

26th World Gas Conference

1 – 5 June 2015, Paris, France



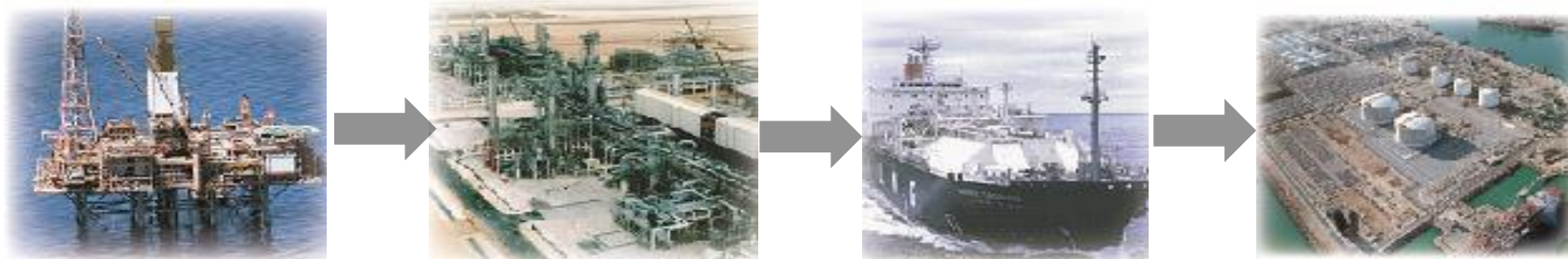
Small-Scale LNG Supply Chain
Confronting the Diseconomies of Small-Scale LNG

Robert Chambers
Merlin Advisors



Merlin Advisors – Global Leader for LNG Advisory Services

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



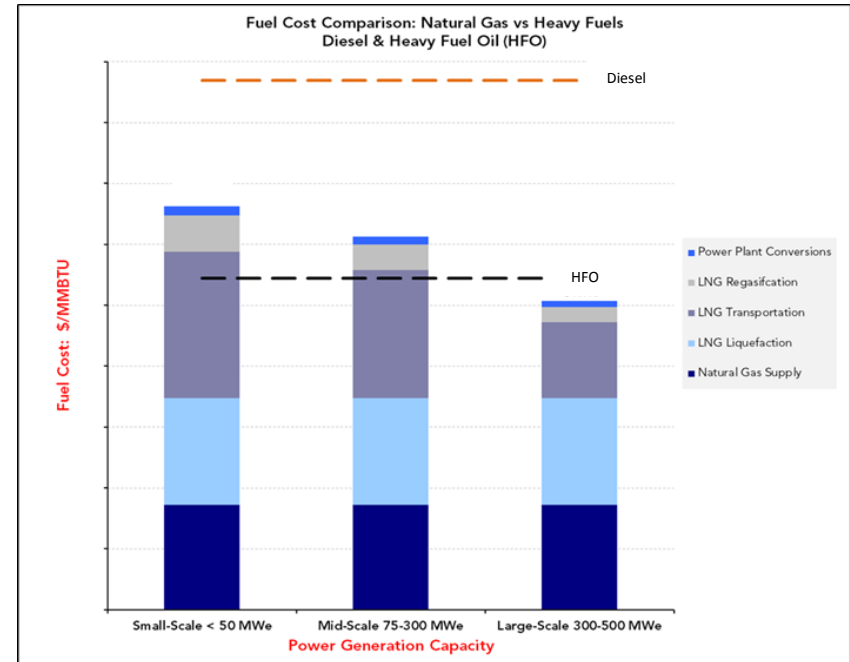
www.merlinadvisors.com

www.poten.com

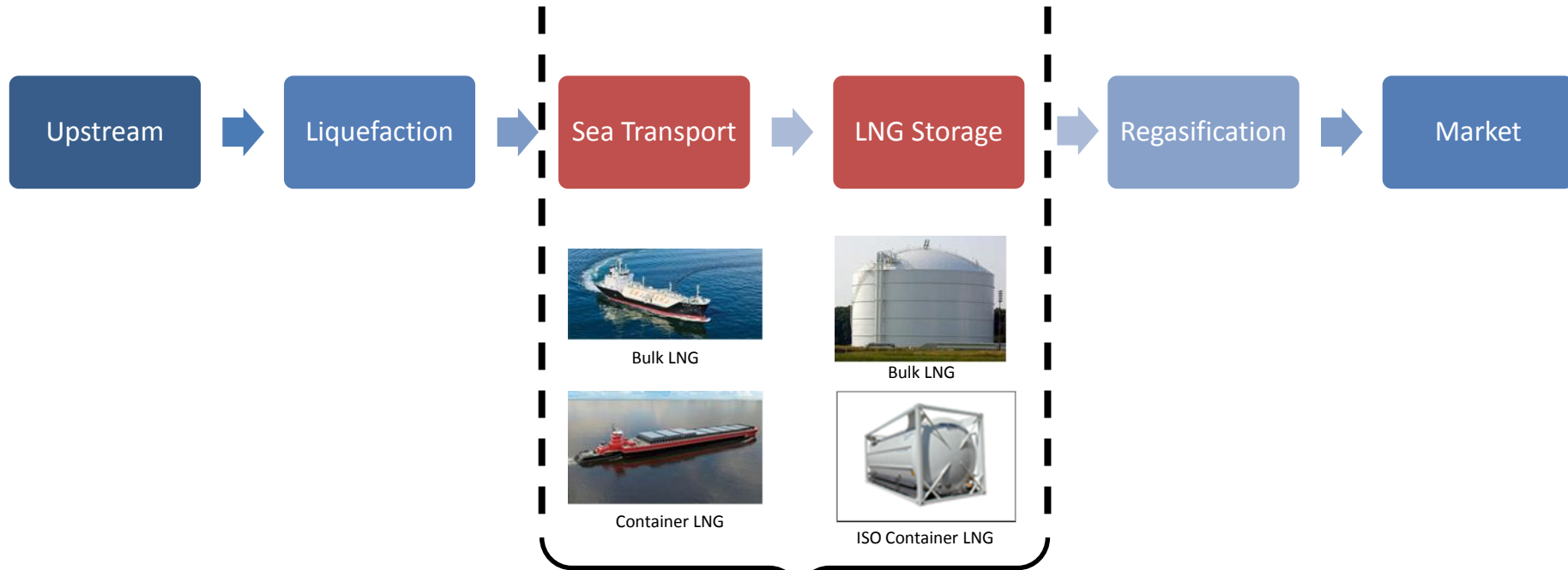
- Merlin Advisors is a wholly-owned affiliate of Poten & Partners
- Poten is the recognized leader in the energy and ocean transportation industries for over 60 years
- Provides strategic advisory services along the entire natural gas and LNG value chain
- Largest LNG advisory team in the world (over 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)

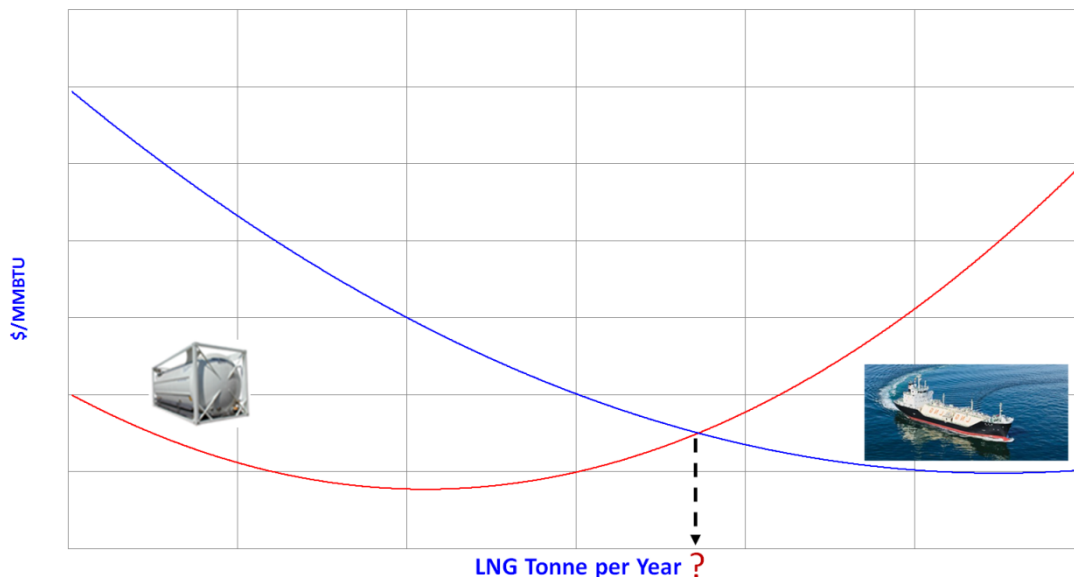
Analysis assumptions

- 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 m³, 20,000 m³ LNG carriers
- Container capacity: ISO-40
- Truck capacity: 40 m³

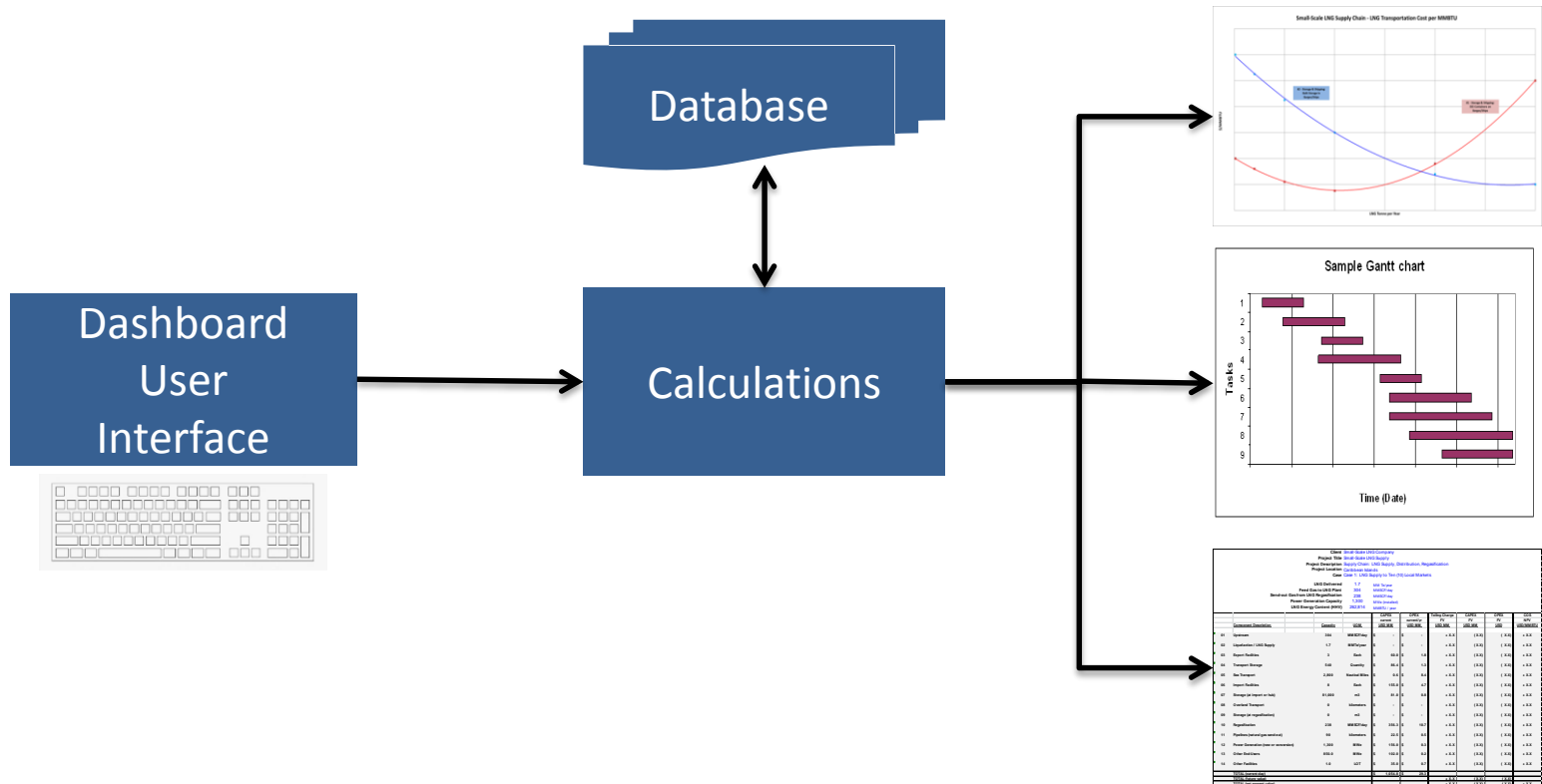
Comparison measurement basis

- Unit costs (\$/MMBTU)

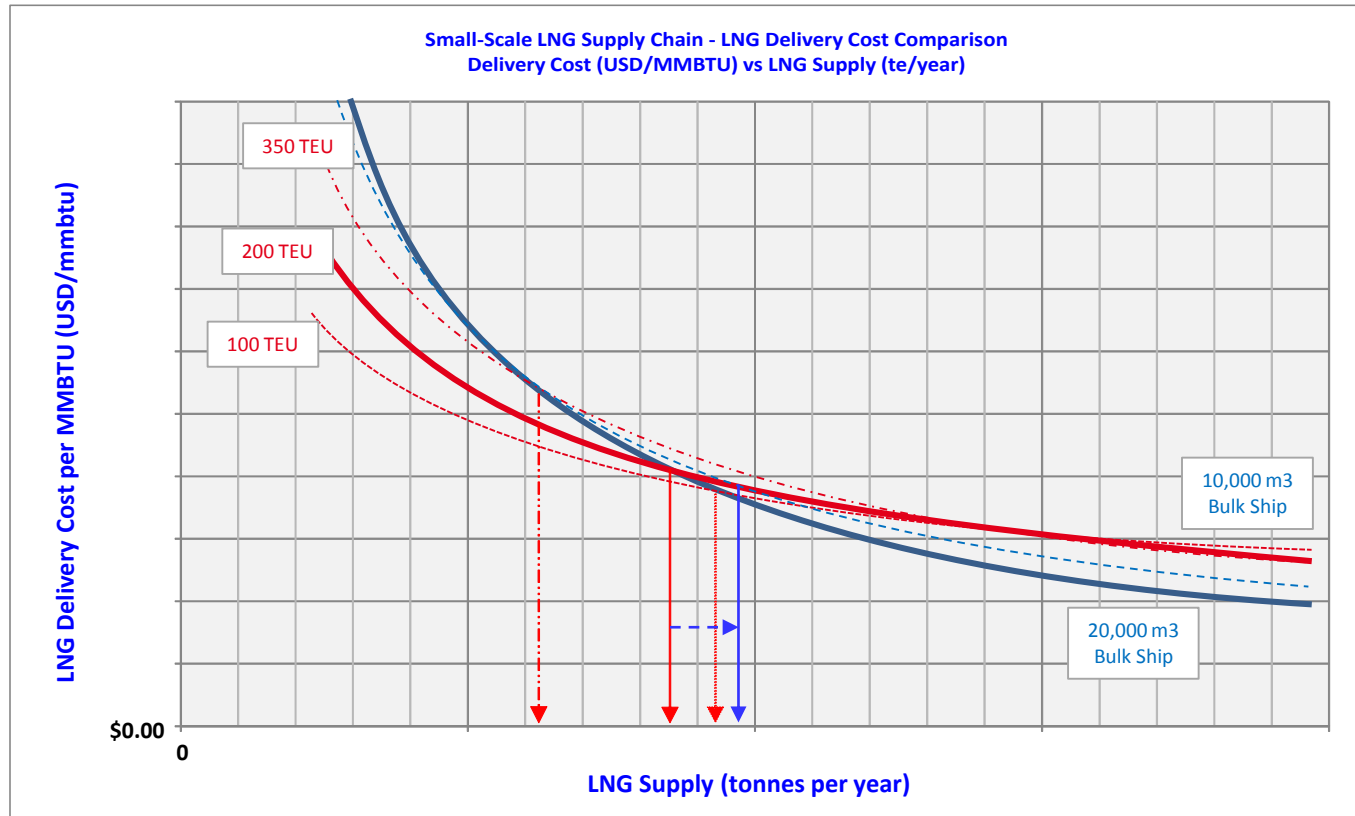
Small-Scale LNG Supply Chain - LNG Transportation Cost per MMBTU



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*



HOUSTON

LONDON

NEW YORK

PERTH

SINGAPORE

AMERICAS

5847 San Felipe, Suite 800
Houston, TX 77057

Contact: Ilmars Kerbers
+1 713.344.2376
ikerbers@merlinadvisors.com

LONDON

101 Wigmore Street
London W1U 1QU

Contact: Raj Gopal
+44 20 3747 4819
rgopal@merlinadvisors.com

www.merlinadvisors.com