Oil and Gas: LNG at the Crossroads

Andrew Slaughter
Executive Director | Center for Energy Solutions
Deloitte Services LP

George Given
Senior Manager
Deloitte MarketPoint LLC

Jai Gopal
Specialist Leader
Deloitte MarketPoint LLC
LNG at the Crossroads

- Global LNG landscape
- LNG infrastructure and capacity
- LNG in the future
- Getting from here to there – Follow the blue brick road
Global LNG landscape
LNG resources at Deloitte
LNG is...

• A global commodity – liquid fuel; Derived from natural gas, a local commodity

• Commercial shipping began as early as 1960

• Monetization of a trapped gas supply to reach markets far and beyond pipeline destinations

• Clean as natural gas but cleaner than oil and coal

• Gaining traction as a fuel of choice globally
The typical LNG life cycle

Infrastructure to get gas from rock pore to burner tip

Natural gas is produced at the wellhead, transported via gathering pipelines and processed to remove NGLs and other impurities and then piped to a LNG plant for liquefaction.

Gas is pressurized and cooled to -260 °F to a liquid form, taking up less than 1/600th of the original volume.

Liquefied gas is loaded onto specialized vessels or ‘LNG tankers’ and shipped to destination.

At destination, re-gasification facility converts LNG back into gaseous form.

Gas is exported via pipelines to end-use markets for res-com, industrial, and gas-fired power plants for final consumption.
LNG market has been growing rapidly

Source: Deloitte MarketPoint
LNG markets

• LNG competes with coal in most regions and mostly for electricity generation
• LNG also competes with piped gas in many domestic regions
• Shipping fleets are expected to favor LNG over bunker fuel
• Global environmental push can push LNG demand
• FLNGs and FSRUs are projected to complement large facilities and promote LNG distribution to local demand centers
• FLNGs are proliferating and opening new markets, but the future of LNG looks quite challenging for the next 10 years
• Global LNG pricing is more competitive with gas prices except in Asia which is slowly changing
• Henry Hub (HH) (and other hubs) gas-linked LNG prices are getting more prevalent

FLNG: Floating Liquefied Natural Gas Unit
FSRU: Floating Storage and Regasification Unit
Surprises

• Low cost feed gas is a big driver behind LNG supply development making it competitive compared to other fuels

• Technology in liquefaction, regasification and shipping again lower the high capital investments across the LNG landscape

• Increase in natural gas reserves in the US and in many other regions is another ‘surprise’ that makes LNG an economical commodity

• Excess LNG liquefaction capacity tend to suppress LNG prices which further enhances LNG consumption

Given these opportunities, it would be no surprise that LNG demand grows over the future and could become the leading fuel from a global perspective
Disruptions

• Excess global liquefaction capacity may likely pose a significant threat to LNG prices

• Growth in renewables on a global scale may likely erode LNG demand

• Continued indexation to oil could make LNG prices more volatile compared to gas market prices and thus disrupt markets

• Increased pipeline supply and domestic gas production may likely erode demand for LNG

Given these threats, there is ample reason for a disruptive LNG market to raise significant questions on what the industry can do to survive and thrive
LNG on a global scale

• 250 mtpa LNG was traded globally in 2015
• 75 mtpa LNG traded on spot basis in 2015
• 300 mpta of LNG liquefaction capacity
• 760 mpta of LNG regasification capacity
• 410 LNG shipping vessels
• Proposed liquefaction capacity is ~900 mtpa

Source: Deloitte MarketPoint
North America approved import and export terminals

Import Terminals

U.S.
- APPROVED - UNDER CONSTRUCTION - FERC
  1. Corpus Christi, TX: 0.4 Bcf/d (Cheniere – Corpus Christi LNG) (CP12-507)
- APPROVED – NOT UNDER CONSTRUCTION - FERC
  2. Sallinas, PR: 0.6 Bcf/d (Aguirre Offshore GasPort, LLC) (CP13-193)
- APPROVED – NOT UNDER CONSTRUCTION - MARAD/Coast Guard
  3. Gulf of Mexico: 1.0 Bcf/d (Main Pass McMoran Exp.)
  4. Gulf of Mexico: 1.4 Bcf/d (TORP Technology-Bienville LNG)

Export Terminals

U.S.
- APPROVED - UNDER CONSTRUCTION - FERC
  5. Sabine, LA: 2.1 Bcf/d (Cheniere/Sabine Pass LNG) (CP11-72 & CP14-12)
  6. Hackberry, LA: 2.1 Bcf/d (Sempra–Cameron LNG) (CP13-25)
  7. Freeport, TX: 1.8 Bcf/d (Freeport LNG Dev/Freeport LNG Expansion/FLNG Liquefaction) (CP12-509)
  8. Cove Point, MD: 0.82 Bcf/d (Dominion–Cove Point LNG) (CP13-113)
  9. Corpus Christi, TX: 2.14 Bcf/d (Cheniere – Corpus Christi LNG) (CP12-507)
  10. Sabine Pass, LA: 1.40 Bcf/d (Sabine Pass Liquefaction) (CP13-552)
- APPROVED – NOT UNDER CONSTRUCTION - FERC
  11. Lake Charles, LA: 2.2 Bcf/d (Southern Union – Lake Charles LNG) (CP14-120)
  12. Lake Charles, LA: 1.08 Bcf/d (Magnolia LNG) (CP14-347)
  13. Hackberry, LA: 1.41 Bcf/d (Sempra - Cameron LNG) (CP15-560)
  14. Elba Island, GA: 0.35 Bcf/d (Southern LNG Company) (CP14-103)

Canada
- APPROVED – NOT UNDER CONSTRUCTION
  15. Port Hawkesbury, NS: 0.5 Bcf/d (Bear Head LNG)
  16. Kitimat, BC: 3.23 Bcf/d ( LNG Canada)
  17. Squamish, BC: 0.29 Bcf/d (Woodfibre LNG Ltd)

* Trains 5 & 6 with Train 5 under construction

North America proposed export terminals

As of June 2, 2016

PROPOSED TO FERC
Pending Applications:
1. Sabine Pass, TX: 2.1 Bcf/d (ExxonMobil – Golden Pass) (CP14-517)
2. Pascagoula, MS: 1.5 Bcf/d (Gulf LNG Liquefaction) (CP15-521)
3. Freeport, TX: 0.34 Bcf/d (Freeport LNG Dev) (CP15-518)
5. Brownsville, TX: 0.55 Bcf/d (Texas LNG Brownsville) (CP16-116)
6. Brownsville, TX: 3.6 Bcf/d (Rio Grande LNG – NextDecade) (CP16-454)

Projects in Pre-filing:
7. Plaquemines Parish, LA: 1.07 Bcf/d (CE FLNG) (PF13-11)
8. Plaquemines Parish, LA: 0.30 Bcf/d (Louisiana LNG) (PF14-17)
9. Robinston, ME: 0.45 Bcf/d (Kestrel Energy – Downeast LNG) (PF14-19)
10. Jacksonville, FL: 0.075 Bcf/d (Eagle LNG Partners) (PF15-7)
11. Brownsville, TX: 0.94 Bcf/d (Annova LNG Brownsville) (PF15-15)
12. Port Arthur, TX: 1.4 Bcf/d (Port Arthur LNG) (PF15-18)
13. Freeport, TX: 0.72 Bcf/d (Freeport LNG Dev) (PF15-25)
14. Corpus Christi, TX: 1.4 Bcf/d (Cheniere – Corpus Christi LNG) (PF15-26)
15. Plaquemines Parish, LA: 2.80 Bcf/d (Venture Global LNG) (PF15-27)
17. Cameron Parish, LA: 1.84 Bcf/d (G2 LNG) (PF16-2)

PROPOSED TO U.S.-MARAD/COAST GUARD
18. Gulf of Mexico: 1.8 Bcf/d (Defin LNG)

PROPOSED CANADIAN SITES
19. Kitimat, BC: 1.28 Bcf/d (Apache Canada Ltd.)
20. Douglas Island, BC: 0.23 Bcf/d (BC LNG Export Cooperative)
21. Prince Rupert Island, BC: 2.74 Bcf/d (Pacific Northwest LNG)

LNG in the future
Key factors driving the future of LNG

• Global economic growth
• Market liquidity
• Excess/new capacity and costs
• Ship construction and shipping costs
• New markets and new users
• Energy efficiency and environmental traction
Deloitte MarketPoint’s MarketBuilder model
Need for a fundamental forecasting model

**Supply:** Represents the various feedstock supplies, their costs and distribution bottlenecks.

**Demand:** Represents customer demand for each of the key products and the price elasticity of each.

**Global or Regional Market:** Broad platform that can model all of the regions that impact the market.

**Competition:** Model market participants driven by profit margins.

**Market Behavior:** Model the balancing of the market’s supply and demand.

**Transportation:** Transportation should inter-link supply chains and commodities to provide world-wide arbitrage.

Deloitte MarketPoint offers MarketBuilder configured for the:

1. World Oil Market,
2. World Gas, NGL & LNG Market and
3. North American Power and Fuels

Designing and building user-created custom models are strengths of the MarketBuilder platform.
LNG representation in MarketBuilder

- World Gas Model (WGM) in the Deloitte MarketBuilder platform simulates liquefaction and regasification represented by country/region worldwide, with a full schedule of new and existing facilities and existing and prospective LNG shipping routes.
- LNG competes with pipeline supplies in each demand region.

- 609 regions and sub-regions worldwide.
- 1017 full-forward price schedules worldwide, for wellhead, processing, pipelines, hubs, demand centers.
- 39 liquefaction regions worldwide.
- 53 regasification regions worldwide.
- 367 existing and prospective liquefied natural gas (LNG) shipping routes.
- 1889 transportation links.
- 689 demand nodes worldwide.

Source: Deloitte MarketPoint
Majority of liquefaction growth through 2020 will be in Australia and the United States

2011: 268 mtpa
- Middle East: 36%
- Other Americas: 7%
- Asia: 24%
- Russia: 6%
- Africa: 4%
- Europe: 2%

2020: 453 mtpa
- Middle East: 22%
- Other Americas: 5%
- Asia: 18%
- Russia: 16%
- Africa: 18%
- Europe: 16%

Source: Deloitte MarketPoint
Déjà vu: Japan (Asia) prices drop

- After Fukushima, prices surged—but new supply entered the market in 2015
- Japanese (& Asian) prices collapsed in 2015, converging with Europe prices

Historical: BP Statistical Review 2015; Projection: Deloitte MarketPoint projection in 2012
LNG demand over the next decade

- Global LNG use is expected to increase by about 70% or by about 180 mtpa
- Asian LNG is expected to contribute nearly 45% of total gas
- China LNG use is 14% of total natural gas use
- Southeast Asia LNG use could triple
- Middle East LNG exports are expected to grow beyond the next decade with potential Iran exports
- US gas demand power generation continues to grow
- Egypt, Jordan and Pakistan joined the rank of importing countries in 2015, expanding the LNG horizon
LNG supply in the future

- Overcoming geopolitical and investment climate risks could favor LNG development in Iran
- Growth in LNG demand overcomes the glut in LNG capacity over the next five years
- Iran LNG, if developed, could suppress some other emerging locations
- Pipelines are expected to impact LNG market, putting a downward pressure on prices and quantities

Source: Deloitte MarketPoint
LNG capacity stays ahead of demand

- Liquefaction capacity has outpaced demand
- Trend is expected to continue over the long term
- Locational and geopolitical issues influence excess capacity
- Iran progress can influence the global market and regional development

Source: Deloitte MarketPoint
Getting from here to there – Follow the blue brick road
Challenging path foreseen for LNG

• Global LNG is expected to be influenced greatly by local markets

• Small scale FSRU is expected to change the LNG landscape

• Competition and liquidity in LNG is expected to dictate LNG industry success

• New and emerging demand for natural gas is essential for LNG growth

• Active spot market is a likely success element for LNG growth
LNG pathway for the future - 1

Supply and demand uncertainty

• Uncertainty in LNG demand growth: Where are the markets? Power generation, industrial, petrochemical feedstock, shift in core gas use in appliances and heating needs? Regional distribution of demand growth - how will this translate in various countries? Will they embrace natural gas use?

• Demand for natural gas: New and emerging demand for natural gas is essential for LNG growth

• Supply of natural gas: Resilience of producers over the next five years
LNG pathway for the future - 2

Project management and cost containment

• LNG storage: Storage capacity for LNG at liquefaction and regasification points to benefit flexibility in LNG transport schedules

• Regional impacts: Global LNG is expected to be influenced greatly by local markets

• Small scale FSRU is expected to change the LNG landscape

• Improved technology in LNG supply chain

• Financing models to capture regional characteristics
LNG pathway for the future - 3

Pricing and contract

• Competition and liquidity in LNG is expected to dictate LNG industry success

• Active spot market is a likely success element for LNG growth

• Flexibility in contract terms

• Gas wellhead costs in regional (country) markets and LNG export potential – time and costs
Impacts of policies on emissions and fuel choice:

• Energy nexus: How will energy fuels portfolios change in the future? Will renewables and nuclear displace fossil? At what rate?

• COP21 – How committed are countries and what is the implementation timeline?

• Contracting process: Indexation, length of contracts, diversion and swap clauses.