

*Confidential Multi-Client Study*

# Micro-, Small-, and Mid-Scale LNG in North America



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# Outline

- ▶ **Prospectus**

- ▶ Sample Pages

# Four key drivers are enabling new growth and interest in the micro-, small-, and mid-scale LNG market in North America

1

## Cheap and abundant gas supply

- Large supply of natural gas from North American unconventional plays
- Flaring in plays such as Bakken and Eagle Ford is leading to new regulations and demand for small-scale, modular gas monetization options
- Low gas price through the next 15 years will enable cost-effective LNG

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## New demand segments and regional markets

- New and growing interest for LNG use in various demand segments including marine, heavy-duty trucking, rail, high-horsepower industrial equipment, etc.
- Maturing regional economies in the Caribbean and Central America that could be optimally served through small-scale LNG plants

3

## Structural changes in LNG markets

- Growing adoption of LNG in emerging economies is driving interest in LNG procurement in smaller volumes over shorter periods at lower prices ...
- ... Without relying on traditional long-term sales and purchase agreements due to new LNG buyers' lack of creditworthiness driving interest in small- and mid-scale LNG

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## New and improved technologies

- New technologies have helped reduce the size, scale, and cost of liquefaction plants enabling more players an opportunity to consider LNG investments
- Other emerging technologies in the supply and end-user segments will facilitate further growth in small-scale LNG markets

# This study will address several questions around the small-scale LNG value chain ...

<b>A</b> <b>Demand</b>	<ul style="list-style-type: none"><li>▪ What are the key drivers for small- and mid-scale LNG demand?</li><li>▪ Where is LNG most competitive with diesel: marine, trucking, rail, or HHP?</li><li>▪ Can new business models tackle barriers to small-scale LNG demand growth?</li><li>▪ How will small- and mid-scale LNG demand evolve in a low-oil price scenario?</li></ul>
<b>B</b> <b>Supply</b>	<ul style="list-style-type: none"><li>▪ What and where is the existing supply from small- and mid-scale LNG plants?</li><li>▪ How much new small- and mid-scale LNG capacity is expected through 2025?</li><li>▪ What markets and end-use segments are current and new plants serving?</li><li>▪ Who are the players in small/mid-scale LNG and how are they positioned?</li></ul>
<b>C</b> <b>Economics and Infrastructure</b>	<ul style="list-style-type: none"><li>▪ Where is current and future small- and mid-scale LNG infrastructure located?</li><li>▪ How competitive are the costs and economics of existing and new plants?</li><li>▪ What projects are coming online and what demand segments will they serve?</li><li>▪ Will there be linkages between small-, mid-, and large-scale LNG projects?</li></ul>
<b>D</b> <b>Technology</b>	<ul style="list-style-type: none"><li>▪ What liquefaction technologies are used in small- and mid-scale plants?</li><li>▪ Who are the major manufacturers of small- and mid-scale LNG technology?</li><li>▪ What new technologies are emerging in small- and mid-scale LNG? Impacts?</li><li>▪ What are the costs and economics associated with different technologies?</li></ul>

# ... Through a structured and comprehensive report reflected in the proposed “Table of Contents”

1	Demand	<ul style="list-style-type: none"><li>▪ Drivers of small/mid-scale LNG demand in North America and globally</li><li>▪ LNG demand by segment in marine, rail, trucking, HHP, and other uses</li><li>▪ LNG export opportunities to regional economies in North/South America</li></ul>
2	Supply	<ul style="list-style-type: none"><li>▪ Current and forecasts of LNG supply through 2025 by region</li><li>▪ Existing and upcoming supply infrastructure by location and volume</li><li>▪ New supply models to serve economies in North/South America</li></ul>
3	Infrastructure	<ul style="list-style-type: none"><li>▪ Regional and play-wise look at small- and mid-scale LNG infrastructure</li><li>▪ Linkages with availability of feedstock gas and demand segments</li><li>▪ Regional export infrastructure including transport and shipping models</li></ul>
4	Costs, Economics, and Pricing	<ul style="list-style-type: none"><li>▪ Costs and economics of switching to LNG in various demand segments</li><li>▪ Costs and economics of micro-, small-, and mid-scale LNG supply</li><li>▪ Price forecasts and mechanisms by region and demand segment</li></ul>
5	Projects and Players	<ul style="list-style-type: none"><li>▪ LNG supplier and end-user company profiles and market strategies</li><li>▪ Profiles and benchmarking of existing and upcoming projects</li><li>▪ Project feedstock sourcing and LNG product off-take strategies</li></ul>
6	Technology and Regulatory	<ul style="list-style-type: none"><li>▪ Equipment manufacturer company profiles and strategies</li><li>▪ Current and emerging technology profiles with costs and economics</li><li>▪ State and federal regulations and impacts on small- and mid-scale LNG</li></ul>

# Our study offers a wide range of coverage and content offering various benefits to different subscribers

## Coverage and Content

### Markets

- ▶ Supply / demand
- ▶ End-use markets
- ▶ Project tracking / benchmarking
- ▶ Pricing

### Players

- ▶ Operators
- ▶ Equipment vendors
- ▶ Tech. licensors
- ▶ Investors
- ▶ Competitive landscape
- ▶ Market shares
- ▶ Portfolio strategy
- ▶ Start-ups

### Economics

- ▶ Capital costs
- ▶ Operating costs
- ▶ Project economics
- ▶ Industry spend
- ▶ Cost of supply
- ▶ Regional variations

### Policy

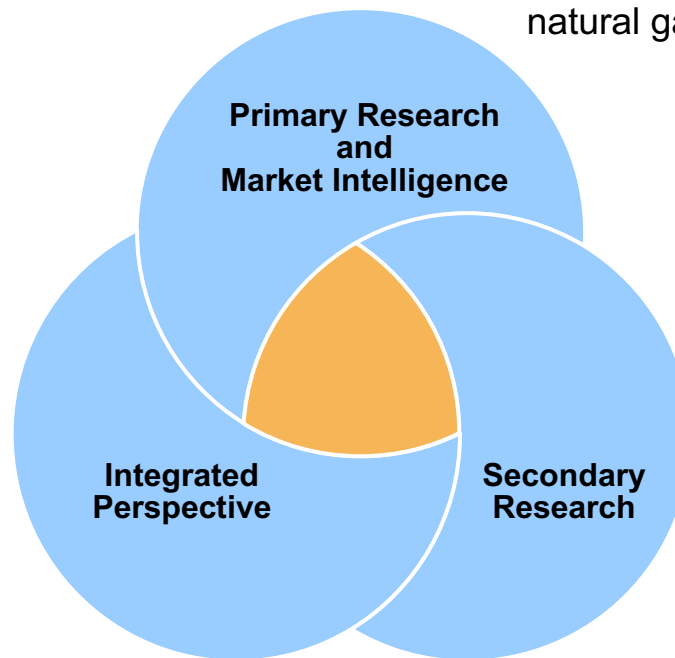
- ▶ State flaring regulations
- ▶ Export approvals
- ▶ Other regulations
- ▶ Scenario planning

## Study Deliverables

- ▶ In-depth report (~150 pages)
- ▶ Executive summary
- ▶ Key project profiles
- ▶ Key technology assessments
- ▶ Key stakeholder / player profiles
- ▶ Interim review conference call
- ▶ Final review workshop in Houston
- ▶ All subscribers have the opportunity to shape research agenda and content of deliverables

# The study combines proprietary analytics, authentic market intelligence, and rigorous research in the LNG sector ...

**Primary research** through first-hand interviews with operators, investors, market players, and field staff brings authentic market intelligence across all natural gas monetization markets



Unique, **holistic coverage** of all natural gas monetization options that provide subscribers with **an integrated view** of natural gas demand

**Secondary research** covering literature, open and proprietary data sets, SEC filings, company presentations, news, and government reports

# ... Executed by the ADI team which brings extensive experience and deep expertise in global LNG markets



**Uday Turaga**

*Industry and consulting experience of 18 years at ConocoPhillips and Booz. Led 200+ strategy projects in oil, gas, energy, and chemicals. PhD and MBA.*



**Vis Viswanathan**

*Industry and consulting experience of 35 years at ConocoPhillips, Albemarle, CB&I, and Nexant. Deep oil, gas, and chemical ops and tech expertise. PhD.*



**Swetha Sivaswamy**

*Extensive oil, gas, energy, and chemical consulting experience at KPMG and Frost & Sullivan. MS and BS in chemical engineering.*



**Faiza Tanvir**

*Supported multiple consulting projects in oil, gas, energy, and chemicals with primary and secondary research, analysis, and modeling. BS.*



**Brandon Johnson**

*Lead analyst on market research and tech assessment for energy equipment. Supported multiple consulting projects and research deliverables. BS.*



**Palak Puri**

*Upstream and downstream oil and gas consulting and M&A experience. MS in petroleum engineering. BS in chemical engineering.*



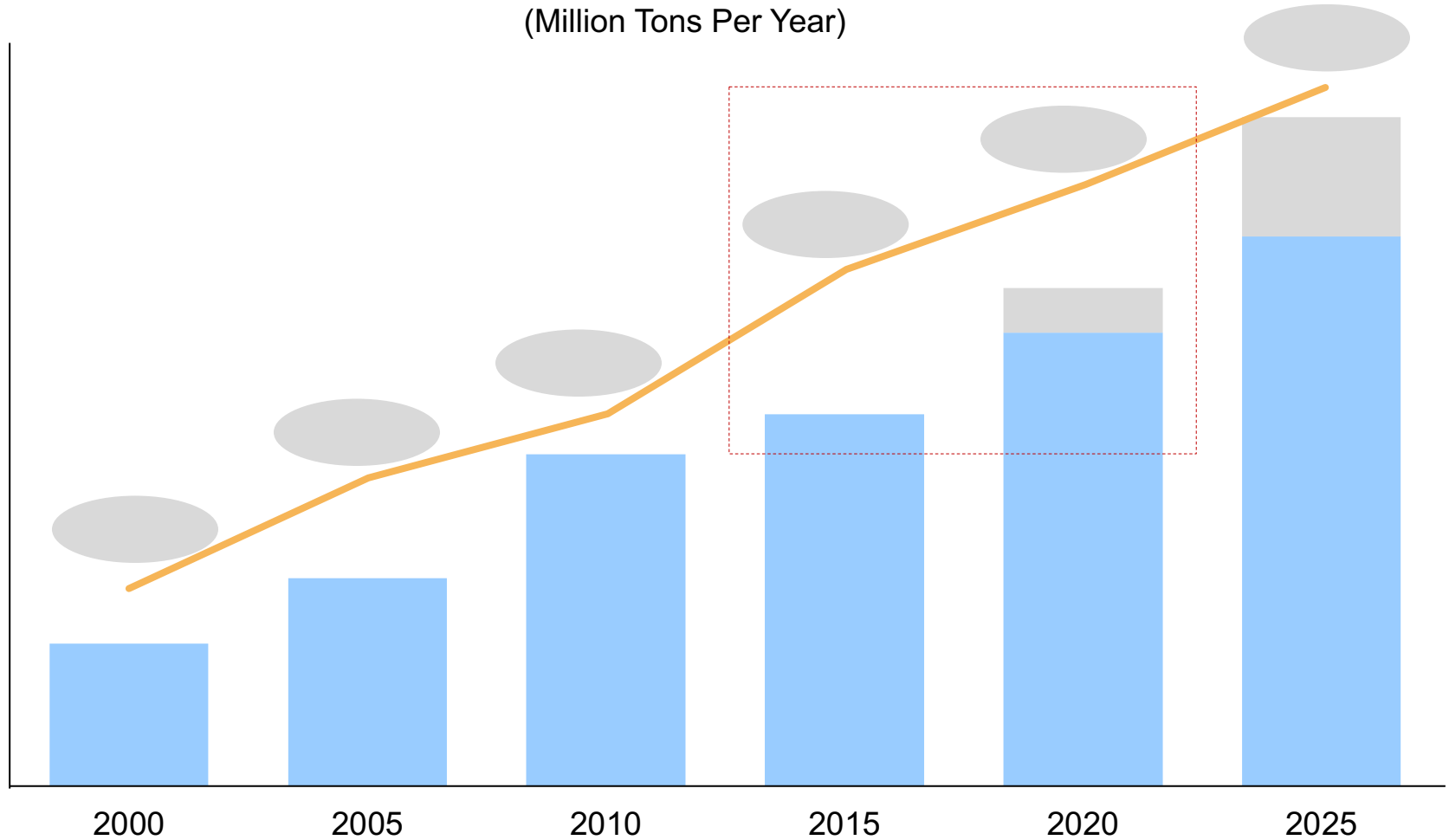
# Outline

▶ Prospectus

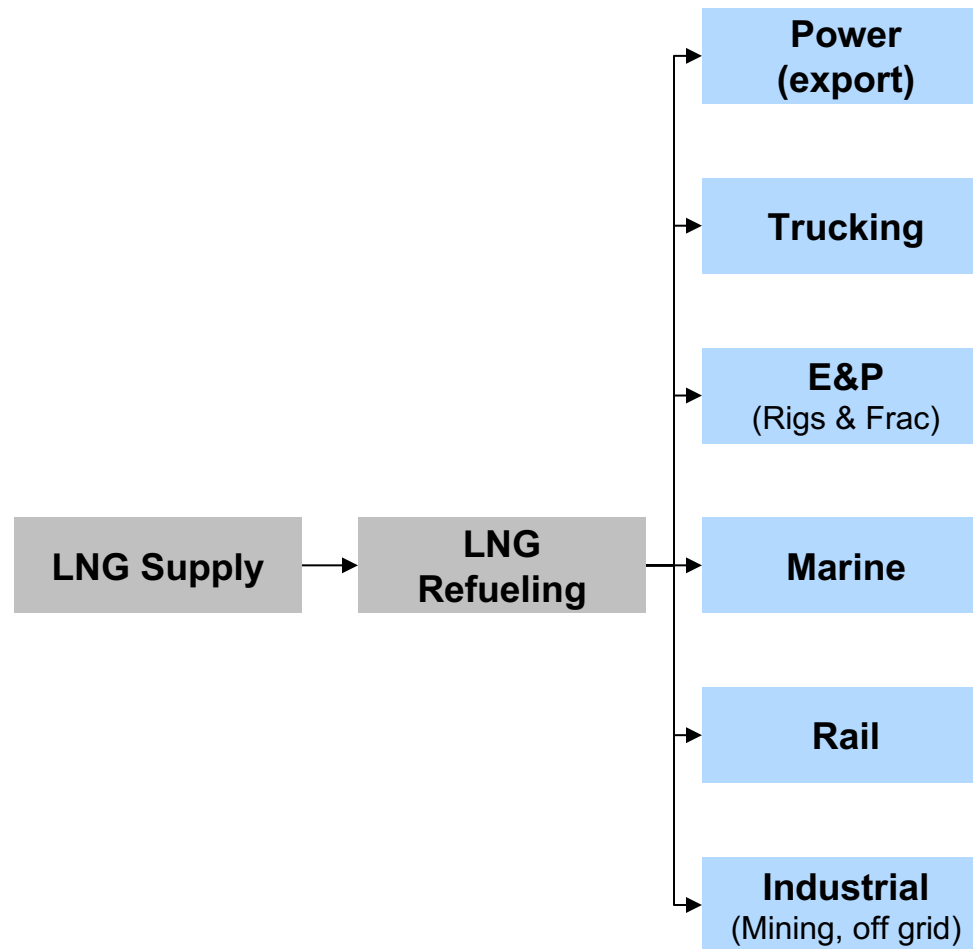
▶ **Sample Pages**

# Even so, global LNG market is oversupplied as demand growth has slowed but new supply has grown dramatically

Worldwide LNG Demand and Supply  
(Million Tons Per Year)

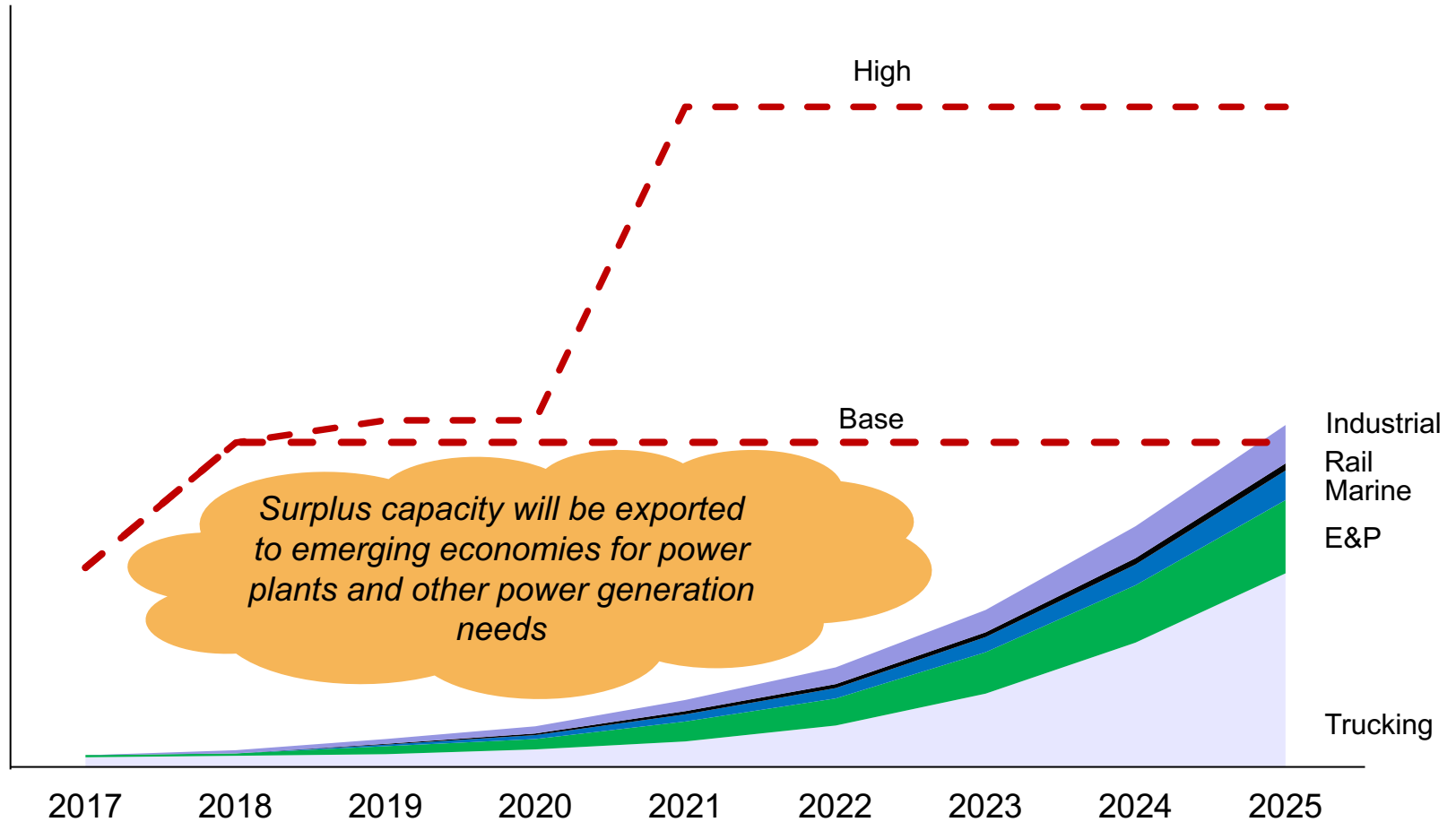


# Six segments drive demand for LNG from small- and mid-scale facilities and our study models each of them



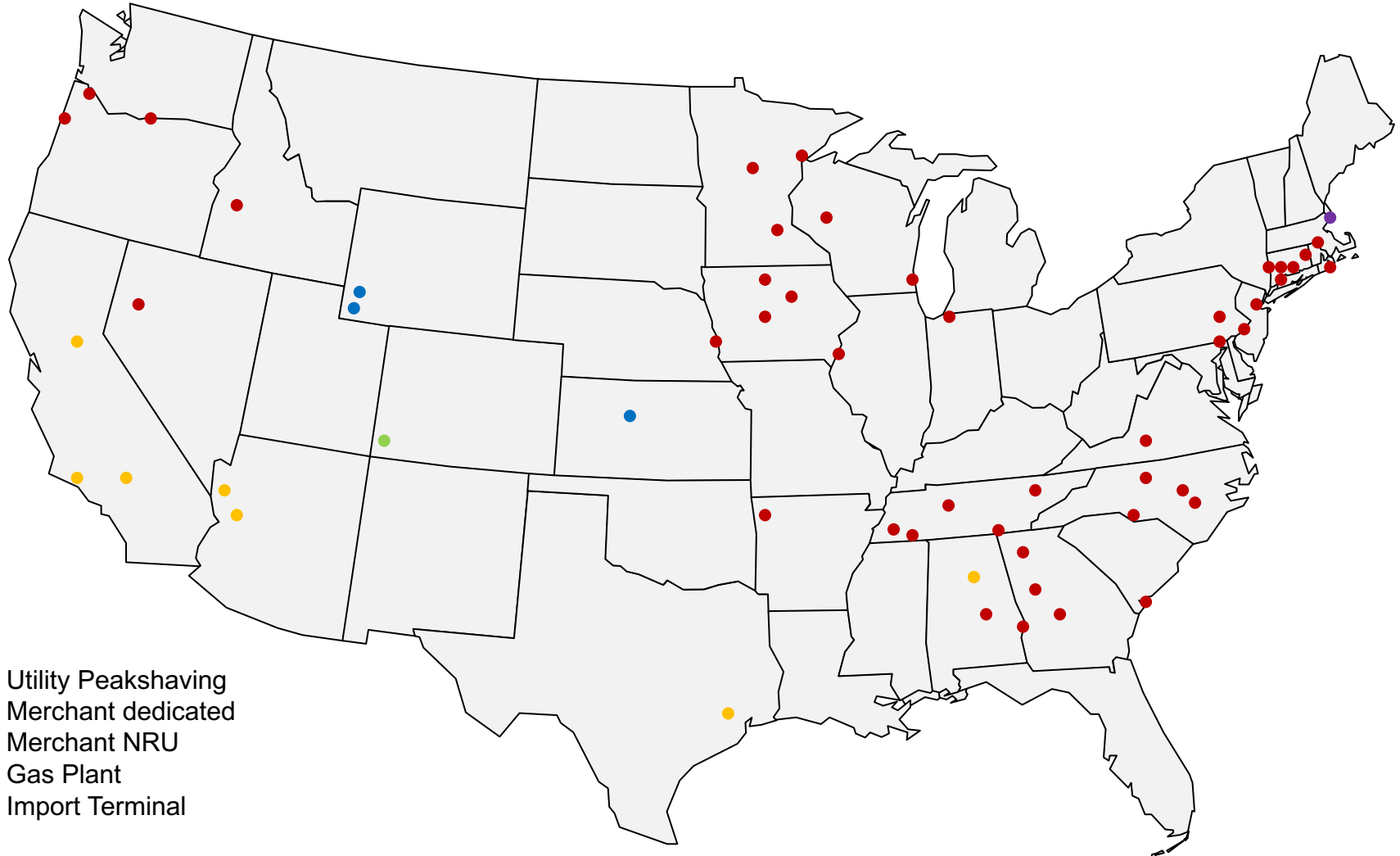
... Far exceeds demand from new applications in the base case thus leaving most of the new plants to serve ...

U.S. LNG Demand\* and Supply  
(Million Gallons Per Year)



\* Demand in the chart refers to the base case demand

# There are many LNG supply sources -- mainly peak shaving units -- across the U.S. but few can meet emerging needs



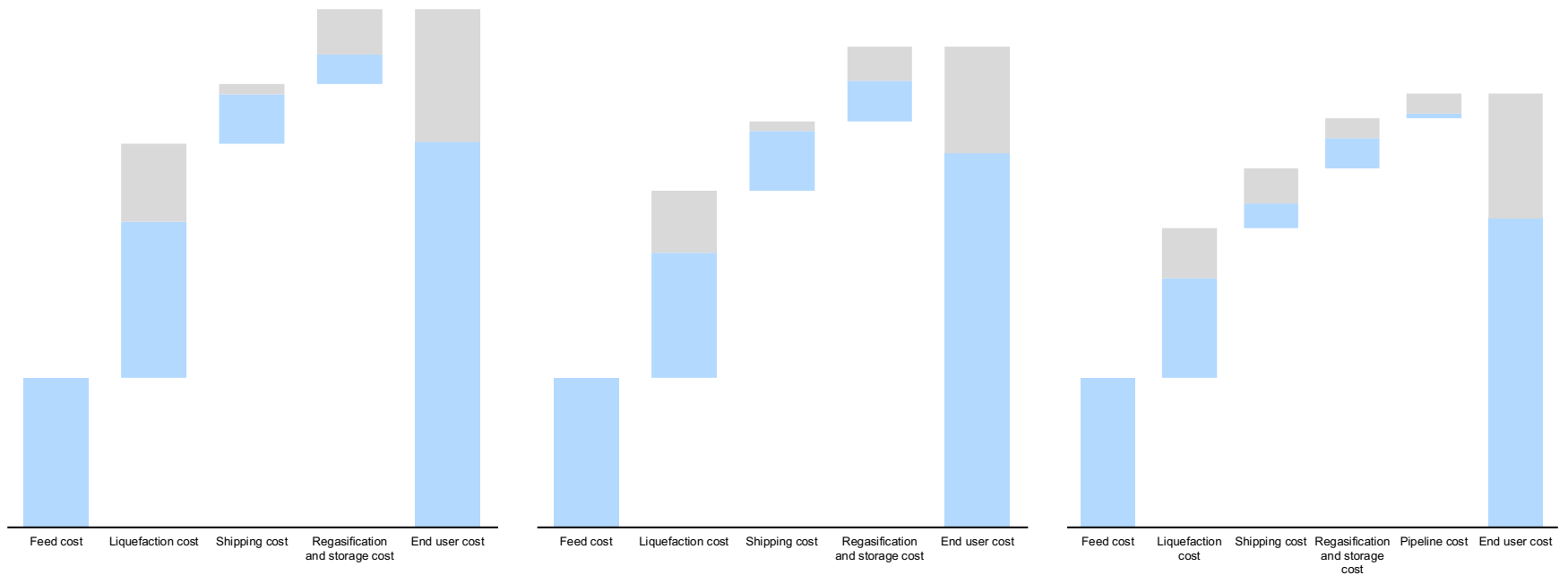
Utility Peakshaving  
Merchant dedicated  
Merchant NRU  
Gas Plant  
Import Terminal

# Small scale LNG tends to be more expensive than a mid- or large - scale because of high cost of liquefaction

**LNG Cost - Small-scale**  
(USD Per Million Btu)

**LNG Cost – Mid-scale**  
(USD Per Million Btu)

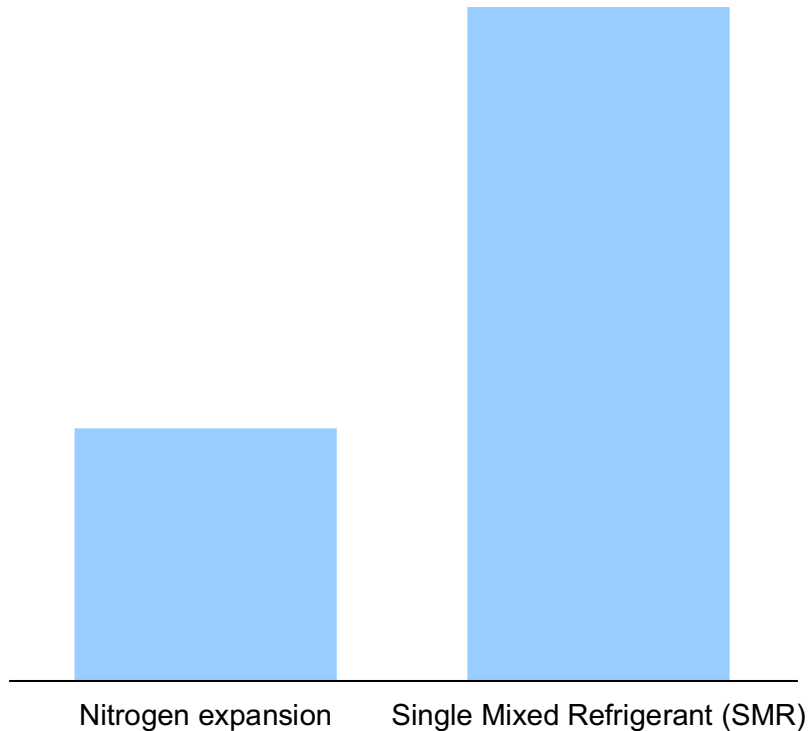
**LNG Cost – Large-scale**  
(USD Per Million Btu)



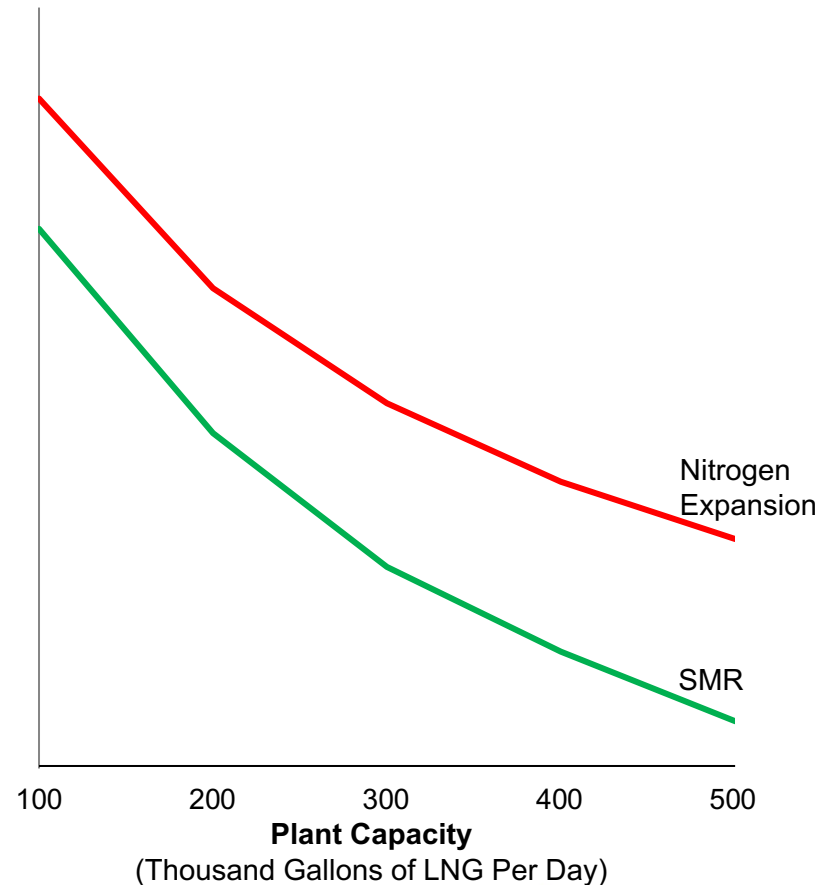
■ Low ■ High

# Licensors are continuously trying to differentiate themselves with single mixed refrigerants claiming higher efficiencies

**LNG Process Cycle Efficiency**  
(Percentage)



**Unit Production Cost**  
(USD Per Gallon LNG)





# ADI Analytics

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