Energy Insights

Global LNG Market Outlook

Workshop document
Bangkok, 29 July 2015

We will split our analysis into 3 time periods

Historical market analysis

Tightening

- Loose market between 2008 and 2010 as a result of significant new capacity coming online to meet growing demand
- Increasingly tightening market after 2010, driven by strong Asian demand with limited new supply

Short to medium term outlook

Loosening

- Balanced market roughly until 2018, with underlying demand increasing to keep pace with new supply additions
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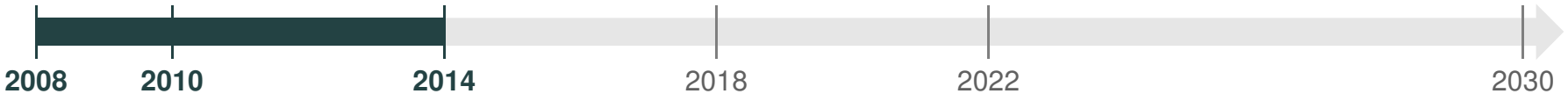
Long term outlook

Balancing

- Tight market from 2022 onwards, as players struggle to take FID and sign contracts in the next ~2 years, limiting supply additions from 2022 whilst demand growth is expected to keep a strong pace
- Balanced market mid-2020s, as we expect the cyclicality of the LNG market in the long term to trends towards a balanced position – however this will require significant new export capacity



SOURCE: Energy Insights

The LNG market has shown solid growth for the last decade and increased global trade routes

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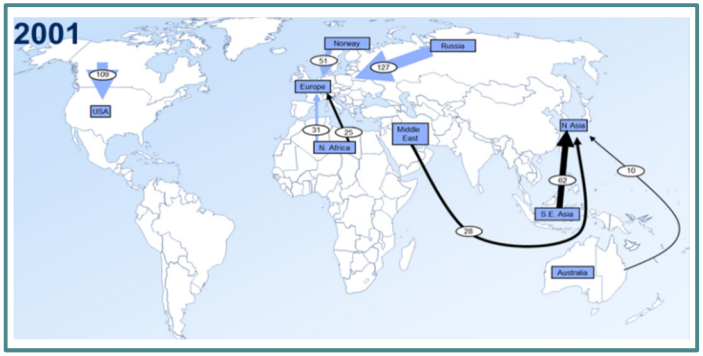
New suppliers have come onto the market …

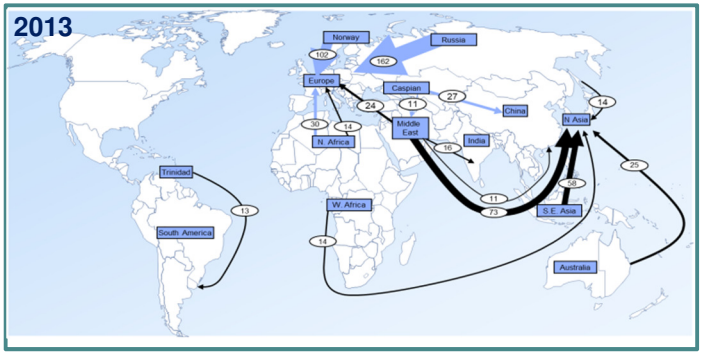
From 2001

- **8 main export routes**
- **3 main markets** (Europe, USA, North Asia (Japan/Korea/ Taiwan)
- **Each supplier serves only one main market**

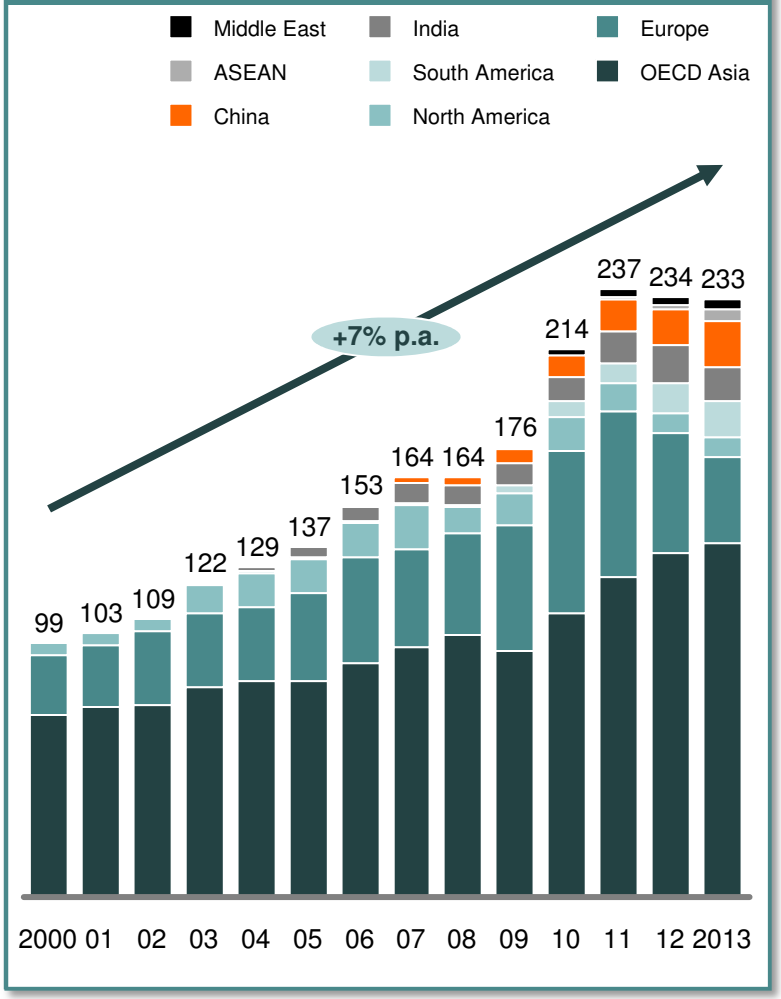


To 2013

- **14 main export routes**
- **3 new import markets** (India, China and Latin America)
- **Middle East and Russia each serve multiple markets**



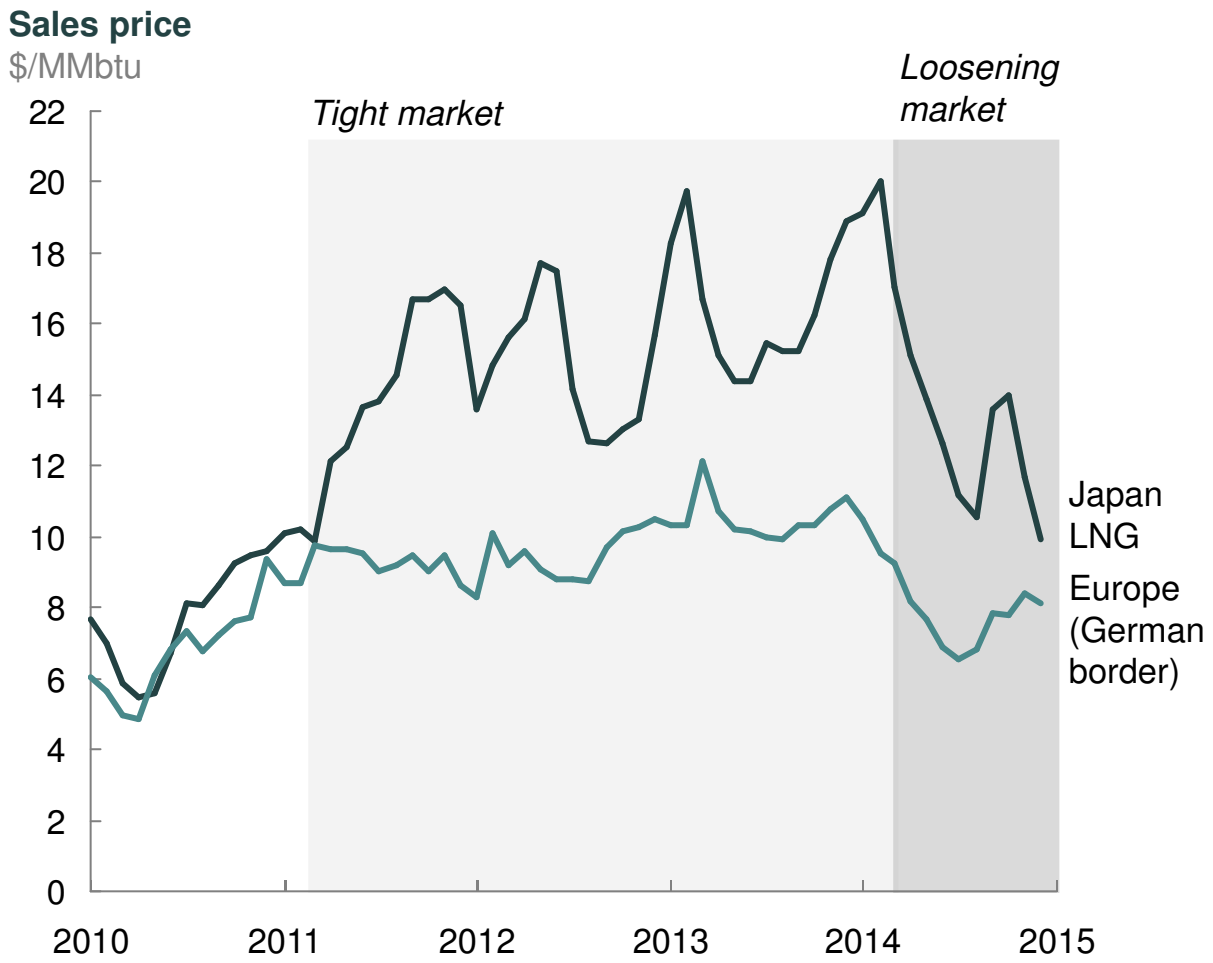
… helping to support strong growth in demand



SOURCE: BP Statistical Review of World Energy

Lower demand and availability of new supply led to lower spot prices even before the fall in oil linked contract prices

Premium in Asia began to disappear as the global balance went from tight to long



Factors that led to price weakness

- **Mild weather across Europe and Asia** allowed inventories to stay at sometimes record highs depressing the demand for summer refilling cargos
- Additionally the inclusion of roughly **20 unexpected and incremental cargoes from PNG LNG** flooded into the market further weakening the spot situation
- **Prices began to converge between Europe and Asia in late 2014** as continuing weak demand in Asia and European re-exports brought the markets to parity, separated only by the cost of transportation

SOURCE: Energy Insights, Bloomberg, FACTS Global Energy

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SOURCE: Energy Insights

MEDIUM TERM OUTLOOK: OVERALL MARKET BALANCE

Underlying demand for LNG, under normal weather, will struggle to keep pace with new capacity in the medium term

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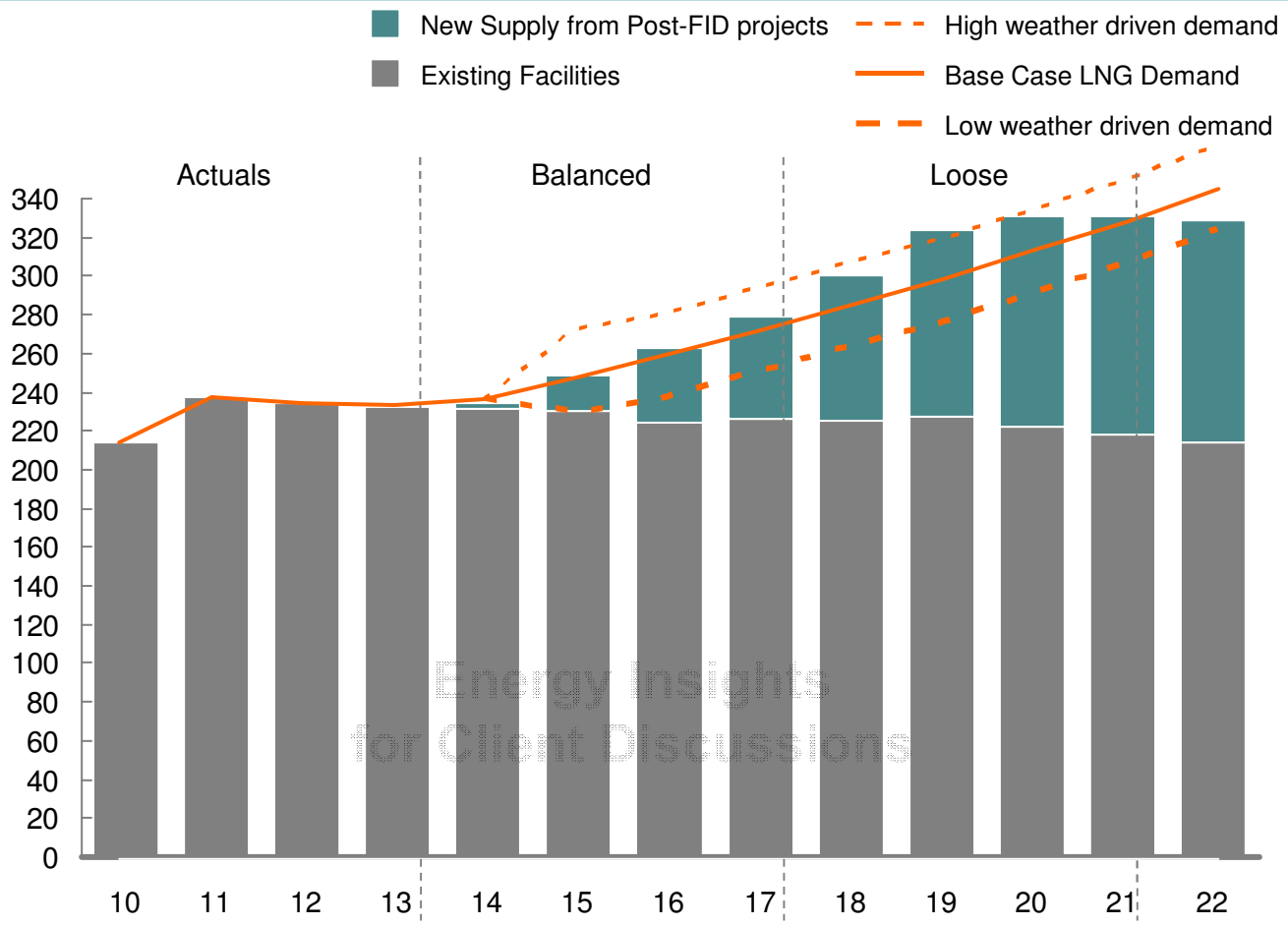
Global LNG Supply and Demand Balance: 2017-2022: Loose turning tight quickly



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- In the **short term LNG market is likely to stay balanced** as supplies from new projects coming on will be met with new demand
- **US liquefaction projects have surprised on the upside** – coming ahead much faster than expected:
  - Asian consumer signed LTC quickly
  - Construction has been quick and efficient
- **2018 to 2020 sees the market over supplied** for a short period as demand cannot keep up with capacity additions
- **Low oil prices (i.e. reduced cash flows) and an over supplied spot market (hence low prices) do not encourage long term contracting and project FIDs** increasing the risk of market tightness from 2022

SOURCE: BP Statistical Review, Energy Insights' Global Gas Model

MEDIUM TERM OUTLOOK: NEW LNG CUSTOMERS

New LNG consumers continue to ramp up significantly

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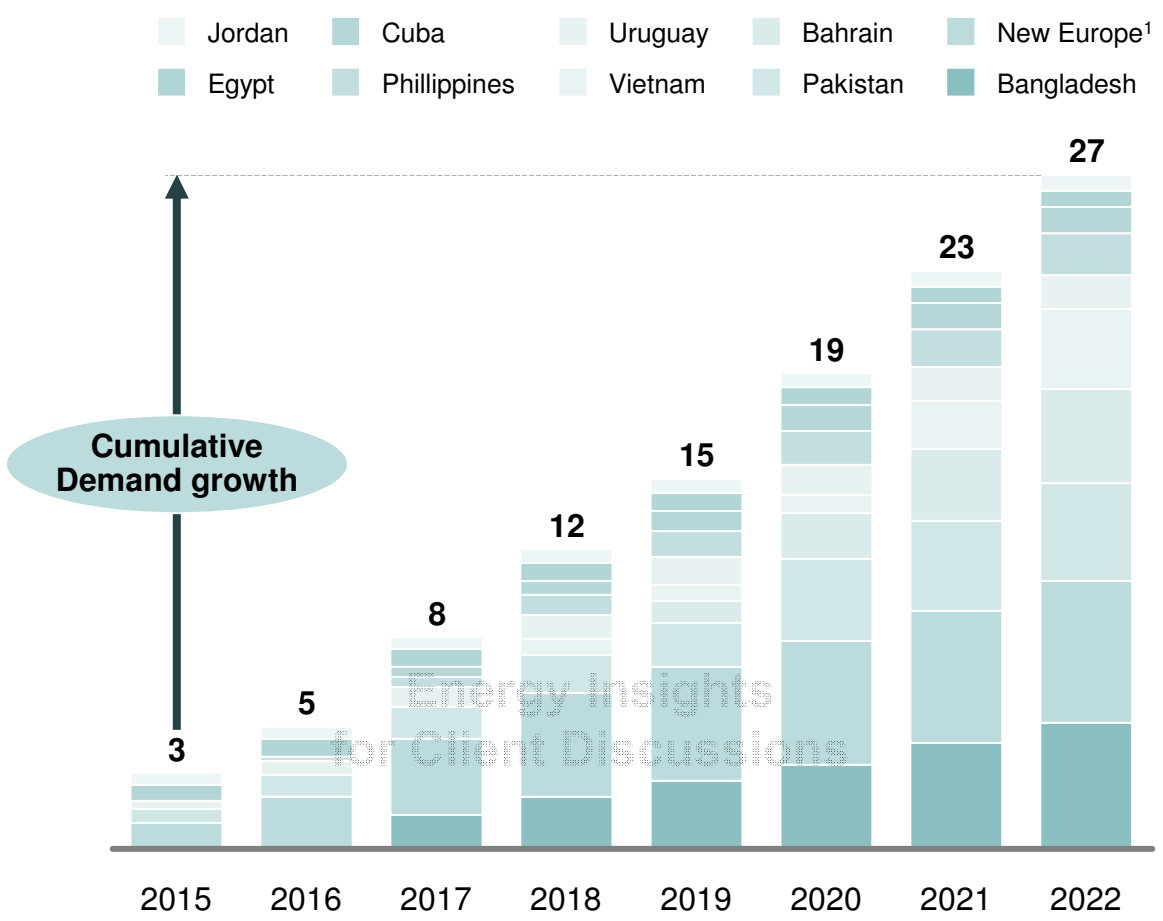
New LNG consumers - mtpa



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Market implications

- **Significant new consumers are entering the global LNG** – many of the small the consumers are purchasing FRSUs
- New regasification capacity usually **ramps up more slowly than new liquefaction capacity** as consumer demand picks up and the full downstream infrastructure is built out
- Once regas projects are online they generally **assume a 60% utilization rate** annual to allow for seasonality, unless the facility is serving a specific industrial facility
- Poland, Singapore, Thailand, Malaysia, Indonesia, and Puerto Rico are also **all expanding their regasification capacity significantly**
- **Low spot LNG prices would encourage further build out of floating regas**

1 Europe: Poland, Lithuania & Albania

SOURCE: Energy Insights, McKinsey Experts

MEDIUM TERM OUTLOOK: NEW LNG SUPPLIES

However, significant new supply will come online before 2022; mostly coming out of the US Gulf and Australia

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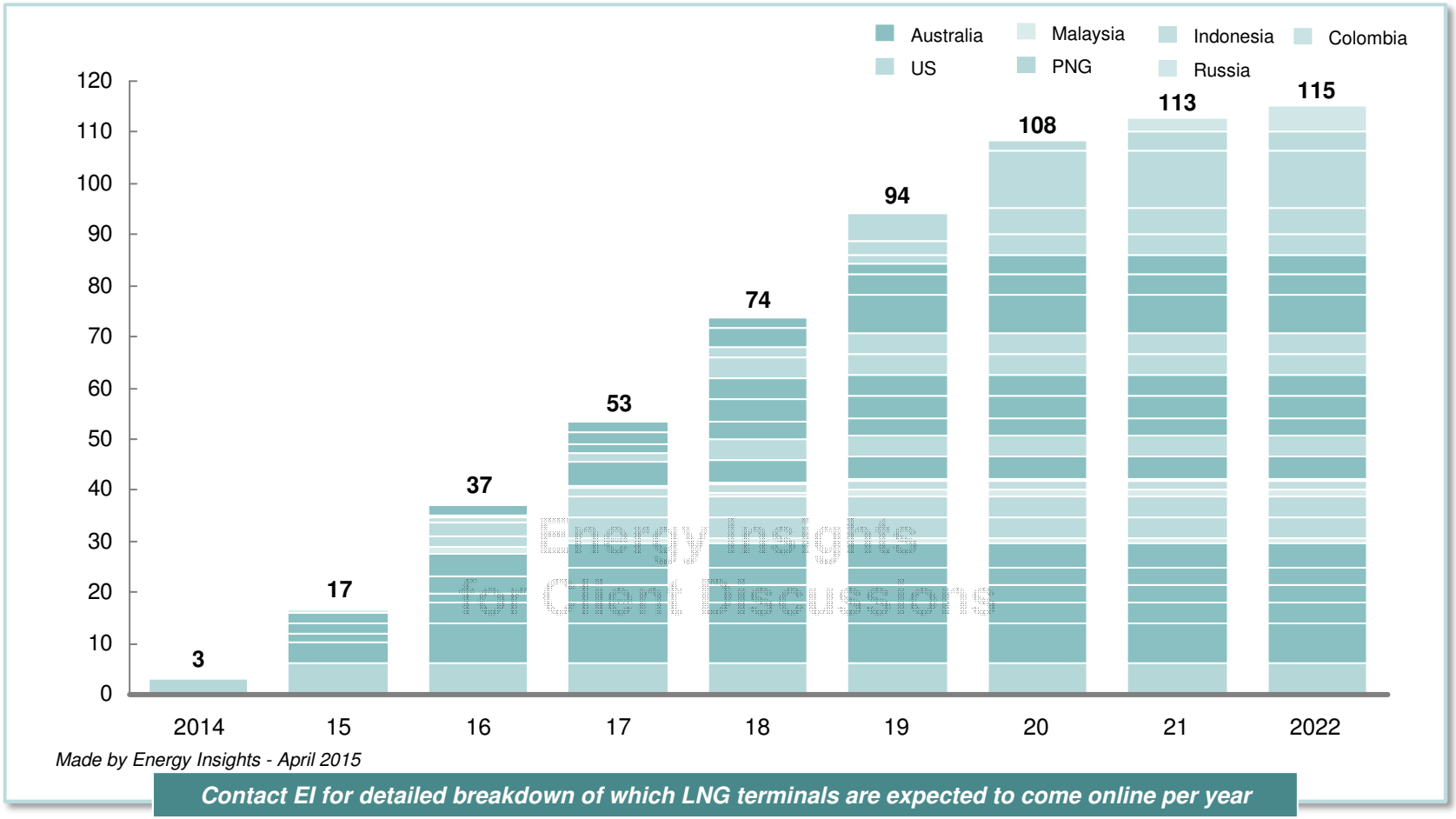


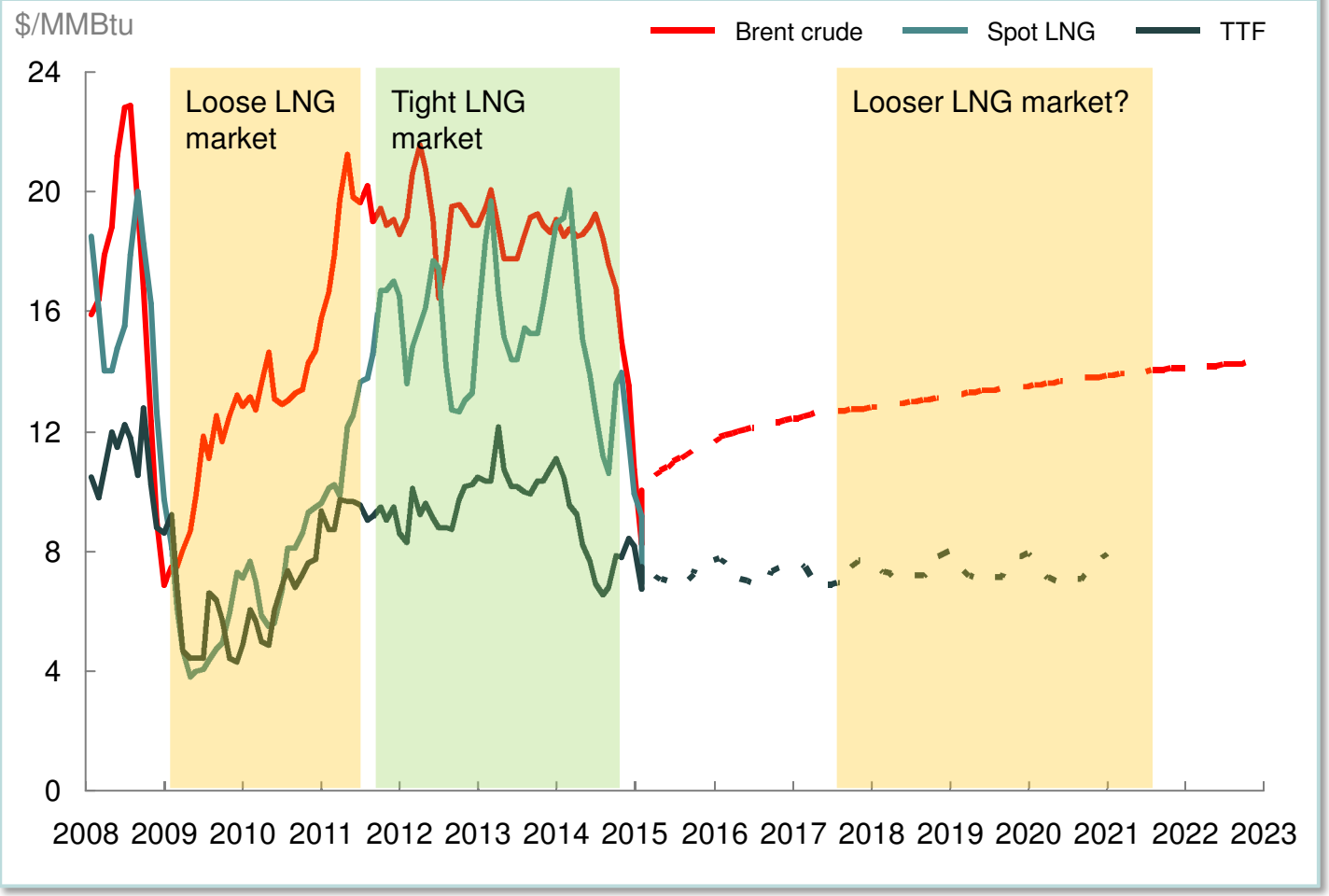
1 Base case outlook assumes 50% capacity utilization in year one and 90% capacity utilization thereafter
2 Train 2 is actually reported to be ahead of T1 in terms of development which has limited effect on the overall market but significant effect on stakeholders, who are different for each train

SOURCE: Energy Insights' Global Gas Model

Asian spot LNG prices will fluctuate between a European price floor, when looser, and an oil equivalent ceiling, when tighter

$/mmbtu

Oil spot LNG and TTF prices



- **Fuel switching economics** make it uneconomical to pay for natural gas consistently above oil equivalent prices, thus providing a ceiling
- Given **Europe's liquid trading hubs** excess LNG can always find a home in Europe if prices economically compared with other gas sources at the hub, thus Europe provides a floor for spot LNG prices
- With the outlook for the LNG market turning from balanced to loose prices are **likely to trade closer to the European floor than the oil parity ceiling**

SOURCE: Bloomberg

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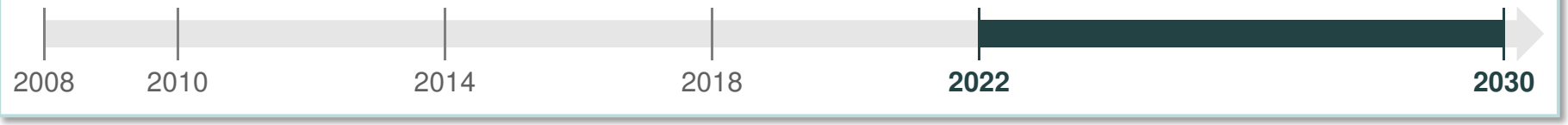
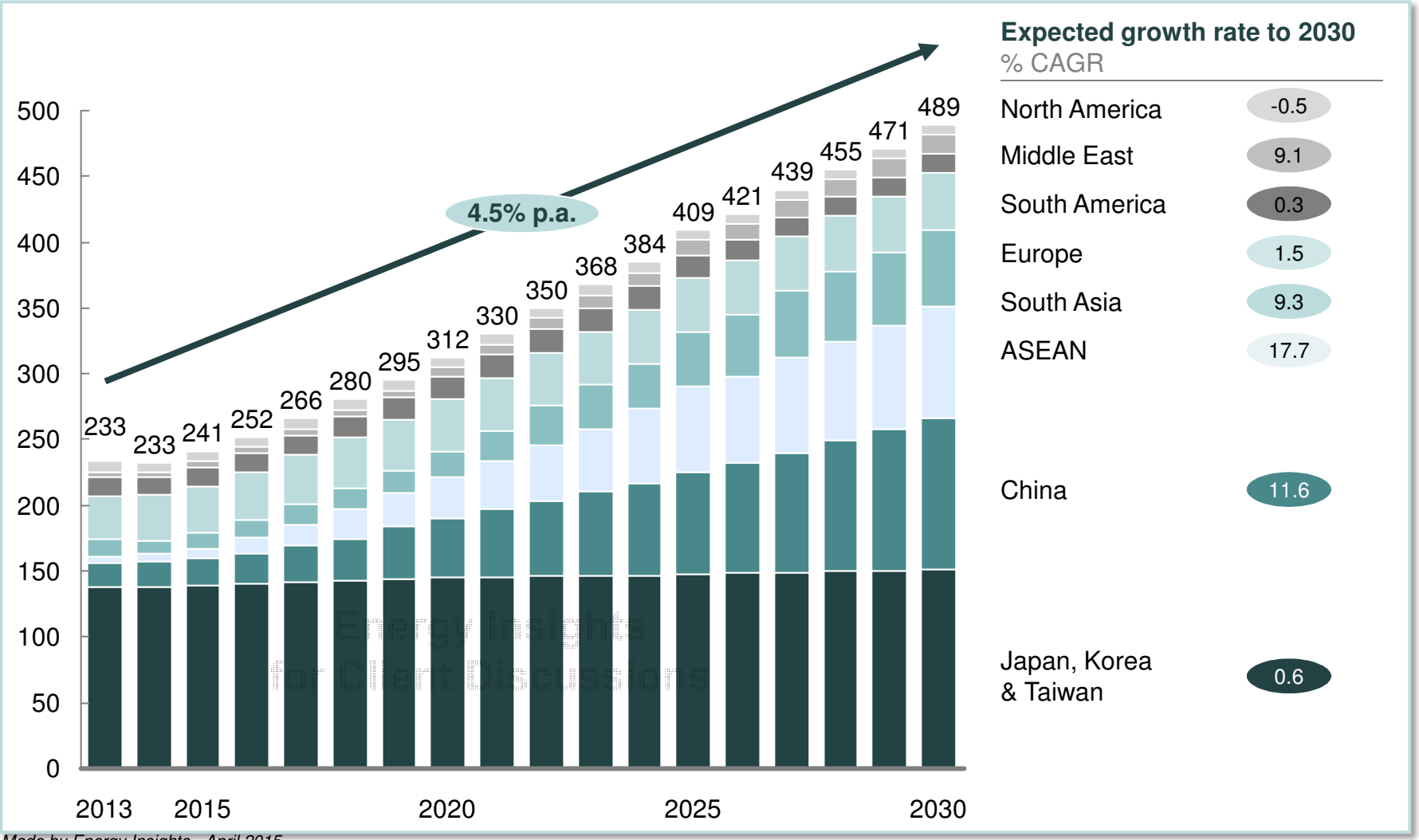


SOURCE: Energy Insights

LONG TERM OUTLOOK: OVERALL DEMAND

Global LNG demand is expected to increase by 4.5% p.a. to 2030, with China, India, and ASEAN being the growth engine

mtpa



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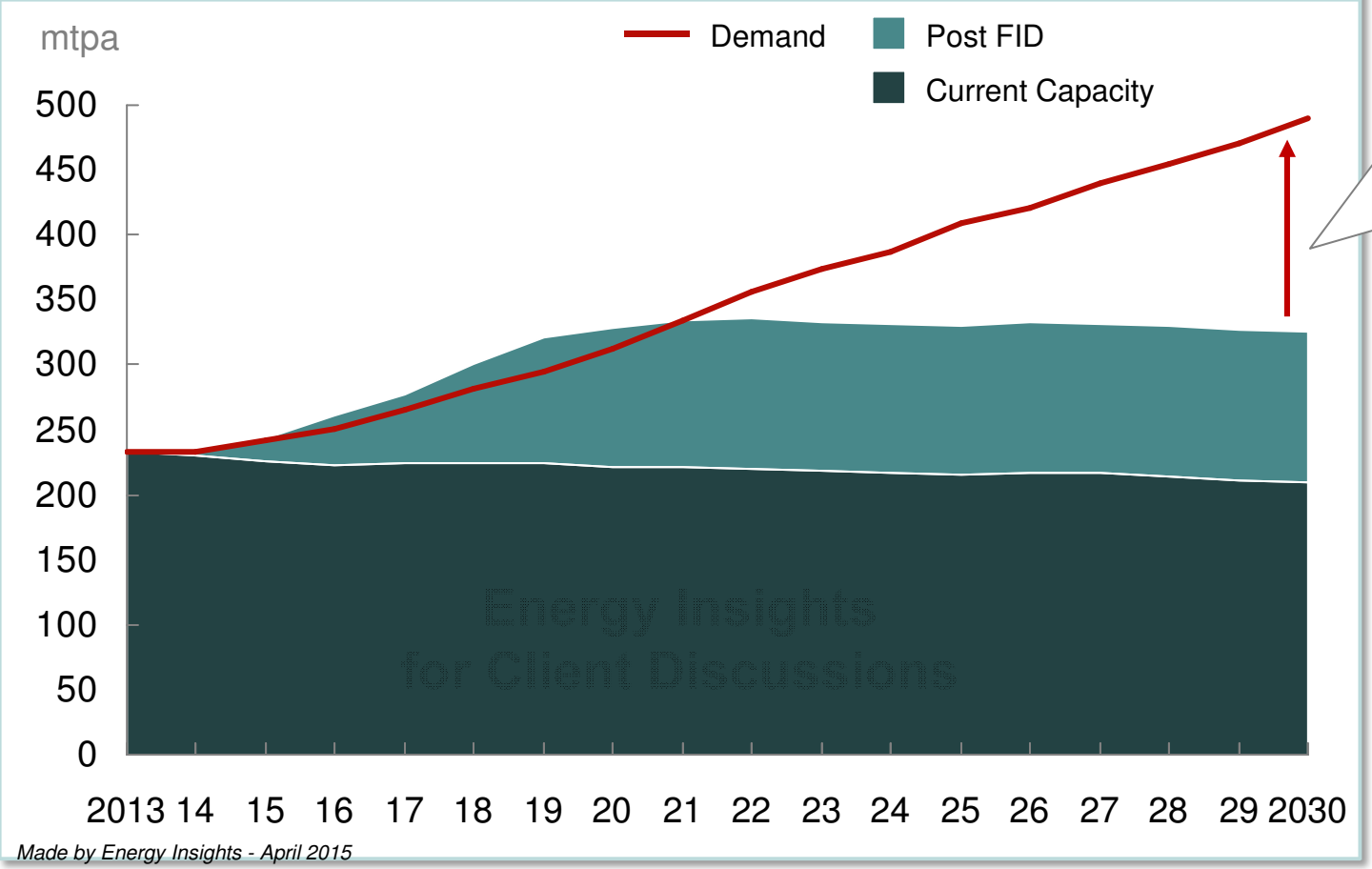
SOURCE: Energy Insights, Global Gas Model

Therefore for the market to be balanced by 2030 we need ~180 mtpa of additional new LNG capacity built

Global LNG supply and demand balance to 2030



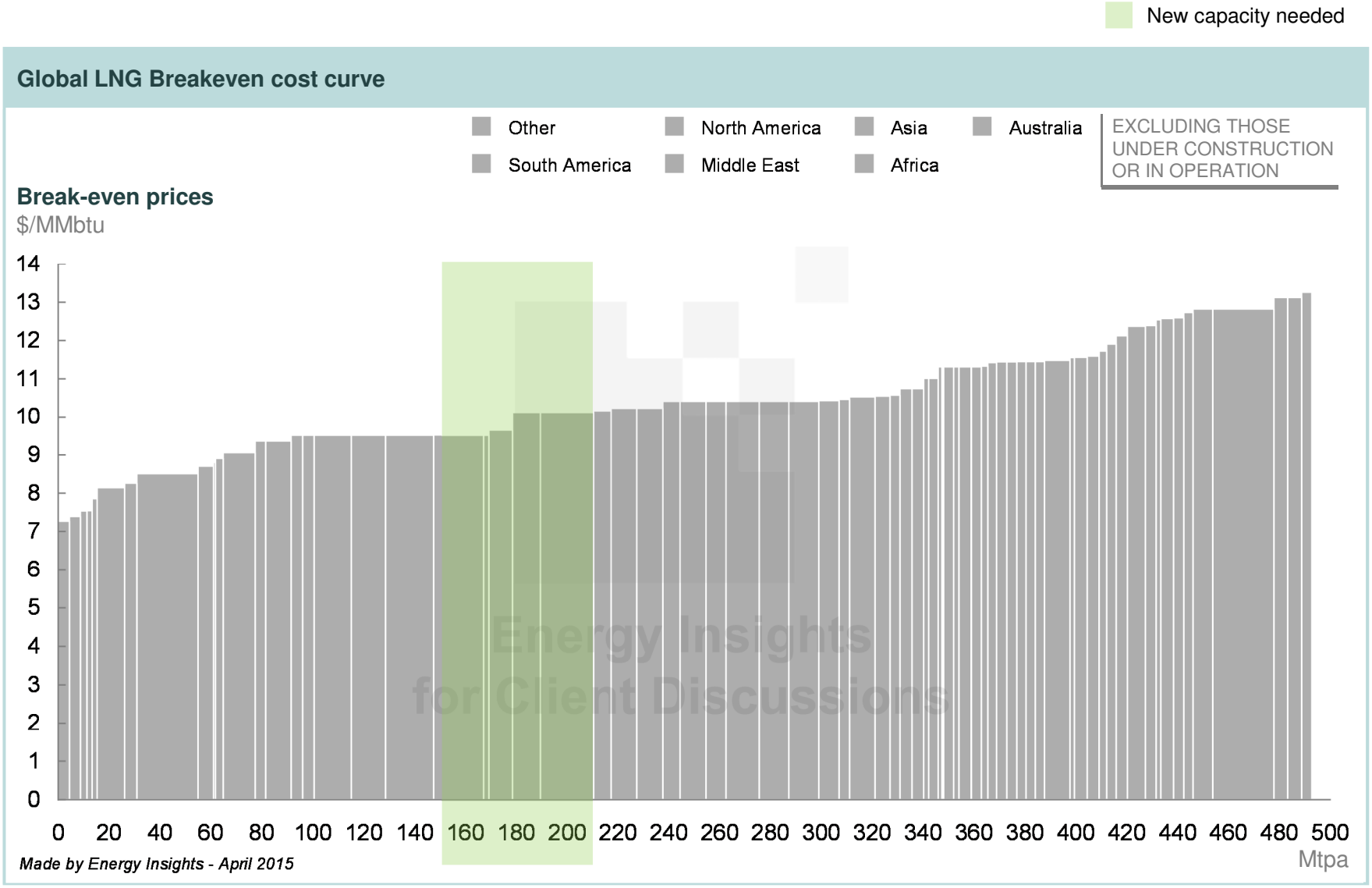
+165mtpa of new supply needed to meet demand which @ 90% utilization requires 180mtpa of capacity build outs

Note: On stream supply is based on bottom up analysis of gas available for exports after domestic demand is me, New projects are expected to produce at 50% of capacity in year one and 90% of Capacity in following years;

SOURCE: Energy Insights' Global Gas Model

LONG TERM OUTLOOK: NEW SUPPLY COST CURVE

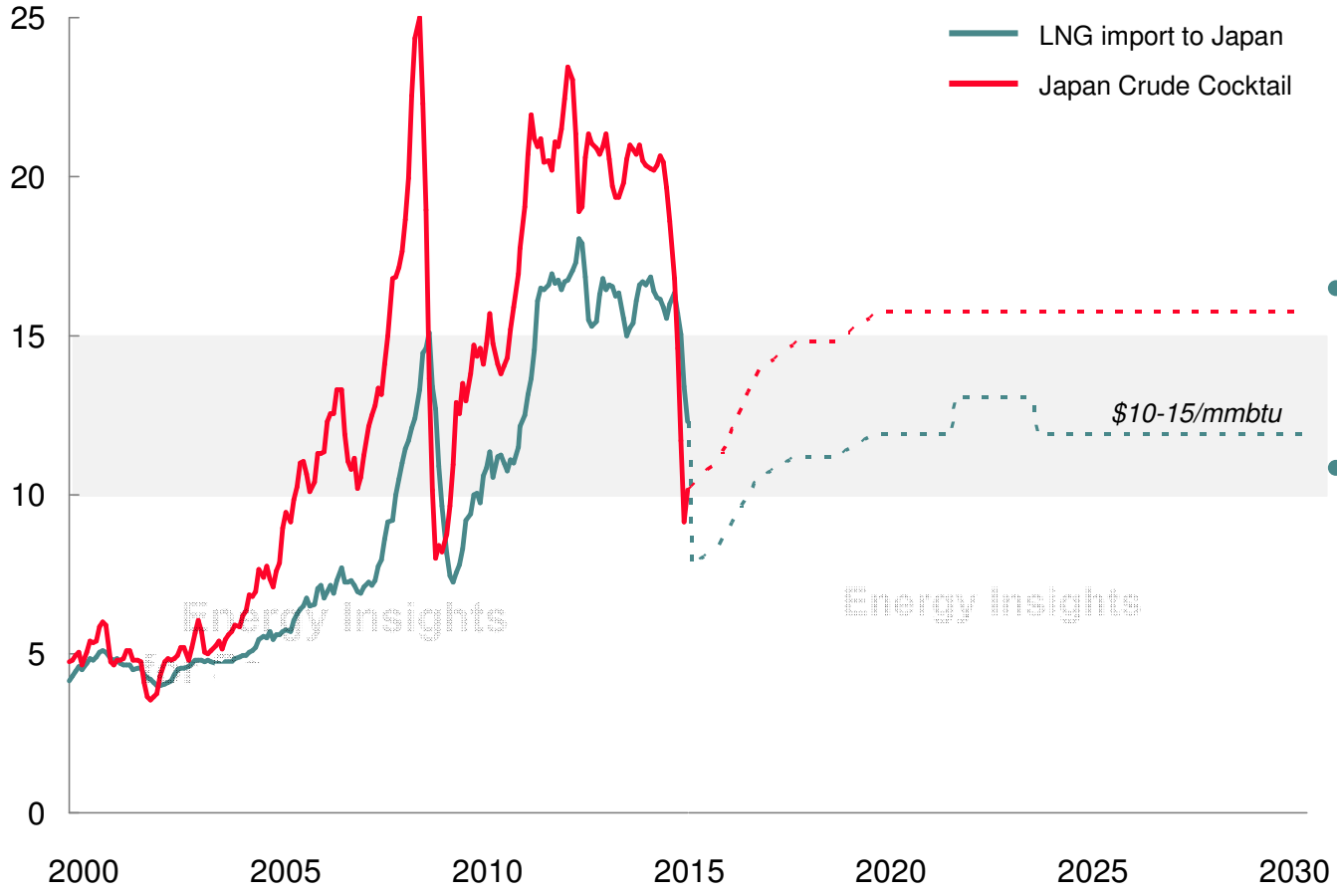
Proposed capacity covers a wide range of breakeven prices and each project faces its own set of challenges



SOURCE: Energy Insights' Global Gas Model

While short term fluctuations in spot and contract prices are quite likely, long-term prices face clear upper and lower boundaries

Asian LNG import price projection, $/mmbtu



I

LNG price trend will not go higher than **~$15/mmbtu**, which would require a $100/bbl oil price and slightly increased contracts slopes

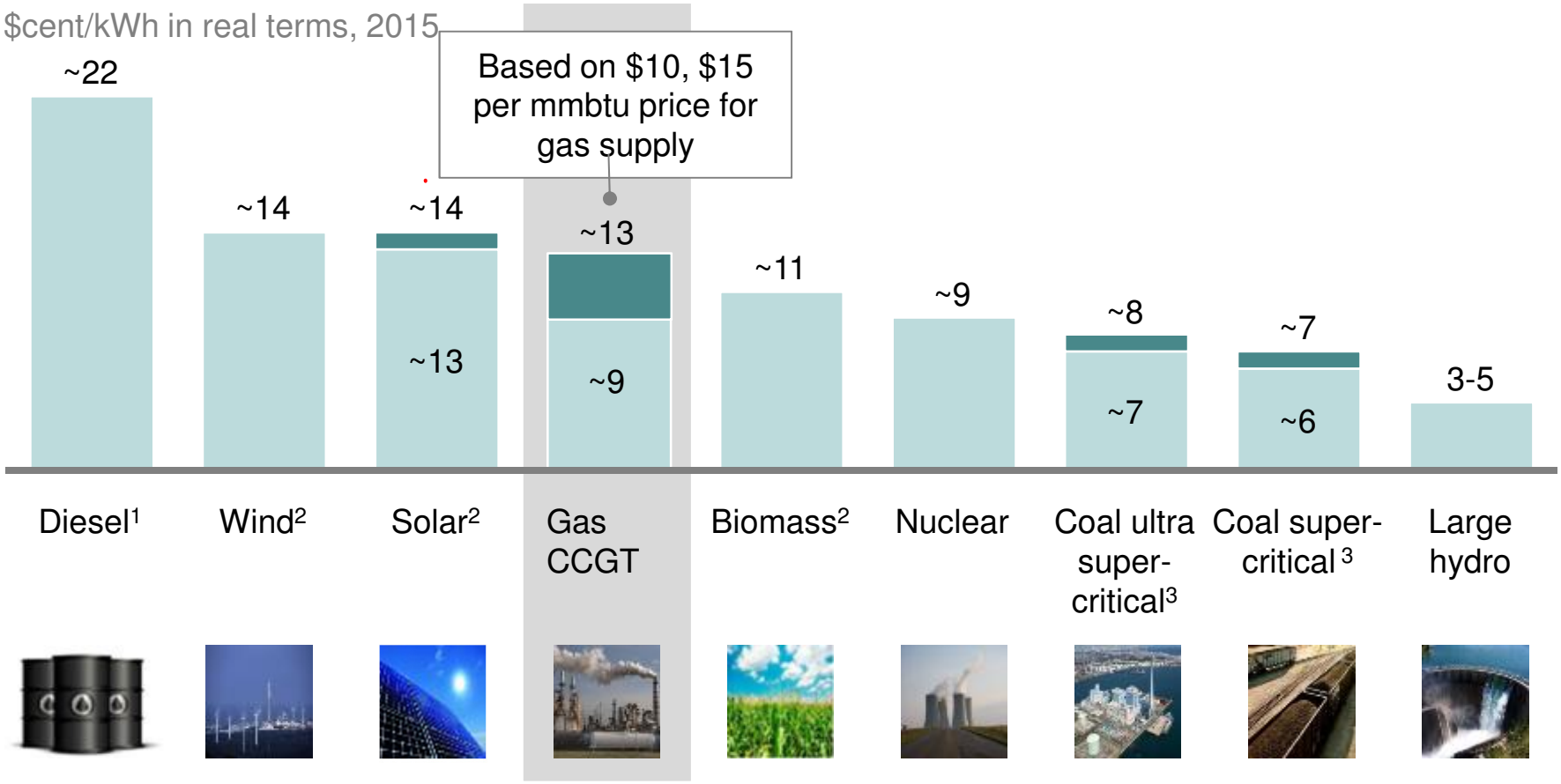
II

LNG price trend will not go lower than break-even cost of required additional LNG supplies; **~$10/mmbtu** with some cost deflation

SOURCE: Energy Insights, Bloomberg, FACTS

As a result LNG will likely be less cost-attractive for Thailand as a long term power generation fuel

Levelised Cost of Electricity (LCOE) generation by technology in ASEAN



1 Assuming 100 $/bbl oil price, peak use (20% load factor) and 15% price premium vs. Brent for Diesel 0.5% sulphur
2 LCOE estimation for Thailand by DEDE
3 Based on 80-120 $/tom price range for export grade coal with GCV >5,500 Kcal/kg

Source: IEA Southeast Asia Energy Outlook (2013); ADB; REN 21 (2010), DEDE

Gas market – Implications for Thailand

- Re-evaluate the **role of gas in the domestic energy and power generation mix**, given increasing proportion of LNG imports subject to international prices
- Ensure domestic **wholesale gas prices** adequately reflect market **cost of LNG supply** to incentivize energy efficiency and upstream supply
- Plan ahead for **adequate import infrastructure** (LNG regas terminals, pipelines) to support expected increases in LNG imports
- Pro-actively analyze and create an **LNG sourcing strategy** for the country that will take advantage of current market discontinuities and ensure optimal balance between cost and security of supply

SOURCE: McKinsey