The LNG Marketplace: A Supplier's Perspective

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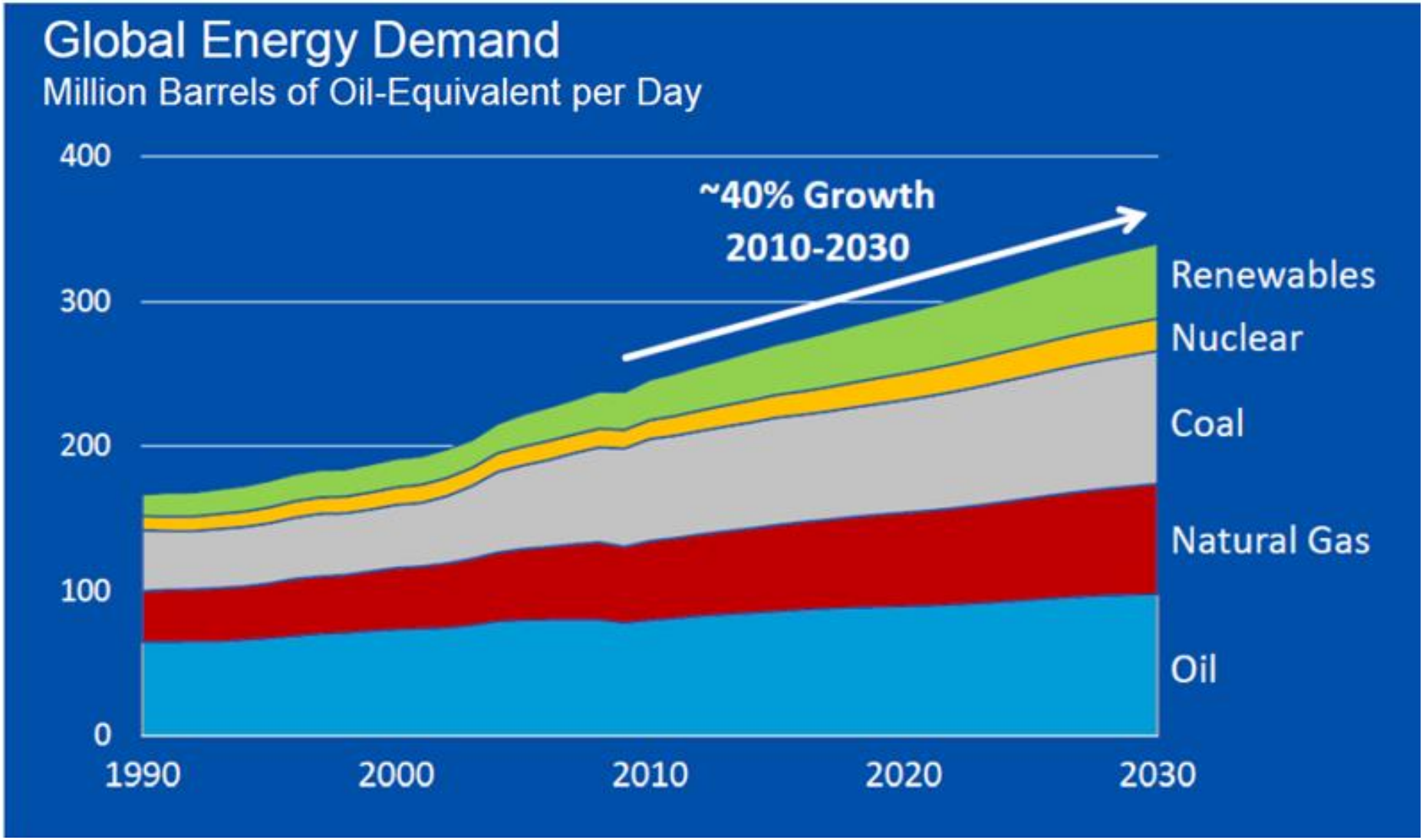
BPC Workshop

All Energy Sources Needed to Meet Demand



What is LNG

- **Liquefied Natural Gas** or **LNG** is natural gas that has been converted to liquid form for ease of storage and / or transport
  - Condenses to liquid form at -260°F (-162°C)

When natural gas is liquefied, it shrinks more than 600 times in volume.

When liquefied, natural gas that would fill a beach ball...

600 to 1

...becomes LNG that can fit inside a ping-pong ball.

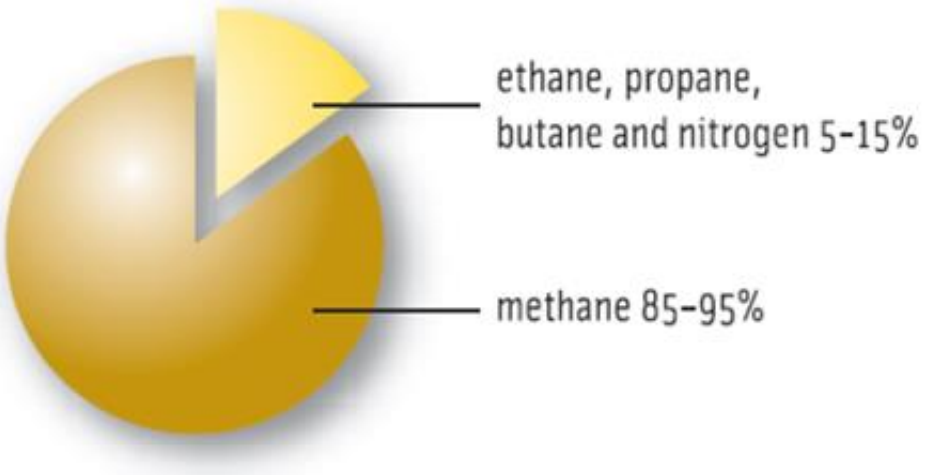
By Contrast:

- LPG – Primarily Propane or Butane
  - Compressed to 3 – 22 Bar
  - 250th of original size
- CNG – Natural Gas
  - Compressed to 200-240 Bar
  - 100th of original size

LNG is a Clean Burning Fuel

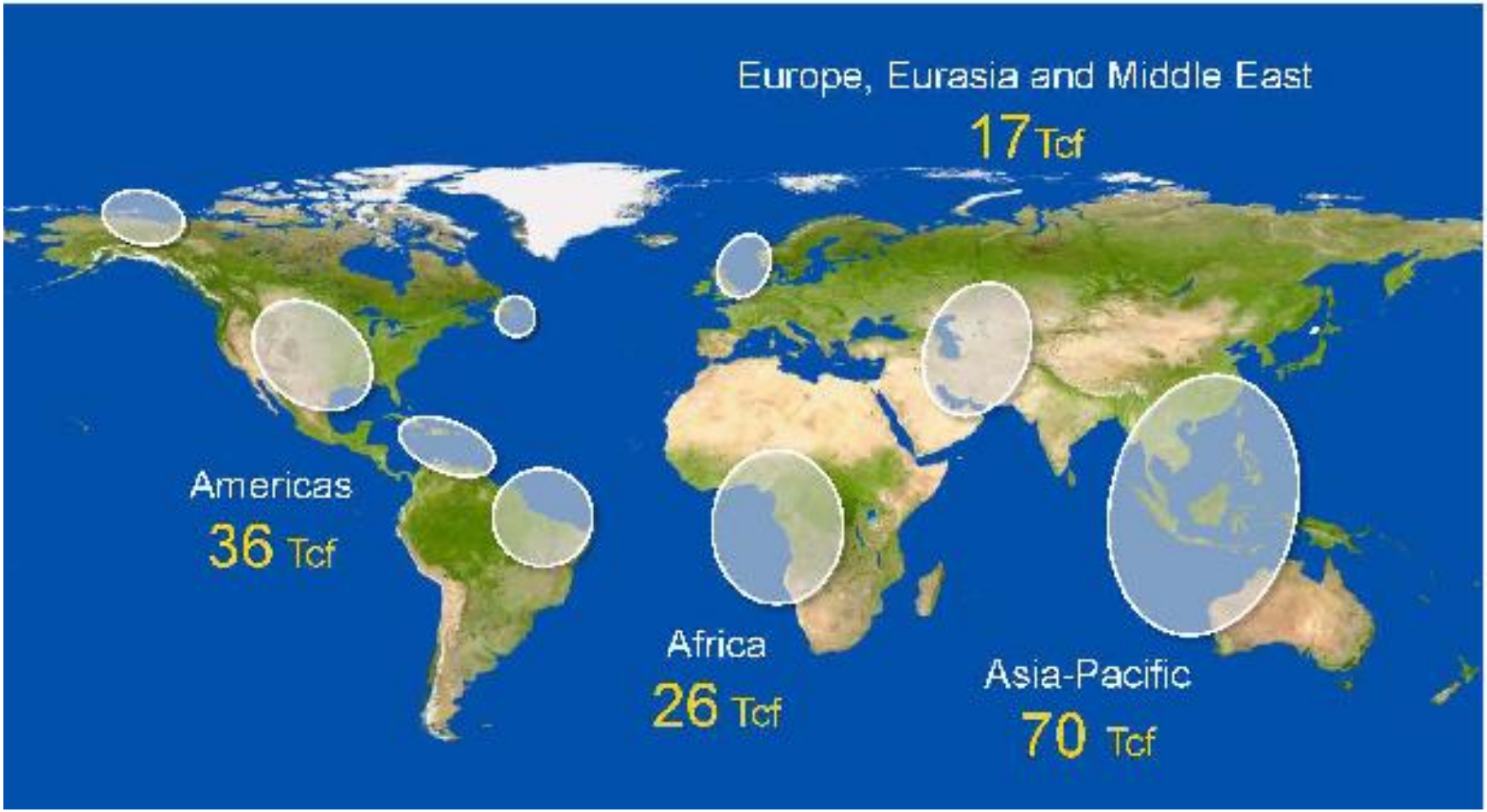
- Odorless, colorless, non-corrosive, and non-toxic
- Weighs less than half of the equivalent volume of water (density ~ 460 kg/m^3)

LNG is mostly methane plus a few percent ethane, even less propane and butane, and trace amounts of nitrogen.

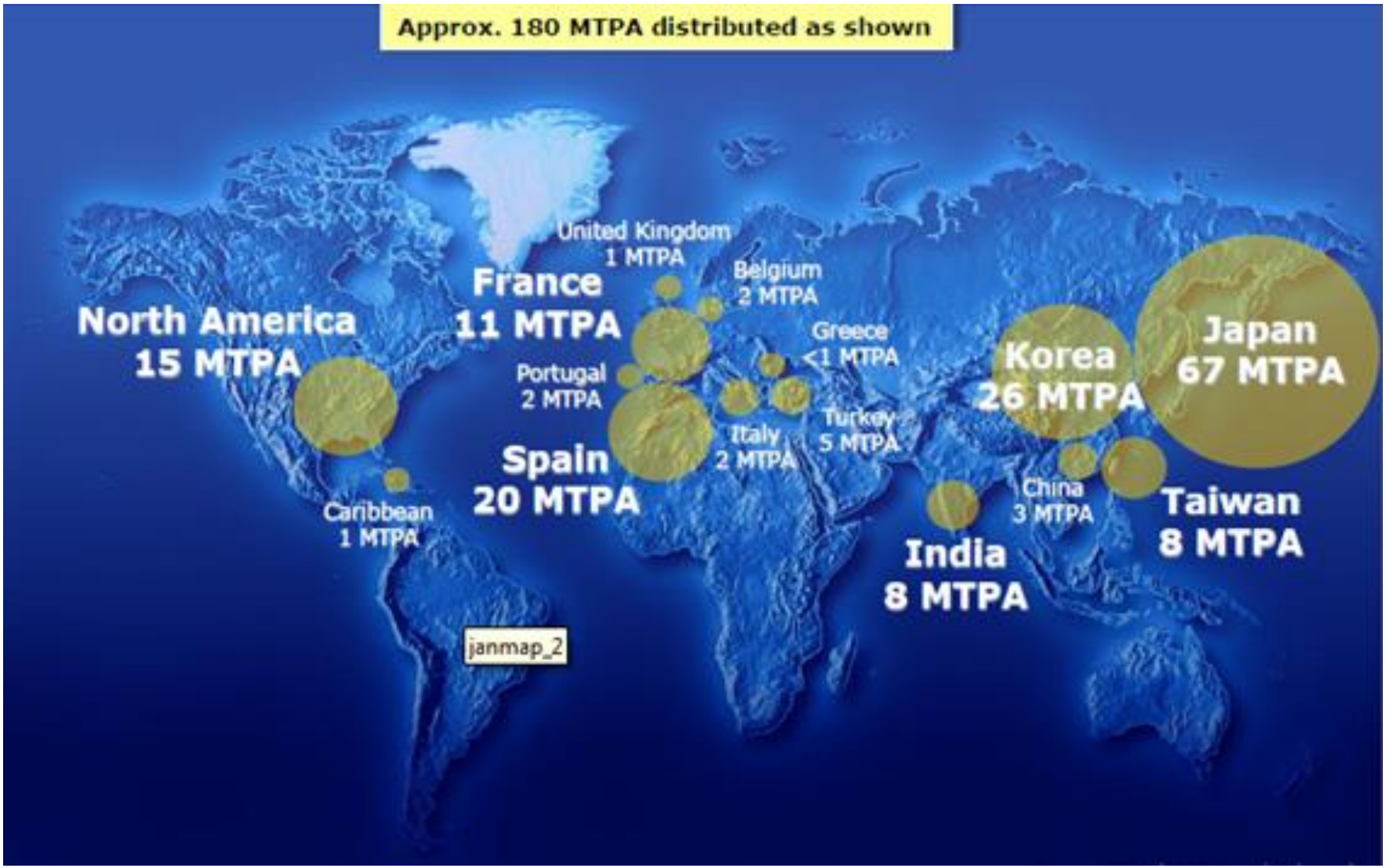


Graphic source: US Dept of Energy

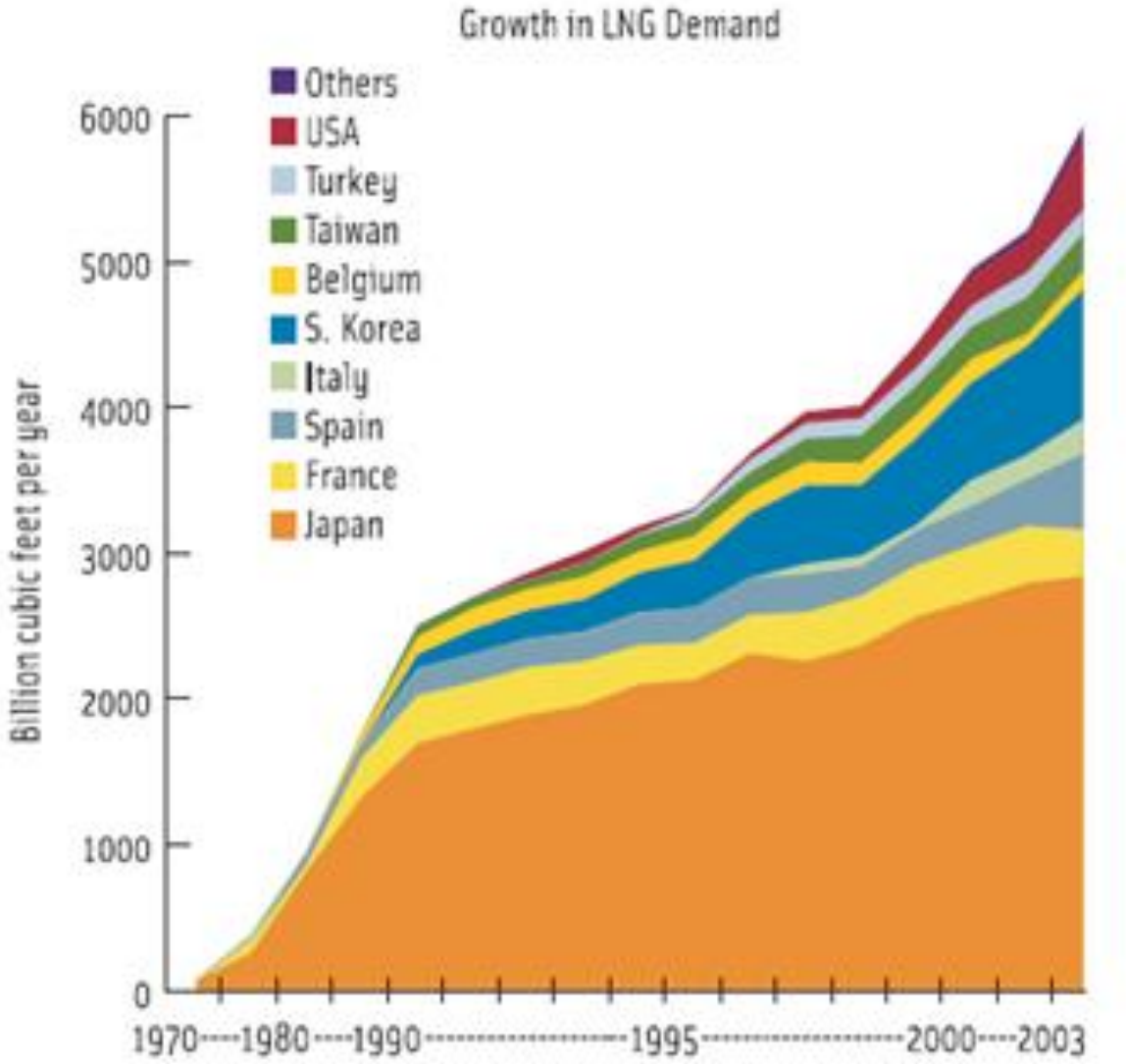
Natural Gas Resources



Asia Buys >65% of LNG Imports

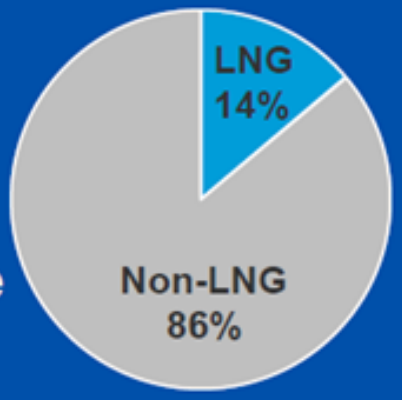


Japan the Major Importer for 30 years



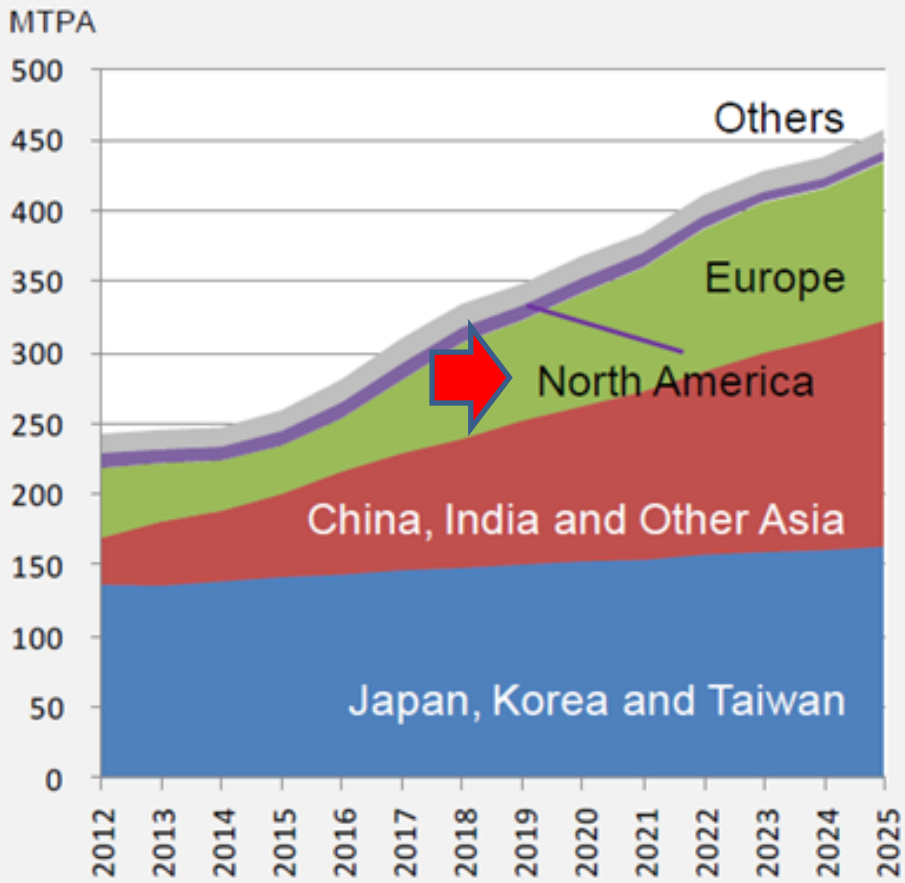
Demand for LNG Will Grow

- LNG demand is predicted to almost double by 2025
- Most demand growth to come from Asia
- Buyers in Japan, Korea and Taiwan are expected to continue to target reliable supply
- Europe relatively flat until end of decade. Growth in unconventional supply could influence imported gas.
- LNG supply to increase from 10% of total in 2012 to 14% by 2025



2025 World LNG and Pipe Gas Shares

Source: Wood MacKenzie



Source: Wood MacKenzie – May 2012

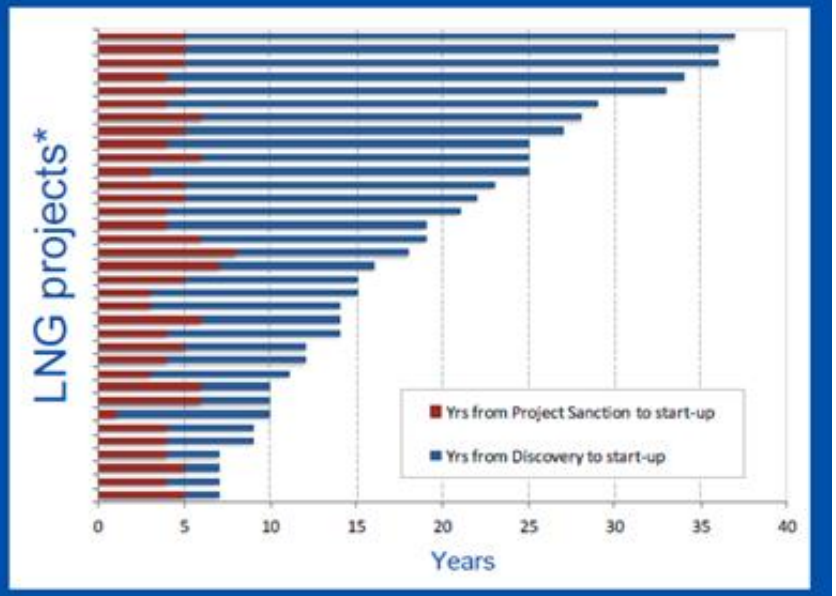
The LNG Value Chain

Discovery to Delivery is a Multi-Step and Multi-Year Process

Technical Activities	Stakeholder Involvement	Commercial Activities
Multi-year exploration phase	NOC participation	Agree project operator
Appraisal drilling and potential unitization	Government elections	Determine business model and agree value sharing
Site selection/acquisition	Establishment of project fiscal terms	Impact of differing value chain ownerships
Evaluate development concepts	Local content requirements and skilled labor availability	Financing
Detailed engineering, design and contracting	Local infrastructure	LNG sales contracts required before FID
Project construction	Environmental approvals and other permitting processes	Land use agreements

From Discovery to Delivery

- Complex and time-consuming process to bring new LNG supply to market
- >10 years from discovery to start-up for majority of LNG projects
  - >50% take 15+ years
- On average ~5 years from project sanction to start-up
- Mega-projects often require unanimous agreement by multiple partners in each development phase
- Multiple work fronts required
  - Technical
  - Stakeholders
  - Commercial & Marketing

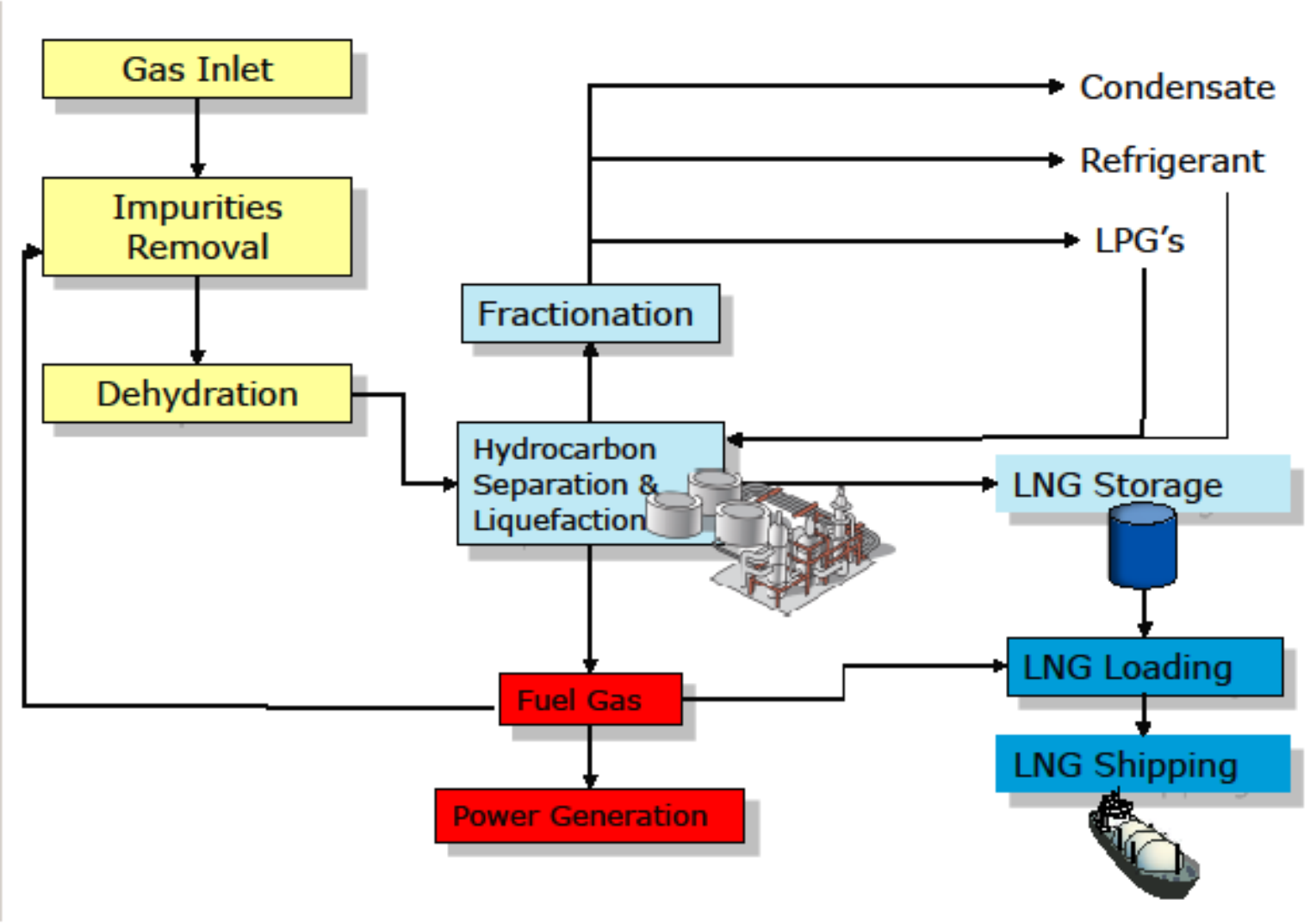


Capital Costs in the Value Chain

Exploration & Production	Liquefaction	Shipping	Storage & Regasification
			
Gas production and preplant processing and transport	Liquefaction plant, including preliquefaction processing, storage, and carrier loading	Shipping	Receiving terminal, including unloading, storage, regasification, and delivery
15 to 20	30 to 45	10 to 30	15 to 25
Varies widely	$1.5 to $2 billion for a plant that produces 8.2 million tons of LNG per year	$155 million to purchase a single 138,000 cubic meter ship, or $60,000 per day to charter	$400 million for a U.S. terminal capable of delivering between 180 and 360 Bcf per year

Liquidation Facility

Liquefaction Process



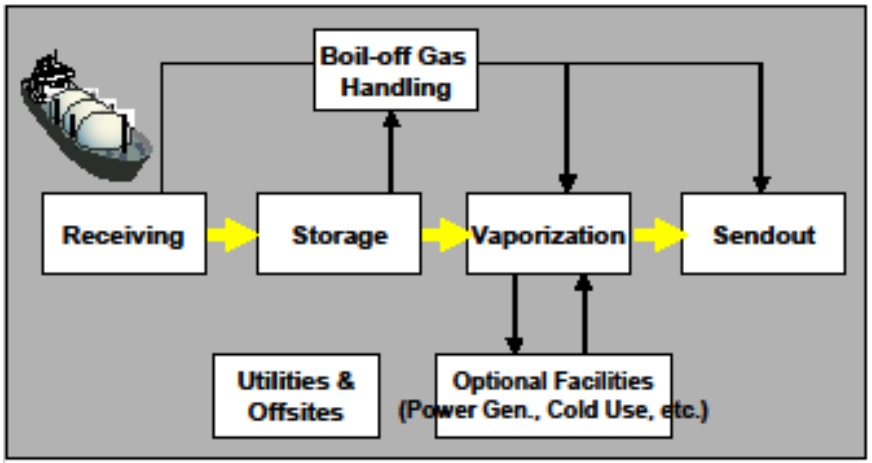
Ship Transportation is Key

- **LNG** is transported in safe, world-class vessels
  - Stored in well insulated tanks at atmospheric pressure – NOT pressurized

- One cargo of LNG (~ 3 billion ft^3, or 84 million m^3 natural gas)
  - Enough energy to heat more than 40,000 homes for an entire year

Regasification Terminal

Regasification Terminal



Sabine Pass

LNG Receiving

- Jetty
- Large enough to accommodate range of ship sizes (138,000 m^3 to 165,000 m^3+).
- LNG unloading arms

Storage

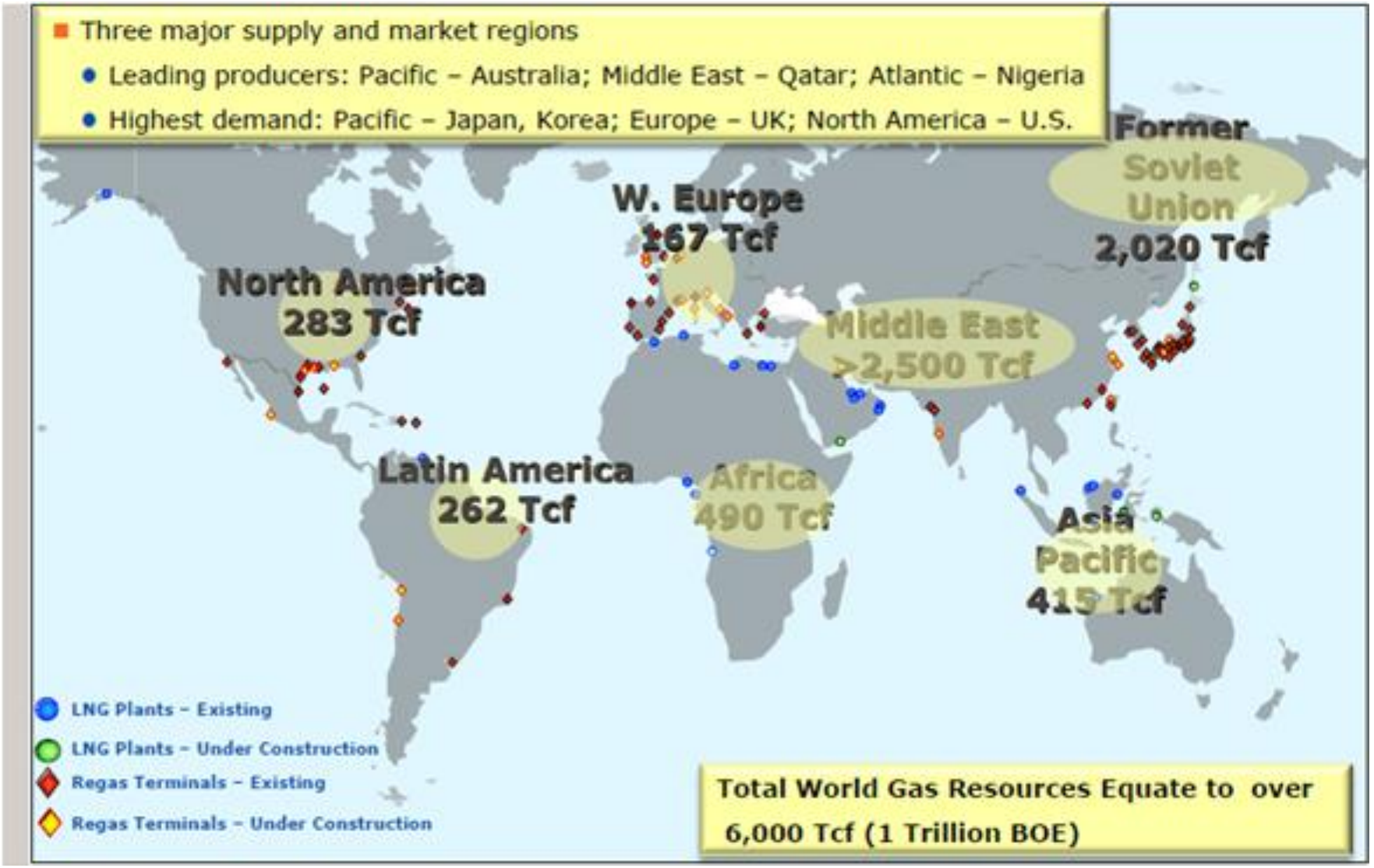
- Enough storage for at least one shipload of LNG
- LNG storage tanks, with plot space for expansion

Vaporization & Sendout

- Two stages of pumps
- Vaporizers
- Boil-Off Gas handling

Power Plants and Industry use most of the Natural Gas produced worldwide

Liquefaction and Regas Plants



Terminals and 100 Satellite Facilities

Few on the West Coast

Everett, Massachusetts

Cove Point, Maryland

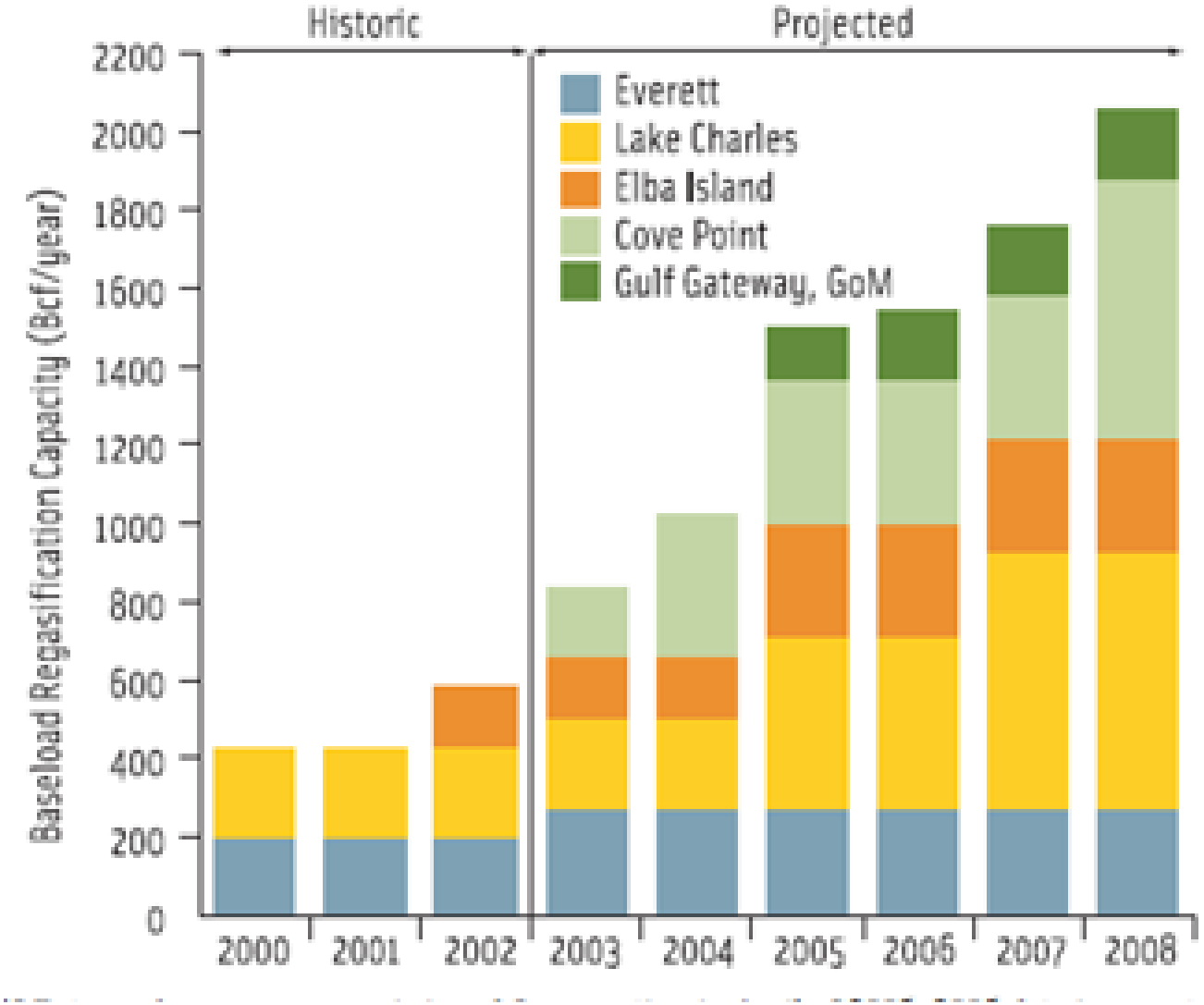
Lake Charles, Louisiana

Elba Island, Georgia

Gulf Gateway Energy Bridge, Gulf of Mexico

Source: EIA, *U.S. LNG Markets and Uses: June 2004 Update*

U.S. LNG Terminals will meet Half of Forecasted Demand in 2015



LNG as a Transportation Fuel

Benefits

- Lower pump prices
- 20 – 30% less GHG and 9% less tailpipe emissions
- Extended engine life
- Large domestic supply
- Similar driving experience to conventional vehicles

Challenges

- Shorter driving range
- High vehicle costs
- Limited fueling infrastructure
- Longer refueling time

LNG as a Transportation Fuel

- Best suited at this point for fleets and long haul vehicles (buses, transportation and delivery vehicles) due to concentrated ownership, a few large vehicles and centralized fleet fueling facilities
- Large potential for ships and railroads
- Need for retooling of fleets (engines and distribution infrastructure) by both suppliers and consumers

LNG/ CNG for Passenger Cars

- Existing Infrastructure
  - 150,000 NGVs in the US/ 3% of Transportation
  - Similar to storage and fueling of gasoline in the vehicle
  - 1500 fueling station in the US, half open to the public
- As with Commercial infrastructure, need for retooling of fleets (engines and distribution infrastructure) by both suppliers and consumers
- LNG vs. CNG
  - Advantages and disadvantages to both
  - It's Beta vs. VHS for video tapes

Challenges in the Transition

- Permitting
  - Opposition to a clean fossil fuel that is not renewable
  - CEQA and Legal Challenges
  - Onerous and uneconomical conditions or mitigations
  - Extensive approval process causes capital investment to gravitate toward other infrastructure projects outside the area
- Facility Siting
  - Need for industrial facilities close to infrastructure and population centers, but not too close
  - Safety concerns for ships and plants
- Government Policies
  - Could encourage development or potentially prompt capital investment to other markets

Conclusion

- Demand for energy is increasing
- LNG is a significant contributor to meeting this demand
- LNG projects are large, complex, have multiple stakeholders and require significant initial investments
- Multiple years from initial discovery to project start-up
- Chevron is committed to bringing our LNG projects to market