Optimizing LNG shipping portfolios - Realities, Uncertainties, Opportunities

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The LNG fleet is growing more rapidly than the LNG demand

Growth of the LNG Fleet*

*excludes floating liquefaction and small-scale ships
**excludes ships in (semi) lay-up

Source: Poten & Partners
LNG trade has grown more complex, shipping distances have increased.

Global LNG Trade Routes and Flows, 2000

Global LNG Trade Routes and Flows, 2020
Global LNG shipping demand could double between 2016 and 2030

- The ship demand is the number of ships required to serve LNG trade, calculated as follows:
  - The annual ship requirement is calculated for contracted and uncommitted LNG volumes
  - A 15% ‘trading allowance’ is included
- LNG ship demand is estimated to rise from ~300 ships in 2015 to ~600 by 2030 - a ~100% increase, compared to an LNG demand increase of ~80% over the same period
- The faster increase is due to the further increase in Atlantic Basin to Pacific Basin trade

Source: Poten & Partners
Our ship supply projection considers only existing ships and firm orders

- When assessing ship supply on a year by year basis into the future, the key following assumptions are applied:
  - Only existing ships and firm orders are considered
  - Ship utilisation rate is 345 days per year
  - Existing LNG ships are assumed withdrawn from service and scrapped after 40 years in service OR when charter term ends – whichever is later
  - Capacities are normalized to 160,000m³
  - A 15% “trading allowance” is included
New ships are required from 2019/2020 based on the fleet balance

- Based on the fleet balance the market does not require new ships until 2019/2020
- Longer-term, around 160 additional LNG ships are required by 2030 to meet rising demand and replace ageing ships

![LNG Ship Supply & Demand Forecast](chart)

**Additional LNG Ship Requirement**

![Source: Poten & Partners](chart)
LNG Fleet Supply-Demand Balance

Uncertainties, opportunities: the effects of disruption and optimization
Endogenous factors may impact the total shipping balance beyond new project requirements

• Replacement at a younger (or older) age than 40 years, or conversion

• Increase in re-exports, currently difficult to predict/forecast

• Change in the production assumption (unplanned maintenance, production above nameplate capacity)

• Mismatch between location of the ship and spot cargo requirements

• Change in trade route patterns assumptions (eg geographical cargo swaps)
Closure of LNG traffic choke points would materially affect the total shipping balance.

Source: Poten & Partners
Avoiding South China Sea could add an LNG shipping requirement of up to 30 ships by 2020

- Key route affected by unrest in South China Sea would be Qatar to Far East
- Alternative using Lombok and Makassar Straits adds ~1,000 nm each way, or ~2.5 extra days each way
- E.g. ~6,500 nm from Qatar to Tokyo via South China Sea vs ~7,500 nm via Lombok and Makassar Straits
Closure of Panama Canal could add an LNG shipping requirement of up to 40 ships by 2020

- Panama Canal expansion due to open in June this year
- Key route affected by Panama Canal closure would be US Gulf to Asia, hence the impact is more visible towards the end of the decade
- Alternative via Suez Canal – significant increase in distance
  
  - E.g. ~9,300 nm from US Gulf to Japan via Panama vs ~15,200 nm via Suez (avoiding High Risk Area), or ~15 extra days each way
Closure of Suez Canal could add an LNG shipping requirement of up to 60 ships by 2020

- Key route affected by Suez Canal closure in the future would be Qatar to Europe
- Alternative via Cape of Good Hope - significant increase in distance e.g. ~6,500 nm from Qatar to NW Europe via Suez vs ~12,500 nm via Cape of Good Hope (avoiding HRA), or ~15 extra days each way
  - Had Suez Canal been closed in the immediate aftermath of Fukushima, impact would have been by requirement for ~70 additional ships, due to a large number of intra-basins diversions

Source: Poten & Partners
Even when choke points can be transited, cost of shipping can be a major diseconomy of LNG

- Poten has looked specifically at South-East Asia, an obvious candidate for shipping optimization through cargo swaps
  - Historically a major exporter of LNG
  - In recent years, has also imported growing amounts of LNG to support its robust economic growth and associated power generation requirements
  - Despite continuing large LNG production within the region, LNG imports come from as far away as Trinidad

![Selected 2014 shipping costs to Southeast Asian countries](source: Poten & Partners)
The size of the prize is overwhelming

- Southeast Asia would have gained in ~US$200 million just in 2014 - almost the cost of a new LNG ship - had it maximized opportunities for cargo swaps within region.

- Devil is in the details and swaps initiative have been very limited to date by implementation issues.
  - Concerning liabilities for non-delivery or off-spec supply and negotiations over the calculation of the gains from optimization and the split of the same between counterparties have blocked the way to ‘yes.’

*Estimated potential savings from intra-regional LNG trade in Southeast Asia*

This $200 MM prize will only grow

*Calculated for Thailand, Malaysia, Singapore and Indonesia LNG imports

Source: Poten & Partners
A growing need, plenty of work still to be done

- Long-haul LNG trade is growing, largely as a result of US exports under construction
- LNG ship demand is projected to increase around 20% faster than LNG trade itself
- Long-haul trade is particularly exposed to disruption at shipping choke points
  - If choke points are closed, “normal” industry trading reserves of shipping capacity, around 15% of total, may be insufficient
- Even without choke point concerns, the high shipping cost for long-haul trade argues for optimization, e.g., through cargo swaps
  - Seizing the prize will require a new focus for the LNG industry, which has generally developed conservatively, from the individual venture up
  - Current industry conditions, reflecting severe drop in oil prices, may mean the time is ripe for change
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