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# The Outlook for LNG

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Senior Research Fellow

Tokyo 27th September 2011

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# LNG has been in a Strong Growth Phase in 2010 and 2011

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- Supply increased by 39.2mt (21.6%) in 2010
- It is on course to increase by a further 22mt (10.9%) in 2011
- This compares with the historic growth rate of 7.7% per annum 1980 to 2009
- Qatar has been the main source of growth accounting for 50% of the increased supply in 2010 and 75% of the increase in 2011
- The other sources of increased supply since 2009 have been new projects in Russia (Sakhalin), Yemen, Peru and Indonesia (Tangguh)

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# LNG Imports by Region in the First Half of 2009, 2010 and 2011

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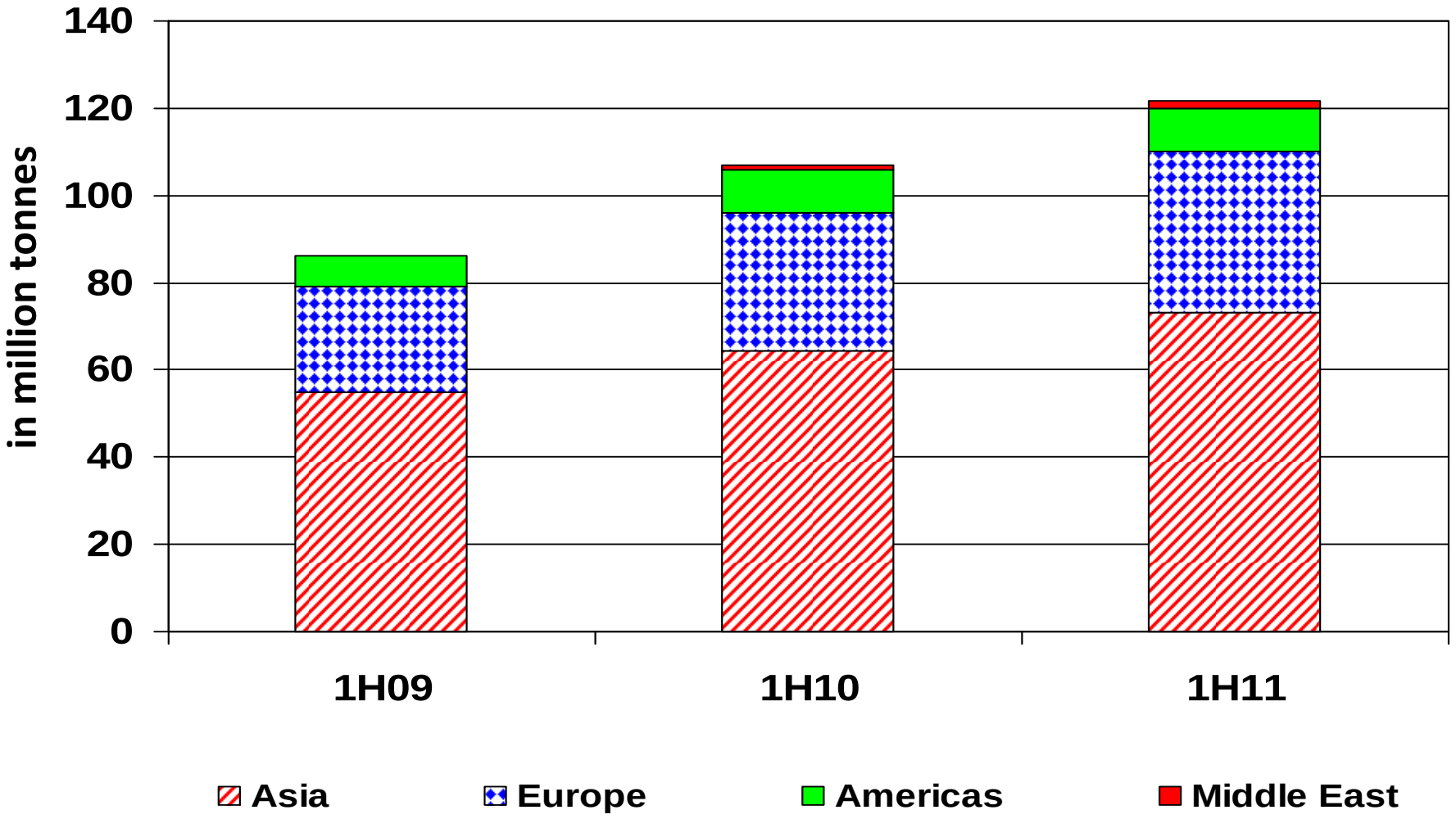

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# Impact on the LNG Market of the Fukushima Nuclear Crisis

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- The main impact has been in Japan with LNG purchases by the power utilities up by 3.84mt between April and August compared with the same period of 2010
- Elsewhere Governments have set in motion safety inspections and stress tests on nuclear plants
- Only Germany has taken immediate action permanently closing seven older plants and one plant that had technical problems and announcing that all nuclear plants will be closed by 2022
- Germany does not import LNG so any impact on the LNG market will be indirect
- In other countries the development of nuclear power will be delayed or abandoned which will have an impact on LNG demand in the longer term

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# The Increase in LNG Imports into Japan is Having an Impact on the UK - Monthly LNG Imports January to August 2011

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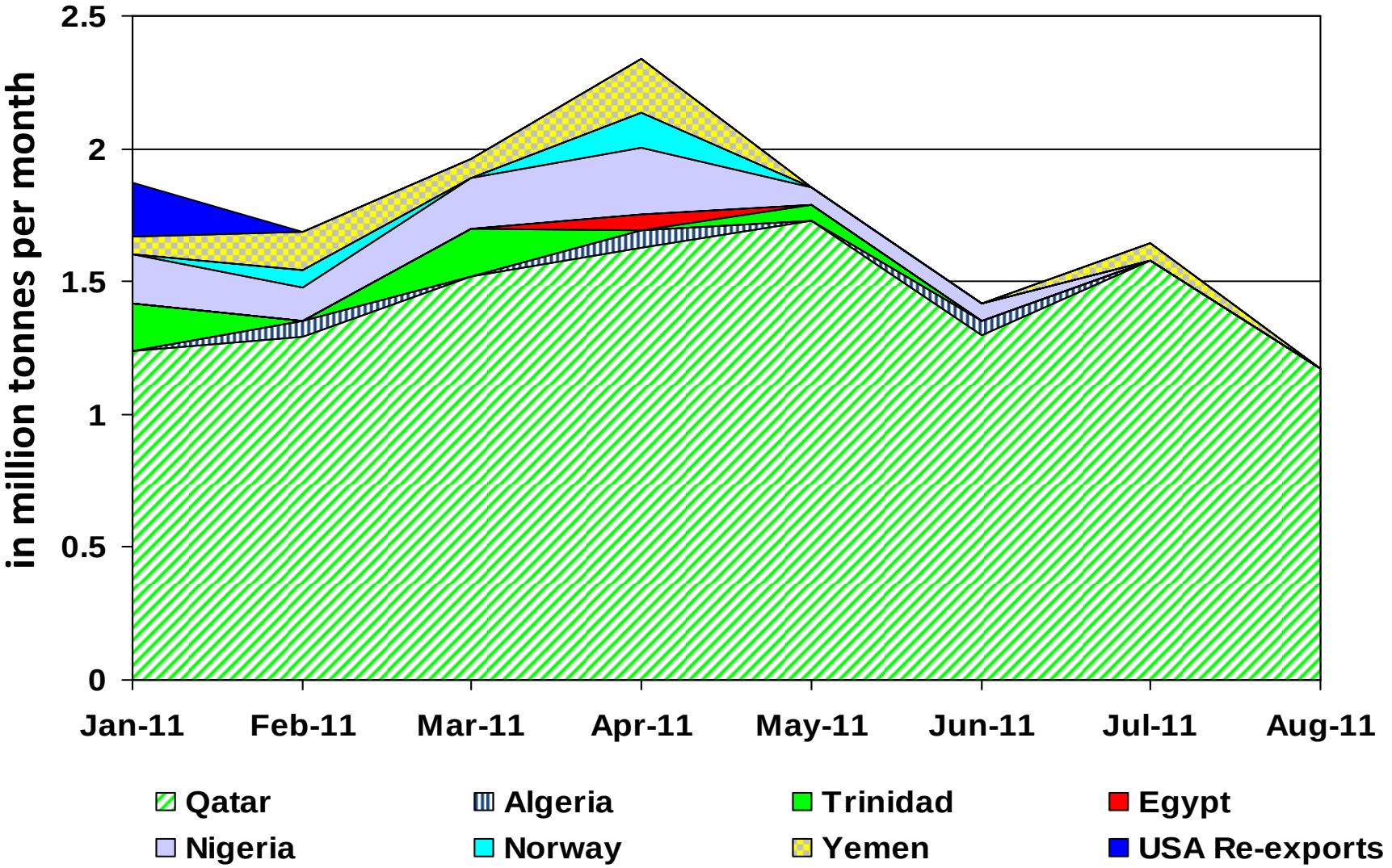

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# ICIS Heren Assessment of Weekly Prices for Delivery of LNG to the UK and Japan

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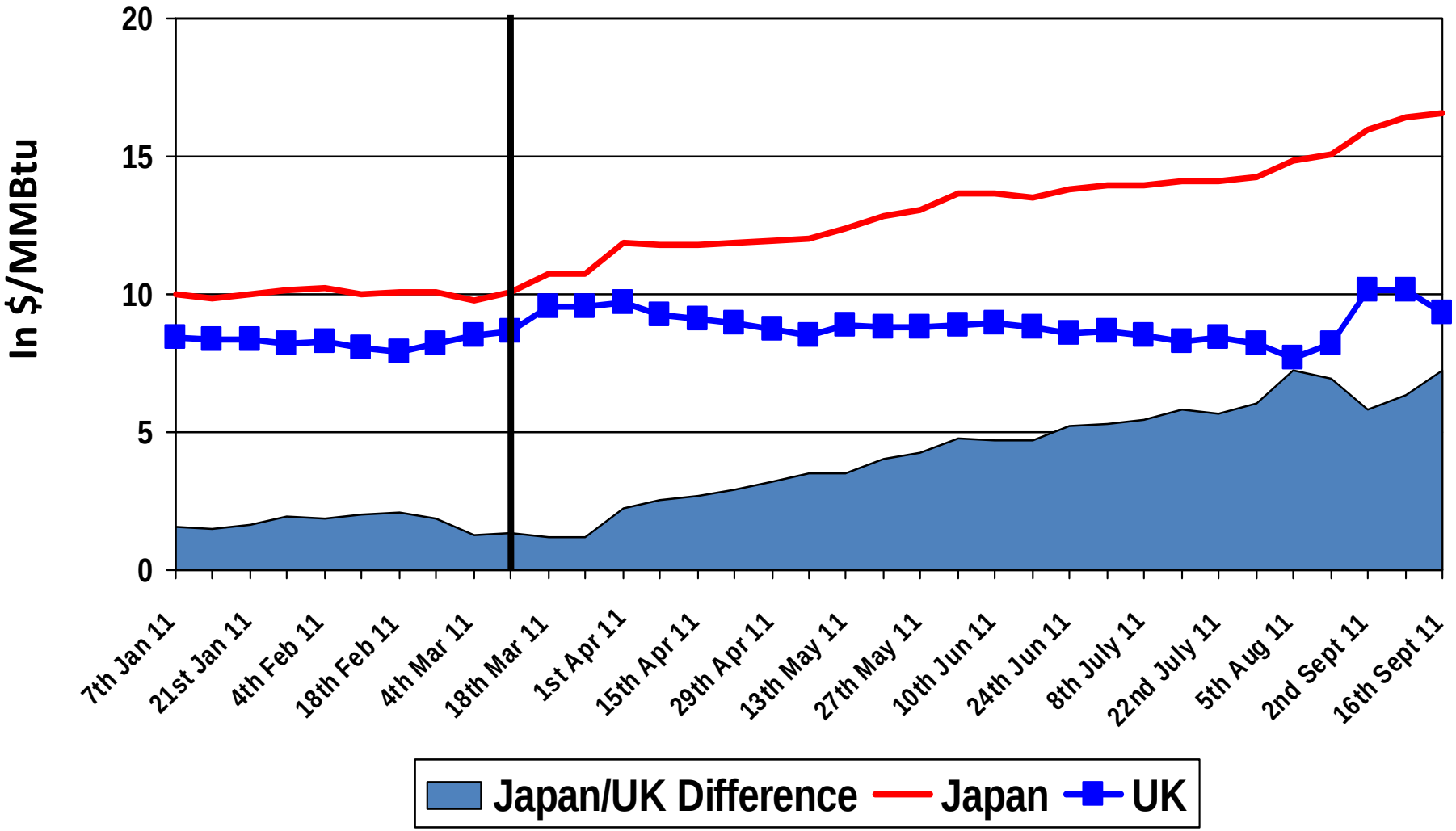

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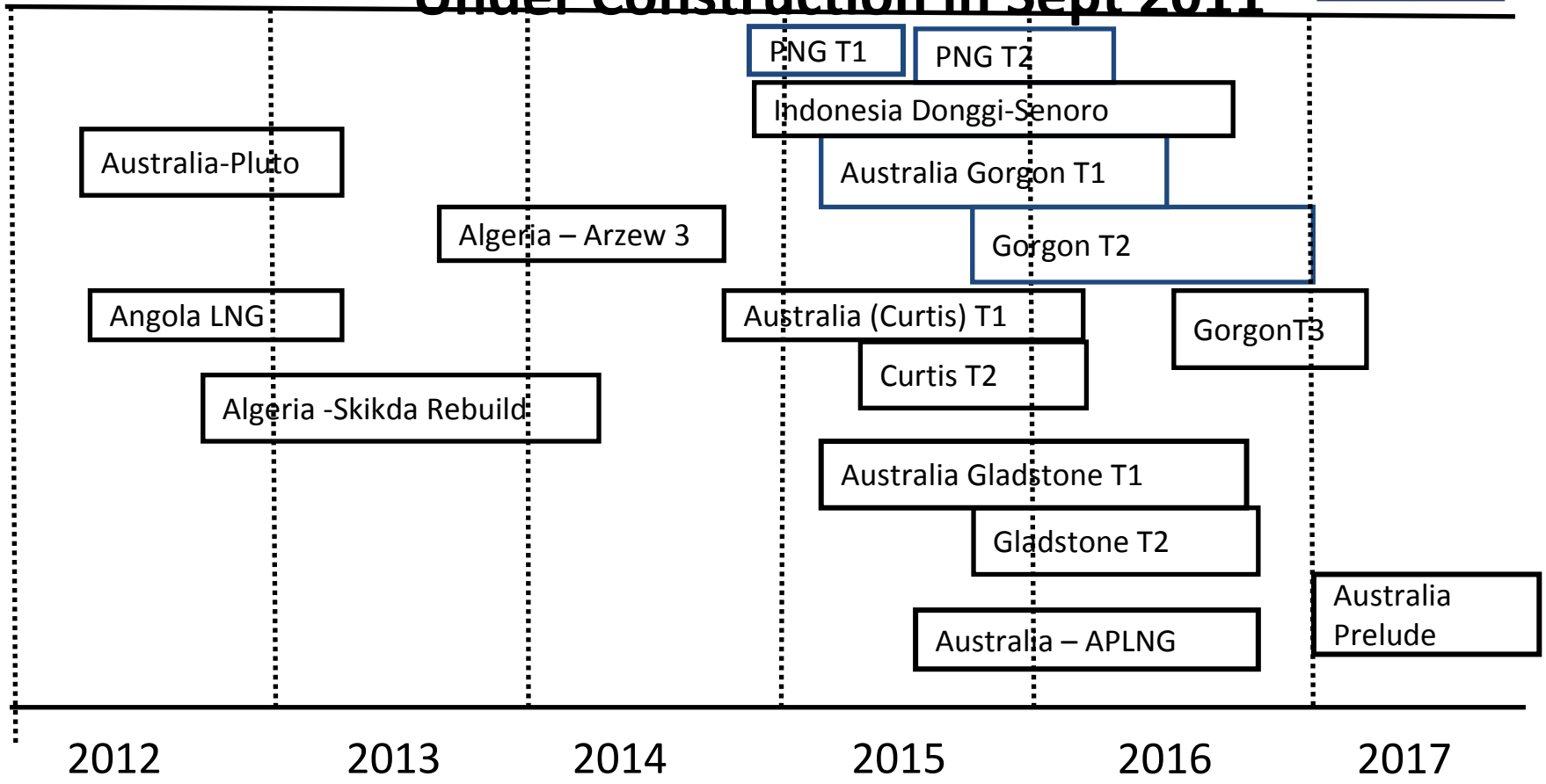
# Expected Start-up Times for Capacity Under Construction in Sept 2011




The left-hand end of the bar denotes expected start-date
66.7mtpa of capacity scheduled to come on stream between 2011 and 2016
of which 43.7mtpa in Australia

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# Planned Liquefaction Capacity – September 2011 (in mtpa)

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| Pacific Basin | | Middle East | | Atlantic Basin | | Total |
|---|---|---|---|---|---|---|
| Indonesia (Tangguh T3) | 3.8 | Qatargas Debotlle | 8.0 | Nigeria (Brass) | 10.0 | |
| Indonesia (Masela) | 5.0 | RasGas Debottle | 4.0 | Nigeria (OK) | 22.0 | |
| Australia (APLNG Exp) | 13.5 | Iran (Iran LNG) | 10.0 | Nigeria LNG T7 | 8.5 | |
| Australia (Pluto T2/3) | 8.6 | | | Cameroons | 2.6 | |
| Australia (Ichthys) | 8.4 | | | Norway (Snohvit T2) | 4.2 | |
| Australia (Wheatstone) | 8.9 | | | Equatorial Guinea T2 | 4.4 | |
| Australia (Browse) | 12.0 | | | Russia Shtokman | 15.0 | 297.8 |
| Australia (Sunrise) | 4.0 | | | Russia Yamal | 15.0 | |
| Australia (Pilbara) | 6.0 | | | Russia Pechora | 2.6 | |
| Australia (LNG Ltd) | 3.0 | | | USA (Freeport) | 9.0 | |
| Australia (Bonaparte) | 2.0 | | | USA (Sabine Pass) | 16.0 | |
| Australia (GorgonT4/5) | 10.0 | | | USA (Lake Charles) | 14.0 | |
| Australia (Shell CBM) | 12.0 | | | USA (Cove Point) | 8.0 | |
| Australia (Curtis T3) | 4.3 | | | | | |
| Russia (Sakhalin T3) | 4.8 | | | | | |
| Russia (Vladivostok) | 10.0 | | | | | |
| PNG (Elk/Antelope) | 4.0 | | | | | |
| Canada (Kitimat) | 5.0 | | | | | |
| Canada (BC LNG) | 1.8 | | | | | |
| Canada (Prince Rupert) | 10.0 | | | | | |
| Canada (Petronas) | 7.4 | | | | | |

**Other possible new projects include:**
**Israel (Leviathan)**
**Mozambique**
**Tanzania**
**West Coast of USA**

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# Liquefaction Capacity Summary – September 2011 (in mtpa)

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| Region | Operating | Under Construction | Planned | Total |
|---|---|---|---|---|
| Pacific Basin | 93.5 | 52.3 | 144.5 | 290.3 |
| Middle East | 100.9 | 0.0 | 22.0 | 122.9 |
| Atlantic Basin | 78.1 | 14.4 | 131.3 | 223.8 |
| **TOTAL** | **272.5** | **66.7** | **297.8** | **637.0** |

**Forecast Production in 2011: 245mt**

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# Final Investment Decisions (FIDs) on Liquefaction Capacity 2005 to 2011

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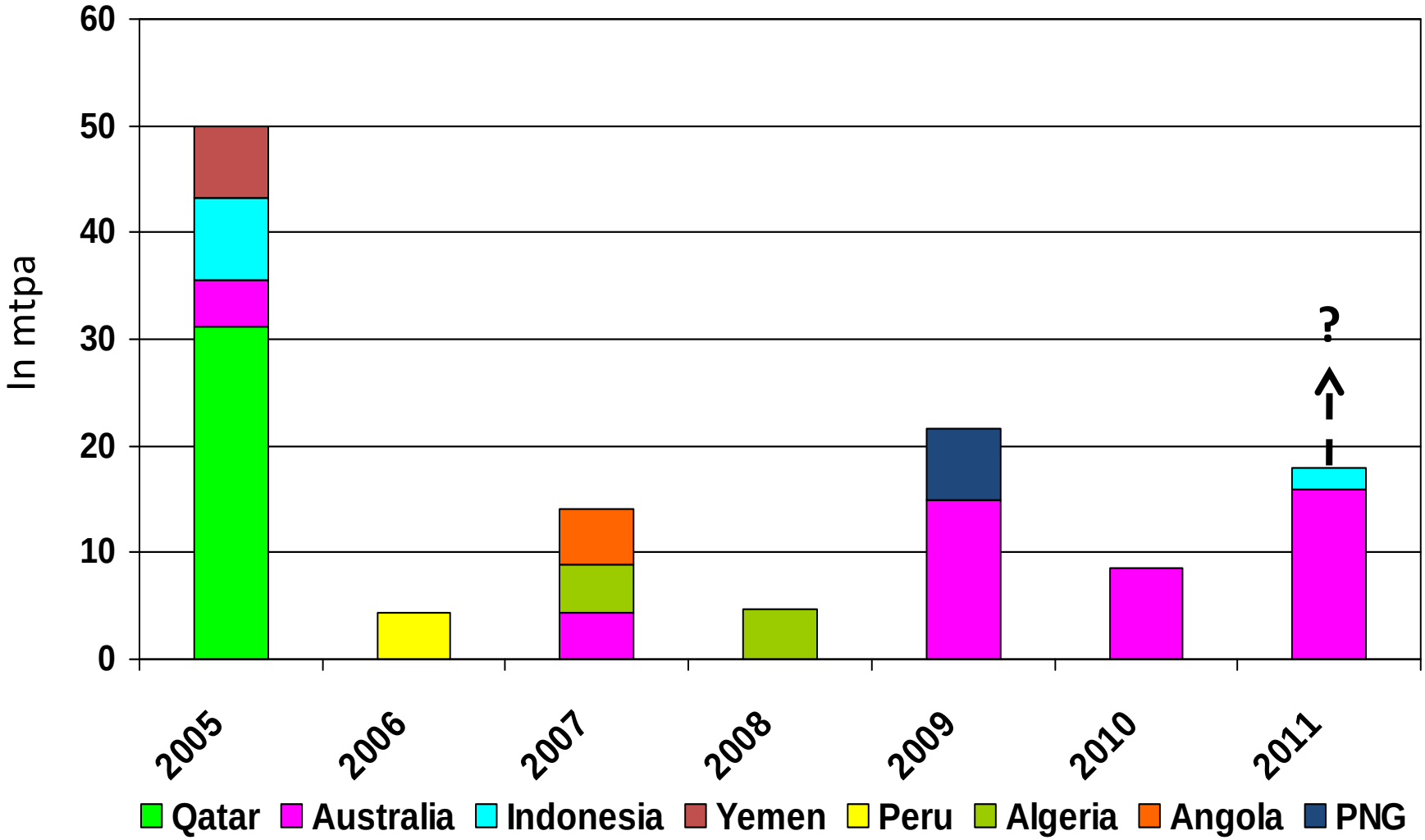

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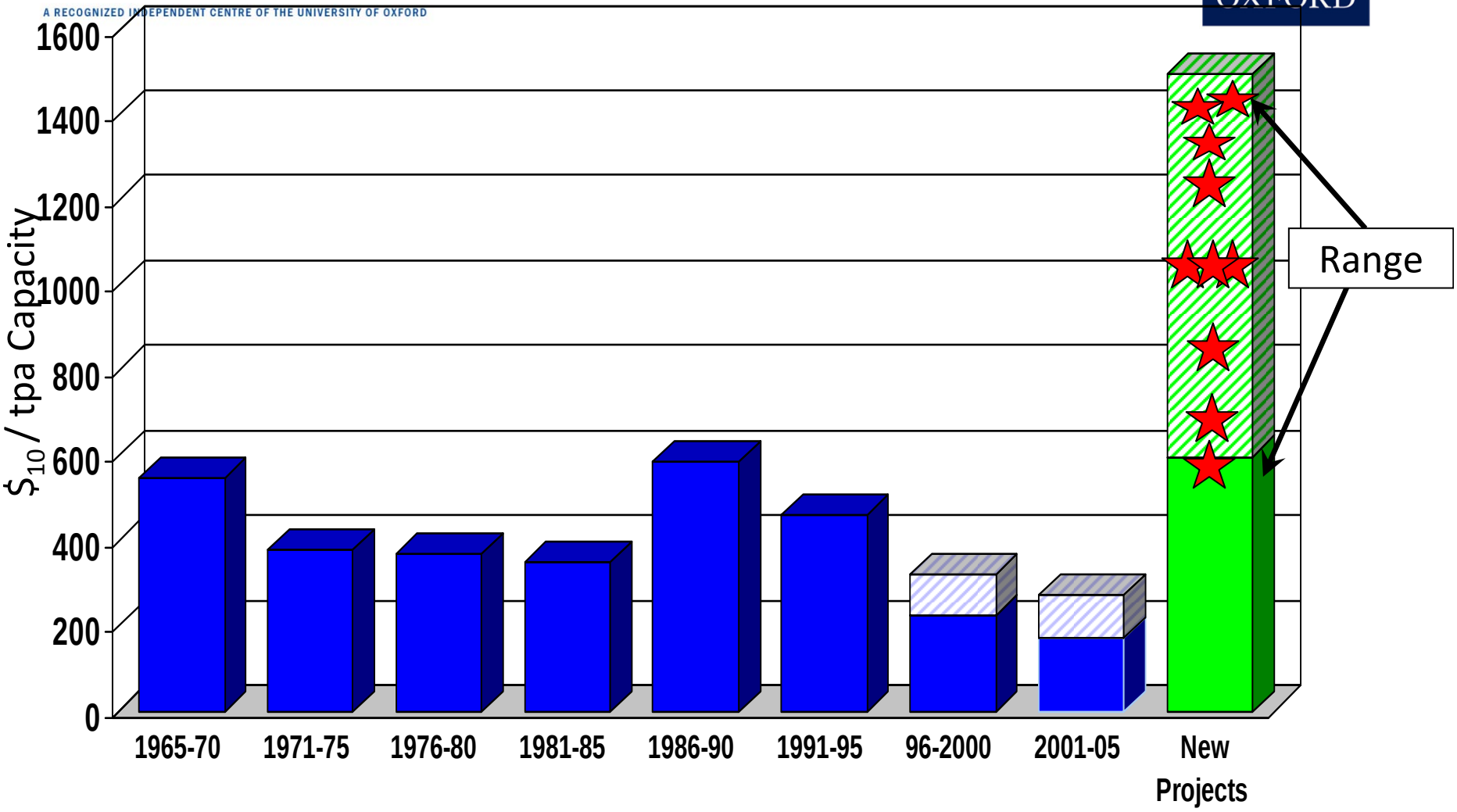
# Liquefaction Plant Capital Costs



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# The LNG Cost/Price Challenge

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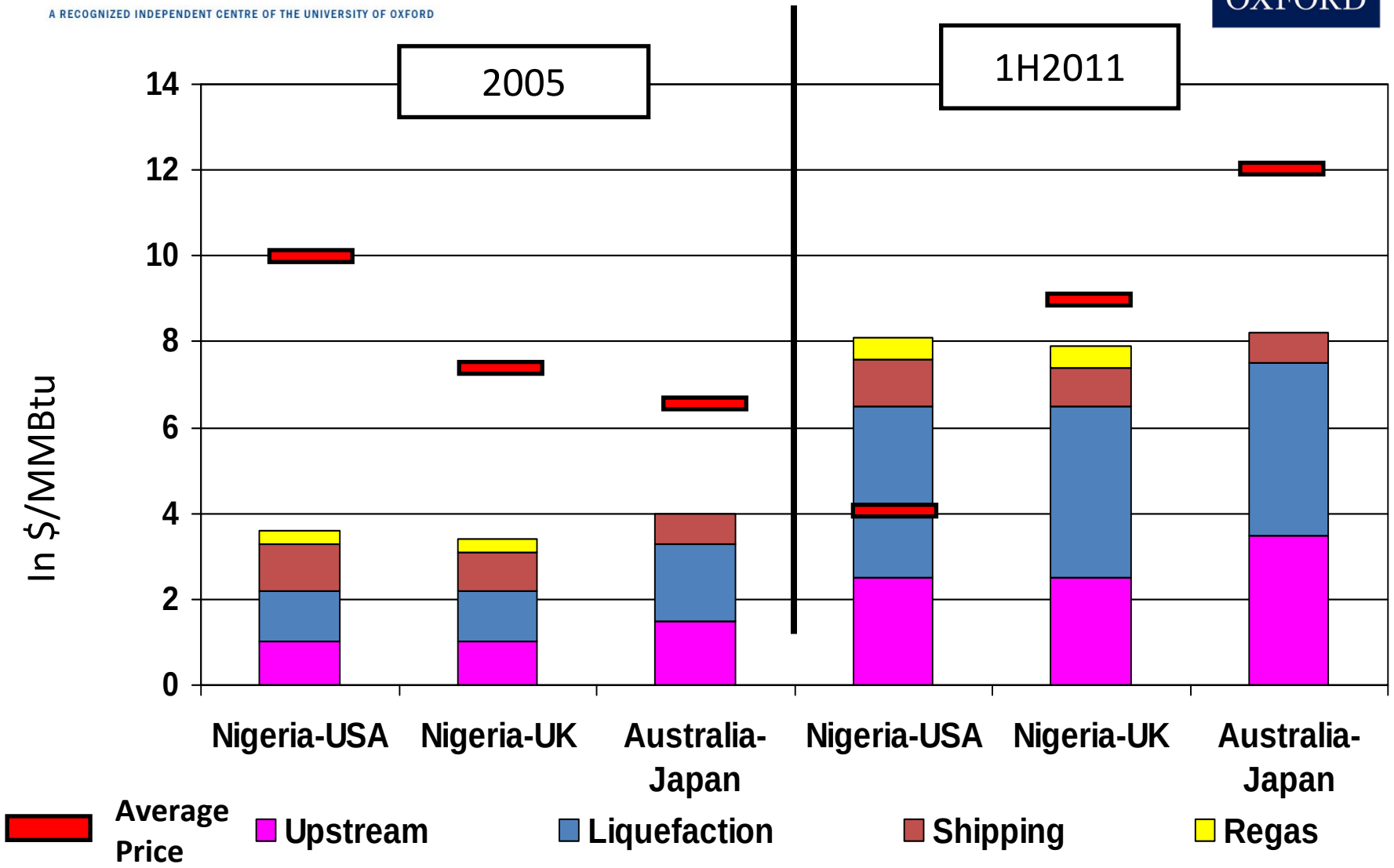

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# US Terminals Planning LNG Production and Exports

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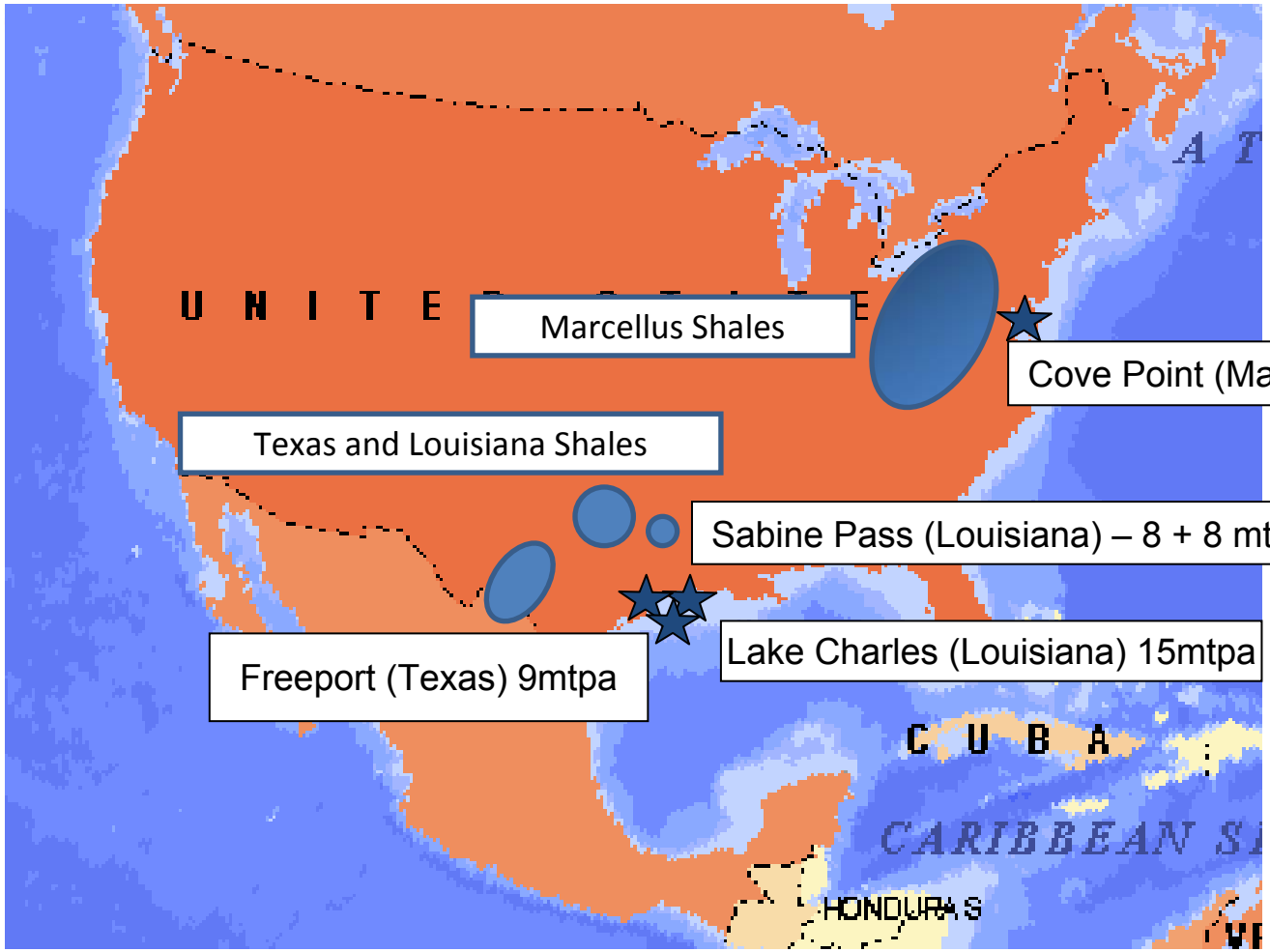

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# US LNG Exports – Plans (1)

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- Sabine Pass
  - The owner and operator Cheniere announced plans for up to four 4mtpa trains at the Sabine Pass receiving terminal
  - Non-binding agreements for bi-directional flow (i.e. export and import) have been signed with Morgan Stanley Capital 1.7mtpa, ENN (China) 1.5mtpa, Gas Natural (Spain) 1.5mtpa, EdF (France) 0.7 to 1.4mtpa. Sumitomo (Japan) 1.5mtpa and ENEL-Enarsa (1.5mtpa)
  - Cheniere also has a deal to supply 0.6mtpa for power generation in the Dominican Republic and to work with Lithuania on LNG supply
  - However, Cheniere has now said it plans to offer companies the opportunity to purchase LNG on an FOB basis at a price of Henry Hub plus $2 to $3/MMBtu
  - Cheniere has DoE approval for exports to members of WTO. It will also need FERC approval
  - It is targeting FID in early-2012 and start-up in 2015
  - Shale gas producers, including, Chesapeake have expressed interest in supplying gas but not in participating in the project

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# US LNG Exports – Plans (2)

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- Freeport
  - Freeport LNG in association with Macquarrie has applied for a permit to produce and export up to 1.4Bcf/d (about 9mtpa after taking into account fuel use)
- Cove Point
  - The owner and operator, Dominion Resources, has said it is talking to shale gas producers in the Marcellus Basin about the possibility of adding liquefaction trains
- Lake Charles
  - Southern Union, the owner of the terminal, and BG, which has committed to the entire import capacity, have been granted permission by the US Department of Energy to export up to 2Bcf/d (17.6mtpa) to countries with which the US has a Free Trade Agreement

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# US LNG Exports - Economics

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- The existing terminals have infrastructure in place (site, berths, unloading/loading facilities and storage tanks) which typically account for 25 to 35% of the cost of a new liquefaction plant
- They will have access to local sub-contractors and a skilled work-force
- Capital costs could be under $600/tpa of capacity compared with a current benchmark of $1,000/tpa
- If this cost can be achieved liquefaction costs will be $1.75 to $2/MMBtu
- At a Henry Hub price of $5/MMBtu, the cost of the gas used in the plant will be around $0.60/MMBtu
- The shipping cost USA-Japan will approximately $2.50/MMBtu (the widening of the Panama Canal will reduce the cost by around $0.80/MMBtu but what will be the canal fee?)
- Total cost for liquefaction and shipping will be $4.75 to $5/MMBtu
- The issue for investors is will there by a systematic differential of $4.75 to $5/MMBtu between US gas prices and prices in other markets?

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# Exports from the West Coast of Canada

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- Apache and EOG Resources are planning a 5mtpa LNG plant at Kitimat in British Columbia to export Canadian gas to Asia
- Gas supply will come mainly from shale gas reserves in the Monteney and Horn River basins
- FEED work has started and the project is targeting FID by early 2012 with start-up in 2015
- No off-take agreements have yet been signed
- The project has the advantage of being closer to Asian markets (around 24 round days voyage) compared with the Gulf of Mexico (with or without the widened Panama Canal)
- However, as a green-field project construction costs will be higher and new pipelines will be needed to transport the gas to the plant
- Apache has said that oil-linked Asian prices will be needed to make to project economic
- BC LNG, a joint venture between LNG Partners and the Haisla First Nation is planning a 1.8mtpa plant close to Kitimat
- Other companies including Shell (with Asian buyers as partners) and Petronas are carrying out studies on the feasibility of exporting LNG from British Columbia

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# Global LNG Supply 2010-2025

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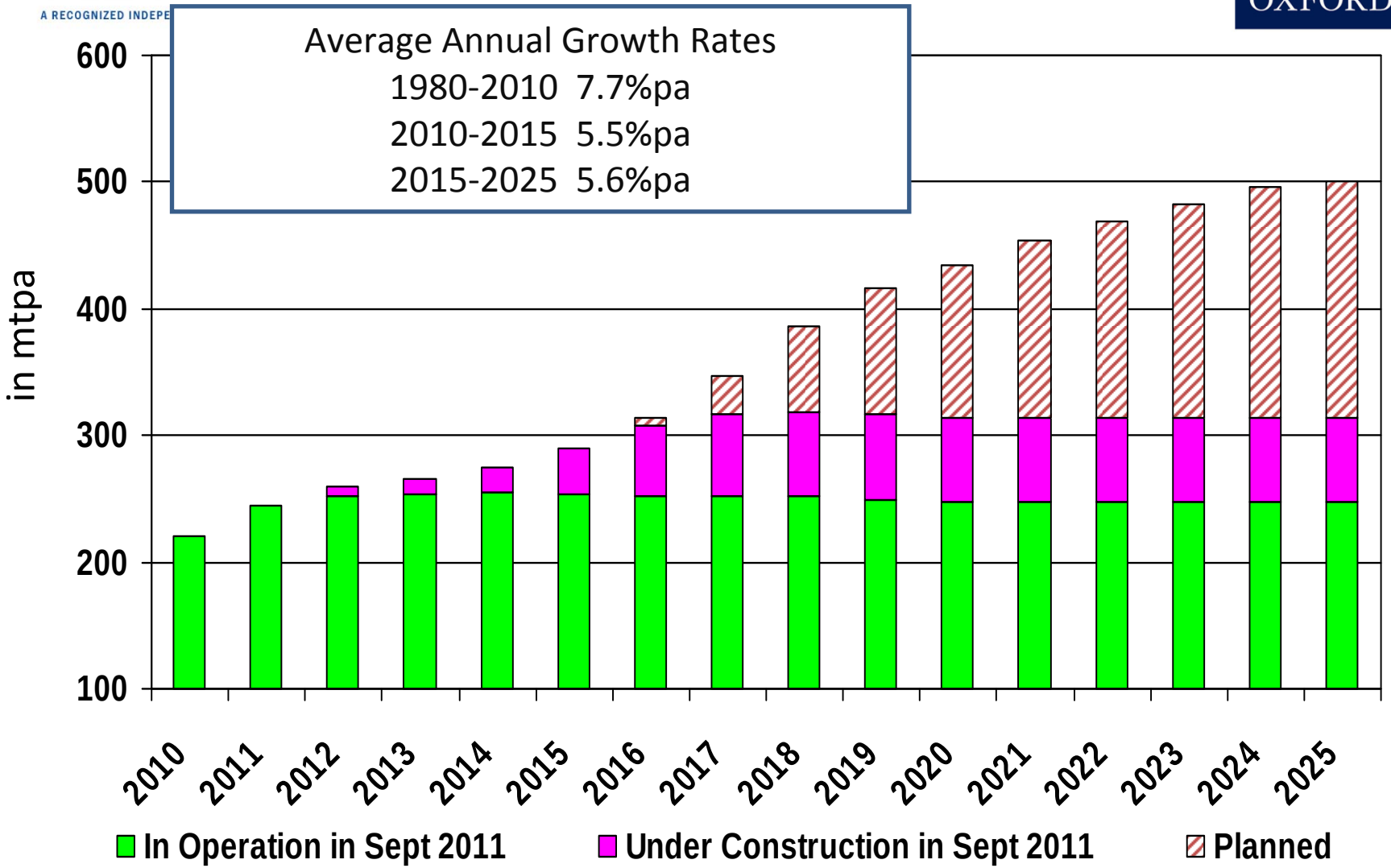

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# Firm and Flexible Demand

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- Firm
  - Markets which have to have the LNG supply and will pay the price needed to secure cargoes
  - Asia, southern Europe (Turkey, Spain, southern France, Portugal), Latin America, Caribbean

- Flexible
  - Markets with alternative pipeline gas supplies where price will determine whether LNG is imported
  - USA, UK, Belgium, Netherlands

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# LNG Demand in Firm Markets and LNG Supply 2010 – 2020

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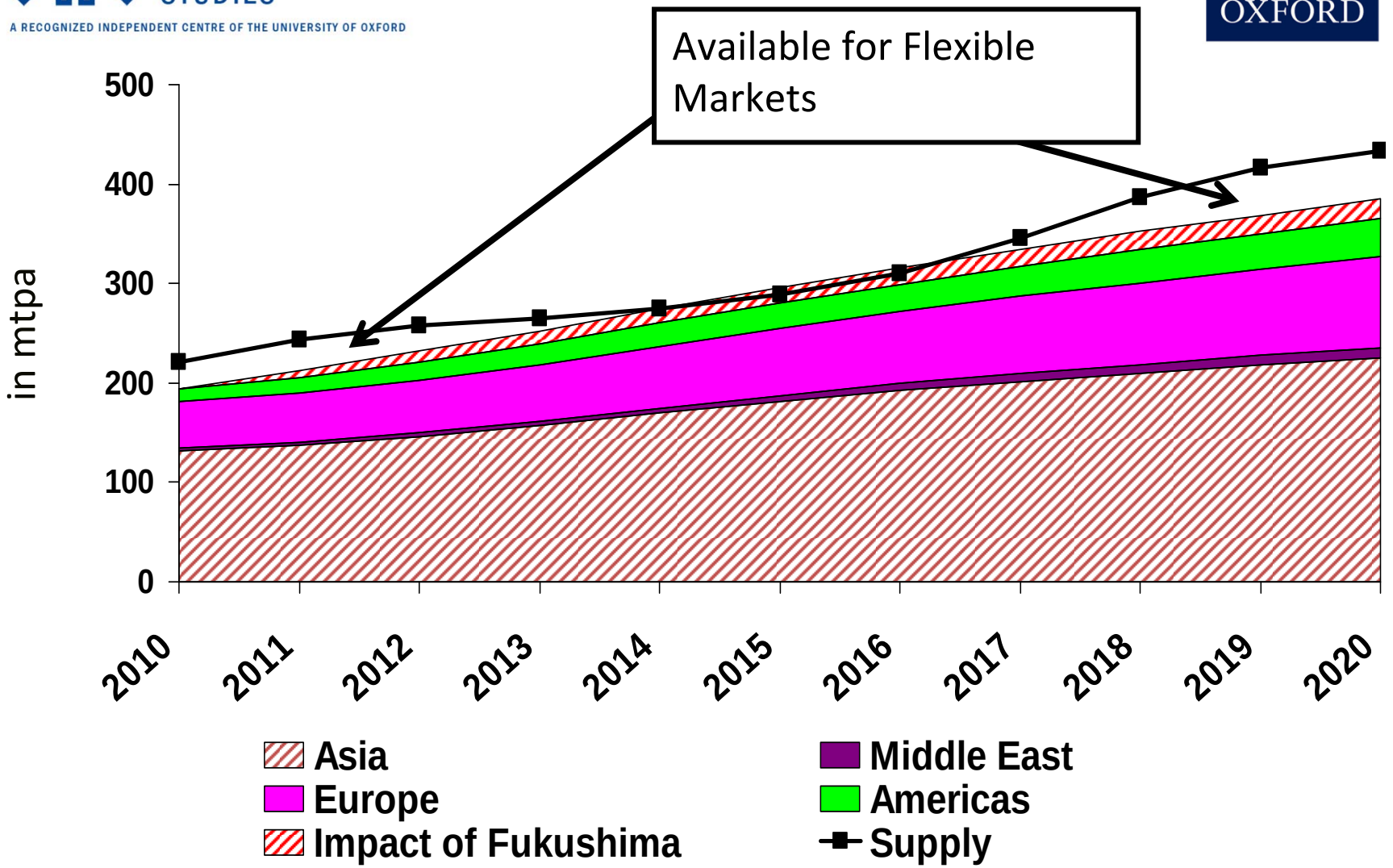

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# Natural Gas and LNG Prices January 2008 to July 2011

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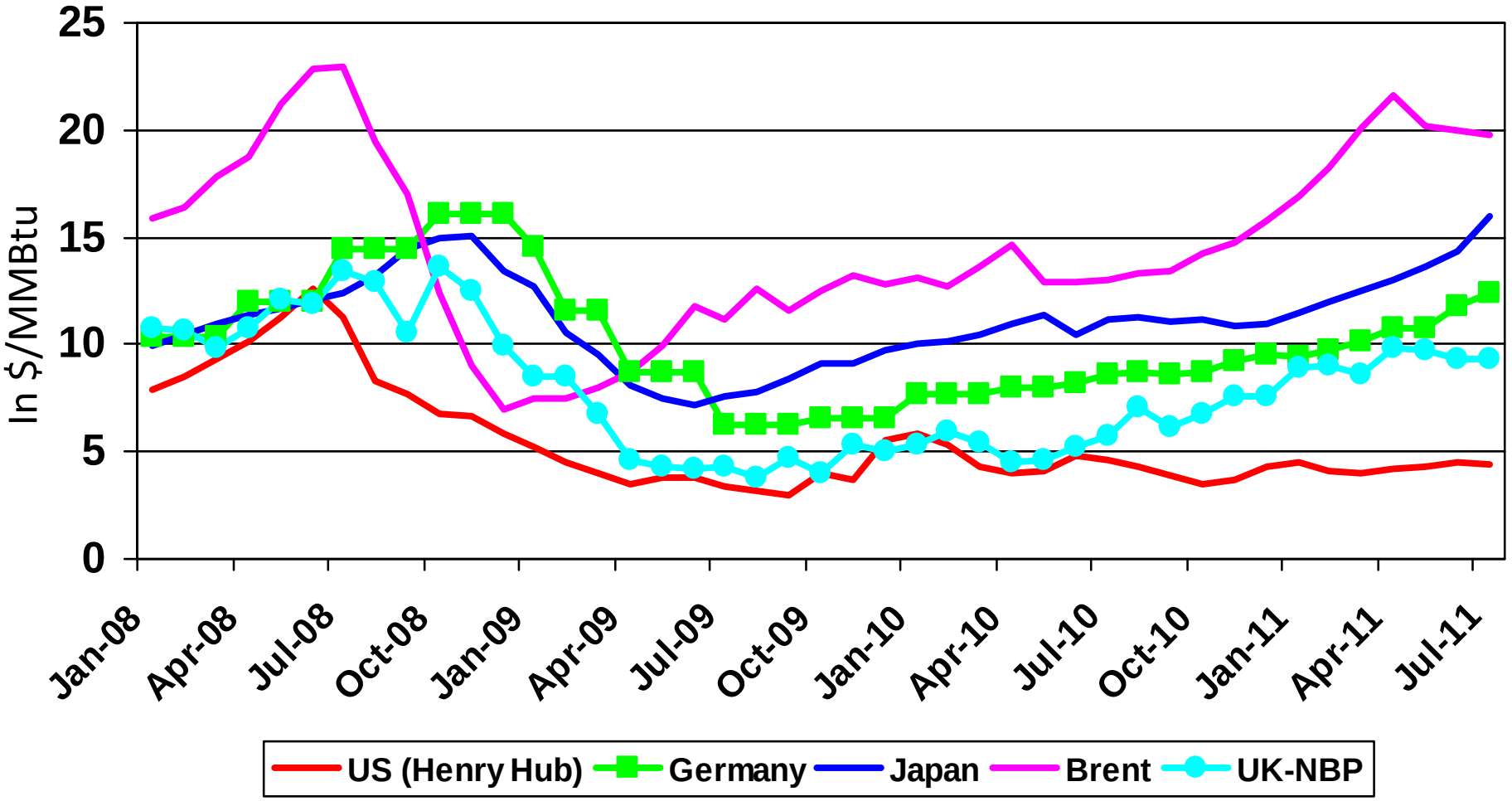

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# Price Range in New Contracts in Asia 2008 to 2011

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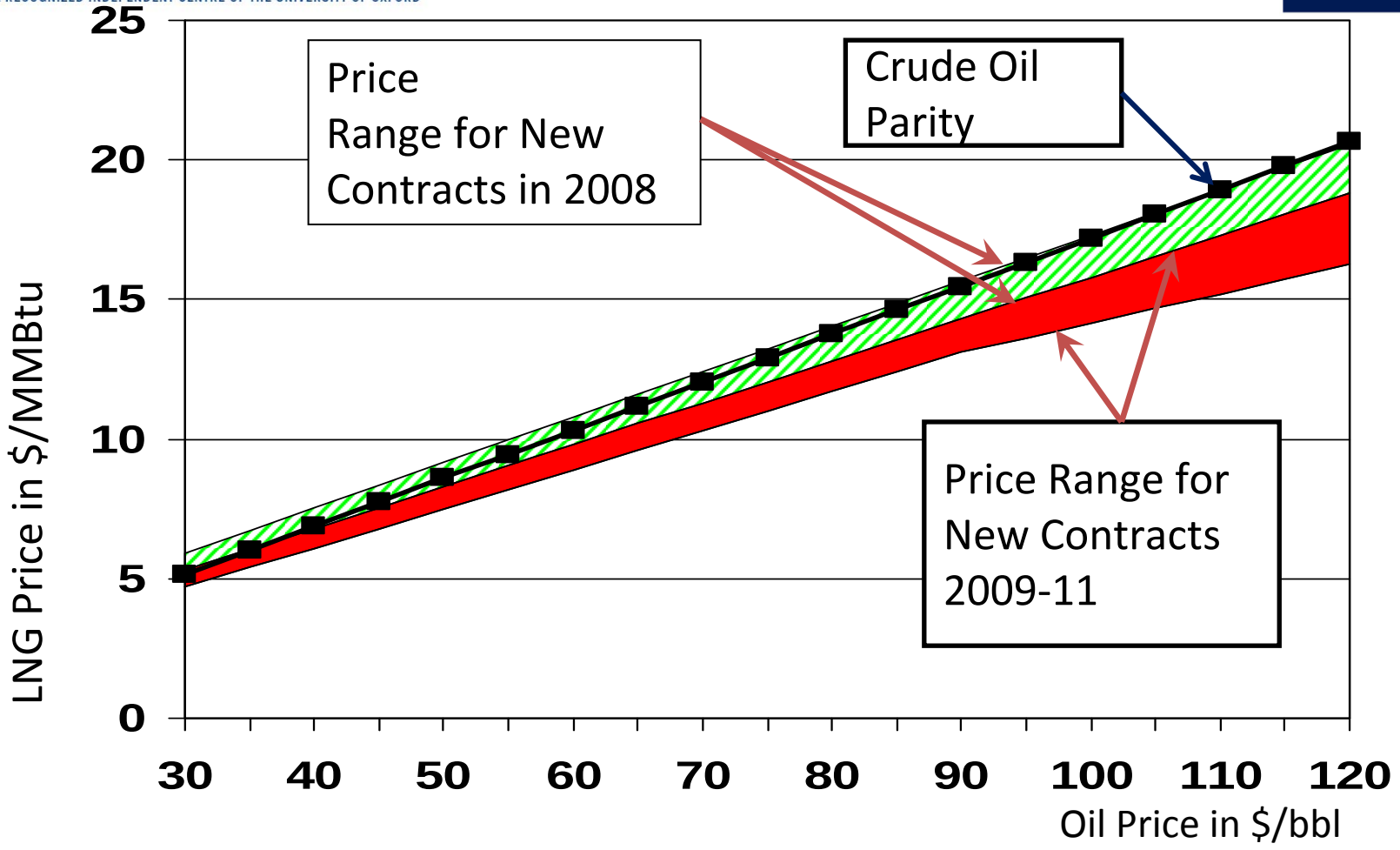

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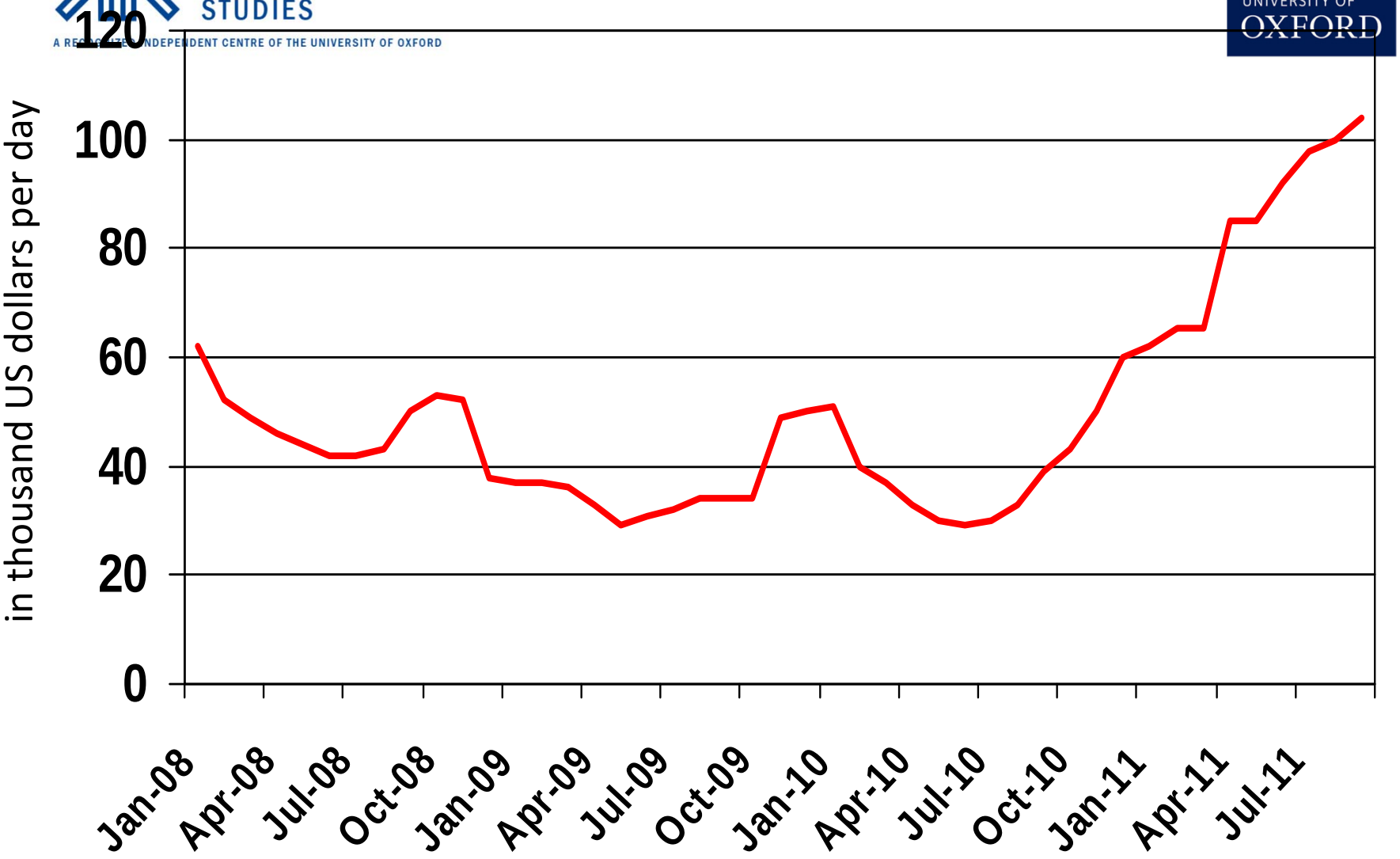
# LNG Ship Short-term Charter Rates Jan 2008 to Sept 2011



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# Orders for New LNG Ships

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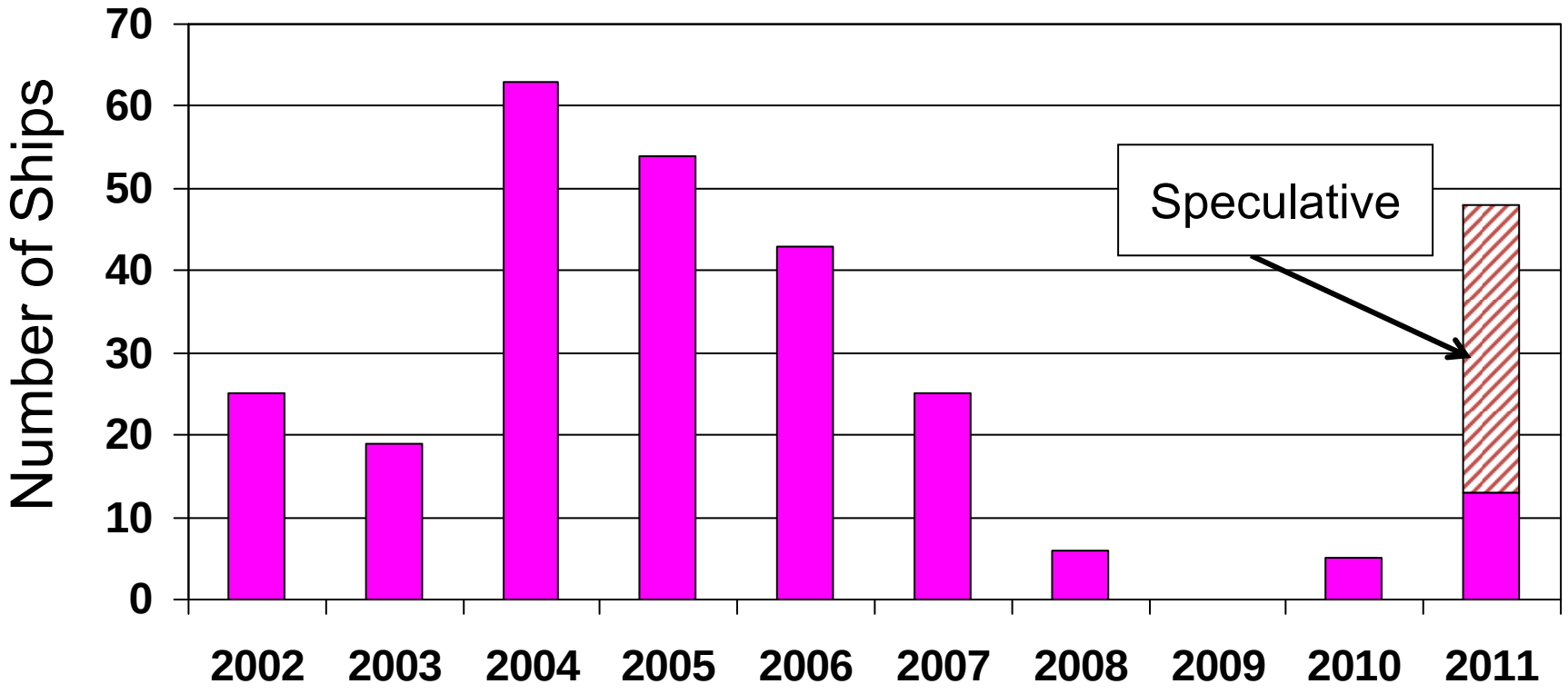

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# Percentage Changes in Shipping Capacity & LNG Production 2000 to 2016

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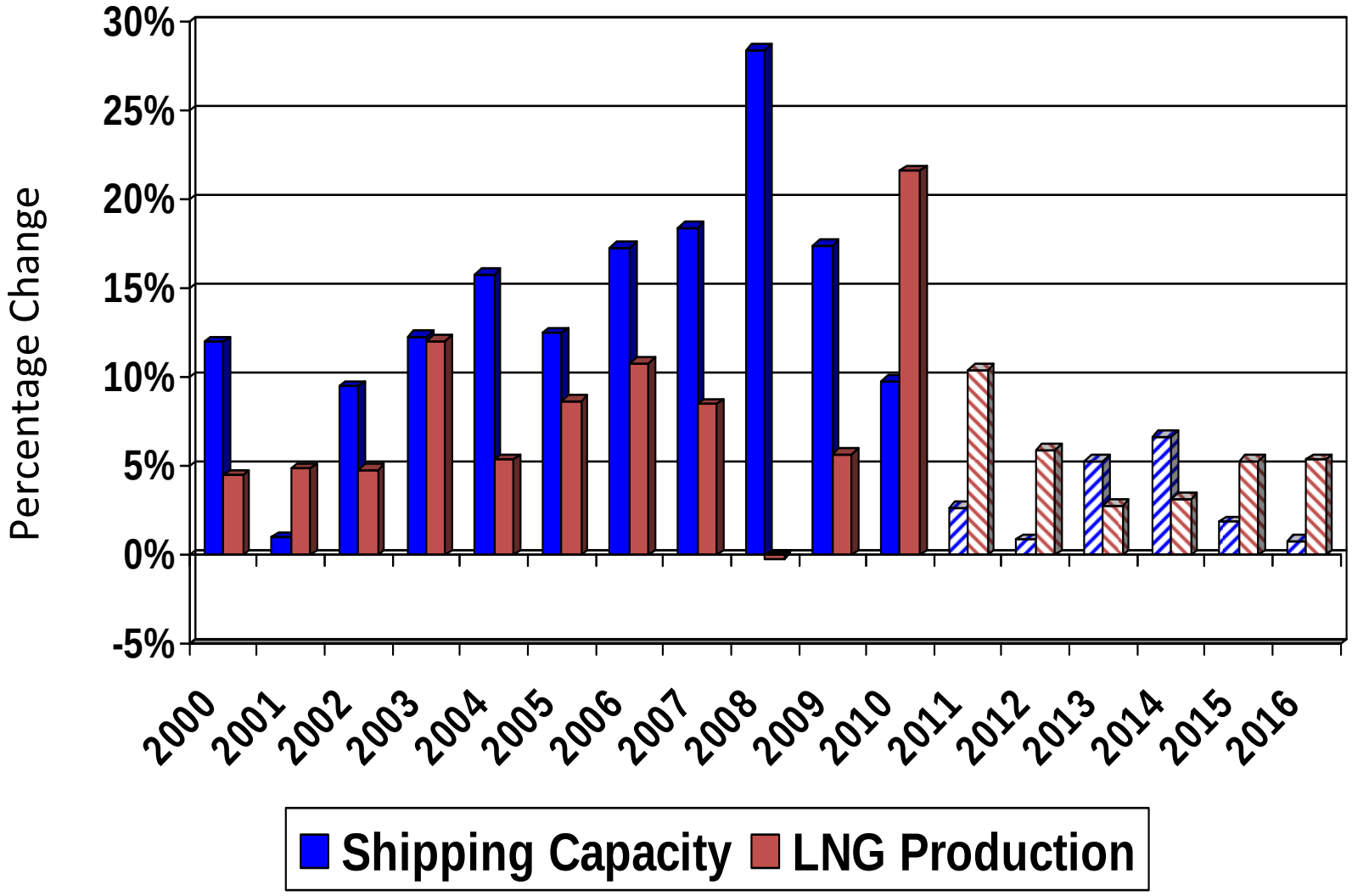

# Thank You

Contact: report@tky.ieej.or.jp