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Atlantic Basin LNG Dynamics

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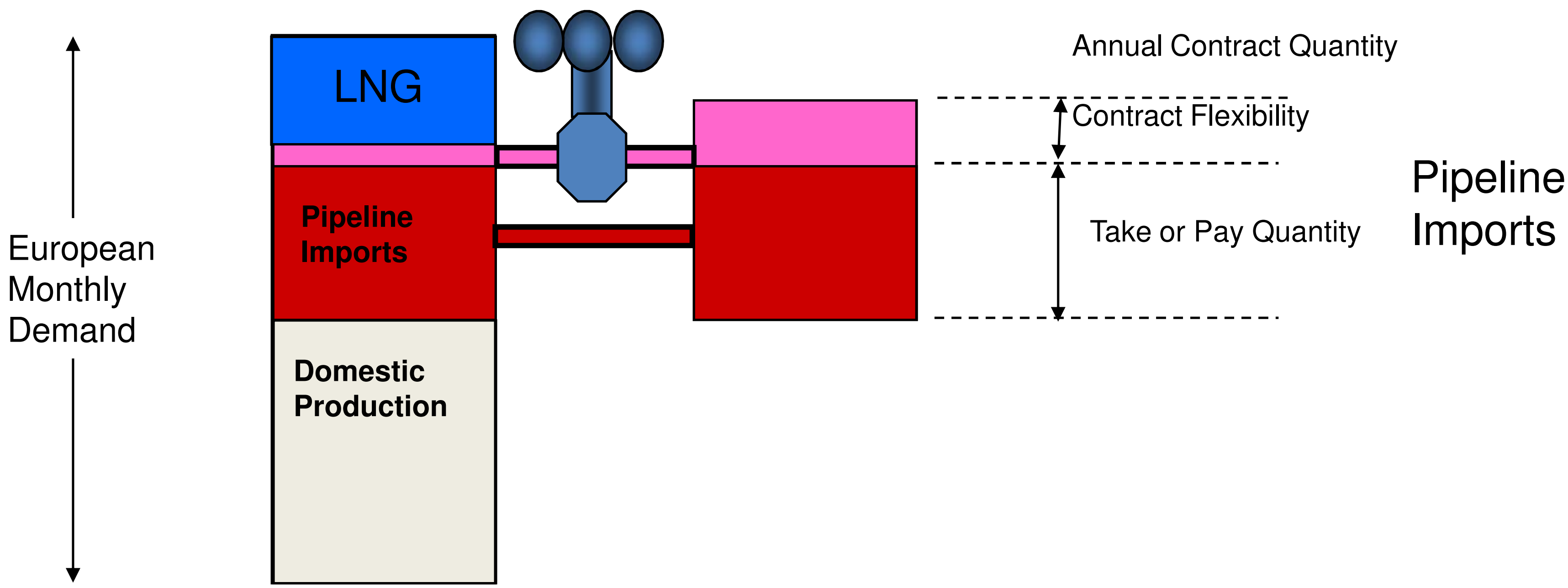
Roadmap

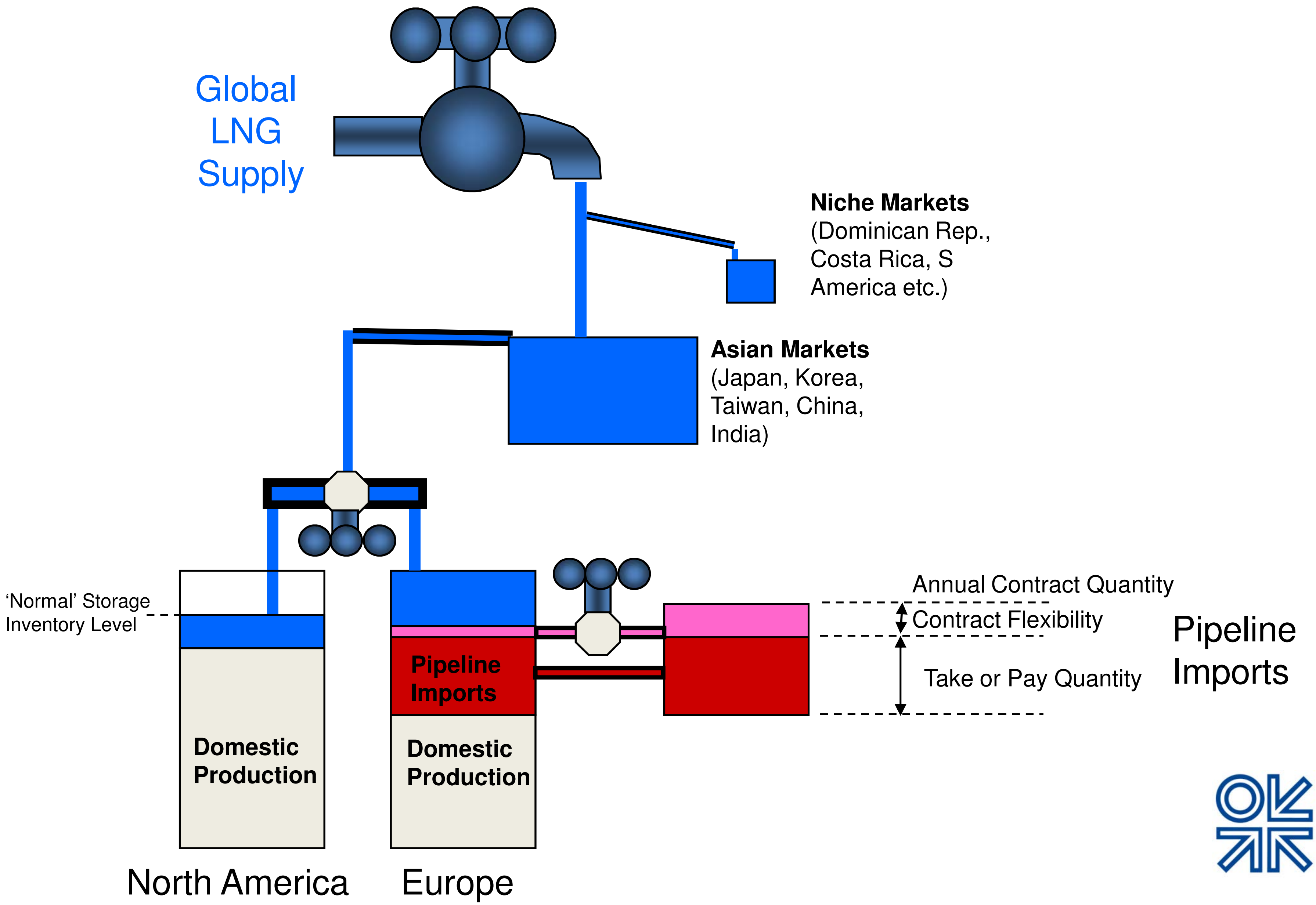
- Analytical Framework & Methodology
- Current Gas Market Status and Outlook
- UK Gas Market Future Challenges.

LNG trade-flows in the Atlantic Basin, trends and discontinuities, Howard Rogers March 2010, http://www.oxfordenergy.org/pdfs/NG41.pdf

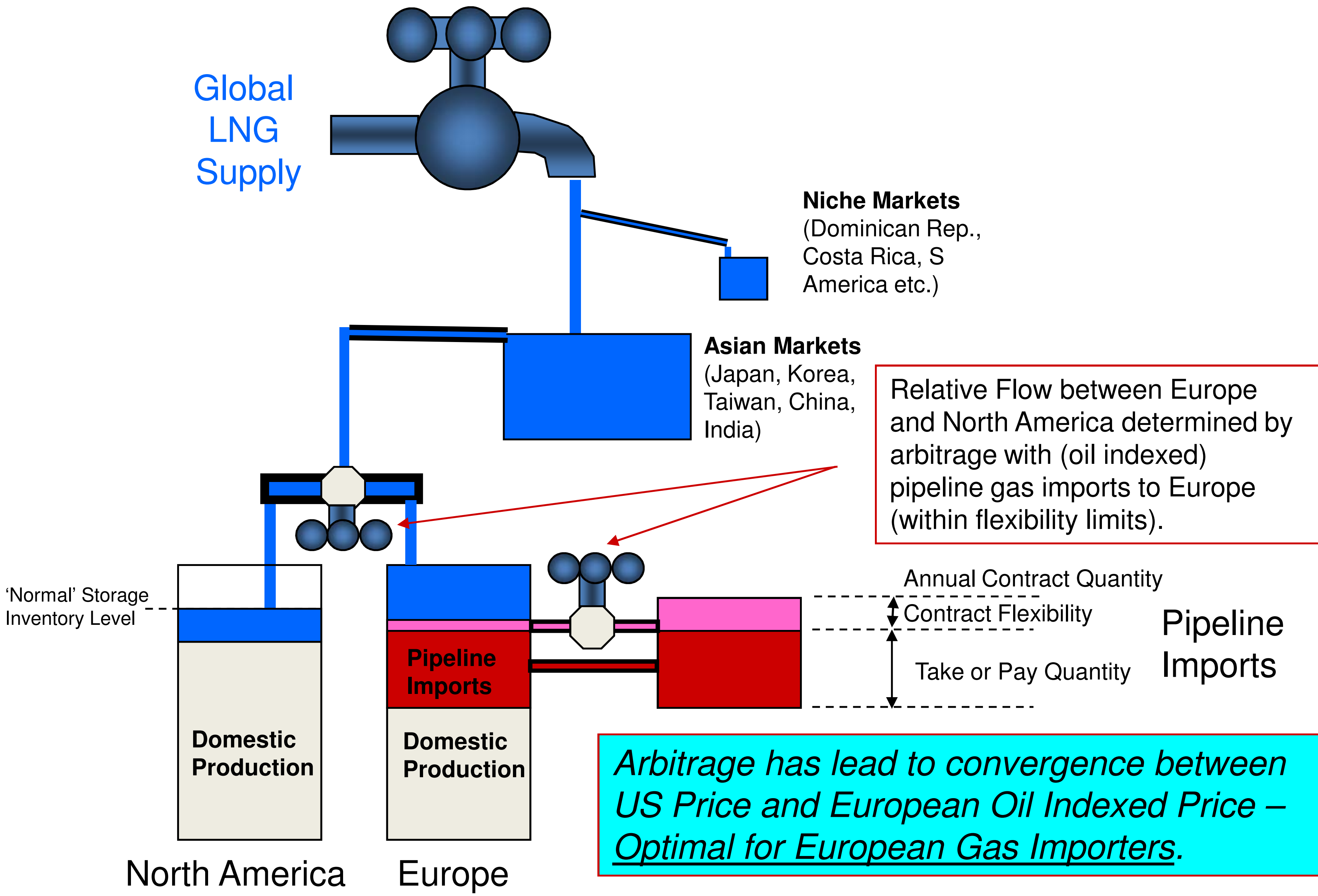
European Supply Dynamics



Global LNG System -1

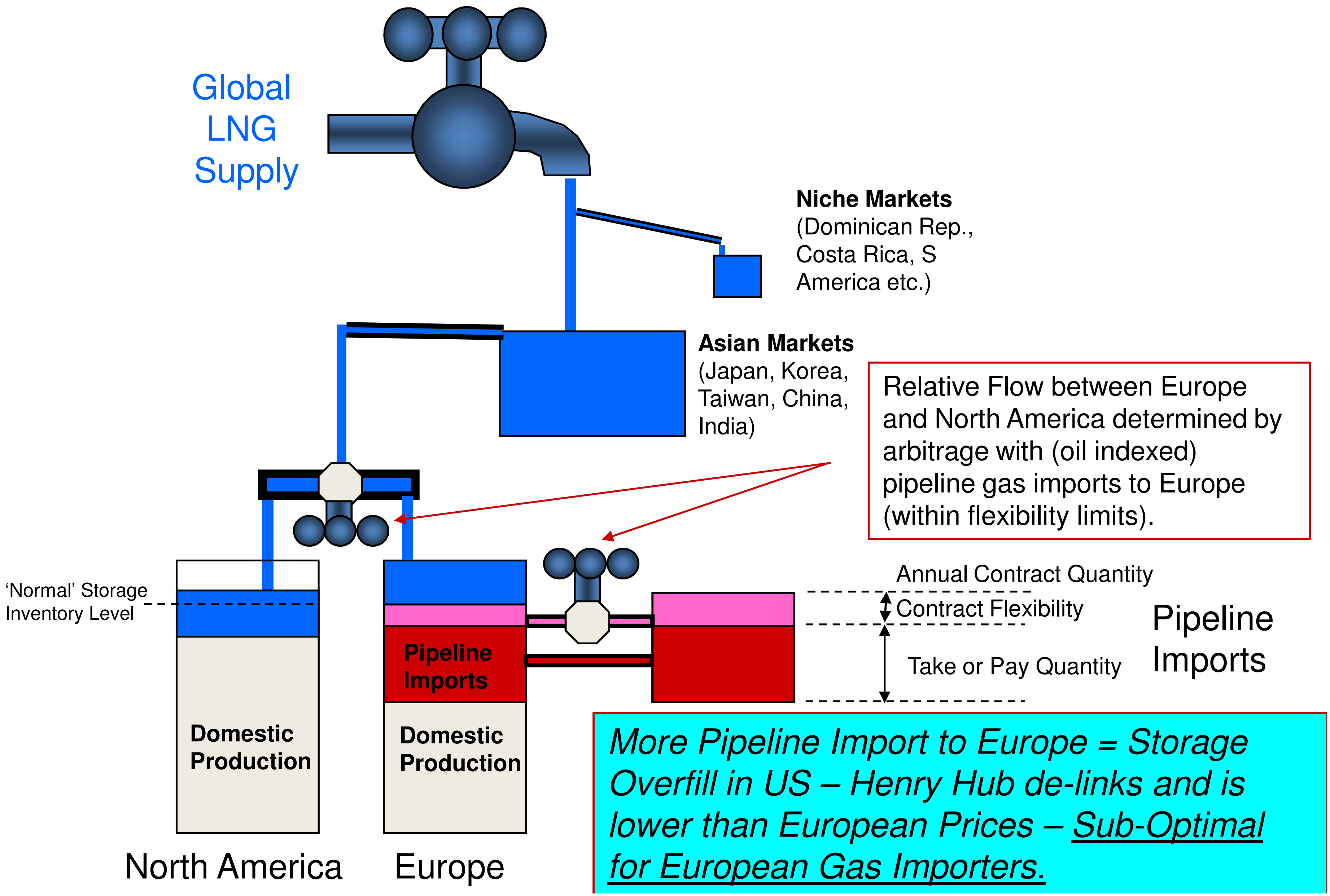


Global LNG System - 1



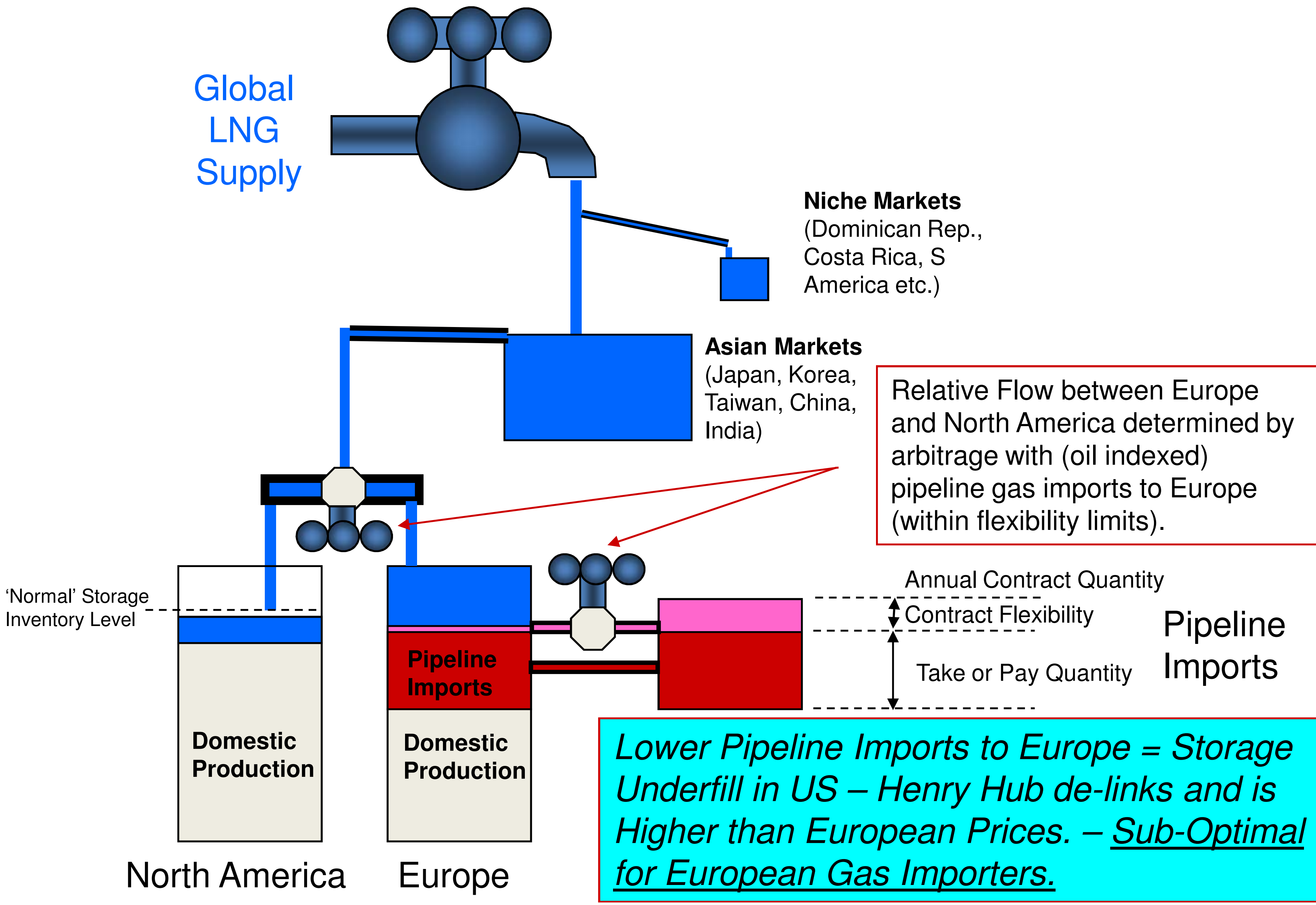
Arbitrage has lead to convergence between US Price and European Oil Indexed Price – <u>Optimal for European Gas Importers</u>.

Global LNG System - 2



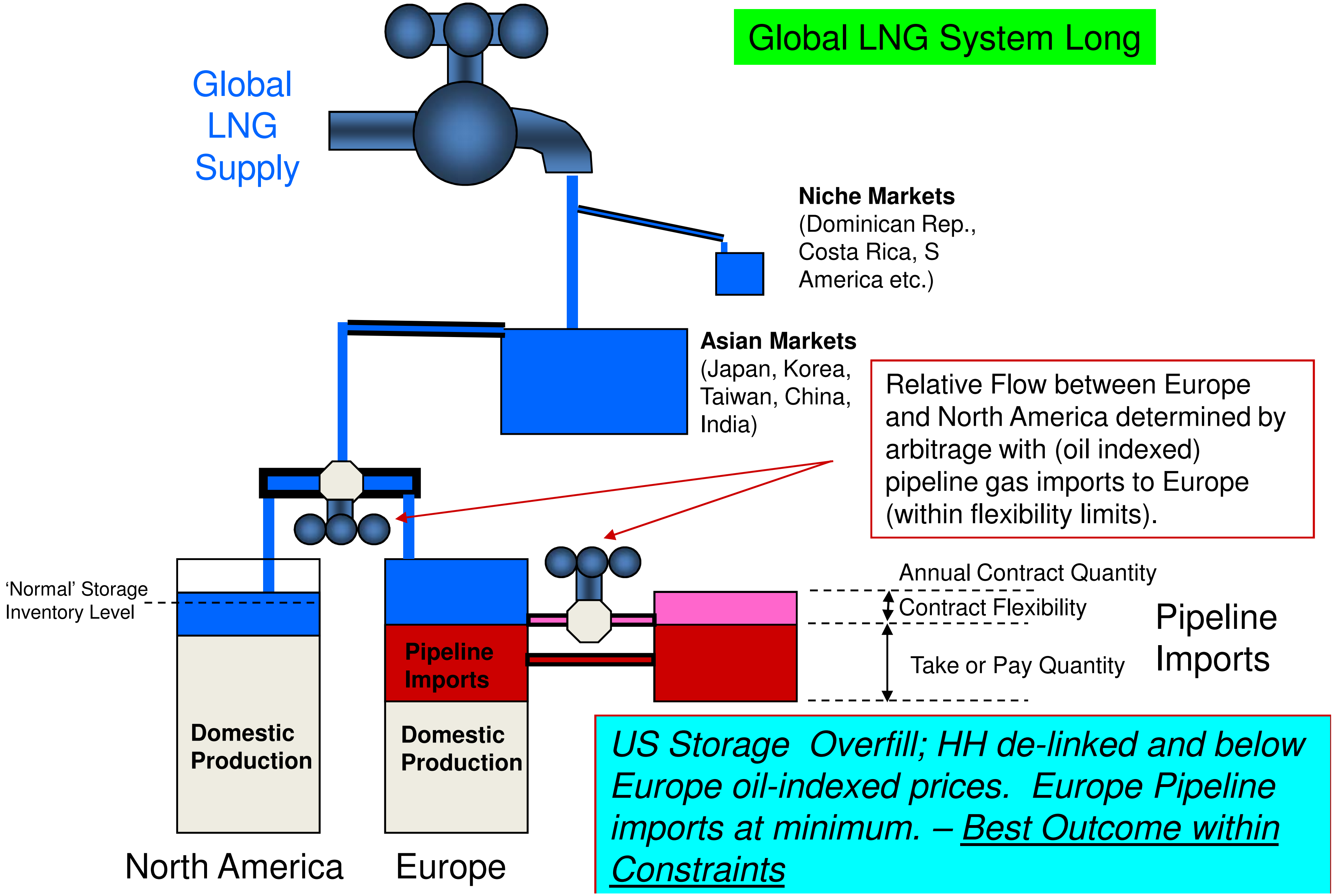
More Pipeline Import to Europe = Storage Overfill in US – Henry Hub de-links and is lower than European Prices – <u>Sub-Optimal for European Gas Importers.</u>

Global LNG System - 3

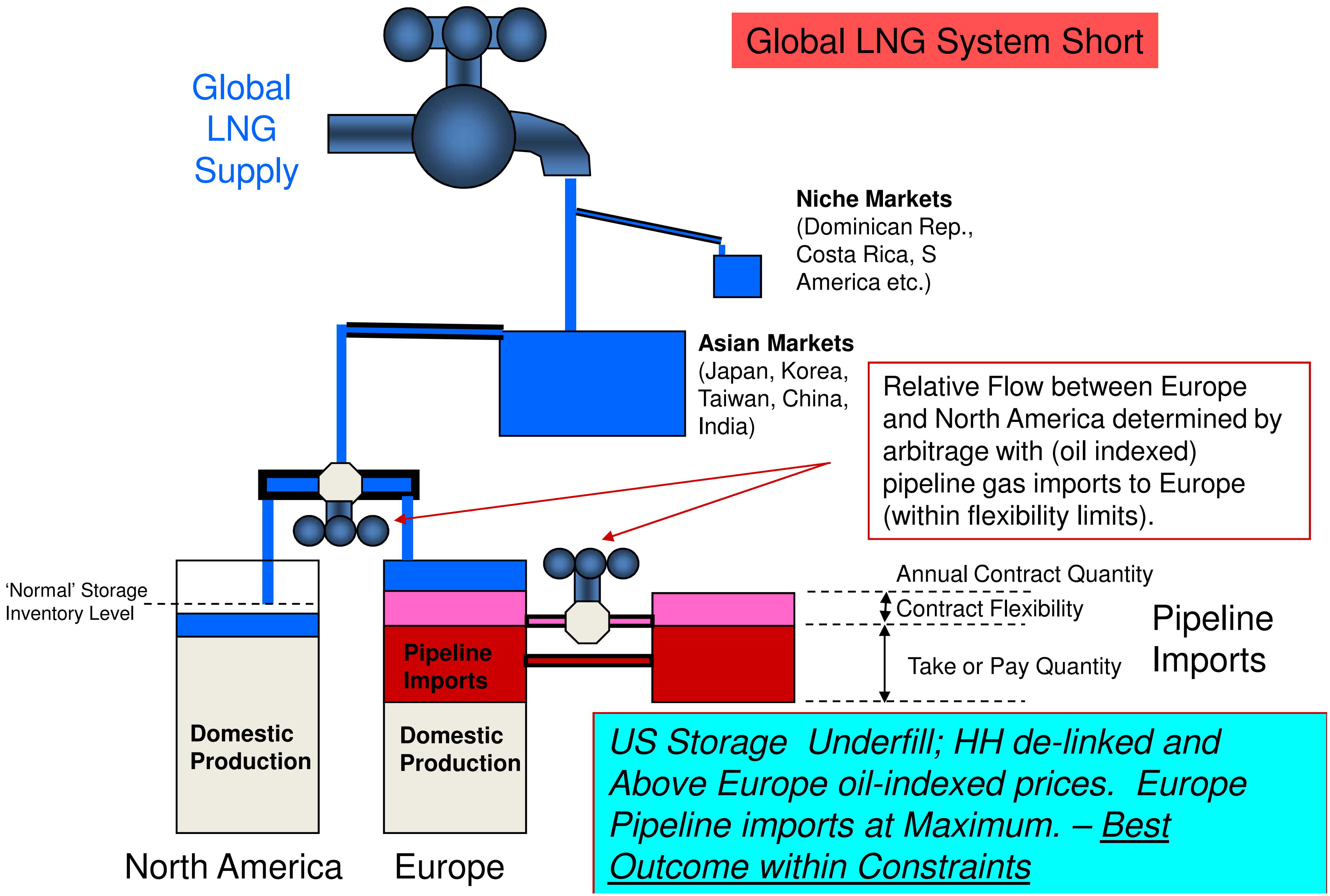


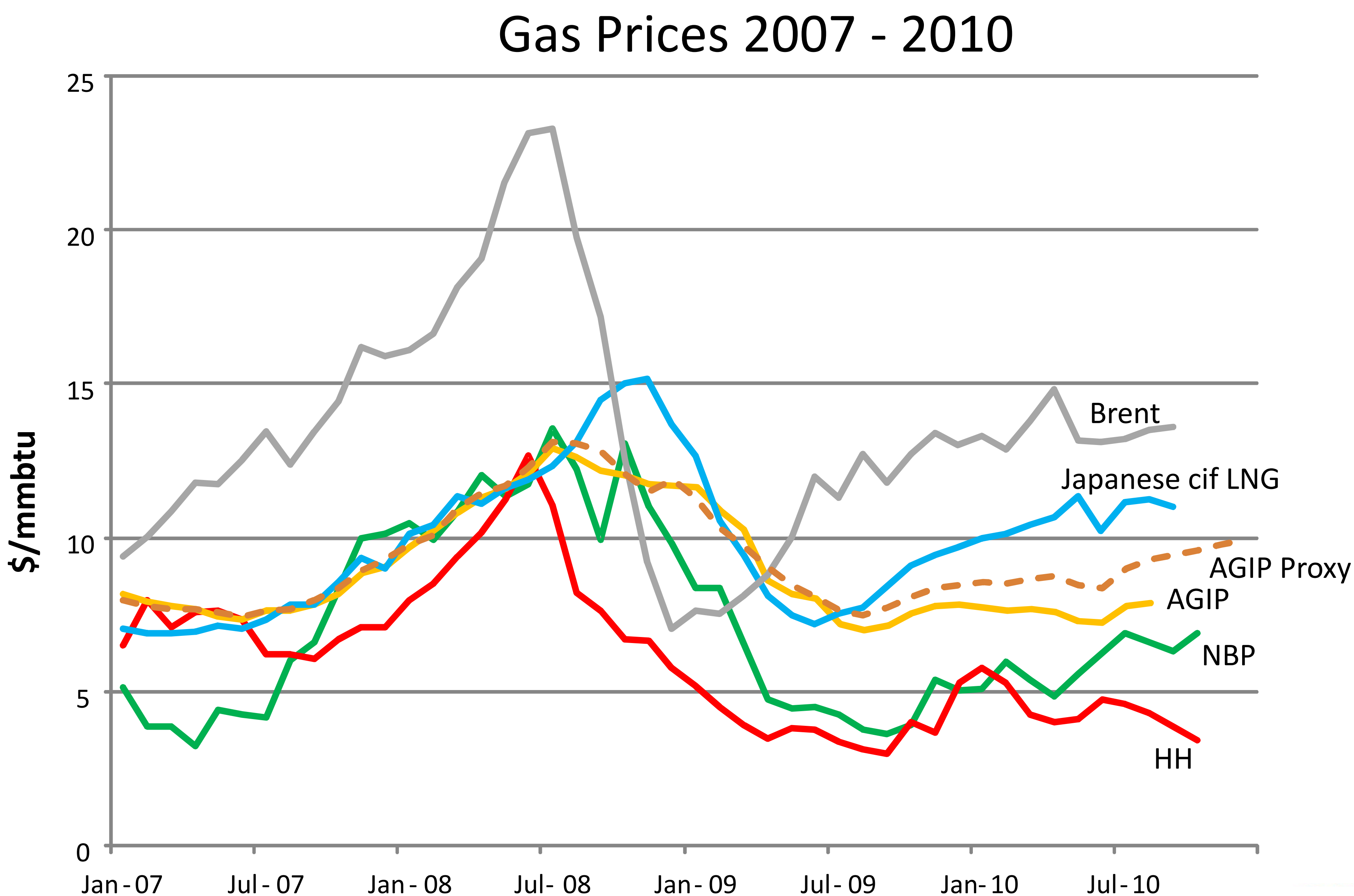
Lower Pipeline Imports to Europe = Storage Underfill in US – Henry Hub de-links and is Higher than European Prices. – <u>Sub-Optimal for European Gas Importers.</u>

Global LNG System - 4



Global LNG System - 5

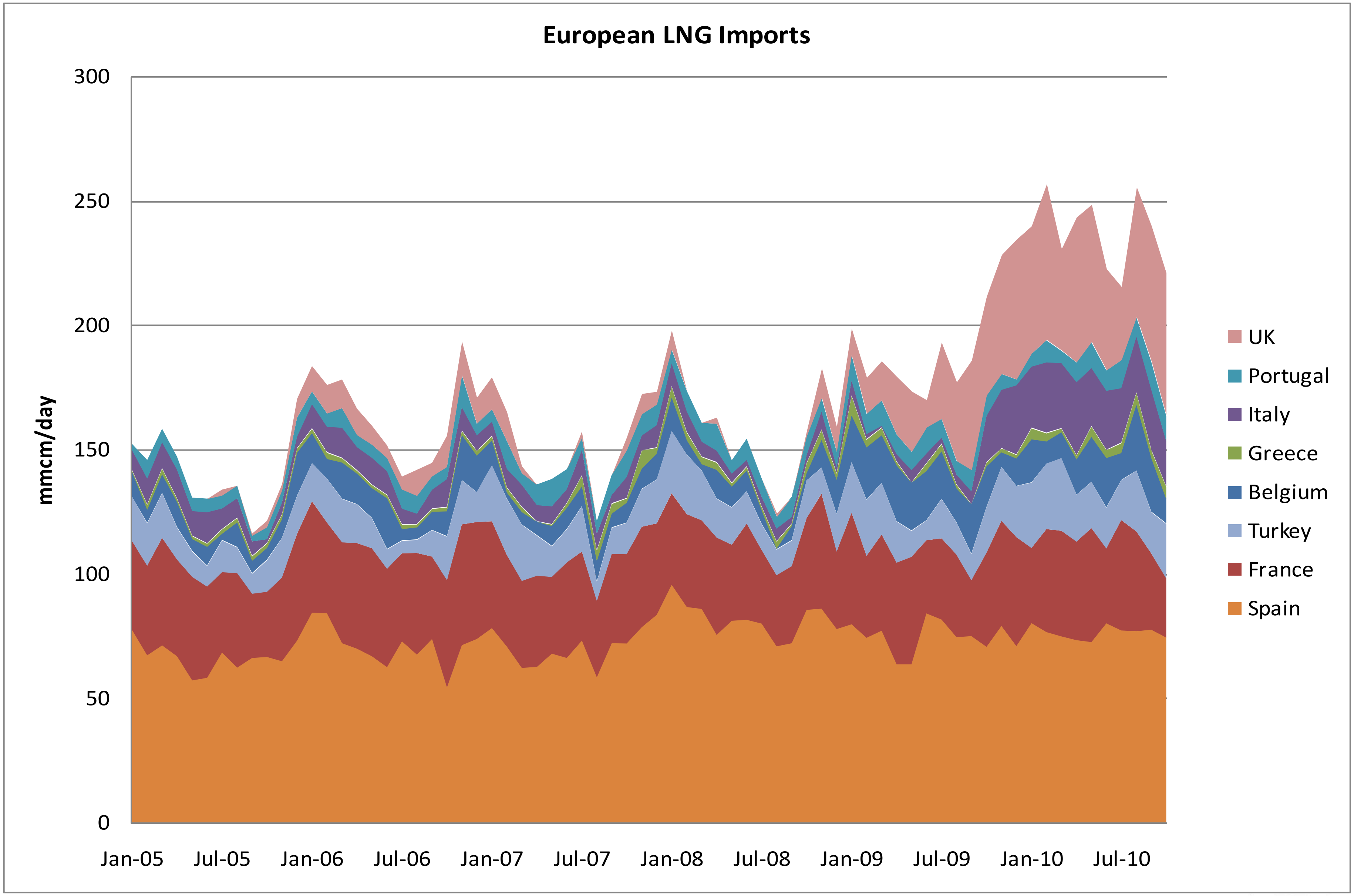




AGIP = Average German Import Price (Oil Indexed Gas)
NBP = UK National balancing Point Price
HH = Henry Hub US Price

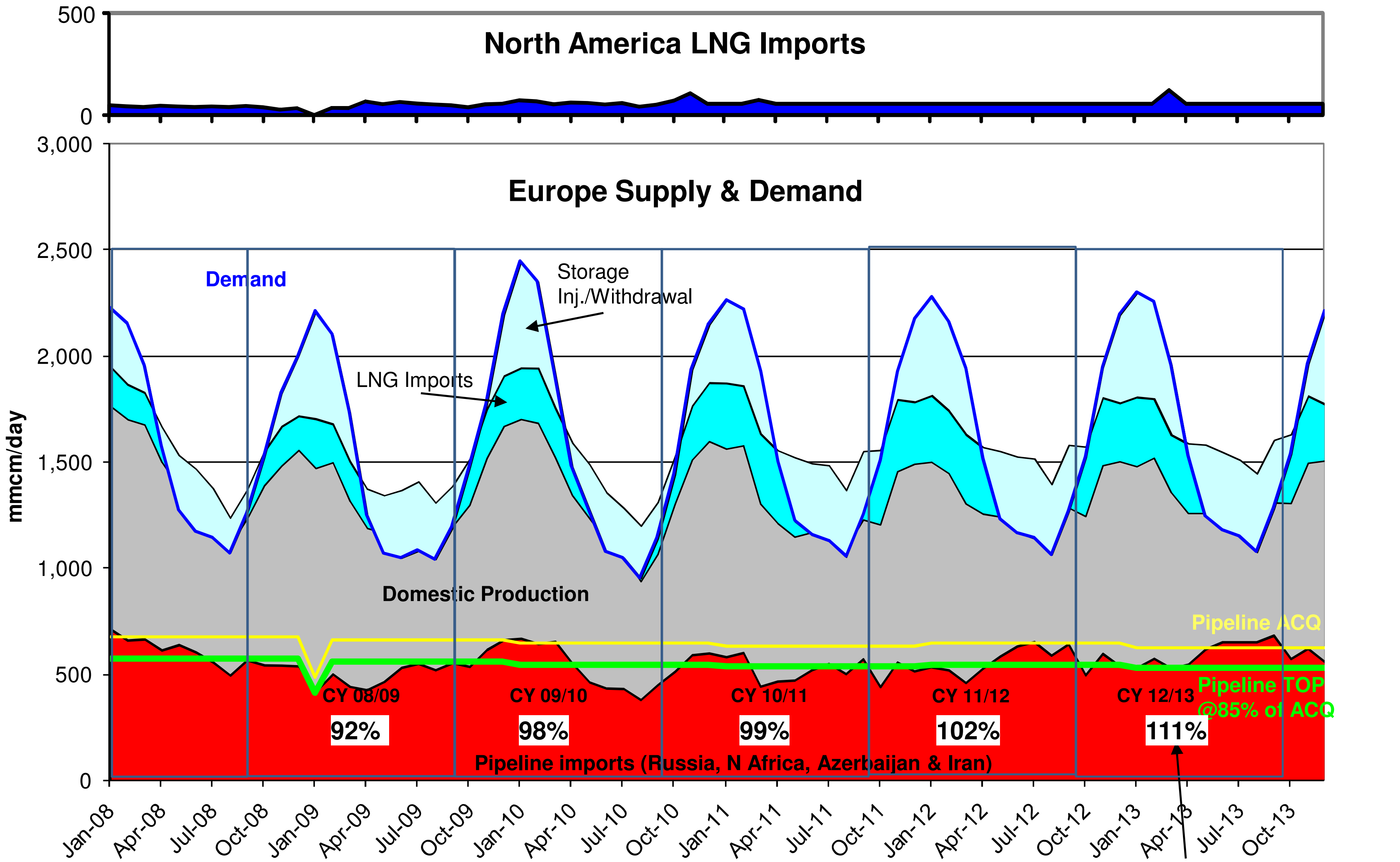
Sources: Argus, BAFA, EIA, Own analysis

European LNG Imports Jan 2005 – Oct 2010



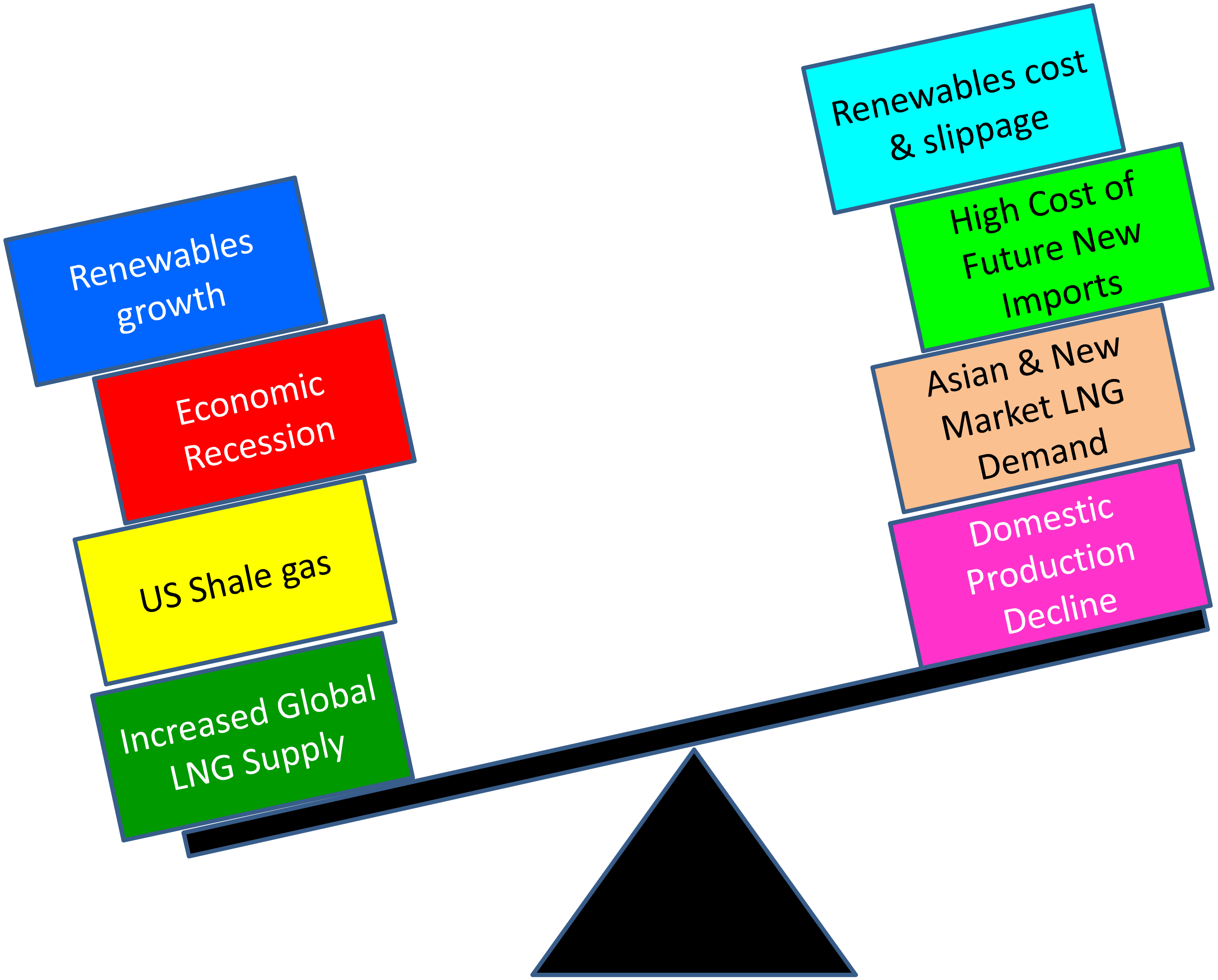
Source: Waterborne LNG

North Atlantic LNG Balance 2008 - 2013

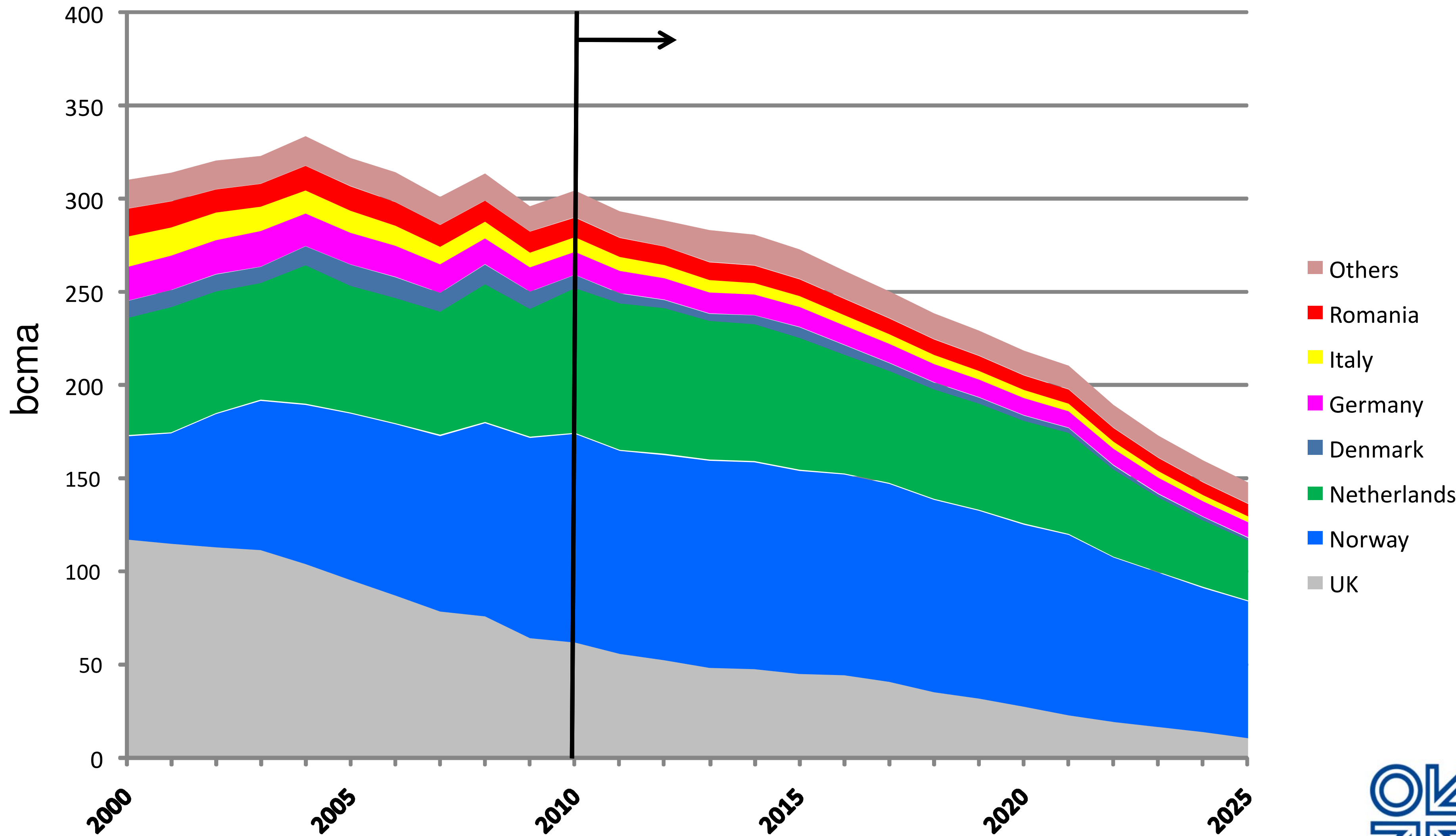


Sources: IEA Monthly Data, Waterborne LNG, Own analysis

Global Factors Influencing the European Market



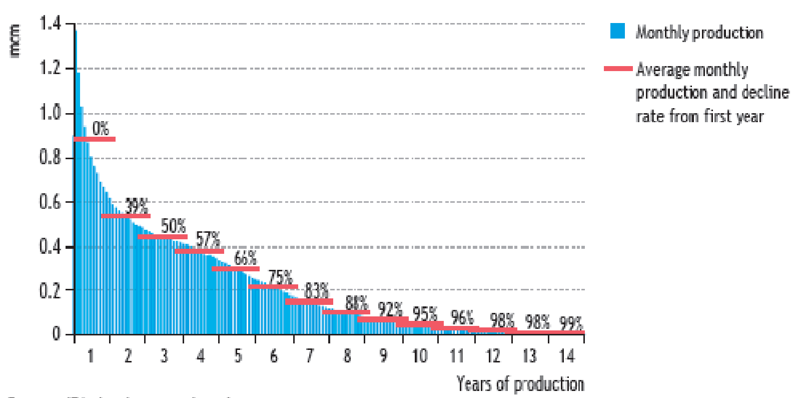
European Domestic Production to 2000 - 2025



Sources: IEA, WoodMackenzie, National Grid, Dutch Ministry of Foreign Affairs, Energi Styrelsen, Own Analysis

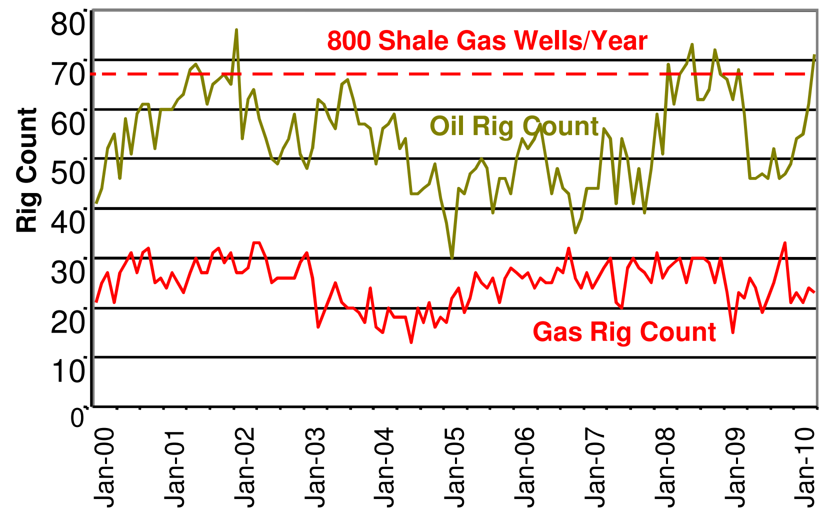
Shale Gas - Dynamics

Production decline rates for Barnett shale horizontal wells

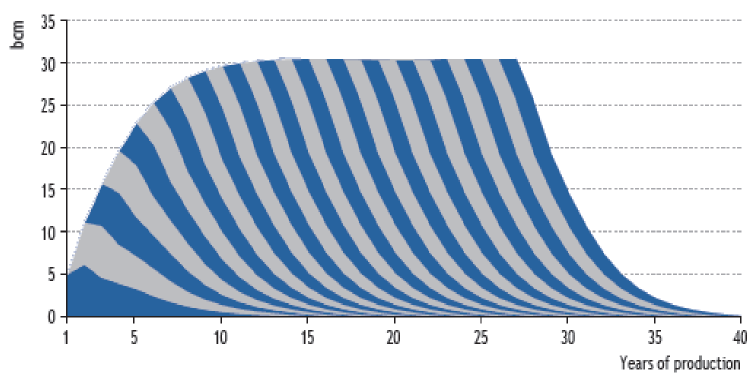


Source: IEA databases and analysis.

European Rig-Count - 2000 - 2010



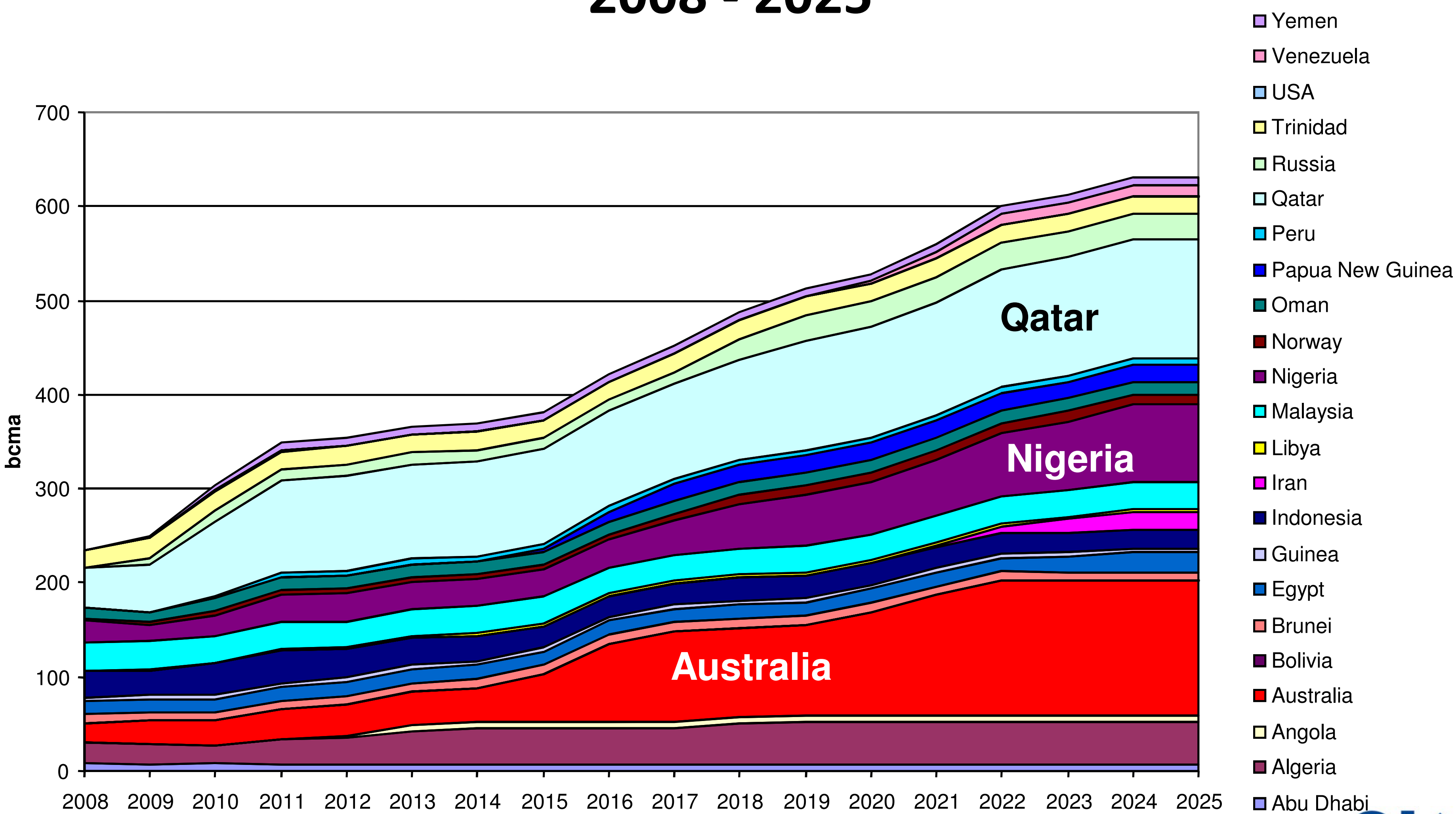
Hypothetical production profile of a new gas shale play, based on the typical profile of Barnett shale wells



Notes: Assumes 800 wells drilled annually for 27 years. Coloured segments represent production from each vintage.

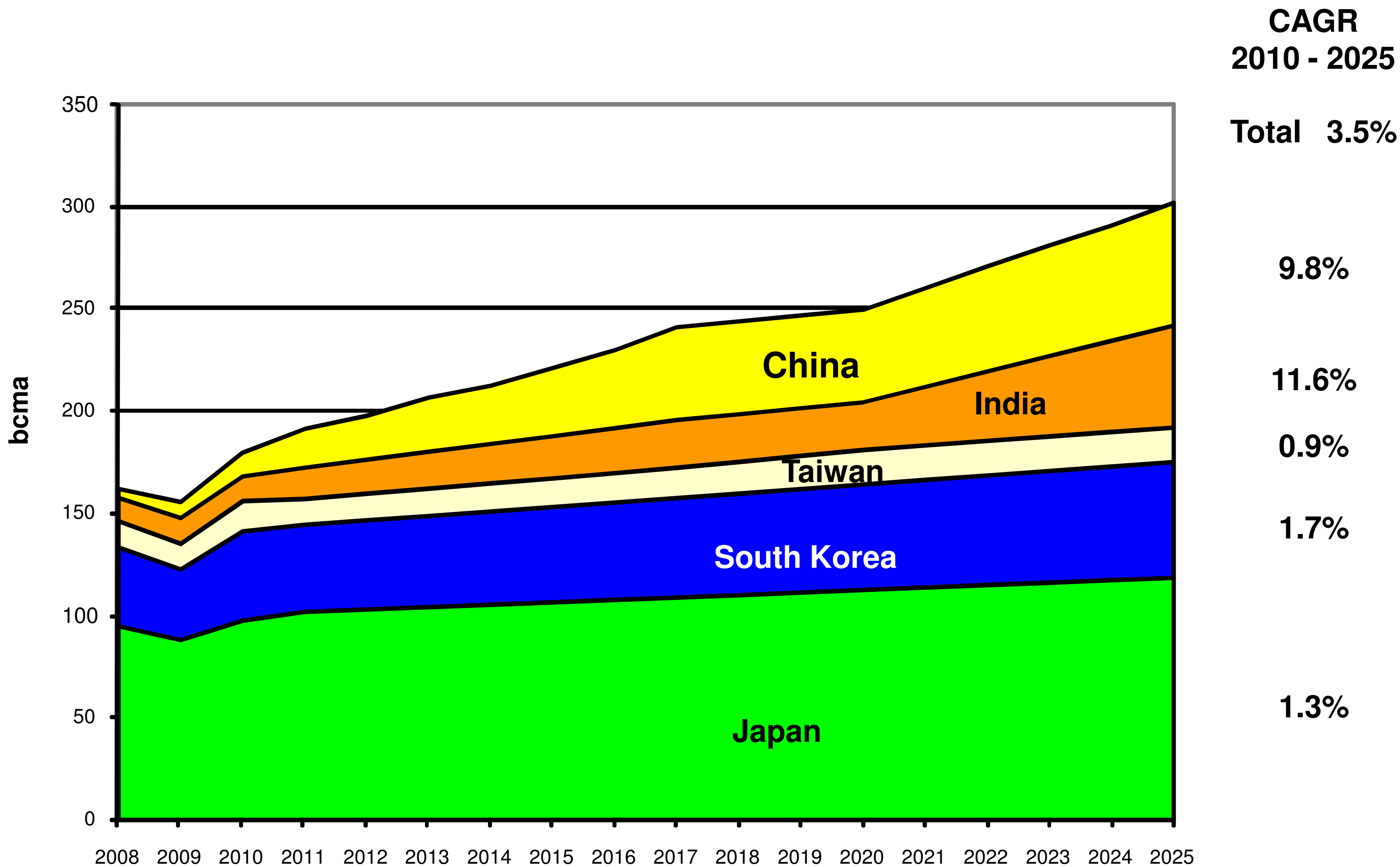
Sources: IEA WEO 2009, Baker Hughes

Global LNG Supply Assumptions 2008 - 2025



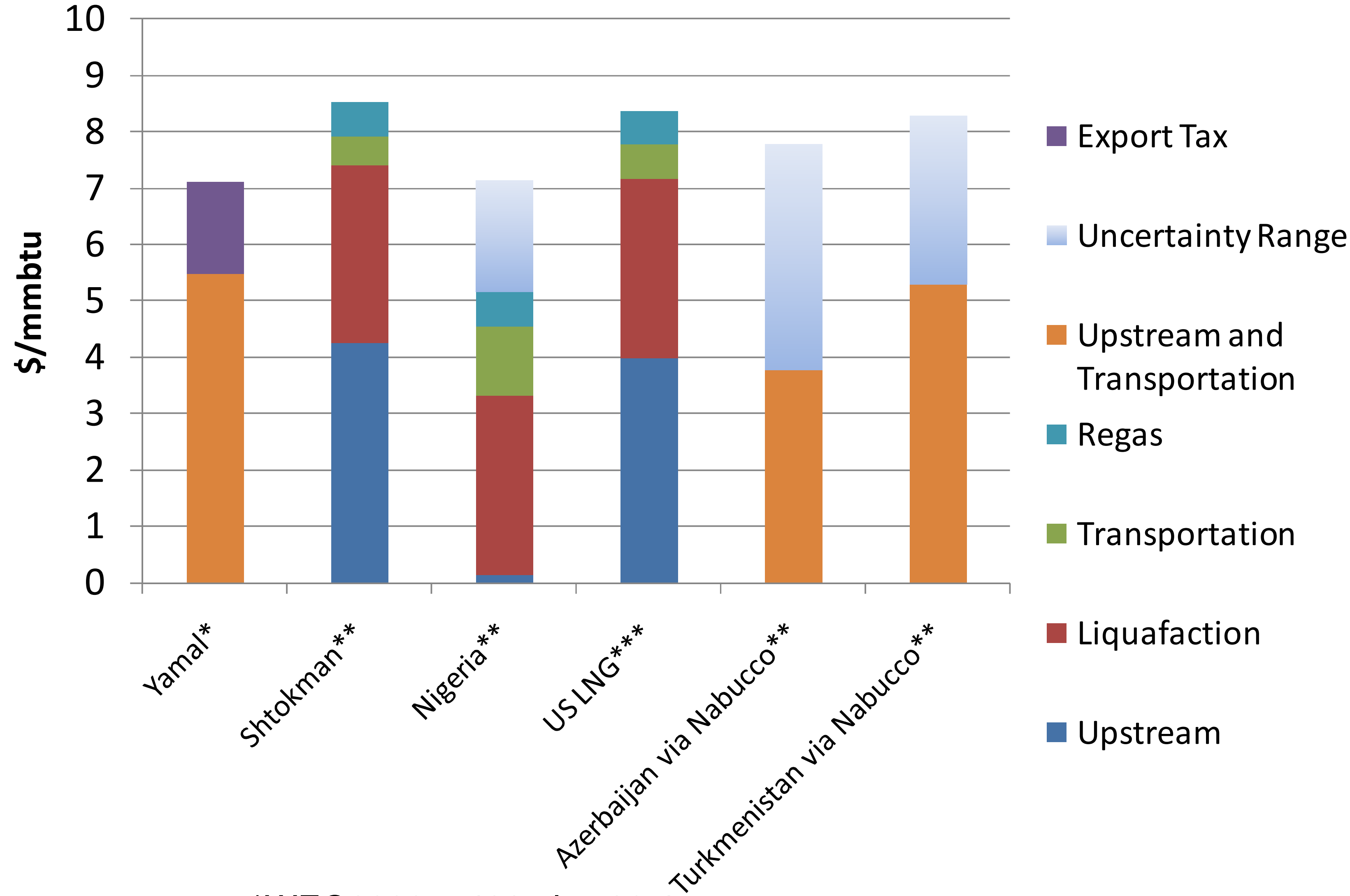
Sources: Waterborne LNG, Company Reports, Own analysis

Asian LNG Import Assumptions



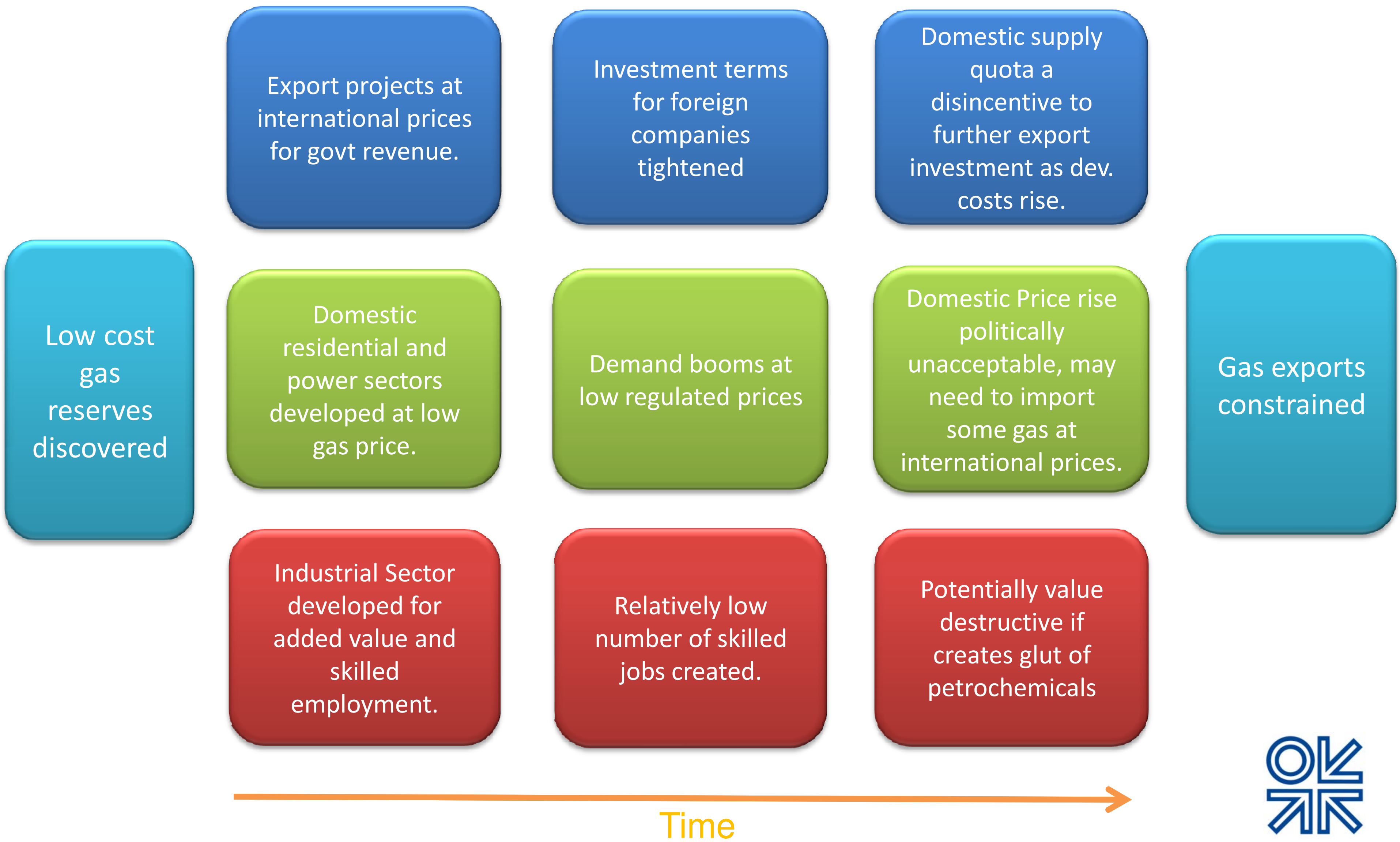
Sources: IEA, WoodMackenzie, Own analysis

Competing Sources of New Supply for Europe ?

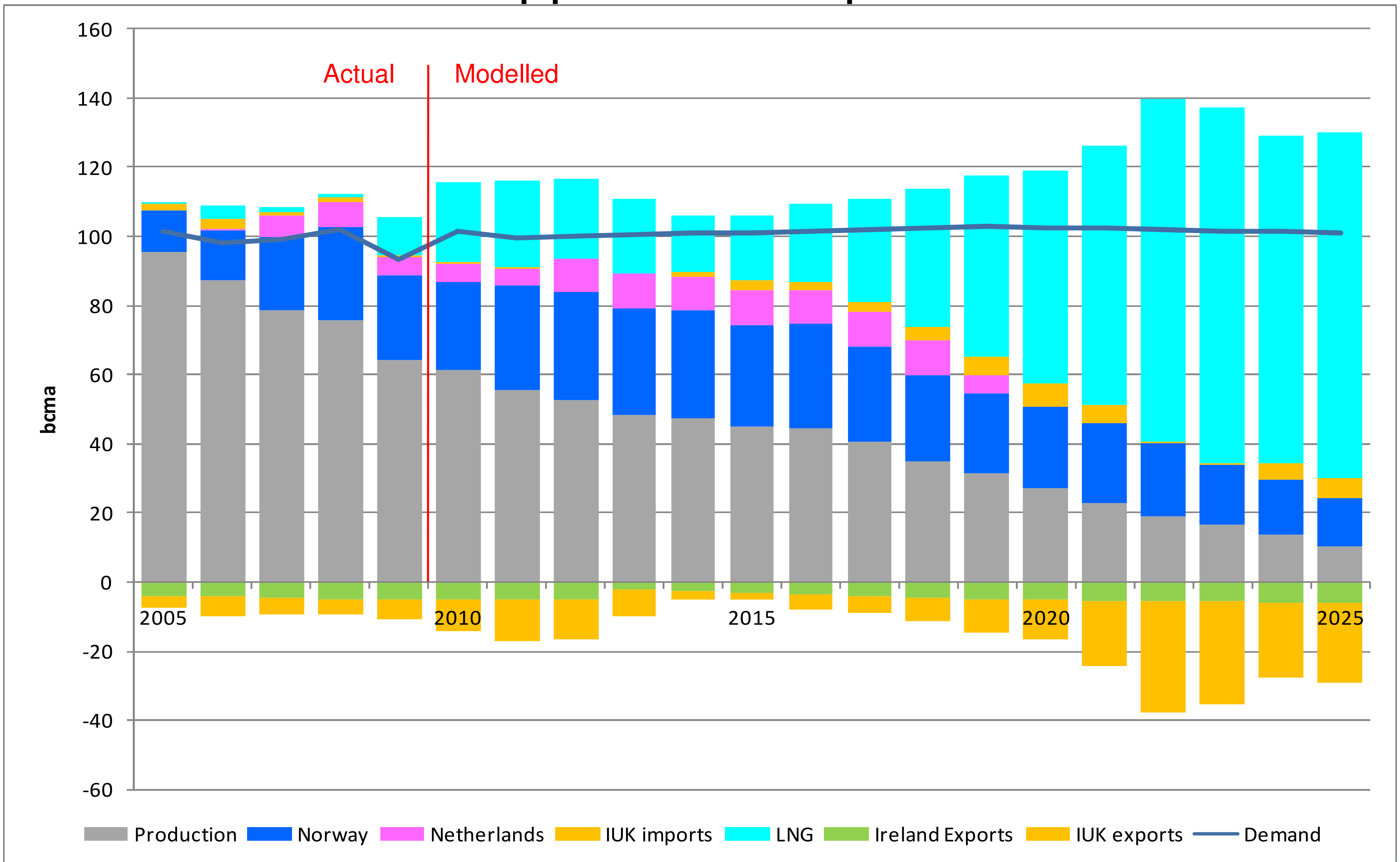


*WEO2009, p482 plus 30% export tax.
**WEO2009, p481 plus regas @$0.60/mmbtu.
*** Broad estimate.

The Gas Exporter's Conundrum



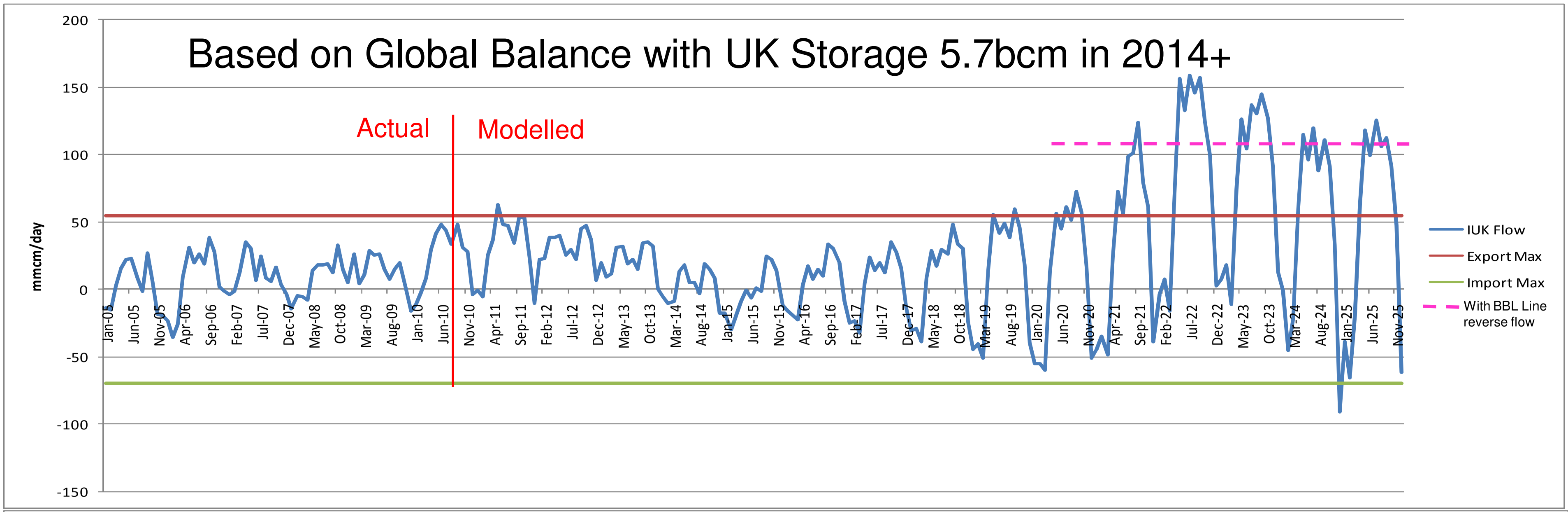
UK Future Supplies and Import Infrastructure

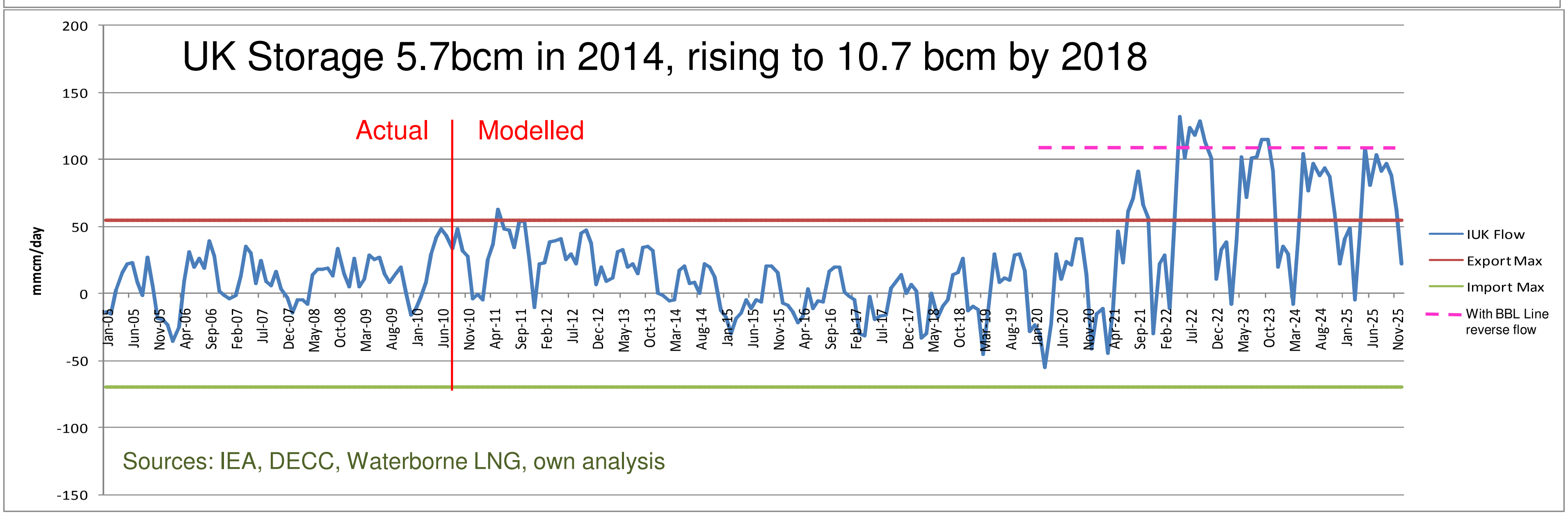


NB. Assumes storage in existing & under construction categories only (i.e. 5.7 bcm by 2014)

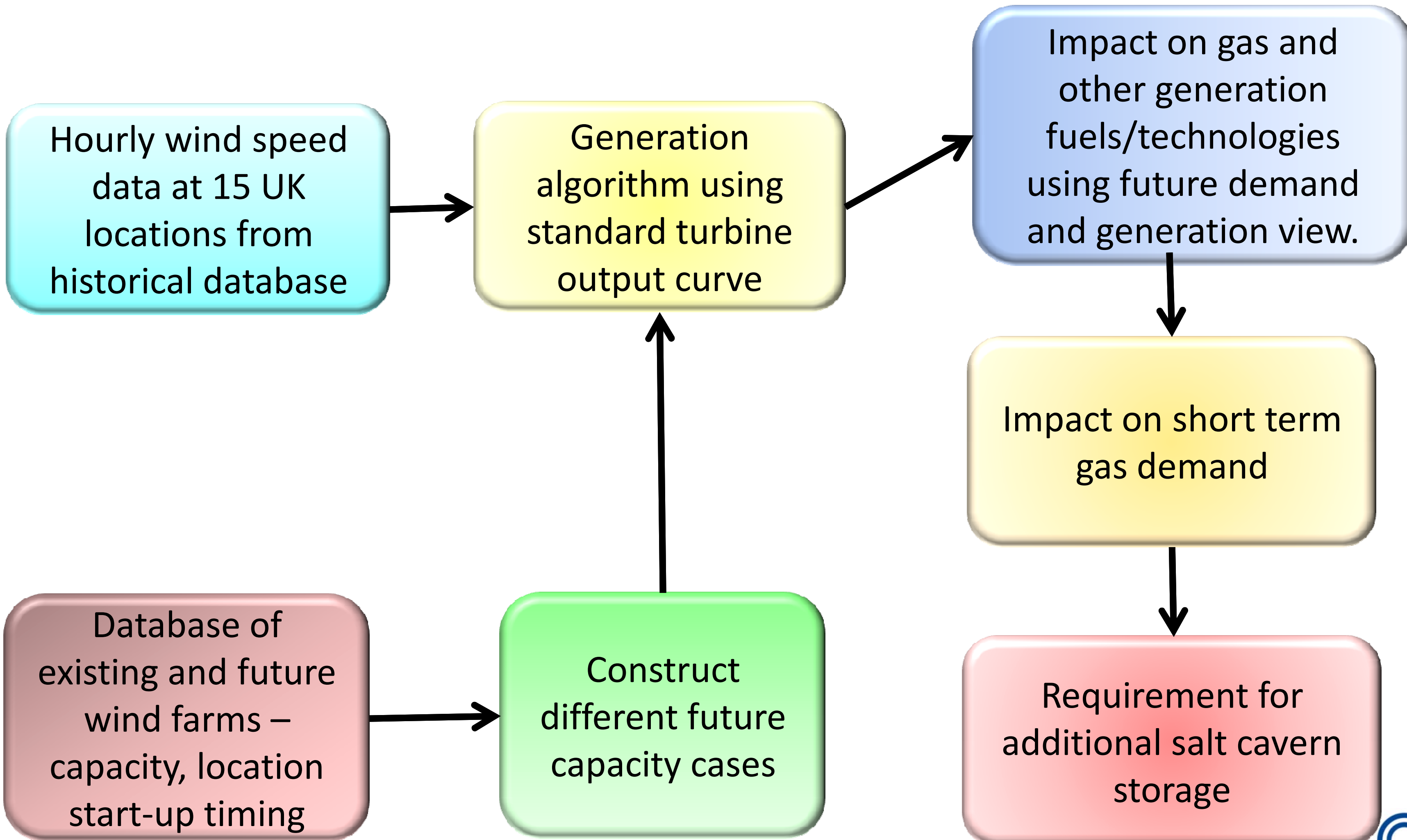
Sources: IEA, DECC, Waterborne LNG, own analysis

IUK Flows 2005 - 2025

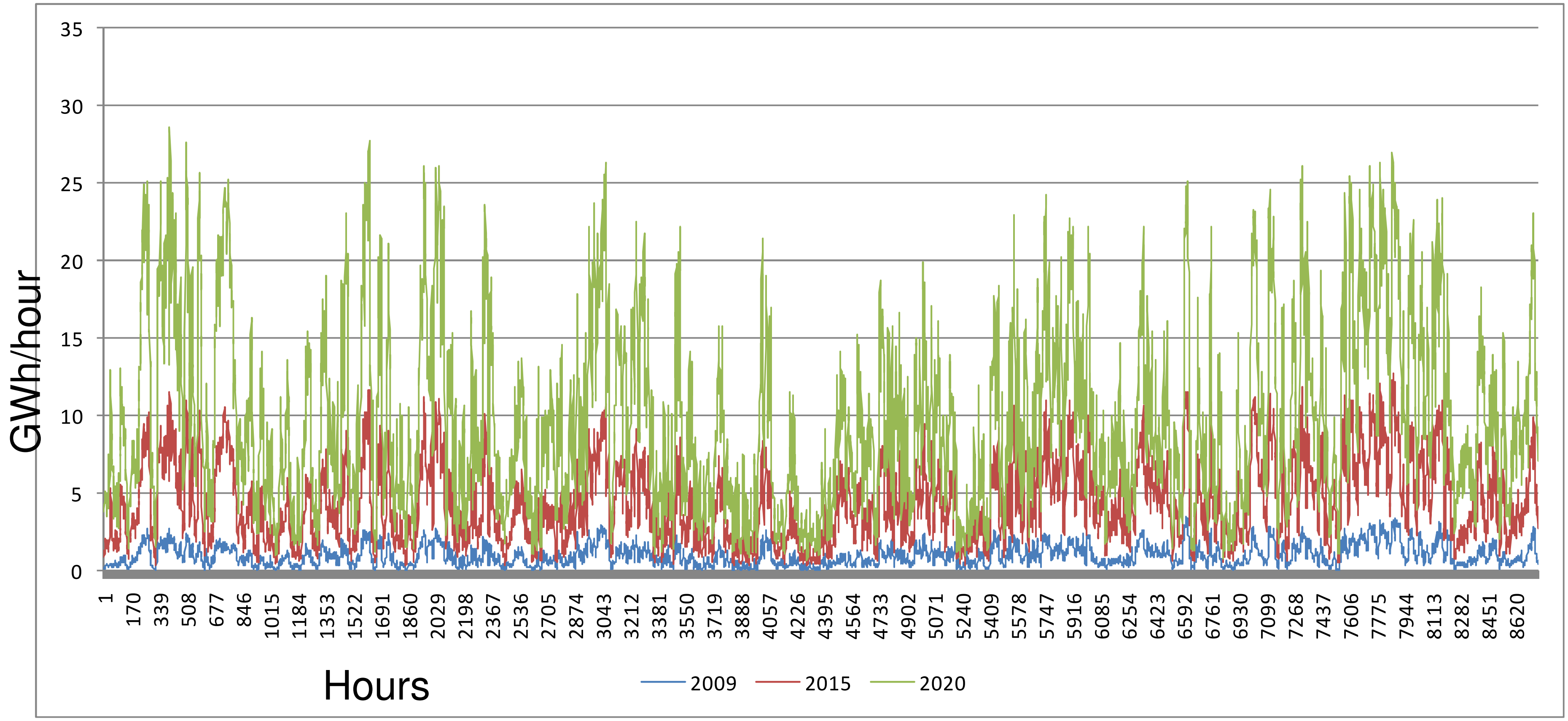




Wind Intermittency Impact on Gas Fired Generation



Hourly Wind Generation 2009, 2015 and 2020



Conclusions

- **Global LNG System**
  - Model valid but recession and US Shale gas growth (minimal LNG imports) has eliminated trans-Atlantic arbitrage for time being.
  - Analytical framework still highly useful for exploring European balance (LNg vs Pipeline imports) as domestic production declines.

- **Medium Term Outlook**
  - De-linkage of Henry Hub and NBP could remain until 2014/15, with NBP arbitraging on coal and oil-indexed price. However balance could soften periodically and therefore expect prices to be volatile.
  - 2015 + system tightening due to Asian demand growth, European domestic production decline.
  - Will US shale growth plug the gap between demand and declining US and Canadian conventional gas ?
  - Outlook for new sources of long distance gas trade uncertain; incremental new supplies will not be low cost.

- **UK Market**
  - Uncertainty on demand levels but rise in imports inevitable.
  - Space heating market will require significantly more seasonal storage capacity.
  - Wind power intermittency will require fast response from CCGT’s and more salt cavern storage.

Questions Welcome.

Thank You

for your attention.

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