PT PELAYARAN BAHTERA ADHIGUNA

Compressed Natural Gas (CNG) Shipping in Indonesia : Opportunities ahead

Bima Putrajaya

President Director of PT Pelayaran Bahtera Adhiguna

2nd Small LNG Shipping Conference

Bali 17th September 2015



Contents

Company profiles

Customer List

Briefly Report

Gas Transportation

Company Profile

(Composition of Holding & Subsidiary Companies)

Ministry of State Owned Enterprises (MSOE)

Ministry of Energy and Mineral Resources (MEMR)

Ministry of Finance (MoF)

Ministry of the Environment

National Development Planning Authority (BAPPENAS)

100% Owned by Government of Indonesia

Oversight

PT PLN (Persero)

PT Indonesia Power

Power Generation and OM

PT Pembangkitan Jawa Bali

Power Generation and OM

PT PLN Batam

Regional Fully Integrated Electric Utility

PT PLN Tarakan

Regional Fully Integrated Electric Utility

Majapahit BV

Financial Institution

PT Indonesia Comnets Plus

IT and Telecommunications

PT Prima Layanan Nasional Enjiniring

Engineering and Construction Services

PT PLN Batubara

Coal Supplier for PLN

PT Pelayaran Bahtera Adhiguna

Shipping Activities

PT PLN Geothermal

Geothermal Energy Generation

PT Haleyora Power

Distribution Maintenance

Company Profile

(Business Overview)

To Secure Coal Supply of Power Plant owned by PLN, PLN subsidiaries, and Independent Power Producer (IPP)

PT Bahtera Adhiguna

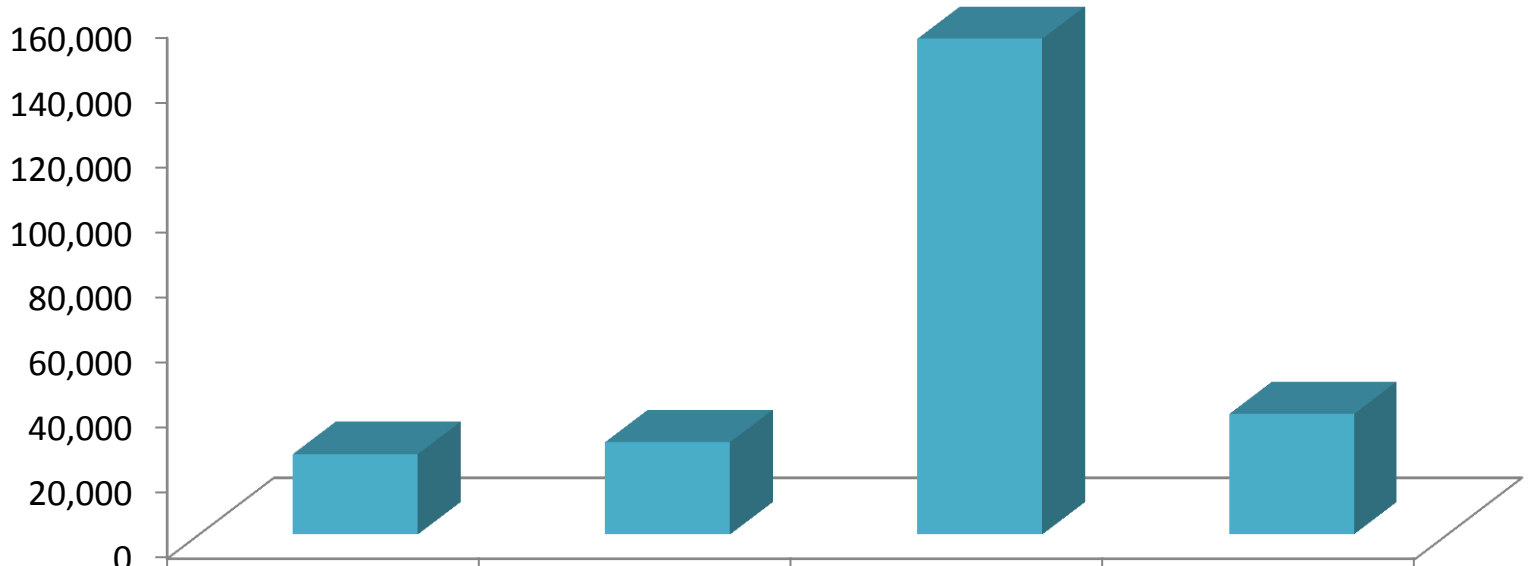
(PT BAg) activities consist of :

Ship services agency business

Company Profile

(BAg Own Vessel)

Various Type of BAg own vessel



	Self Unloading Vessel (small handy)	Handysize	Panamax	Tugboat & Barge
Total (DWT)	24,697	28,376	152,286	37,000

Total DWT : 242.359

Customer List

Contract with Coal Division of PT PLN (Persero) for 2,7 million Ton /year to Existing power plant for years

PT. PLN (PERSERO)

PLN Power Plant 10.000 MW at Java

19%

Contract with Tanjung Jati 3 & 4 for 3,6 million Ton/ year until 20 years

PT PLN (Persero)
Pembangkitan Tanjung Jati B

Tanjung Jati 3 & 4

26%

Contract with S2P from Tarahan – Cilacap for 1 million Ton/ Year until last 2016

S2P

S2P (Tarahan - Cilacap)

7%

Contract with PT Indonesia Power from Bukit Asam to Suralaya Coal Power Plant for 5,1 million Ton/ year from 2013 to 2022

INDONESIA POWER

PT Indonesia Power (Bukit Asam - Suralaya)

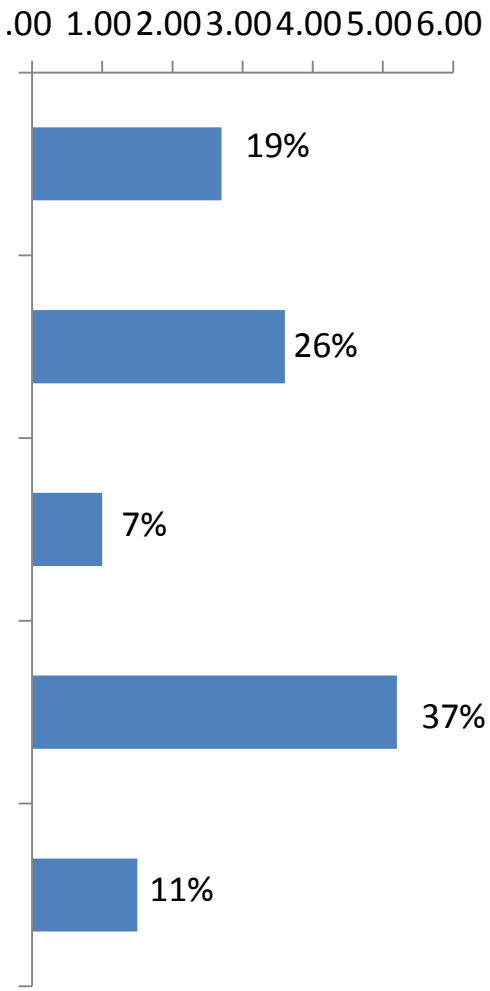
37%

Contract with PT Indonesia Power from Adaro to Suralaya Coal Power Plant for 1,5 million Ton/ year from 2014 - 2023

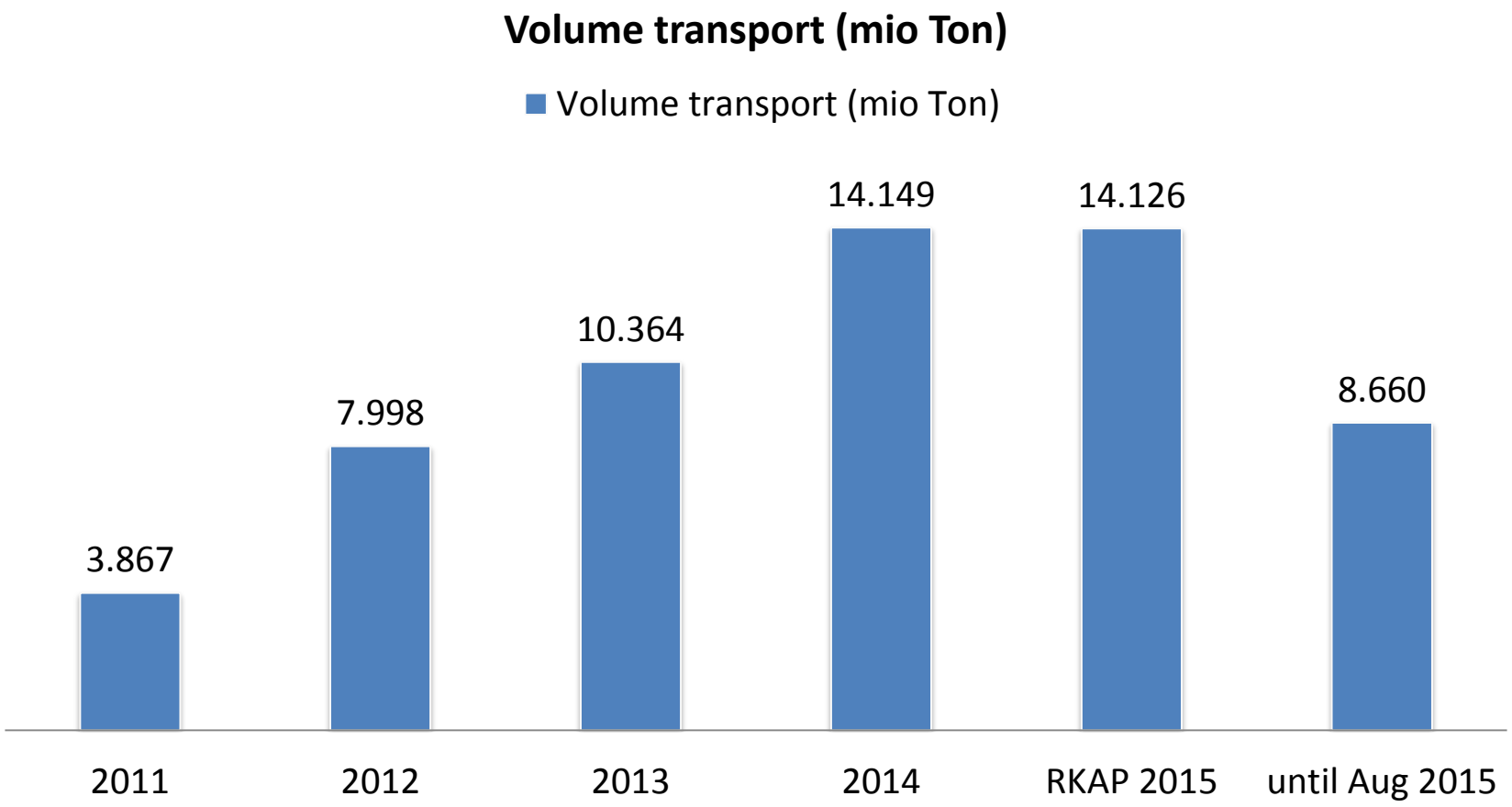
INDONESIA POWER

PT Indonesia Power (Adaro - Suralaya)

11%



Briefly Report

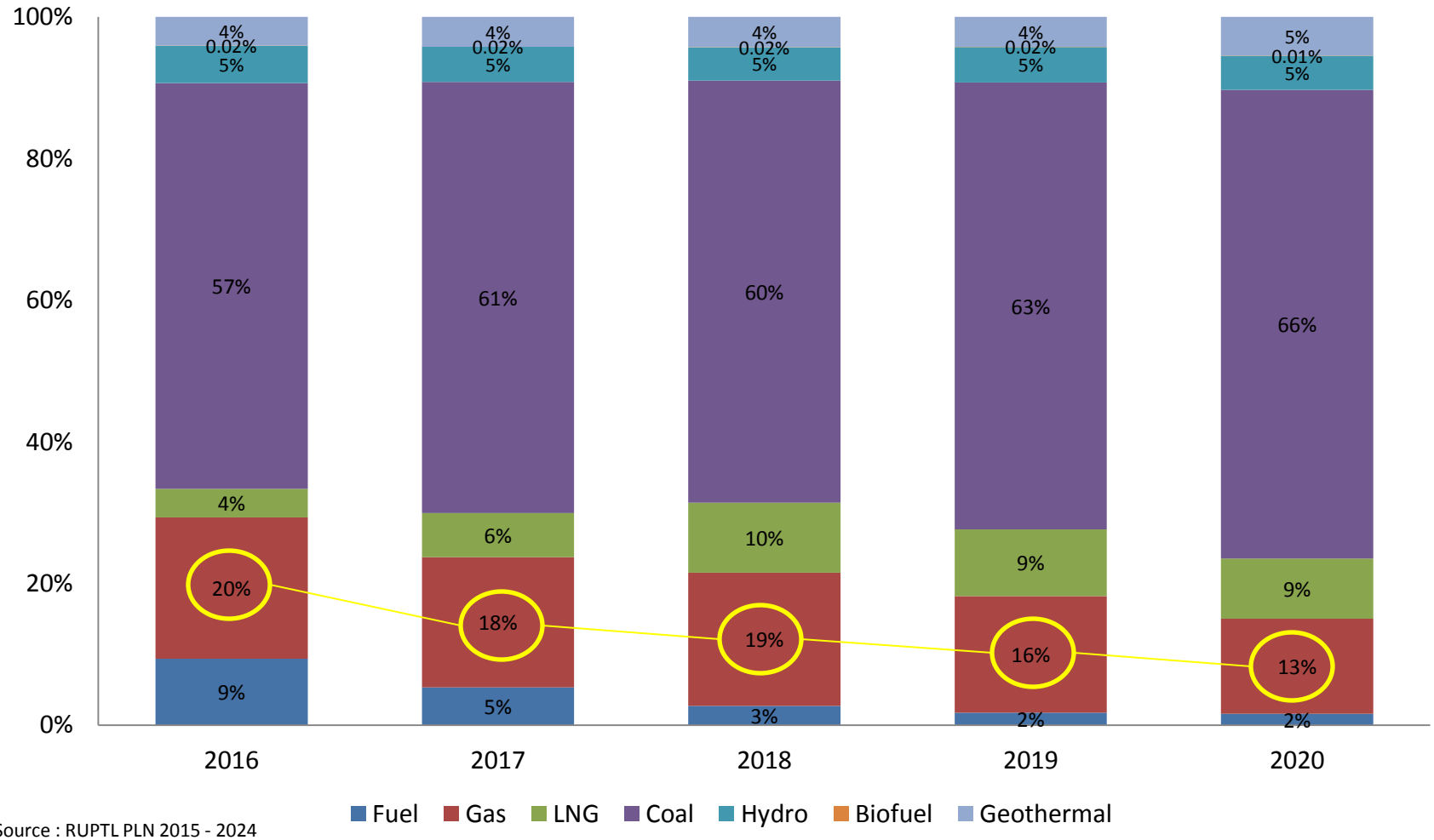


Gas Transportation

Gas Transportation

(Opportunities Gas Ahead)

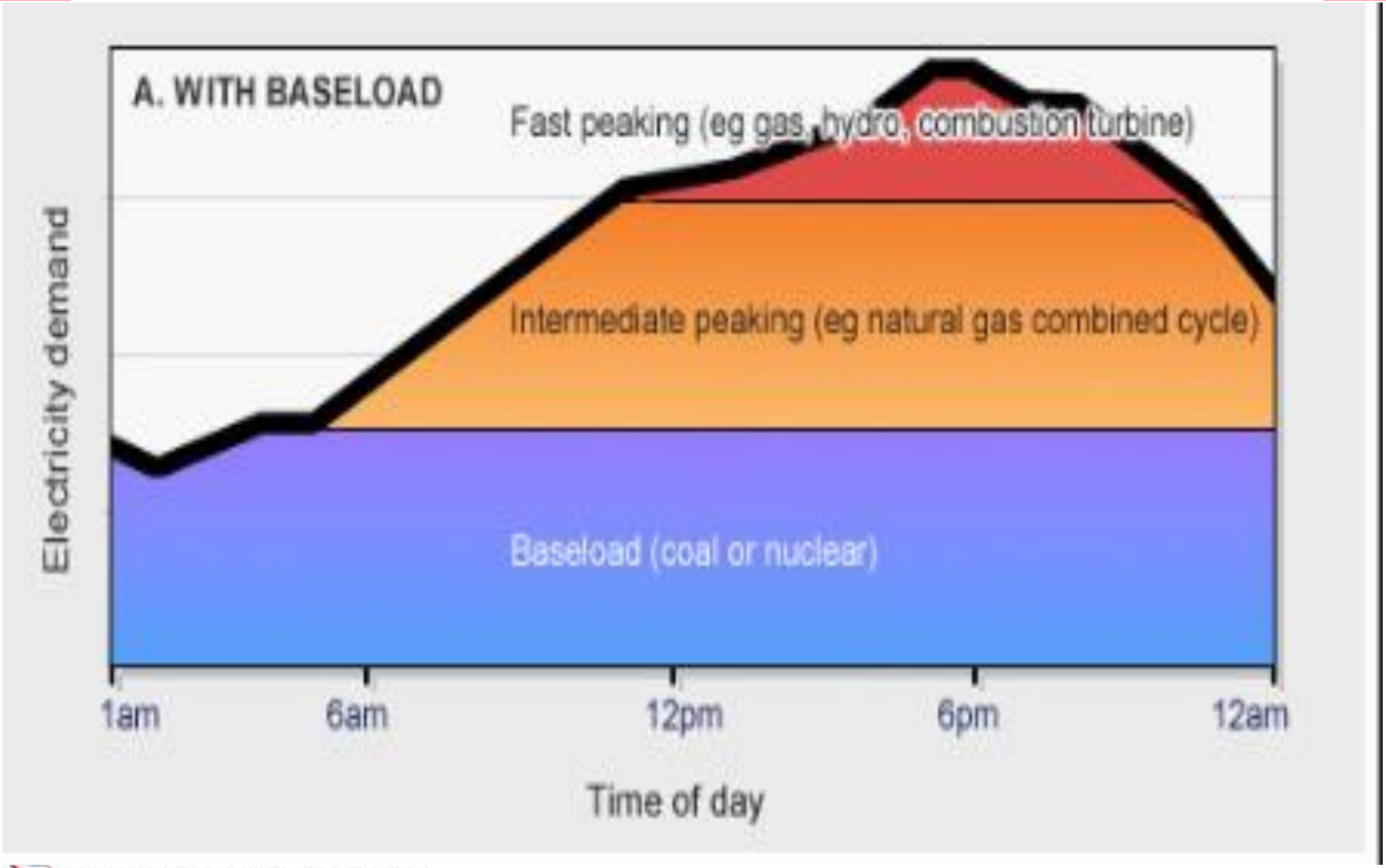
Electric Energy Production Based on Fuel Type (GwH)



*) Source : RUPTL PLN 2015 - 2024

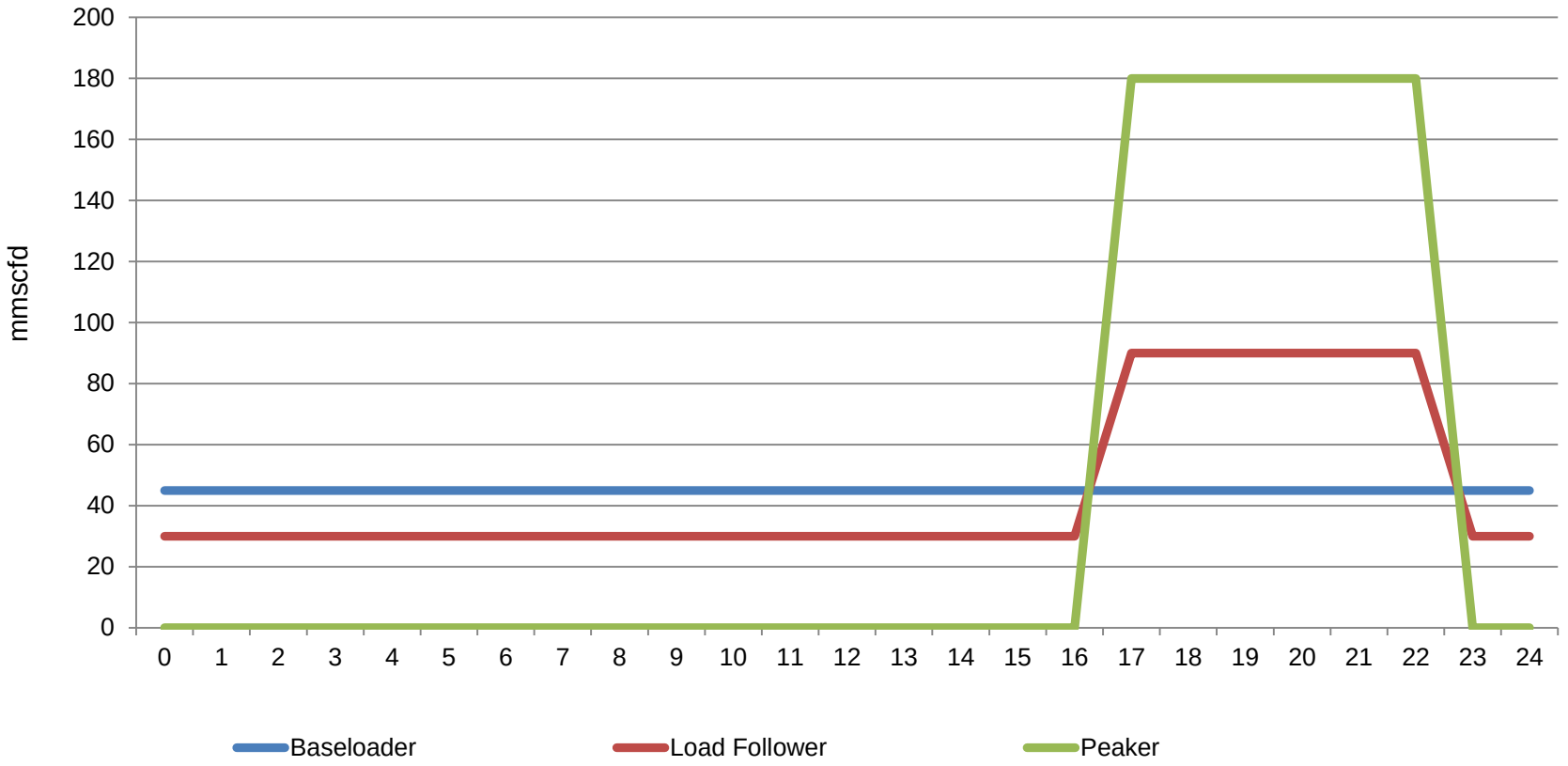
Gas Transportation

(Producing Electricity to meet Demand)



Gas Transportation

(Role of Gas Power in Electricity)

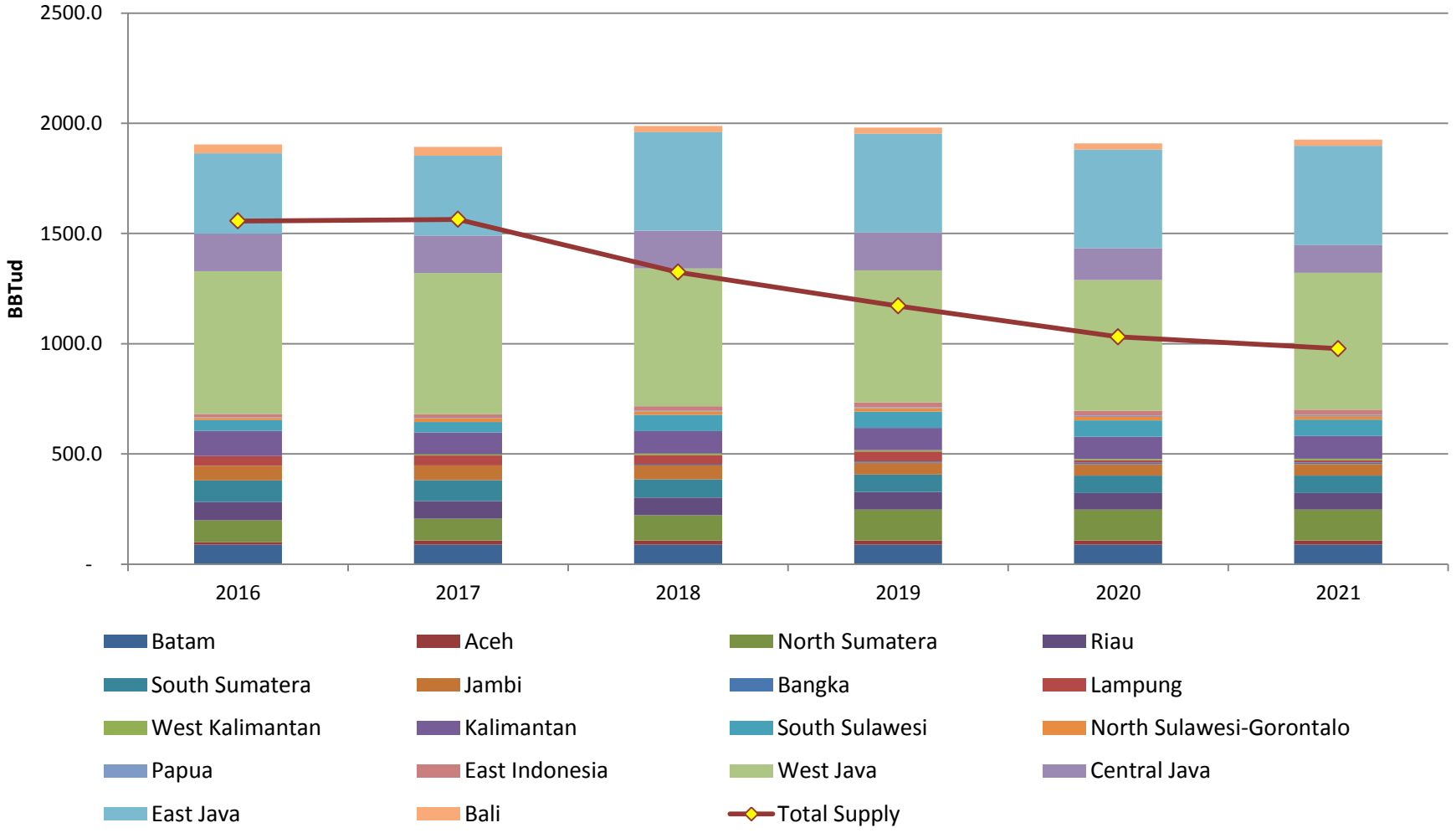


Typical drawback of piped natural gas in Indonesia :

- Limited opportunity for swing rate
- Still not integrated
- Gas reservoir decline earlier than what has been forecasted.

Gas Transportation

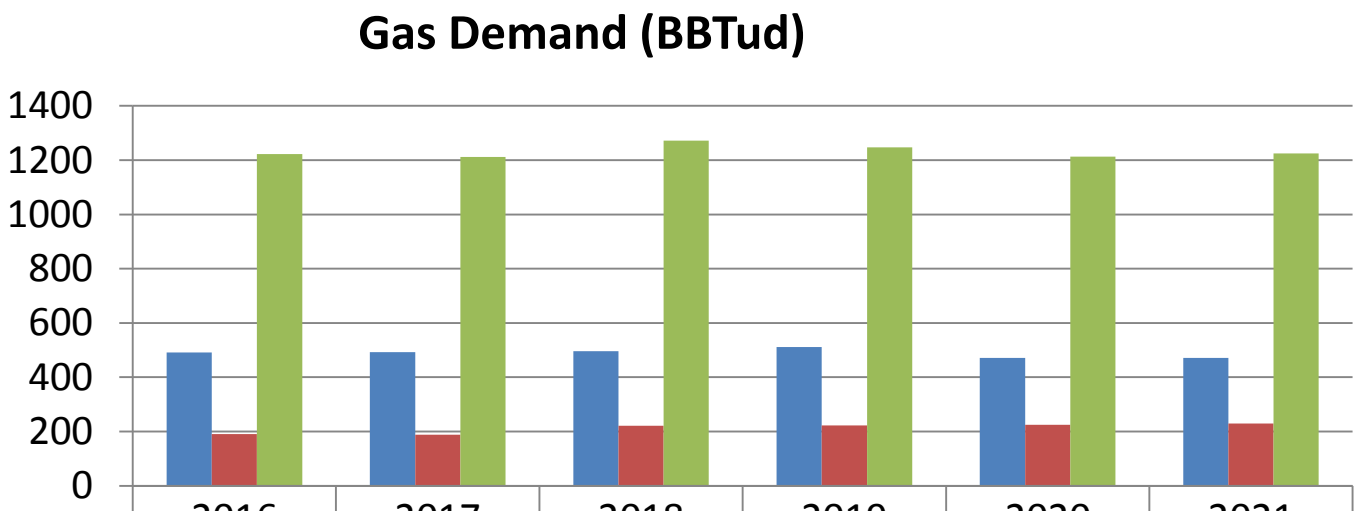
(PLN Gas Balance)



Source from : Gas and Oil Division PT PLN (Persero)

Gas Transportation

(Gas demand from each area in Indonesia)

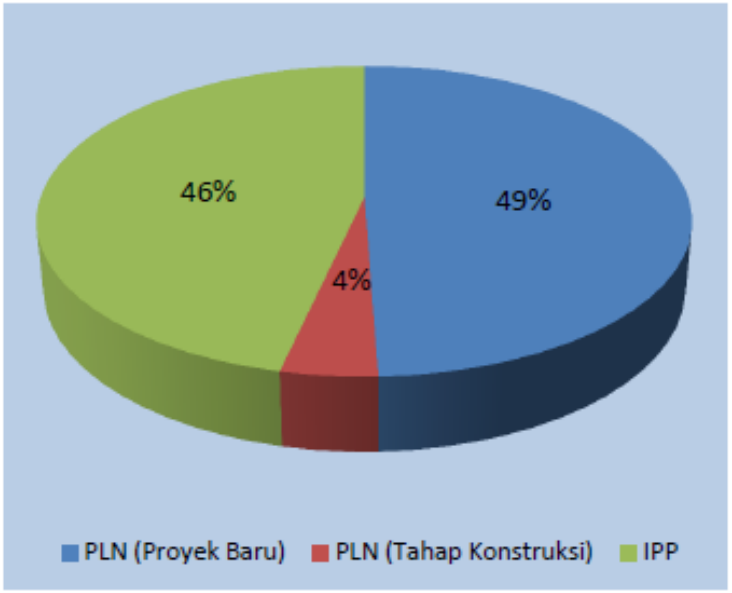


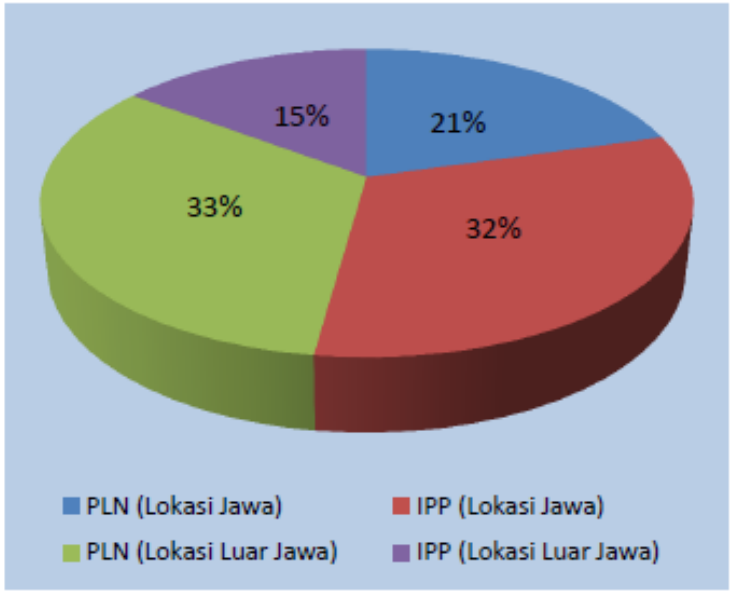
	2016	2017	2018	2019	2020	2021
Sumatera	491	493	496	511	471	471
East Indonesia	191	188	221	222	225	230
Jawa Bali	1222	1212	1271	1247	1213	1224

Source from : Gas and Oil Division PT PLN (Persero)

Gas Transportation

(Project Plan of Gas Power Generation 13.4 Thousands MW)





RENCANA PEMILIK	KAPASITAS (MW)
PLN (Proyek Baru)	6,634
PLN (Tahap Konstruksi)	555
IPP	6,233
TOTAL	13,422

WILAYAH	KAPASITAS (MW)
PLN (Lokasi Jawa)	2,754
IPP (Lokasi Jawa)	4,250
PLN (Lokasi Luar Jawa)	4,435
IPP (Lokasi Luar Jawa)	1,983
TOTAL	13,422

Gas Transportation

(LNG and CNG Comparison)

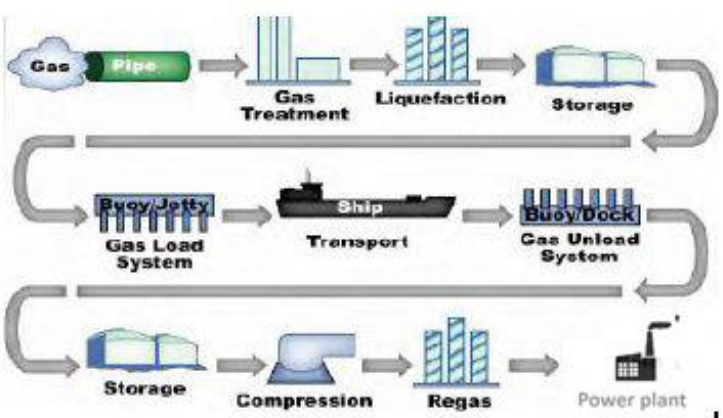
No		LNG	CNG
1	Investment Cost	▪ More investment (seen from the loading and offloading facilities) a. Loading : Treat, Liquefy, Store b. Unloading terminals : Jetty or regas offshore	▪ Less investment (seen from the loading and offloading facilities) a. Loading : Dehydrate, Compress b. Unloading terminal : Jetty or buoy
2	Transportation Scenario	Appropriate for long distances and large loads	Appropriate for short distances and small loads
3	Vessel Design	Sophisticated and efficient	Innovative low cost and high-efficiency design (the main capital cost for CNG is incurred in building the transportation vessel)

Gas Transportation

(LNG Vs CNG : Value Chains)

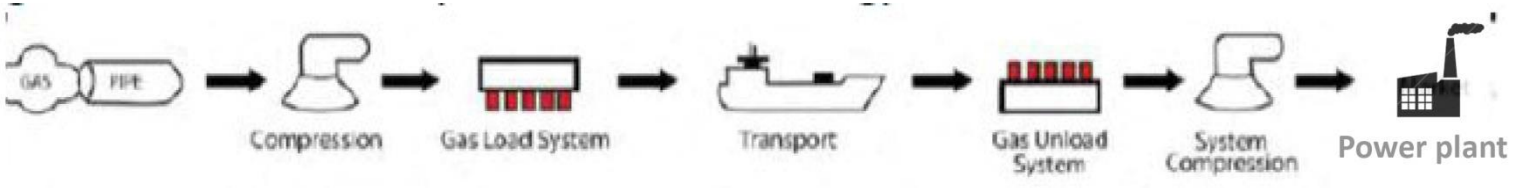
LNG : gas ⇨ liquid ⇨ gas

Loading :Treat, liquefy, store
Terminals: Jetty or regas offshore
Ships : Sophisticated, efficient
Receiving: Store, regasification



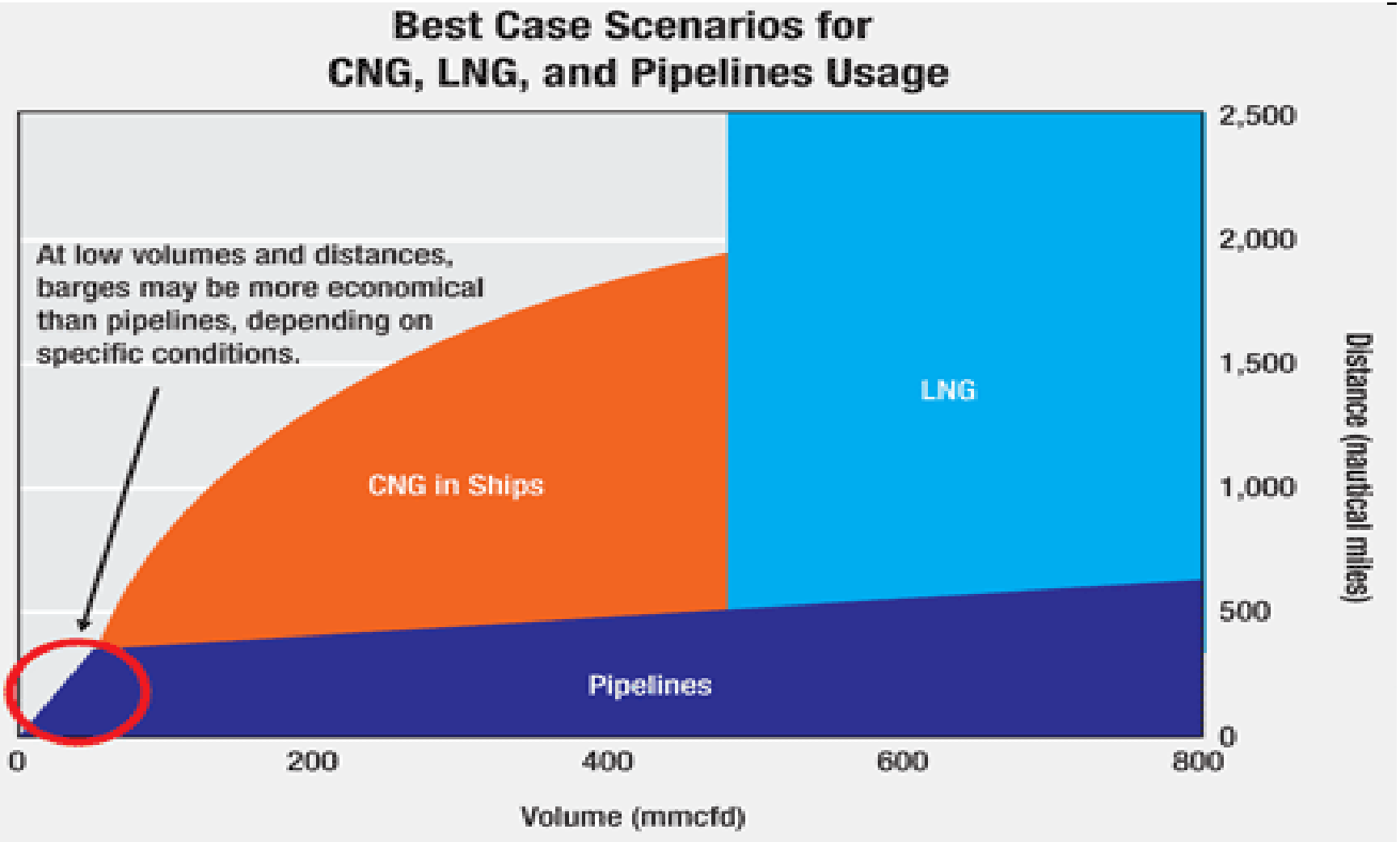
CNG : always a gas

Loading :Dehydrate, compress
Terminals: Jetty or buoy
Ships : Simple – like bulk-carrier
Receiving : Heat & decompress – utilize energy released



Gas Transportation

(PIPELINES, CNG AND LNG SCENARIO)

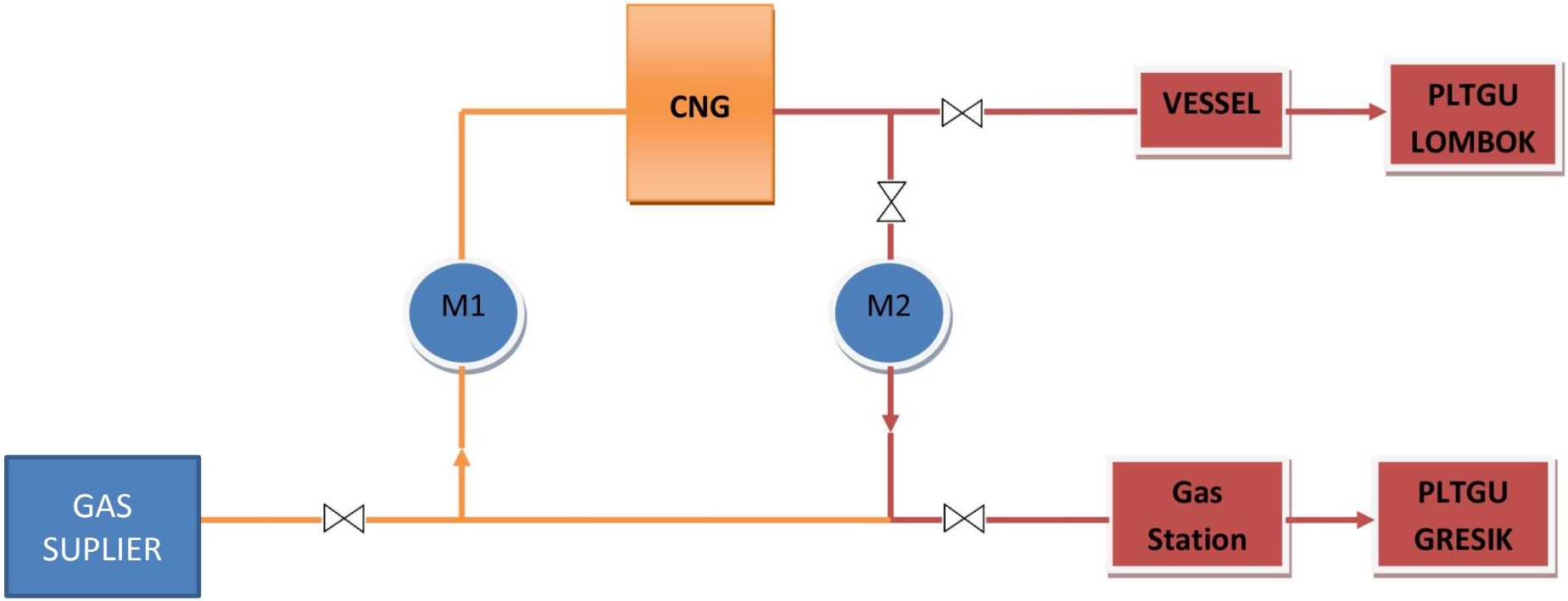


Stephen and Cano, 2004

Gas Transportation

CNG STORAGE NEAR PIPELINE RECEIVING FACILITY

GRESIK Gas Fired Power Plant :



Before : gas supply during off peak is surpressing operation of coal fired power plant nearby, and fuel oil still required during peaking time

Gas Transportation

(CNG STORAGE SOLUTION)

Problem :

1. Take or pay penalty with limited swing rate offered, make the operation of gas fired power plants not optimum and tend to suppress the operation of coal fired power plants which assigned as baseloader.
2. Remote location with no gas resources, still need gas fired power plants to replace oil fueled power plants operated for intermediate and peaker units.

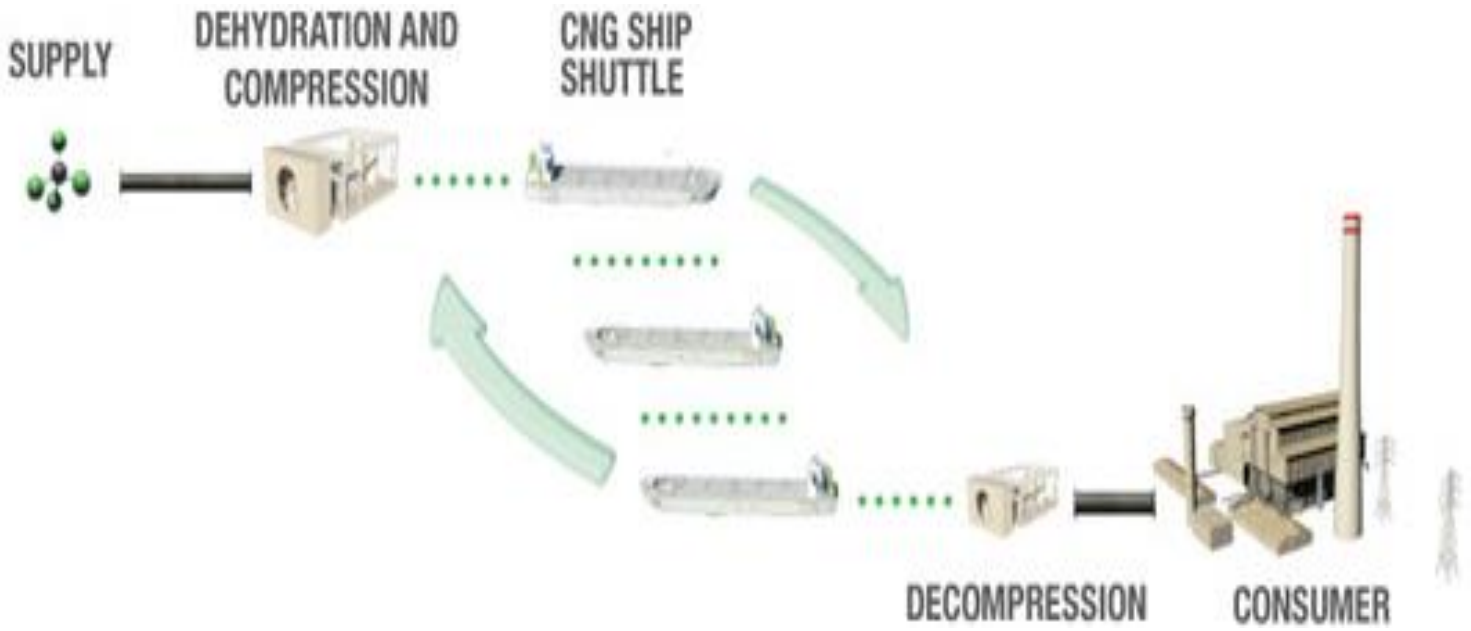
Solution :

1. Gas supply are sent at relatively flat rate, and diverted between power plants and storage.
2. **CNG Marine technology**

Gas Transportation

(IMPLEMENTATION CNG MARINE)

1. No natural gas resources or allocation for the location
2. Marine transportation distance less than 500 NM
3. More economic than Mini LNG (ie. less complexity)



Gas Transportation

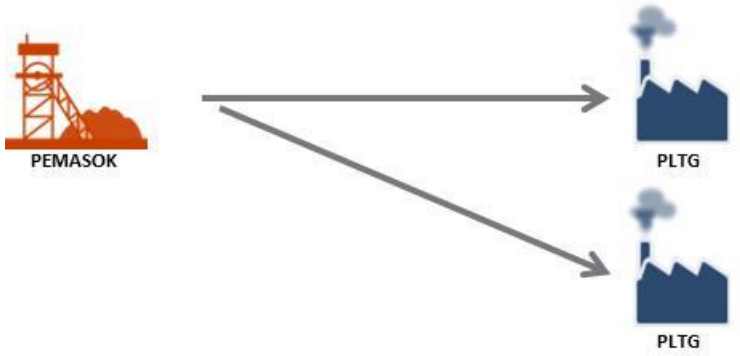
(LNG Vs CNG Features)

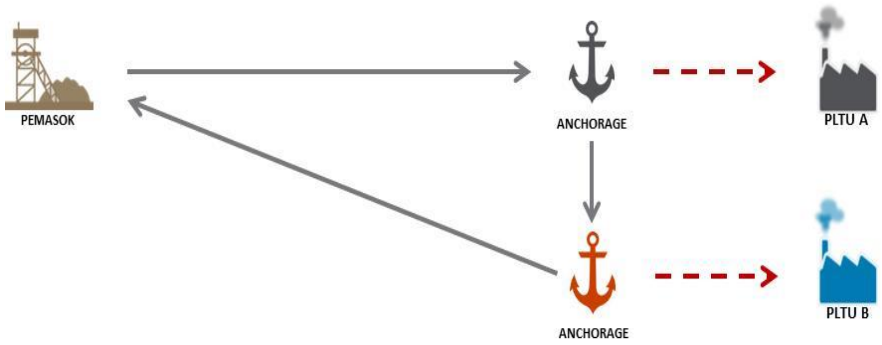
Liquefied Natural Gas	Gas is at atmospheric pressure (1 bar)
	Cargo is at cryogenic temperature (- 163° C)
	Cargo is always liquid
	Cargo as a liquid is hard to ignite
	Loading / offloading as a liquid
	Compression ratio ~600 / 1
	Containment D / t ~1000
	Aluminium, Stainless, Ni Steel
Compressed Natural Gas	Gas is at an elevated pressure (100-250 Bar or more)
	Cargo is at ambient temperature (+30 to -40° C)
	Cargo is always gas
	Cargo as a gas is easy to ignite
	Loading/offloading as a gas under pressure
	Compression Ratio ~250-350: 1 depending on gas composition and storage
	Containment D / t ~25 to 60
	Fine grain normalized C-Mn steel, FRP

Gas Transportation

(CNG Path Distribution)

Hub and Spoke	Milk Run
Characteristic : Preferred for sites with consumption rates high enough to justify using transportation vessels above a minimum reasonable size for each site	Characteristic : Preferred for sites with consumption is low, then vessels with size above a reasonable minimum will visit multiple sites and offload natural gas to local storage at each site





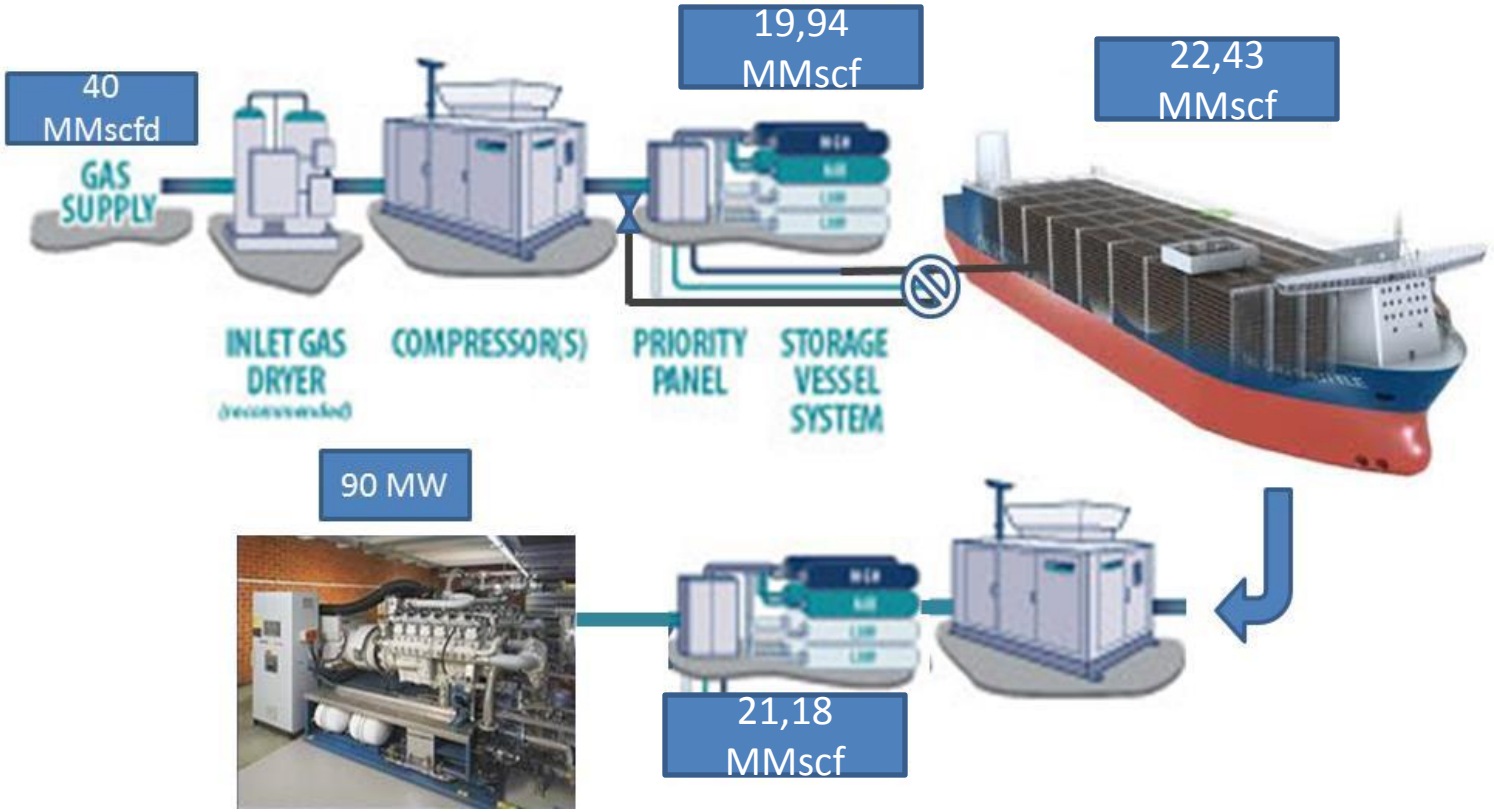
Gas Transportation

(Why CNG?)

- Feasibility study have been done by PT RINA (consultant) based on Consultation Agreement between PT PLN (Persero) with PT RINA Indonesia (31 January 2012), for pilot project Implementation of Marine CNG Technology to Gas Transport from Gresik to Lombok.
- Power Generation necessity in PJB Gresik that using CNG Plant to support the Peak Load Operation
- Feed Gas on Gresik available only Off peak period during 12 hour/ day (20:00 – 08:00) so that operation mode for CNG Plant according with loading window allowed. It's difficult to accommodate by using LNG Plant.
- Availability land in Gresik appropriate for CNG Plant with storage configuration that able to be nested. That land can be used not only for CNG Plant but also for new power plant construction (PLTGU Jawa 2)

Gas Transportation

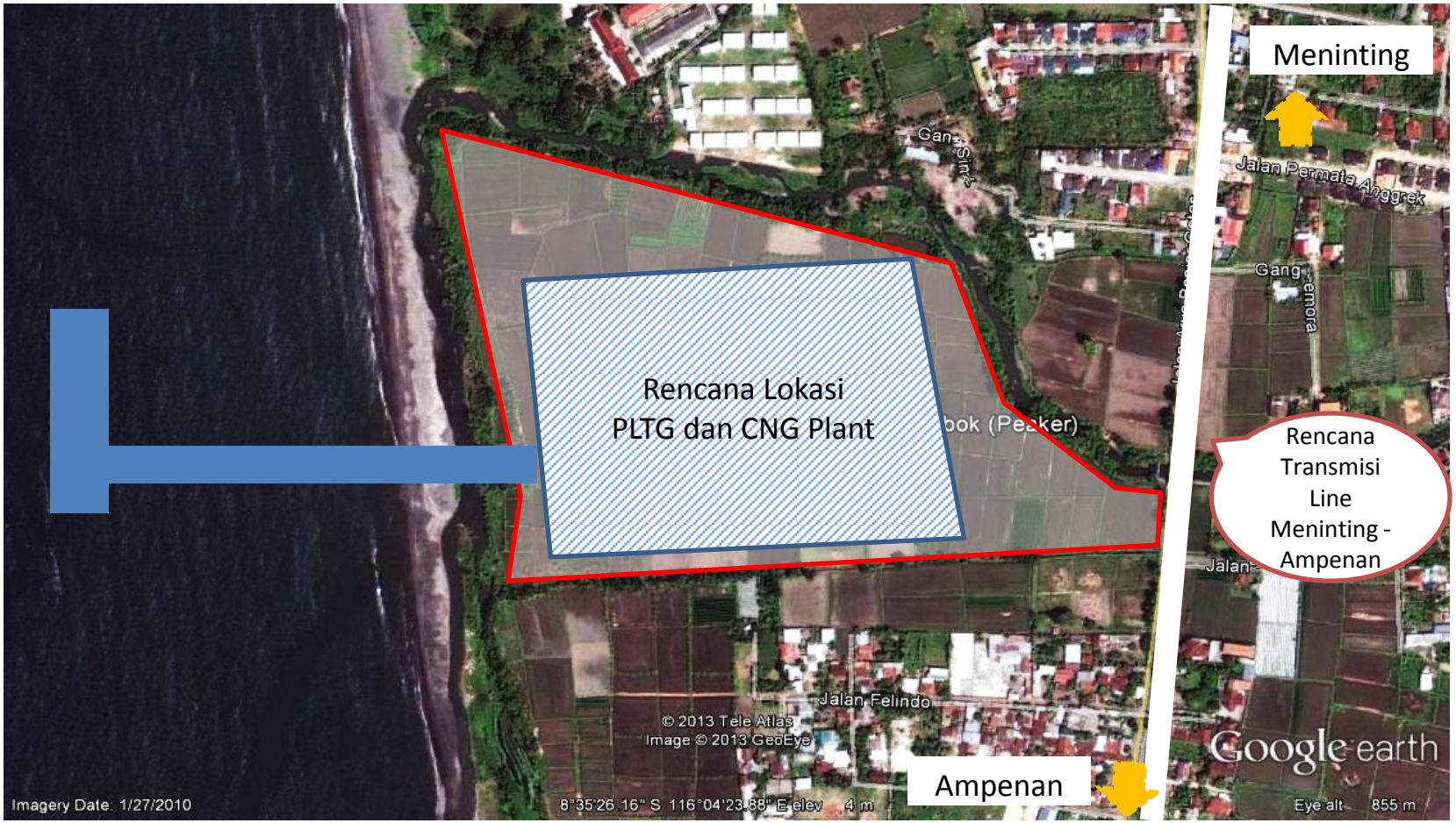
(Operations and Transportation Scheme)



CNG Plant Gresik will be operated to serve the need of *peaker* in Gresik for 3 days and the fourth day will be used for loading to CNG Vessel. The capacity of Decompression station in Lombok can be used for 4 day *peaker* operation

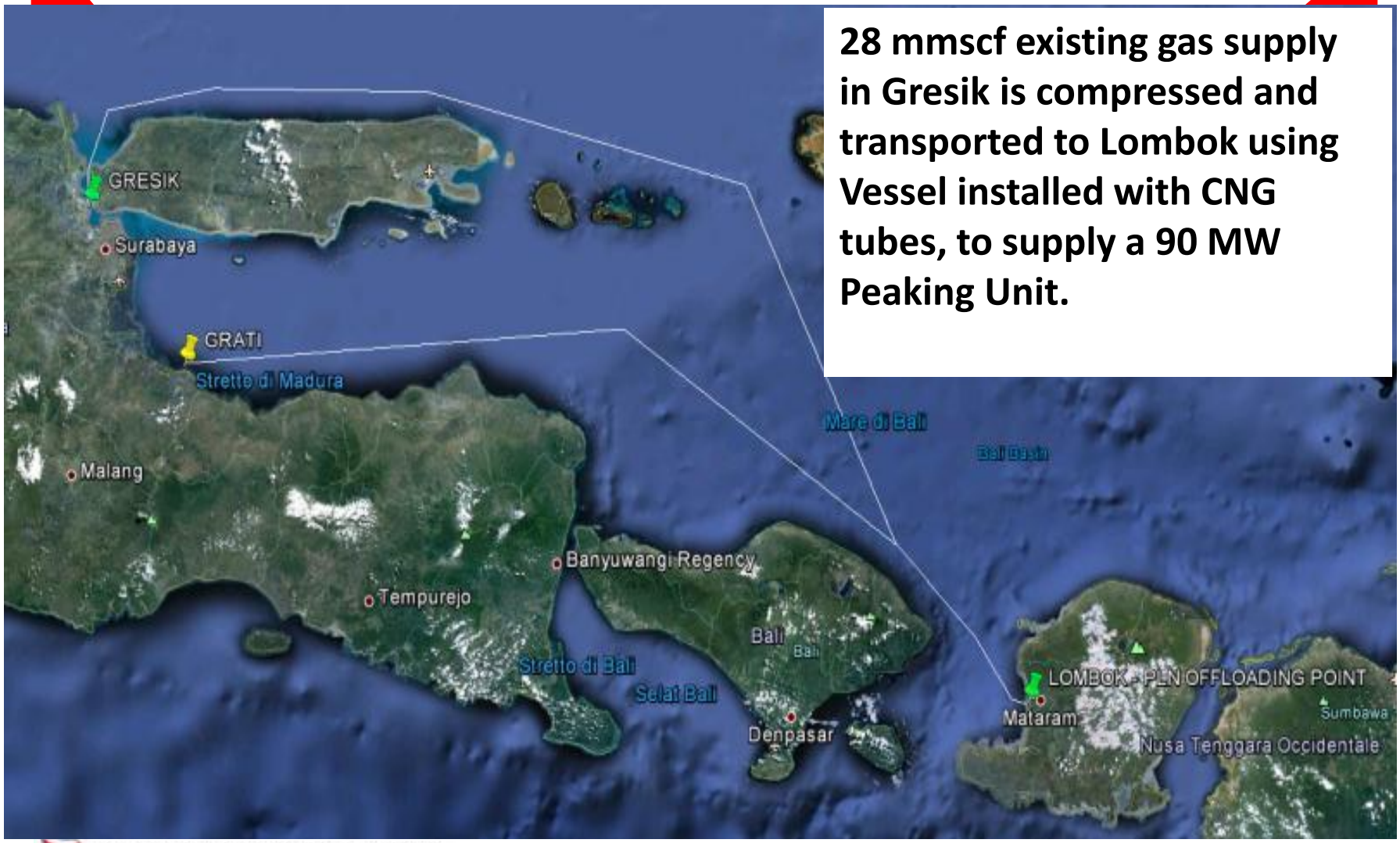
Gas Transportation

(Lay Out Lombok Peaker)



Gas Transportation

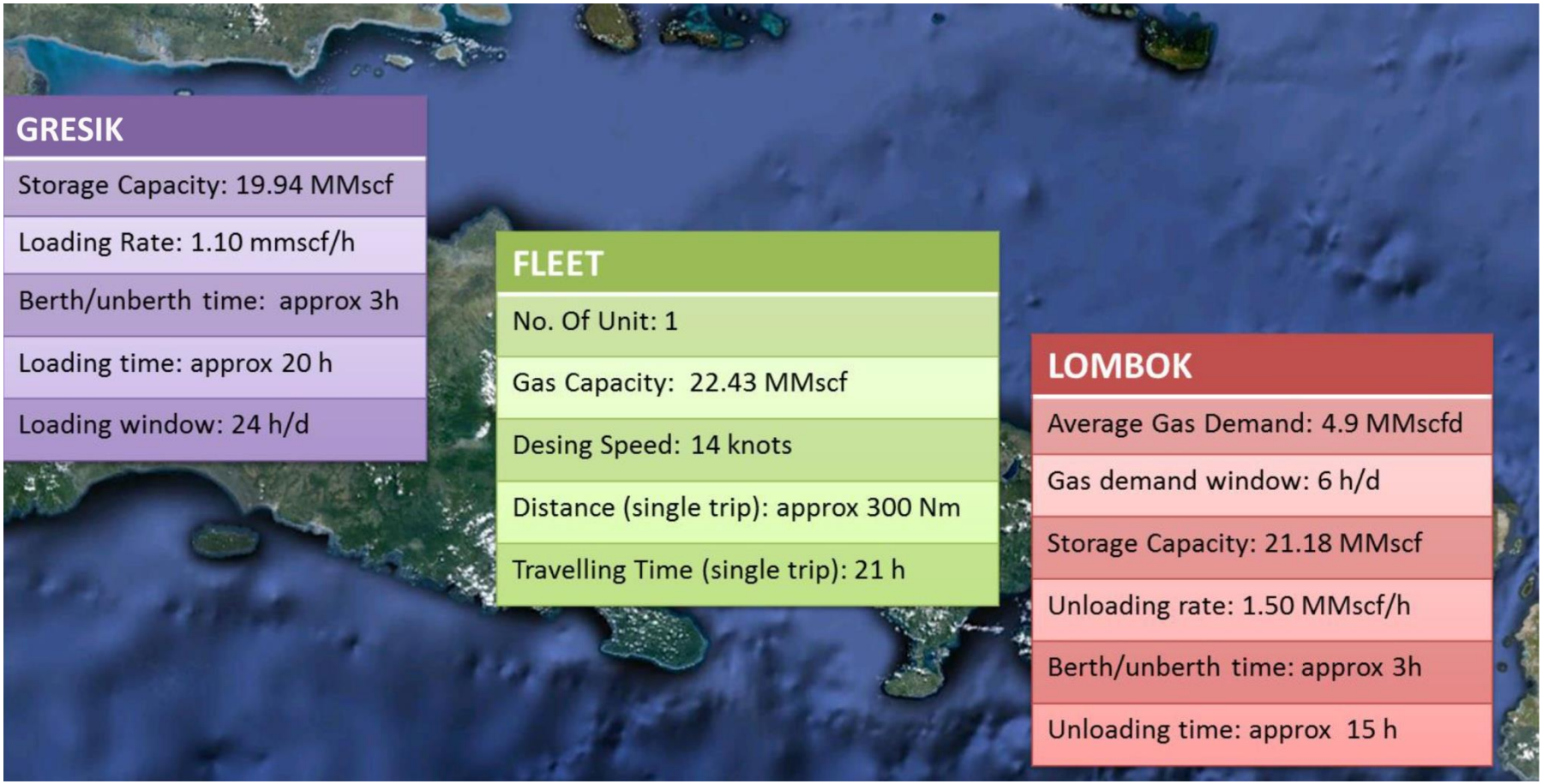
(Gresik to Lombok)



28 mmscf existing gas supply in Gresik is compressed and transported to Lombok using Vessel installed with CNG tubes, to supply a 90 MW Peaking Unit.

Gas Transportation

(Proposed Solution Summary for Gresik – Lombok project)



Gas Transportation

(CNG Solution for Gresik – Lombok Project)

Compression station in Gresik	**CNG Carrier Fleet**	**Decompression Station in Lombok**
• Storage loading compressors • Onshore CNG storage • CNG ship loading compressors • Storage capacity 19.94 MMscf • Carrier loading rate 26.40 MMscfd	• Carrier Capacity 22,43 MMscf • Design Speed 14 knots • Length overall 110.00 m • Breadth (moulded) 21.60 m • Depth (moulded) 12.75 m • Operating Draught 5.60 m • Installed Power 5400 kW	• CNG offloading compressors • CNG buffer storage • Storage capacity 21.18 MMscf • Carrier offloading rate 36.00 MMscfd

Gas Transportation

(Design of CNG Carrier)

CNG Carrier Design	Technical Requirements in the Bid Documents
Minimum Gas Capacity: 23.38 MMSCF	23.38 MMSCF
Medium Speed Dual Fuel Main Engine With A Controllable Pitch Propeller	Medium Speed Dual Fuel Main Engine
Design environmental conditions: Temperature : 35 °C Relative Humidity : 90%	(1) Annually average temperature Gresik : 22.3℃ - 33.3℃ Lombok : 22.5℃ - 32.25℃ (2) Annually Relative Humidity Gresik : 48.1 - 95 % Lombok : 79.8 - 80.9 %
Classification Society : ABS	Classification Society : IACS member
Cruise Speed : about 14 knots at 85% SMCR and 20% Sea-margin	Minimum Cruise Speed: 13 knots at 85% MCR and 20% Sea-margin
Endurance: 8 days	Round trip : 4 days Distance : 300 nm

Gas Transportation

(Design of CNG Carrier)

Length overall	~106.30 m
Length between perpendiculars	99.20 m
Breadth (moulded)	17.60 m
Depth (moulded)	9.00 m
Design draft	~5.20 m
Displacement (at design draft of 5.2m)	~7024.3 t
Main Engine(SMCR)	4050 kW *750 r/min
Complement	18 p

Gas Transportation

(Contractor for CNG Project)

- Consortium from:
  - Shijiazuang Enric Gas Equipment Co.Ltd;

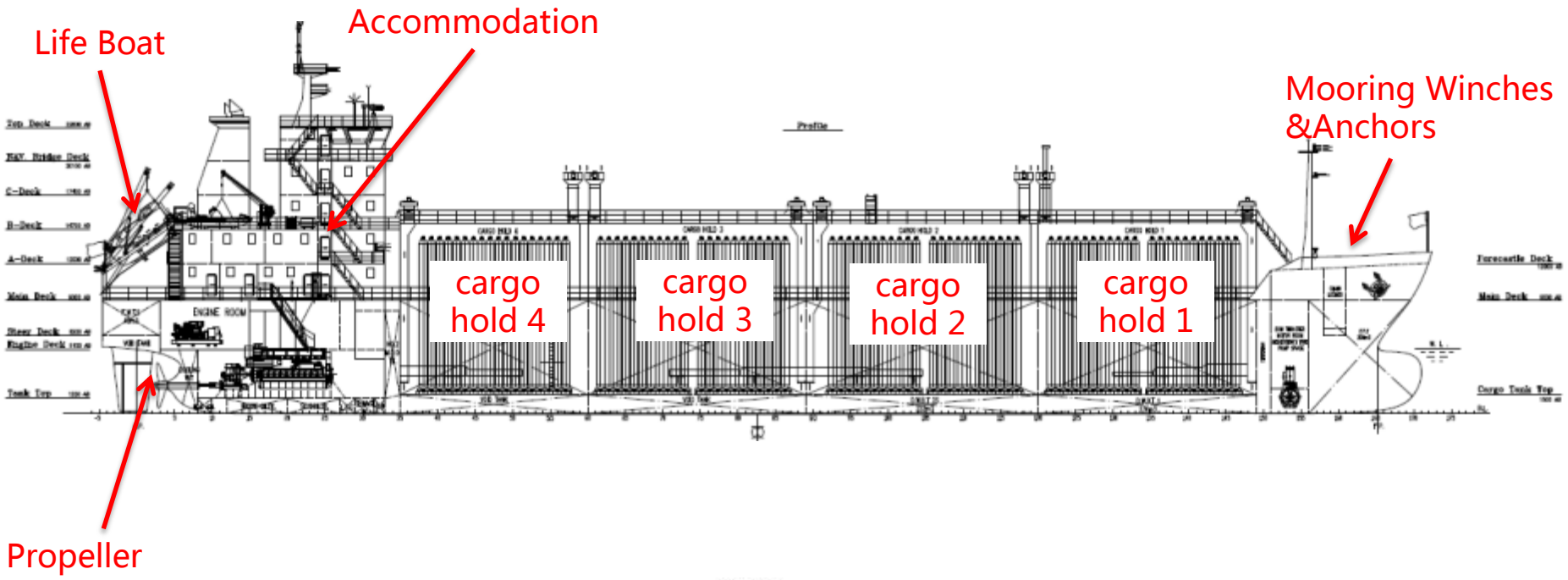
    As a leader & Consortium Coordinator
  - PT Enviromate Technology International

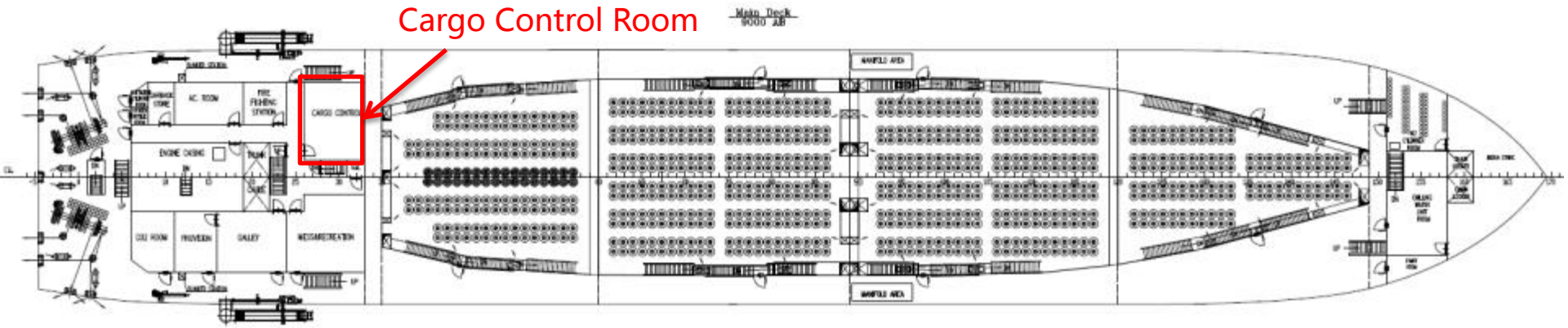
    responsible for design, procurement, construction and installation for CNG
  - Ocean Engineering Design and Research Institute of CIMC

    responsible for design, procurement, construction and installation for CNG vessel

Gas Transportation

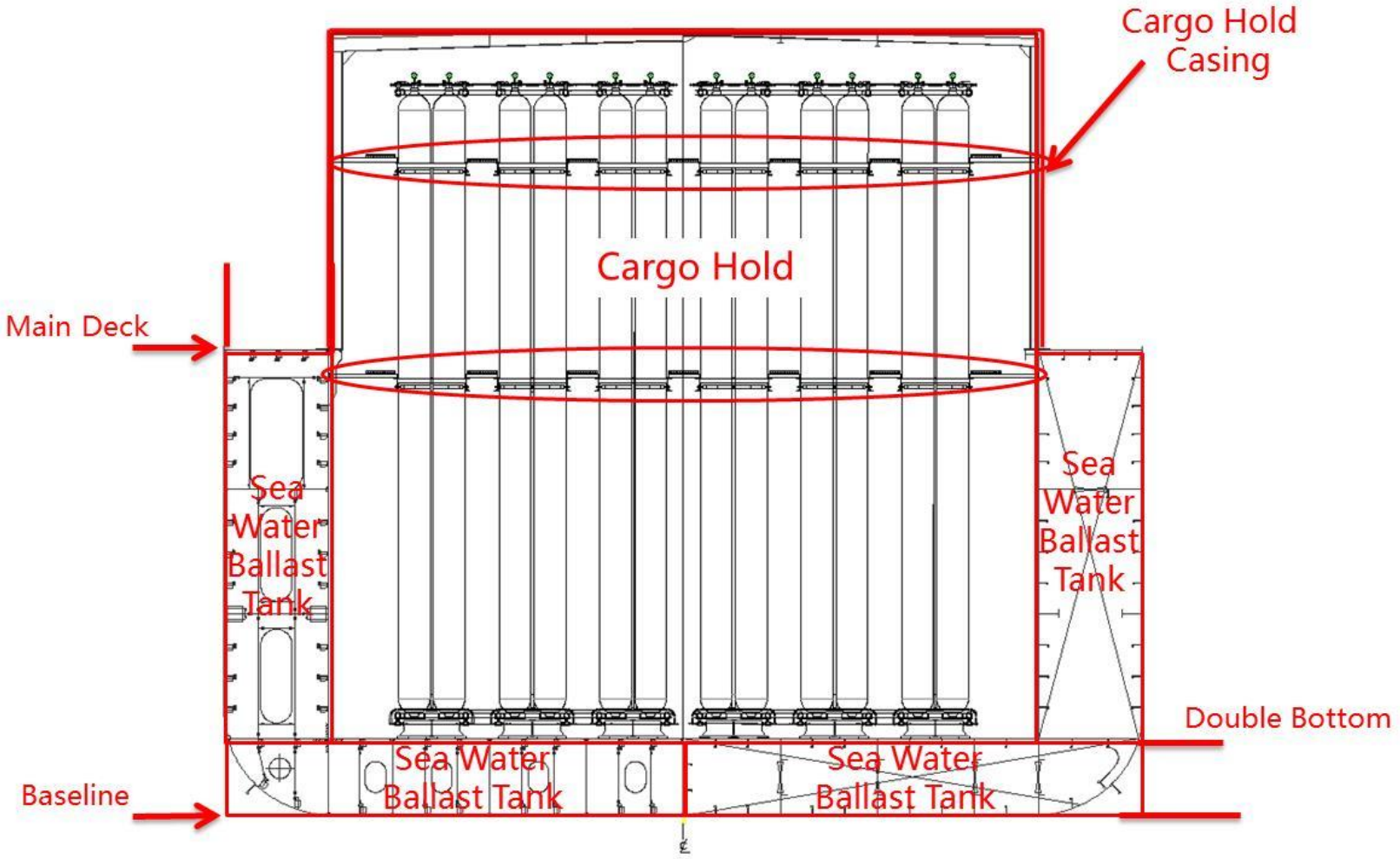
(Design of CNG Carrier)





Gas Transportation

(Design of CNG Carrier)



Closing Remarks

1. Implementation of CNG/LNG technology is SIGNIFICANT as solution to replace current Power Plant's fuel oil consumption..

2. CNG Storage will be installed to match fluctuative gas demand by load follower type gas power plant, when gas supplier unable to provide wider swing rate.

3. CNG Marine technology still feasible for short distance and low gas demand.

4. Benefit gained through implementation of CNG Storage :
   a. To avoid the use of fuel oil during peaking time → lower fuel cost
   b. Optimum operation of coal fired power plants which previously were surpressed in order to avoid Take of Pay Penalty imposed by Gas Supplier
   c. Cleaner power plant's emission

Thank You