
- **Later, multiple small diameter pipelines can be laid .**



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Bhutan – India : Potential of gas trade

- Like Nepal, ‘Virtual LNG’ supply chain can be beneficial for consumers bulk diesel and commercial LPG.
- Once penetration sets in, multiple small diameter and short distance pipelines can be laid connecting via the various entities of CGD in the bordering areas.



Potential of India as a gas hub for Bangladesh, Nepal & Bhutan

- The development of gas exchange in India is an opportunity for this region.
- With cross-border pipeline connectivity, neighbouring countries can meet their gas demand at a transparent and more affordable price
- The pipeline connectivity beyond to Myanmar if completed, will also strengthen the regional gas markets and help to overcome demand-supply imbalances.
- The above are key enablers for a South Asian pipeline network, fostering of Intra-regional trade, and development of a South Asian Gas Hub.



Potential of trade benefits (in Mn \$ per annum)

Country	2025			2030			2040		
	Trade	Expected Benefit @ 5\$/mmbtu	Benefits for Supplier @ 2 \$ mmbtu	Trade	Expected Benefit @ 5\$/mmbtu	Benefits for Supplier @ 2 \$ mmbtu	Trade	Expected Benefit @ 5\$/mmbtu	Benefits for Supplier @ 2 \$ mmbtu
	MMTPA	Mn \$/year	Mn \$/year	MMTPA	Mn \$/year	Mn \$/year	MMTPA	Mn \$/year	Mn \$/year
BANGLADESH	3.0	750	300	4.0	1000	400	7.5	1875	750
NEPAL	0.5	125	50	1.3	325	130	2.7	675	270
BHUTAN	0.01	2	1	0.03	6	3	0.06	15	6
TOTAL	3.5	877	351	5.3	1331	533	10.3	2565	1026

LNG	Heat	Equivalent
MT	Eq mmbtu	Mn \$ @ 1\$/MMBTU
1000000	4.86E+13	
1	48600000	48.6



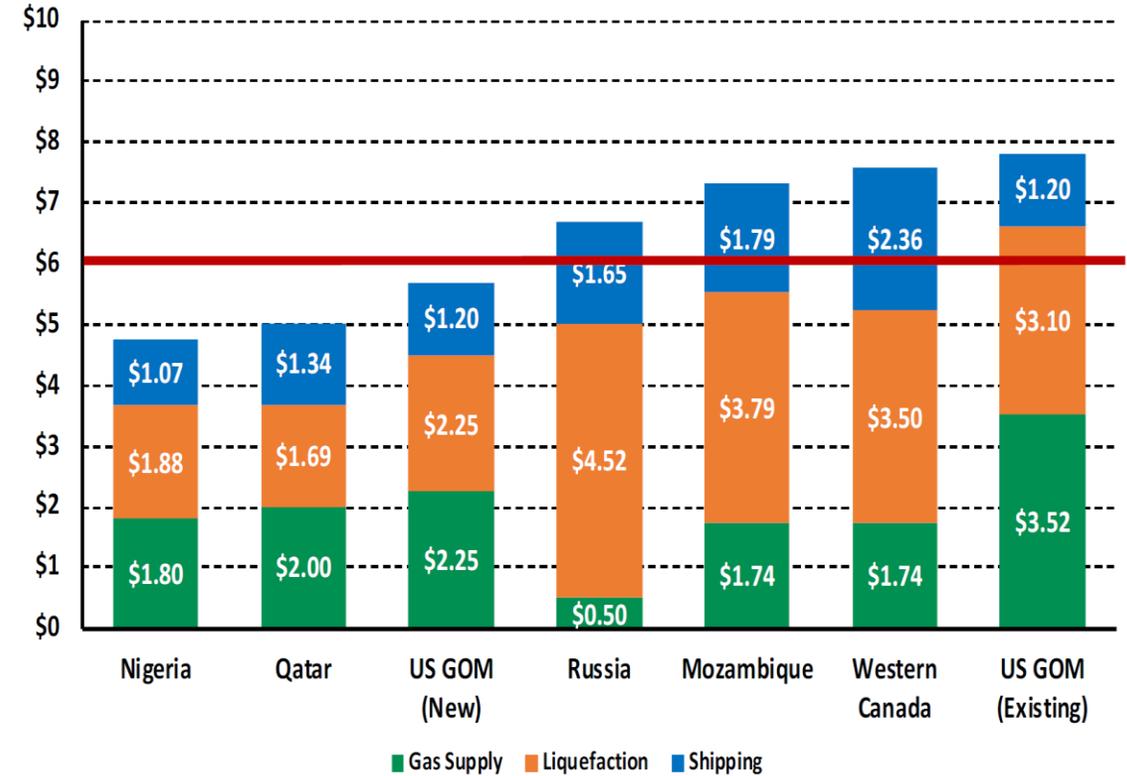
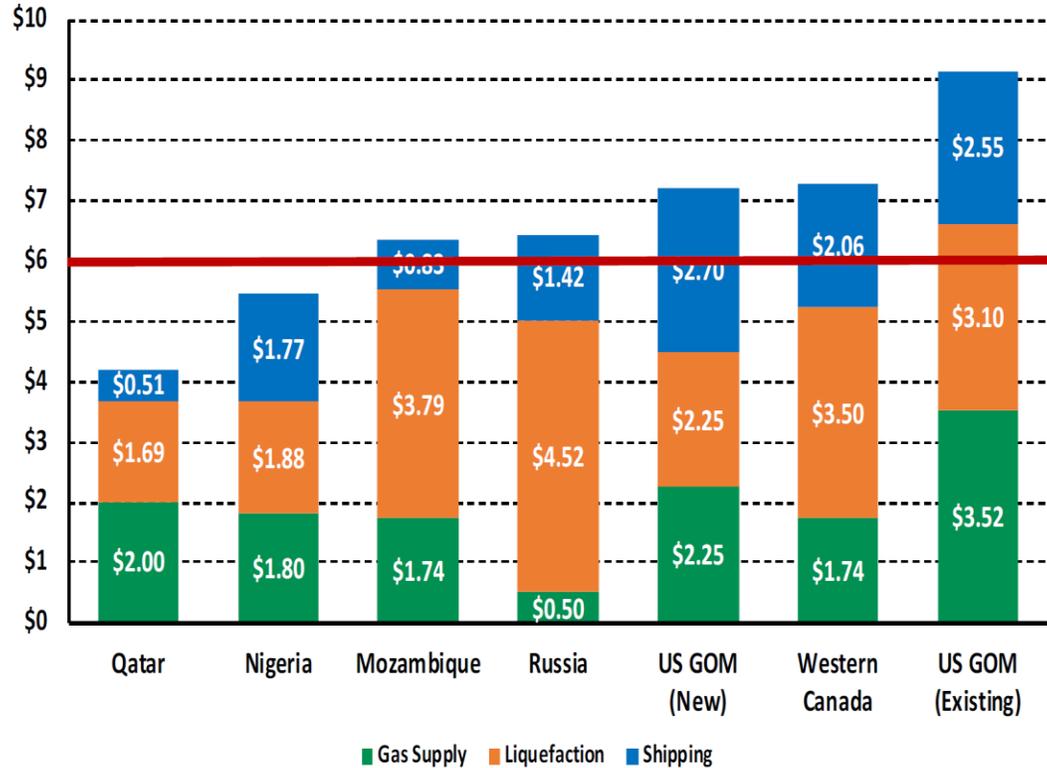
Key Conclusions

- LNG has emerged as a dependable fuel, in terms of long-term availability and affordability
- Country-wise analysis indicates increase of gas demand , particularly for LNG
- With its upcoming LNG import terminals, India is expected to be surplus from 2024 onwards.
- The upcoming pipelines, development of ‘Virtual / Small scale’ LNG supply options, forthcoming reforms in pipeline tariffs and an operational gas exchange also offers opportunities for trade between India with neighbouring countries.
- Shortages in Bangladesh and surplus supply in India indicates that cross-border Gas trade can bear good dividends for both countries.
- The upcoming FSRU-based LNG trade terminal at Hambantota, offers opportunities of marginal trade and collaboration in LNG for the region.
- Regional Cooperation will enhance bargaining power and help in meeting short-term demand fluctuations in respective countries.



Thank you

Key findings on affordability in regions of different income segments (\$/mmbtu)



Source: EIA, ICIS Global LNG Markets, Forward Curves CME Group as of 14/12/18, SyEnergy estimates

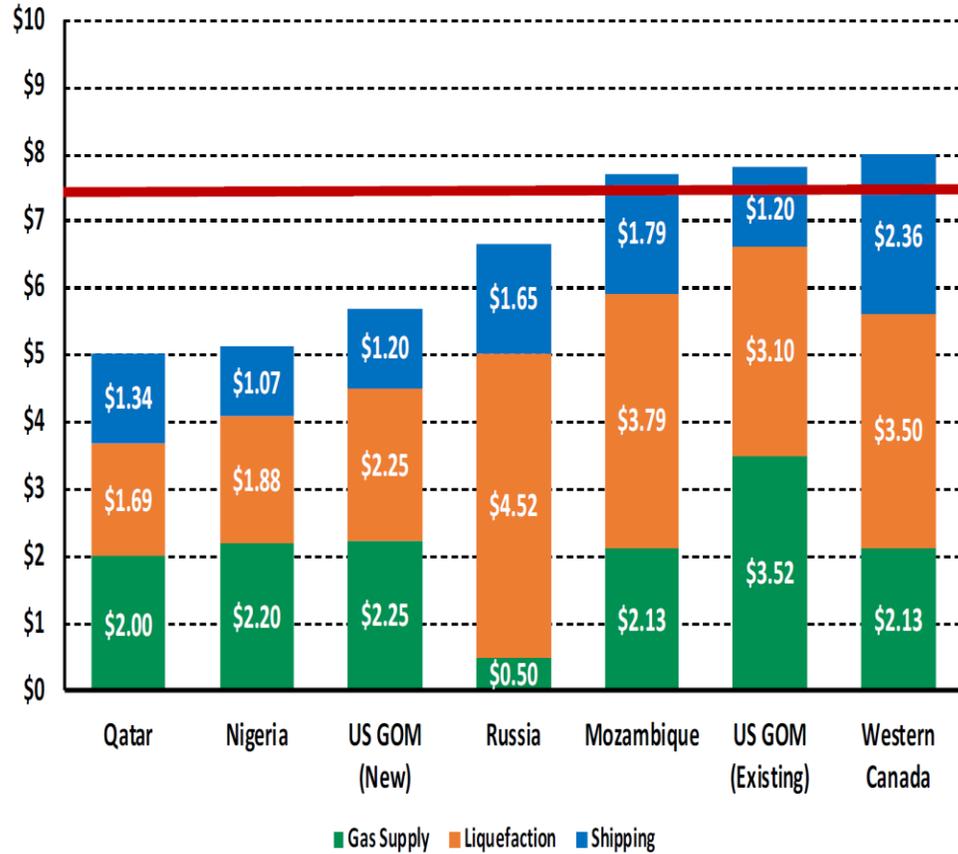
Low Income Markets : India-Pakistan-Bangladesh in 2025

Source : OIES Paper NG 142

Low Income Market : North West Europe in 2025

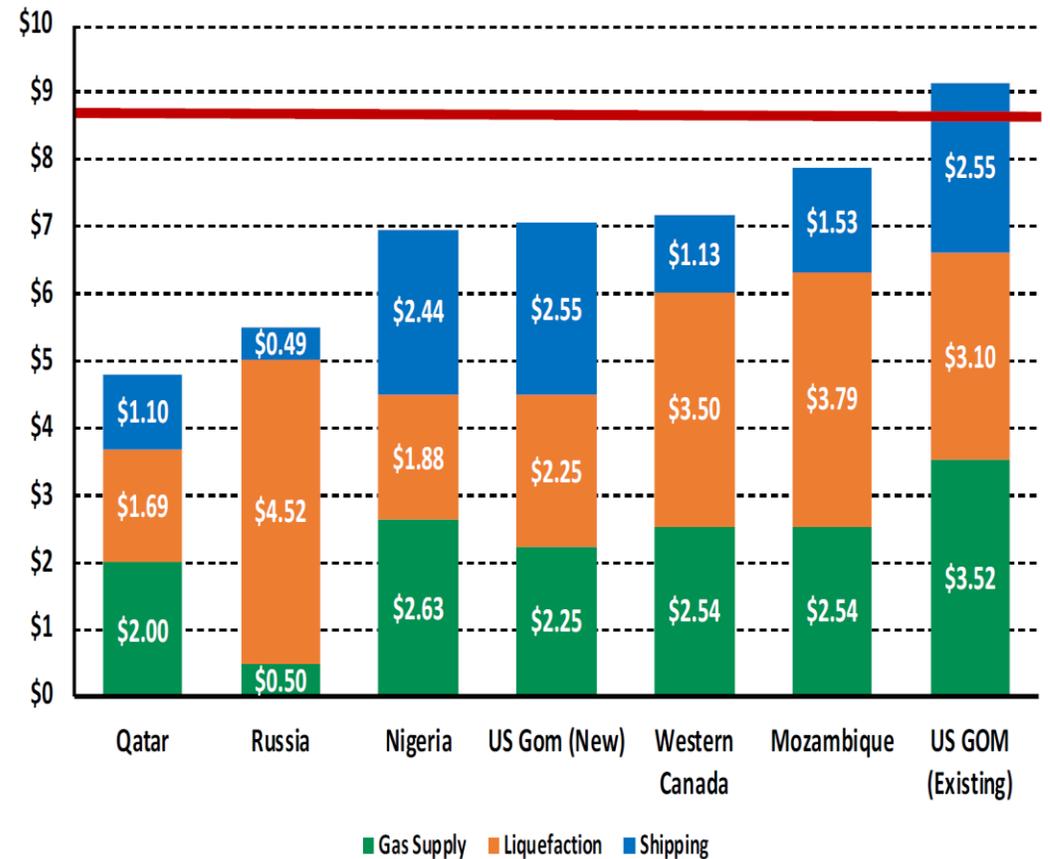
Source : OIES Paper NG 142

Key findings on affordability in regions of different income segments (\$/mmbtu)



High income North & West Europe in 2025

Source : OIES Paper NG 142



High Income Market (Japan Korea Taiwan China) in 2025

(Source : OIES)