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Gas in Europe

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Promoting sustainable energy for the greatest benefit of all

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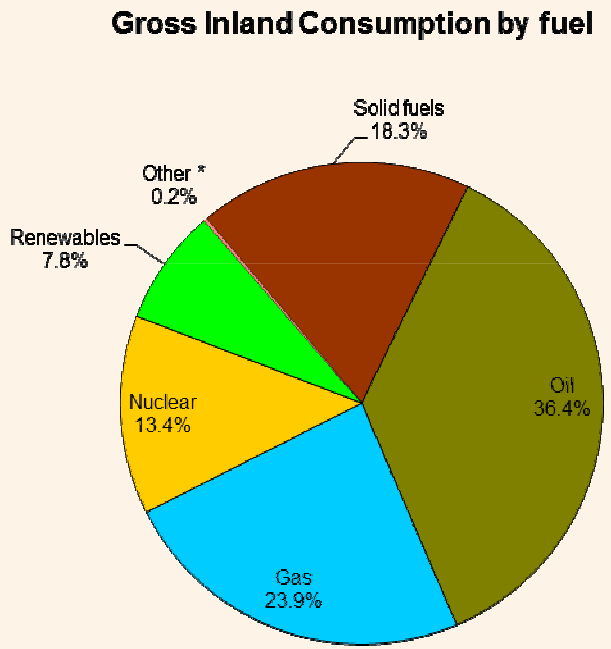
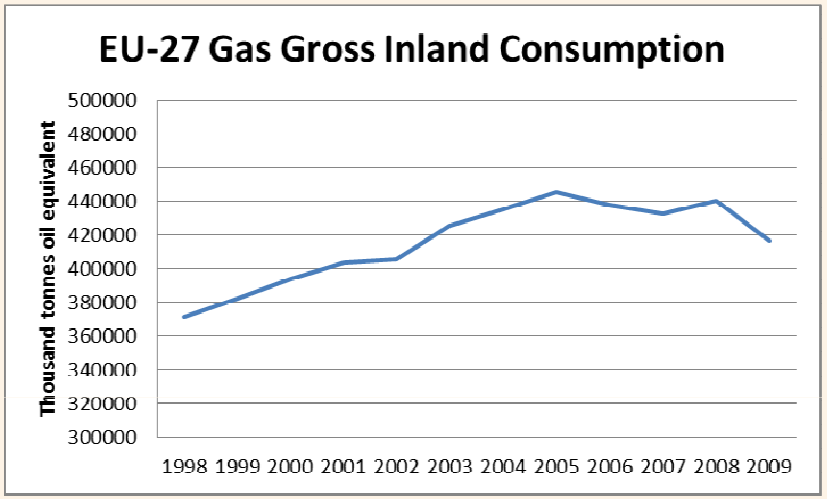
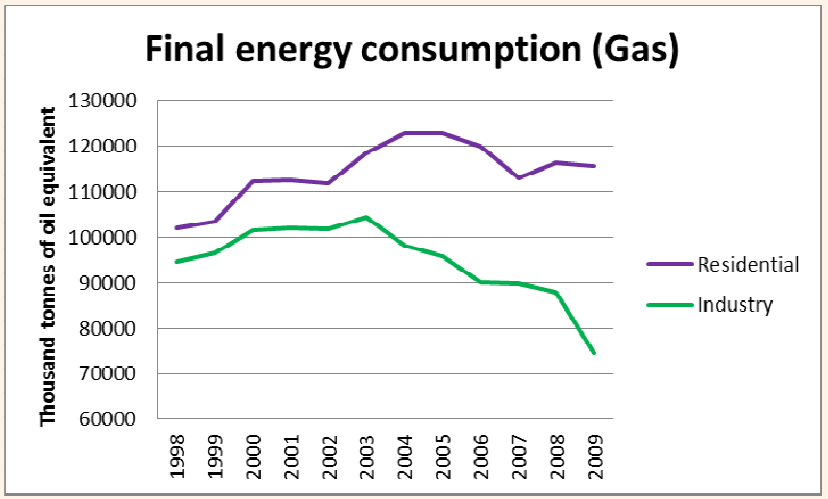
EU-27 gas consumption

Predetermined trend - EU gas consumption will grow.







Source: EU Energy in Figures 2010, EC DG-TREN, Eurostat

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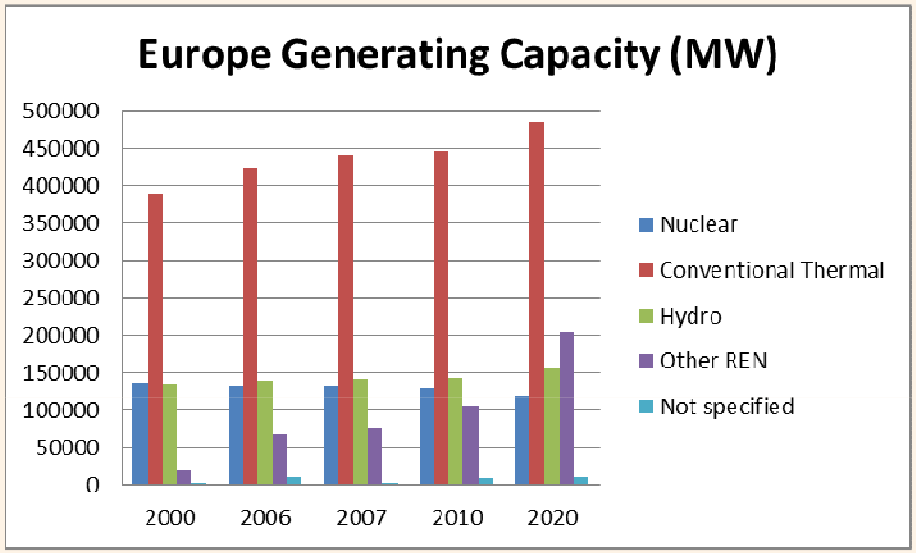
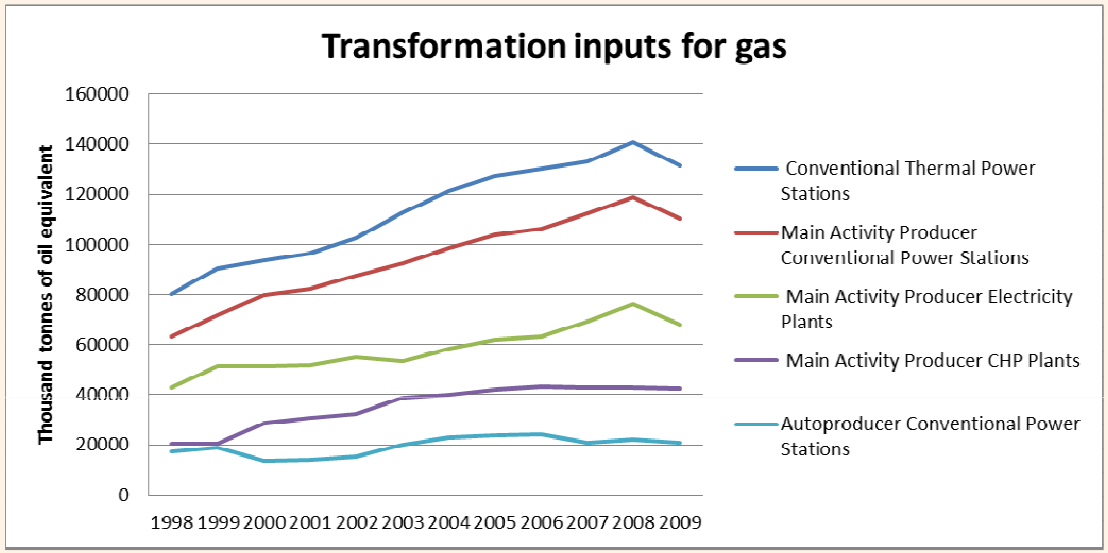
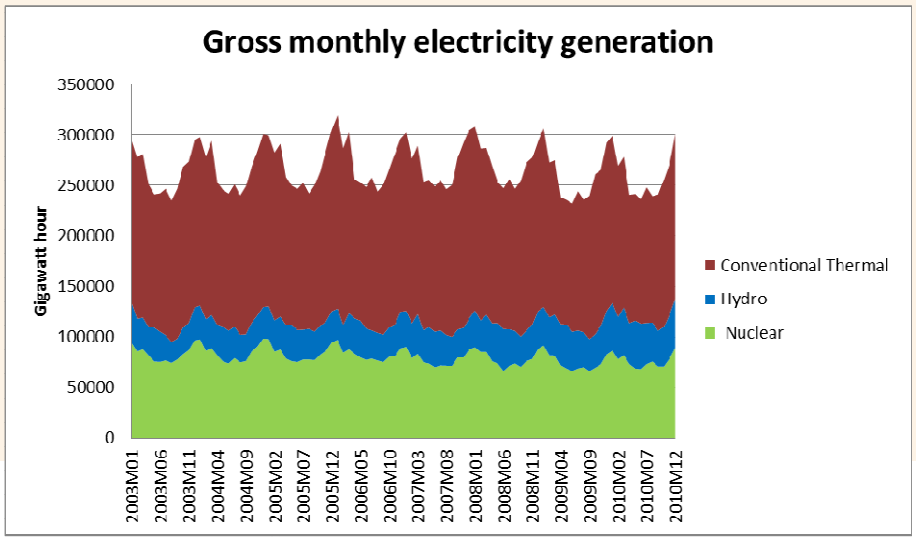
EU generation figures







- Gas → lowest CO_2 emissions of any fossil fuel, suited for baseload and peak power generation, use in CHP plants allows for higher efficiency & better utilization.
- EU-27 currently has 195GW of natural gas-fired maximum net generating capacity.

If Europe wants to meet its 2020 emission target sustainably, it will have to invest in gas.

Source: Eurelectric 2009, Eurostat

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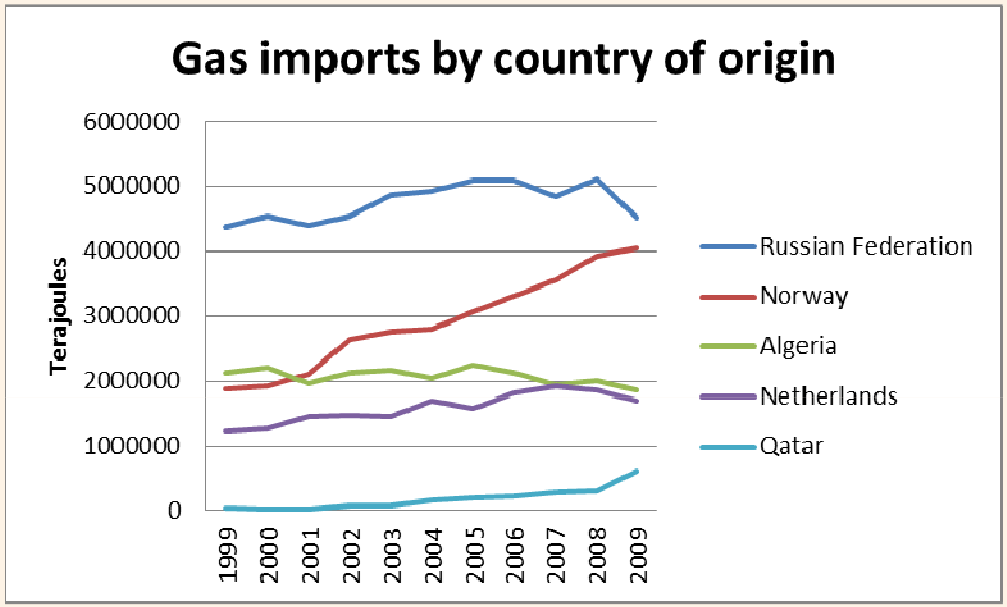
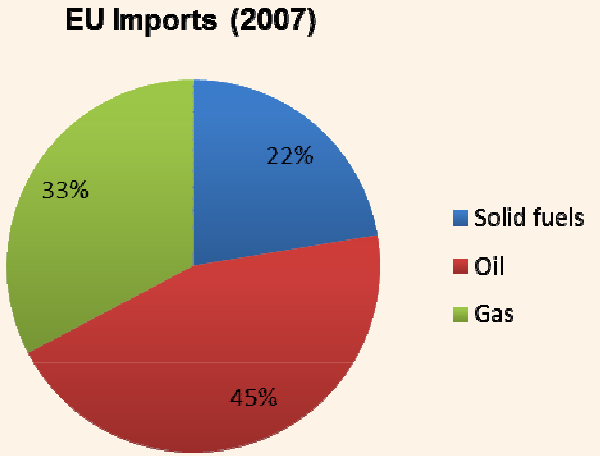
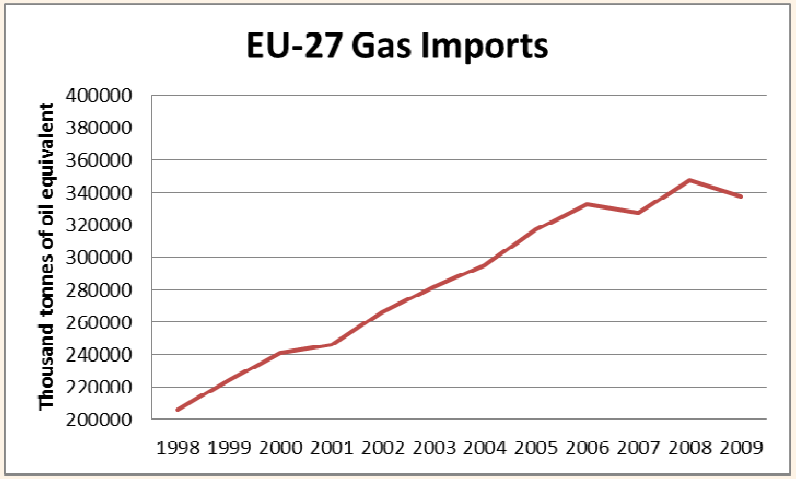
EU-27 gas imports







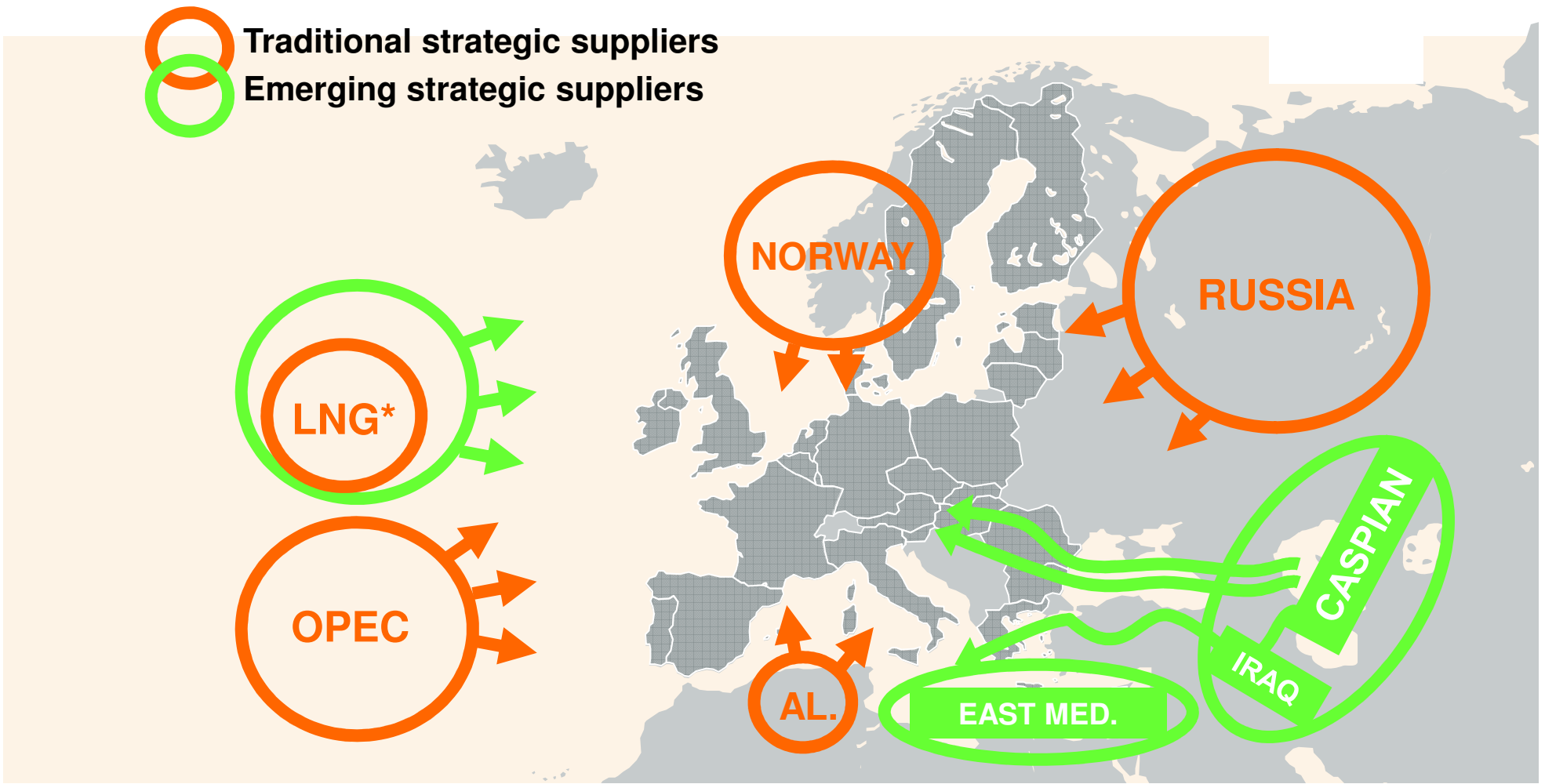
Top 3 suppliers of gas to EU: Russia, Norway, Algeria.

Security of gas supplies is a strategic issue.

Will Russia be the EU gas backbone or will LNG be used to diversify risk?

Source: EU Energy in Figures 2010, EC DG-TREN, Eurostat

Traditional and emerging hydrocarbon suppliers



* LNG: Liquefied natural gas (Qatar, Algeria, Nigeria, etc.)

Slide extracted from presentation of J.M. Barroso to the European Council, 4 February 2011

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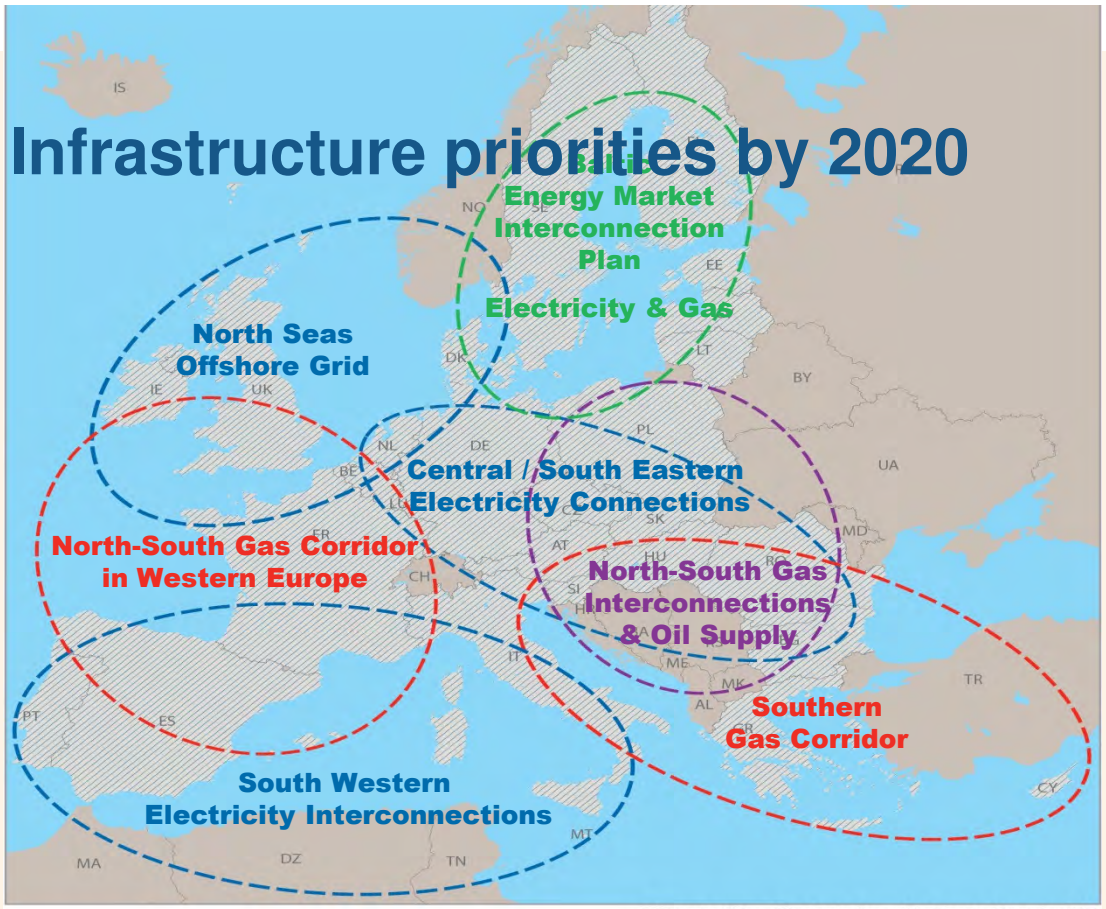

- Gas
- Electricity
- Electricity and Gas
- Oil and Gas
- Smart Grids for Electricity in the EU

The Commission has identified priority infrastructures of European interest to be delivered by 2020. See: http://ec.europa.eu/energy/infrastructure/strategy/2020_en.htm

Slide extracted from EC presentation – Background on Energy in Europe

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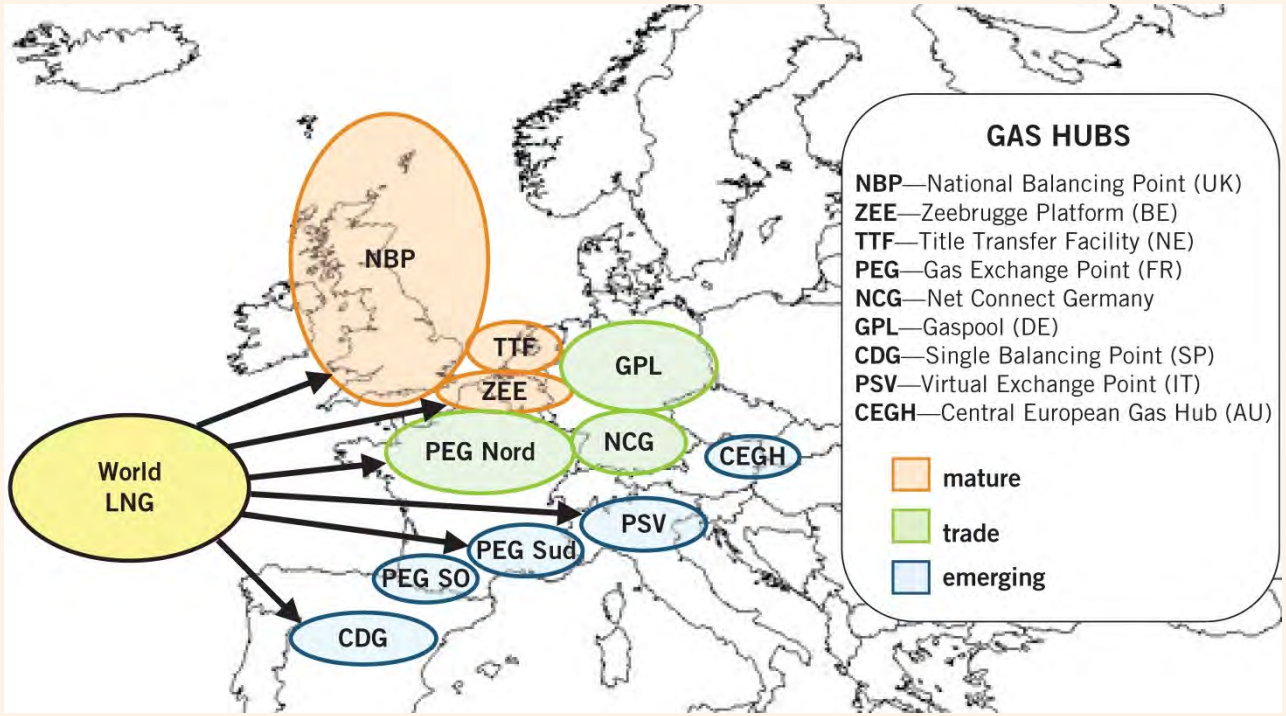
Pricing gas

1. **Hub-based pricing**: US, parts of Europe.



Majority of spot-priced gas in Europe is traded at the UK NBP (*churn rate is 15)

US gas is spot priced at the Henry Hub (churn rate is 100).

Minimum churn rate required for hub liquidity is 15. Other than UK NBP, other European hubs have lower churn rates.

*Churn rate is the ratio between traded and delivered volumes.

Source: Melling, A.J., 2010.

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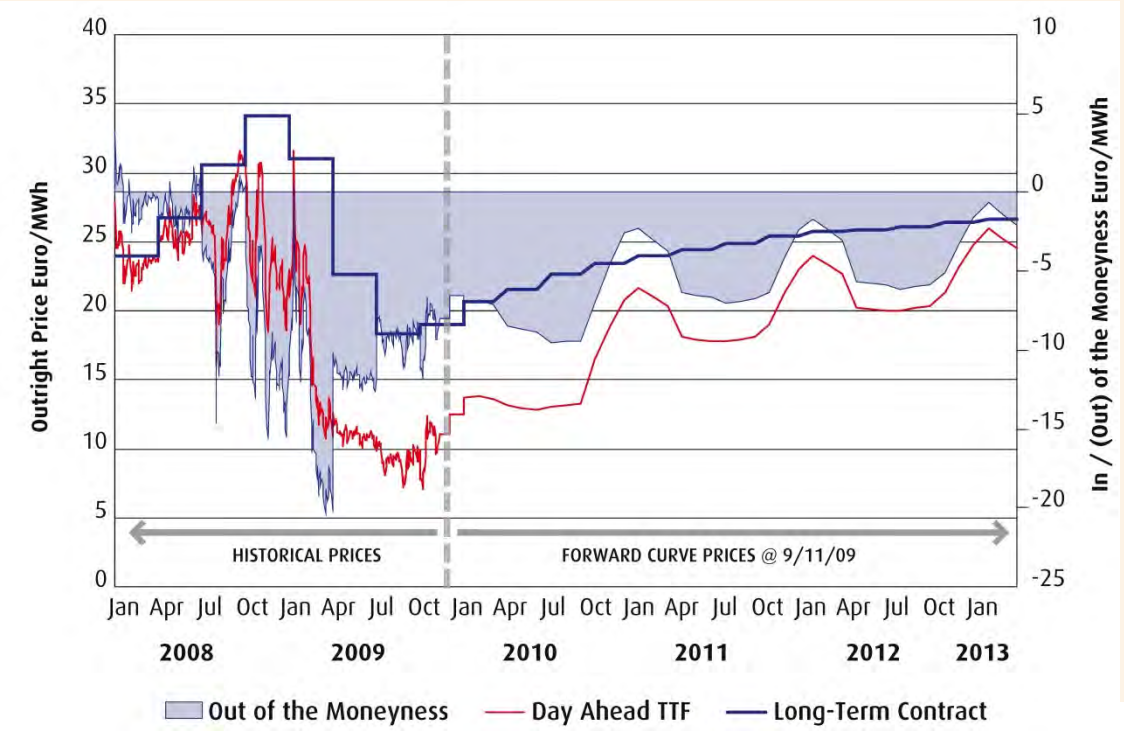
Pricing gas

2. **Oil indexation**:

- Prevalent in continental Europe, North Africa, Asia.
- Based on the Groningen model of *net-back pricing*.
- Gas is priced relative to the price of alternative fuels at the burner tip.
- "Take-or-pay" contract rule along with ACQ (Annual Contract Quantity) clause.

3. **Hybrid model**:

- Recent development – forced by very low spot prices of gas in Europe.
- Part of the gas supplied by the producer is sold at spot market rates while the remaining amount is priced under the long-term contractual rate.



Source: slide presentation – Alger, RWE Trading

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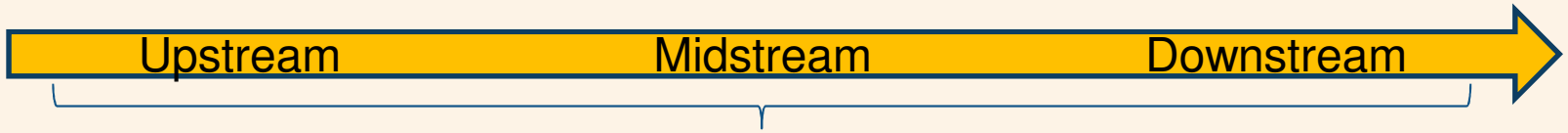
Transmission aspect of oil-indexed & hub-based pricing

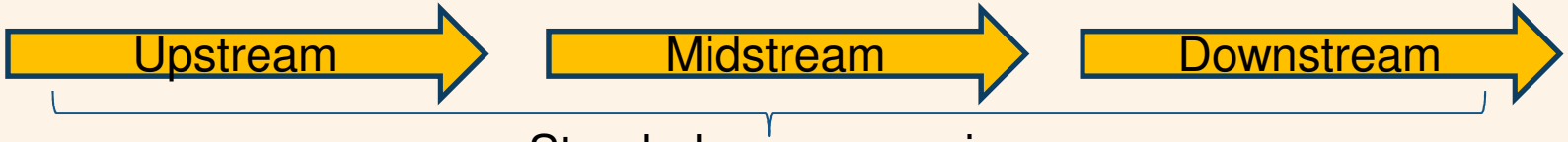


Vertically integrated companies

Investment risk for sizeable infrastructure was minimized by benchmarking gas prices to that of oil.

Monopolistic nature of gas supply – single supplier dominance.

EC Deregulation Directives (1998, 2003, 2008) forced unbundling of players along supply chain



Stand-alone companies

Liberalization rationale is increased competition and cost efficiency. However, now investors have to look to non-capacity based factors for future investment signals, this has led to *higher uncertainty*.

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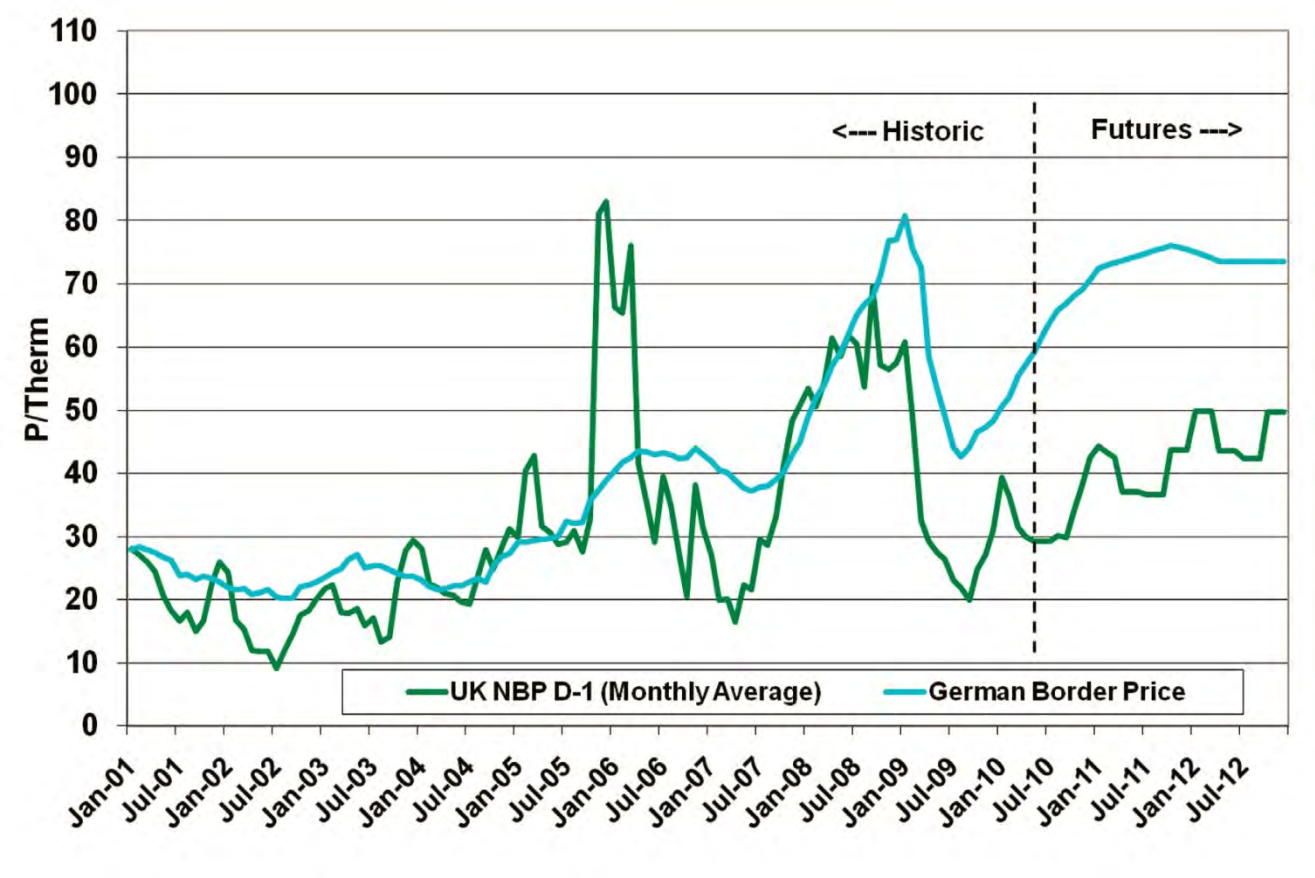
Spot price vs. Indexed price



Since the start of 2009, a significant spread has developed between the spot price of gas and the indexed (contract) price of gas.

Source: Melling, A.J., 2010.

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Factors affecting this spread

Short-term factors

1. On the back of the recession, the gas market in Europe contracted by around 40bcm in 2009.
2. LNG supplies (mostly from Qatar) destined for the US and Asia were routed to Europe, causing a rise in market-priced gas volumes. (2009 levels were 4x more than '07 & '08 levels)
3. Oil-indexed gas volumes were offloaded onto the spot market by purchasers seeking to minimize their losses in the face of reduced demand.

Long-term factors

1. De-linking of oil and gas switching in power plants. Oil = transport, Gas = power gen. Oil prices no longer have signals for gas price formation.
2. Liberalization of gas markets through regulation.
3. Bullish over-contracting of gas volumes linked to "take-or-pay" contracts.
4. Rate of renewables development.

Dependency to russian gas imports 2009

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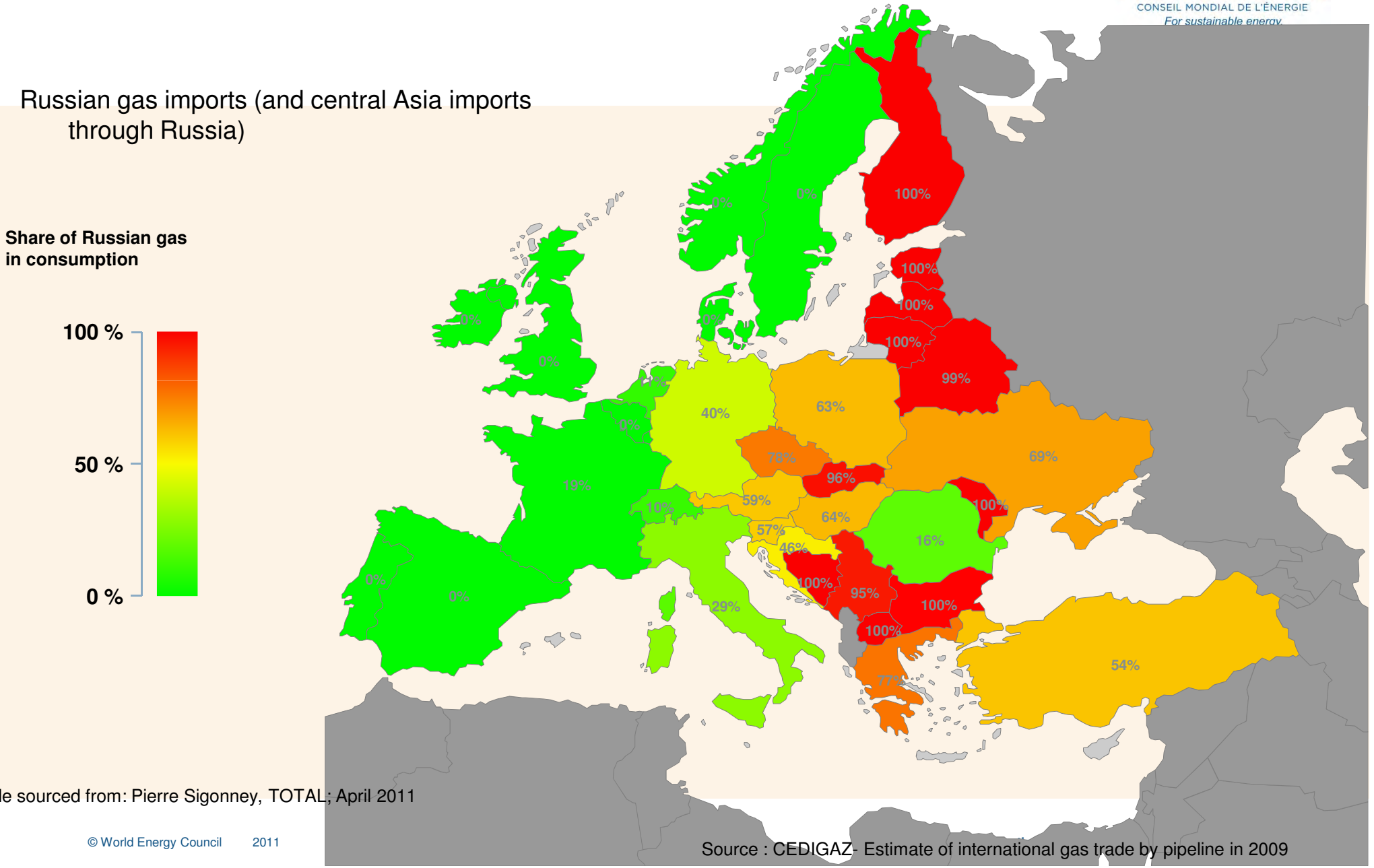
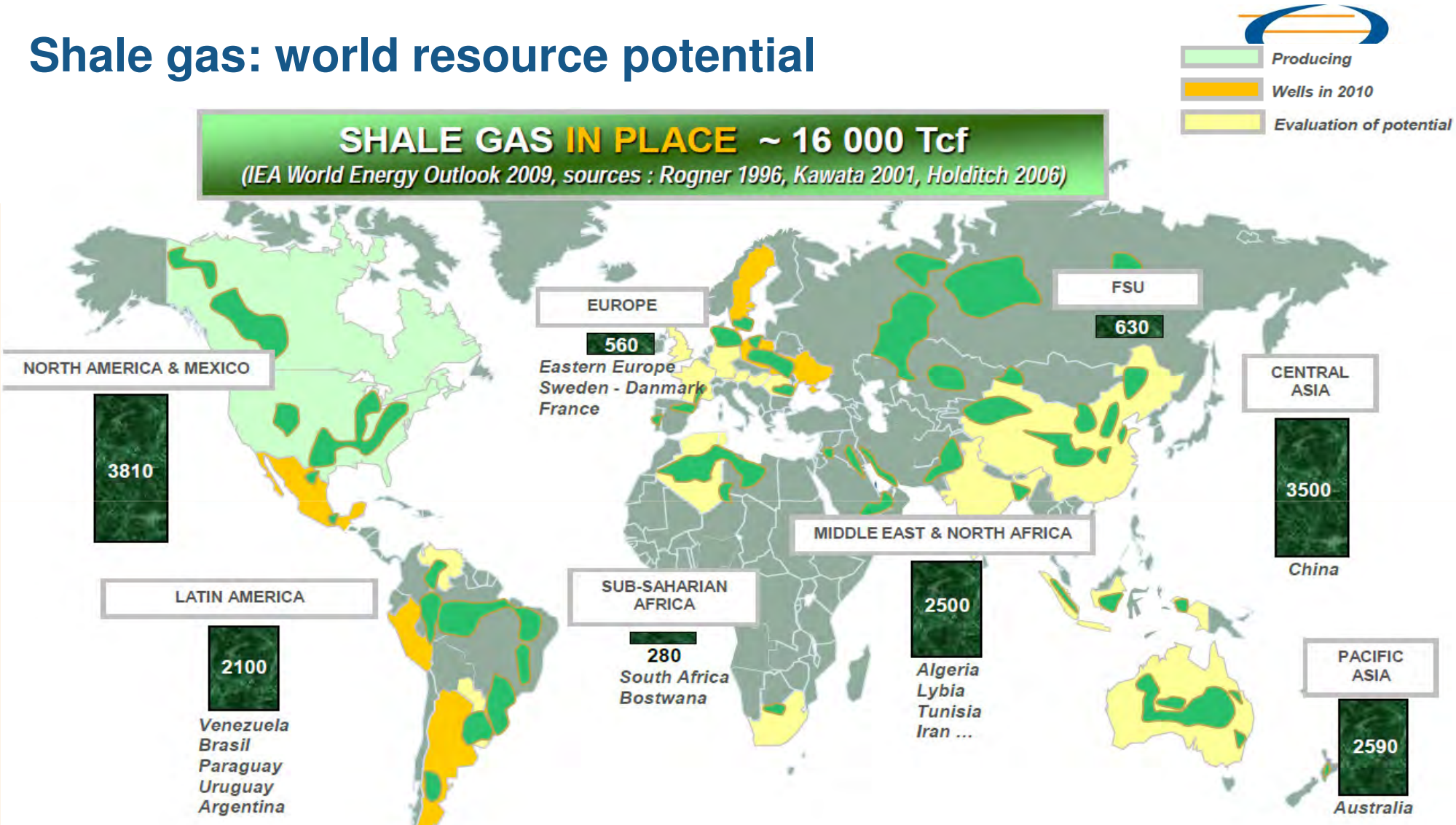
Russian gas imports (and central Asia imports through Russia)



Slide sourced from: Pierre Sigonney, TOTAL; April 2011

Source : CEDIGAZ- Estimate of international gas trade by pipeline in 2009

Shale gas: world resource potential



Slide sourced from: Pierre Sigonney, TOTAL; April 2011

Significant worldwide exploration potential

Recoverable Resources & Risk Factors largely unknown outside North America

- IEA 2009 : 6 000 Tcf
- CERA 2009 : 5 000 – 16 000 Tcf

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Shale gas

US experience:

- Large existing gas pipeline infrastructure allows shale gas flow into market.
- Private ownership of sub-soil mineral rights.
- Large single gas market
- High liquidity at Henry Hub
- Confirmation of geological conditions

Europe

- Regional gas markets within Europe – 27 markets with varying interconnectivity
- State ownership of sub-soil mineral rights.
- Pipeline connectivity not in place yet – South Stream, Nabucco,
- Insufficient liquidity in European gas hubs
- France has banned fracking
- Geological resource plays need to be confirmed

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Cheap gas on the horizon?

Possible if…

1. Current gas volumes in Europe are a sign of over*capacity* and not over*supply*.
2. Gas supply from Caspian and CIS region is developed.
3. Sufficient LNG volumes continue to reach Europe.
4. Improvements in depth and liquidity occur at hubs.
5. Shale gas resources are confirmed, resources committed & political consensus.

Current status…

1. There is concern that significant tightening of gas markets will occur by 2013-14.
2. Nabucco start date pushed back to 2013. Shell pulls out of Kazakh gas project.
3. Possible LNG exporters could include Iran, Iraq, Cameroon, Mauritania, Gabon.
4. New LNG terminals and South Stream can provide additional volumes to the market.

- Transition to hub-based pricing will take time and will involve the **interplay of *security of supply* and *security of demand*.**
- Short-term gas bubbles will strengthen the case for long term contract prices.
- Gas will further delink from oil as more LNG supply comes online and the impacts of shale gas production are more widely felt.