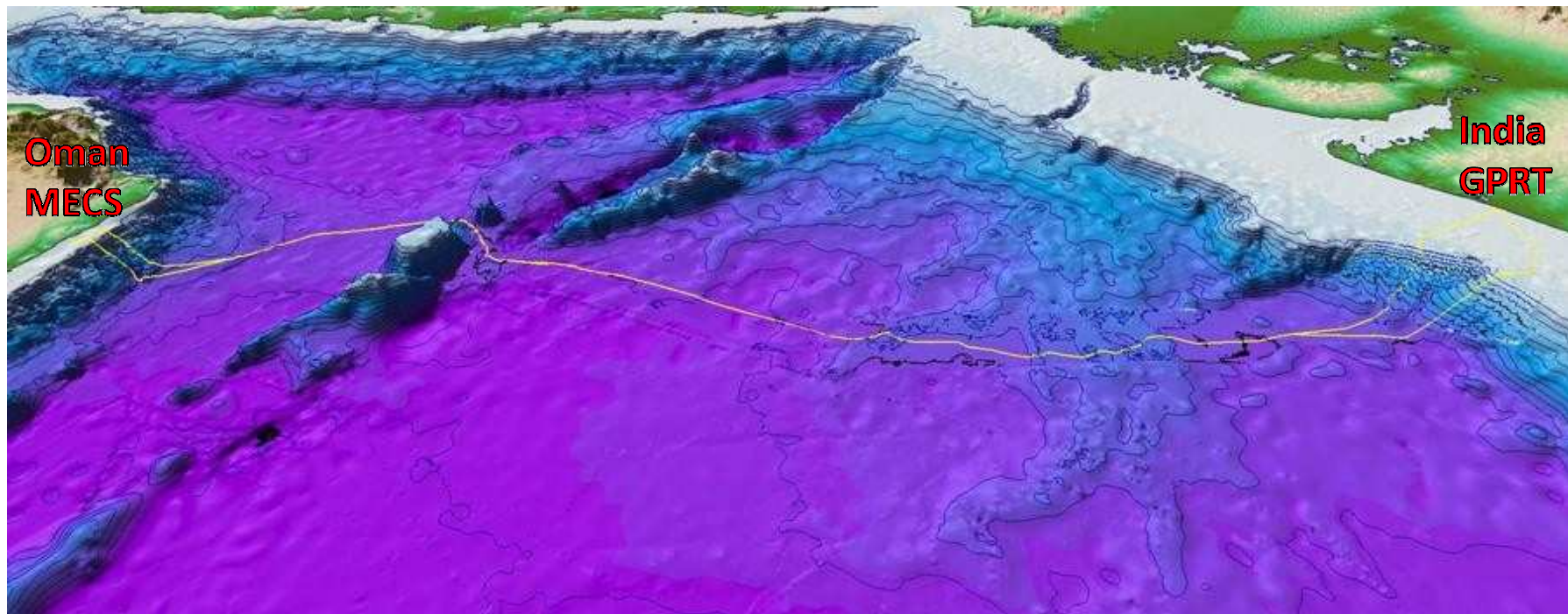


# Role of transnational pipelines to meet the future gas requirement in India



## MEIDP India's Transnational Gas Pipeline



Workshop on: Natural Gas Vision 2030; Role of domestic production, LNG import & transnational gas pipelines

3<sup>rd</sup> April 2019

# **MEIDP - India's transnational Gas Pipeline**

**TRANSNATIONAL GAS PIPELINES AROUND THE WORLD**

**SUCCESS OF TRANSNATIONAL GAS PIPELINE PROJECTS-KEY DRIVERS**

**INDIA- ENERGY SCENARIO & GAS DEMAND**

**MEIDP – THE PROJECT AND ITS RATIONALE**

**MEIDP - PIPELINE TARIFF ESTIMATION & GAS PRICING**

**MEIDP - PROJECT STRUCTURE AND STAKEHOLDERS**

**MEIDP - PROJECT BACKGROUND & CURRENT STATUS**

**THE WAY AHEAD AND TIMELINE**

**CONCLUSION**

**TURKSTREAM PIPELINE INSTALLATION BY PIONEERING SPIRIT (ALLSEAS)**

# TRANSNATIONAL GAS PIPELINES AROUND THE WORLD

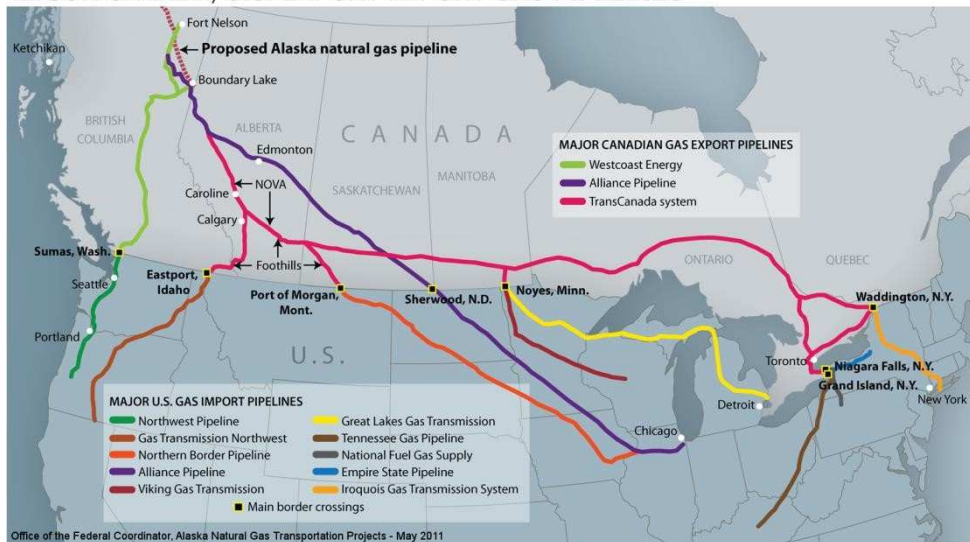


# Transnational Pipelines – Overview

- Northern Europe
- Turkmenistan to China
- Russia to Europe
- Russia to China
- USA to Canada
- West Africa



MAJOR CANADA, U.S. EXPORT-IMPORT GAS PIPELINES

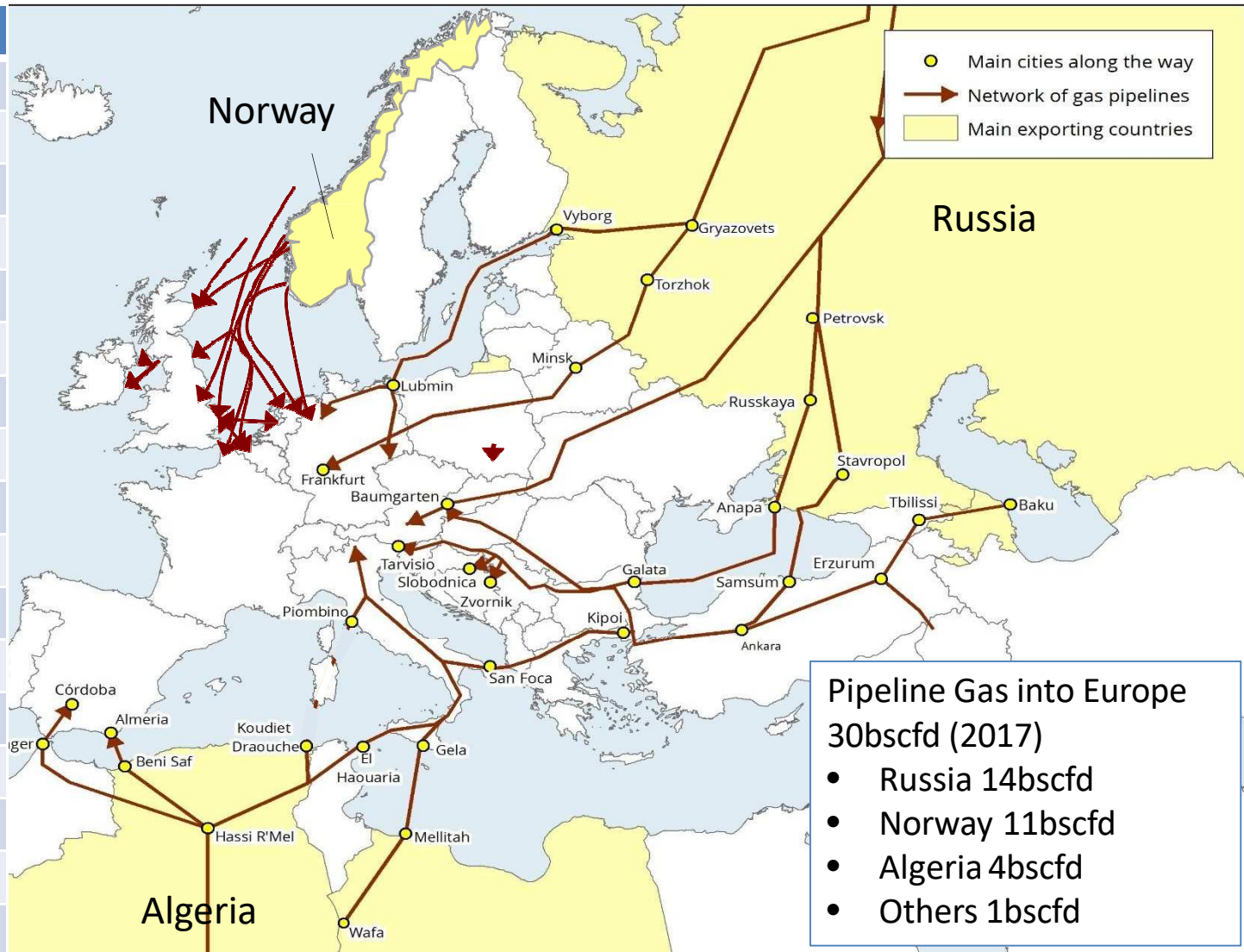


# Transnational Pipelines – Operating or Under Construction

Project	Length	Capacity	No.	Dia	Depth	Status		
	(KM)	(BCM)	-	(inch)	(m)		from	to
Medgaz	210	8	1	24	2165	Operating	Algeria	Spain
TurkStream 1-2	925	63	4	32	2200	Installed	Russia	Turkey
NordStream	1222	55	2	48	210	Operating	Russia	Germany
Nordstream2	1222	55	2	48	210	Construction	Russia	Germany
ITGI	217	10	1	32	1800	Construction	Albania	Italy
Poseidon	210	10	1	36	1400	Tender	Greece	Italy
Blue Stream	396	16	2	24	2100	Operating	Russia	Turkey
Europipe 1	670	18	1	40	70	Operating	Norway	Germany
Europipe 2	642	24	1	42	354	Operating	Norway	Germany
Franpipe	840	19	1	42	70	Operating	Norway	France
Langeled	1166	24.5	1	44	385	Operating	Norway	UK
ZeePipe	1300	19	1	44	70	Operating	Norway	Belgium
Dolphin	364	33	1	48	70	Operating	Qatar	UAE
Tuxpan	260	88	1	42	200	Installed	USA	Mexico

# Transnational Pipelines that supply Europe

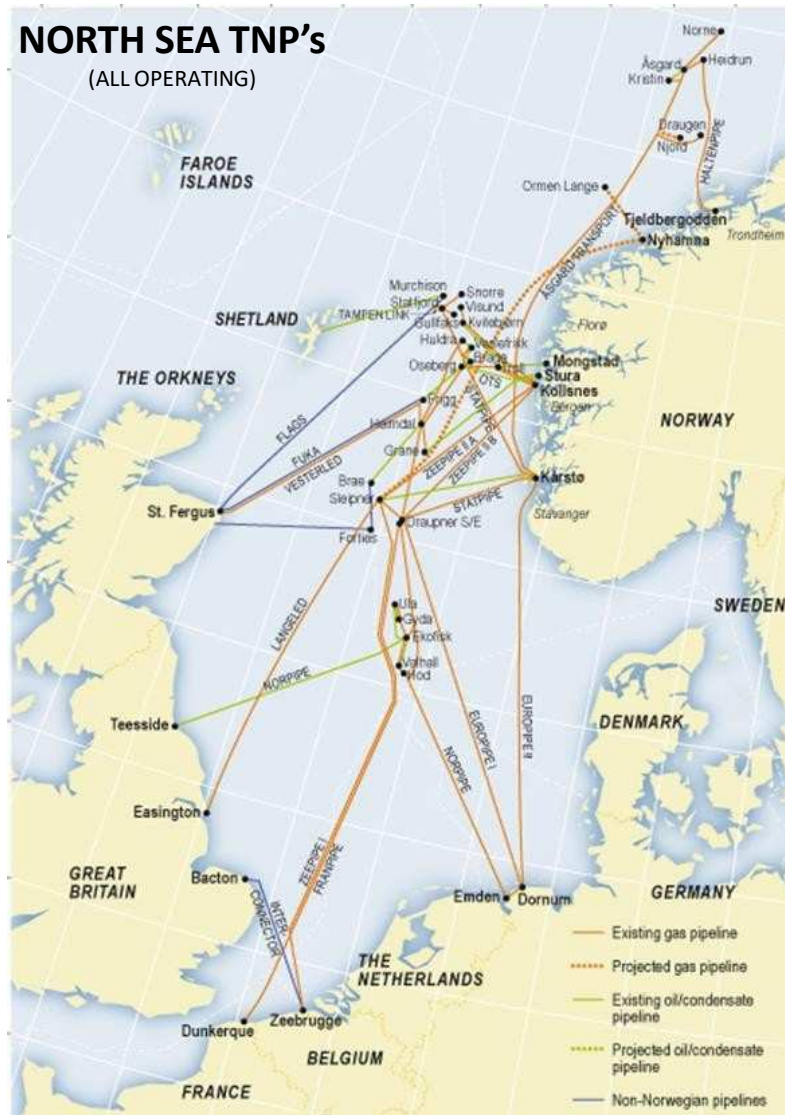
From	To
Norway	UK
Norway	France
Norway	Germany
Norway	Belgium
UK	Ireland
UK	NL
UK	Belgium
Russia	Germany
Russia	Poland
Russia	Turkey
Russia	Ukraine
Kazakhstan	Turkey
Greece	Italy
Libya	Italy
Tunisia	Italy
Algeria	Spain
Morocco	Spain



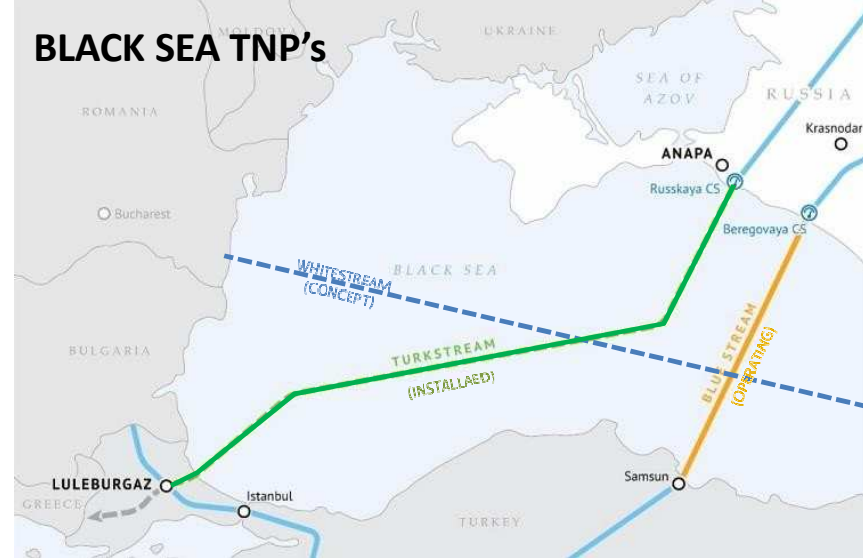


# Transnational Pipelines – Operating in Europe

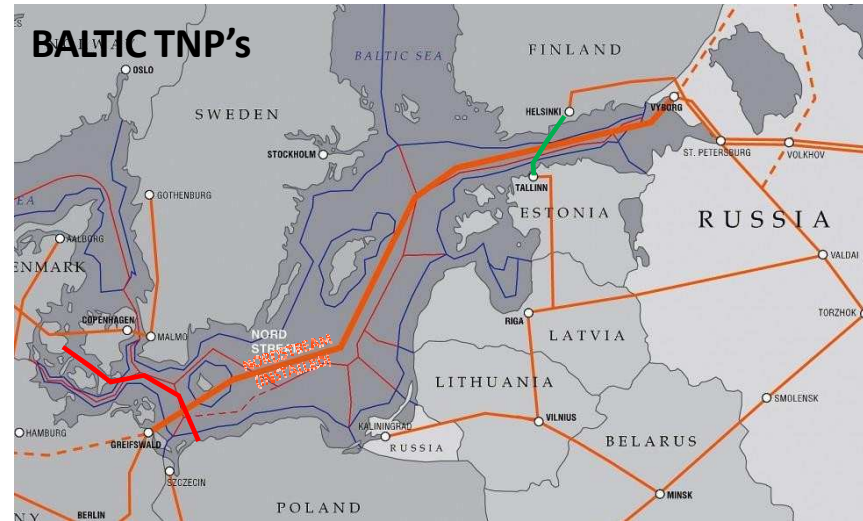
**NORTH SEA TNP's**  
(ALL OPERATING)



**BLACK SEA TNP's**



**BALTIC TNP's**



# Transnational Pipelines - Proposed

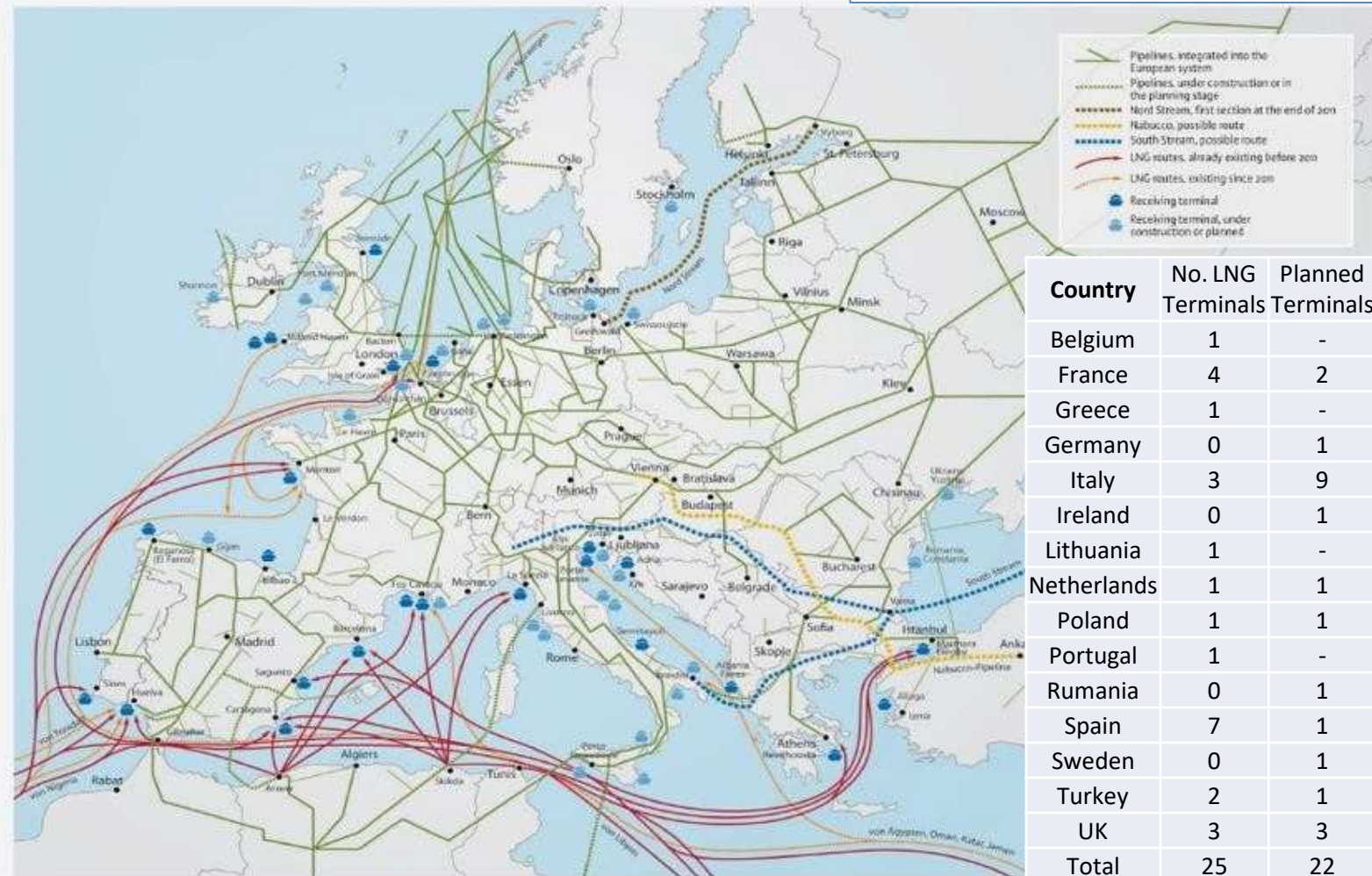
Project	Length	Capacity	No.	Dia	Depth	Status		
	(KM)	(BCM)	-	(inch)	(m)		from	to
<b>MEIDP</b>	<b>1200</b>	<b>10.5</b>	<b>1</b>	<b>27</b>	<b>3500</b>	<b>Pre-FEED</b>	<b>Oman</b>	<b>India</b>
East Med	1500	14	1	28	3200	Pre-FEED	Cyprus	Greece
Timor Gap	231	?	4	22	3200	FEED	Australia	Timor Leste
Galsi	560	10	1	28	2800	FEED	Algeria	Italy
Venezuela Florida	1800	?	1	24	4400	Concept	Venezuela	USA
Baltic Pipeline	275	10	1	36	120	FEED	Denmark	Poland
Baltic Connector	151	2	1	20	70	Execute	Estonia	Finland



# LNG that supplies Europe

Natural gas pipelines and LNG terminals in Europe

LNG into Europe 5bscfd (2017)



Sources: BDEW, Eurogas

# SUCCESS OF TRANSNATIONAL GAS PIPELINE PROJECT-KEY DRIVERS

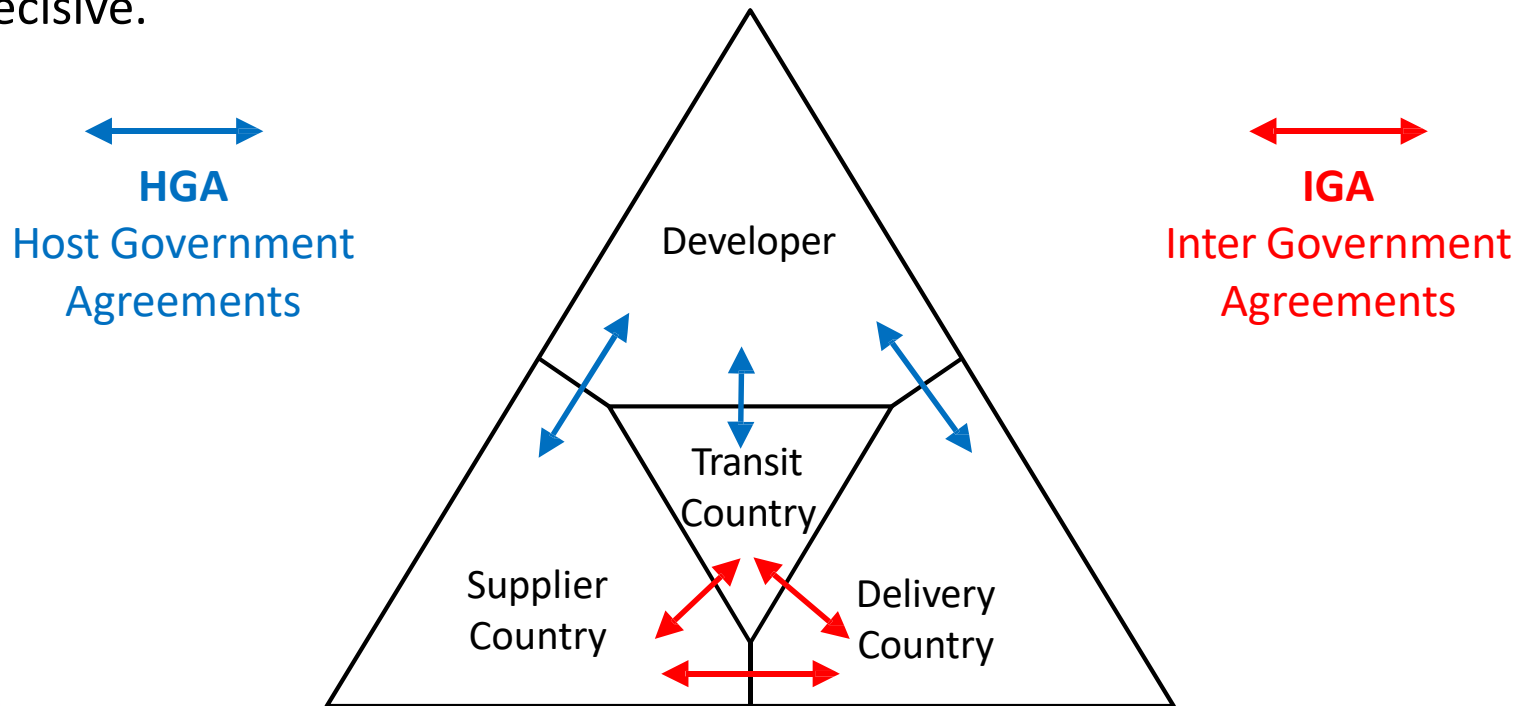
# Success of Transnational Gas Pipelines Key Project Drivers

- ❖ Transnational Gas Pipeline (TNGP) Projects are driven by both Gas **Producing** and Gas **off-taker countries**
- ❖ Gas **producers** typically take **Equity stake** in the TNGP Projects to derive maximum return from Gas Value Chain
  - This also demonstrates **strong commitment** of Gas Producing **country/Company** in the Project
  - Provides **confidence** & comfort to gas **off-taker** for **delivery of gas** on long term basis
- ❖ Due to participation in Gas Value Chain, the Gas producers can have better control to **ensure smooth & uninterrupted supply of gas**
  - **Progress** of implementation of the TNGP project
  - **Awareness** of TNGP funding tie-up /**Issues**
  - Update on **day-to-day** operation of TNGP project

**Strong involvement of Gas Producer essential for success of any Transnational Gas pipeline Project**

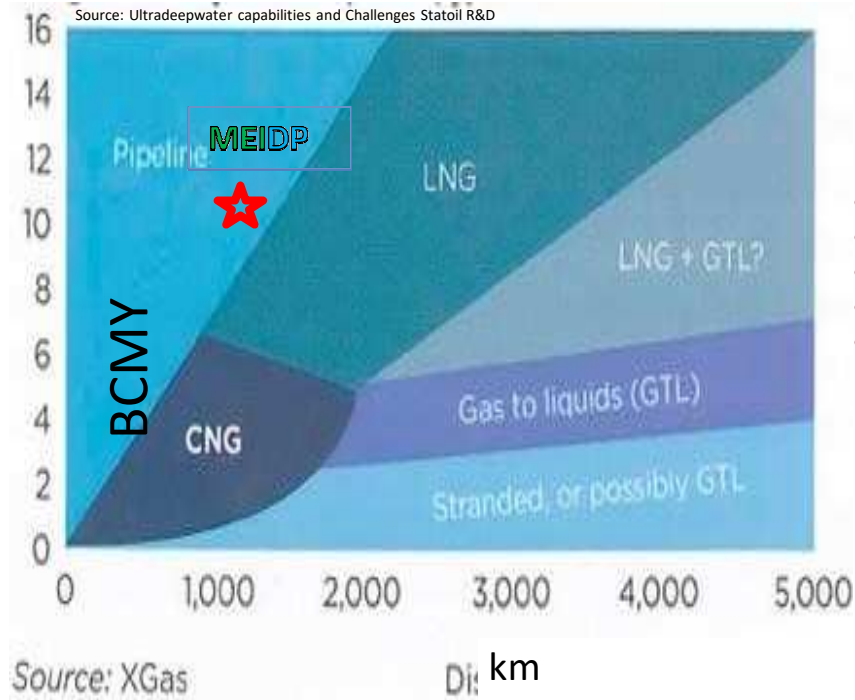
# Transnational Pipelines-Elements for Success

- ❖ **Major dedicated volumes** of gas, which are essential for a project.
- ❖ A competent and committed **commercial champion**.
- ❖ **Economic viability** of the pipeline and superiority over other alternatives.
- ❖ **Political support**, which is instrumental (**Absolutely Necessary**) but not decisive.





# Competitiveness of Pipelines v's LNG

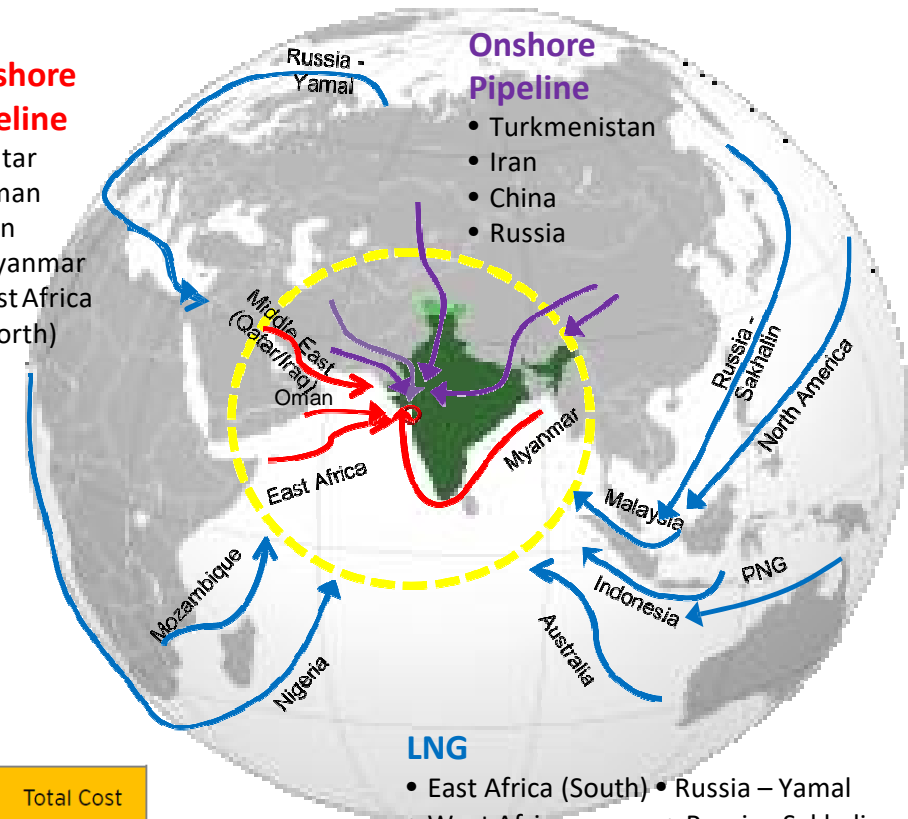


## Offshore Pipeline

- Qatar
- Oman
- Iran
- Myanmar
- East Africa (North)

## Onshore Pipeline

- Turkmenistan
- Iran
- China
- Russia



## LNG

- East Africa (South)
- West Africa
- Australia
- Indonesia
- North Africa
- Western Med
- Russia – Yamal
- Russia - Sakhalin
- Malaysia
- North America
- PNG

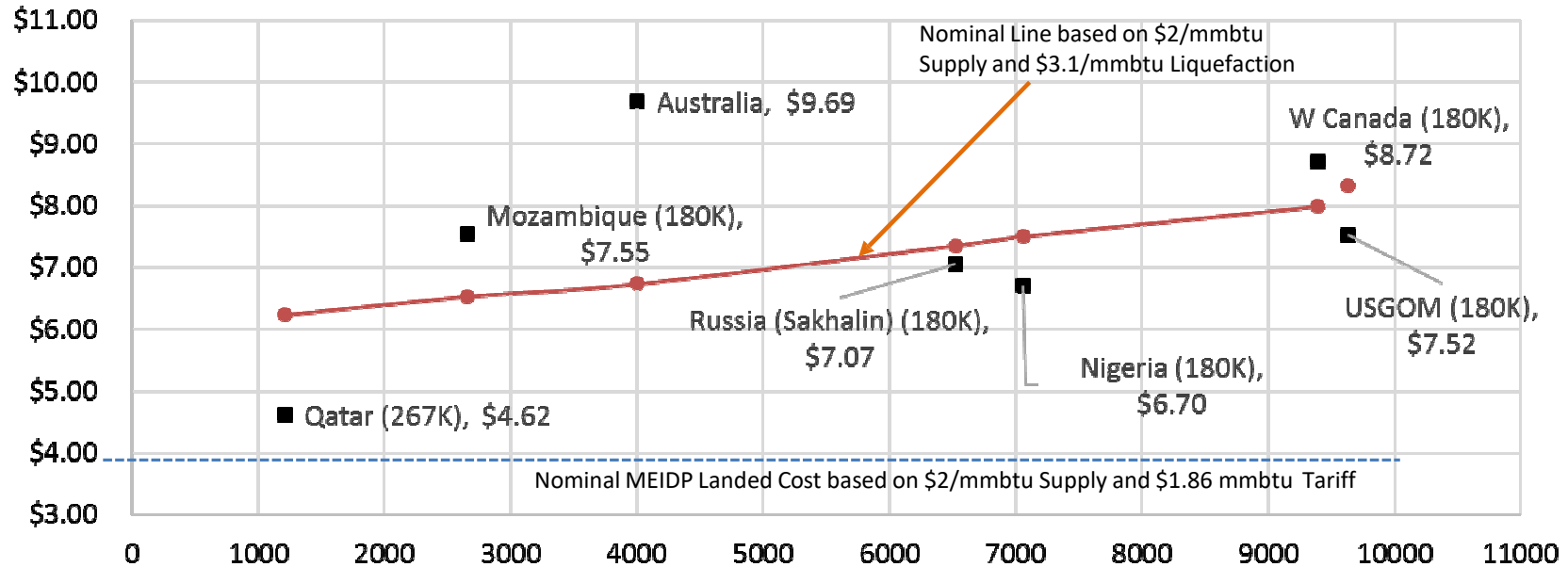
**Economic Limit of Pipeline Gas to India West Coast is ~2500km**

	Dry Gas Price	Liquefaction Cost	Shipping Tariff	Regasification	Total Cost
LNG	3-4	~4.0	0.3	0.5	7.8-8.8
Pipeline	3-4	-	2.5	-	5.5-6.5
Difference in landed gas price					2.3

# Competitiveness of Pipelines v's LNG

## LNG Supply, Transportation & Regas Cost

Source: Oxford Institute for Energy Studies Outlook for Competitive LNG Supply March 2019



LNG Shipping Cost 2025	Gas Supply	Liquifaction Plant Cost	Distance to Market	Shipping Cost	Regas Cost India (assumed)	Delivered Cost
	\$/mmbtu	\$/mmbtu	NM	\$/mmbtu	\$/mmbtu	\$/mmbtu
Qatar (267K)	2	1.69	1210	\$ 0.43	\$ 0.50	\$ 4.62
Mozambique (180K)	2.54	3.79	2653	\$ 0.72	\$ 0.50	\$ 7.55
Australia	2	6.26	4000	\$ 0.93	\$ 0.50	\$ 9.69
Russia (Sakhalin) (180K)	0.5	4.52	6528	\$ 1.55	\$ 0.50	\$ 7.07
Nigeria (180K)	2.63	1.88	7063	\$ 1.69	\$ 0.50	\$ 6.70
W Canada (180K)	2.54	3.5	9390	\$ 2.18	\$ 0.50	\$ 8.72
USGOM (180K)	2.25	2.25	9631	\$ 2.52	\$ 0.50	\$ 7.52

# INDIA: ENERGY SCENARIO AND GAS DEMAND

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# India's Current Energy Mix

- **India is the 3<sup>rd</sup> Largest Energy Consumer & 3<sup>rd</sup> Largest Oil Consumer in the World** (BP Statistical Review 2018)
- Energy Demand to grow with GDP growth of India
- India has a stated aim for Natural Gas to constitute **15% total energy by 2030**.

## Energy Sources in India

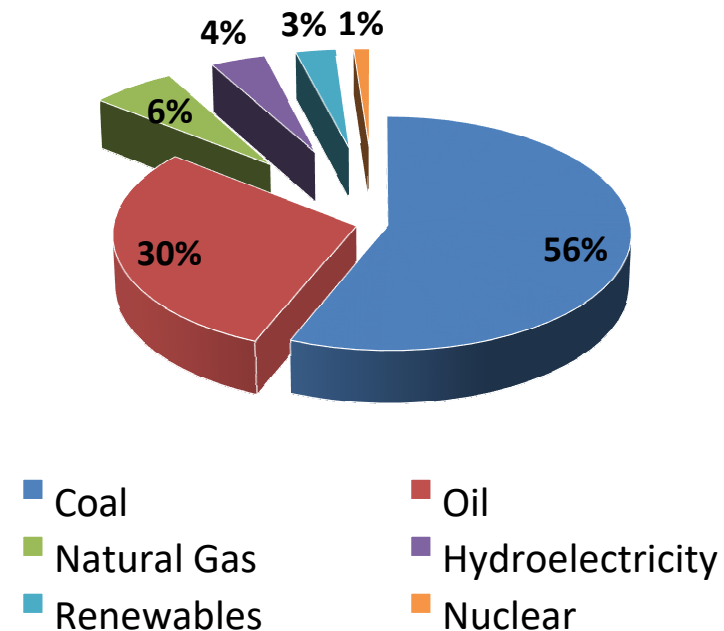
**COAL:** Coal is the dominant energy source contributing **56%** of the total energy consumption

**CRUDE OIL:** Second major fuel consumed in India; Import Dependency: 30% of Consumption

**NATURAL GAS:** Third major fuel consumed in India;

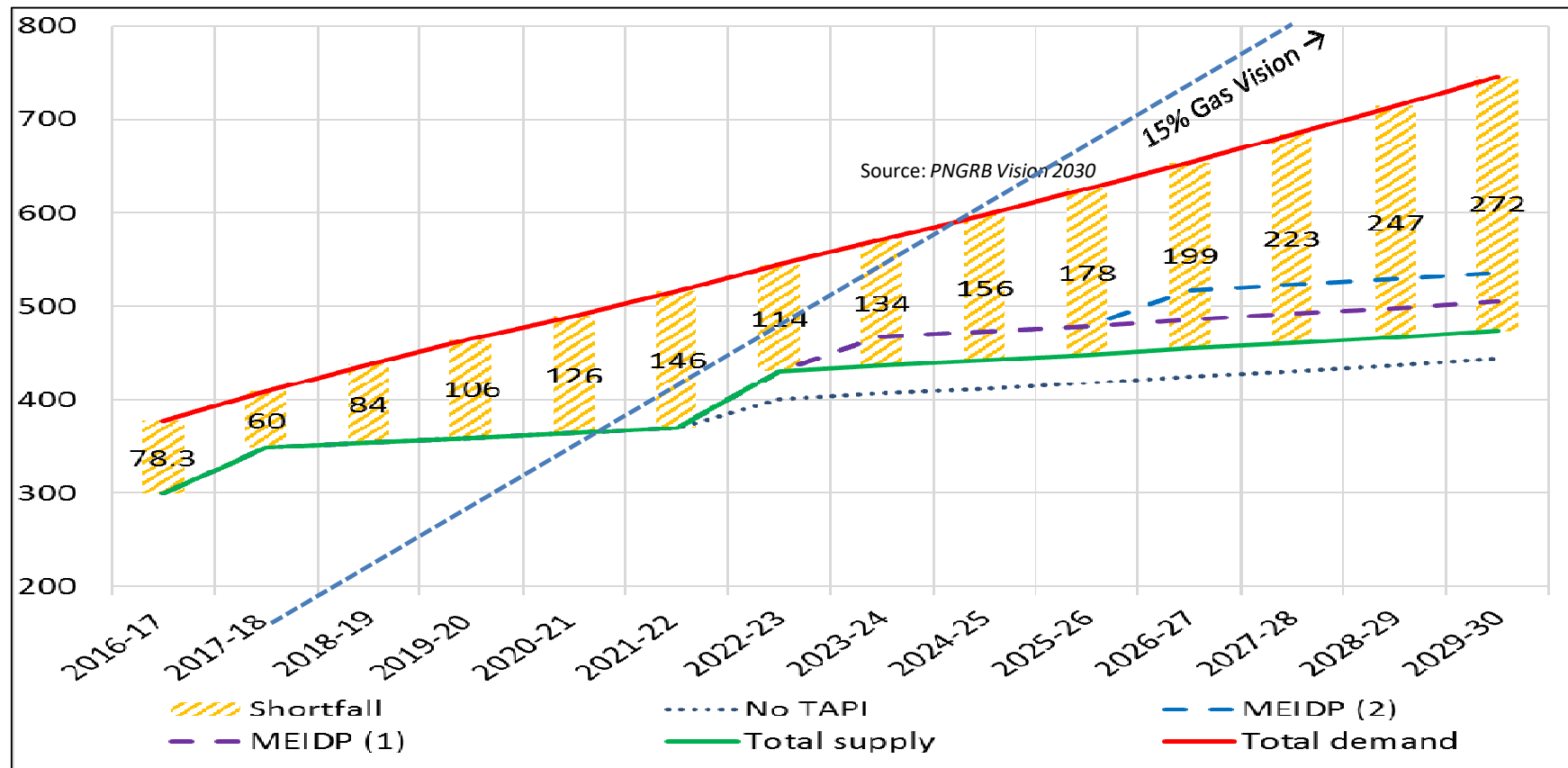
- ✓ **Domestic Production of Natural Gas** in India has declined in the recent years from **143 MMSCMD** in **FY2011** to **88 MMSCMD** in **FY 2017**
- ✓ India has **Low reserves of Natural Gas** (Proven Reserves of 1.2 TCM, 0.7% of World Reserves)
- ✓ All Gas import options LNG & Pipelines must be used

## ENERGY MIX OF INDIA (2017)





# India's Demand-Supply Gap



- Based on India's vision to reach **15%** energy supplied by gas **by 2030**. India will have gas demand of over **950 mmscmd** over the next 20 years. (3 – 4 times current gas demand), if power plants and City Gas Distribution (CGD) use gas fully too and all gas needs have to be met
- The **gap** between **demand & supply** of domestic natural gas is expected to **widen** going forward
- The shortfall in Gas Supply can only be met by a mix of sources **LNG/RLNG and Transnational Gas Pipelines will be required.**

# Indian Sector Specific Demand of Natural Gas

[SBI Cap Review of Affordability of Gas for SAGE]

FY	2013	2014	2015	2016	2017	Average
<b>DEMAND</b>						
Fertilizer	25%	30%	31%	32%	30%	30%
Power	28%	22%	20%	21%	23%	23%
CGD	13%	14%	14%	13%	14%	14%
Refinery	9%	10%	9%	9%	9%	9%
Petrochemical	4%	3%	5%	5%	4%	4%
Others	20%	22%	21%	21%	20%	21%
<b>SUPPLY</b>						
Domestic Gas	70%	67%	66%	66%	56%	65%
LNG Import	30%	33%	34%	34%	44%	35%

Source: PNGRB

- ❖ 67% of the demand from anchor sectors such as Power, Fertilizer, CGD
- ❖ Going forward, **Power & Fertilizer** sectors are expected to be major demand centre for imported gas
- ❖ However, Power sector being the most price sensitive sector, (**15GW are Stranded**)
  - Affordability of Gas price will determine the overall demand

# MEIDP – THE PROJECT AND ITS RATIONALE

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# MEIDP - SAGE Key Team Members/ Technology Partners

Mr T.N.R Rao	Former Petroleum Secretary, Govt of India Architect of Oman-India Pipeline Chairman of SAGE Advisory Board	Mr Asle Venas	Global Director of Pipelines DNVGL
Mr Subodh Jain	Director South Asia Gas Enterprise PVT Ltd. Director Siddho Mal & Sons and Director INOX Air Products Ltd. Former Senior Advisor to Oman-India Pipeline	Dr Roberto Bruschi	Senior Vice President Saipem SpA, Milan, Italy
Dr Herman Franssen	Member of the SAGE Advisory Board and Senior Consultant to SAGE President, International Energy Associates, USA Former Advisor to Oman-India Pipeline & Former Economic Advisor to the Sultanate of Oman, MoP	Dr Ping Liu	Operations Director, Intecsea BV, Netherlands
Mr Ian Nash	Manging Director, Peritus International (UK) Ltd. and Senior Technical Consultant to SAGE PM for Detailed Design of Europipe 2 Gas Trunkline and BP Block 31 ultra deep flowlines PM for MedGaz FEED Ultra Deep Trunklines and EM for Canyon Express Ultra Deep development	Mr Marco Monopoli	Offshore Commercial Manager Saipem SpA, Milan, Italy
Mr AK Purwaha	Former Chairman n Managing Director of Engineers India Ltd ( EIL) Member of the SAGE Advisory Board	Mr Johan Drost	Allseas International, Delft, Netherlands
		SBI Capital Markets Ltd	Financial Advisory Services
		Engineers India Ltd	Leading Onshore Pipeline and Facilities Engineering SAGE Indian Design Consultants
		Ernst & Young	Financial Advisory Services



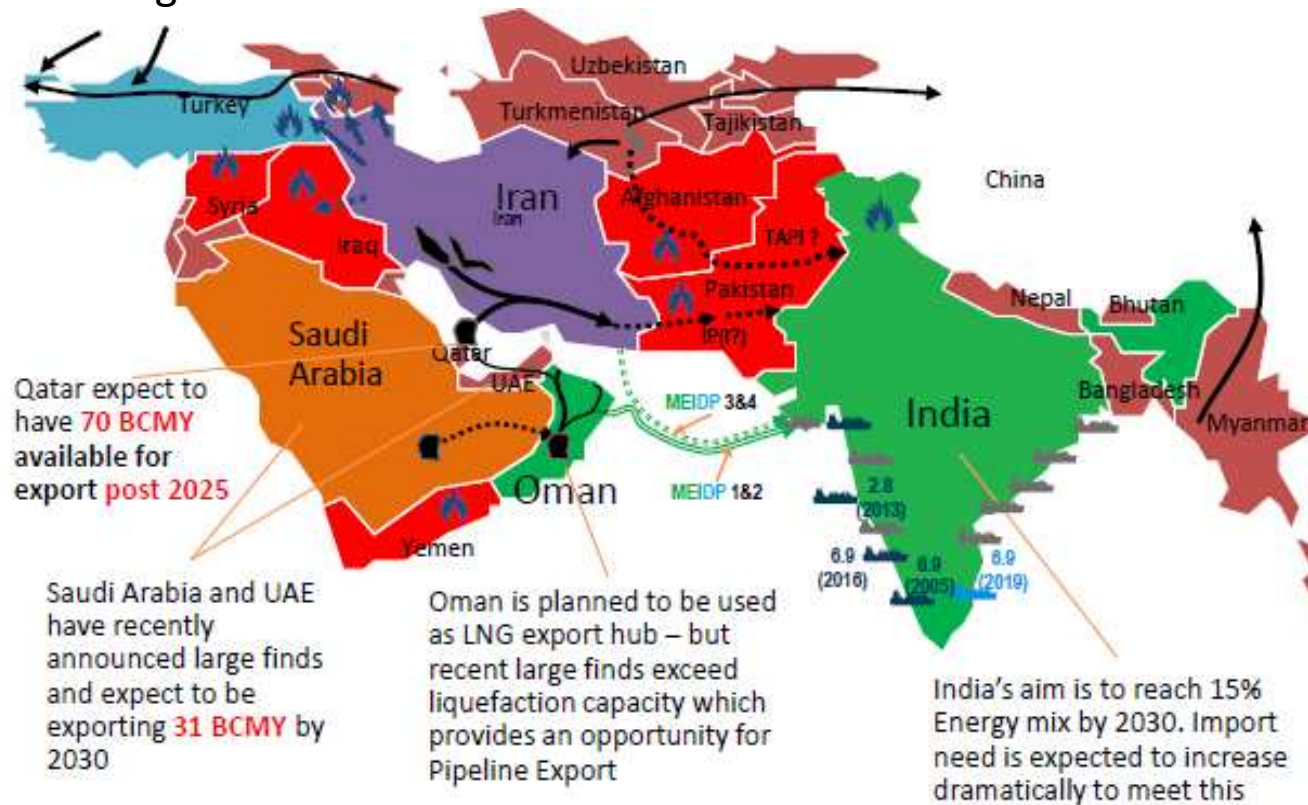
# MEIDP - SAGE Project Vision

Project	Middle East to India Deep-Water Gas Pipeline ( <b>MEIDP</b> )
Sponsor	South Asia Gas Enterprise Pvt Ltd (SAGE)
Proposal	Development of an <b>Energy Corridor</b> for transportation of gas from <b>Middle East to India</b> by the <b>safest, most economic &amp; reliable means</b>
Proposed Route	Middle East Landfall (Oman) to Indian Landfall (Gujarat), via Arabian Sea. Alternate route from Iran (Chabahar), Subject to lifting of US Sanctions.
Common Carrier	The pipeline will be laid as a “ <b>Common Carrier</b> ” pipeline whereby SAGE will be the Gas Transporter and will be paid a Tariff for pipeline use
Tri- Partite Agreement	<b>Gas Buyers &amp; Gas Seller</b> will negotiate the Long Term Gas Supply Contract along with <b>MEIDP-SPV</b> in a <b>Tri-partite Framework Agreement</b>
Global Consortium	<b>SAGE</b> has been working on the Project with Global Consortium for last <b>9 years</b>

# MEIDP - Competing Indian Gas Import Projects and Security

To cover the increasing gas demand, India plans to expand its import infrastructure with new RLNG plants and pipelines

**MEIDP** from Oman is the only pipeline project catering to India markets and not crossing conflict



Pipelines help to moderate Gas prices, but the larger MENA region and South Asia generally presents a **challenging geopolitical environment** and security environment for large-CAPEX cross-border infrastructure

The offshore route of **MEIDP** **avoids conflicts** and limits the impact of potentially deteriorating geopolitical relations as well as **limiting on-the-ground security threats** posed by non-state actors

—— MEIDP 1 & 2 From Oman    - - - - MEIDP 3 & 4 From Iran (Post US Sanctions)

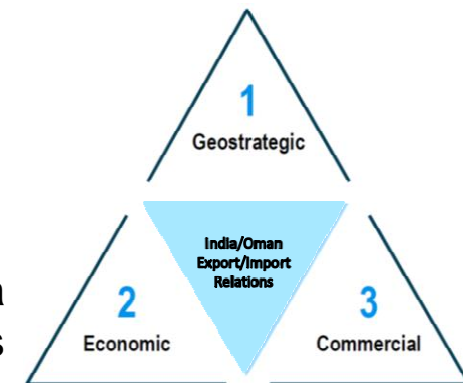
— Pipeline    - - - Planned pipeline    🔥 Major looming or ongoing violent conflict

🏗️ RLNG onstream    🏗️ RLNG under construction    🏗️ Considered RLNG (uncertain)

# MEIDP - Win for Oman (Saudi and UAE)

Recent large Oman Gas finds in Mubrouk and phase 2 development of Khazzad will mean Oman has spare gas. MEIDP provides Oman with a **Safe and Secure** long term means of Gas monetization

- Gives Oman **access** to a **large** and growing **gas market** on its doorstep. With potential for up to 4 Pipelines along the corridor based on India's projected gas shortage.
- Facilitates upstream **investment** in Oman by **Indian companies**
- Builds on **existing intergovernmental agreements** on trade and development.
- Consistent with Oman's aim to become a **regional gas hub** as a route for anticipated excess Saudi Gas from Recent red sea gas finds.
- Saudi Arabia and UAE will have **surplus gas** in the next 5 years based on recently announced **large gas finds**. India is an Ideal destination for this gas (Via Oman)



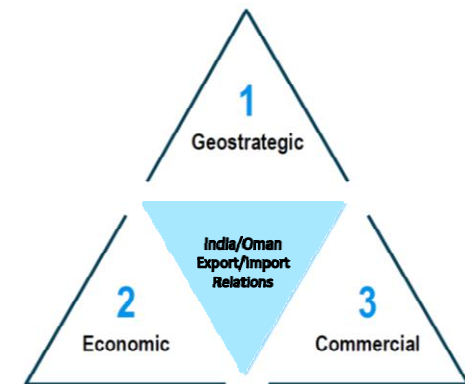
# MEIDP - Win for India

Even as a developing Country it can be argued that **India is becoming too heavily dependent on costly LNG.**

**MEIDP** Gas from Oman can facilitate Power Generation at prices similar to Clean Coal.

Potentially each **MEIDP** gas pipeline **delivers 31.1 mmscmd (1.1 bscfd) saving India almost a billion dollars annually** when compared to Spot / Term LNG imports / price.

- Pipeline/LNG **competition moderates Gas prices** to the consumer
- **53%** of India Gas demand is from the **Power & Fertilizer** industry, who can only use Gas at **affordable** prices (~\$6 per mmbtu) and hence cannot afford LNG, unless **subsidized**.
- Currently **15,000 MW** of Gas based Power generation capacity is **stranded** due to **High long term LNG** Gas prices
- Five new Fertilizer Plants are planned in India (India is also considering overseas Fertilizer plants).
- Much **investment** is taking place **in India** internal Gas pipelines (and LNG Terminals) but currently there is **no Gas in India's** main "Arteries"





# PIPELINE TARIFF ESTIMATION & GAS PRICING

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# MEIDP – Competitive Gas Price Summary

[SBI Cap Review of MEIDP Tariff for SAGE]

- ❖ **Weighted Average Gas Price** at the inlet of MEIDP pipeline has been evaluated based on the
  - Affordable gas price for each sector
  - Contribution of each sectoral demand in the total demand of gas

Sector	Affordable price at MEIDP pipeline inlet (USD/mmbtu)	Price at MEIDP pipeline delivery point (USD/mmbtu)	Sector wise MEIDP Gas demand (%)
Power	3.00	7.09	30%
Fertilizer	3.75	7.84	30%
Other sectors (CGD, Petrochemical, etc.)	4.50	8.59	40%
<b>Weighted Average Gas price at inlet of MEIDP Pipeline (USD/mmbtu)</b>	<b>3.825</b>	<b>7.92</b>	<b>100%</b>

- ❖ The **Weighted Average Gas Price** at the inlet of the MEIDP Pipeline is estimated to be around USD 3.83/mmbtu

# MEIDP – Pipeline Tariff Estimation

## ❖ Levelized Pipeline Tariff\* based on

- Financial / Commercial Viability & Bankability of the Project

### Case 1: Levelized Tariff (USD \$/MMBTU)

Particulars/Year	Oman-India
For all years	1.86

### Case 2 : Fixed Tariff with escalation

Particulars/Year	Oman-India
1	1.48
2	1.52
3	1.57
4	1.61
5	1.66

*Tariff Calculation by SBI Cap*

*\*Levelized Tariff based on Project IRR of 12% (post-tax)*

*Project CAPEX \$4.5b, 50yr life*

## ❖ Route 1 (Oman-India)

- For a gas price of USD 3.83/mmbtu at the inlet of MEIDP Pipeline, the landed price is USD **\$5.69/mmbtu**, with delivered price of gas for end user in India is estimated to be **USD \$7.92/mmbtu**.

Particular	Value (\$)
Landfall price-Iran	3.83
Pipeline Tariff	1.86
<b>Landed Cost-Indian Port</b>	<b>5.69</b>
Custom Duty	0.30
Other Taxes & Duties	0.93
Local Transport	1.00
<b>Delivered Cost-End User</b>	<b>7.92</b>

## ❖ Route 2 (Iran-India)

- For a gas price of USD \$3.83/mmbtu at the inlet of MEIDP Pipeline, the landed price is USD **\$5.78/mmbtu**, with delivered price for end user in India is estimated to be **USD \$8.01/mmbtu**.
- ❖ Landed Cost of Pipeline Gas is expected to be USD **\$2.00/mmbtu** cheaper than LNG.

# PROJECT STRUCTURE AND STAKEHOLDERS

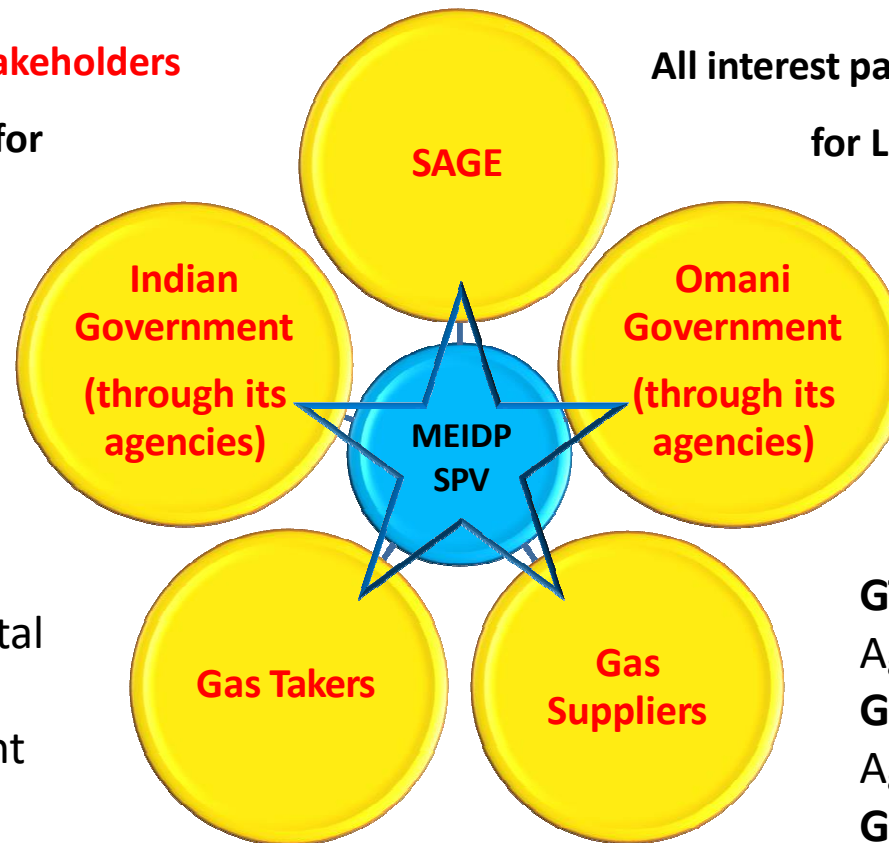
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# MEIDP - Stakeholders

## Stakeholders

Governments **must be stakeholders**  
*(through their agencies)* for  
Transnational Pipelines

All interest parties **must be stakeholders**  
for Large Infrastructure Projects  
(Anchor Buyer)  
(Anchor Seller)

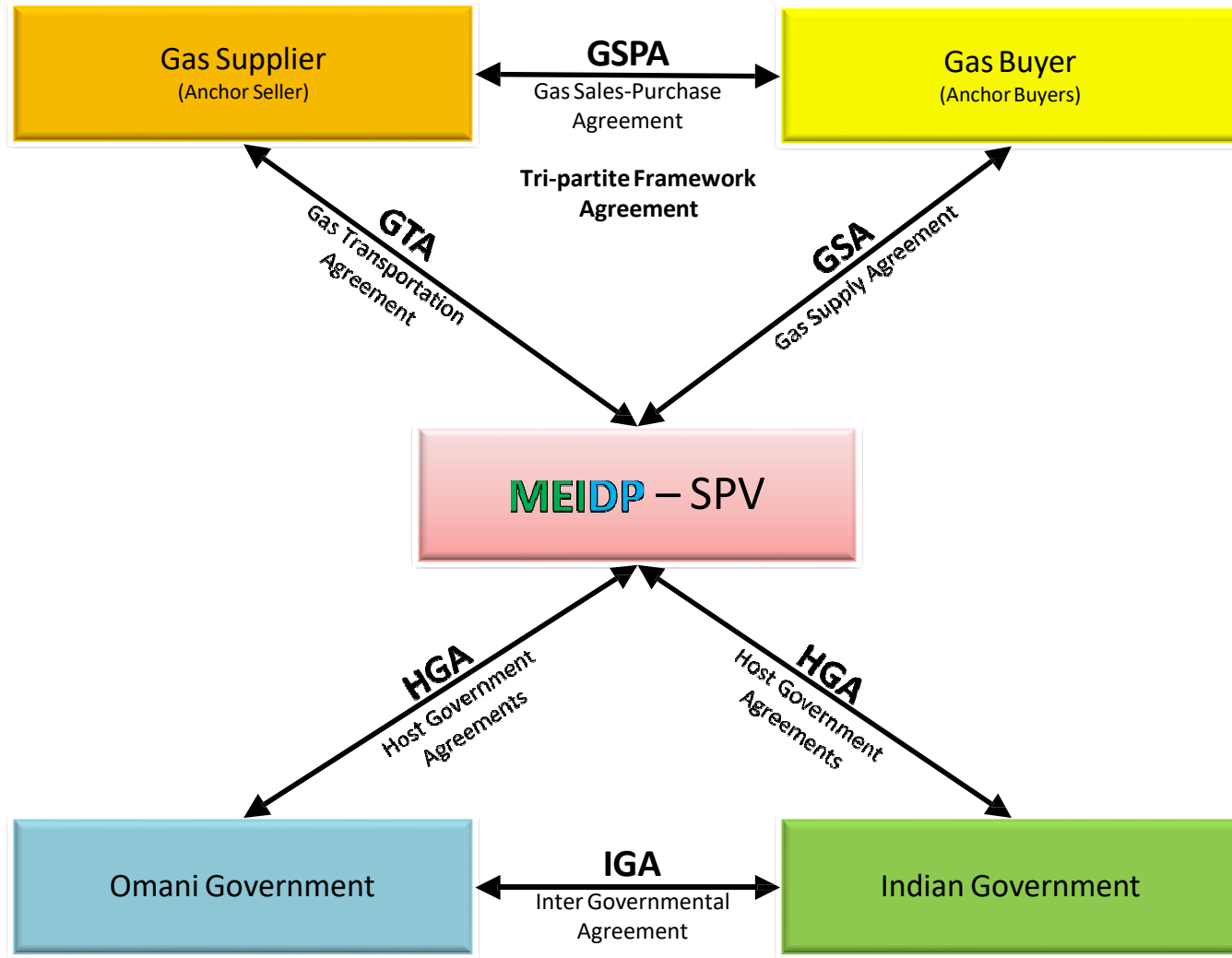


**IGA** - Inter Governmental Agreement  
**HGA** - Host Government Agreements

**GTA** - Gas Transportation Agreement  
**GSA** - Gas Supply Agreement  
**GSPA** - Gas Sales-Purchase Agreement



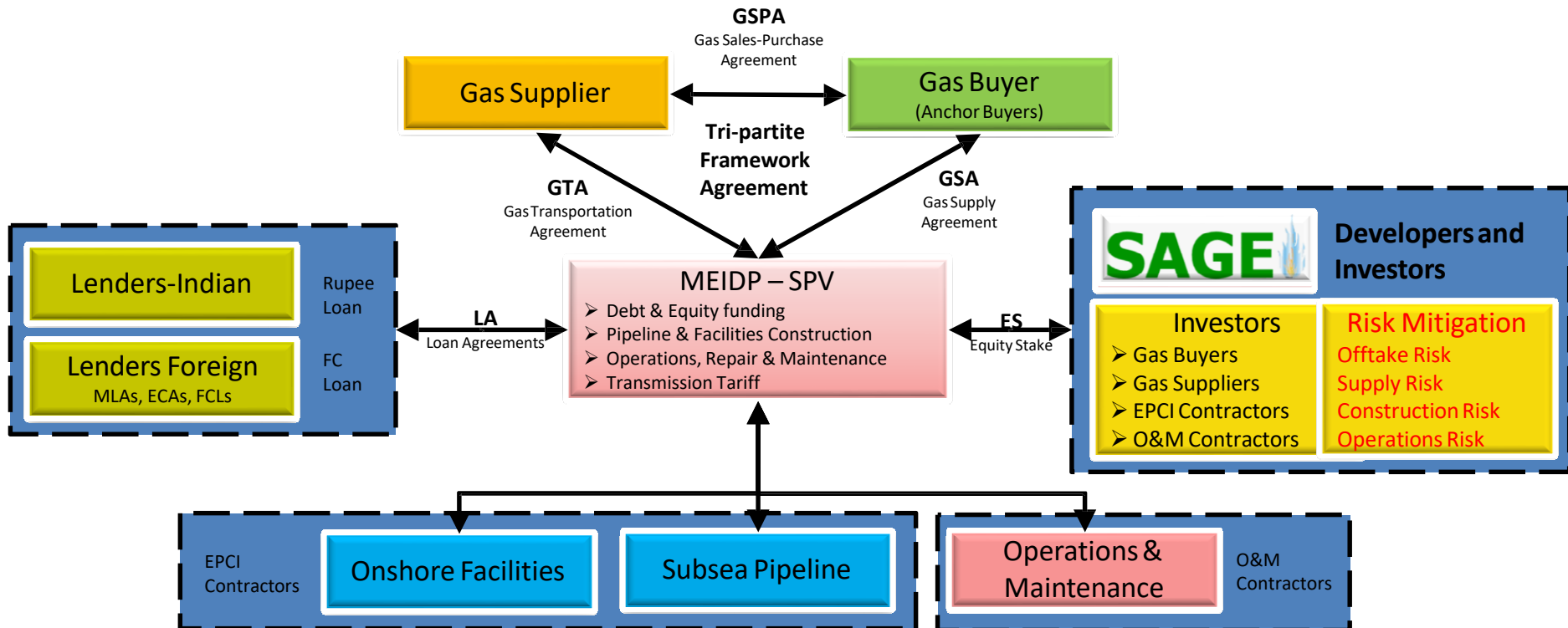
# MEIDP - Agreements



# MEIDP - Proposed Project Structure

As most Transnational Gas pipelines are Gas supplier driven, Oman should consider token Equity investment in SAGE Project

This will reassure Indian Gas Buyers regarding long term Gas availability for at least 25 years, and long term commitment / support for this Project.



Offshore SPV to be incorporated based on tax implications of different geographies in the world  
Project de-risked through the involvement of multiple global stakeholders who have the capability to implement this project

# MEIDP PROJECT BACKGROUND & CURRENT STATUS

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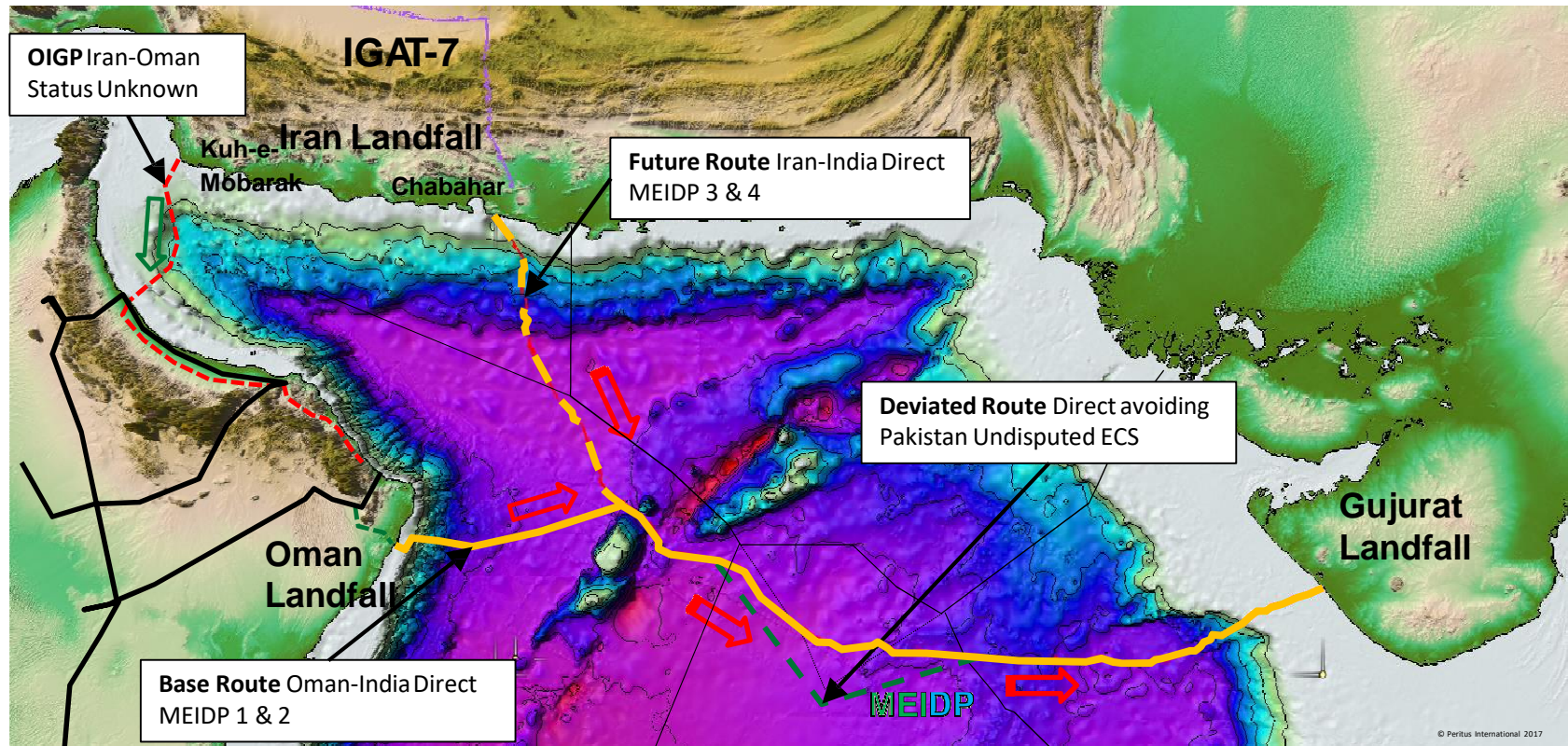
# MEIDP – Working Partners



MOUs and Agreements to Co-operate in developing MEIDP have been signed with:

Pipe Mills	Installation Contractors	Suppliers & Takers	Engineering & Consultancy
<ul style="list-style-type: none"> <li>• British Steel (TAT Corus)</li> <li>• Welspun</li> <li>• JindalSAW</li> <li>• PCK (China)</li> <li>• <i>JFE</i></li> <li>• <i>Europipe</i></li> <li>• <i>NSSMC (Nippon Sumitomo)</i></li> <li>• <i>Bio Steel</i></li> </ul>	<ul style="list-style-type: none"> <li>• Allseas</li> <li>• Saipem SpA</li> </ul>	<ul style="list-style-type: none"> <li>• Indian Oil Co</li> <li>• GAIL</li> <li>• GSPC</li> <li>• Oman Ministry of Oil and Gas</li> <li>• NIOC (NIGEC)</li> </ul>	<ul style="list-style-type: none"> <li>• Peritus International Ltd.</li> <li>• Engineers India Ltd.</li> <li>• Intecsea</li> <li>• FUGRO GeoConsulting Ltd.</li> <li>• SBI Caps</li> <li>• Ernst &amp; Young (EY)</li> </ul>
	Certification Bodies		
	<ul style="list-style-type: none"> <li>• DNVGL</li> </ul>		

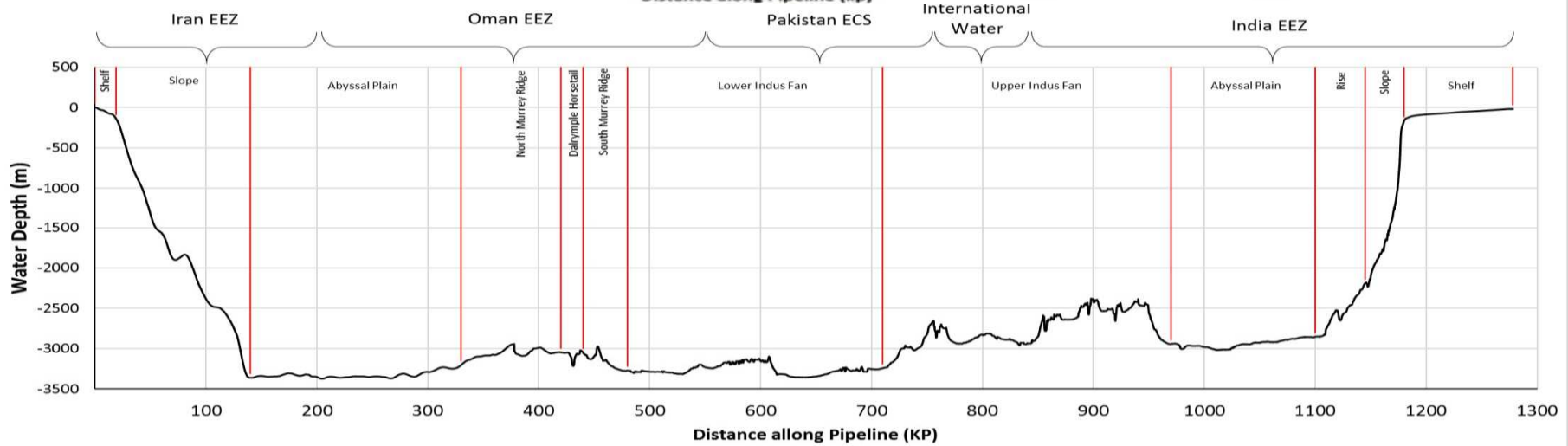
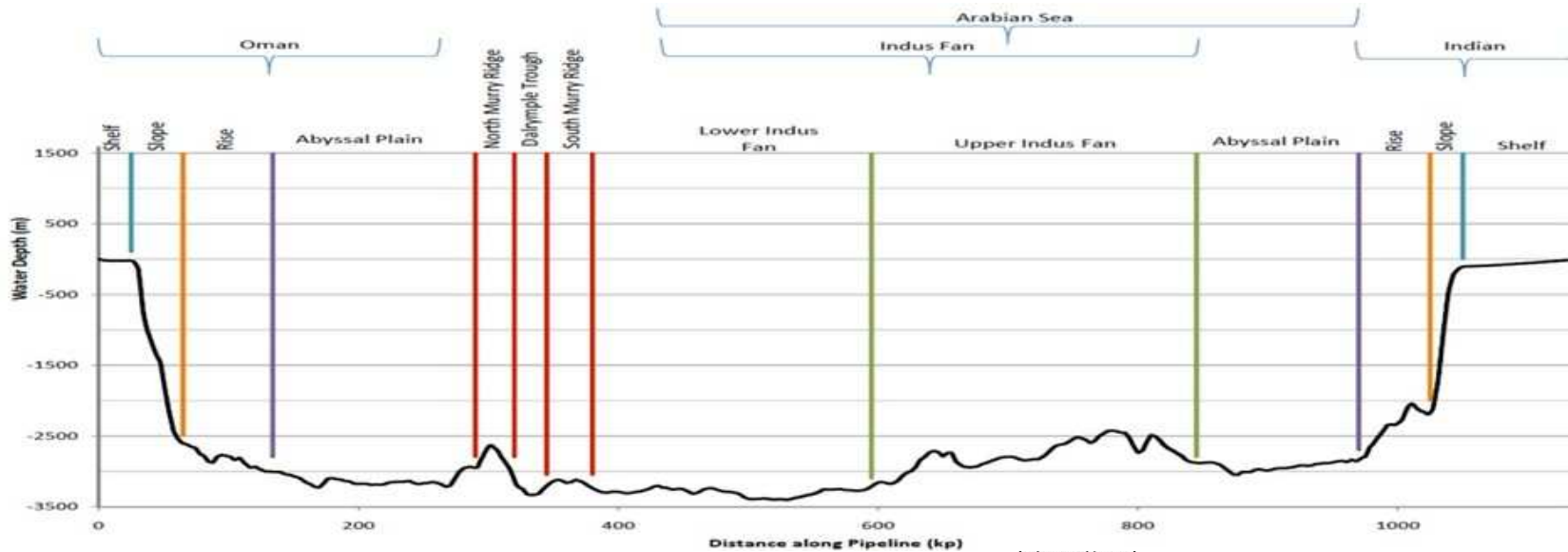
# MEIDP ROUTE- Oman to India (via Arabian sea)



Oman-India Route Length 1200km, Max WD 3500m  
Iran-India Route Length 1300km, Max WD 3500m  
Deviation adds 50km, Max WD 3500m



# MEIDP - Middle East to India Route Profiles



# MEIDP - Design Basis

## MECS

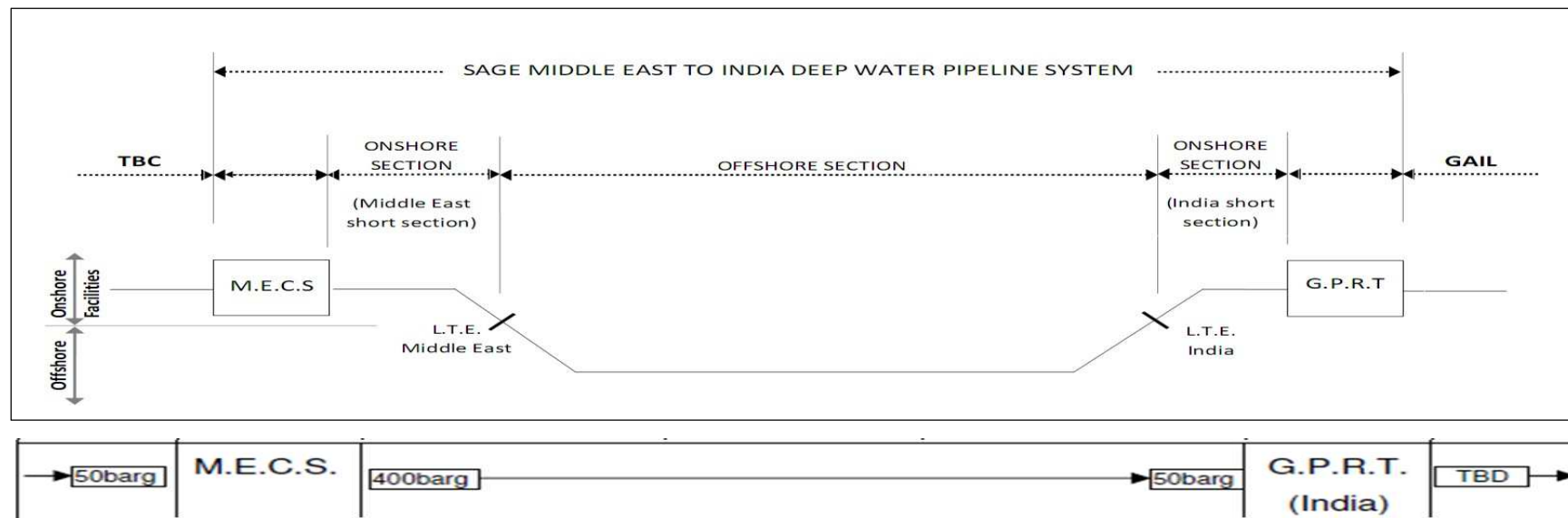
- 1.0BSCFD (annual Average)
- 1.1BSCFD Nominal flowrate
- Sales Quality Natural Gas
- Dehydrated at MECS (<math><47\text{mg}/\text{Sm}^3</math>)
- Inlet pressure 50 – 100 Barg
- Outlet pressure 400 Barg
- Cooling

## GPRT

- 1.0BSCFD (annual Average)
- 1.1BSCFD Nominal flowrate
- Inlet at 50 Barg
- Compression to 90 Barg
- Heating/Cooling

## Primary Design Code

- Offshore - DNVGL, Offshore Standard DNVGL-ST-F101, Submarine Pipeline System :2017



# MEIDP - Project De-Risking

## Technical Viability and de-risking by DNVGL and Peritus International Limited (2017)



**SAGE has collaborated with global leaders to develop solutions for MEIDP's technical challenges**

# MEIDP - Established Technical Feasibility



## Capable Installation Vessels

- ✓ Three vessels are capable of installing the pipeline in the maximum water depth of the MEIDP Project.



Allseas and Saipem have all **confirmed their vessels can install** the Middle East to India Deepwater Pipeline (**MEIDP**)

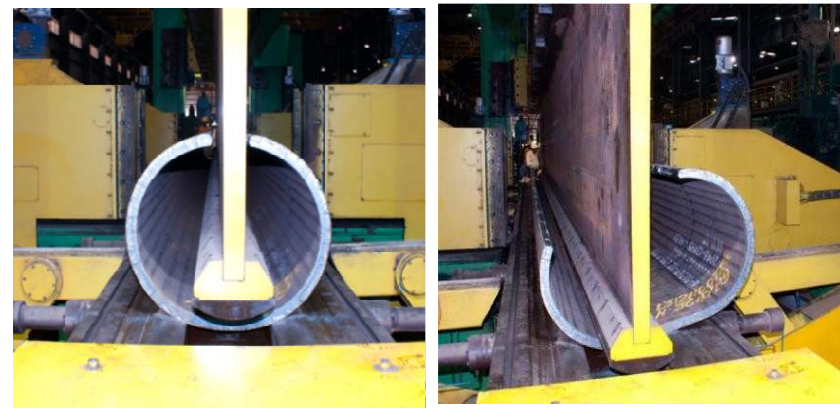
Allseas will present details of the recent completion of Turkstream 2200m WD, 900km, 32”OD  
*“With the right vessel as you go deeper it gets easier”*

# MEIDP - Established Technical Feasibility



## Capable Pipe Mills

- ✓ Two pipe mills (JindalSAW & PCK) have manufactured pipeline specifically for SAGE to MEIDP Dimensions and Specification. (24"ID, 40.5mm WT,  $a_{Fab}=1.0$ )
- ✓ Three pipe mills (JindalSAW, WELSPUN & PCK) have successfully completed prequalification and ring collapse testing trials.
- ✓ JFE and Europipe are currently undertaking similar production and prequalification/testing trials.



**MAKE in INDIA** - India can make a substantial part of the 800,000tonnes of Pipe required.



# MEIDP - Project De-Risking

## Technical Viability and de-risking by DNVGL and Peritus International Limited (2017)

- Project Definition and preliminary technical studies were carried out in 2010-2013
- Confirmed Technical Viability 2013
- Reconnaissance survey performed in 2013 on Oman to India route. Base case route reviewed and optimised
- Review of project economics and legal project framework 2014
- Route options defined to avoid Pakistan ECS and updated flow assurance mechanical design performed 2015/2016
- Updated Cost Estimate and schedule 2016
- Technical Review Workshop Held Aug 2016 (SAGE/Peritus/EIL/DNVGL/Saipem/Allseas/Intecsea)
- Pipeline Installers reconfirmed their ability to lay the pipeline 2016
- Statement of Feasibility by DNVGL 2017
- Statement of Feasibility by EIL 2017
- Technical Qualification Plan developed by SAGE and approved by DNVGL 2018



# MEIDP – Feasibility Confirmed



Page 1 of 3

पंजीकृत कार्यालय : इंजीनियर्स इंडिया भवन, 1, भीकाजी कामा प्लेस, नई दिल्ली-110066  
 Regd. Office : Engineers India Bhavan, 1, Bhikaji Cama Place, New Delhi-110066

No. SAGE/B028/1704

Date: 27<sup>th</sup> October 2017

South Asia Gas Enterprise (SAGE)  
 Siddhomal Group  
 A-6, Connaught Place  
 New Delhi-110001

Kind Attn: Mr S.K. Jain, Director, South Asia Gas Enterprise (SAGE)

Reference: EIL Proposal No MKTG/SHM/A943/REV.0 dated 13th January 2017 and email dated 04.02.2017 from SAGE

Subject: Preparation of Pre-Feasibility Report for Middle East to India Deep water Pipeline, EIL Job No. B028 – **Submission of Report.**

Dear Sir

Attached please find the Pre-Feasibility report for Middle East to India Deepwater Pipeline (MEIDP), a transnational pipe line infrastructure to transport 31.1 MMSCMD processed natural gas from Iran to the western coast of India near Porbandar. The transported gas will be received at Gujarat Pipeline Receiving Terminal (GPRT) in the western coast of India in Porbandar district. The natural gas received at GPRT, shall be taken to different markets, across the length and breadth of India, by onshore pipeline interconnecting GPRT with existing gas network.

In line with various meetings held between SAGE and EIL, following route options have been studied.

- **OPTION-1:** Deepwater pipeline route from Iran to India to transport 31.1 MMSCMD gas.
- **OPTION-2:** Offshore pipeline route from Iran to Oman and then deep water pipeline route from Oman To India including onshore pipeline route in Oman to transport 56.1 MMSCMD gas from Iran to Oman out of which 25 MMSCMD gas to be supplied to Oman and remaining 31.1 MMSCMD gas to be transported to India.

The route Option-2 (via Oman) has been further divided into following three alternatives:

- **Option-2a :** Offshore pipeline from Kooch Mobarak (Iran) to Sohar (Oman), then onshore Pipeline from Sohar to Al Hadd (Oman) and then finally deep water pipeline from Al Hadd to Porbandar (India).

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DNV·GL

## STATEMENT OF FEASIBILITY

Statement No.: 2017-0553

This is to state that

### Middle East to India Deepwater Pipeline

has been evaluated in accordance with DNVGL-RP-A203 /1/ as reported in DNV GL Technical Report 2017-0553 /3/. DNV GL considers the technology required to successfully execute the project to be feasible as defined in DNVGL-SE-0160 /2/ and thereby the project is suitable for further development and qualification.

Owner: South Asia Gas Enterprise PVT. LTD.

Description: Deepwater Pipeline from Middle East to India

Involvement: DNV GL has been involved in the qualification process as required in /2/ and has facilitated and documented the technology qualification process as described in /3/.

Limitations: The statement of feasibility is limited to this projects and its qualification basis.

Reference documents: /1/ DNVGL-RP-A203, Technology Qualification, June 2017

/2/ DNVGL-SE-0160, Technology qualification management and verification, 2015

/3/ DNV GL Report no. 2017-0553, Technology Qualification of Middle East to India Deepwater Pipeline

The qualification process is in progress and new sources of uncertainty might be discovered as qualification progresses. Attention is drawn to the iterative nature of the technology qualification process /2/.

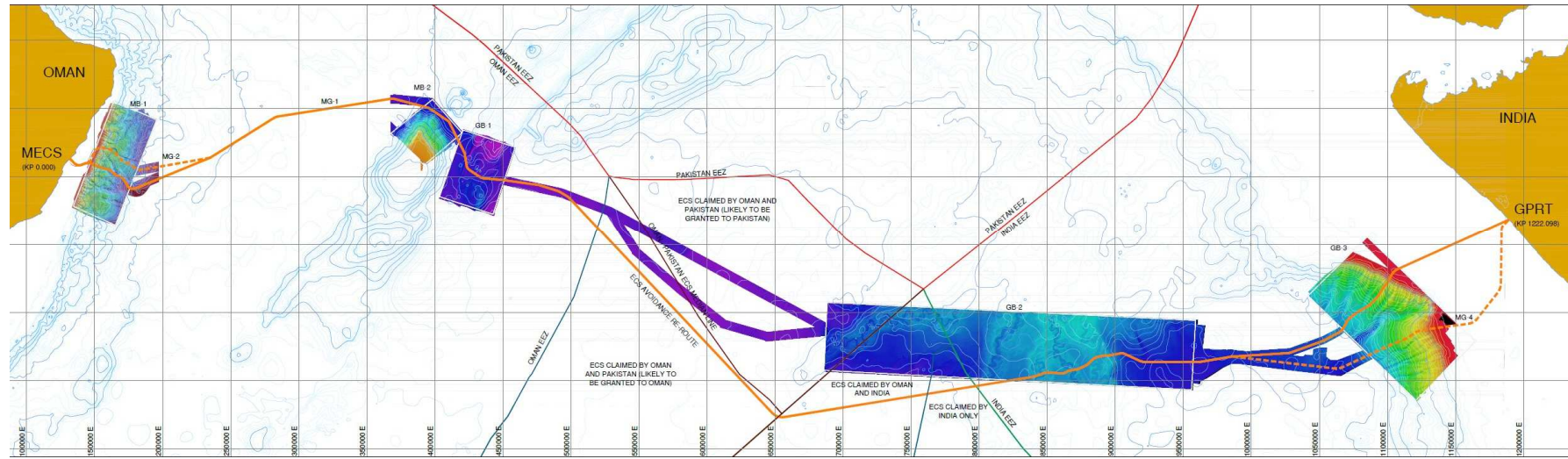
Issued at Havik on 2017-09-11

for DNV GL AS

Olav Aamlid  
 Senior Principal Specialist

Olav Fyrileiv  
 Technology Leader

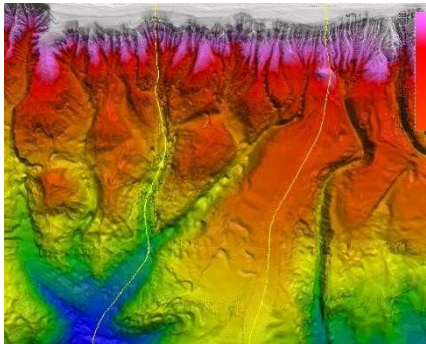
# MEIDP - 2013 Reconnaissance Survey



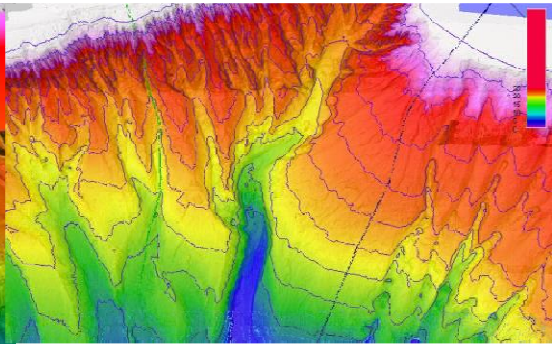


# MEIDP - 2013 RMS Highlights

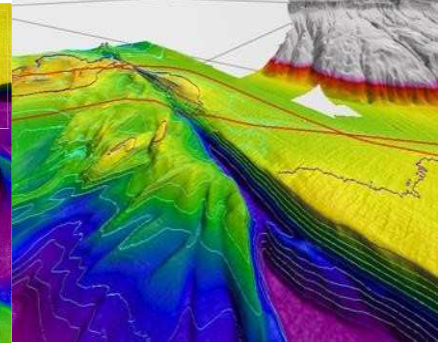
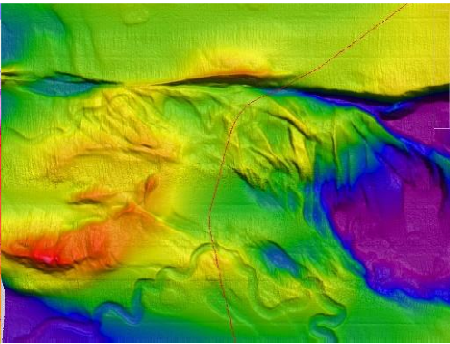
*Oman Continental Slope*



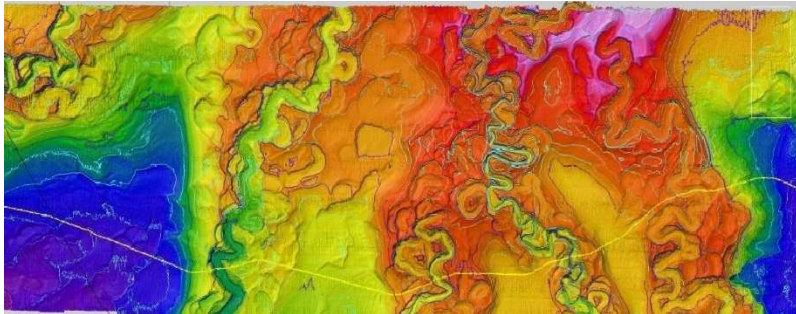
*Indian Continental Slope*



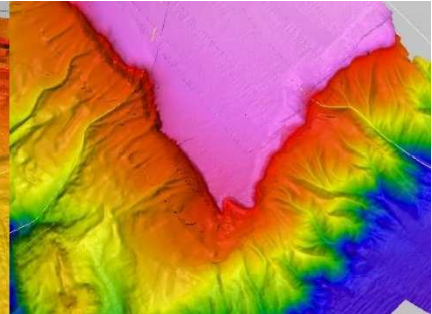
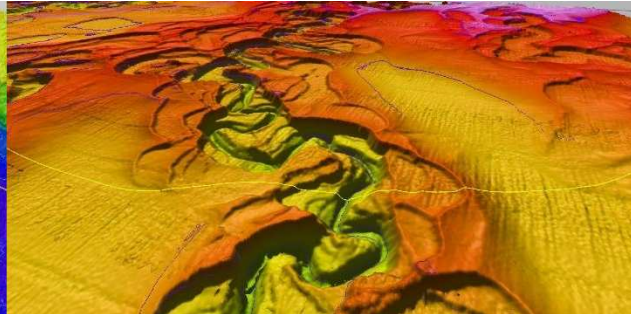
*Owen Fracture Zone*



*Indus Fan*



*Qalhat Seamount*



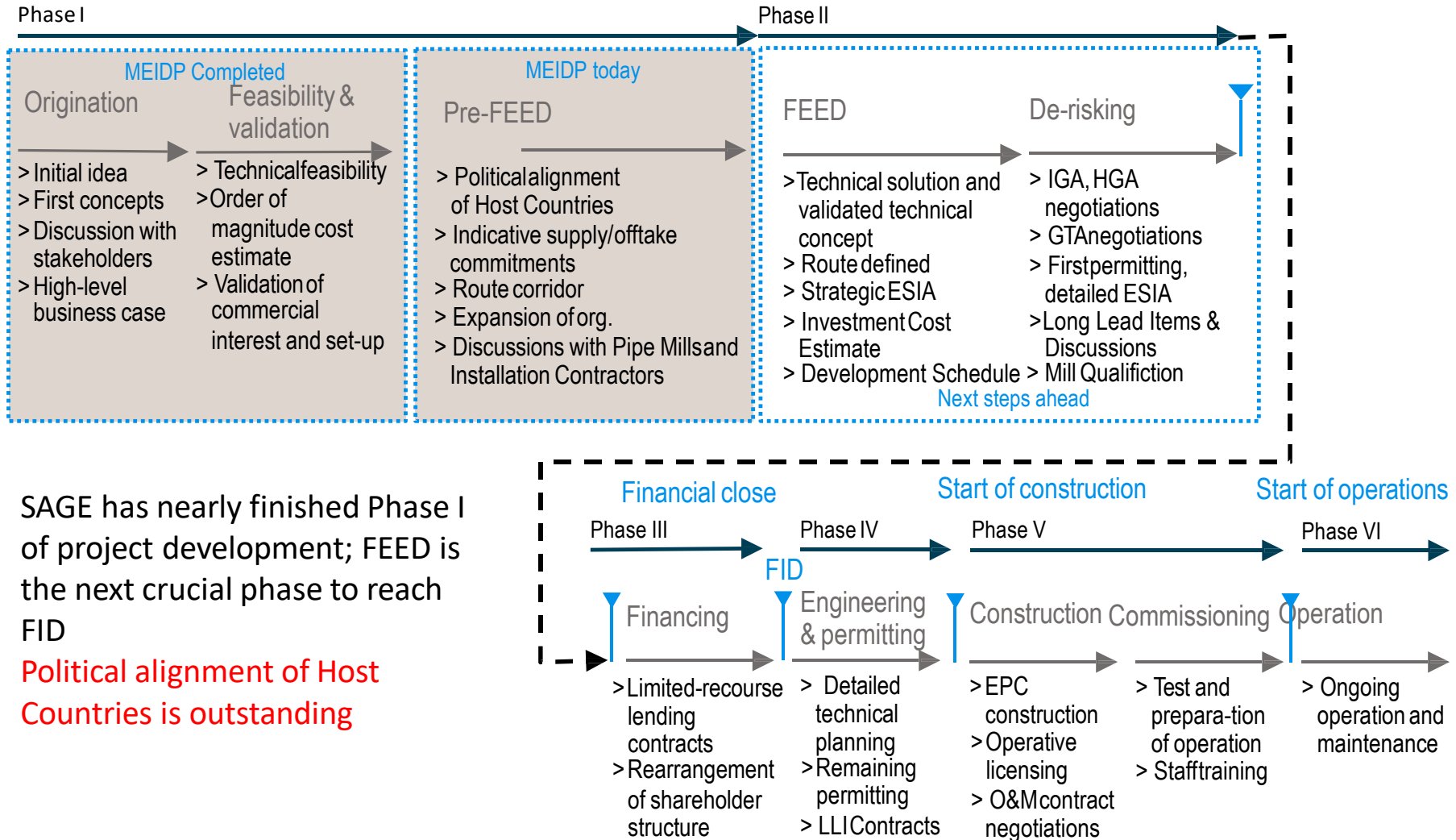
# MEIDP - Technical Summary

- **Start Point:** - Ras al Jifan, Oman
- **End Point:** - Near Porbandar (South Gujarat), India
- **Throughput:-** 10.3BSCM/yr (Averaged Annual) 11.3BSCM/yr (Max)
- **Inlet Pressure:-** 400barg
- **Diameter:-** 24" I.D. (27.2" O.D.)
- **Wall Thickness:-** 32.9-40.5mm WT (DNVGL ST-F101)
- **Steel Grade:** - DNVGL SAWL485 FDU (X70 Equivalent)
- **Maximum Depth:** - 3,450m
- **Length:** - 1,200 km
- **Steel Tonnage:** - 800,000 tonnes
- **Project Duration:** - 5 years (as Fast Track)
- **Pipeline Construction:** - 2 years

# THE WAY AHEAD AND TIMELINE

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# MEIDP - The Way Ahead



SAGE has nearly finished Phase I of project development; FEED is the next crucial phase to reach FID

**Political alignment of Host Countries is outstanding**

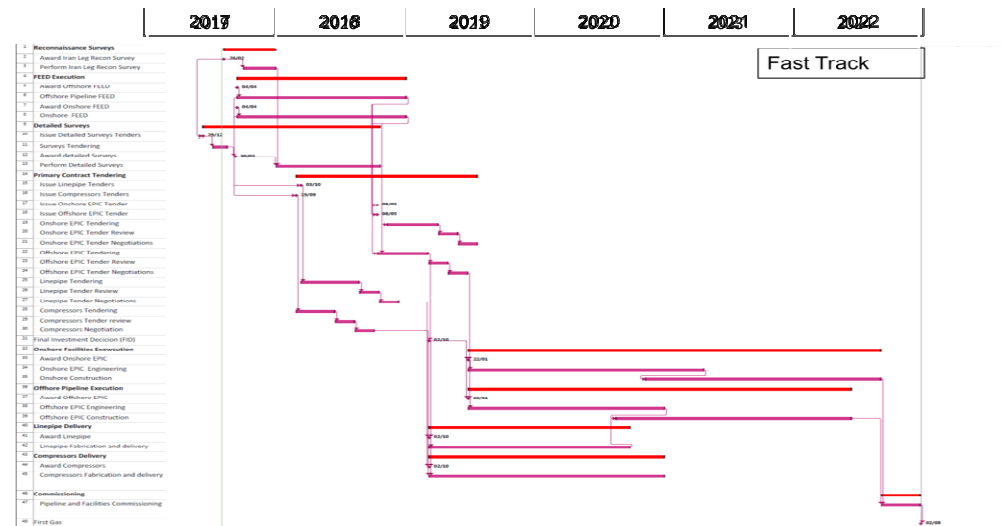


# MEIDP - Schedule (provisional timeline)

Event	Date
Award Reconnaissance and Metocean Surveys	Jun 2019
Commence Reconnaissance Survey (For Deviation)	Oct 2019
Commence Metocean Survey	Oct 2019
Award Onshore & Offshore FEED	Aug 2019
Award Detailed Surveys	Oct 2019
Final Investment Decision	Dec 2020
Award Linepipe Contract	Dec 2020
Award Onshore & Offshore EPIC	Jun 2021
Start Offshore Construction	Oct 2022
Start Compressor Station Construction	Apr 2023
Complete Offshore Construction	Apr 2025
Complete Compressor Station Construction	Jun 2025
First Gas	Dec 2025

Project can be executed in a 5 years if bought on **fast track** with **active government support** as substantial preparatory work has already been done and continues

Pipeline construction will occur over a 2 year period



# CONCLUSION

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# MEIDP - Conclusions

- **Technical feasibility** of the **MEIDP** Project has been **confirmed**
  - DNV GL, Norway has confirmed the Feasibility for MEIDP Project
  - Engineer India Limited (EIL) has prepared 'Pre-feasibility Report' and estimated the Project Cost
  - Feasibility and Pre FEED Studies completed- by Peritus International Ltd
- Indian gas demand and supply balance **shortfall** continues to increase from 100mmscmd in 2014 to **270 mmscmd in 2030** as per PNGRB vision 2030 study.
- To meet Government aim of **15% Energy mix by 2040** there will be a shortfall of **950mmscmd** which will require **at least 4 transnational gas pipelines** and **all the LNG that India can get!** (i.e India's future requires **BOTH LNG and Transnational Pipelines**)
- Oman and/or Saudi Arabia (via Oman) has 31 mmscmd gas for MEIDP. Iran has also confirmed it can supply 2 Pipelines (after US Sanctions lifting).
- **MEIDP** Project will add to India's energy **security by diversification.**
- Provides an **economically competitive** method of gas supply and **promotes completion** in Indian energy markets.
- **Indian Mills** are both **capable** and keen to supply the high quality **linepipe required** for **MEIDP**. Supporting GoI **MAKE in INDIA** policy.
- The **technology** to undertake the design, manufacture the linepipe and lay deep sea pipeline is available **NOW**.
- Long Term contracts and surety of supply, will facilitate **existing** projects and **new greenfield** projects in India which utilise the gas especially **Power & Fertilizer Sectors.**
- As with all transnational gas pipelines the **MEIDP** Project needs **strong diplomatic & political** support from Omani and Indian Governments

## MEIDP – National Energy Policy (Words of Wisdom)

*“Development of a vibrant gas market is the key to raising the share of gas in primary commercial energy mix. The Government has already declared its intention of transitioning towards a gas economy. Availability of domestic gas supplies, which is likely to grow only over medium term, cannot be the lone strategy. LNG and gas supplies via pipelines from West and Central Asia need to be assimilated in our energy system. The Oil Marketing Companies (OMCs), whose primary business so far has been liquid fuel, have to recognize the role of gas and enhance their uptake of the latter. The Government will come up with a comprehensive strategy to encourage gas as a substitute for oil.”*

*...(And Coal!)*

National Energy Policy  
NITI Aayog, Government of India  
Version as on 27.06.2017

# MEIDP – Thank You

---

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[www.sage-india.com](http://www.sage-india.com)*

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# MEIDP - Published Papers for Reference

- Middle East India Deepwater Pipeline (MEIDP) – Geohazard Features Assessment and Intervention, Ian Nash and Christopher Burnett ISOPE 2014 – Proceedings
- Middle East India Deepwater Pipeline (MEIDP) crossing of the Indus Fan, Ian Nash, Christopher Burnett and Russell Smith, Peritus International Ltd. Offshore Technology Conference (OTC), May 2014, (OTC 25175)
- Middle East to India Deepwater Pipeline (MEIDP) Crossing of the Owen Fracture Zone, Ian Nash, Christopher Burnett and Simon Parry, Peritus International Ltd, Offshore Technology Conference Asia (OTC-ASIA), March 2014 (OTC 24958)
- Middle East India Deepwater Pipeline (MEIDP) – findings and implications of the 2013 reconnaissance survey, I. Nash, Petrotech 2014 Conference, New Delhi, India, Feb 2014.
- Bringing the Middle East India Deepwater Pipeline (MEIDP) closer to reality – findings of the 2013 reconnaissance survey. Ian Nash, Peritus International & Robert Hawkins, Fugro. Offshore Pipeline Technology (OPT) Conference, Amsterdam, Feb 2014.
- The Production and testing of JCOE Linepipe for the Middle East to India Deepwater Pipeline’s 3500m Application, I Nash & P Carr, Offshore Pipeline Technology (OPT) Conference, Amsterdam, Feb 2013
- The Production and Testing of MEIDP Line-Pipe for 3500m Application, I Nash & P Carr, International Society of Offshore and Polar Engineers (ISOPE), Anchorage, Alaska, USA, June 2013
- Middle East to India, Deepwater Pipeline: Challenges and Opportunities, I Nash, Presentation given at 2nd World Energy Policy Summit (WEPS), New Delhi, India, November 2012
- MEIDP The Deepwater Route to India, I Nash, Presentation at Offshore Pipeline Technology (OPT) Conference, Amsterdam, Feb 2011
- MEIDP The Deepwater Route to India, I Nash, Presentation at Offshore Technology Conference (OTC), Houston, May 2011
- Inspection Maintenance and Repair of Deepwater Pipelines, I Nash, Presentation at Deepwater and Ultra-deepwater Pipelines Conference, Paris, Sept 2011
- Middle East to India, Deepwater Pipeline (MEIDP) requirements for Installation, Intervention and Emergency Repair, I Nash, Presentation at Deepwater and Ultra-deepwater Pipelines Conference, Paris, Sept 2011
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- MEIDP The Deepwater Route to India, OTC 21259, I Nash & P Roberts, Offshore Technology Conference (OTC), Houston, May 2011





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## **INSTALLATION OF TURKSTREAM PIPELINE BY PIONEERING SPIRIT by Raymond Vink of ALLSEAS**