

**LNG BUSINESS STRATEGIES : TRAINING FOR PARTICIPANTS
FROM SAARC COUNTRIES**

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Session 7

LNG Receiving Terminals



Agenda

- LNG Receiving Terminals : Introduction to the key features
- Demand Assessment, Assurance of Off-take, Pipeline Connectivity
- Requirement of LNG Suppliers and users
- Capex and Financing of Land based terminals
- FSRU : Key features and benefits
- Comparison of Land-based RLNG terminal & FSRU,
- RLNG Tolling contracts, RLNG Contracts with aggregators / consumers / marketing companies,
- Small scale LNG (ssLNG)

LNG Value Chain

**Floating Storage &
Regasification Unit
(FSRU)**



**Onshore/Land based
Receiving Terminal**



LNG Receiving Terminals

19 MTPA of receiving capacity was added in 2020.

+4 new terminals in 2020

+4 expansion projects at existing terminals

850.1 MTPA of global regasification capacity as of February 2021

China and Chinese Taipei expanded existing LNG plants



Growth in

2020



Was primarily driven by existing LNG markets: China, India, Chinese Taipei, the USA (Puerto Rico) and Brazil

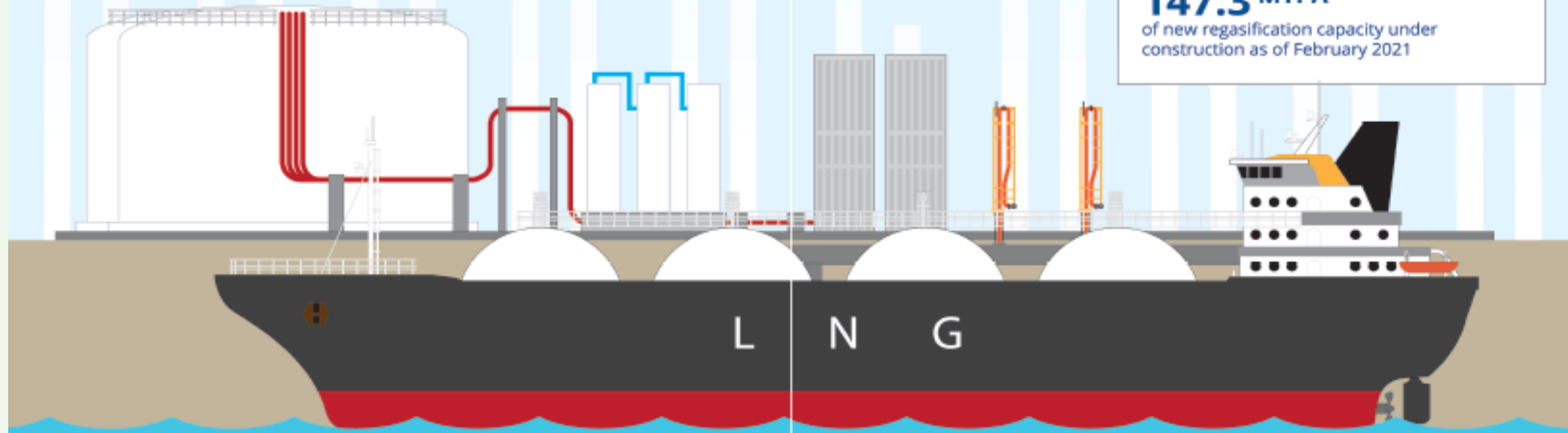


2 new FSRUs Brazil and Croatia

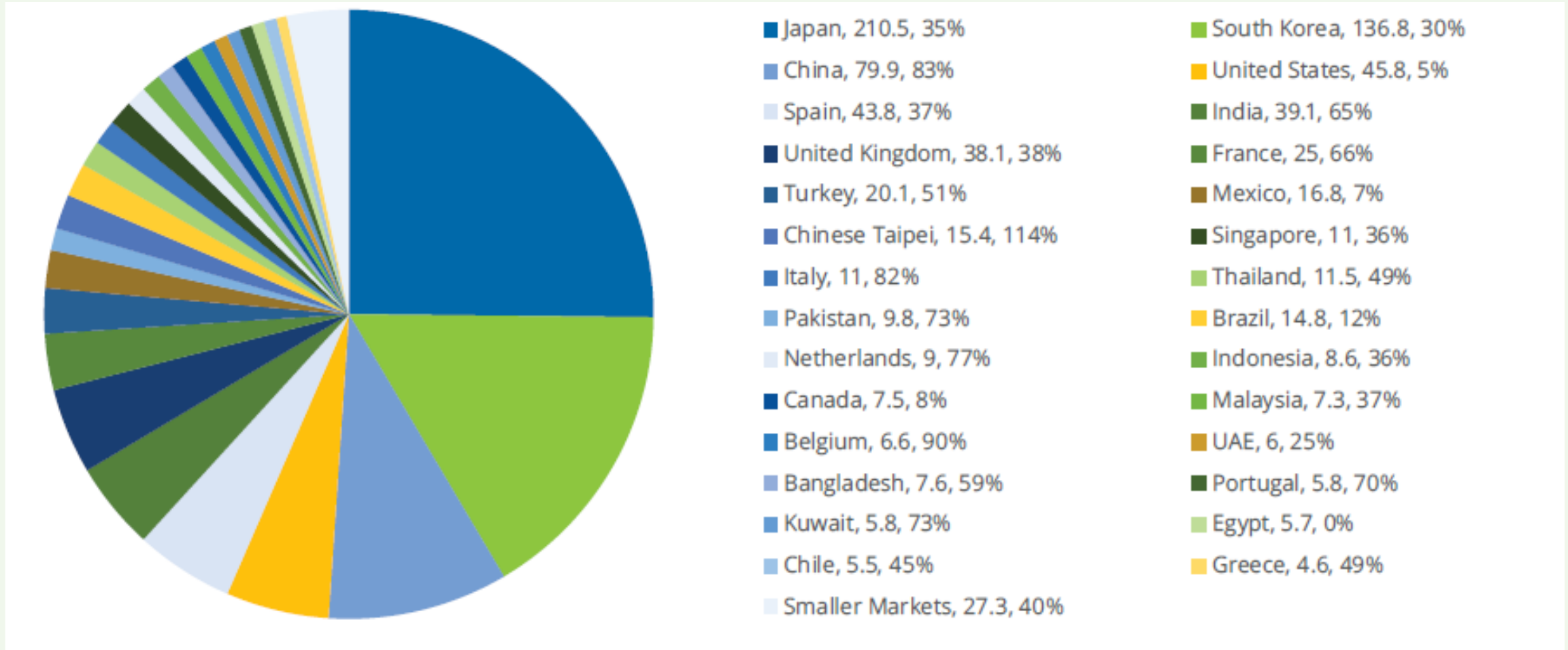


147.3 MTPA

of new regasification capacity under construction as of February 2021



Receiving Terminals Capacity and Utilization



Important Issues for Consideration

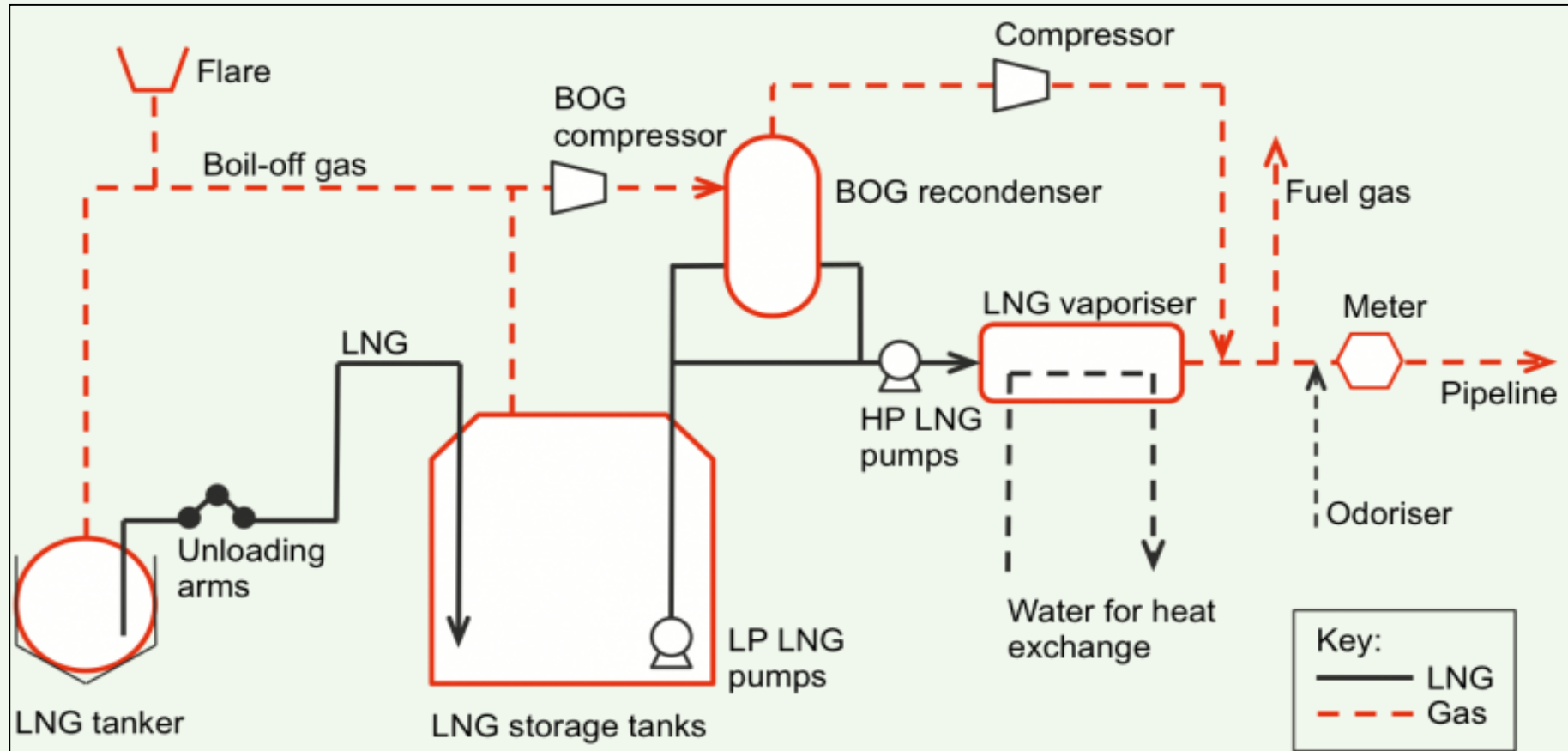
- Market assessment for Demand of Gas
- Decision on Land based or FSRU
- Financial feasibility and commitment of funds
- Site conditions, land availability and EIA
- Marine and Port Infrastructure
- Within time and budget completion of Terminal
- Commitment of Off-take/Use
- Pipeline connectivity of sufficient capacity reaching to customers
- Operational efficiencies of terminal and its maintenance

Land Based - LNG Receiving Terminal



**Port & Jetty, Storage Tanks
Regasification and Utilities**

Typical Process Flow

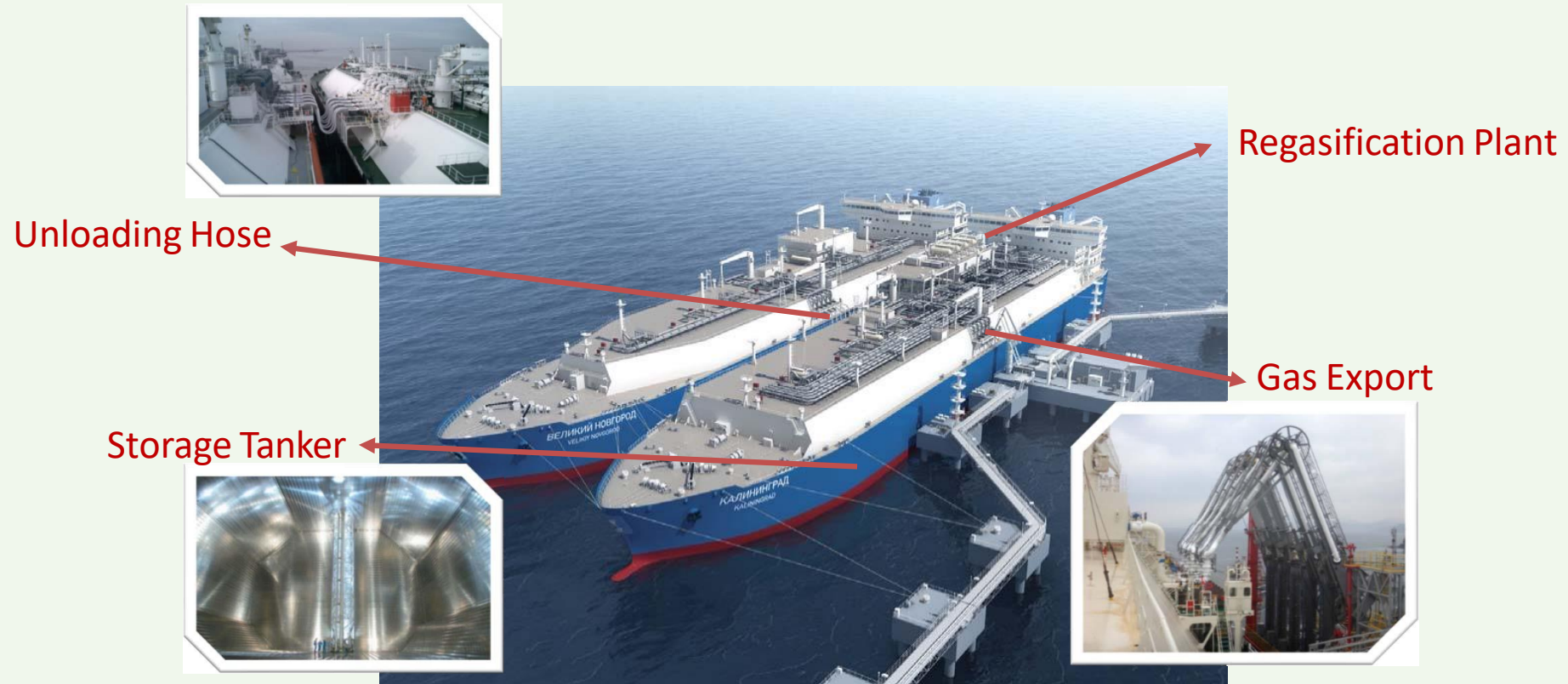


Floating Storage & Regasification Unit (FSRU) Scenario 2020

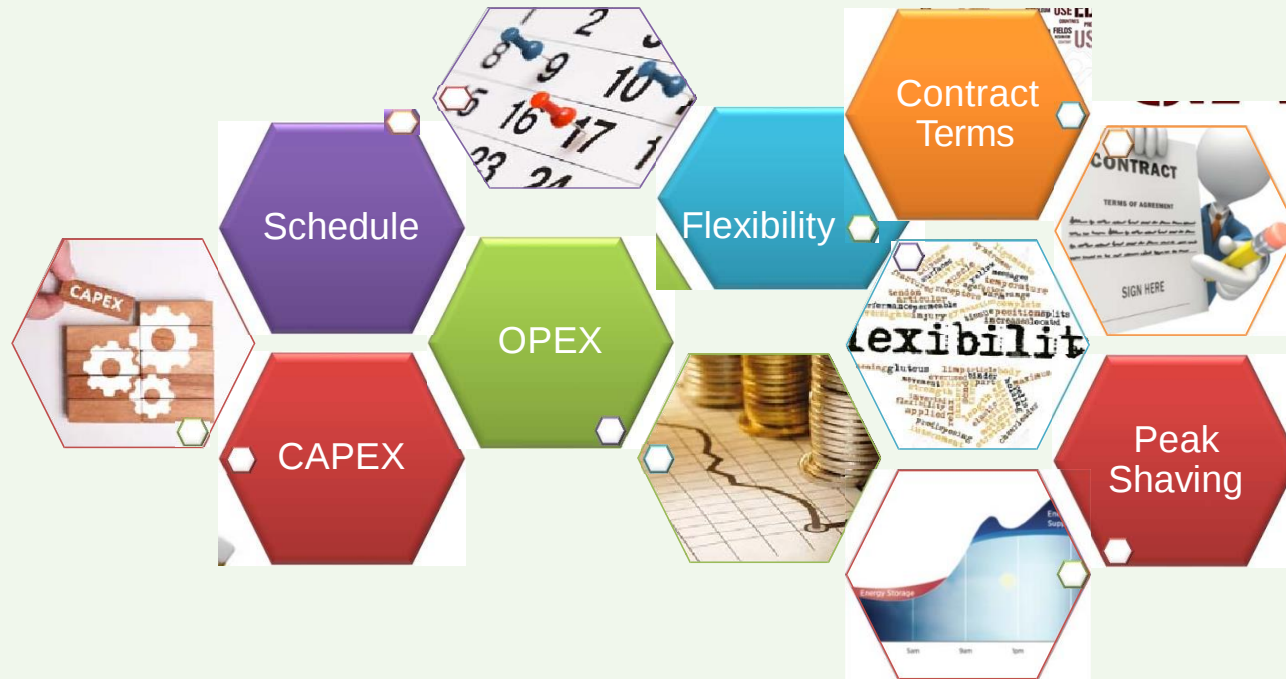


- The total FSRU fleet consisted of 43 units at the end of 2020.
- Total FSRU cargo capacity at the end of 2020 stood at around 6.4 million cubic meters.
- The order book comprised of 7 FSRUs, 5 of which were scheduled for delivery in 2021.

FSRU - LNG Receiving Terminal



Comparison of LNG Terminals and FSRU



FSRU/Onshore LNG terminal

- FSRU enjoys advantages when considering economic efficiency, flexibility, responding time to requirements, environment protection etc.
- LNG terminal, due to its better peak shaving ability and expandability, can easily deal with seasonal fluctuations in demand and fulfill national strategic storage demands in comparison with FSRU.

Capex Comparison

Capex Comparison Of Terminal with FSRU (3MTPA)

Component	LNG Terminal	FSRU
Jetty including piping	US\$60m	US\$60m
Unloading Lines	US\$100m	N/A
Tanks 1X180000m3	US\$85m	In FRSU
FSRU Vessel	N/A	US\$250m
Process equipment	US\$130m	In FRSU
Utilities	US\$60m	N/A
On-shore Infrastructures	N/A	US\$30m
Land Fee and others	US\$125m	US\$20m
Total	US\$560m	US\$360m

The cost of a new FSRU is approximately only 60% of the cost of a new onshore terminal

Opex Comparison



The operating cost of the FSRU is usually 2.5% of capex each year, but the actual USD/day-rate will depend on the location of the FSRU. Sources quote OPEX in the range of US\$20,000-45,000/day

For LNG terminal, the cost will be US\$20000-40000/day

Schedule Comparison

In general, a LNG receiving terminal will cost Owner 36-40 months to construct comparing with 27-36 months for a new built FSRU.

Schedule

36-40
months

LNG Terminal

FSRU

27-36
months

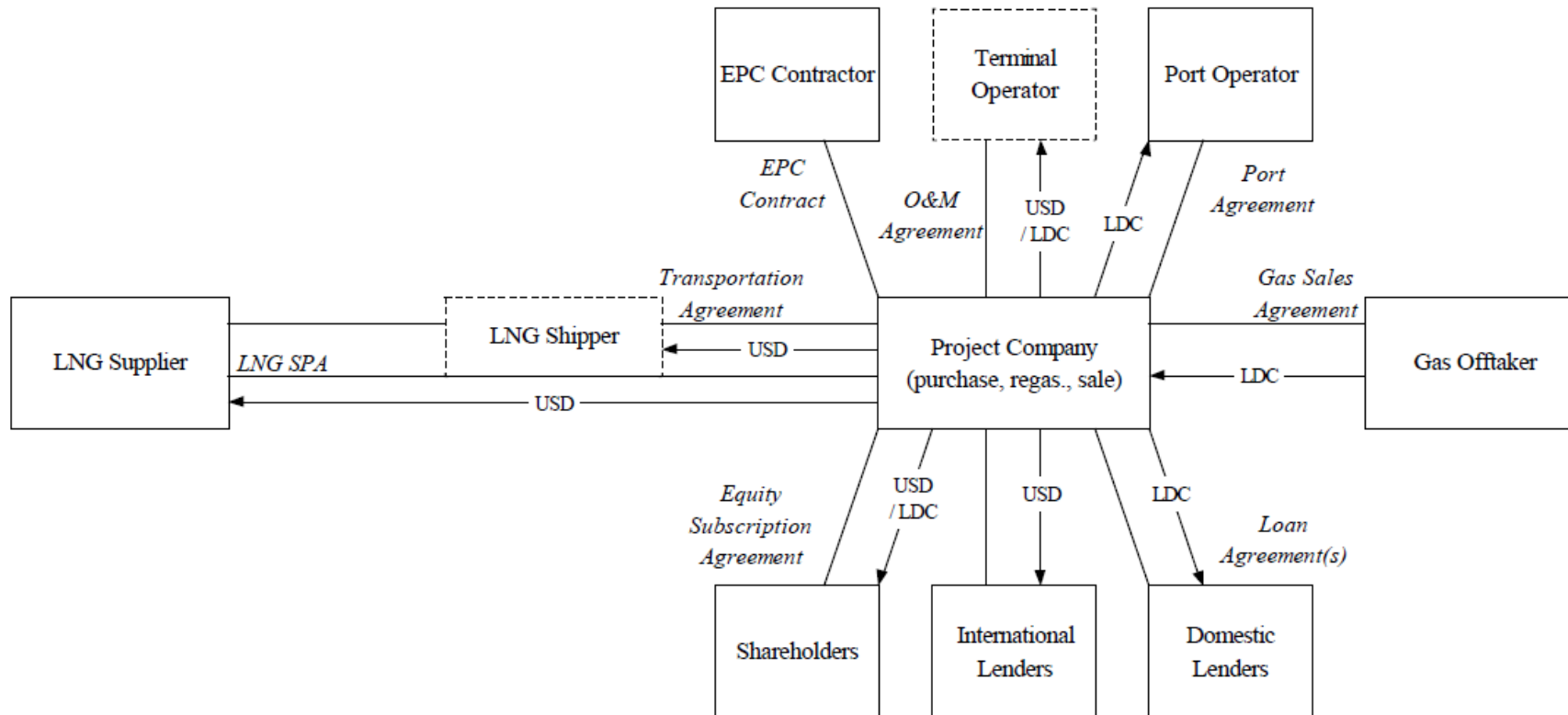


FSRU vs Land Based Terminal

Item	FSRU	Land Based Terminal
Industry Status	Emerging but increasingly accepted	Industry Standard
Capital Cost	Much lower Capital Costs	Higher Capital Costs
Time to in-Service	Rapid access to International LNG	Longer time of Implementation
Construction Timeline	18-24 months for Marine Infrastructure 18 – 32 months for FSRU	36 months
Operating Cost	Higher	Lower
Unit Regasification Cost	Cost effective way to meet low demand or to “grow into” LNG	Competitive as compared to FSRU
Land Acquisition	Minimal or no land necessary	Land Acquisition is time consuming and expensive
Environmental Impact	Minimal Impact	Bigger Environmental footprint
Flexibility	Can be relocated and used a regular LNG carrier for trading purposes	Cannot be relocated to another location
Scalability	Limited Scalability	Easy to expand

Regasification Project Structure and Financing

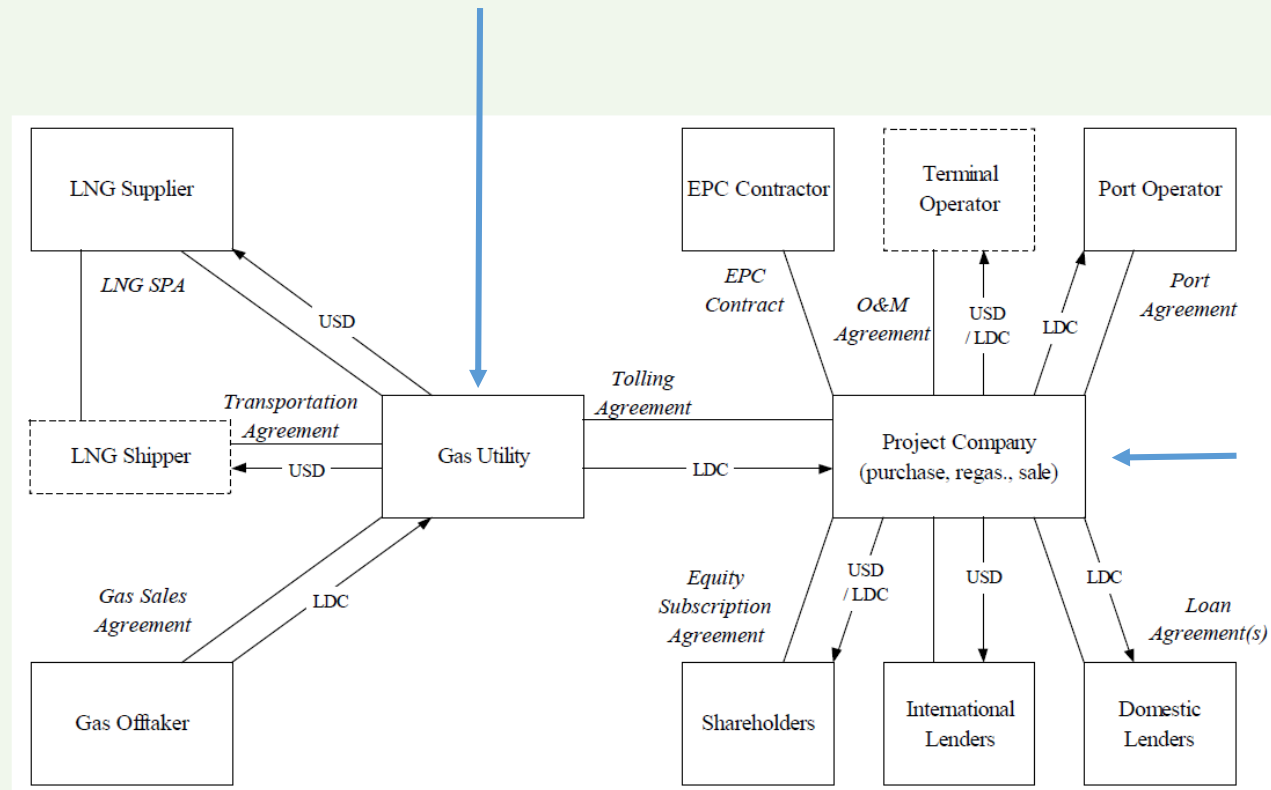
Merchant Structure



Regasification Project Structure

Tolling Structure

Tolling structure transfers LNG import business risks such as supply and market risk or foreign exchange risk, to third parties.



Construction and Operating risks related to the terminal

Key Terms of the Terminal Use Agreement

Services & Scope

- Berthing of LNG Vessels at the LNG Terminal
- Unloading and receipt of LNG from LNG Vessels at the Receipt Point
- Storage of Terminal User's Inventory
- Pumping, regasification and send-out (as Regasified LNG) of LNG held in Storage
- Transportation and making available for delivery such Regasified LNG to the Delivery Point
- Measurement and testing of LNG and Regasified LNG
- Maintenance of an electronic inventory tracking and management service

Receipt of LNG

- Title, Custody and Risk of Loss
- Quality and Measurement of Terminal User's LNG
- Refusal to Accept Off-Specification LNG

Operating Conditions

- No Segregated Storage Facilities
- Maximum LNG Inventory
- Commingling of LNG in Storage and Regasified LNG Stream
- Standard of Operation of terminal
- Failure to Take LNG and Delivery of Regasified LNG
- Scheduling of LNG receipts – Nomination procedure
- Nomination and Scheduling of Regasified LNG Deliveries
- Gas Quality Specifications and Measurement of Gas at the Delivery Point
- Responsibility - Downstream Arrangements

Shipping and Port Charges

- Compatibility of LNG Vessels with the LNG Terminal
- LNG Vessel Requirements
- Berthing and Unloading
- Port Dues and Charges

Comparison of Services Charges

- Terminal Fees and Charges
 - Capacity fee and a Usage Fee
 - Use or Pay Charges
- Treatment of Fuel Gas and Lost & Unaccounted Gas

Other Provisions

- Invoicing and Payment
- Taxes Provisions
- Insurance provisions
- Terminal Owner Failure to Receive LNG or Redeliver Regasified LNG
- Liability clause
- Force Majeure related provisions
- Default and termination provisions

Small-scale LNG Pivotal to Meeting Demand

Small-scale LNG covers terminals with a liquefaction/regasification capacity < 1.0 MMTPA and vessels with < 60,000 cbm capacity

Small-scale LNG vs Conventional LNG & Pipeline Supply

- Lower investment cost
- Faster time-to-market
- Greater operational flexibility

Growing Interest in Small-scale LNG Driven By

- Lower greenhouse gas and SOX emissions
- Divergence in price of crude oil vs LNG
- Government policies promoting natural gas
- Flexibility in logistics & transport

Small-scale LNG Taps Stranded Demand

- Small-scale power generation
- Demand centers located in remote areas such as residential & industrial demand
- Land and marine transport fuel
- Places isolated from pipeline grid



50 mmscfd FRU in Bali, Indonesia



2,200 cbm bunkering barge in Jacksonville, USA

LNG Trucking Connects Stranded Customers

LNG-by-truck operations address an unmet need of utilities and industrial customers



Off-grid Customers: Complete LNG virtual pipeline solution, including LNG procurement, LNG transportation and on site LNG processing equipment



Power Generation:

- LNG supply during the summer in response to seasonal spikes in demand
 - Begin service ahead of time by providing short-term supply
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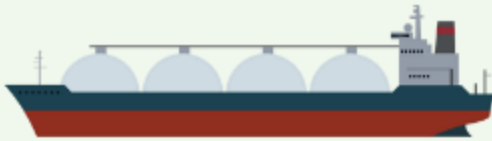
Mining: LNG supply to off-grid customers



Pipeline Disruptions:

- Gas supply for pipeline maintenance, peaking requirements, integrity testing, pigging operations, plant shutdowns and natural gas customers supply interruptions
- Mobile solutions for pipeline supply disruptions using mobile vaporizers, storage containers and LNG transport trailers

Cost of Implementing Small-scale LNG - Various Factors



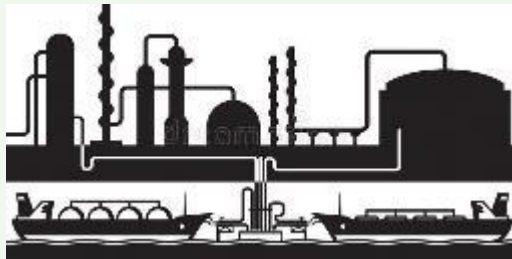
**Transport Volume
(Demand)**



LNG Price



Transport Distance



Facilities Cost



Personnel Expenses

Thank You
Q & A

