

The future role of gas

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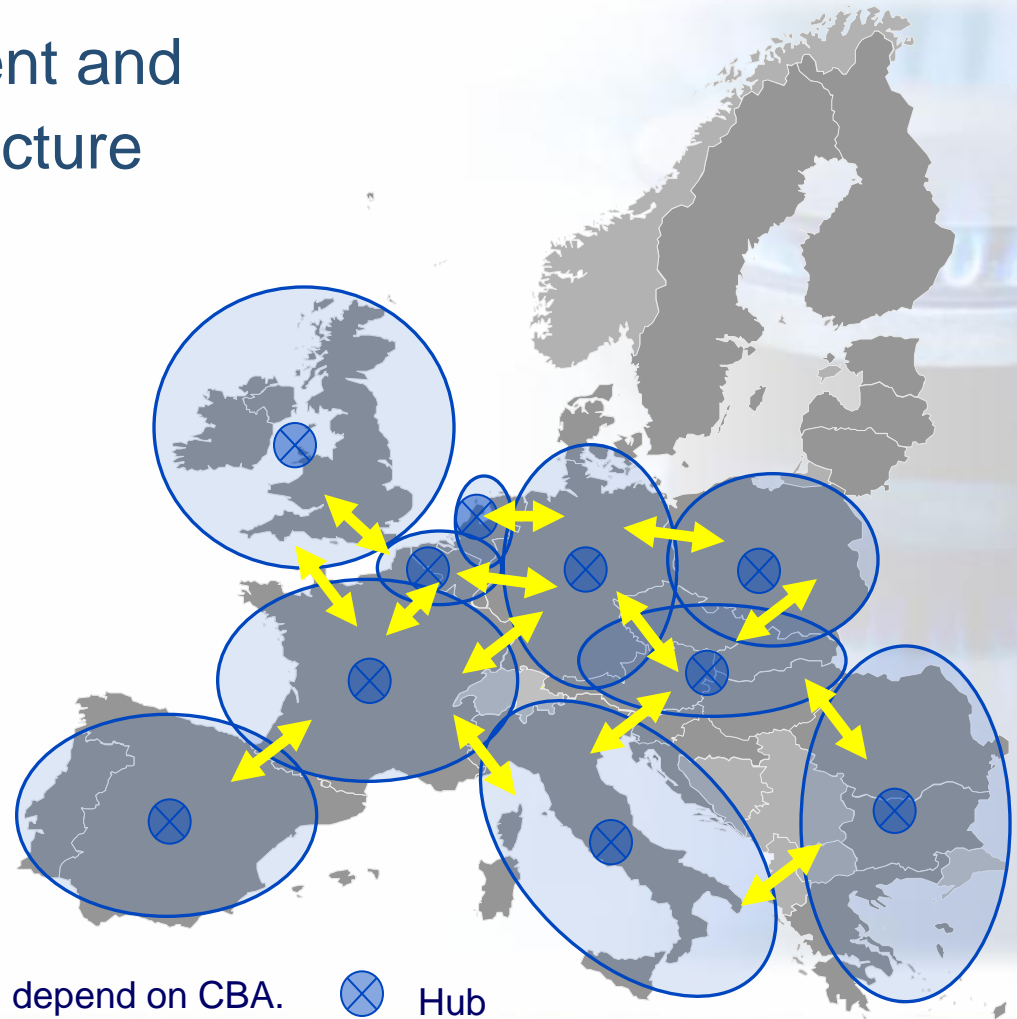
23rd Madrid Forum
17-18 April 2013

The role of natural gas in Europe is changing due to

- ➔ Changes in the European legal framework
 - CMP, NCs (CAM, Balancing, Interoperability and Tariffs) coming into force gradually
- ➔ Changes in the market dynamics
 - US shale gas revolution
 - Growing importance of LNG trade
 - Shale gas revolution in Europe?
- ➔ Changes in the system requirements for natural gas – higher flexibility requirements

Vision for the GTM in a nutshell

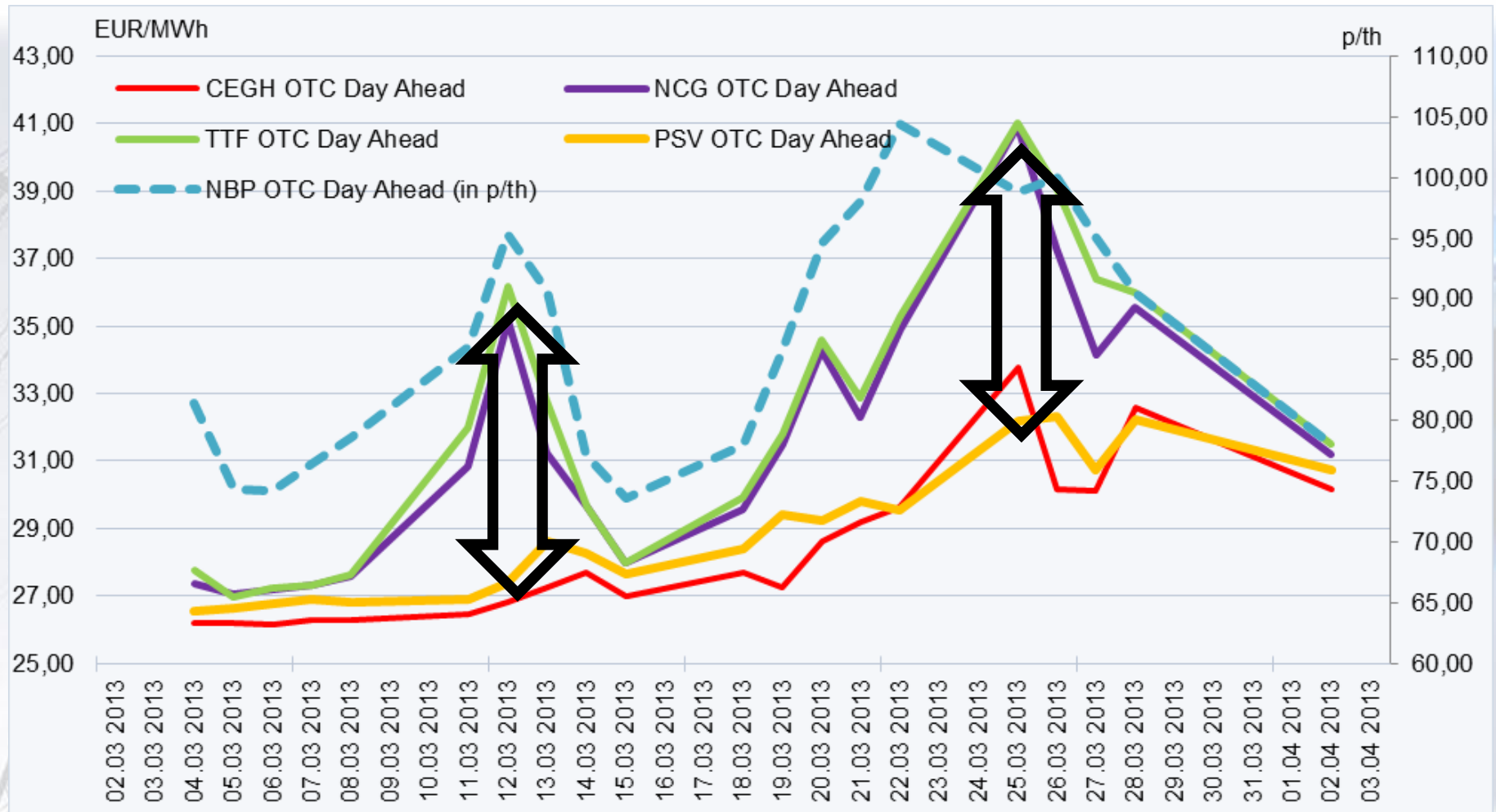
- Liquid hubs with sufficient and efficiently used infrastructure
- Functioning markets in all of Europe
- Ensure that gas flows to Europe



* Zones drawn for illustration. Size of zones will depend on CBA.

 Hub

Gas prices show that we still don't have a European market, while...



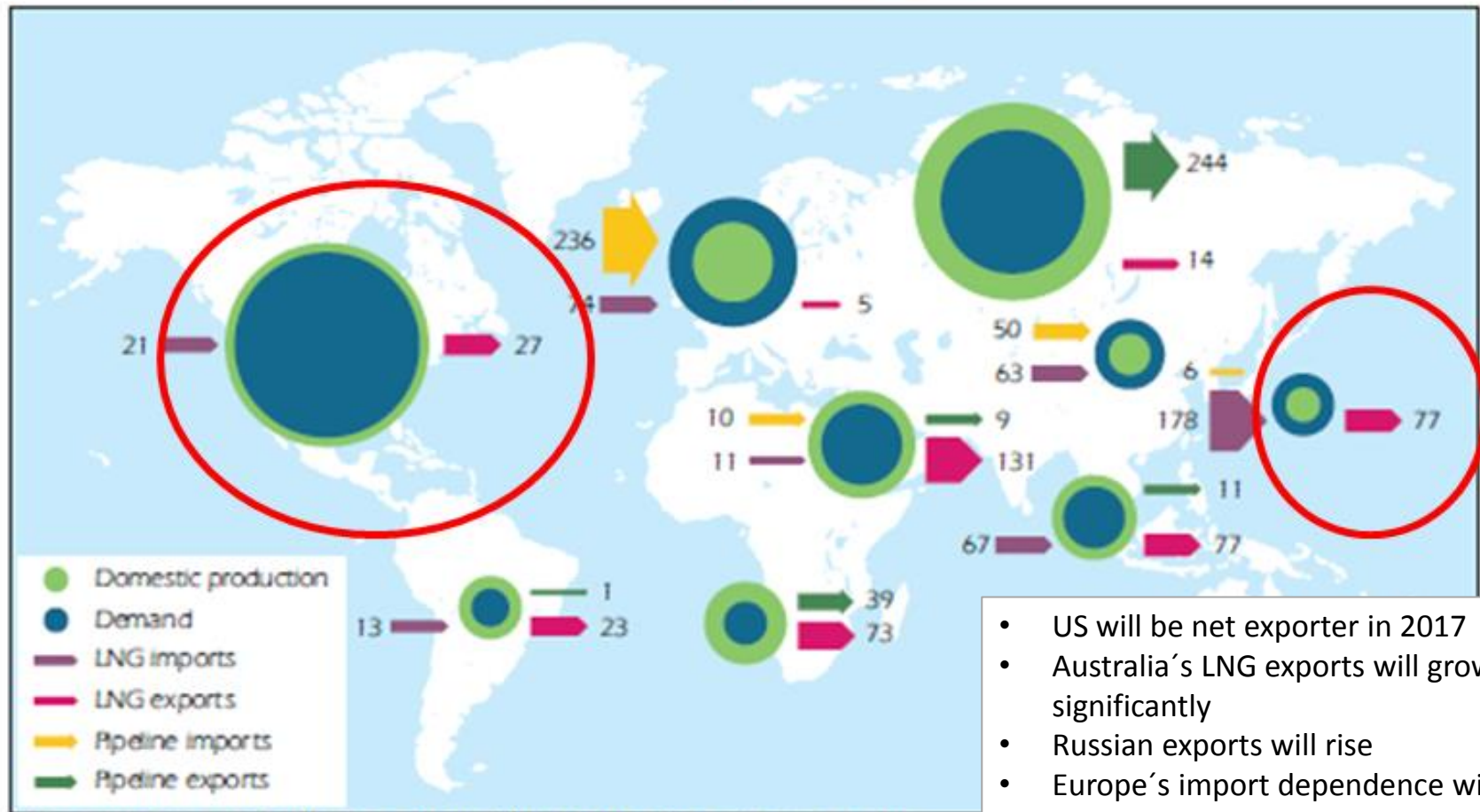
Datasource: ICIS Heren

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Changing landscape of world gas trade

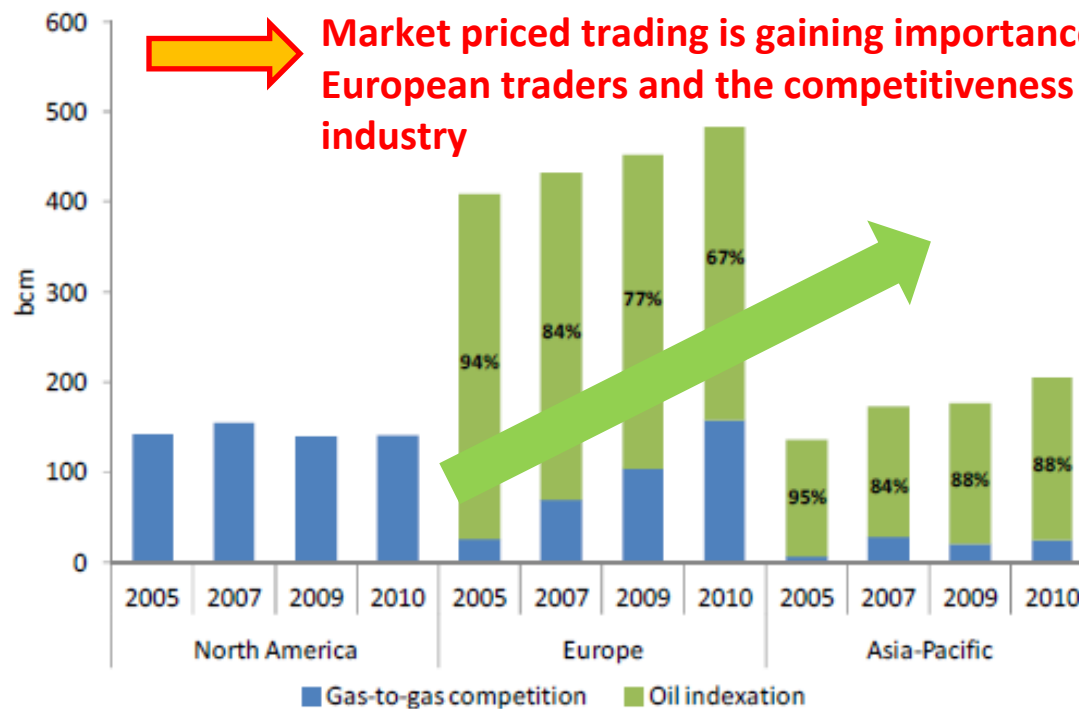
Map 8 Global gas trade in 2017



- US will be net exporter in 2017
- Australia's LNG exports will grow significantly
- Russian exports will rise
- Europe's import dependence will grow

European gas market at a crossroad

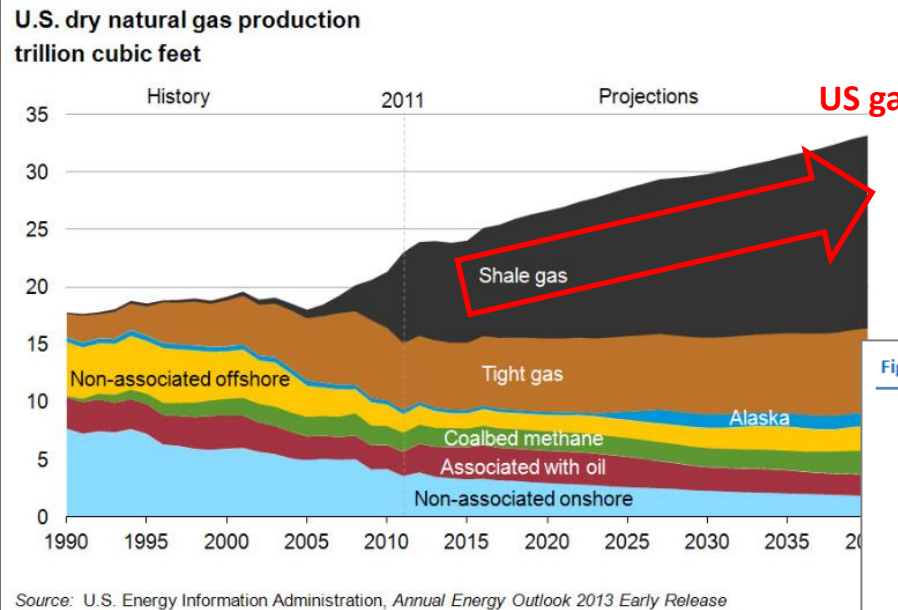
Figure 3 • Market-based pricing in gas trade in North America, Europe and Asia-Pacific



Sources: IGU, 2006; IGU, 2008; IGU, 2010; IGU, 2012.

Source: IEA, *Developing a Natural Gas Trading Hub in Asia*, 2013

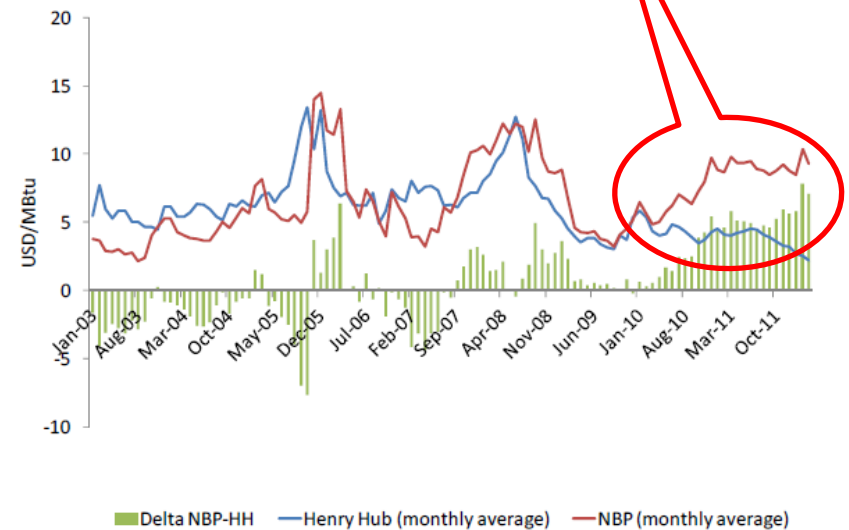
Lower US gas prices cut procurements costs and.....



US gas production will still be rising significantly

Decoupling of HH prices and NBP prices since 2010

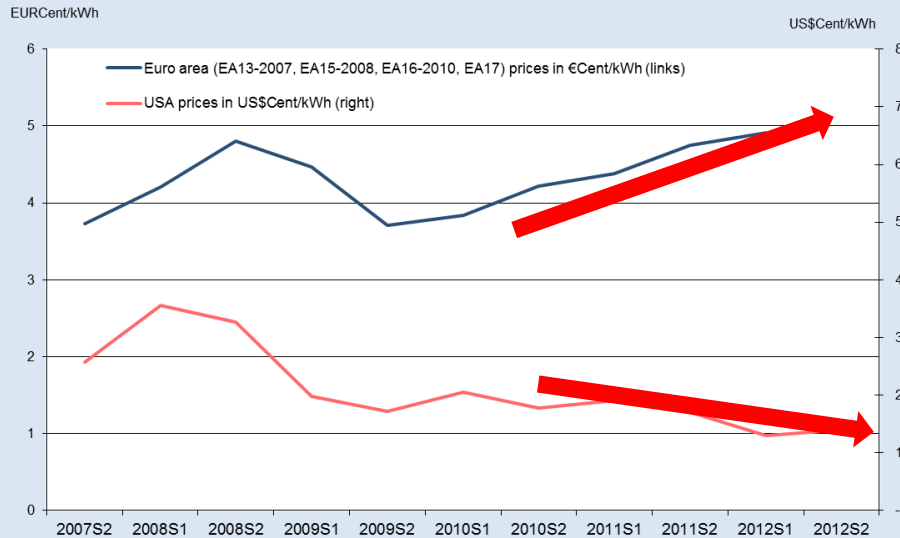
Figure 26 • Price development in the Atlantic Basin, 2003-12



Source: IEA database.

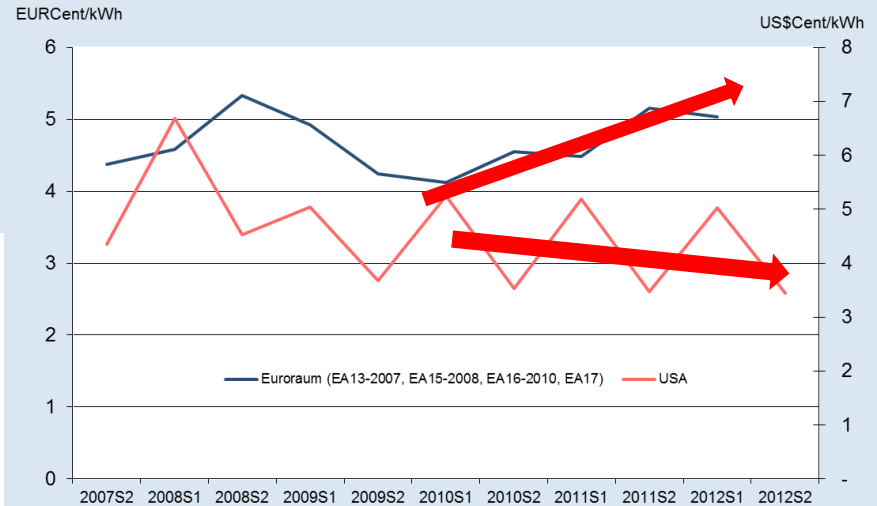
..... created a competitive edge for the US

Industrial Gas Prices incl. Energy, Distribution and all Taxes



Sources:
US Prices - U.S. Energy Administration Information (EIA)
EU Prices - EUROSTAT (Gruppe I3)

Residential Gas Prices incl. Energy, Distribution and all Taxes



Resources:
US Prices - Energy Administration Information (EIA)
EU Prices - EUROSTAT (D2)

Exporting the US shale gas revolution hasn't supported the gas industry in Europe yet....

Impact of the low gas prices on electricity production in US: low gas prices made gas to power more attractive: gas has displaced coal in power production

Figure 11 Coal and gas shares in thermal generation

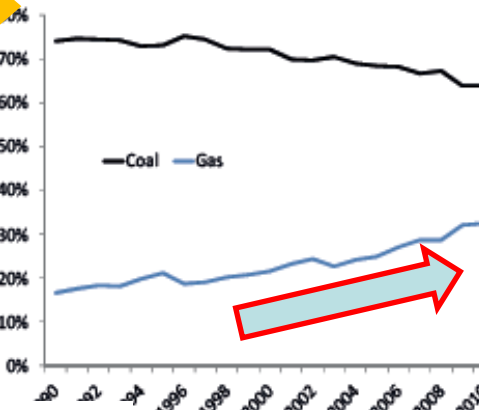


Figure 12 US coal and gas generation

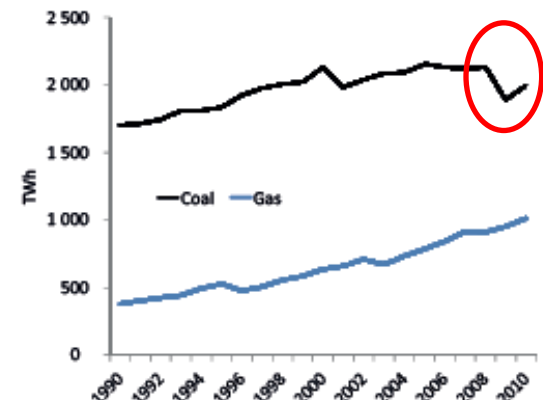
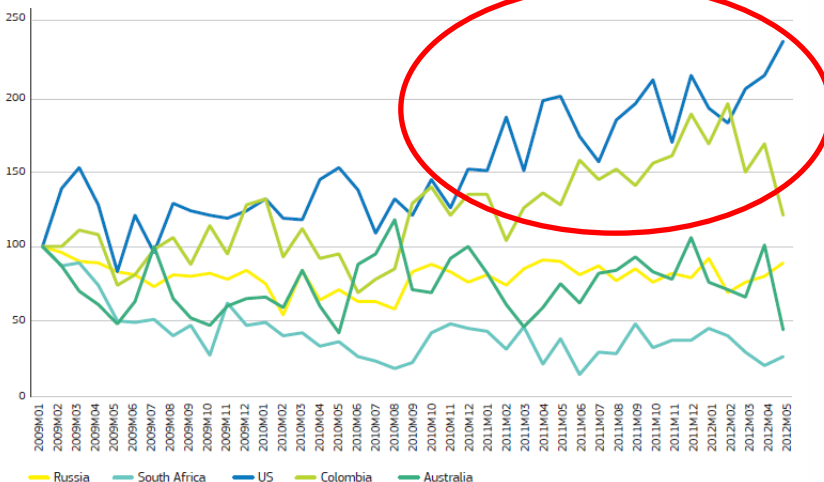


FIGURE 5 - EU 27 HARD COAL IMPORTS (INDEX, JANUARY 2009 = 100)



Source: Eurostat

Impact of the low gas prices for Europe: US exports of coal to Europe has risen since 2009, by 30% from 2012 to 2011

but US LNG Exports could promote the development of the EU gas market

Table 3: The Delivered Cost of US LNG Exports to Europe and Asia (\$/mmbtu)

Henry Hub Price	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
Liquefaction	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Transport to Europe	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Transport to Asia	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Regasification	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Full Cost Europe	6.6	7.6	8.6	9.6	10.6	11.6	12.6	13.6	14.6
Full Cost Asia	8.4	9.4	10.4	11.4	12.4	13.4	14.4	15.4	16.4

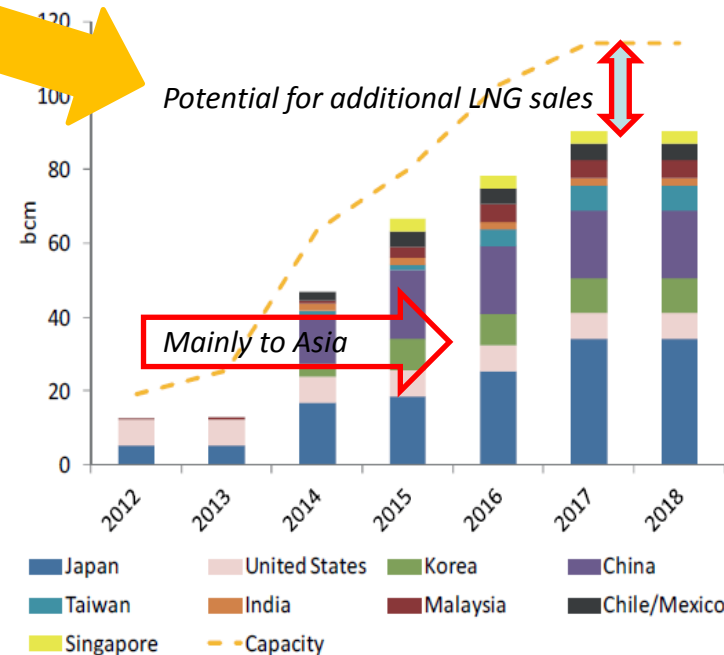
Source: Author's calculations based on *McGraw Hill Construction* Energy data

Note: Full Cost Asian figures assume *use* of the Panama Canal which will have been widened sufficiently to accept LNG vessels from 2014.

Source: James Henderson, *The Potential Impact of North American LNG Exports*, Oxford Energy Institute, October 2012

- Henry Hub price in February 2013: about 9 Eur/MWh
- Full cost to Europe: about 20 Eur/MWh
- Full Cost to Asia: about 25 Eur/MWh

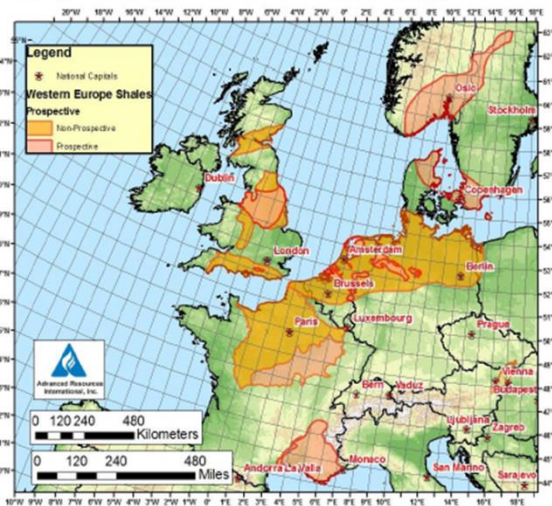
Figure 45 New LNG supplies are almost entirely contracted



Source: IEA, *Medium Term Gas Market Report*, 2012

Shale gas revolution in Europe?

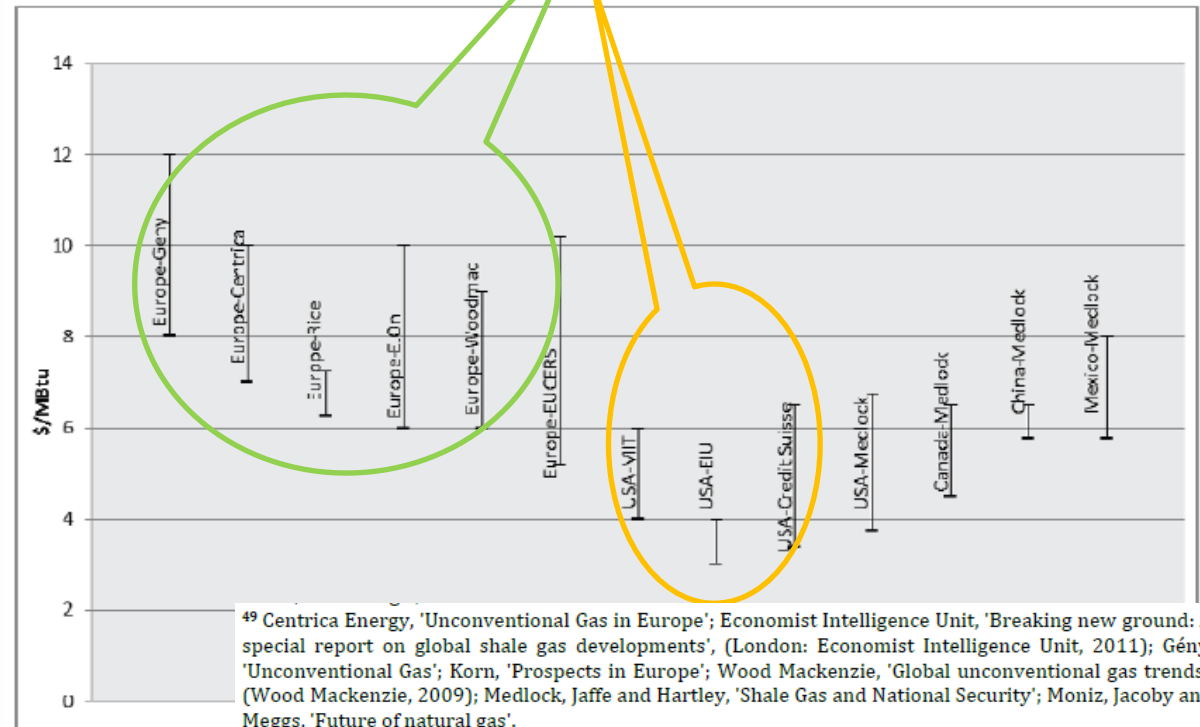
Onshore shale gas basins of Western Europe



Source: EIA ARI World Shale Gas Resources

Assessments for production costs show that European shale gas production seems to be significantly higher than in US

Figure 5-12: Break-even prices for unconventional gas production⁴⁹



Quelle: EU Kommission: Unconventional Gas: Potential Energy Market Impacts in the European Union, 2012, S. 191

But shale gas costs in Europe are on a competitive level

Table 3-24: Shale gas cost scenarios for Europe

'Most likely well and rig site scenario versus Three cost and production scenarios' v production				
Optimistic	Most likely	Conservative	Unit of measure	
9 754 500	12 805 500	18 697 500	€	Total cost per well
9.64	18.87	74.79	€/MWh	Cost per MWh not liquid production

Shale Gas production in Europe could cut the costs for industrial customers: Wholesale gas prices about 24 Eur/MWh (CEER Data, 2012, Month Ahead)

'Most likely well and rig site scenario versus Three cost and production scenarios' with liquid production				
Optimistic	Most likely	Conservative	Unit of measure	
9 754 500	12 805 500	18 697 500	€	Total cost per well
5.28	10.86	44.84	€/MWh	Cost per MWh considering liquid production

Source: EU Kommission: Unconventional Gas: Potential Energy Market Impacts in the European Union, 2012, S. 99

The changing role of natural gas

- Natural gas for vehicles
 - LNG
 - CNG
- Power to gas
- Biogas



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New challenges


Short term gas

- Major use of gas will be power production, less concerning volumes but more and more with flexibility
 - Flexibility markets (commodity and transport) become more important
 - National flexibility might not be sufficient
 - Market integration, appropriate contractual arrangements and trading facilities necessary

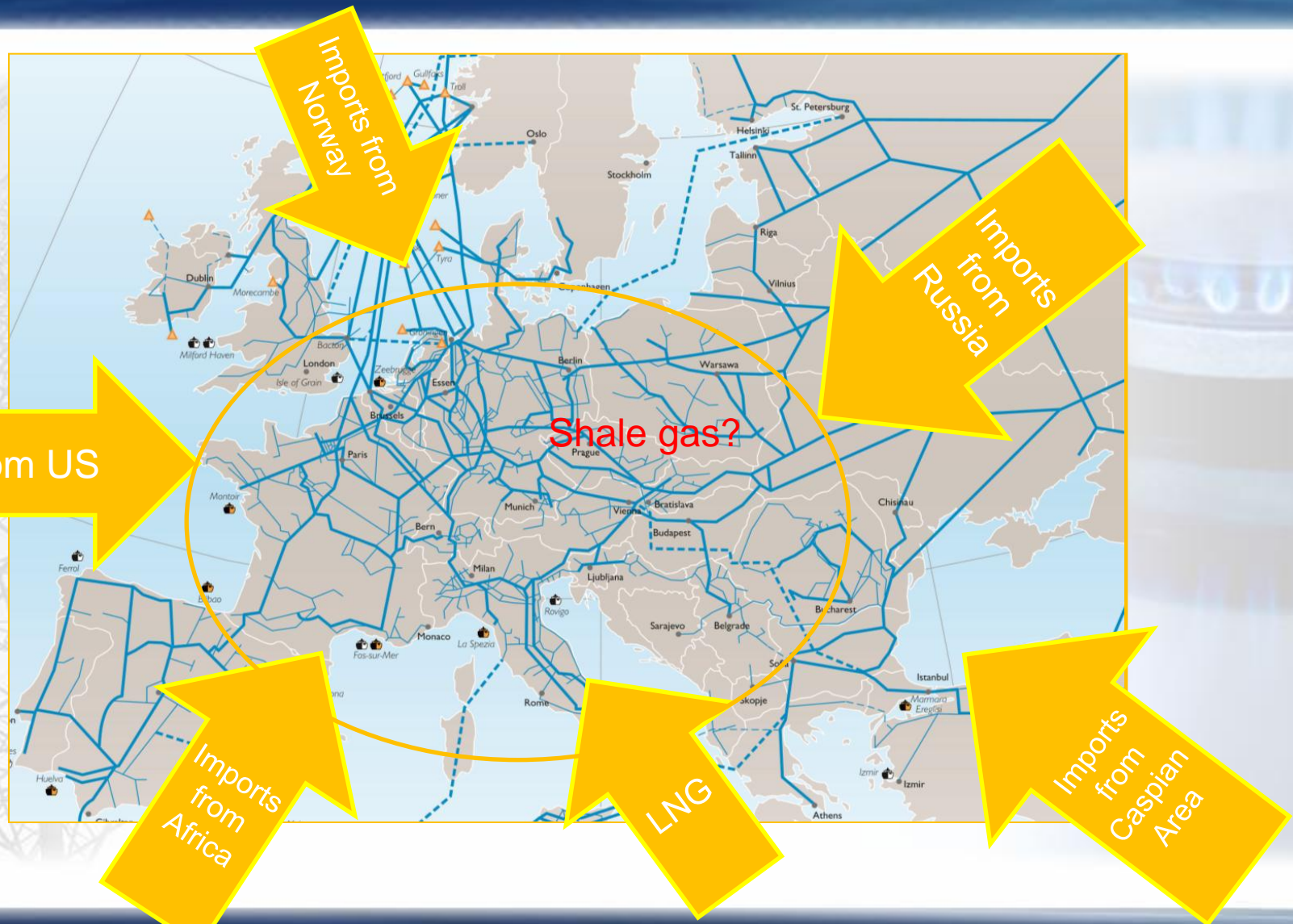
Power vs. coal vs. gas

- Present situation might trigger investment in “wrong” technology (not flexible enough, high investment cost,...)
- Target models of electricity and gas not optimally coordinated
- Cross-border ancillary services markets need cross-border flexibility markets in gas
- Variability in gas will be more important than in the past
- Although the gas system can easily accommodate for variable needs, demand side participation will be important

Conclusions for Europe

- Sustainable competition between gas producers supplying to Europe is of utmost importance for the future role of gas in European economy
 - Essential conditions:
 - Improving flexibility in infrastructure
 - Access to LNG essential for supply diversification
 - Storage as the main flexibility tool
 - Leaving the door open for shale gas production in Europe
 - cutting gas costs for industry
 - Promote market integration based on hub pricing
-  Ensuring that the European gas market will remain an attractive market for global market players

The future role of the European gas market: a real gas hub



Next steps



Review and update of the Gas Target Model

Regulators to undertake a review and update of the Gas Target Model (of 2011)

- Taking into account the changes in market dynamics, in system requirements and in the legal framework (including the experience of early NC implementation and experience of GTM implementation projects), in and
- Including infrastructure component (existing and new infrastructure)
- In close cooperation with stakeholders

Thank you for your attention!

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