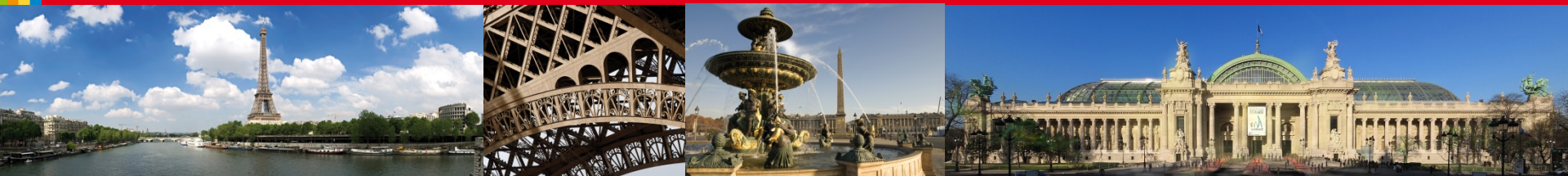


# 26<sup>th</sup> World Gas Conference

1 – 5 June 2015, Paris, France



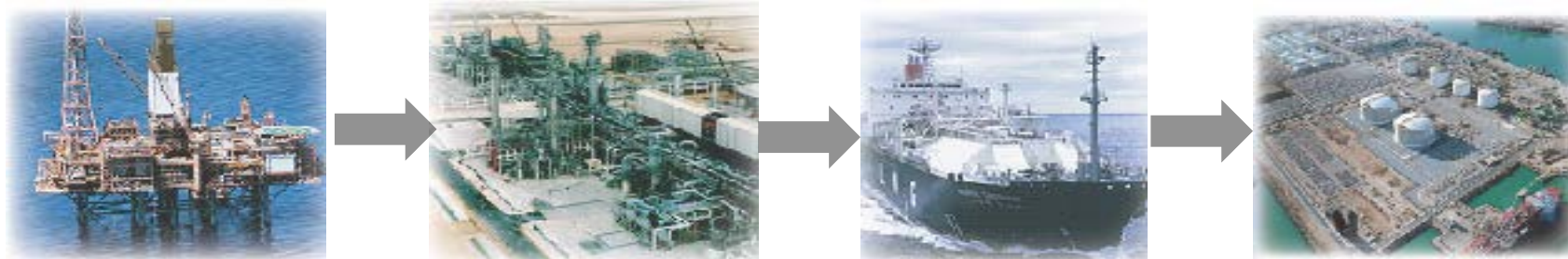
Small-Scale LNG Supply Chain  
Confronting the Diseconomies of Small-Scale LNG

Robert Chambers  
Merlin Advisors



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Covering the entire LNG value chain, from upstream to gas markets



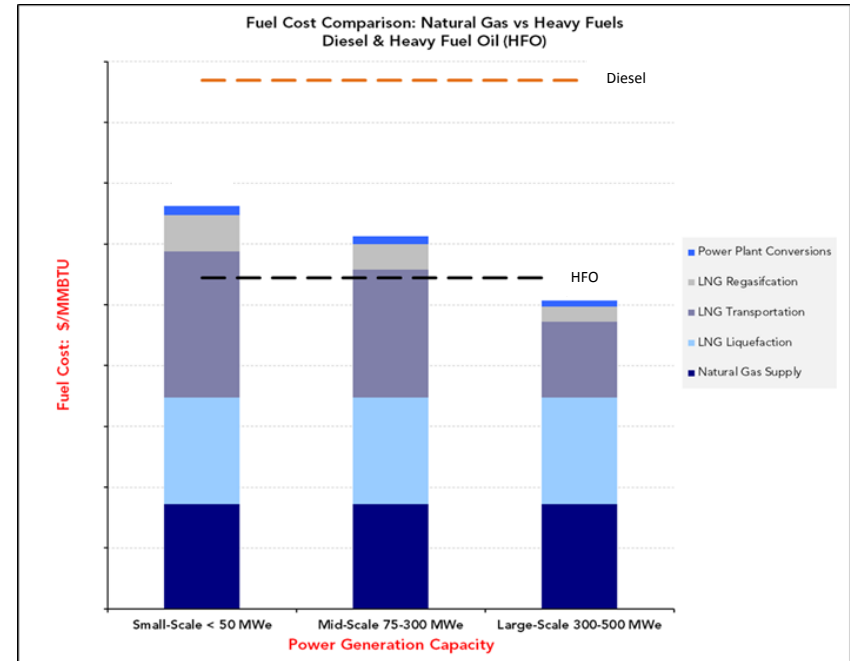
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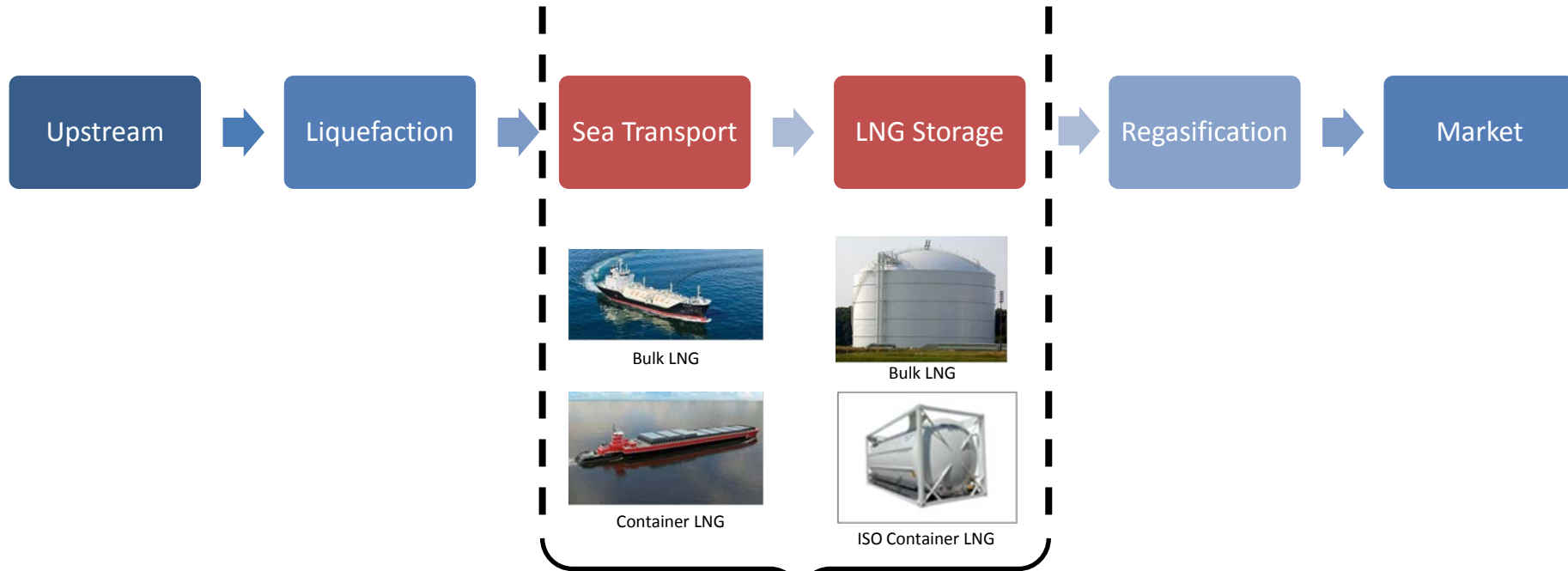
- Merlin Advisors is a wholly-owned affiliate of Poten & Partners
- Poten is the recognized leader in the energy and ocean transportation industries for over 60 years
- Provides strategic advisory services along the entire natural gas and LNG value chain
- Largest LNG advisory team in the world (over 40 LNG professionals in Houston, London, Singapore, Perth, and New York)
- Cover the entire natural gas and LNG value chain (Upstream, Liquefaction, Shipping, Regasification) for all major industry participants, across all functional disciplines (Technical, Due Diligence, Project Costs & Benchmarking, Markets, Commercial)

# Why investigate LNG viability in small-scale markets?

- Increasing interest in small-scale LNG as an alternative to heavier fuels
  - Economic Advantages....saves \$
  - Environmental Advantages....clean
  - Human Factors  
....provide power to remote markets
- However... remote and smaller markets present compatibility challenges with large-scale LNG projects
- So....how do we deliver LNG to small-scale markets as cost-effectively as possible?
- Solutions.....transportation choices



# Analysis focus: Transportation segments of supply chain



Transport segments drive differences in supply chain costs – focus of this presentation

# Where's the "break-point"?

## LNG supply analysis boundaries

- From LNG Storage (Supply)
- To LNG Storage (Regas)

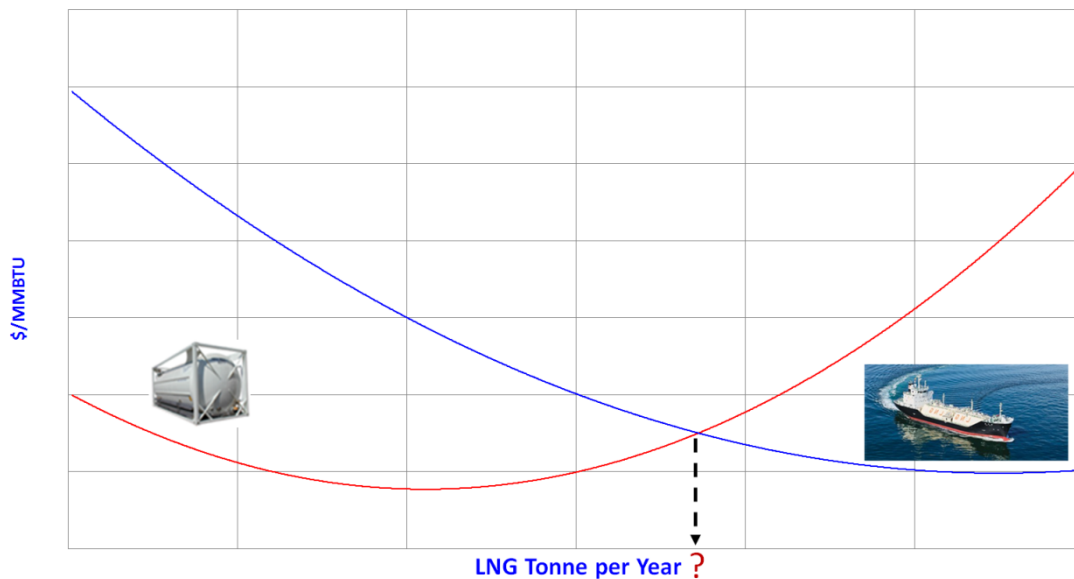
## Analysis assumptions

- LNG supply < 1.0 MMt/yr
- LNG source: US Gulf Coast
- LNG market: Caribbean
- Container shipping: 100, 200, 350 TEU barges
- Bulk shipping: 10,000 m<sup>3</sup>, 20,000 m<sup>3</sup> LNG carriers
- Container capacity: ISO-40
- Truck capacity: 40 m<sup>3</sup>

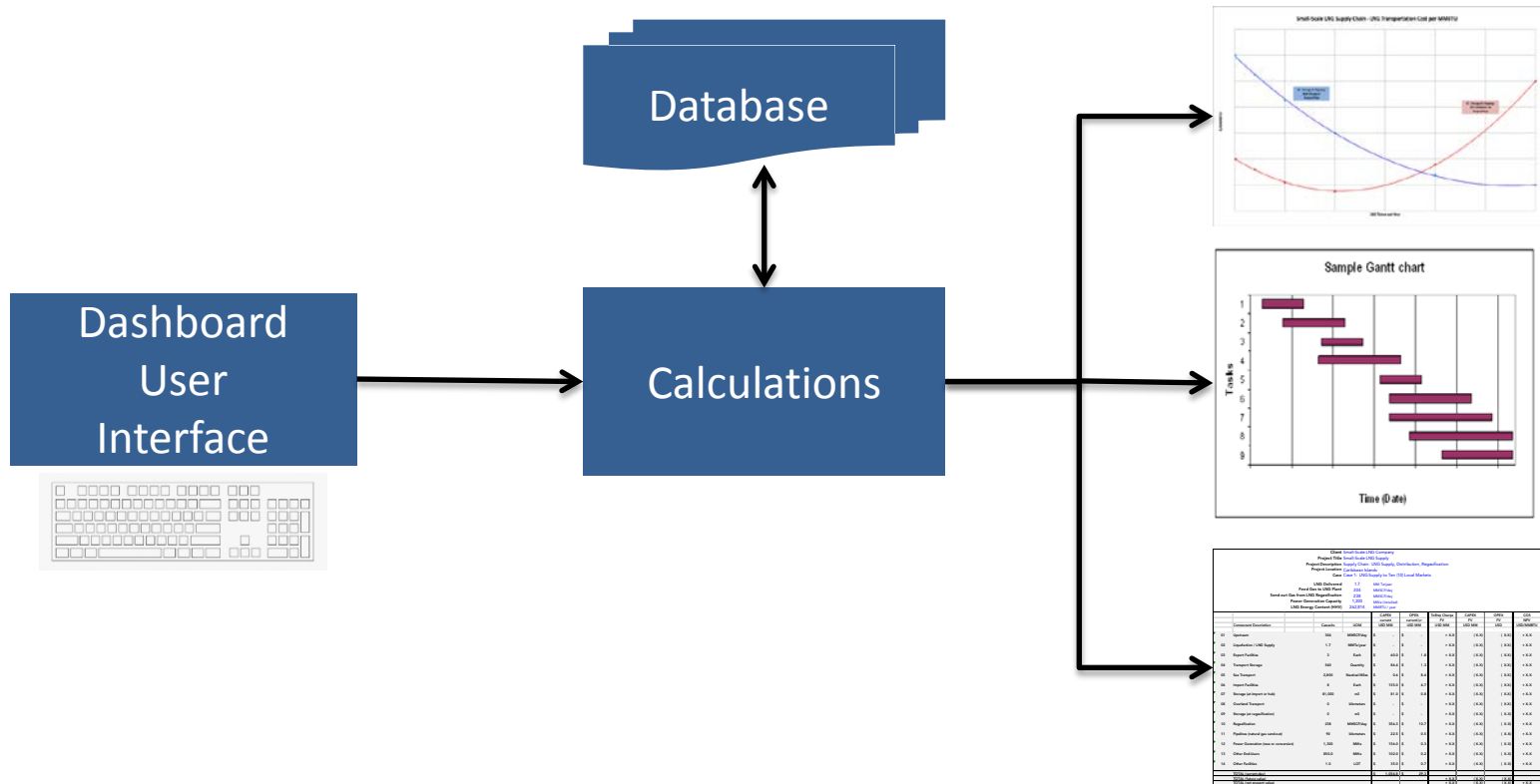
## Comparison measurement basis

- Unit costs (\$/MMBTU)

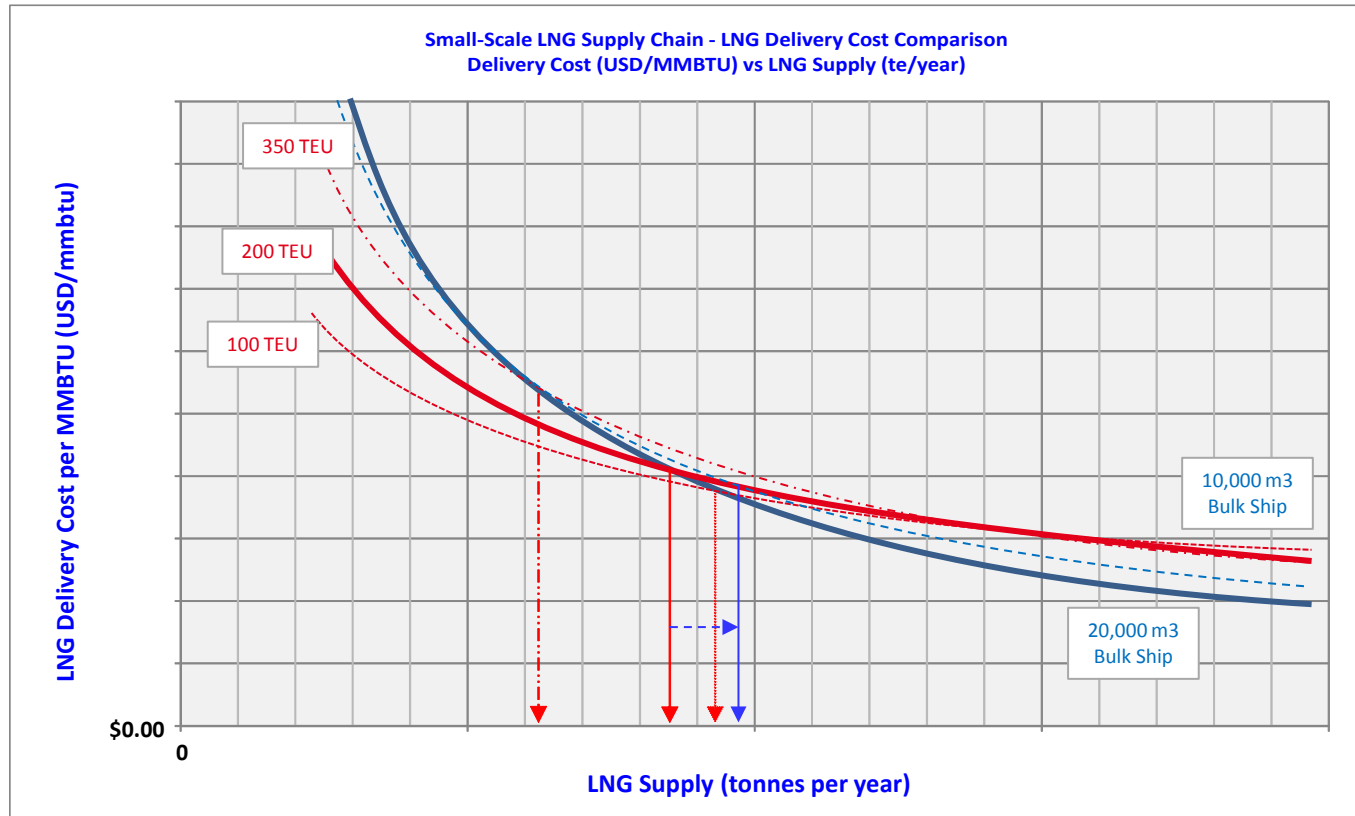
Small-Scale LNG Supply Chain - LNG Transportation Cost per MMBTU



# Supply Chain Model evaluates multiple options



# Break-Point moves with container barge size; ship capacity



# Many challenges besides supply chain economics

## Challenges

## Recommendations

Operational & safety risks; Heat leak;  
Health, Safety, and Environment (HSE)

Develop quality personnel; assess & upgrade Infrastructure; HSE top priority

Reliable small-scale LNG supply

Closer supply-demand collaboration;  
LNG supply diversification

Small-scale industry remains in infancy  
Demand growth with limited expertise

Early project evaluation, study, planning  
Utilize industry expertise & experience

Shipping availability, schedules, control  
(containerized & bulk)

Plan and budget for time-charters rather than scheduled carriers

LNG containers – proven product  
availability & manufacturing capacity

Planning, purchase commitments, supply diversification, lease options



# Conclusions

- Evolving transportation solutions are addressing some of the diseconomies facing small-scale supply chains
- When comparing containerized transportation vs bulk LNG shipping:
  - Containerized transportation is most economical solution for smallest supply chain capacities
- Overall, the economics look promising:
  - Small-scale LNG-based natural gas supply is competitive against diesel fuel for power generation
- However, economics are not the whole story.....

# Merlin Advisors

*Commercially-focused technical advisory to the LNG and process industries*

- *Technology evaluation*
- *Capital cost estimating*
- *Project feasibility and economics*
- *Project risk*
- *Benchmarking*
- *Project due diligence*
- *Owner's engineering*



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