

# Projections for Oil & Gas Pipeline Network in India

Ministry of Petroleum & Natural Gas  
Government of India  
26<sup>th</sup> March 2011

# Present Scenario

- Interdependency of various modes of transport
- Pipelines-most preferred mode of transportation of petroleum products
- Presently 43% of products (including Gas) are transported by Pipelines followed by coastal, rail & road
- Endeavor to maximize transportation through Pipelines- safe, economical & environmentally conducive

# Assessment for future Projections

- POL traffic projections are based on projected demand and production estimates from enhanced refinery production
- Projections on Inter modal-mix is based on future energy-mix
- Current mix of products movement i.e. by pipelines, coastal, rail & road likely to undergo change with more pipelines coming in
- Mode wise share worked out on the basis of primary distribution volumes
- Secondary movement of petroleum products for supplying to retail outlets/ customers would continue to be by road

# Trend in Demand-Supply Situation

- Demand of Petroleum products grew at 3.2% during 2009-10 and is estimated at 4.7% in 2010-11
- Sales of Petroleum products is projected to grow at CAGR of 4.83% (2010-11 to 2026-27)
- Production of POL is projected to grow at CAGR of 5.51%
- Projected demand to be met from the expansions of the existing refineries and new greenfields refineries

# Basis for Assessment

## **Demand contributing factors:**

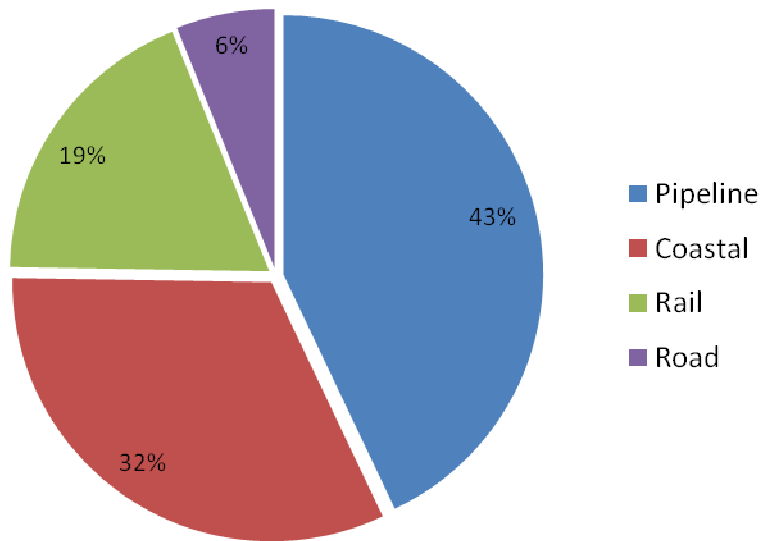
- Pace of economic growth in the country is expected to be robust implying that the petroleum product demand is likely to remain strong
- Current trend on automobiles growth is expected to continue and have a positive impact on growth of MS and HSD

## **Demand suppressing factors:**

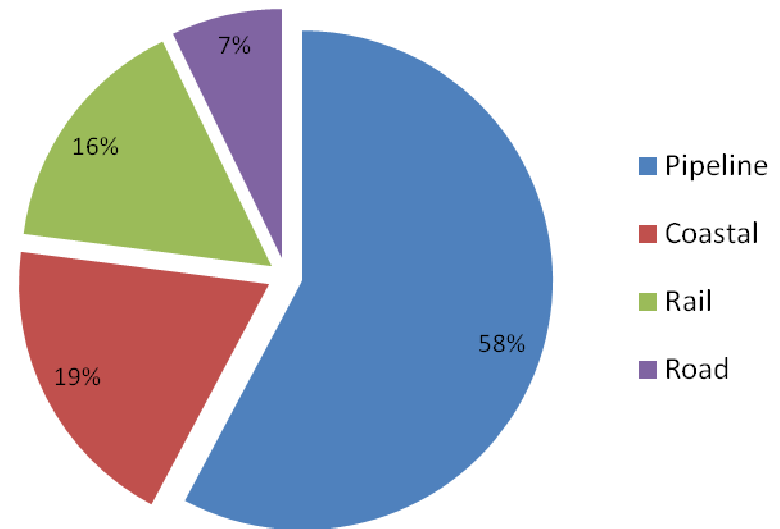
- Favorable *cost economics* and increased availability of natural gas (domestic and imports) will replace the demand for MS and HSD in transport and power sector
- PNG to replace LPG and use of FO/LSHS in heating to be replaced by Natural gas
- Improved vehicle efficiency norms & increasing share of Renewable/ clean energy in the energy basket

# Transportation of Petroleum Products (Tentative Projections)

Present Transport Modal-Mix (2010-11)



Projected Transport Modal-Mix (2030-31)



# Pipeline Infrastructure in India (Crude & Petroleum Products)

# Pipeline Transportation of Liquid Petroleum Scenario in India

- Indian oil industry has around five decades of experience in transportation of crude oil and finished petroleum products through pipelines
- The crude oil pipelines transport waxy crude as well as low sulphur & high sulphur crude
- Liquid Product Pipelines transport various products viz. MS, HSD, SKO & ATF in multi-product pipelines
- LPG is also transported through dedicated pipelines



# Advantages of Pipeline mode of Transportation

- Lower cost of transportation
- Lower transit losses
- Energy efficient
- Safety and Reliability - minimum disruptions
- Environment friendly
- Multi-products handling
- Stationary carrier
- Augmentation at low cost
- Decongestion of surface transport systems

Pipelines are the best suited mode for high volume hydrocarbon transportation over long leads.

## Modes for Transportation of Petroleum products – A Comparison

Head	Road	Rail	Coastal	Pipeline
Energy cost	Very High	High	Medium	Low
Operating cost	Very High	High	Medium	Low
Pollution	High	Low	Medium	Negligible
Movement congestion	High	Low	Low	Nil
Handling loss	High	Low	Medium	Negligible

# Economics of Liquid Pipelines

- **New common/contract carrier pipeline**

Bidding through PNGRB.

- **Existing Liquid Product Pipelines**

For existing liquid product pipelines, based on Industry deliberations, PNGRB has allowed freight for Pipeline transportation @ 75% of Notional Rail Freight (NRF) for equivalent Railway distance for all petroleum products except LPG. Freight for Pipeline transportation of LPG is taken as 100% of NRF for equivalent Railway distance

This logic was formulated on the basis of this assumption that above revenue model would be able to cover up operating cost as well as reasonable return on the investment made

- **Future dedicated pipeline**

Dedicate pipelines for self use are taken up provided pipelines mode is economical than other alternative mode available or there is no alternate mode available at all

Operational necessity or lack of infrastructure (like traffic congestion on roads leading to Airports etc.) may also be a deciding factor for laying dedicated pipelines like pipelines connecting Airport terminal

# Existing Liquid Pipelines: Industry

As on 01.3.2011

	IOCL	BPCL#	HPCL##	GAIL	OIL	ONGC ###	Cairn	Total Industry
<b>Length (Kms.)</b>								
Product	6401	1939	2774	1691	654.3	-	-	13459.30
Crude Oil	4366	935	-	-	1193	488	667	7649
Total	10767	2874	2774	1691	1847.3	488	667	21108.30
<b>Capacity (MMTPA)</b>								
Product	34.86	10.35	25.72	3.6	1.70	-	-	76.23
Crude Oil	40.40	6.0	-	-	8.40	45.13	7.5	99.93
Total	75.26	16.35	25.72	3.6	10.1	45.13		183.66

*#Includes Petronet Cochin-Coimbatore-Karur Product pipeline*

*##Includes Petronet Mangalore-Hassan-Bangalore Product Pipeline*

*### Includes trunk pipeline only*

# IOCL's Existing Petroleum Products Pipelines

S. No.	NAME OF THE PIPELINE	LENGTH (KM)	CAPACITY (MMTPA)
1	Guwahati-Siliguri Pipeline	435	1.4
2	Koyali-Ahmedabad Pipeline	116	1.1
3	Barauni-Kanpur Pipeline	745	3.5
4	Haldia-Mourigram-Rajbandh Pipeline	277	1.35
5	Haldia-Barauni Pipeline	525	1.25
6	Mathura-Delhi Pipeline	147	3.7
7	Panipat-Ambala-Jalandhar Pipeline	434	3.5
7	Panipat-Delhi Pipeline	182	
8	Mathura-Tundla Pipeline	56	1.2
9	Mathura-Bharatpur Pipeline	21	
10	Panipat-Rewari Pipeline	155	1.5
11	Panipat-Bhatinda Pipeline	219	1.5
12	Koyali-Sanganer Pipeline	1056	4.1
13	Chennai-Trichy-Madurai Pipeline	683	1.8
14	Koyali-Dahej Pipeline	103	2.6
15	Amod-Hazira Branch Pipeline	94	
16	Panipat-Jalandhar LPG Pipeline	274	0.7

*\*Separate Capacity of Panipat-Delhi Pipeline, Mathura -Tundla Pipeline and Amod - Hazira Pipeline is not shown as these lines do not have separate dedicated pumping units*

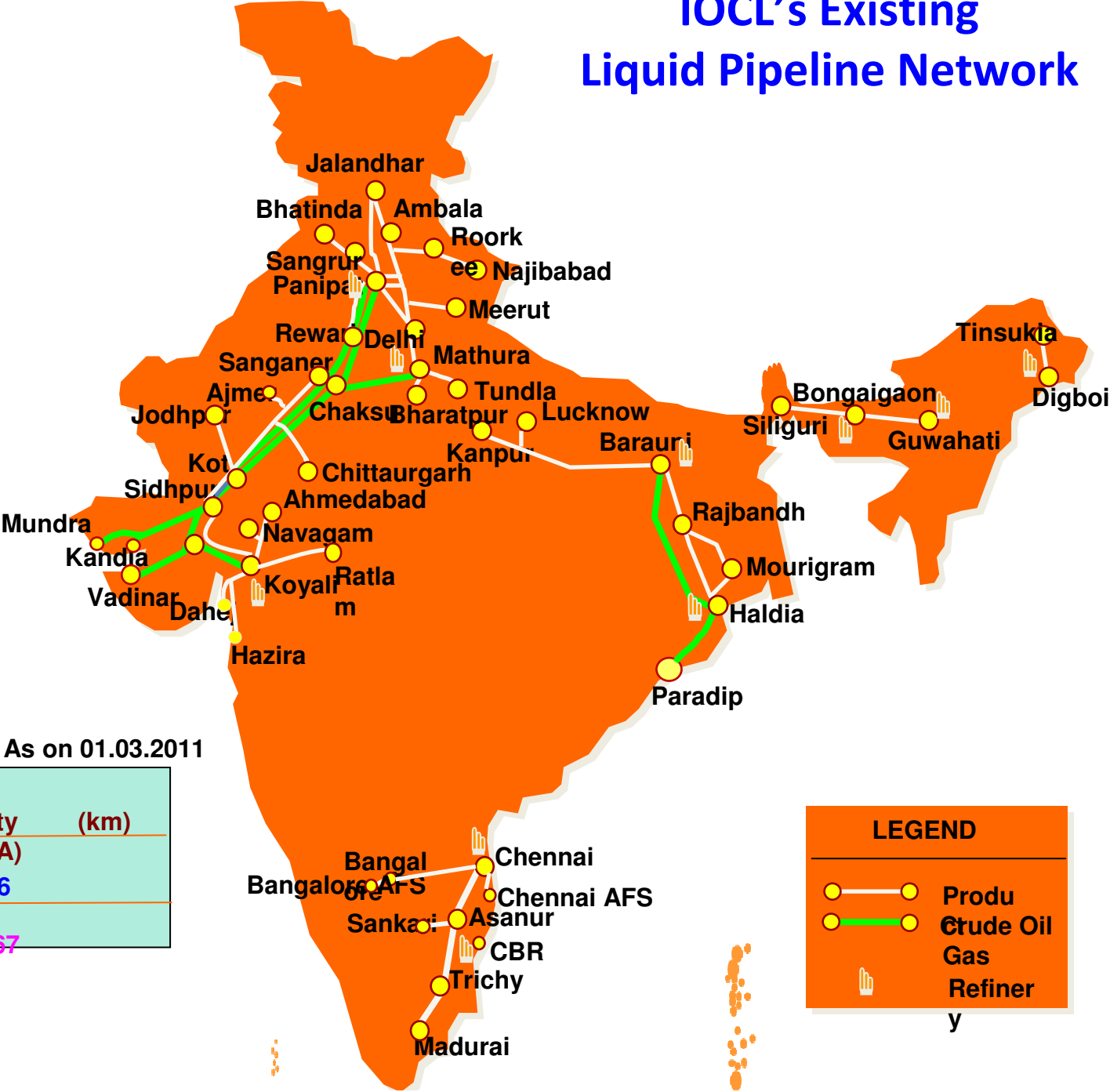
## IOCL's Existing Petroleum Products Pipelines (Contd.)

S. No.	NAME OF THE PIPELINE	LENGTH (KM)	CAPACITY (MMTPA)
17	Chennai ATF Pipeline	95	0.18
18	Koyali-Ratalam Pipeline	265	2.0
19	Chennai-Bangalore Pipeline	290	1.45
20	Bijwasan-Panipat Naphtha Pipeline	111	0.775
21	Digboi-Tinsukia Pipeline	75	1.0
22	CBDU Dock Line from IBP, Narimanam to Nagapattinam	7	0.368
23	ATF Pipeline to Bangalore International Airport	36	0.66

## IOCL's Existing Crude Oil Pipelines

S. No.	NAME OF THE PIPELINE	LENGTH (KM)	CAPACITY (MMTPA)
1	Salaya-Mathura Pipeline	1870	21.0
2	Paradip-Haldia-Barauni Pipeline	1302	11.0
3	Mundra-Panipat Pipeline	1194	8.4

# IOCL's Existing Liquid Pipeline Network



As on 01.03.2011

Pipeline	Length Capacity (MMTPA)	(km)
Product	6401	366
Crude Oil	3480	366
Total	75.26	10767

# Existing Liquid Pipelines of BPCL and its associates/JVs

## Existing Liquid Product Pipelines

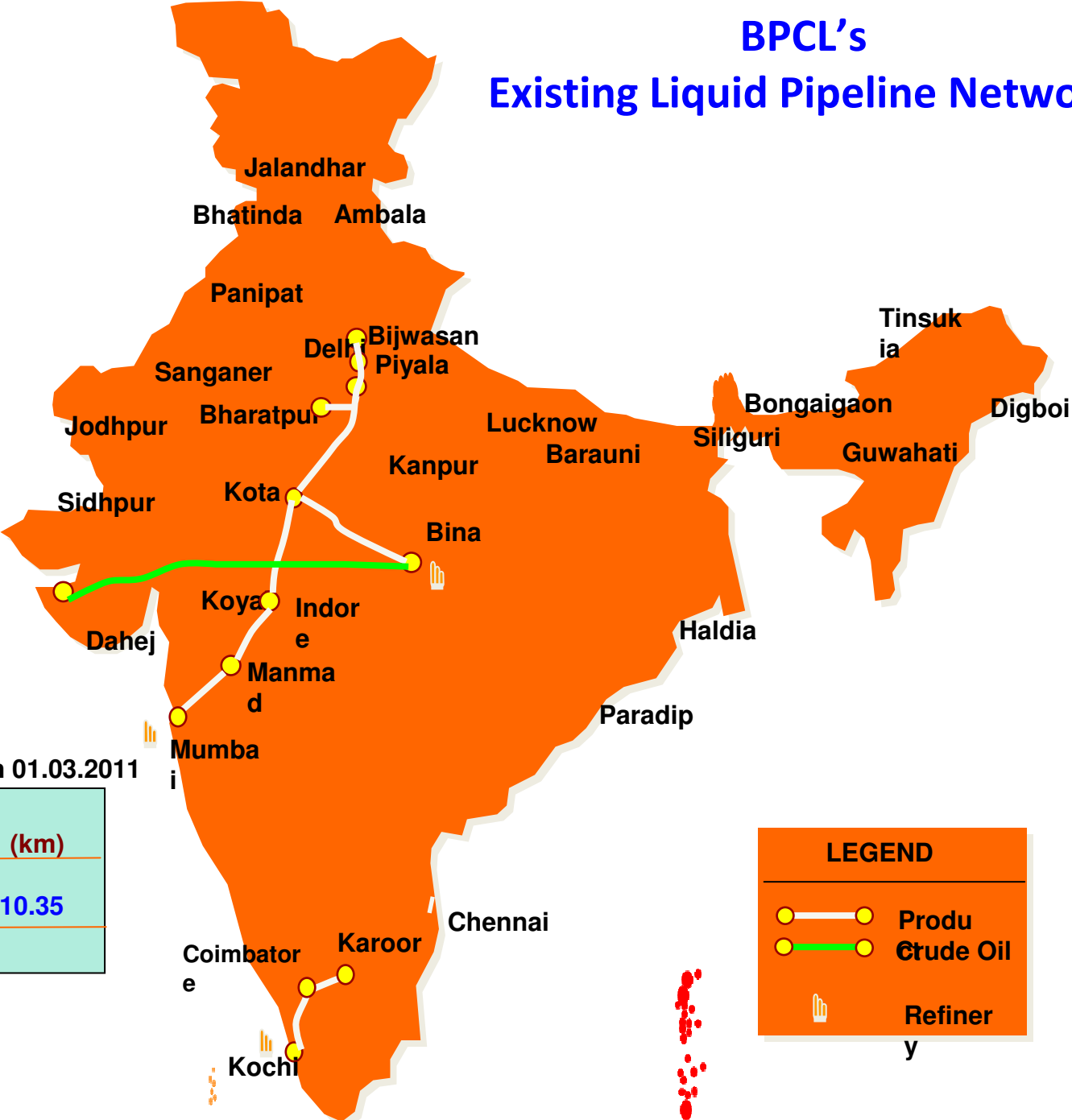
S. No.	NAME OF THE PIPELINE	LENGTH (KM)	CAPACITY (MMTPA)
1	Mumbai-Indore-Bijwasan Pipeline	1389	5.9
2	Bina-Kota Pipeline	257	2.8
3	Kochi-Irugur-Karur Pipeline (BPCL's JV Petronet)	293	1.65
TOTAL		1939	10.35

## Existing Crude Oil Pipelines

S. No.	NAME OF THE PIPELINE	LENGTH (KM)	CAPACITY (MMTPA)
1	Vadinar -Bina Pipeline	935	6.0



# BPCL's Existing Liquid Pipeline Network



As on 01.03.2011

Pipeline	Length Capacity (MMTPA)	(km)
Product	1939.35	10.35
Crude	6.00	
<b>Total</b>	<b>1945.35</b>	<b>10.35</b>

16.35

2874

LEGEND

Product

Crude Oil

Refinery

# Existing Liquid Pipelines of HPCL and its associates/JVs

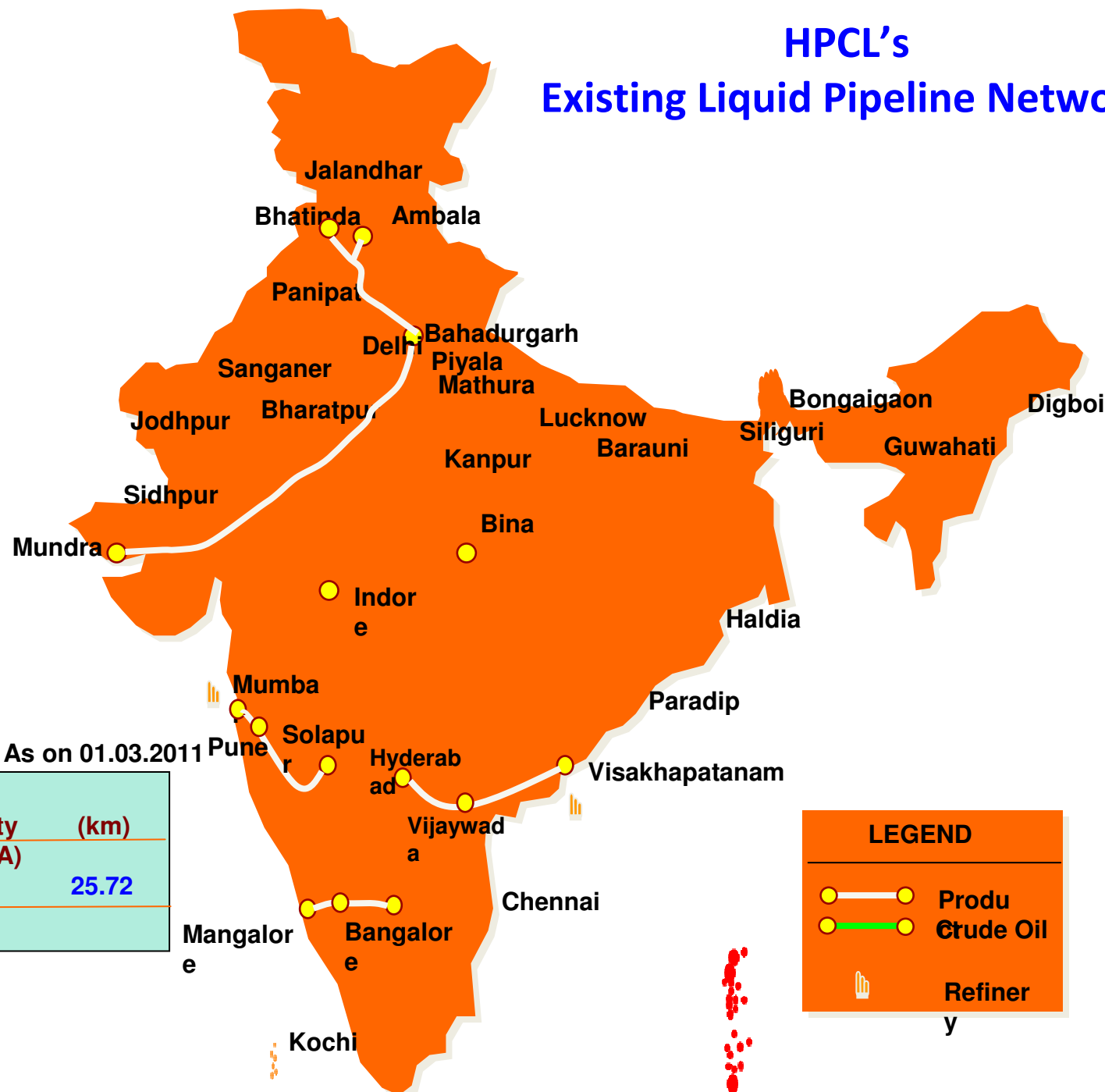
## Existing Liquid Product Pipelines

S. No.	NAME OF THE PIPELINE	LENGTH (KM)	CAPACITY (MMTPA)
1	Mumbai-Delhi Pipeline	1050	5.0
2	RamanMandi-Bahadurgarh Pipeline	250	4.7
3	RamanMandi-Bhatinda Pipeline	30	1.37
4	Mumbai-Pune-Solapur Pipeline	508	3.67
5	Vizag-Vijayawada-Secunderabad Pipeline	572	5.38
6	Petronet Mangalore-Hasan-Bangalore Pipeline	364	5.6
TOTAL		2774	25.72

## Existing Crude Oil Pipelines

S. No.	NAME OF THE PIPELINE	LENGTH (KM)	CAPACITY (MMTPA)
1	NIL		

# HPCL's Existing Liquid Pipeline Network



As on 01.03.2011

Pipeline	Length Capacity (MMTPA)	(km)
Product	2774	25.72

LEGEND

Produ

Crude Oil

Refiner

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# Existing Liquid Pipelines of GAIL,OIL, Cairn & ONGC

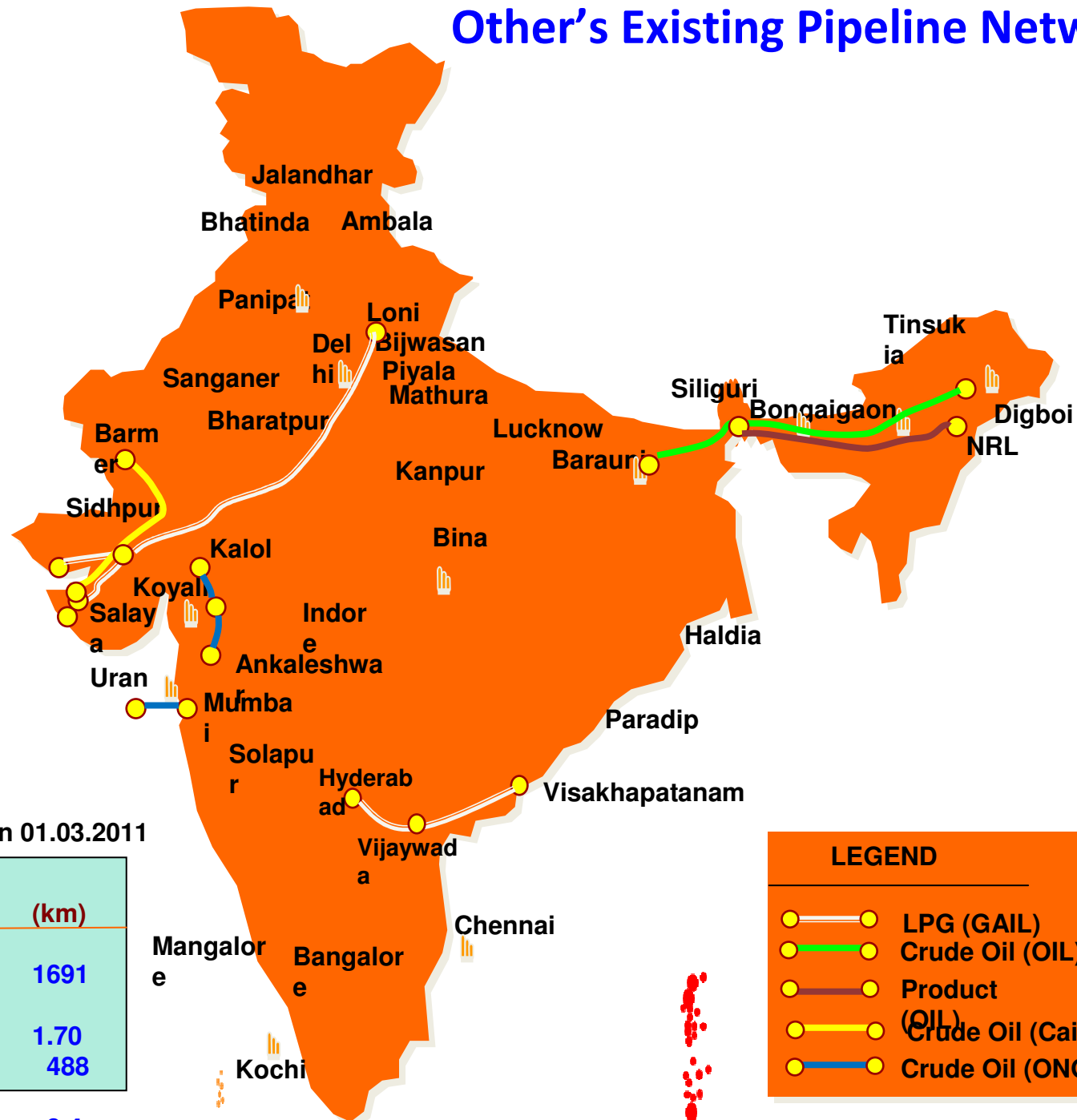
## Existing Liquid Product Pipelines

S. No.	NAME OF THE PIPELINE	LENGTH (KM)	CAPACITY (MMTPA)
<b>GAIL</b>			
1	Jamnagar-Loni LPG Pipeline	1200	2.50
2	Vijag-Vijayawada-Secundarabad LPG Pipeline	491	1.10
<b>TOTAL</b>		<b>1691</b>	<b>3.60</b>
<b>OIL</b>			
1	Numaligarh-Siliguri Pipeline	654.30	1.70

## Existing Crude Oil Pipelines

S. No.	NAME OF THE PIPELINE	LENGTH (KM)	CAPACITY (MMTPA)
<b>ONGC</b>			
1	Mumbai High - Uran - Trunk Pipeline 30'' MUT	204	15.63
2	Heera - Uran - Trunk Pipeline 24'' HUT	81	11.50
3	30'' BUT	203	18.00
<b>TOTAL</b>		<b>488</b>	<b>45.13</b>
<b>OIL</b>			
1	Duliajan-Digboi-Bongaigaon-Barauni Pipeline	1193	8.40
<b>Cairn Energy</b>			
1	Barmer-Salaya Pipeline	667	7.5

## Other's Existing Pipeline Network



As on 01.03.2011

Pipeline	Length Capacity (MMTPA)	(km)
GAIL Product	3.60	1691
OIL Product	654	1.70
ONGC Crude	45.13	488

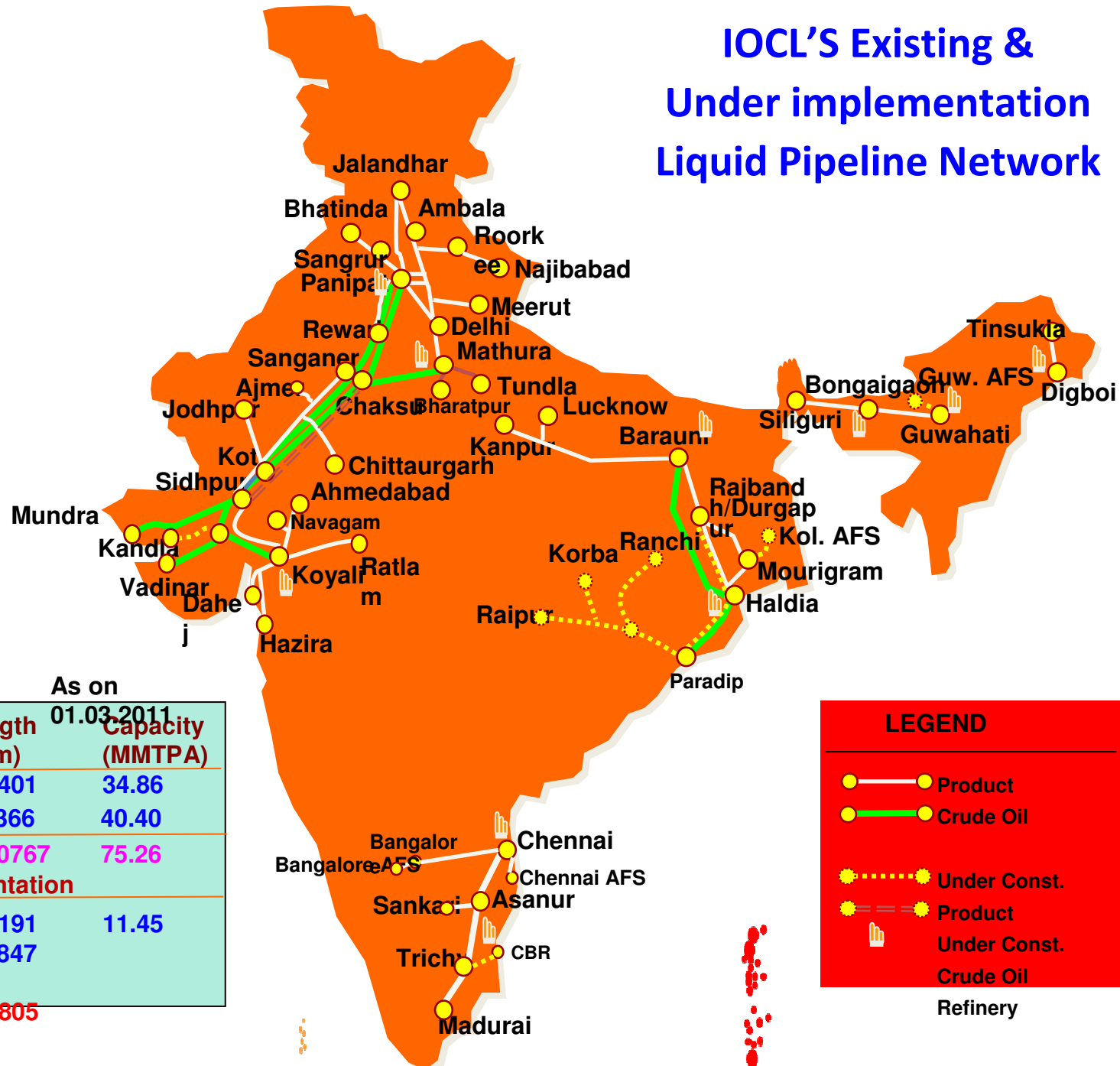
LEGEND	
	LPG (GAIL)
	Crude Oil (OIL)
	Product (OIL)
	Crude Oil (Cairn)
	Crude Oil (ONGC)

# Projects Under Implementation-IOCL

S. No.	Projects' Description	Length (km)	Cap. (MMTPA)
1	Augmentation of CTMPL	-	0.50 <sup>#</sup>
2	Augmentation of Chennai-Bangalore Pipeline	-	1.0 <sup>#</sup>
3	Branch PL from Viramgam to Kandla of KSPL	231	0.50 <sup>#</sup>
4	Integrated Crude Handling Facilities at Paradip	70	-
5	Paradip-Raipur-Ranchi Pipeline	1065	5.0
6	Kolkata ATF Pipeline	28	0.13
7	Guwahati ATF Pipeline	35	0.07
8	De-Bottlenecking of SMPL	767	4.0 <sup>#</sup>
9	Cauvery Basin Refinery-Trichy Pipeline	114	0.4
10	Paradip-Haldia-Durgapur LPG Pipeline	710	0.5/0.85

# Incremental capacity

## IOCL'S Existing & Under implementation Liquid Pipeline Network




As on  
01.03.2011

Pipeline	Length (km)	Capacity (MMTPA)
Product	6401	34.86
Crude	4366	40.40
<b>Total</b>	<b>10767</b>	<b>75.26</b>
<b>Under Implementation</b>		
Product	2191	11.45
Crude	847	4.00

**After Impl.** 13805  
90.71

### LEGEND

- — ● Product
- — ● Crude Oil
- --- ● Under Const. Product
- --- ● Under Const. Crude Oil
-  Refinery

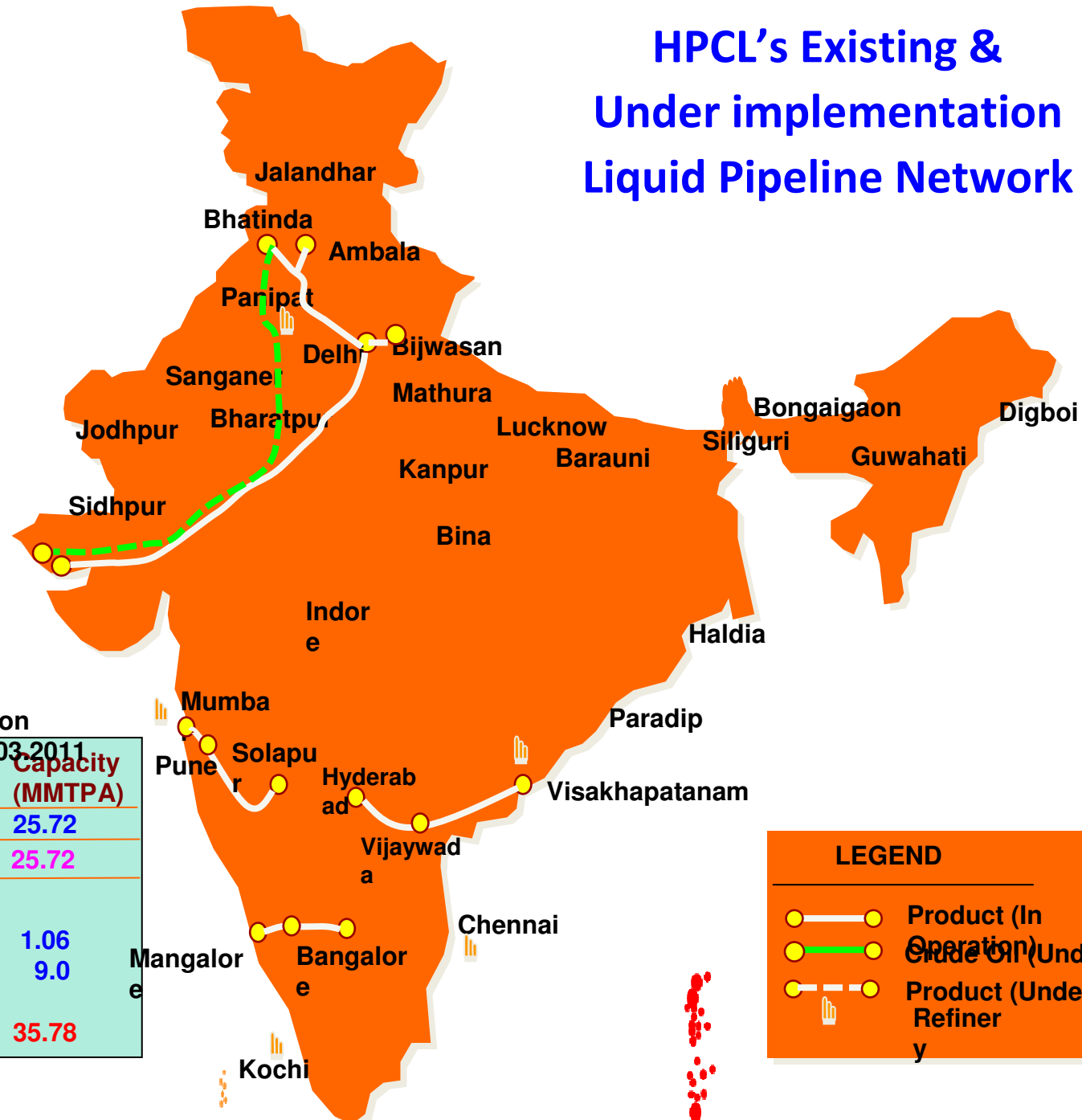
## Projects Under Implementation-HPCL

S. No.	Projects' Description	Length (km)	Cap. (MMTPA)
1	Bahadurgarh-Tikrikalan Pipeline	14	1.06
2	Mundra-Bhatinda Crude Oil Pipeline	1017	9.0

# Incremental capacity



## HPCL's Existing & Under implementation Liquid Pipeline Network



As on  
01.03.2011

Pipeline	Length (km)	Capacity (MMTPA)
Product	2774	25.72
<b>Total</b>	<b>2774</b>	<b>25.72</b>
<b>Under Implementation</b>		
Product	14	1.06
Crude	1017	9.0
-		
<b>After impl.</b>	<b>3805</b>	<b>35.78</b>

### LEGEND

- Product (In Operation)
- Crude Oil (Under Const.)
- Product (Under Const.)
- Refinery

# Existing Liquid Pipelines: Industry

**After completion of ongoing liquid pipeline projects**

Length/ Capacity	IOCL	BPCL	HPCL	GAIL	OIL	ONGC	CAIRN	Total Industry
<b>Length</b>								
Product	8592	1939	2788	1691	654	-	-	15664
Crude Oil	5213	935	1017	-	1193	488	667	9513
Total	13805	2874	3805	1691	1847	488	667	25177
<b>Capacity</b>								
Product	46.31	10.35	26.78	3.60	1.70	-		88.74
Crude Oil	44.40	6.0	9.0	-	8.40	45.13	7.50	120.43
Total	90.71	16.35	35.78	3.60	10.10	45.13	7.50	201.67

# Intermodal Mix for Petroleum Products - IOCL

- Pipelines are considered to be the one of the most preferred modes of transportation of petroleum products and crude oil
- Contribution of Railways is decreasing due to expansion of pipelines network
- Details of historic movement (primary distribution) of petroleum products through various modes, as given below:

*(Figures in MMT)*

Mode	2007-08	2008-09	2009-10
Pipeline	21	22	23.5
Coastal	2.5	3	3
Rail	23	20	20
Road	1	1	1

# Intermodal Mix for Petroleum Products - BPCL

- Requirements of all the Pipelines is met through Refinery Production
- Rail movements of petroleum products is undertaken from various refineries, coastal installations and from Pipeline tap off points
- Details of historic movement (primary distribution) of petroleum products through various modes, as given below:

*(Figures in MMT)*

Mode	2007-08	2008-09	2009-10
Pipeline	6	7	9
Coastal	2	2	3
Rail	7	8	11
Road	1	1	3

# Intermodal Mix for Petroleum Products - HPCL

- Due to new Pipelines lead to Rail haulage & turnaround of rakes comes down leading to more loading in shorter heads
- Hinterland refineries are highly dependent on Rail evacuation despite having Pipelines
- Details of historic movement (primary distribution) of petroleum products through various modes, as given below:

*(Figures in MMT)*

Mode	07-08	08-09	09-10
Pipeline	12	14	15
Coastal	4	7	8
Rail	6	6	7
Road	3	4	3

# Future Projections – IOCL Product Pipelines

Fig in MMTPA

	Projections		
	2016-17	2021-22	2026-27
<b>Total Transportation</b>	76	97	106
<b>Movement through Pipelines</b>	48	63	72
<b>% Movement through pipeline mode</b>	63	65	68

# Future Projections – BPCL Product Pipelines

Fig in MMTPA

	Projections		
	2016-17	2021-22	2026-27
<b>Total Transportation</b>	52	73	100
<b>Movement through Pipelines</b>	33	44	60
<b>% Movement through pipeline mode</b>	63	60	60

# Future Projections - HPCL Product Pipelines

Fig in MMTPA

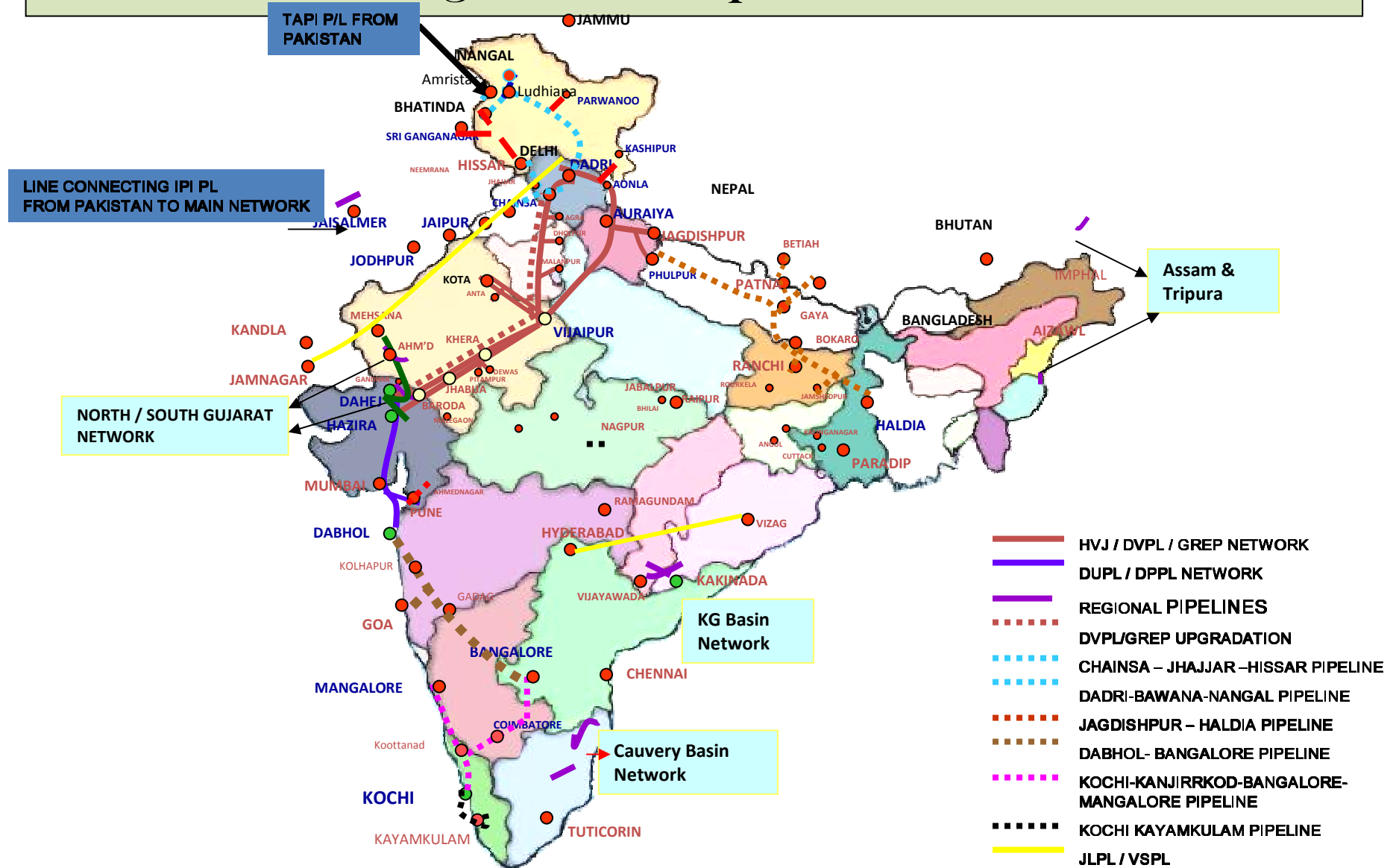
	Projections		
	2016-17	2021-22	2026-27
<b>Total Transportation</b>	49	63	83
<b>Movement through Pipelines</b>	25	29	35
<b>% Movement through pipeline mode</b>	51	46	42



# Gas Pipelines in India

# GAIL (INDIA) LIMITED

## Existing & New Pipeline Network



# GAIL'S Existing Pipeline Infrastructure

S NO	PIPELINE NAME	SIZE	LENGTH (KM)	CAPACITY (MMSCMD)
1	HVJ Pipeline	36"/30"/18	1720	33.4
2	Vijaipur - Dadri (GREP) Pipeline	36"	505	20
3	DVPL Pipeline	42"	610	24
4	Dahej- Uran -Panvel - Dabhol pipeline (DUPL-DPPL)	30"	650	19.9
5	Vijaipur - Kota pipeline	18"	190	5
6	Thulandi - Phoolpur Pipeline	18"	139	5
7	Jagoti - Indore - Pithampur Pipeline	16"/6"	194	3
8	Kailaras - Malanpur pipeline	12"/6"	95	2
9	K G Basin pipeline network.	18"/16"/12	830	25
10	Gujarat pipeline network.	18"/12"/10	650	8
11	Cauvery Basin Pipeline network.	18"/12"/8"	250	3
12	Pipeline network in North east Region	12"/8"/6"	68	2
13	Pipeline network in Rajasthan	18"/12"/10	258	3
14	Pipeline network in Maharashtra	18"/12"	125	3
15	Jamnagar - Loni (LPG) Pipeline	16"/14"/12	1200	2.5 MMTPA
16	Vizag - Secunderabad (VSPL) Pipeline	12"/10"	491	1.1 MMTPA



**Total Natural gas pipeline length – 6284 KM & Capacity 148 MMSCMD**

# GAIL'S New Pipeline Infrastructure






S NO	PIPELINE NAME	SIZE	LENGTH (KM)	CAPACITY (MMSCMD)
1	DVPL –GREP Upgradation	48"	1100	-
1	Chainsa - Jhajjar - Hissar pipeline	36"/20"	300	35
2	Dadri - Bawana - Nangal Pipeline	36"/30"/18	610	31
3	Dabhol - Bangalore Pipeline	36"/30"/18	730 + 656	16
4	Kochi - Koottanad - Mangalore / Bangalore P/L	24"	860	16
5	Jagdishpur - Haldia (JHPL) Pipeline	36"	800 +1200	32
6	Kota -Chitorgarh Pipeline	16"/12"	170	2
7	Karanpur - Moradabad - Rudrapur	12"/8"	250	2.5
	<b>Total</b>		<b>6676</b>	<b>134</b>

**Grand Total of GAIL's Natural gas pipeline length – 12960 KM & Capacity 283 MMSCMD**


# GSPL'S Existing & New Pipeline Infrastructure

Sl. No.	Pipeline Network	Length km	Capacity MMSCMD	Remarks
1	GSPCL Present Pipeline Network	1692	To be determined by PNGRB	Presently Transporting 37 MMSCMD 
2	Under construction P/L	480		
3	3000Kms of Pipelines are planned for future expansion,	3000	N.A	Pipeline details indicated on the Map 
	<b>Total</b>	<b>5172</b>		

# Reliance -Existing & New Pipelines

S NO	PIPELINE NAME	OWNER SHIP	LENGTH (KM)	CAPACITY (MMSCMD)
<b>EXISTING</b>				
1	East West Pipeline	RGTEL	1469	80 
<b>PIPELINE UNDER EXECUTION</b>				
1	Kakinada- Haldia Pipeline	RELOG	928	26. 
2	Kakinada - Chennai Pipeline	RELOG	577	26.7 
3	Chennai – Tuticorin Pipeline	RELOG	585	13.3 
4	Chennai – Bangalore – Mangalore Pipeline	RELOG	538	13.3 
	<b>Total</b>		<b>4097</b>	<b>160</b>

## NEW PIPELINE UNDER BIDDING BY PNGRB

Sl. No.	Pipeline Network	Length km	Capacity MMSCMD	Remarks
1	Mallavaram ( <i>in Andhra Pradesh</i> ) to Bhilwara ( <i>in Rajasthan</i> )	1530	75	Pipeline details indicated on the Map  
2	Mehsana ( <i>in Gujarat</i> ) to Bhatinda ( <i>in Punjab</i> )	1650	30	
3.	Bhatinda ( <i>in Punjab</i> ) to Jammu ( <i>in Jammu &amp; Kashmir</i> )	750	30	
4	Surat (Gujarat) to Paradip (Orissa)	1500	30	
	<b>Total</b>	<b>5330</b>	<b>165</b>	
All the pipelines after authorization from PNGRB shall be completed by 2016-17				

<b>TOTAL PIPELINE IN COUNTRY BY 2016-17 :</b>	<b>LENGTH</b>	<b>- 27559 KM</b>
	<b>CAPACITY</b>	<b>- 610</b>

MMSCMD

# Natural Gas Supply Projections

Year	Domestic Production	Import at LNG Terminals	Import through cross border pipelines	Total Import	Total Sales
2010-11	146	33	0	33	179
2015-16	239	117	0	117	356
2020-21	312	162	40	202	514
2025-26	418	162	40	202	620
2029-30	527	162	40	202	729

*Figs in MMSCMD*



# Assumptions Regarding Gas Availability

- Domestic production estimation is based on DGH projection up to 2016-17 based on established reserves
- From 2017-18 onwards, projection is on GAIL's internal estimation considering additional gas from RIL, ONGC, GSPC, OIL, CBM blocks and other future discoveries. GAIL is assuming an optimistic cumulative growth of 6% in future considering 6.06 % CAGR over the 2011-18 periods
- LNG Imports are pegged at 162 MMSCMD from 2019-20 onwards keeping in view increased domestic productions and import through cross border pipelines which can meet the additional demand
- Cross border pipelines includes TAPI and expected to be in operation from 2018 onwards

# Issues while making Projections that Require to be Flagged

## **1. DOMESTIC GAS AVAILAIBILITY:**

- Commercialization of reserves as per schedule from various suppliers
- Clarity on gas utilization policy
- Clarity on Pricing mechanism

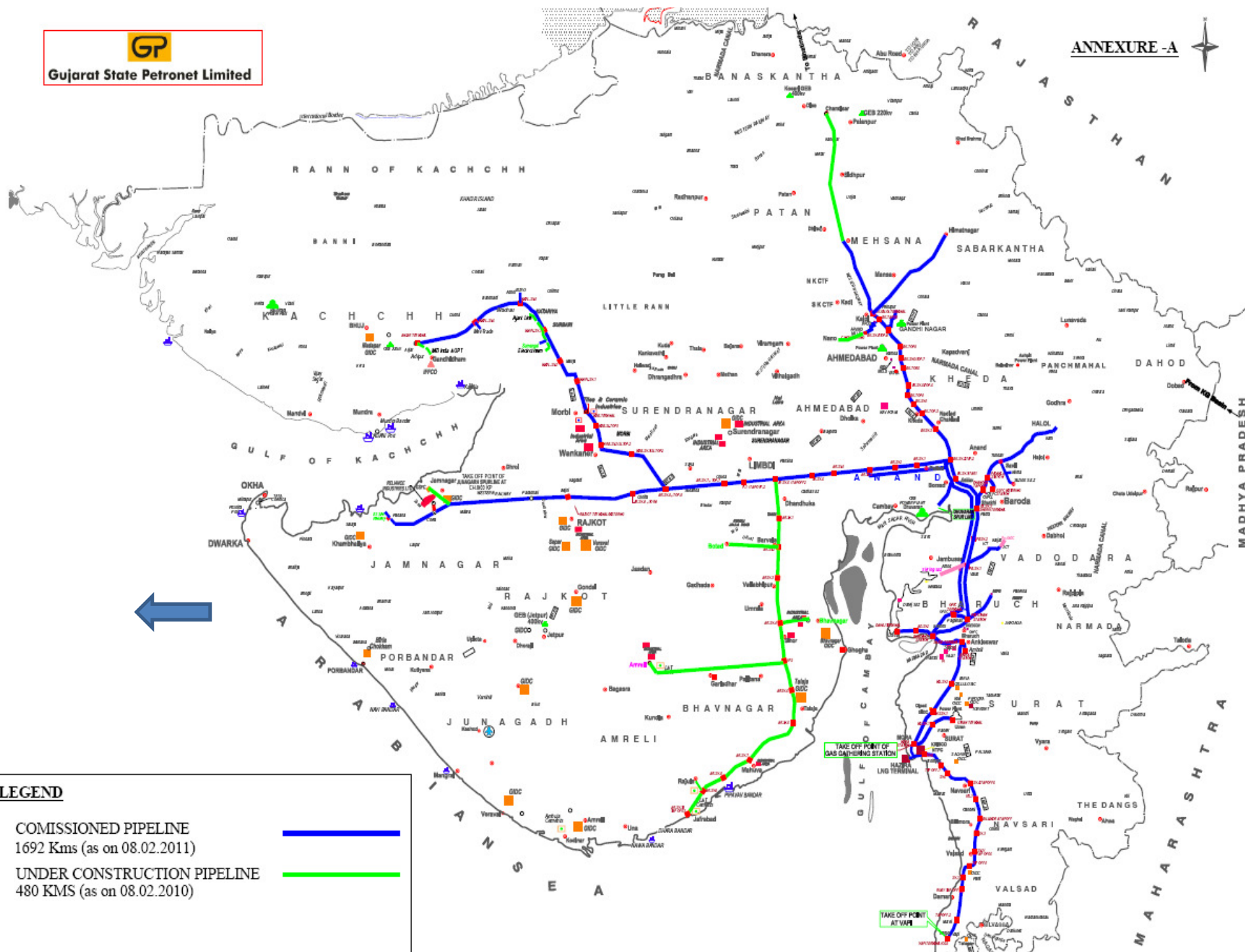
## **2. IMPORT AVAILABILITY:**

- LNG import terminal infrastructure development
- LNG at affordable price

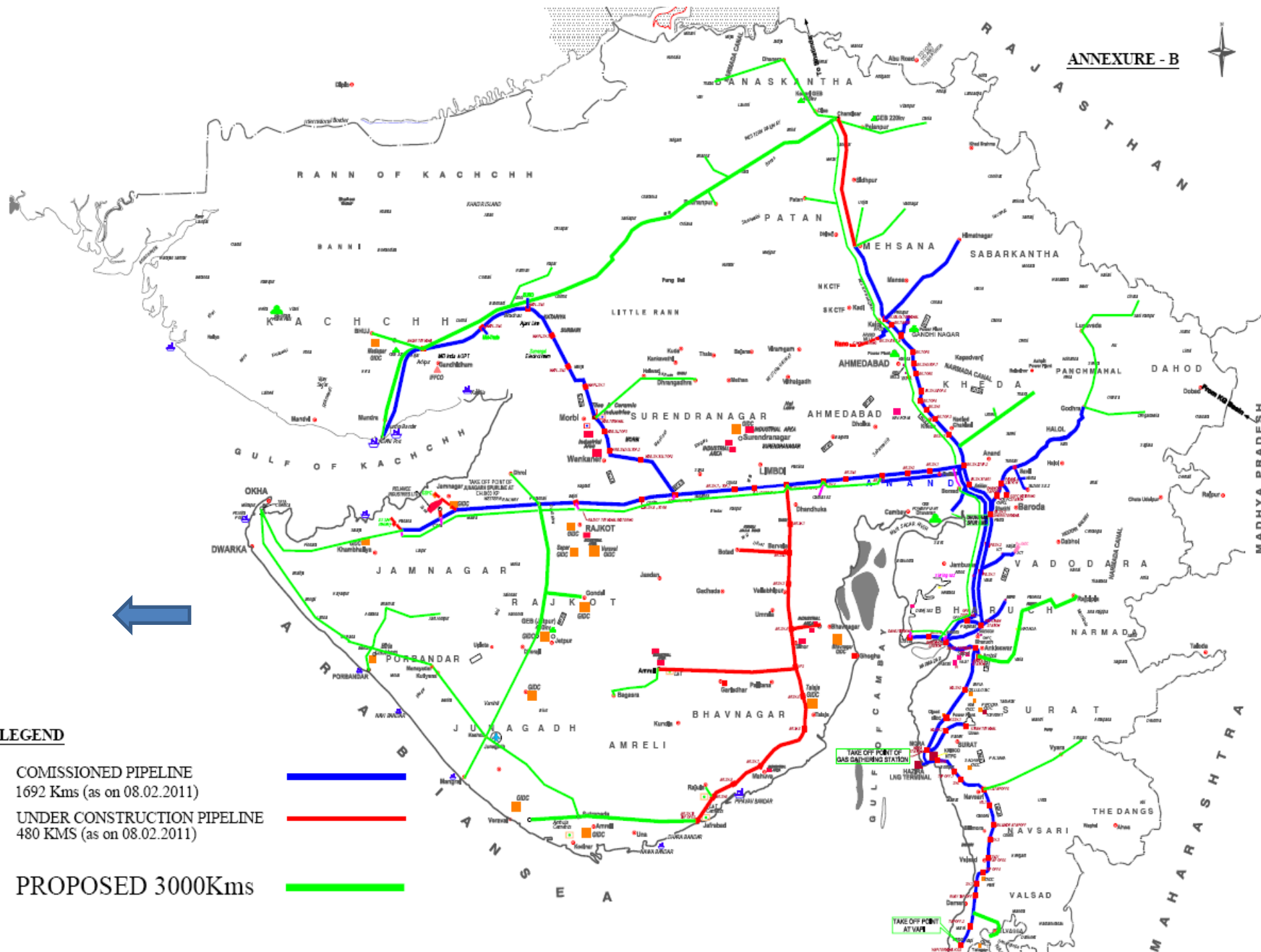
# Pipeline Industry-Critical Issues

- The changes in the Forest Conservation act (circulated vide circular dated 30.7.2009 by MoE&F, GoI) has also brought Pipelines under its purview. This has resulted in conducting Gram Sabha in each of the villages falling en-route pipeline which is cumbersome and time consuming.
- Availability of ROU for pipeline laying and increased land cost
- Post pipeline laying, ROU encroachment has serious implications on safety of people, environment and pipeline
- Pilferage from Pipelines during operating stage

*Thank you*



# ANNEXURE - B



## LEGEND

COMMISSIONED PIPELINE  
1692 Kms (as on 08.02.2011)

UNDER CONSTRUCTION PIPELINE  
480 KMS (as on 08.02.2011)

PROPOSED 3000Kms



# ANNEXURE - C

## PROPOSED PIPELINES BY PNGRB

