# LNG PRICING IN AN ERA OF ABUNDANCE

United States Energy Association

Berkeley Research Group

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# Collision Course: Who Will Blink First?

Numerous global suppliers appear to be locked into a game of chicken, chasing a rapidly slowing market in efforts to close deals, reach FID, and knock out the competition

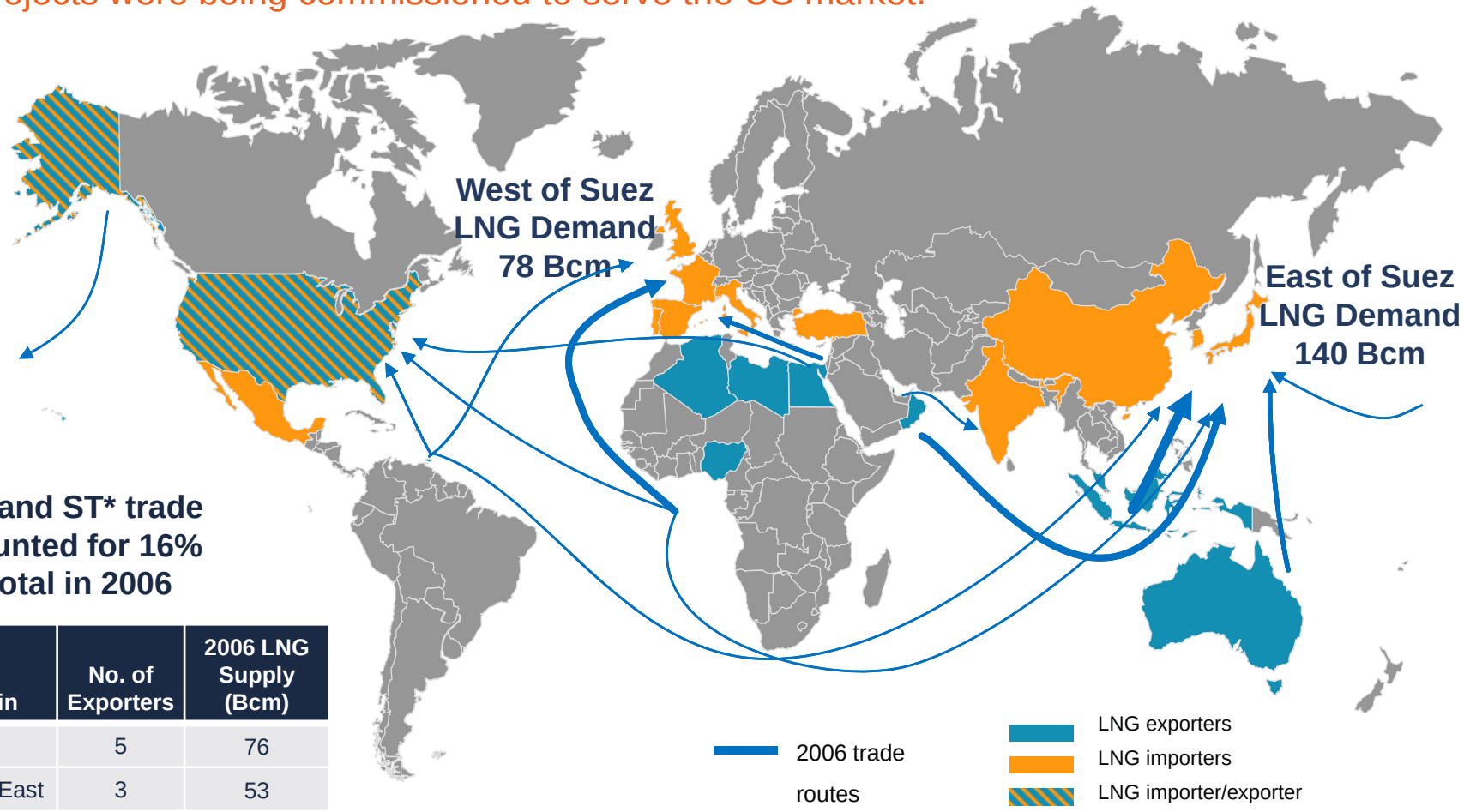
# Agenda

| Section | Topic |
|---|---|
| 1 | Historic Changes |
| 2 | North American Outlook |
| 3 | Global Implications |
| 4 | Repricing LNG |

# 1. HISTORIC CHANGES

# Pre-Shale LNG Trade (2006)

Before the shale boom, LNG trade was 218 Bcm, with 13 export countries serving 16 importer nations and approximately one third of trade West of Suez. New liquefaction projects were being commissioned to serve the US market.



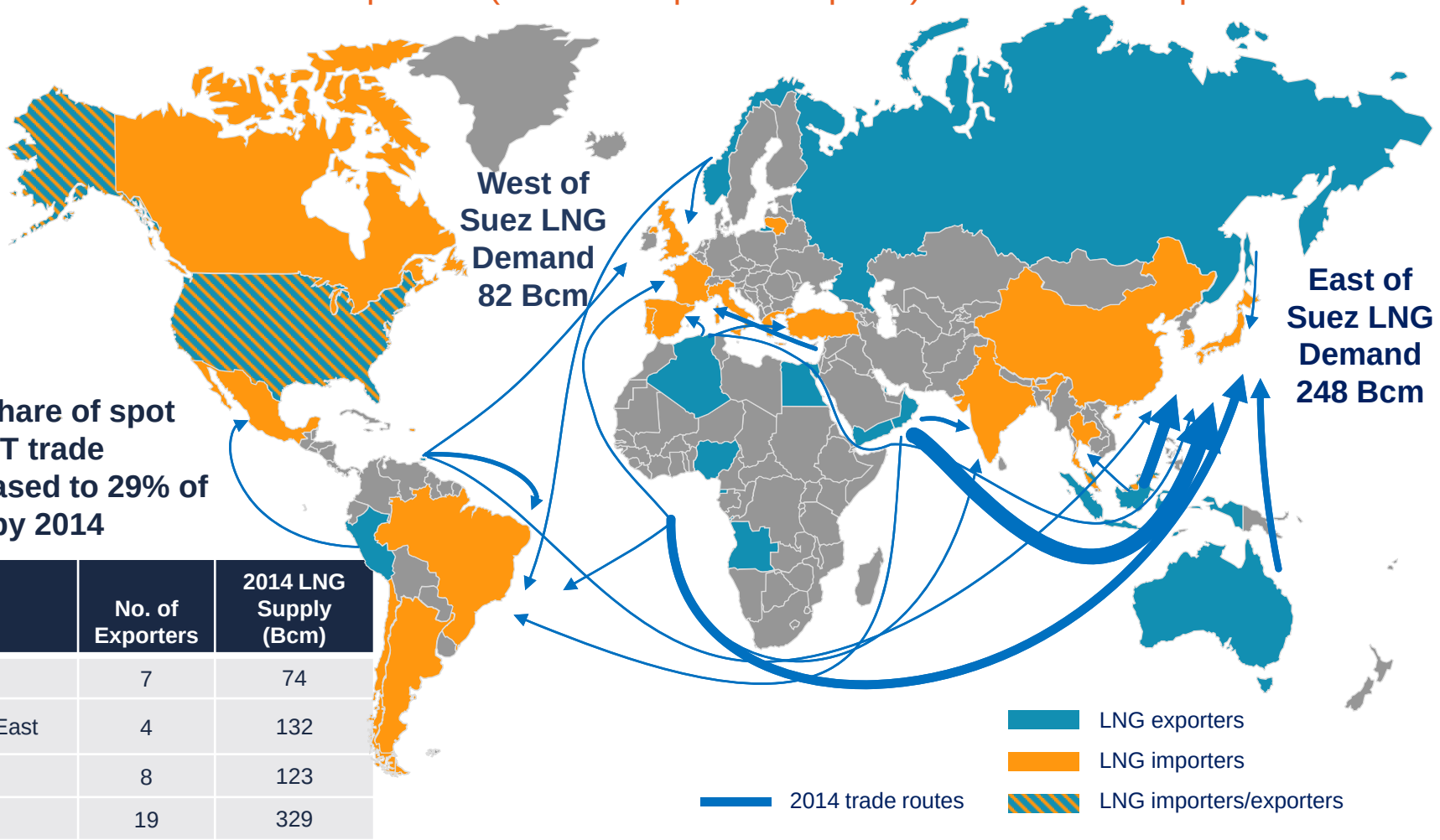

**Spot and ST* trade accounted for 16% of total in 2006**

| Basin | No. of Exporters | 2006 LNG Supply (Bcm) |
|---|---|---|
| Atlantic | 5 | 76 |
| Middle East | 3 | 53 |
| Pacific Basin | 5 | 89 |
| Total | 13 | 218 |

Sources: BRG Analysis, GIIGNL
* Short-term defined as contracts with terms of less than five years.

# US Shale Fosters LNG Liquidity (2014)

Booming shale output took the US off the global LNG market and enhanced LNG trade liquidity in Asia, with West of Suez demand falling below one quarter of the global market as trade grew to 329 Bcm with 7 new exporters (minus 1 exporter drop-out)* and 15 new importers




**The share of spot and ST trade increased to 29% of total by 2014**

| Basin | No. of Exporters | 2014 LNG Supply (Bcm) |
|---|---|---|
| Atlantic | 7 | 74 |
| Middle East | 4 | 132 |
| Pacific | 8 | 123 |
| Total | 19 | 329 |

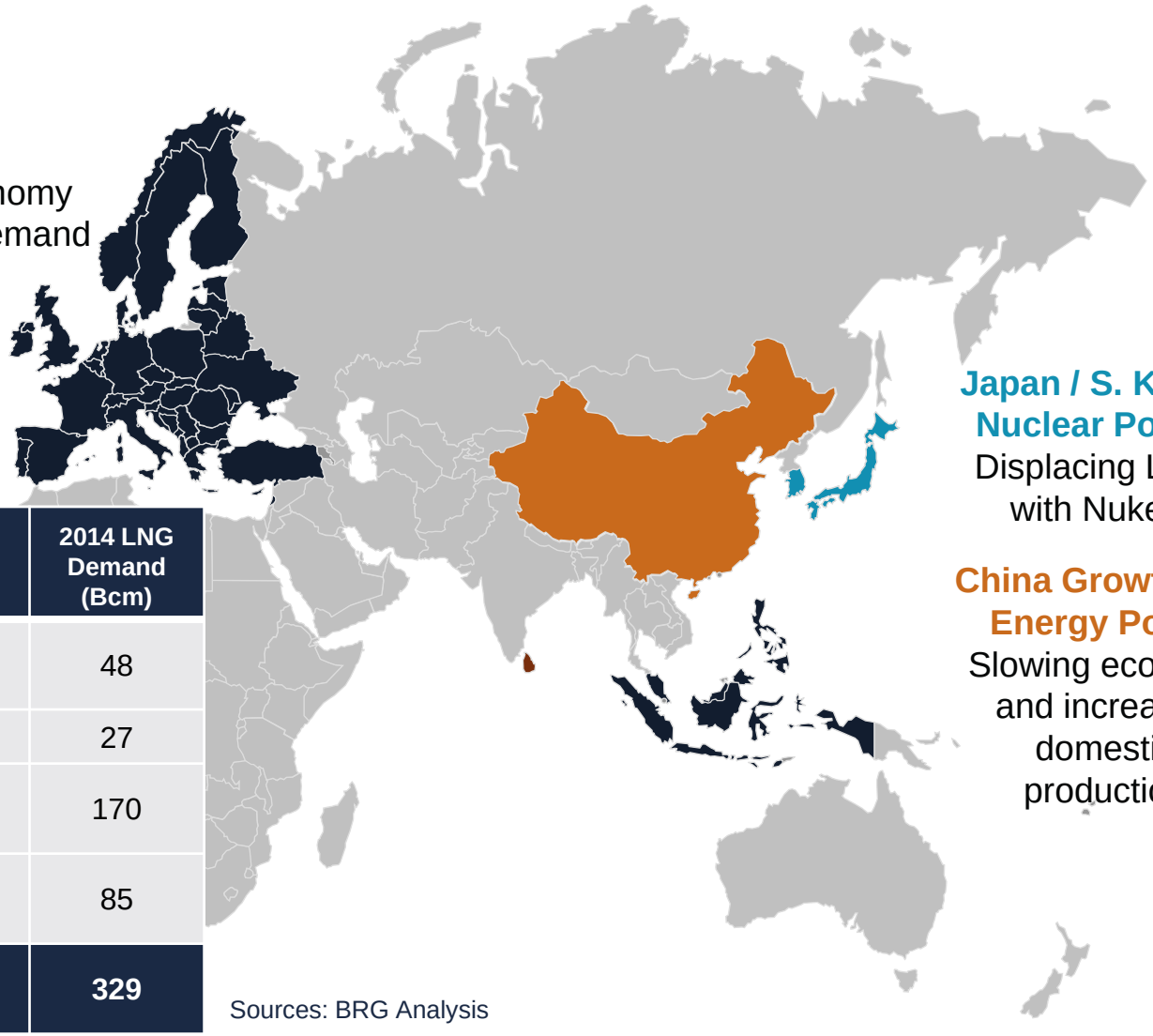
Sources: BRG Analysis, GIIGNL

*There were seven new exporters in 2014. Because one of the 2006 exporters no longer exported in 2014, the total number of exporters increased by six.

# But Global Demand Has Decelerated

After several years of economic malaise and high oil and LNG prices, the global engines of LNG demand in Europe and Asia have hit the brakes

**Europe**
Stagnant Economy
and Slowing Demand



**Japan / S. Korea Nuclear Policy**
Displacing LNG with Nukes

**China Growth and Energy Policy**
Slowing economy and increased domestic production

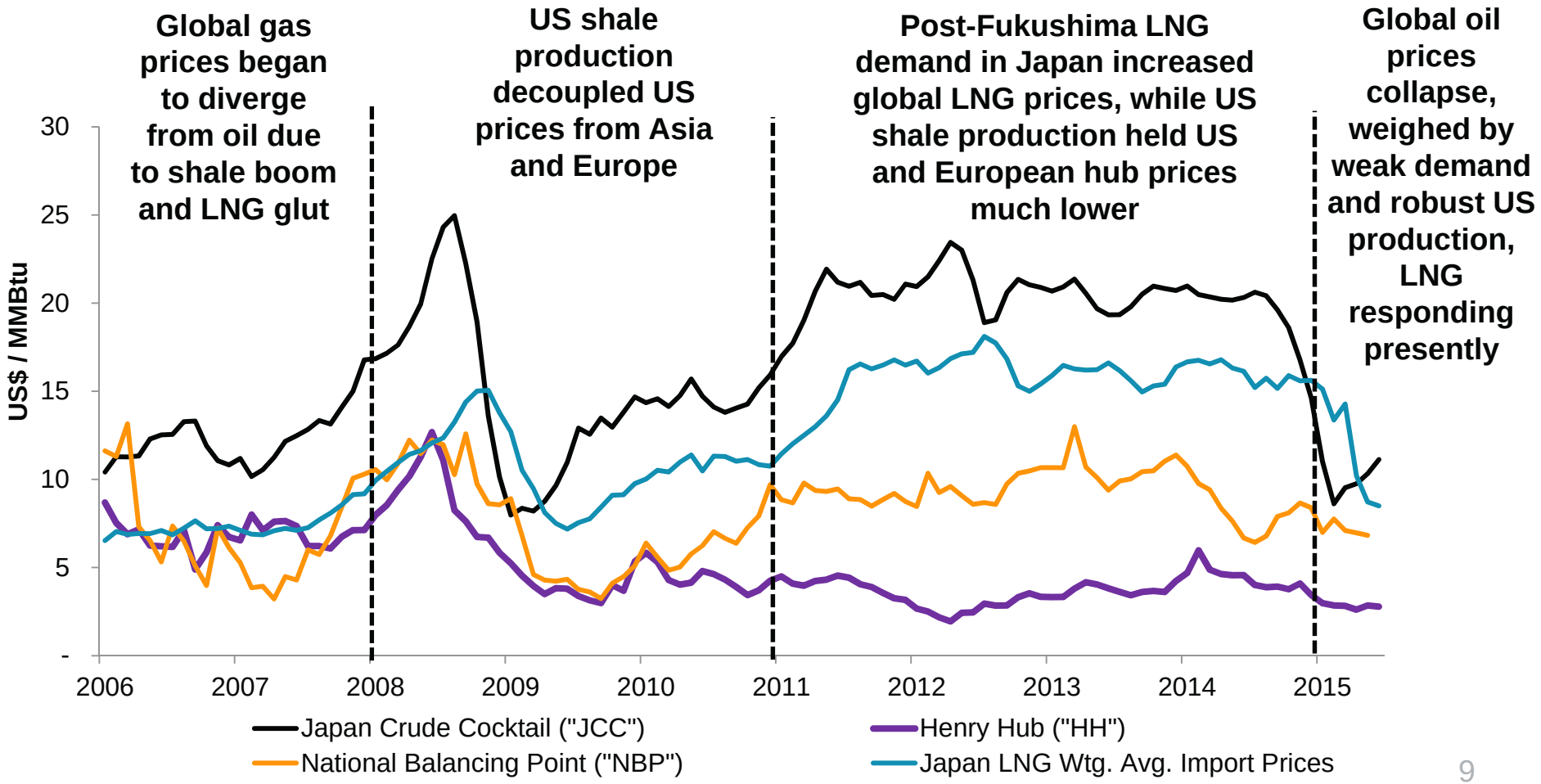
| Demand Growth | CAGR 2008 to 2011 | CAGR 2011 to 2014 | 2014 LNG Demand (Bcm) |
|---|---|---|---|
| Emerging Markets | 34% | 16% | 48 |
| China | 56% | 15% | 27 |
| Japan / S. Korea | 5% | 3% | 170 |
| Other Markets | 14% | -12% | 85 |
| **Total LNG Demand** | **12%** | **0%** | **329** |

Sources: BRG Analysis

# Term Prices Falling Toward Hub Prices

US and European hub prices have seen a sharp reduction since the introduction of shale supply. The price collapse has begun to impact Asian prices as well.

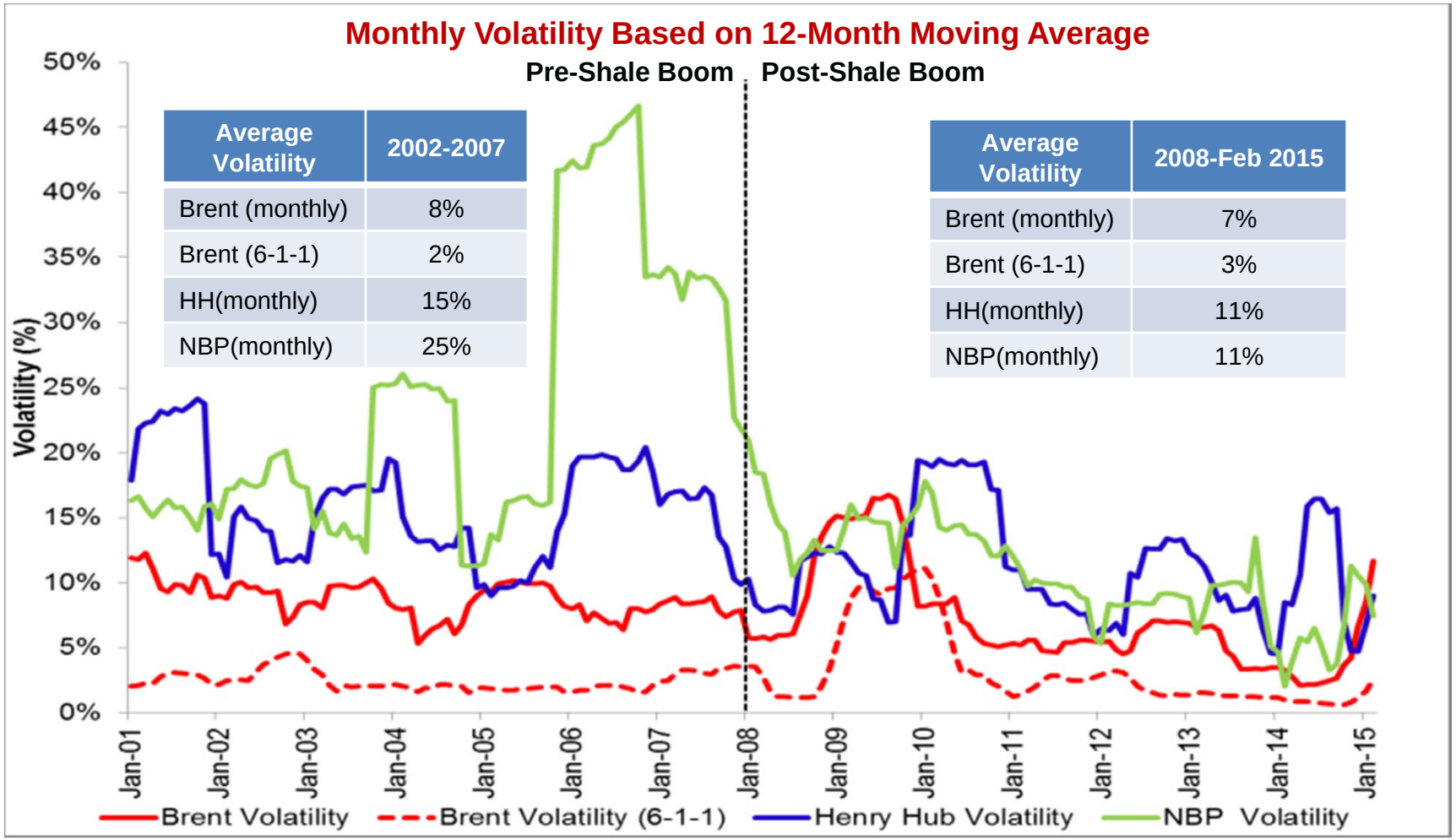
**Global Prices for Oil, Gas, and LNG**




Sources: BRG Analysis, US EIA, Petroleum Association of Japan, World Bank, Bloomberg

# Reduced Hub Volatility

Shale production has and will likely continue to reduce price volatility in the traded markets of North America and Northwestern Europe.

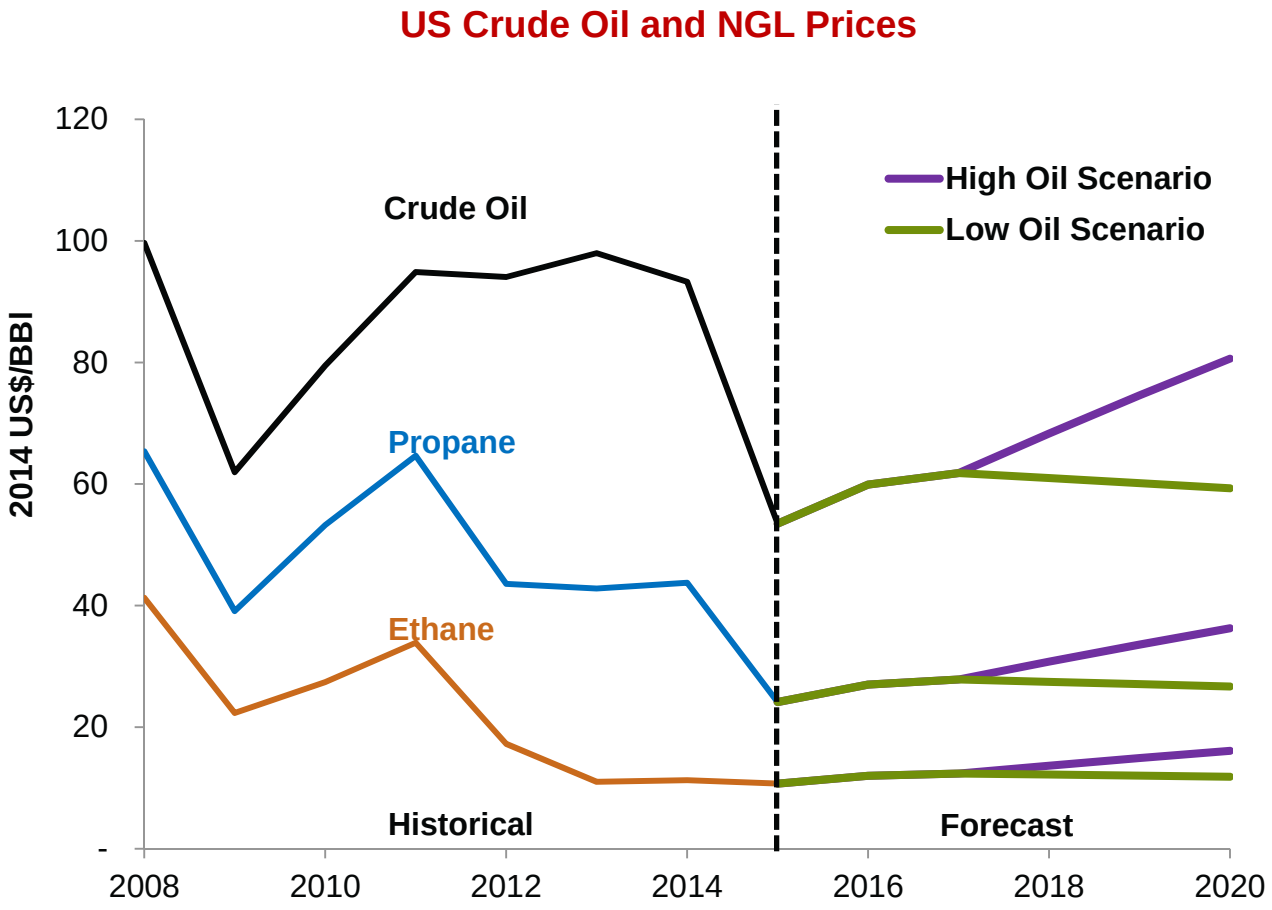



Sources: BRG Analysis. Gas and Oil Future prices and volumes are sourced from Bloomberg and ICE; Volatility is calculated based on moving12-month of monthly price returns; Brent 6-1-1 refers to rolling average Brent prices over 6-month with one month time lag prior to application

# 2. NORTH AMERICAN OUTLOOK

# Lower Oil and Liquids Prices Impact Shale

The most economic shale plays in North America are rich in oil and natural gas liquids (NGLs), making the outlook for lower oil and NGL prices an important factor for shale gas economics




**Oil and NGL Scenarios**

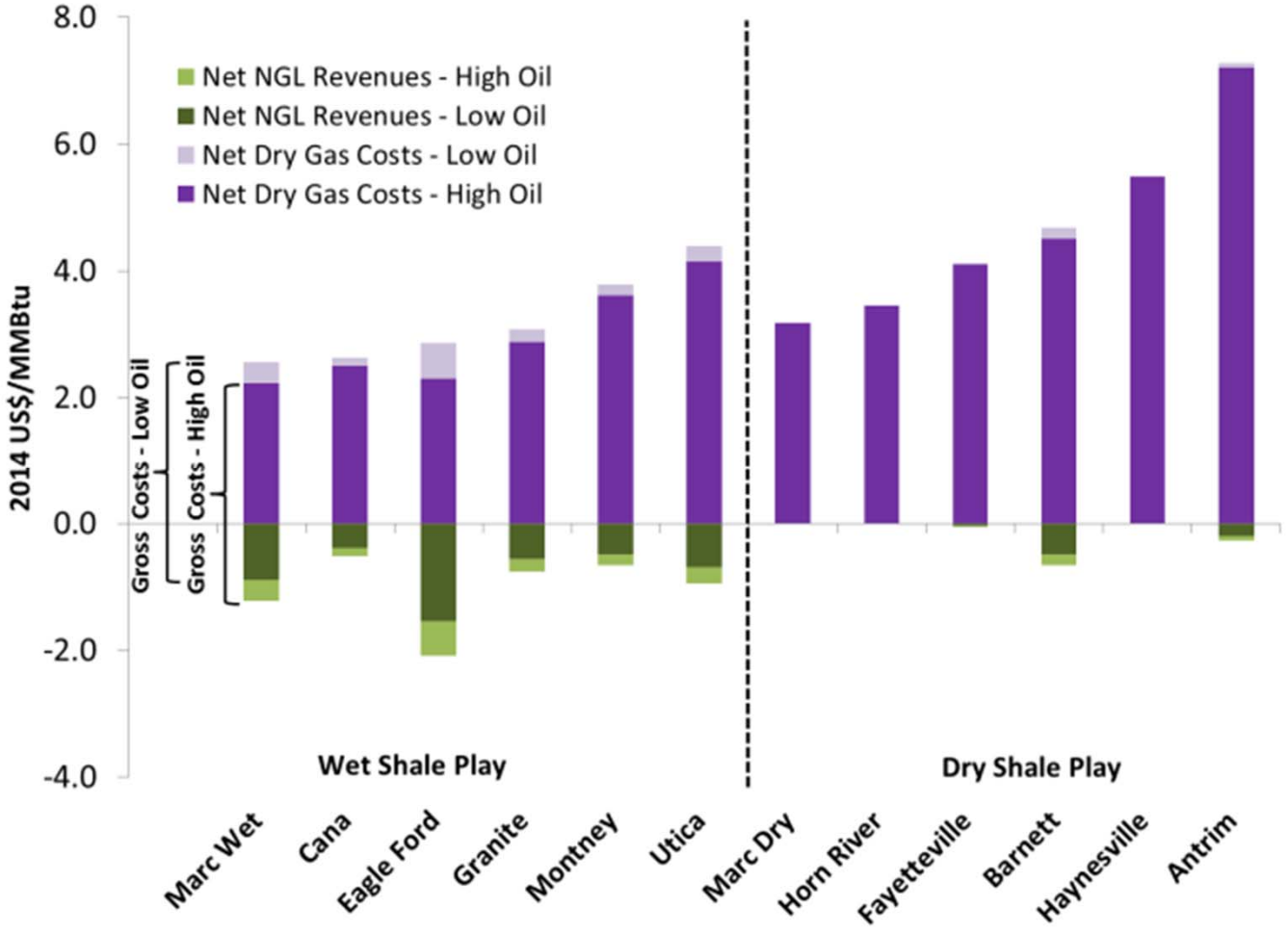
- Near-term oil prices based on NYMEX futures
- Mid-term oil prices based on industry consensus 2020 targets:
  - $60/BBl (Low Scenario)
  - $80/BBl (High Oil Scenario)
- Ethane and propane prices estimated at ratios of 20% and 45% of crude oil, respectively

Sources: BRG Analysis , US EIA, Bloomberg

# Shale Efficiency Offsets NGL Declines

Thus far, lower NGL revenues have been largely offset by production "learning" and efficiency gains

**Class I & II Wells – Average Costs by Play (2020)**



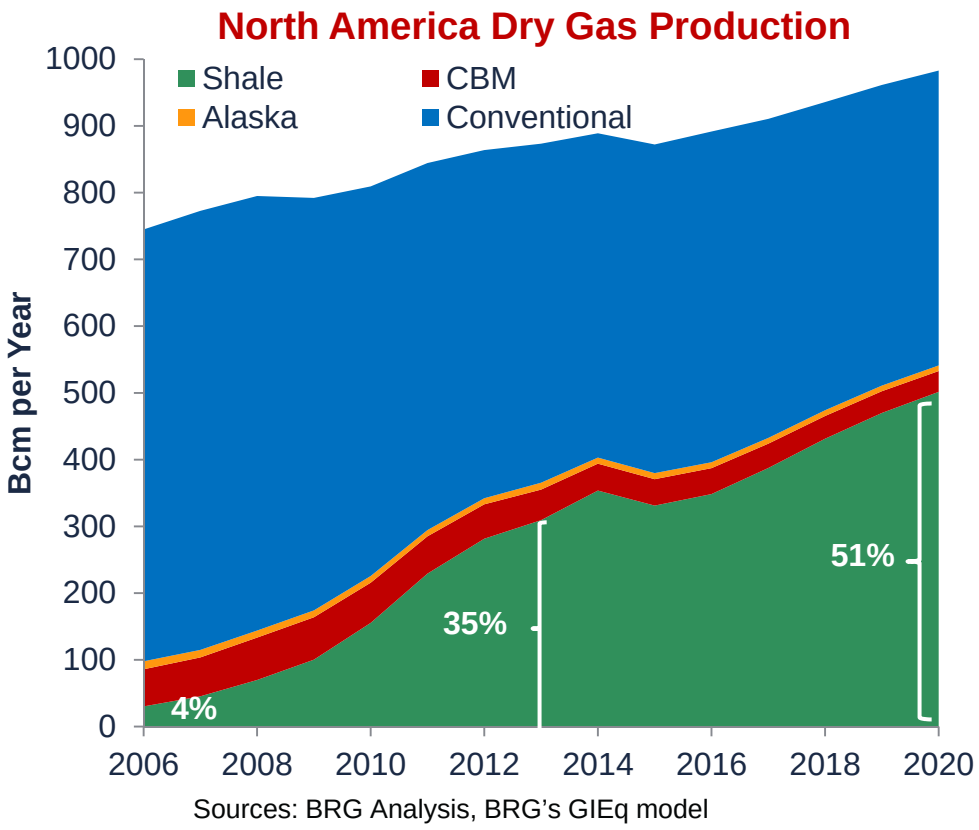

**Sweet Spots**

- The most economic "sweet spot" (Class I & II) wells represent approximately a third of reserves in the lead plays
- A large volume of low cost production will be sustainable for several decades

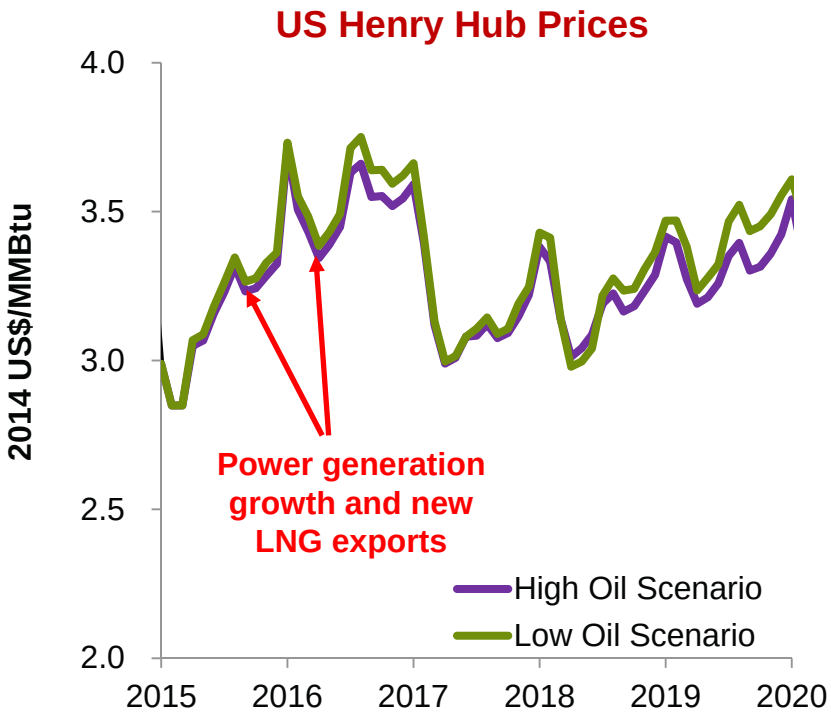
Sources: BRG Analysis, BRG's Shale Resource Potential ("ShaRP") Model

# Tenacious North American Shale Output

During the years of high oil and NGL prices, shale production concentrated on liquids rich plays, which achieved scale economies and operating efficiencies. This will sustain continued high shale production growth from almost 200 Bcm in 2013 to almost 500 Bcm by 2020.




Sources: BRG Analysis, BRG's GIEq model




- HH prices should strengthen in the next years on growth in gas-fired power generation and LNG exports
- Thereafter, prices should moderate on softer demand growth.

# Reduced US LNG Export Expectations

Lower oil prices and slowed US DOE approvals, have delayed FID decisions on some US LNG terminals, tempering estimates for 2020 exports to around 44 to 63 Bcm

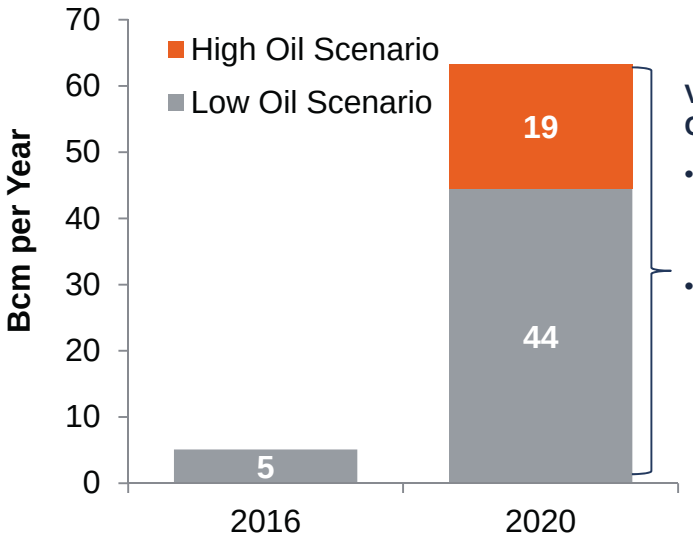
- After slowdown, project success will be driven by the FERC, LNG buyers, and bankers, meaning the most successful projects will be those with signed contracts
- Our estimated 2020 US LNG exports represent 264% to 374% of our Moderate Growth case global incremental LNG demand* of almost 174 Bcm
- US LNG exports could be 40% higher in a high oil scenario due to higher NGL prices, lower shale dry gas production costs, lower HH prices, and thus higher shale spreads

## US LNG Advanced Project Capacity

| Advanced Projects Status** | No | Capacity (Bcm) | Contracted Capacity (Bcm) |
|---|---|---|---|
| Under Construction** | 6 | 87*** | 77 |
| Awaiting FERC Approval / Commercially Contracted | 4 | 54 | 25 |
| **Total Advanced** | **10** | **142** | **102** |

* Incremental LNG demand measured as difference between our 2020 estimate and 2013 LNG trade volumes from BP Statistical Review of World Energy, 2014.
** Includes expansions.
*** Peak Capacity could reach 45 Bcm under optimal operating conditions.

## US LNG Export Volume Scenarios




**Volumes Lower than Capacity due to:**

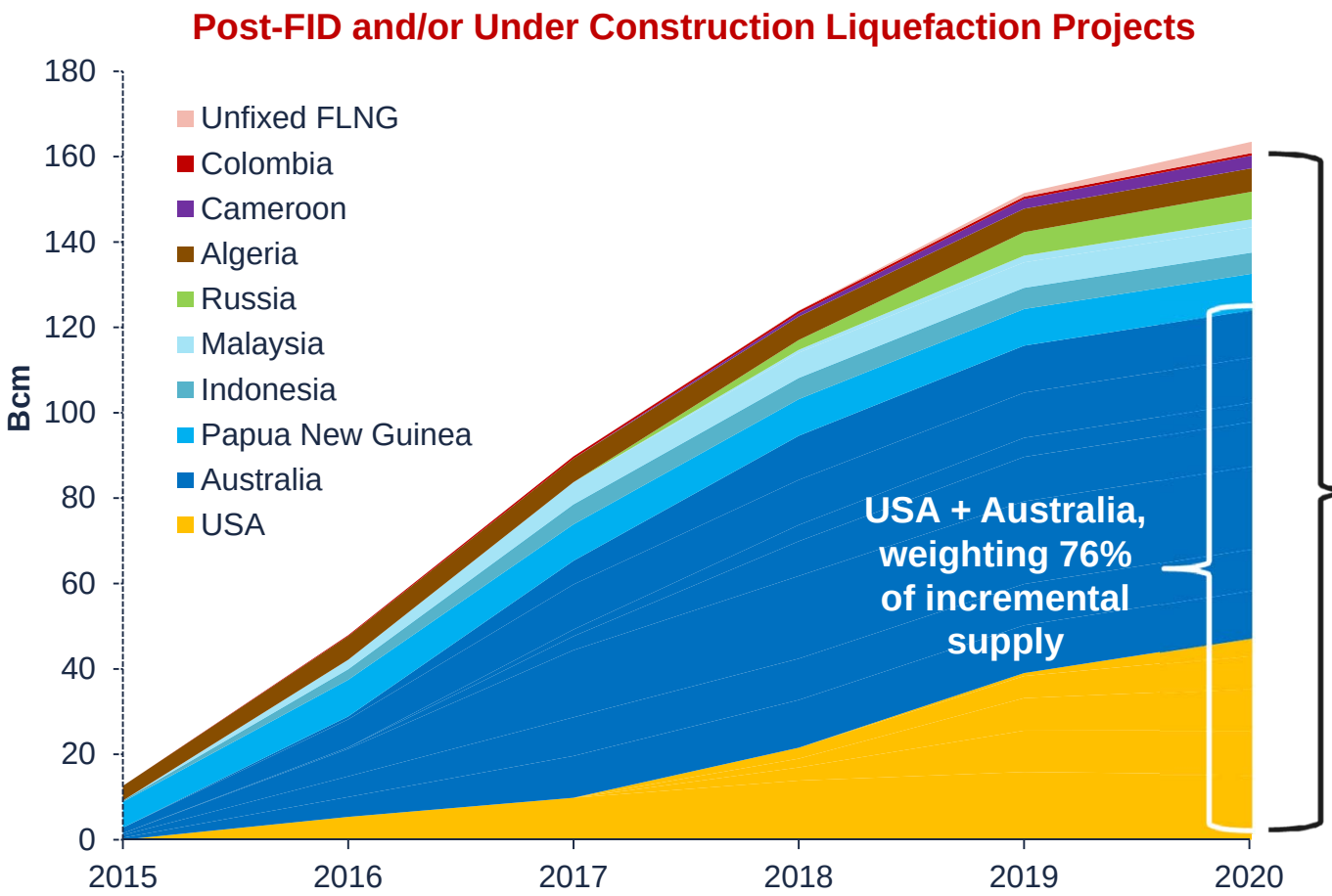
- Assumed 2 year ramping period to full capacity
- LNG exports are dynamic (not fixed assumptions) and respond to global price signals

Sources: BRG Analysis and GIEq model

# 3. GLOBAL IMPLICATIONS

# Post-FID Supply Is Locked

From 2014 to 2020, 163 Bcm of liquefaction projects are post-FID and/or under-construction -- covering 95% of incremental demand and thus allowing for some of the current surpluses to be absorbed




Sources: BRG Analysis, Global LNG Info

NB: The figures include three projects online in 2014 in Australia, Papua New Guinea and Algeria

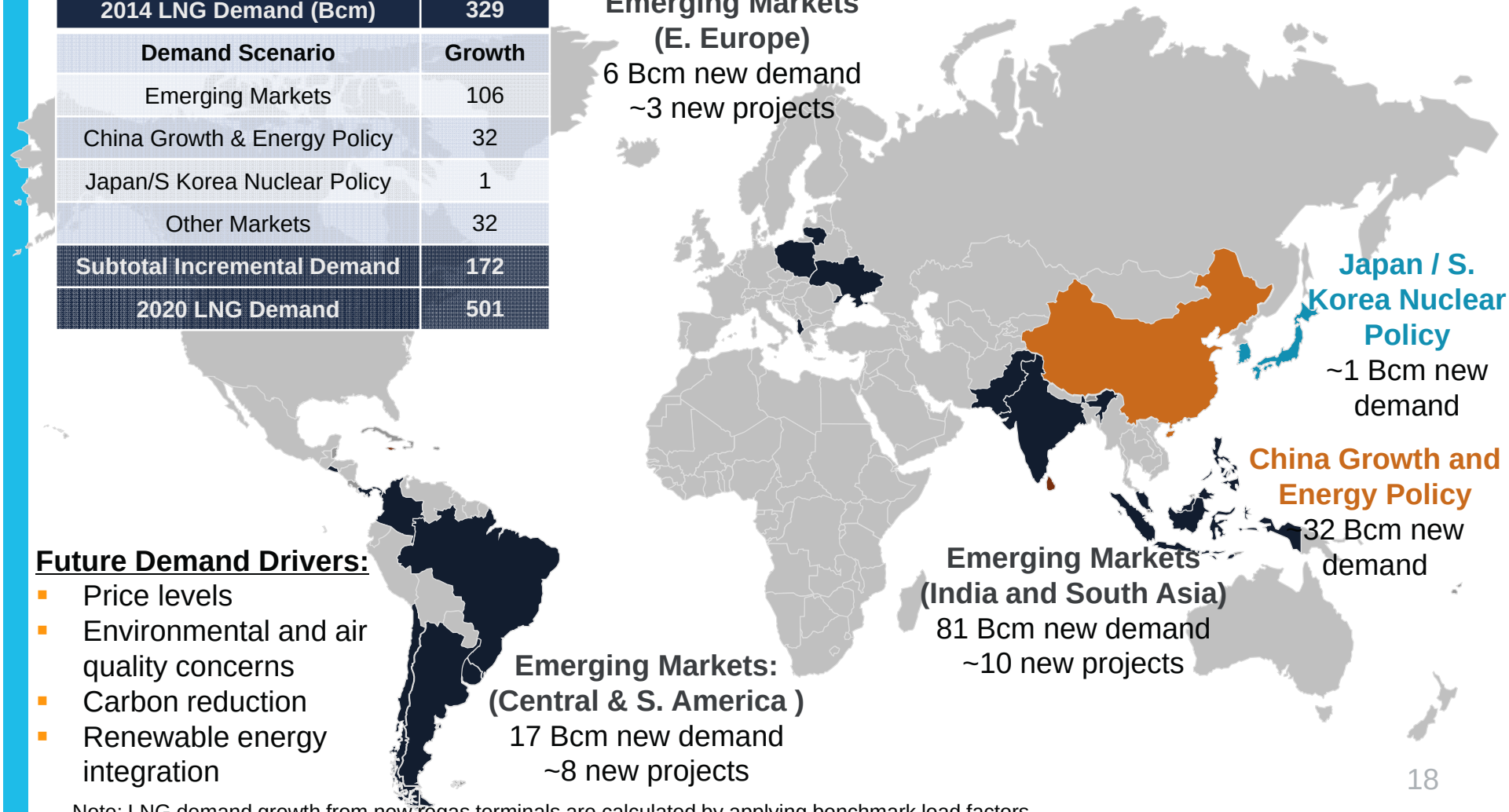
**Locking Down Supply**

- **163 Bcm from 23 new projects**
- **Increases by ~50% from 2013**
- **Covers ~95% of incremental LNG demand**

# Slow LNG Demand Rebound

After years of deceleration, it will take several years for lower LNG and gas prices to revitalize demand growth due to market, project development, and financing lead times

| 2014 LNG Demand (Bcm) | 329 |
|---|---|
| **Demand Scenario** | **Growth** |
| Emerging Markets | 106 |
| China Growth & Energy Policy | 32 |
| Japan/S Korea Nuclear Policy | 1 |
| Other Markets | 32 |
| **Subtotal Incremental Demand** | **172** |
| **2020 LNG Demand** | **501** |



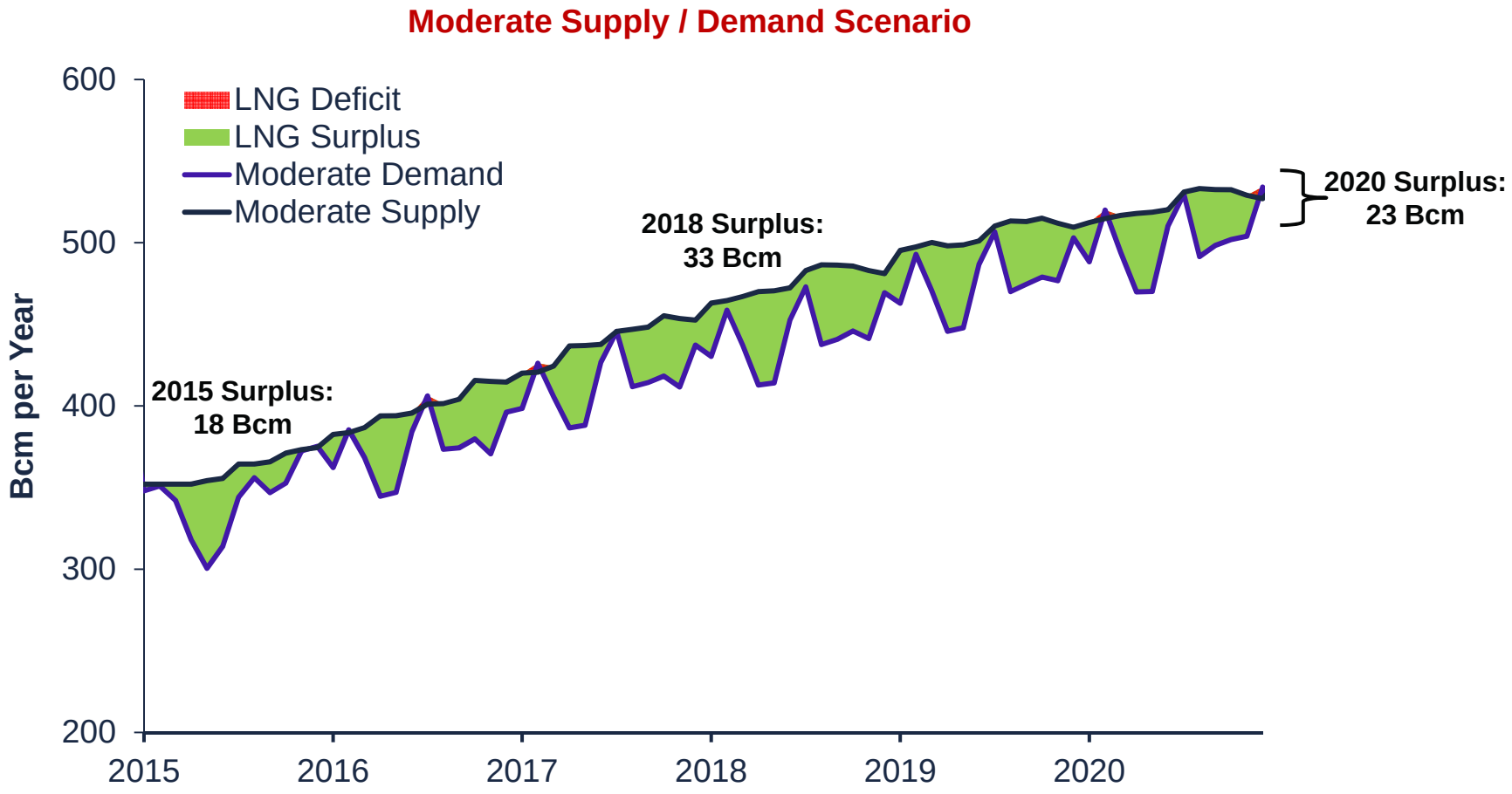

**Future Demand Drivers:**

- Price levels
- Environmental and air quality concerns
- Carbon reduction
- Renewable energy integration

Note: LNG demand growth from new regas terminals are calculated by applying benchmark load factors

# LNG Surpluses on the Rise

With supply increasing faster than demand, global LNG trade surpluses will continue to increase through 2018, but then will be gradually absorbed over into the next decade




Sources: BRG Analysis, BRG Global Balance (“GloBal “) Model, Shale Resource Potential (“ShaRP“) Model, Bloomberg

# 4. REPRICING LNG

# Vehicles of Change

Asia's short-term markets are growing swiftly, but remain thin and not adequate to reprice and revalue the structural market change now afoot in the region.

- In Asia, the ongoing market change may be delivered through a variety of vehicles, including **development of liquidly traded price hubs, term contract re-negotiation, price reviews, and commercial arbitration**.
- Existing SPA indexation mechanisms may not be able to keep track of the structural changes in the market, and liquidly traded hubs are not available to provide price solutions.
- For now, contract renewals, extensions, and price reviews are the primary vehicles for effecting market change, with arbitration on the horizon
- Asia looks to be embarking on a journey of market transformation similar to that which North America and Europe initiated decades ago, but Asian markets begin the journey with unique features:
  - Greater dependency on LNG relative to domestic production and pipeline imports.
  - Less interconnectivity between markets due to geographic distances and the historical development of the industry around LNG.
  - The presence of extra-regional (HH) hub-indexed contracts in the market even before traded markets and hub prices are developed.

# Uncertain Hub Impact

Asian LNG trading hubs and markets are slowly emerging, but falling LNG demand and supply projects with inertia may impede development

- **When will Asian traded markets take off?**
  - IEA has pegged Singapore as a leading candidate, based on its free-market approach to natural gas markets.
  - In June, the Singapore Exchange announced it is considering creating a global market in spot LNG trading, but cautioned it can take years to develop new physical markets.
  - In Japan in July, the first non-deliverable LNG forward deal was done on the Japan OTC exchange almost a year after the trade was launched.
- **After traded markets are developed, will the amount of surplus and liquidity bring market stability or will the hubs lack the liquidity and stability needed to fully or partially replace oil-indexation?**
- **Or will extra-regional hubs such as HH and NBP be used instead?**

# Recent Price Negotiations and Reviews

Long-term LNG import contracts in Asia have recently experienced a wave of renegotiation and price review.

*"Existing sellers have a **large number of price reviews** underway with buyers in Japan"*

- Abu Dhabi's Adgas settled recently with Tepco – 4.9 MMtpa.
- Australia's North West Shelf, which has about **ten negotiations open** covering at least 7 MMtpa.
- Qatargas 1 is also **in price review with its eight buyers** led by Chubu – 6 MMtpa
- Kansai and Tokyo Gas **completed price review** at Australia's Pluto project last year – 3.25 MMtpa

*"The Indonesian government has **come to a resolution** with China's CNOOC over the price of a 2.6 MMtpa contract with Tangguh LNG. **Indonesia will now presumably turn to renegotiation talks** with Tangguh's Korean buyers, SK E&S and Posco, which are also paying below market prices for their LNG."*

*"In the last couple of years, we've been seeing a general trend where three sets of pricing emerged – with **price reviews being the most expensive, extensions next and greenfield supply the cheapest**."*

*Source: Poten, June 2014*

# Conclusions

So far only negotiation and price review have been deployed. No Asian price disputes have been submitted to international arbitration and liquidly traded hub prices are many years away

- To day, market change is being effected only gradually through greenfield contracts, contract renewals, and price reviews.
- So far, buyers appear to have more leverage and sellers more flexibility with new contracts as compared to existing contract renegotiation and price review.
- However, these gradual results available through conventional channels do not appear to track the substantial structural changes afoot in regional and global markets
    - Liquidly traded hub prices are several years away at least, partially depend on downstream market liberalization efforts just beginning, and are likely to remain a short-term price solution until they become deep and well established markets.
    - As far as we know, no price disputes have yet been submitted to international arbitration although several disputes appear to be intractable and at the cusp of formal dispute resolution proceeding.
- The coming few years whether more substantial market change will take root in Asia or whether conventional practices will continue to constrain the range of options and flexibility available to buyers and sellers.

# THANK YOU

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