

Assessing the Future Challenges of the Global Gas Market

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AGENDA



1. The role of gas in the future energy mix
2. The supply challenge
3. The outlook for LNG
4. The outlook for pipeline projects
5. Future global gas dynamic
6. Challenges for industry players

Wood Mackenzie
WGC – Stand 4.210

Introducing Wood Mackenzie



Wood Mackenzie provides forward-looking commercial insight that enables clients to make better business decisions

- › Energy Specialists
 - Expertise spanning oil and gas value chains
 - Upstream, Gas & Power, Refining & Marketing

- › Providing a range of Research and Consulting Services
 - Independent Research acts as a benchmark for the industry
 - Range of bespoke Consulting services

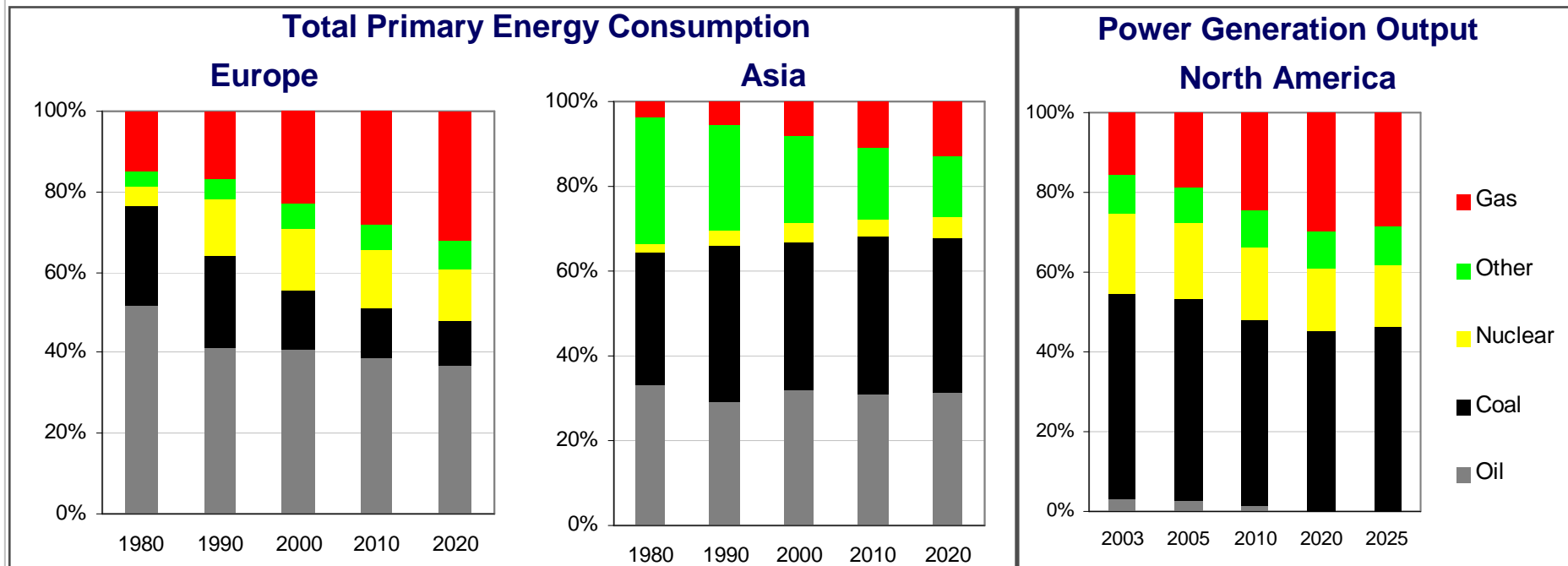
- › Serving clients from all sectors since 1973



We are in the era of the “gas economy”



- › Natural Gas will increase share in global primary energy consumption
- › Although the gas vs coal dynamic depends on value of carbon..



Source: Wood Mackenzie

The Demand challenge – competing fuels in power generation



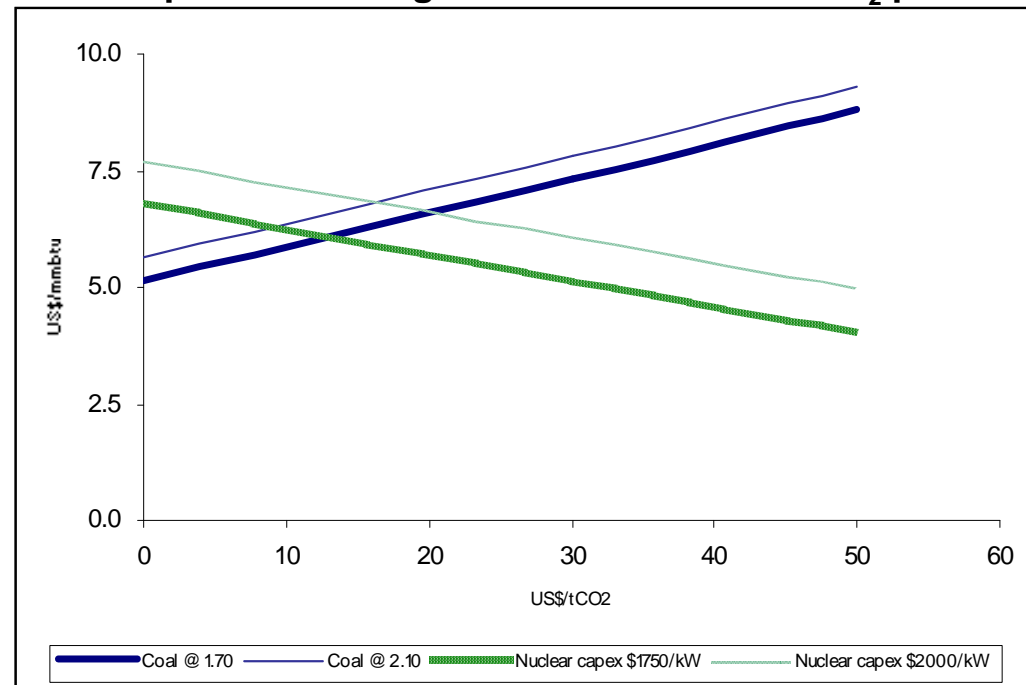
› But carbon trading raises switching level for new-build generation capacity

- coal-fired power more attractive than gas at ~\$7/mmbtu at \$25/tCO₂

› But equally it lowers the switching level for nuclear

- ~\$6/mmbtu at \$25/tCO₂
- Although lead times for new nuclear are substantial!

Gas price switching levels as function of CO₂ price



Carbon trading value (US\$/tCO ₂)	0	25	50
Coal @ 1.70	5.20	7.00	8.80
Coal @ 2.10	5.70	7.50	9.30
Nuclear capex \$1750/kW	6.80	5.40	4.10
Nuclear capex \$2000/kW	7.70	6.40	5.00

Source: Wood Mackenzie

The Supply challenge - increasing import dependency



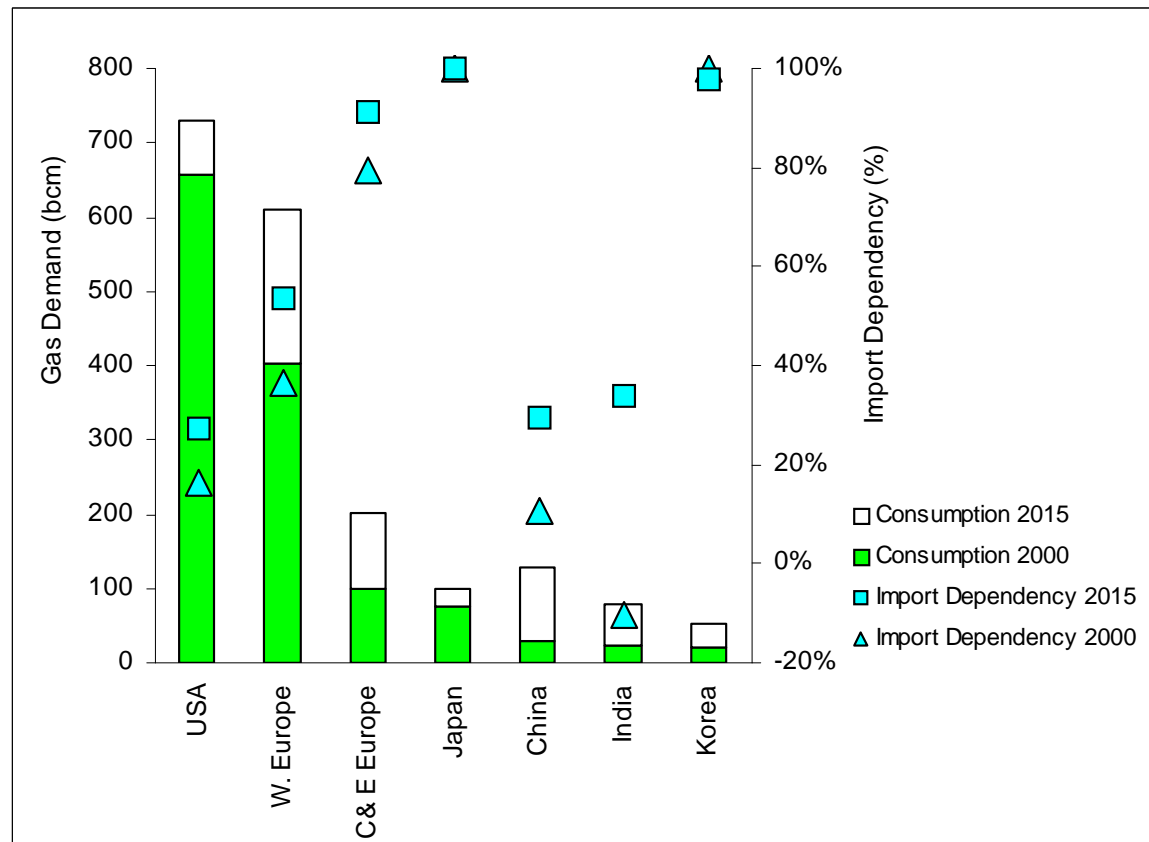
› Aggregate gas import dependency is increasing for all principal markets

- North America
- Europe
- Asia

› Nowhere is the challenge greater than in Europe

- 70% import dependency by 2015
- Increased requirement for LNG, Russia - and others?

Gas Markets – Future Import Dependency



Political challenges – managing energy policy priorities



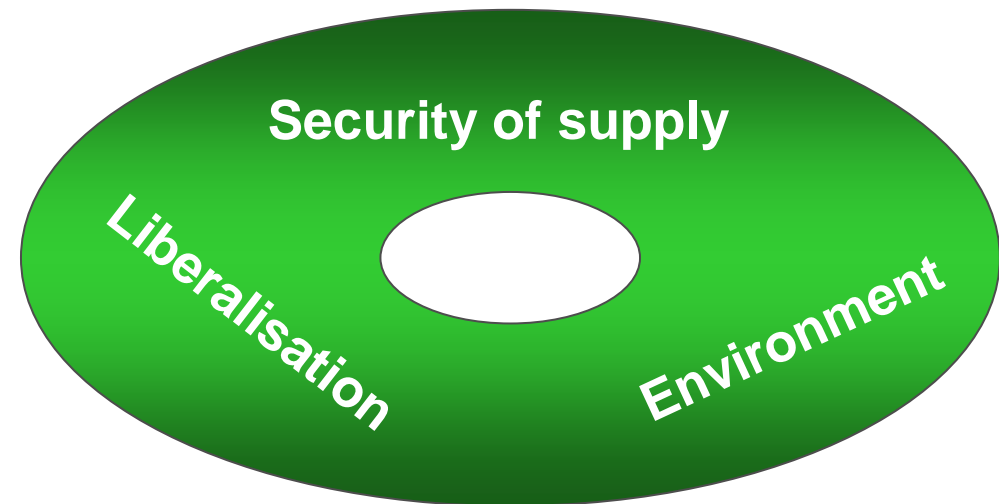
1990's

- Liberalisation first priority
- Environmental awareness increasing
- Security of supply assumed

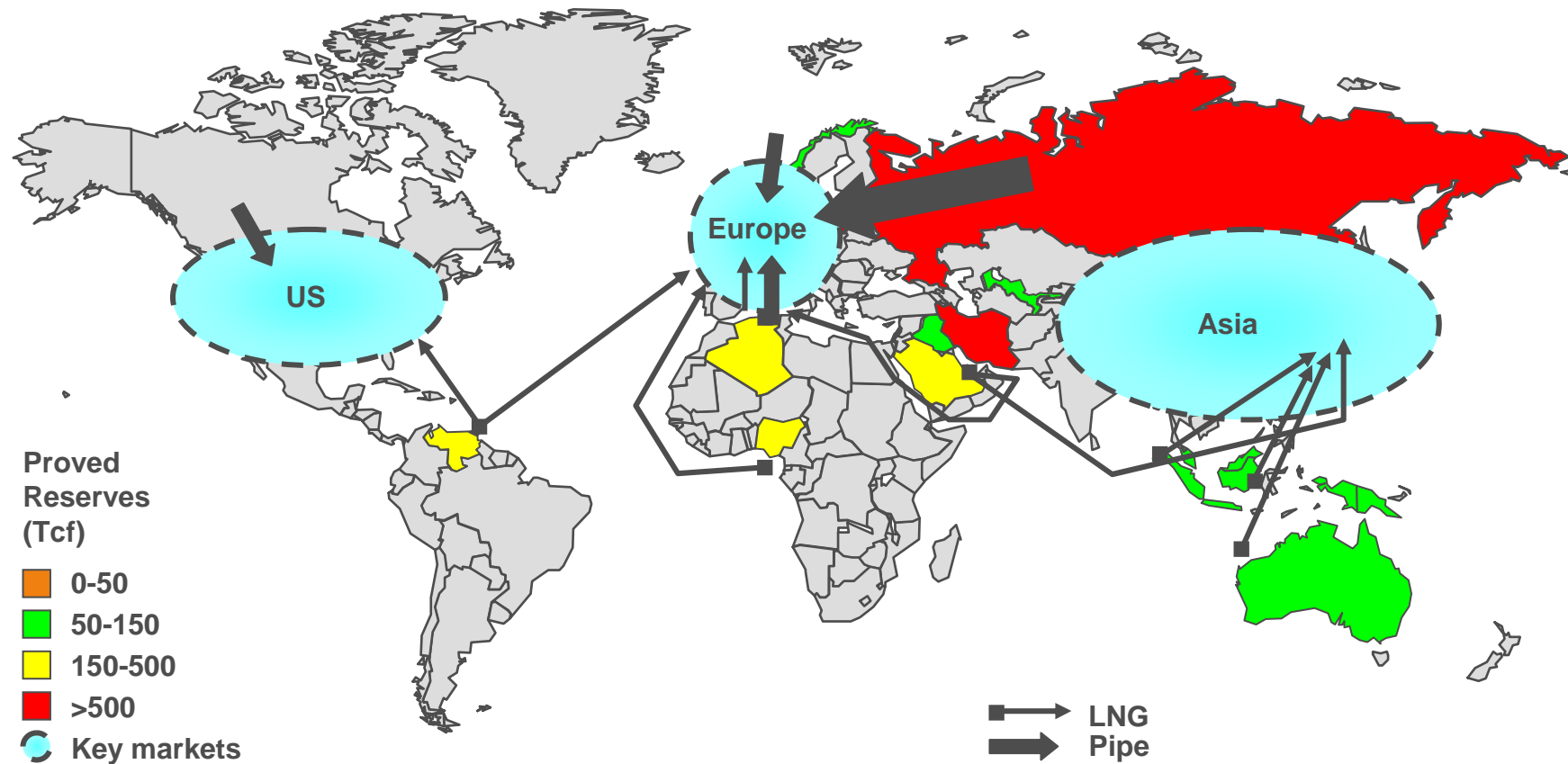


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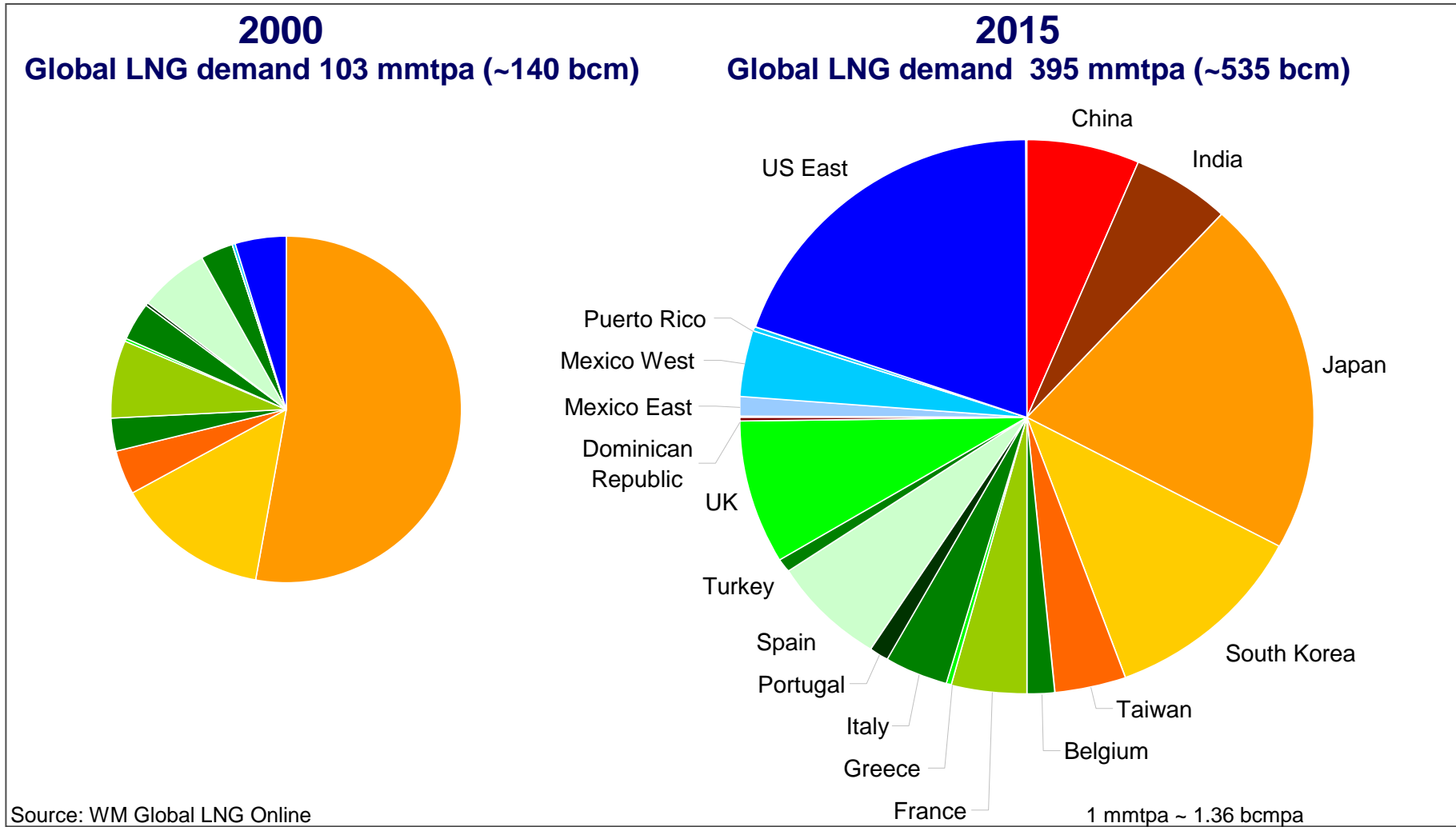
- Security concerns increasing
- Environmental concerns increasing
- Uncertainty where liberalisation fits?



Historically gas flows were dominated by geography...

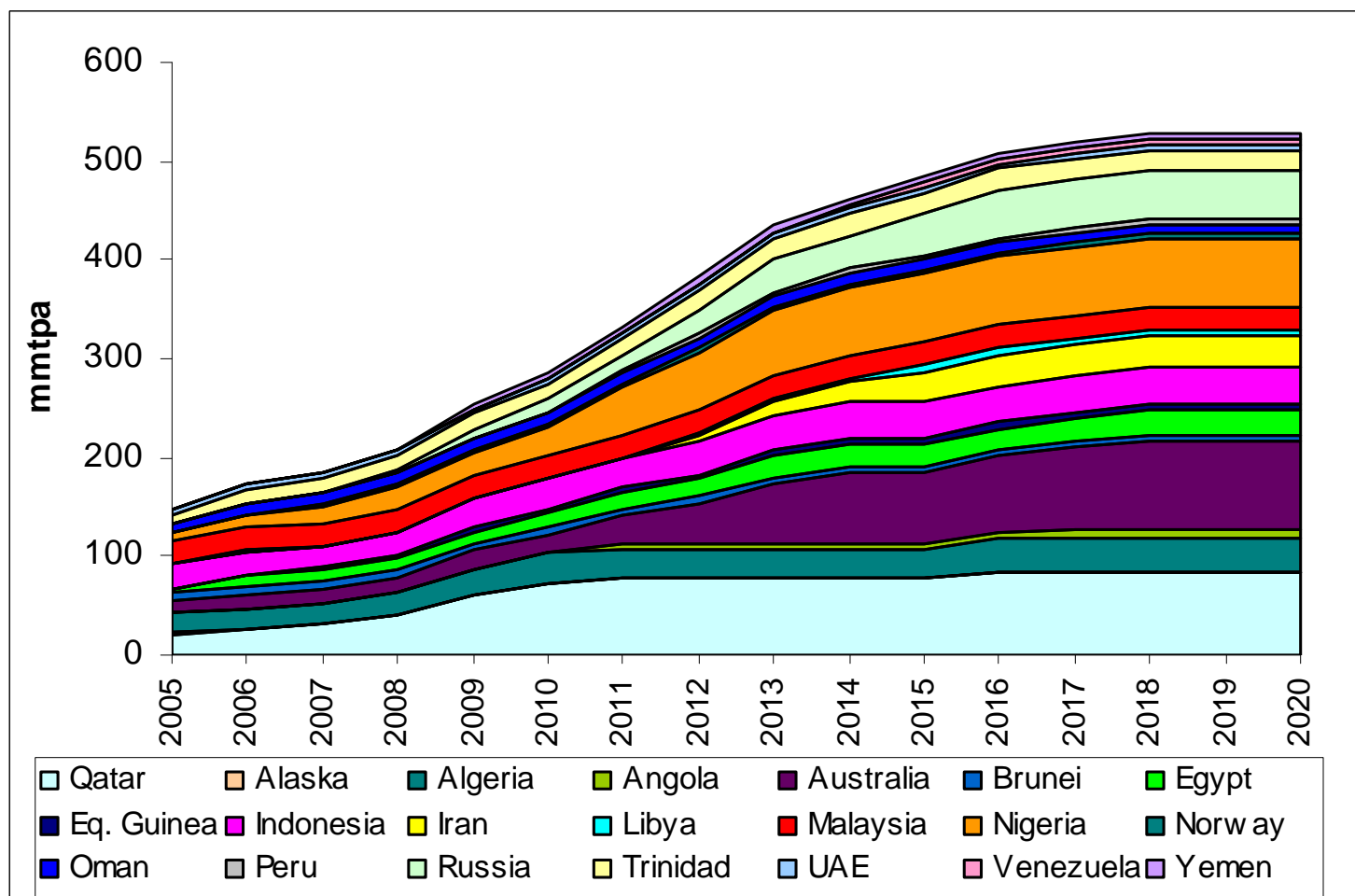


The number of markets receiving LNG is increasing ... and demand for LNG is growing rapidly



Source: WM Global LNG Online

LNG Supply is also diversifying...



Source: WM Global LNG Online

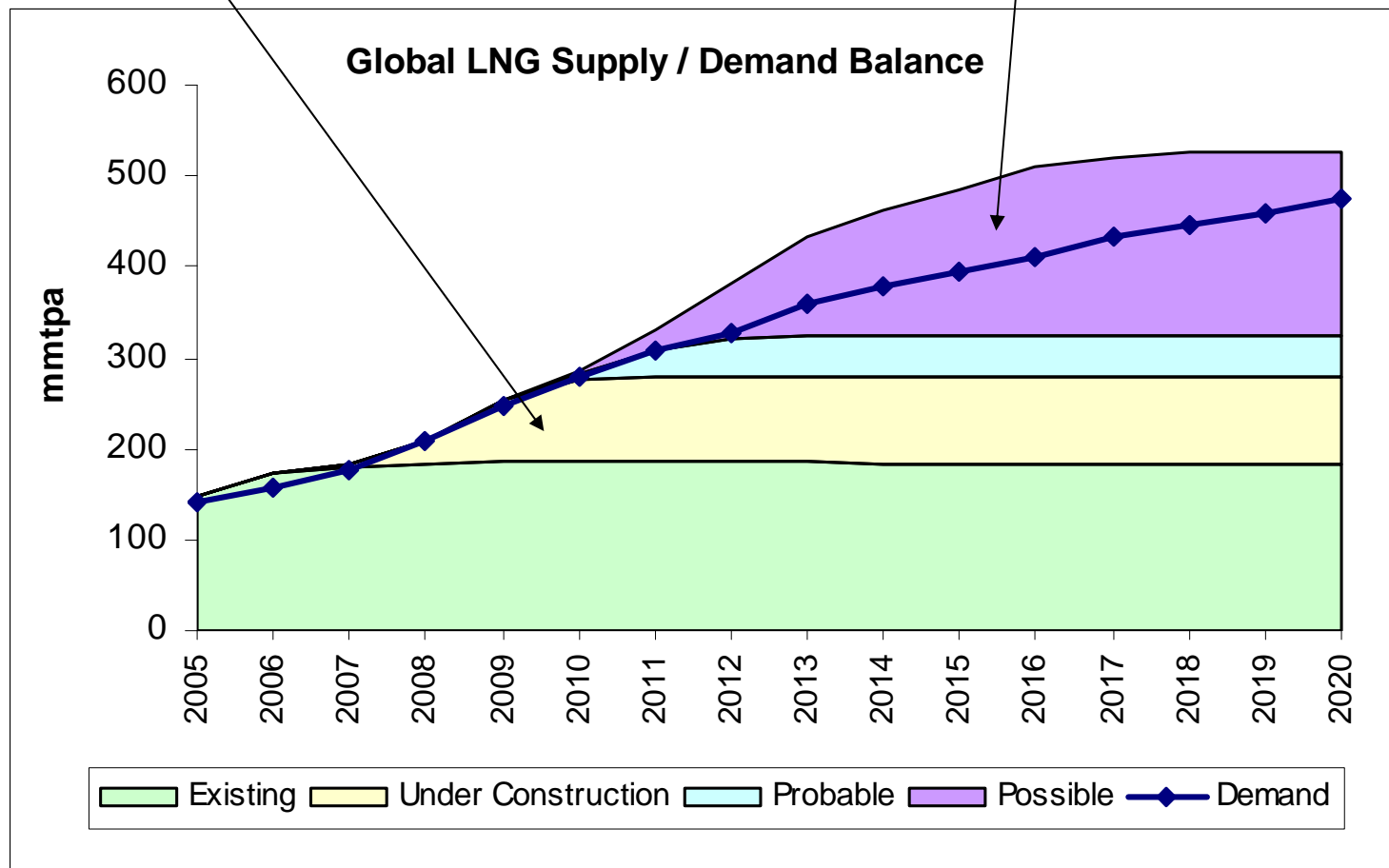
1 mmtpa ~ 1.36 bcmpa

...but in reality the market is tight, and may remain so



Any construction delays will tighten market further

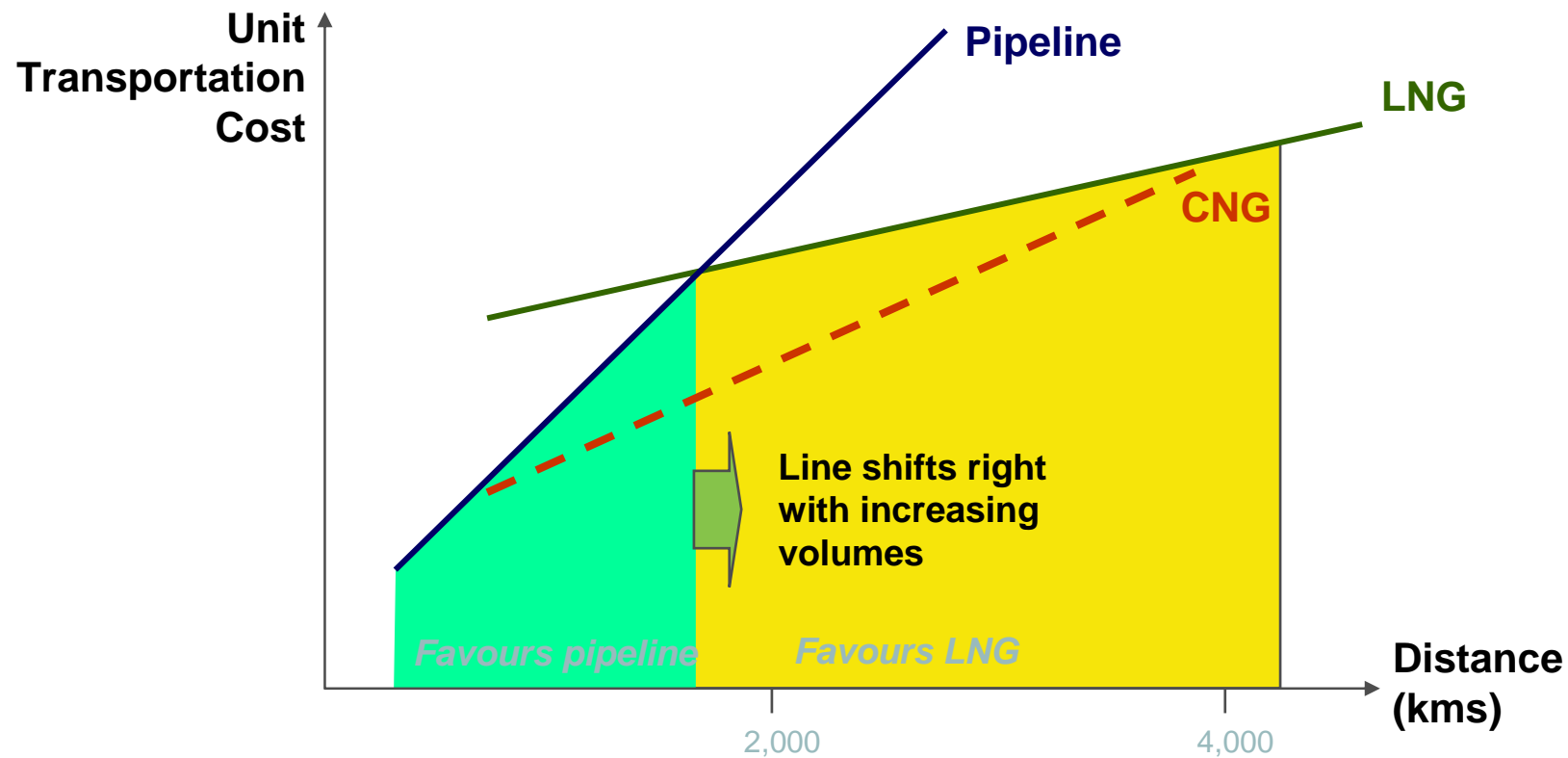
Much of this is speculative, eg Iran, Venezuela, etc



Source: WM Global LNG Online

1 mmtpa ~ 1.36 bcmpa

LNG or Pipeline? Competing Transportation Options



CNG is potentially economic in the range of 400-3,000 kms

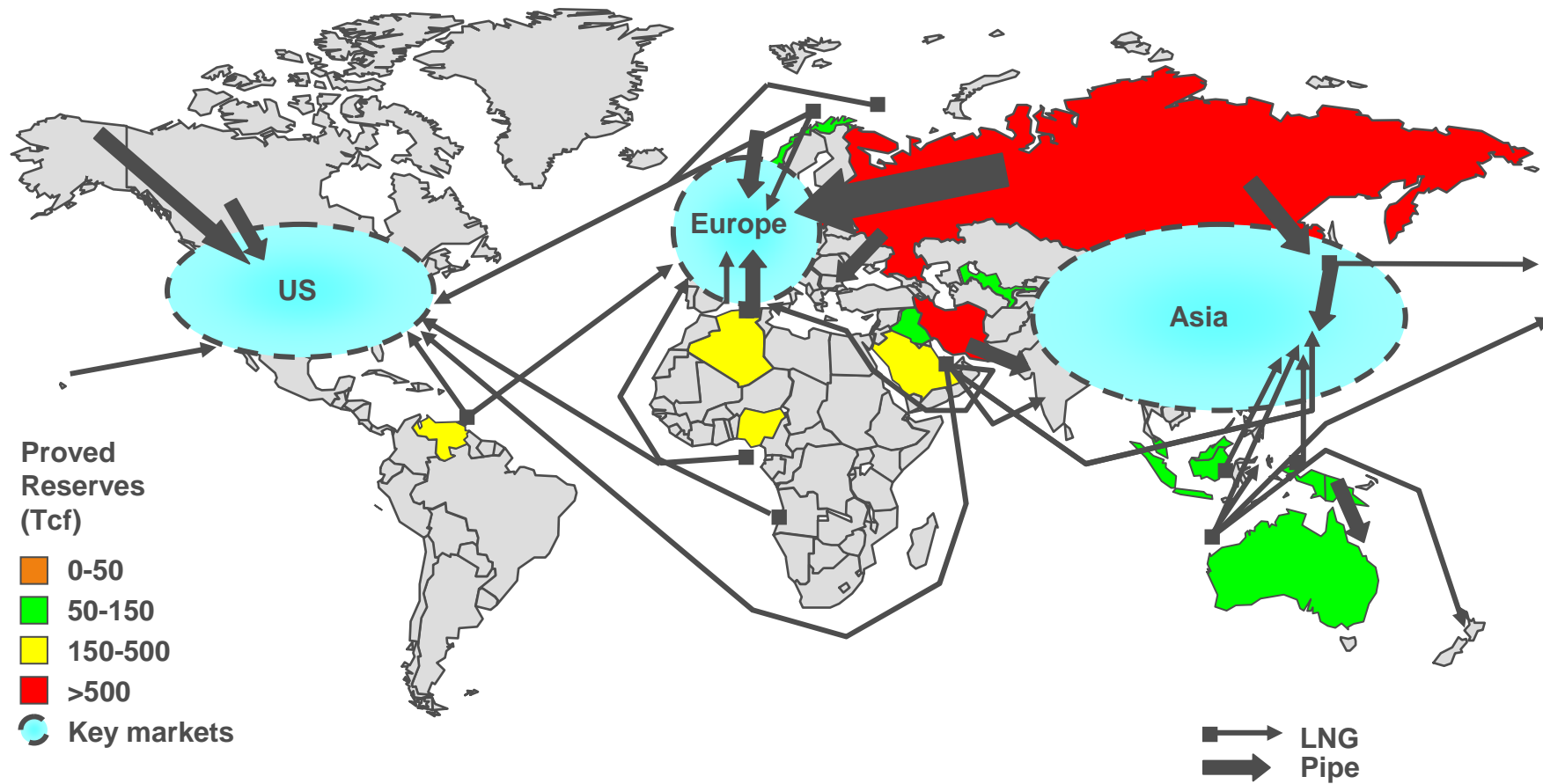
Where are the major new pipelines?



	Capacity bcm/a	Cost \$bn (2005)	Start
<u>Europe</u>			
Medgaz (Algeria to Spain)	8	0.8	2009
NEGP (Russia to Germany)	28	5.0	2012
IGI (Greece to Italy)	8	1.0	2010
Nabucco (Turkey to Austria)	25	4.5	2011
GALSI (Algeria to Italy via Sardinia)	10	2.0	>2012
<u>North America</u>			
Mackenzie Delta (Canada to US)	12	4.5	2010-12
Alaska to US Lower 48	45	15.0	2015-17
<u>Asia</u>			
PNG Gas (PNG to Australia)	4	1.5	2011-12
Kovytko (Russia) to China	~30	6.0	>2010
Iran to Pakistan and India	30-40	7.5	>201

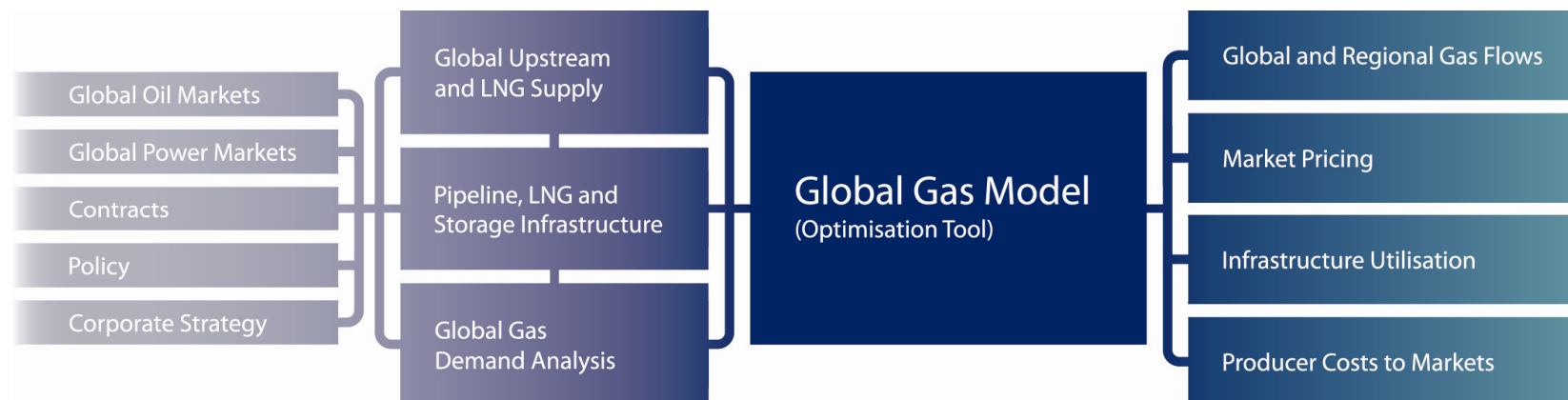
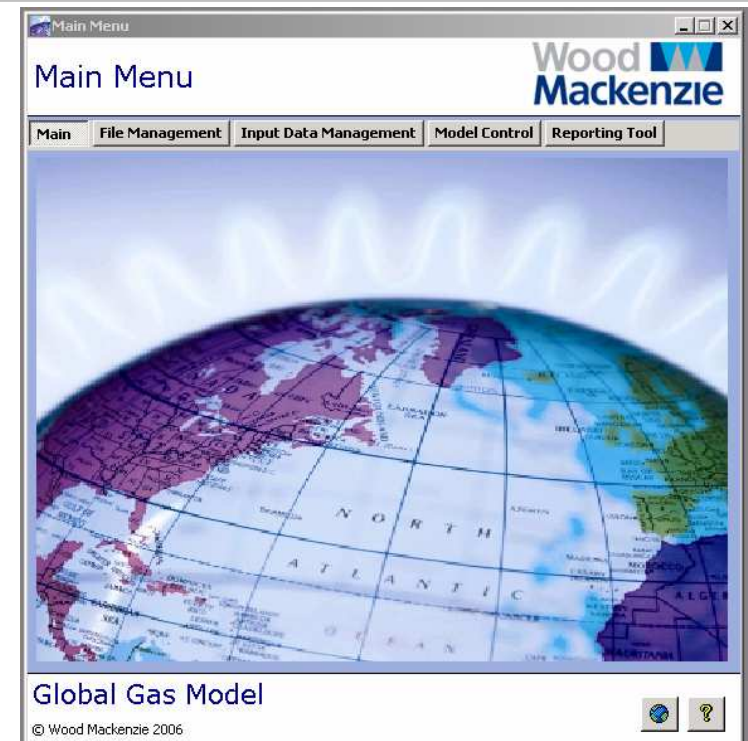
Pipelines offer economies of scale but are more challenging to complete, and offer less optionality regarding choice of markets

A complex global gas trade dynamic is emerging as the market becomes increasingly interconnected



..which requires a sophisticated analytical approach to understand

- › At WGC Wood Mackenzie is launching our Global Gas Model
- › Allocating existing and future supply against demand to forecast future gas flows and market prices
 - Monthly and annual basis to 2025



Will we see the creation of a new global commodity market?

Parallels between LNG and oil are limited



	Contracted markets	Increased Trading	Spot price reference	Maturing Commodity
Oil	1950 - 1972 Spot market insignificant LT integrated contracts Price regulated by governments & companies	1973 - 1979 Spot sales 5% of total market Nationalisation of upstream business breaks vertical integration	1980's Supply surplus increase in non-Opec production WTI futures traded on NYMEX Spot sales reach 30% of market	1990's to today Initial increase in volatility Derivatives are developed and traded markets become liquid Netback pricing
	LNG	1960's - 2005 LNG sold on LT contracts. Buyer - seller relationships key	2002 - ? Some spot sales 5-10% of market National champions start to emerge	2002 - ? Henry Hub prices define US LNG Increasing spot price linkages

What are the future challenges in the global gas market? It depends who you are...



Access to:	NOC's	IOC's	Utilities
Future Reserves	✓	?	?
Monetisation Technology	?	✓	?
Capital	?	✓	✓
Market	?	?	✓

Large green arrows are present: a downward arrow on the left side of the table, and an upward arrow on the right side of the table.

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