

# 2010 Annual Meeting & Natural Gas Forum

*Houston, November 30-December 1, 2010*

## Market trends: gas and renewables

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# Outline

- Introduction on European gas markets
- Focus on the power sector
- Impacts of additional renewables on
  - ❖ Gas demand outlook
  - ❖ Gas demand patterns
  - ❖ Supply flexibility
- Conclusions



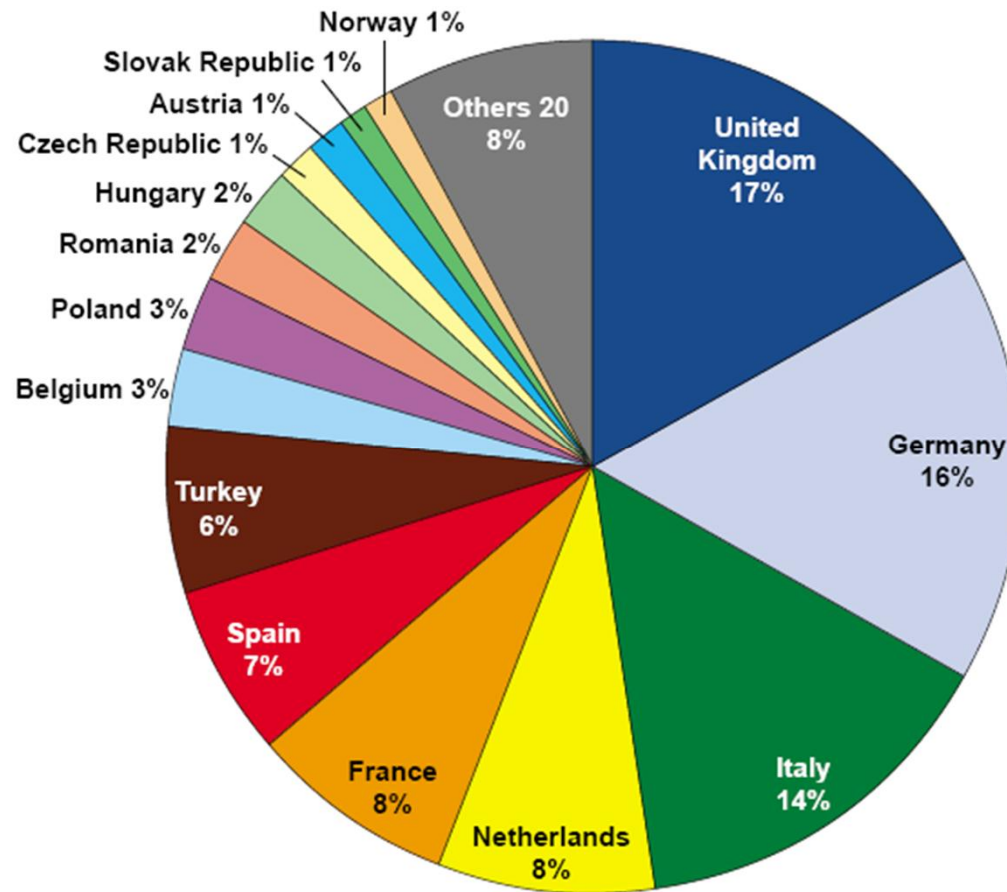
# Europe = markets linked by pipeline networks





# Gas demand in Europe 35 in 2008

## Total: 587 bcm

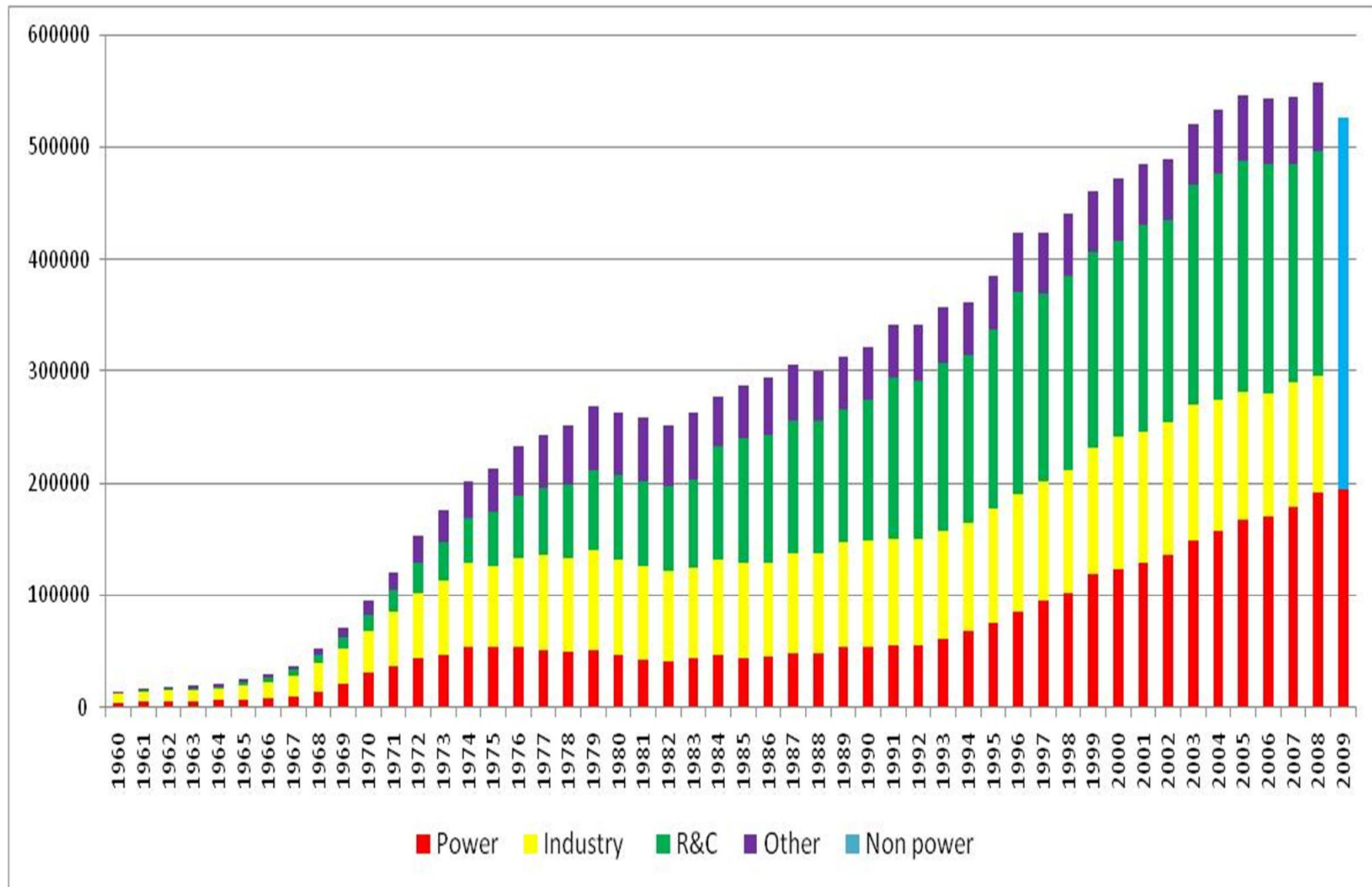


Source: International Energy Agency, *Natural Gas Information 2009*

**3 Countries ~ 50% of demand**  
**7 Countries ~ 75% / 13 countries ~ 90%**

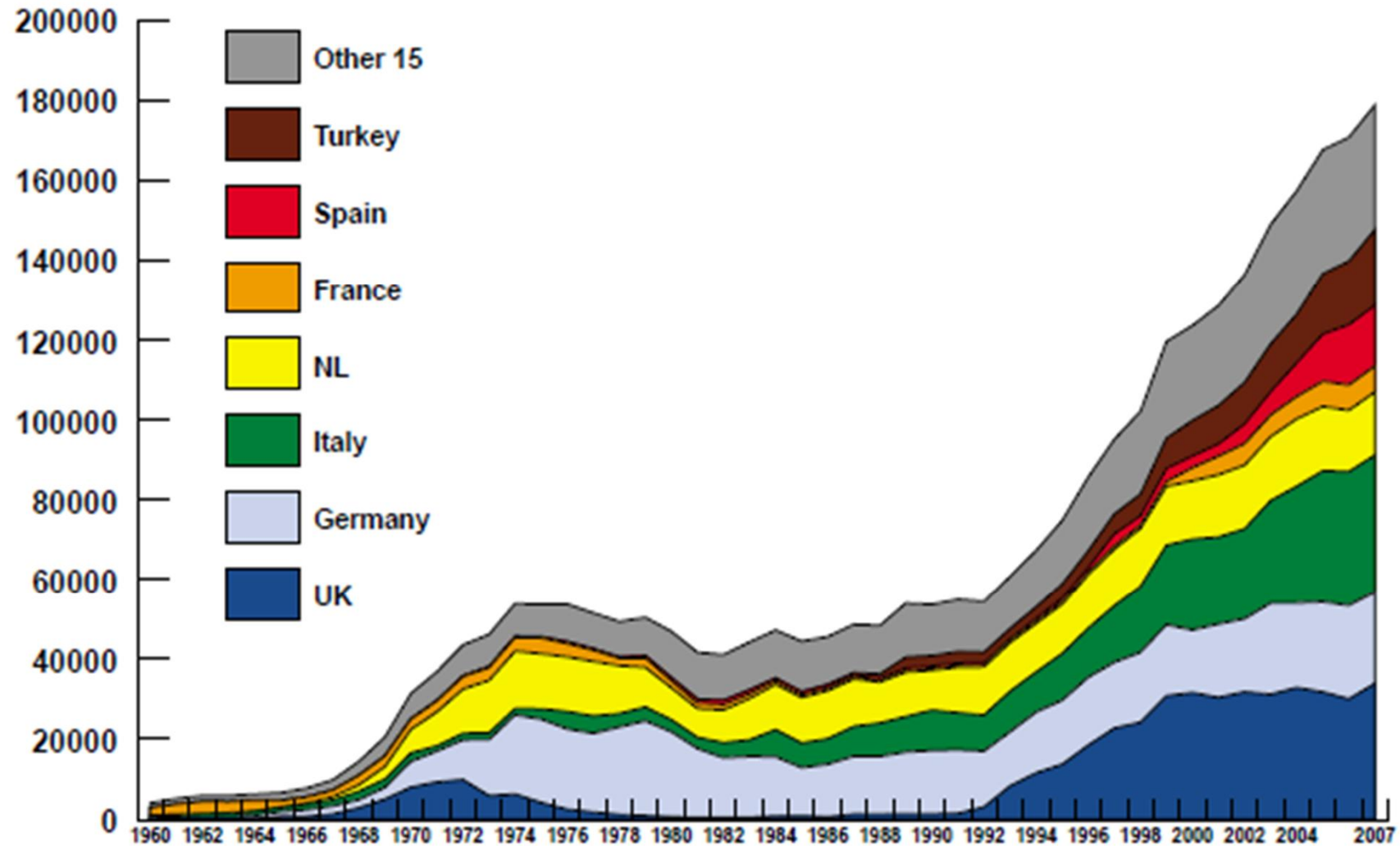


## Natural gas demand in Europe in mcm



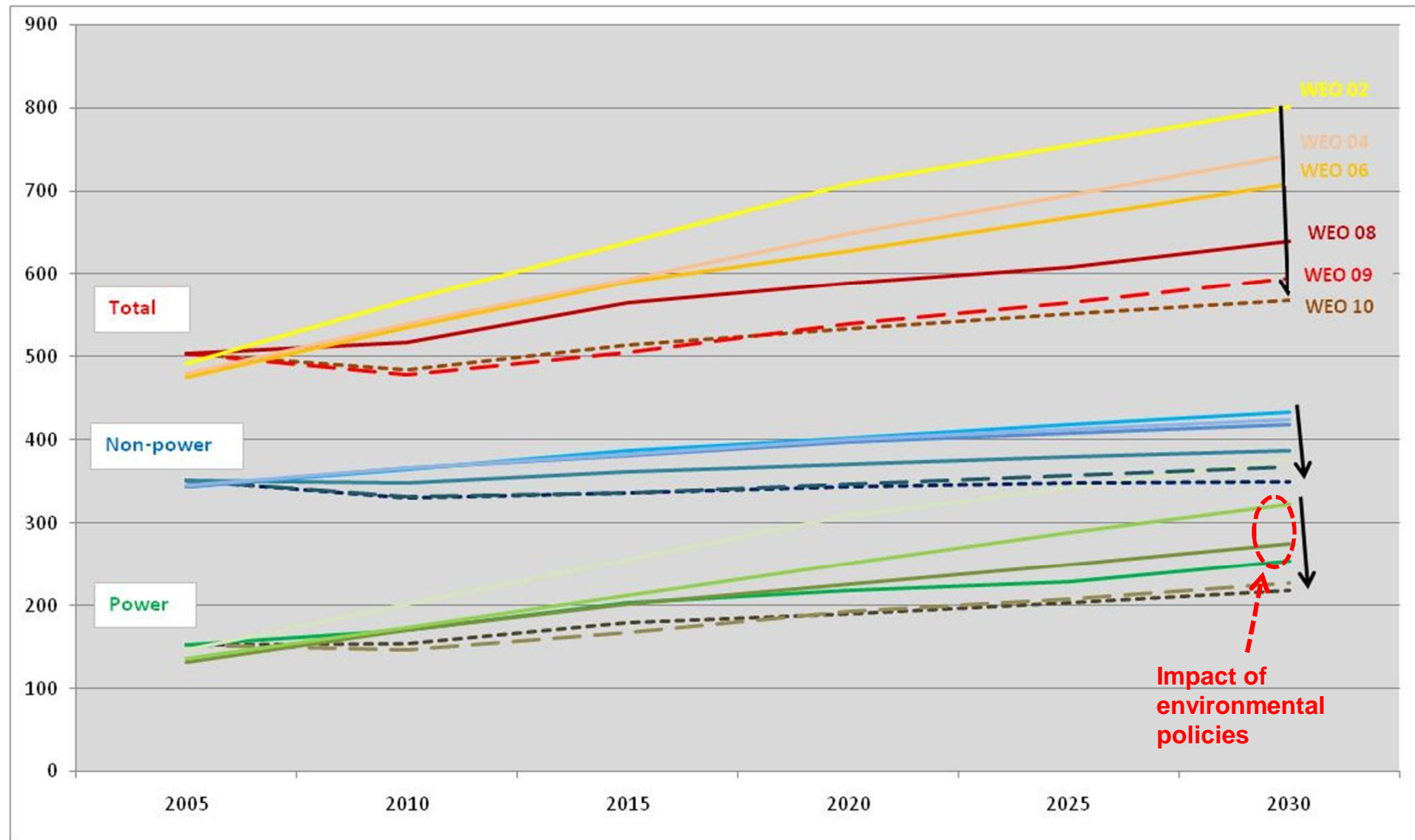
Sources: IEA, *Natural gas information* (various issues) and own analysis

# Natural Gas Gross Consumption in OECD Europe, in the Power Sector, 1960–2007, in mcm



Sources: IEA, *Natural gas information* (various issues)

# Major uncertainty on the future of gas demand in Europe, biggest question mark on the power sector



Sources: IEA, OECD Europe, reference scenario in WEO 2002, WEO 2004, WEO 2006, WEO 2008, WEO 2009 and new policies scenario in WEO 2010

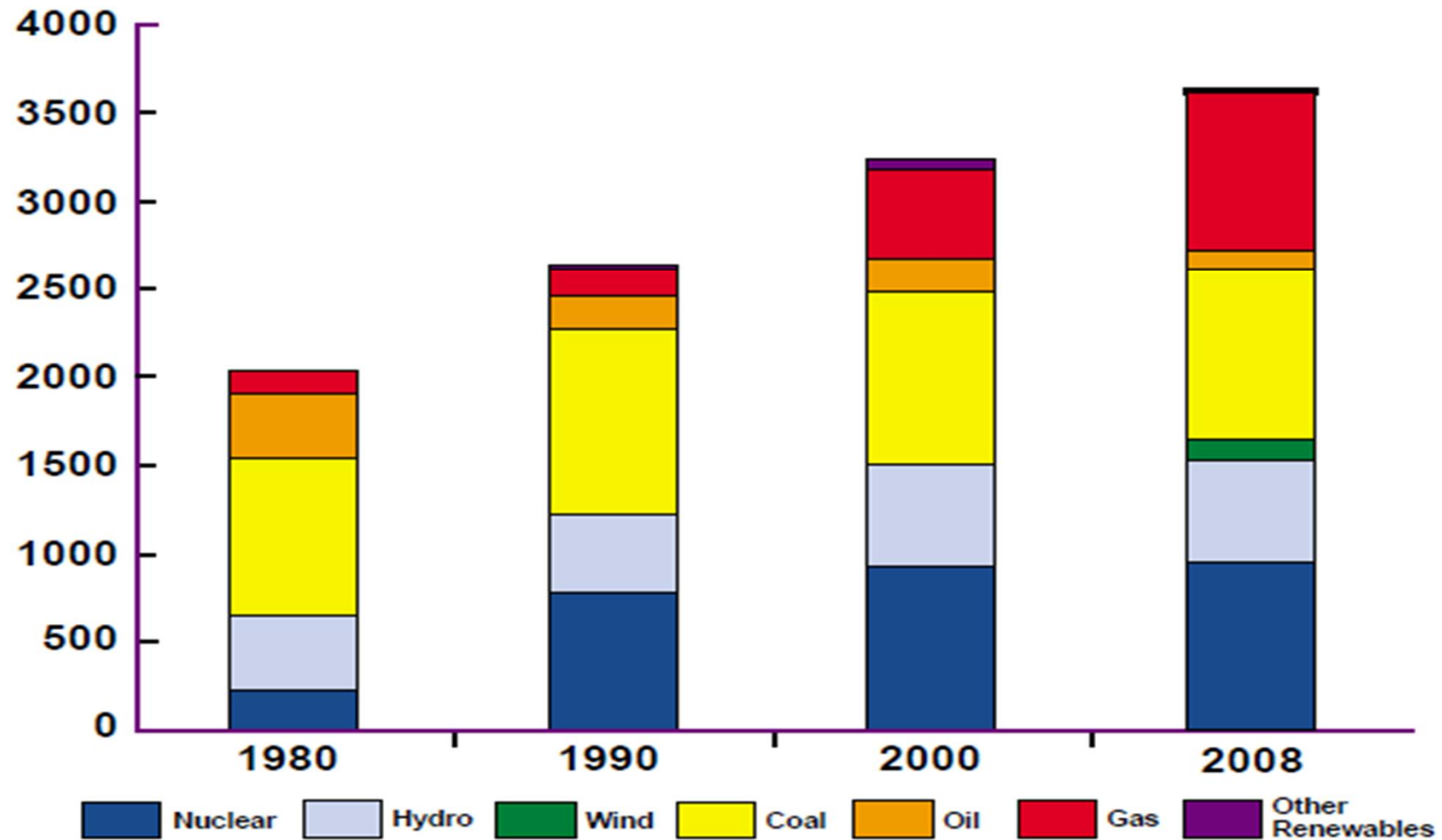


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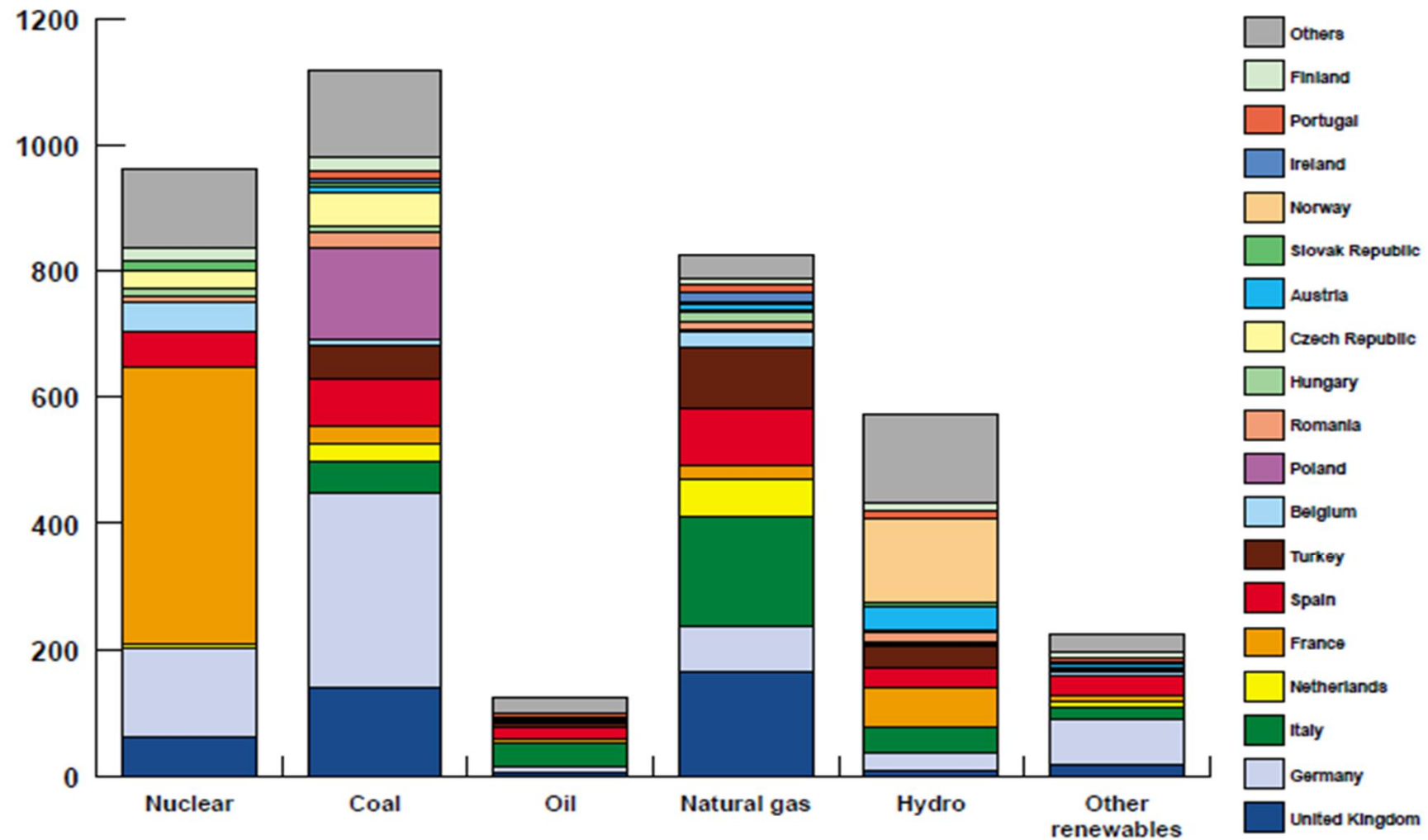
## Electricity Production in OECD Europe in TWh



Sources: IEA, *Electricity information* (various issues)



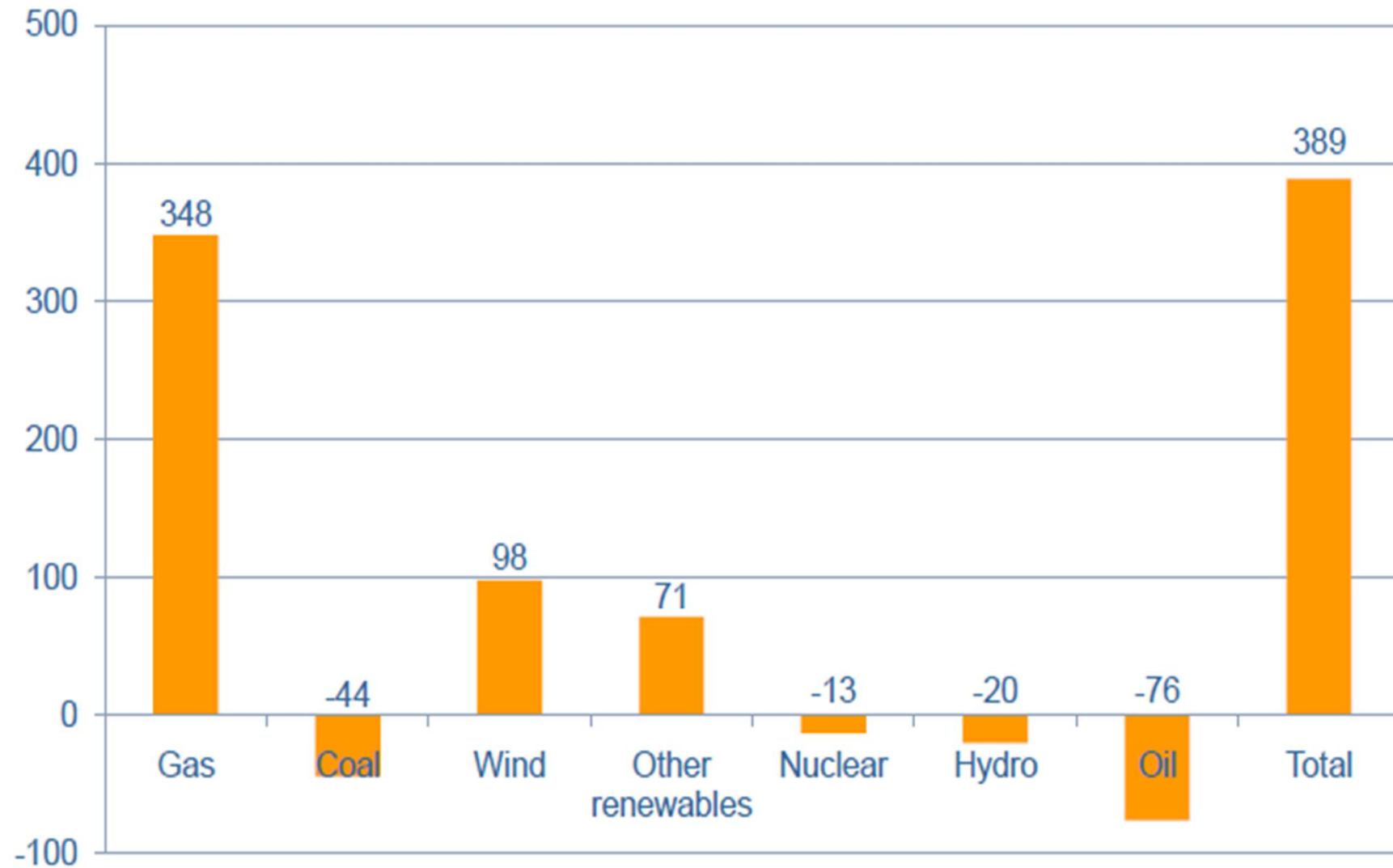
## Electricity Generation in Europe in 2007, in TWh



Source: IEA, *Natural gas information 2009*



## Gas – Main contributor to the 2000-08 growth in OECD Europe electricity generation (TWh)



Source: IEA, WEO 2009

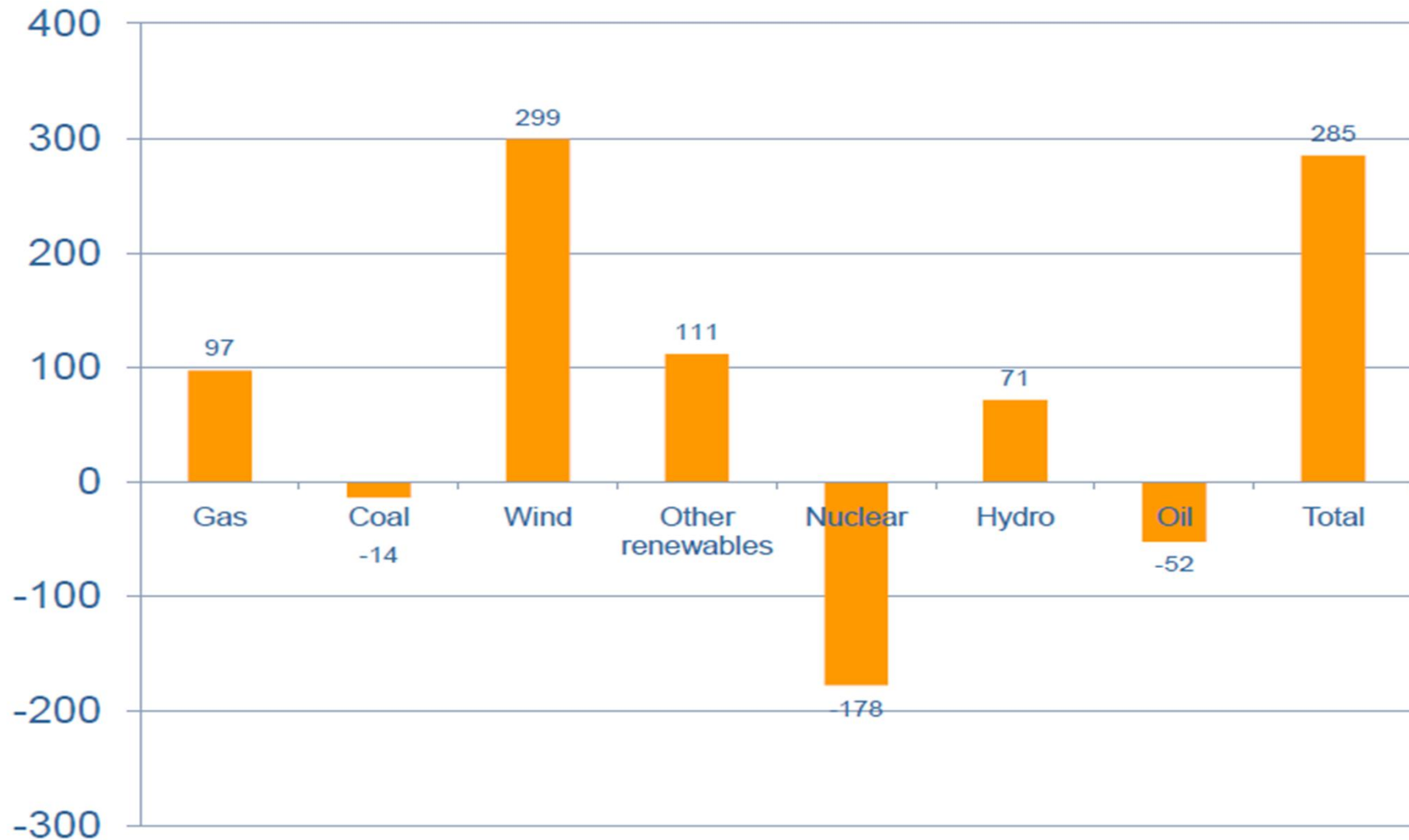


# Key political drivers for investments

- 20/20/20 targets
  - ❖ Cut carbon emissions by 20% by 2020
  - ❖ Raise renewable sources to 20% of total energy use by 2020
  - ❖ Achieve a 20% cut in energy use by 2020
- EU ETS
- LCPD
  - ❖ FGD or 'opt-out'
- IED
  - ❖ Tightens existing limits on emissions of oxides of sulphur and nitrogen (2016-2020)
- EERP
  - ❖ 565 ml euros on 9 offshore wind
- National policies
  - ❖ Ex. Germany: 5bln euros in credit programme, higher feed-in tariffs for offshore wind, 10bln in renewable subsidy in 2010, going to 15bln over the next 2-3 years
- Future electrification of transport and heat ??



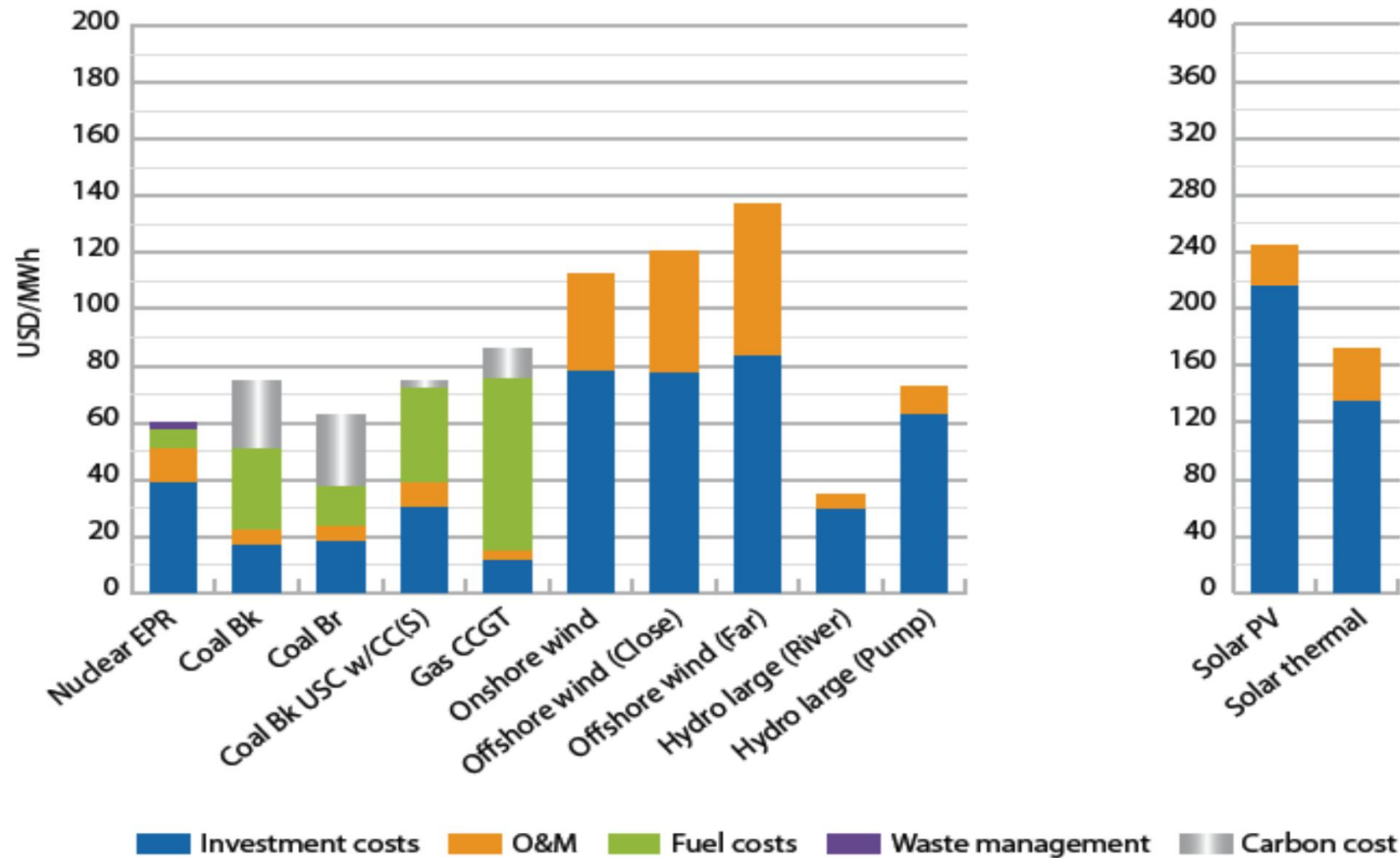
## OECD Europe 2008-2020 (TWh)



Source: IEA, *WEO 2009 reference case*



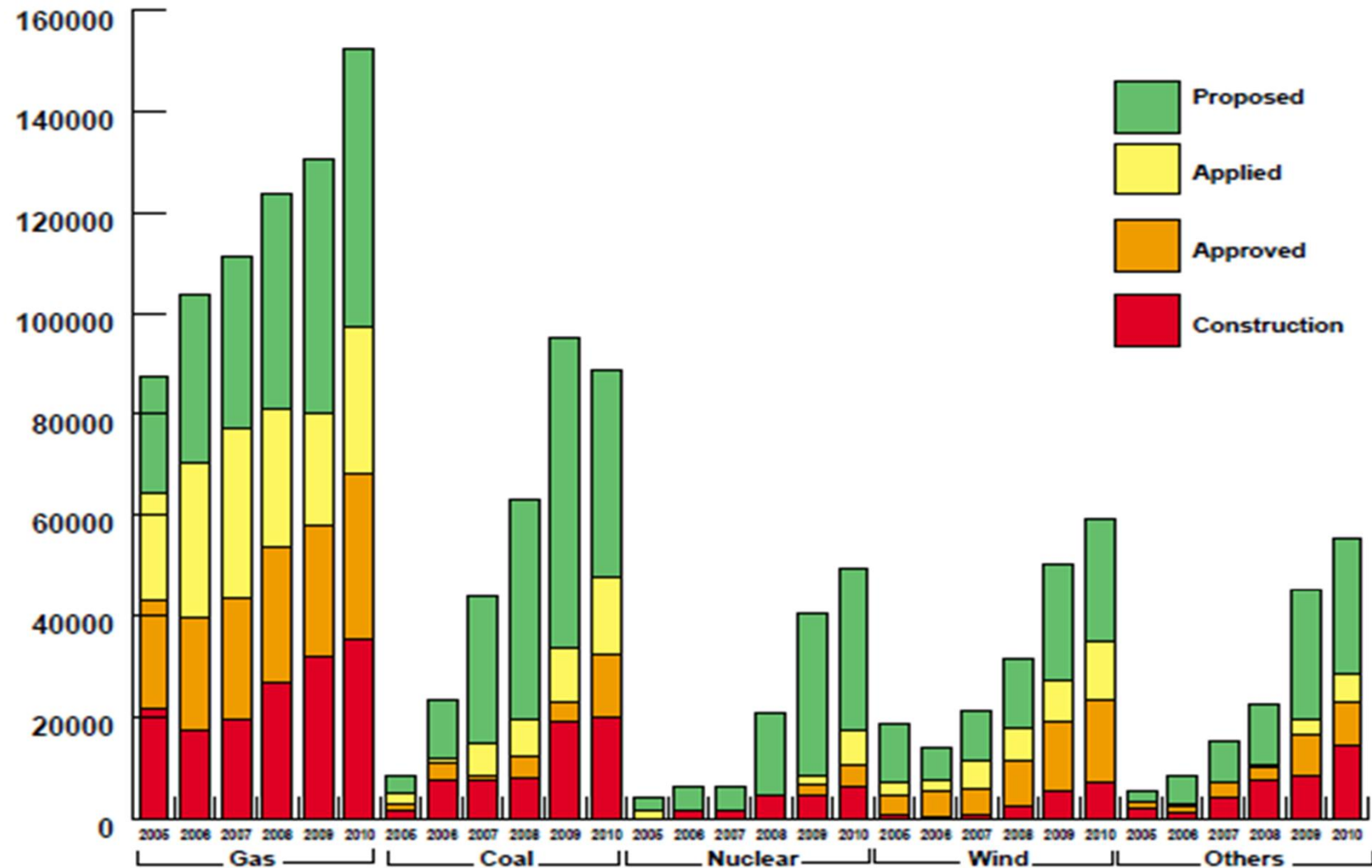
# Levelised costs of electricity



Source: Eurelectric/VGB in IEA, *Projected costs of generating electricity, 2010*

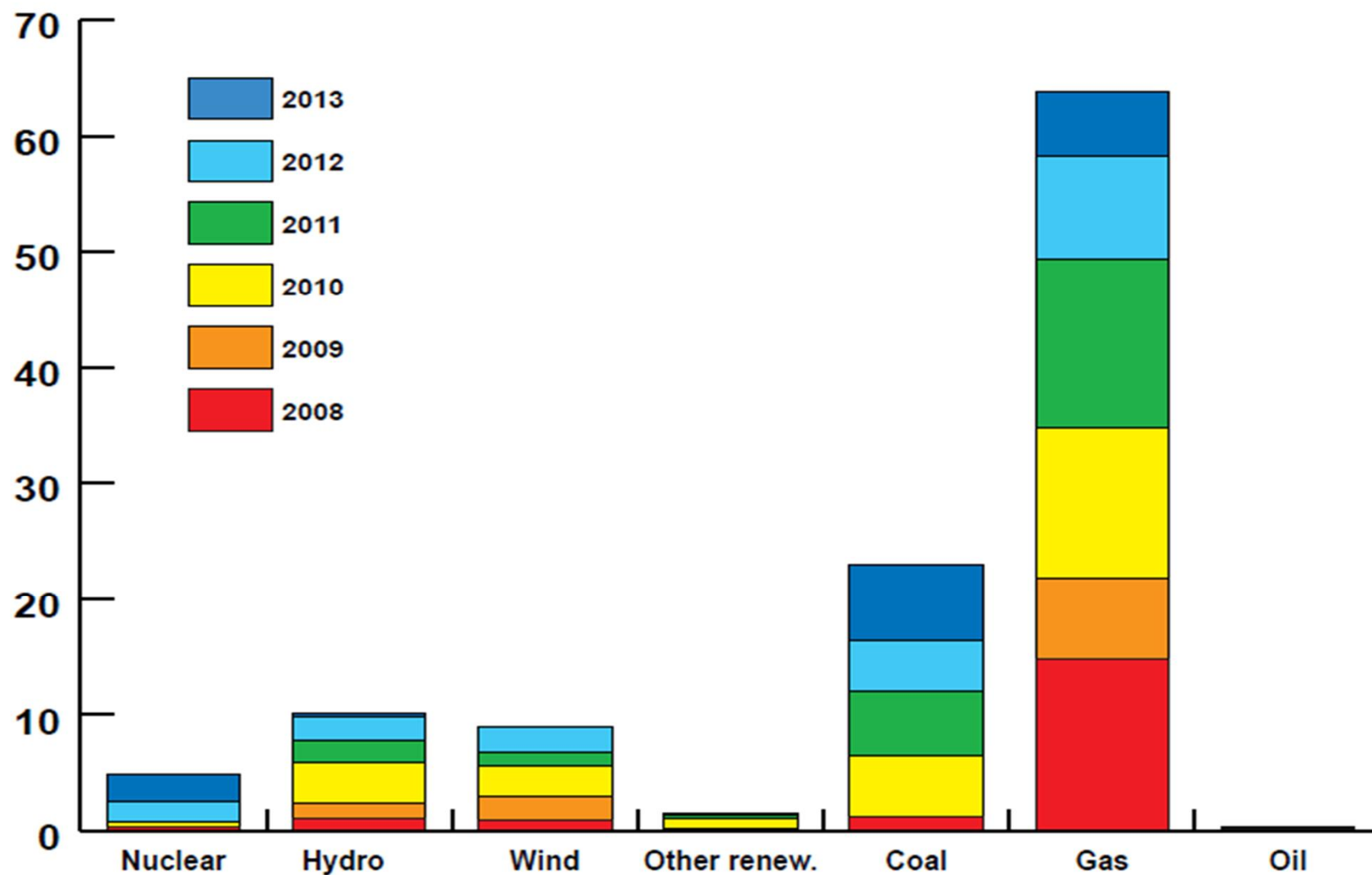


## Power Plant Projects in Europe, in MW



Source: A. Honore, *European Gas Demand, Supply and Pricing*, OIES/OUP 2010, p.82

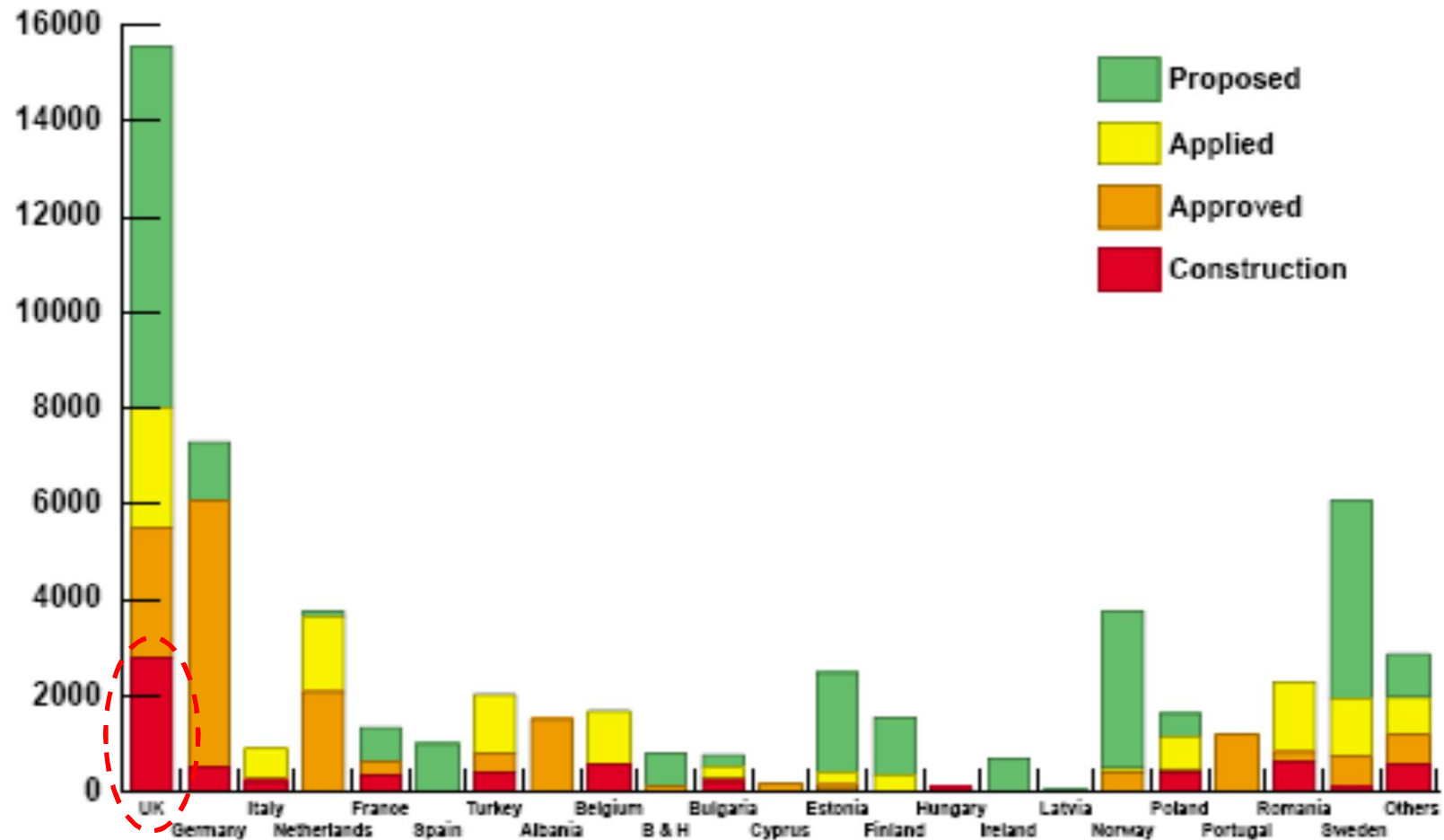
## Additional Generating Capacity in Europe between 2008 and 2013 based on Existing Plants and under Construction in 2010, in GW



Source: A. Honore, *European Gas Demand, Supply and Pricing*, OIES/OUP 2010, p.97



## Wind plant Projects by fuel in Europe in 2010, in MW



Source: A. Honore, *European Gas Demand, Supply and Pricing*, OIES/OUP 2010, p.96



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# Focus on the UK

- Renewable Energy Strategy (July 2009). Targets by 2020:
  - ❖ 15% of energy consumption (2.25% in 2008)
  - ❖ 30% of electricity production, including 2% in small-scale generation
  - ❖ 10% in transport
  - ❖ 12% in heat
- Measures include to extend Renewable Obligation (RO) life
  - ❖ Support to qualifying offshore wind to 2 ROCs/MWh
  - ❖ RO's life extended to 2037
- Spending review (Oct 2010)
  - ❖ £860 million for renewable heat incentive from 2011-12
  - ❖ Green Investment Bank would be set up with £1 billion (below the £2-6 billions hoped for)
  - ❖ £200 million retained to upgrade for offshore wind and ports facilities
  - ❖ Review feed-in tariffs for small renewables



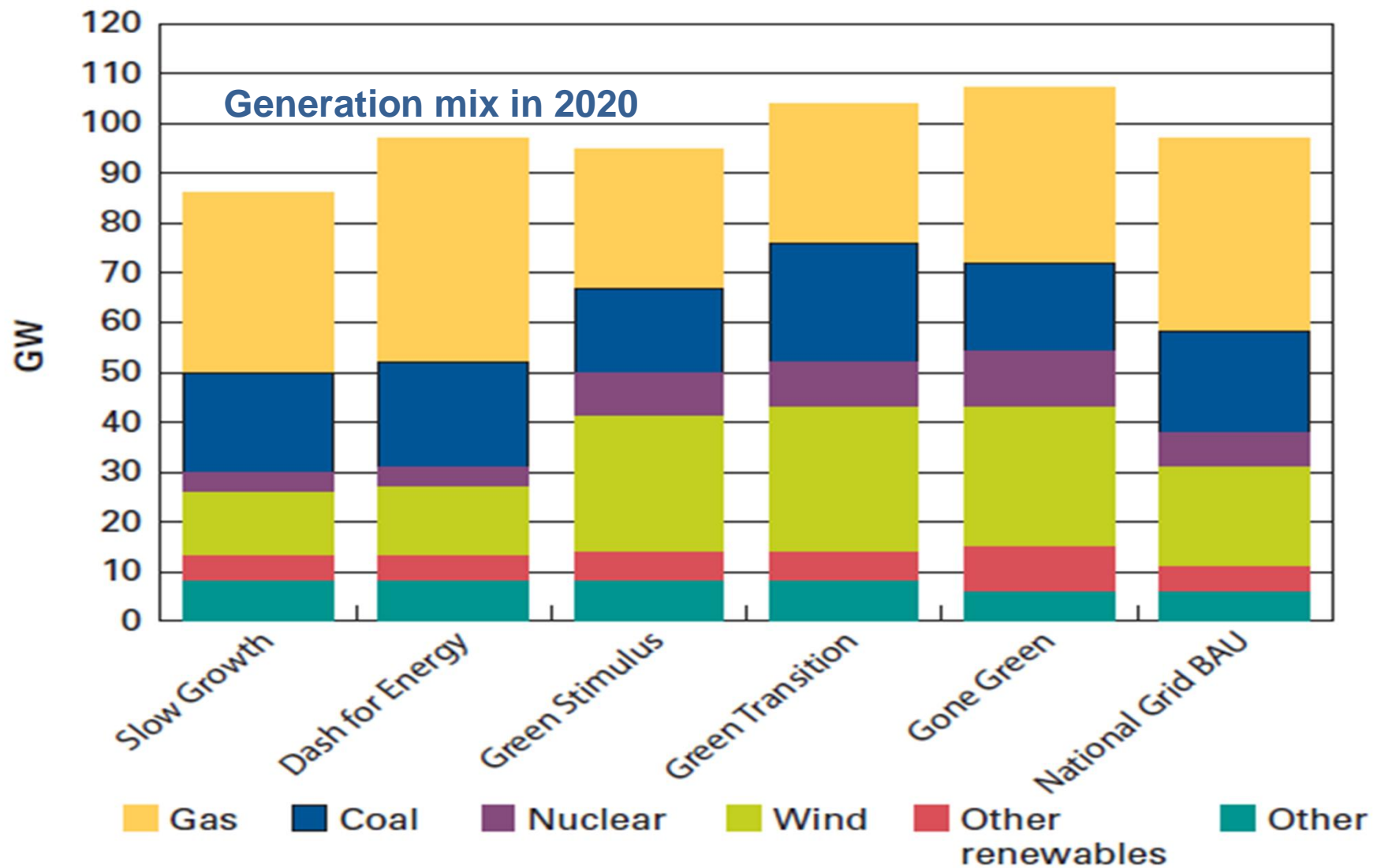
# Revised Overarching National Policy Statement

## 18/10/2010

- Policies to save energy and boost nuclear and renewable could cut gas demand by 17% from 2010 levels by 2020 (i.e. ~ 70 bcm)
- But if new nuclear and renewables development does not proceed according to plan, gas-fired power plants will need to fill the gap, and not fall in line with the forecast
- Gas demand could start to increase again after 2020 due to more switching from coal to gas-fired generation
- “gas will continue to play an important part in the UK’s fuel mix for some years to come”



# Major expectations and uncertainties



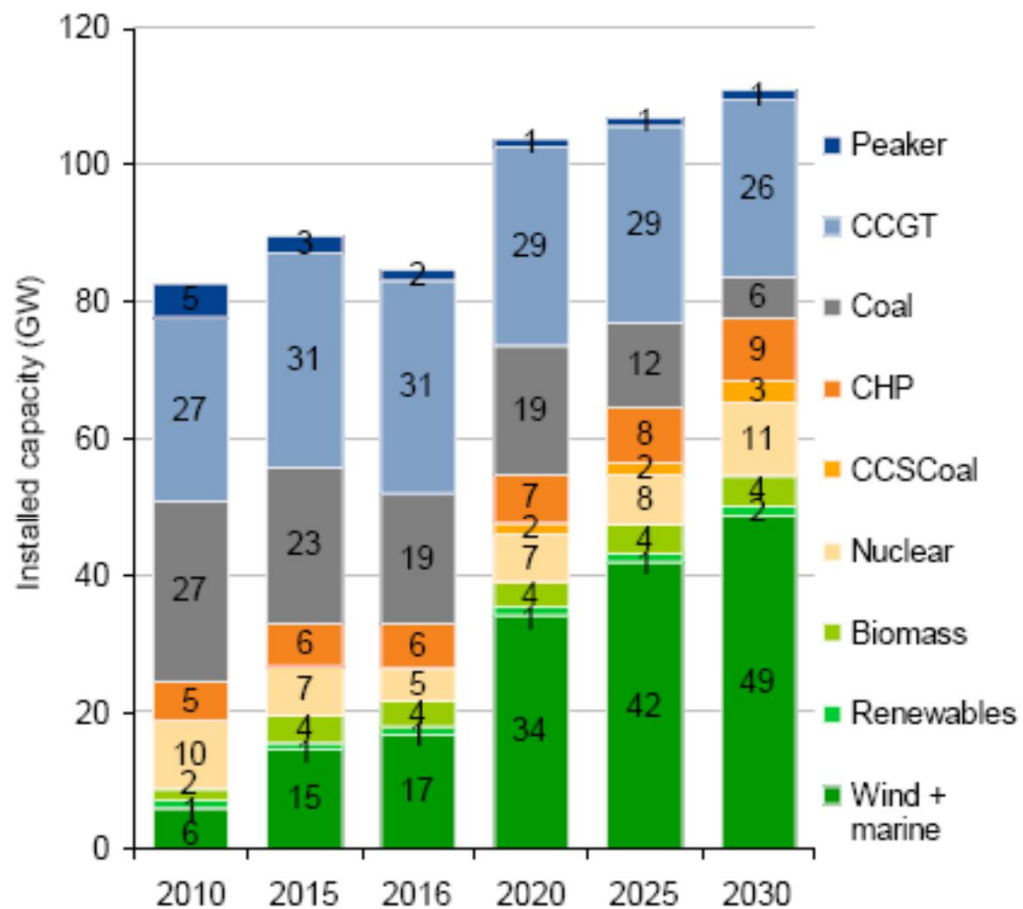
Source: Ofgem's "Project Discovery" scenarios, and in National Grid's "Gone Green" and "Business as Usual" scenarios

# Gas intermittency...



The study was focused around a Core scenario – not a base case but instead a ‘stress-test’ with a high percentage of generation from renewables

GB capacity assumptions



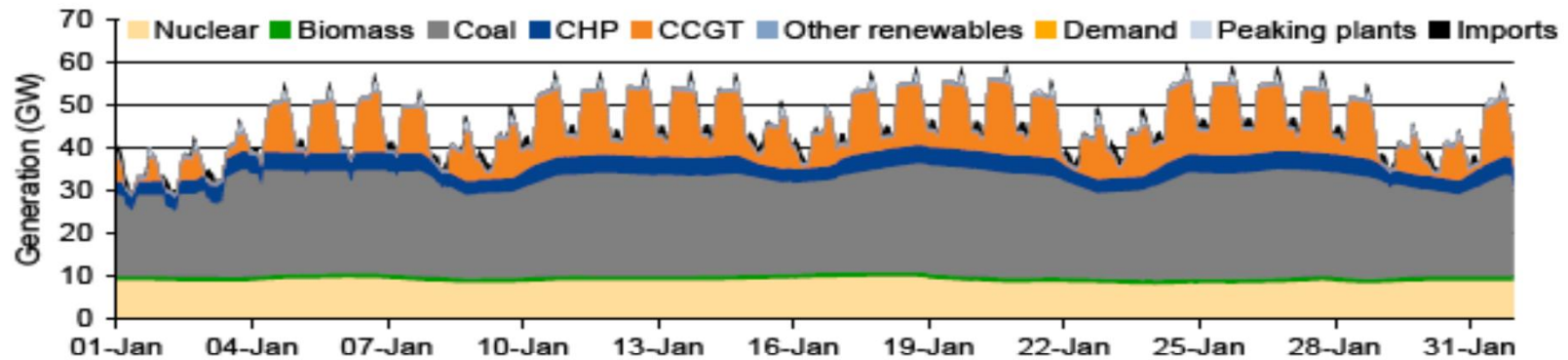
- Demand growth approx 0.4% p.a.
- Oil price ~\$70/bbl
- Coal price ~\$70/tonne
- Carbon price ~€37/tCO<sub>2</sub>

Source: Poyry, *How wind generation could transform gas markets in GB and Ireland*, June 2010

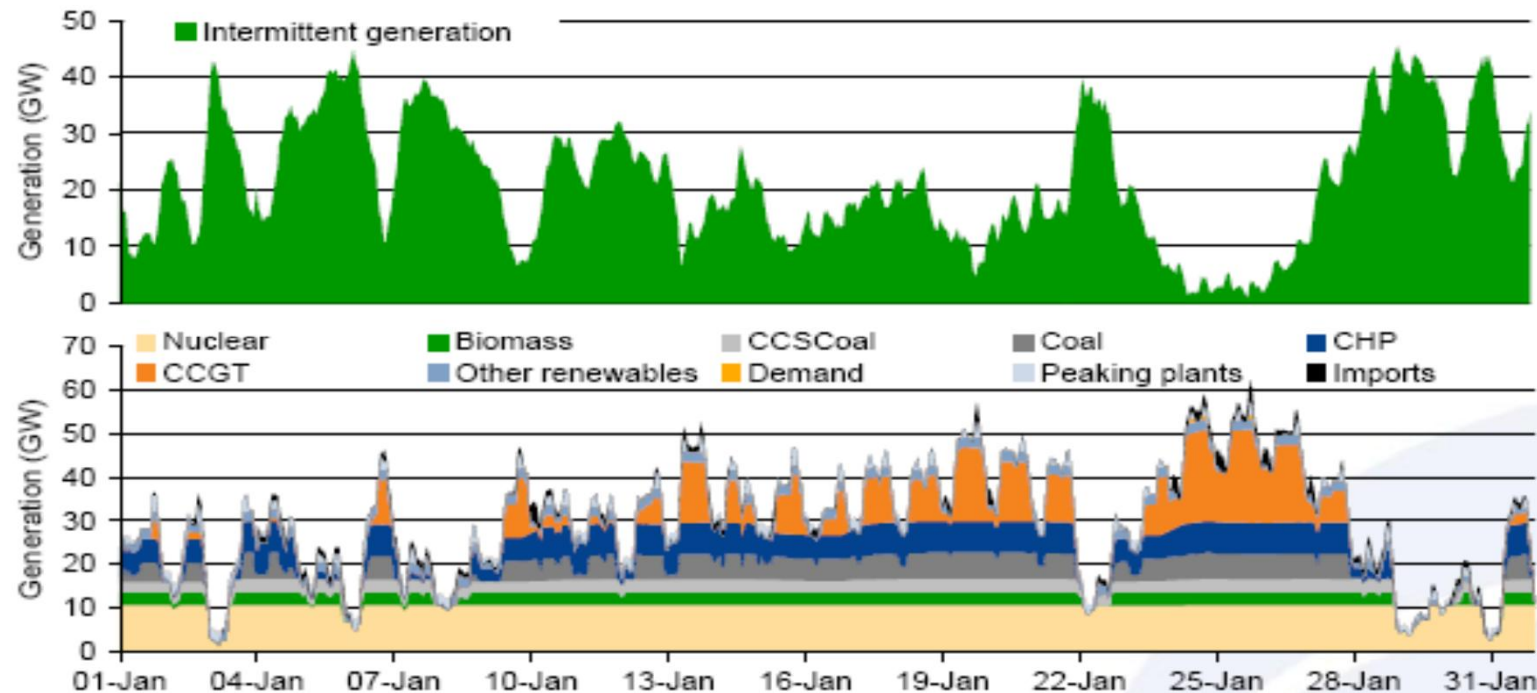
# 2030: electricity system flexes in response to wind

## GB, Feb 2030 based on Feb 2006

2010



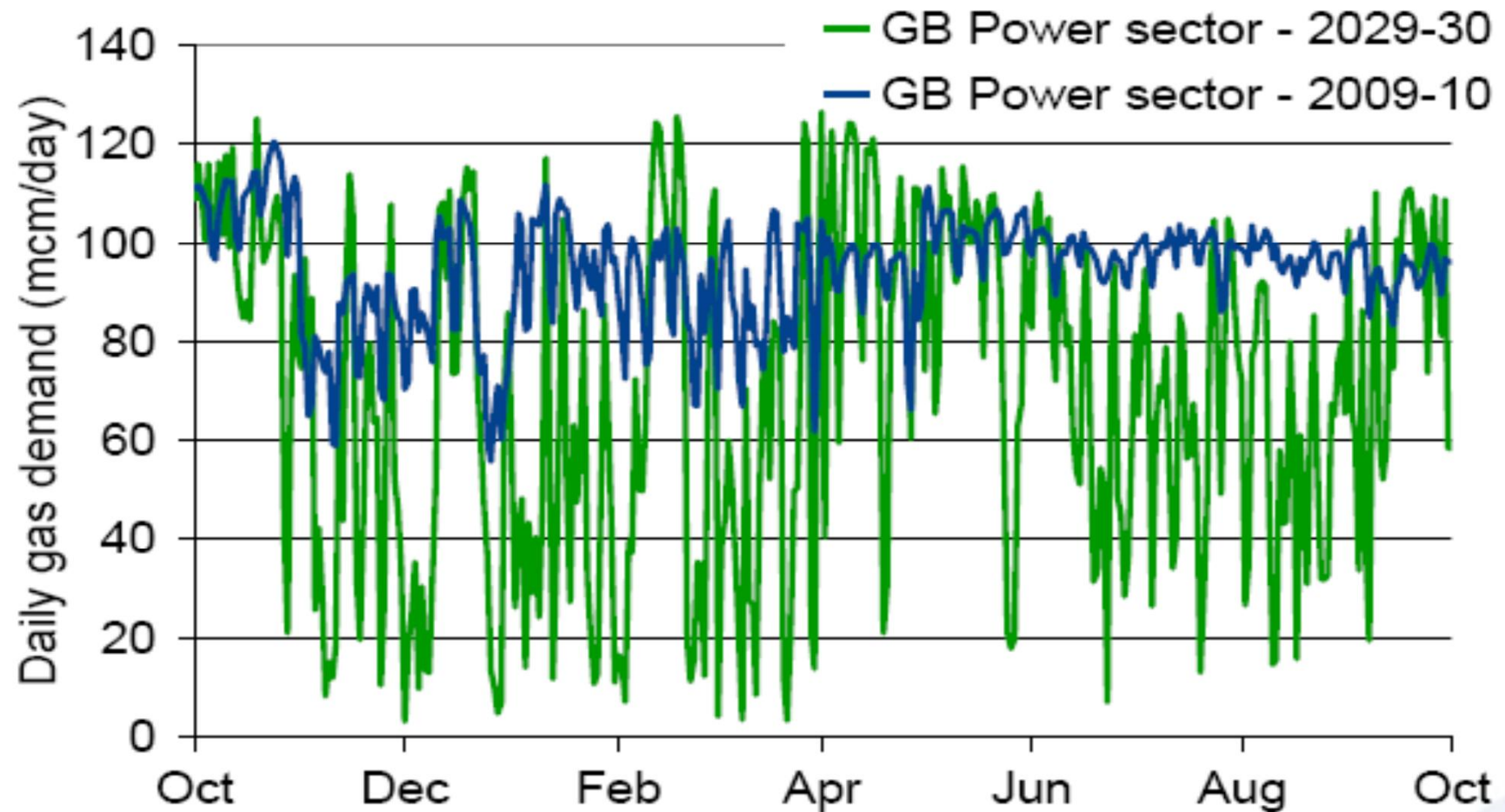
2030



Source: Poyry, *How wind generation could transform gas markets in GB and Ireland*, June 2010

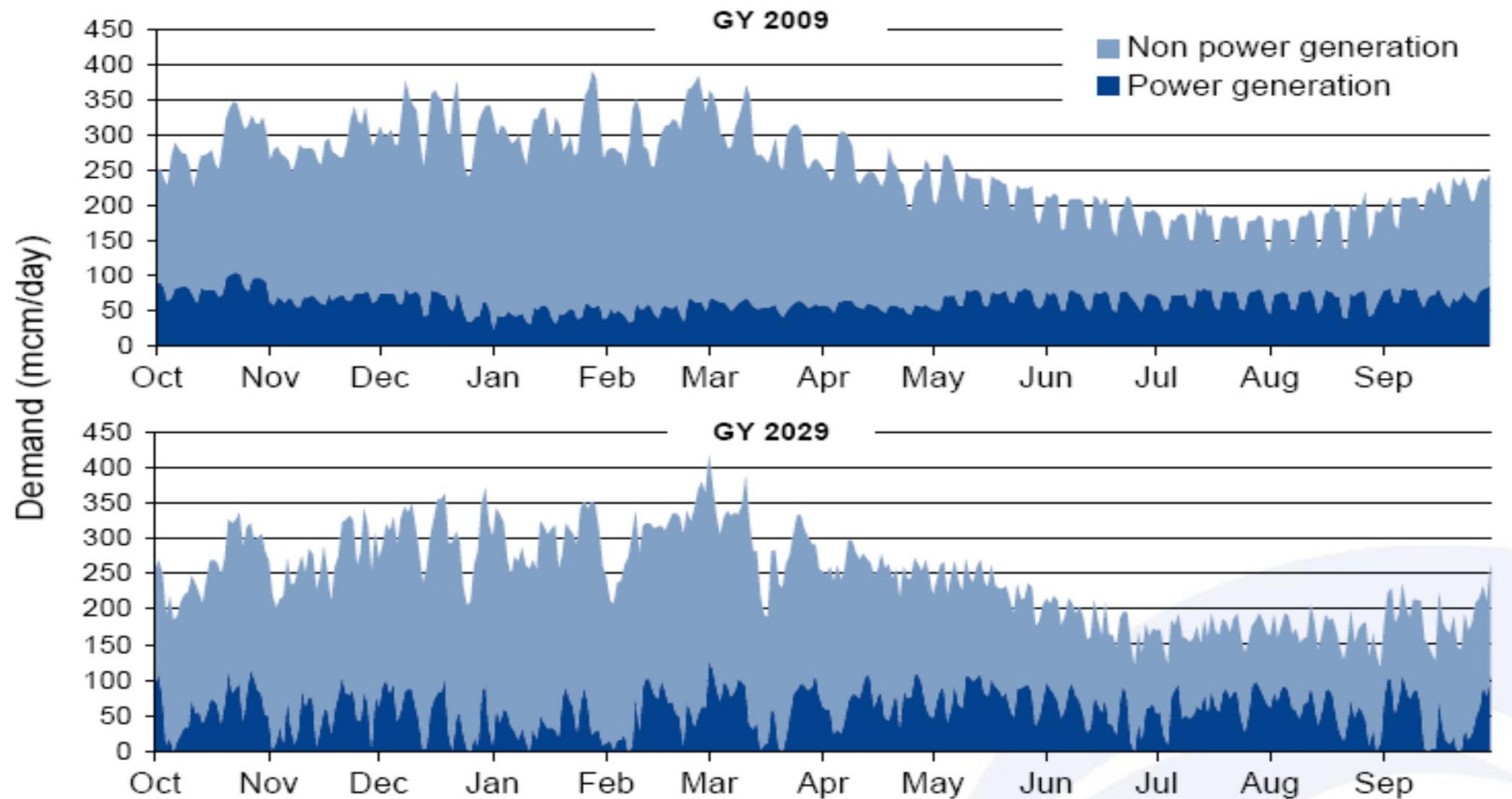


## Gas demand for power



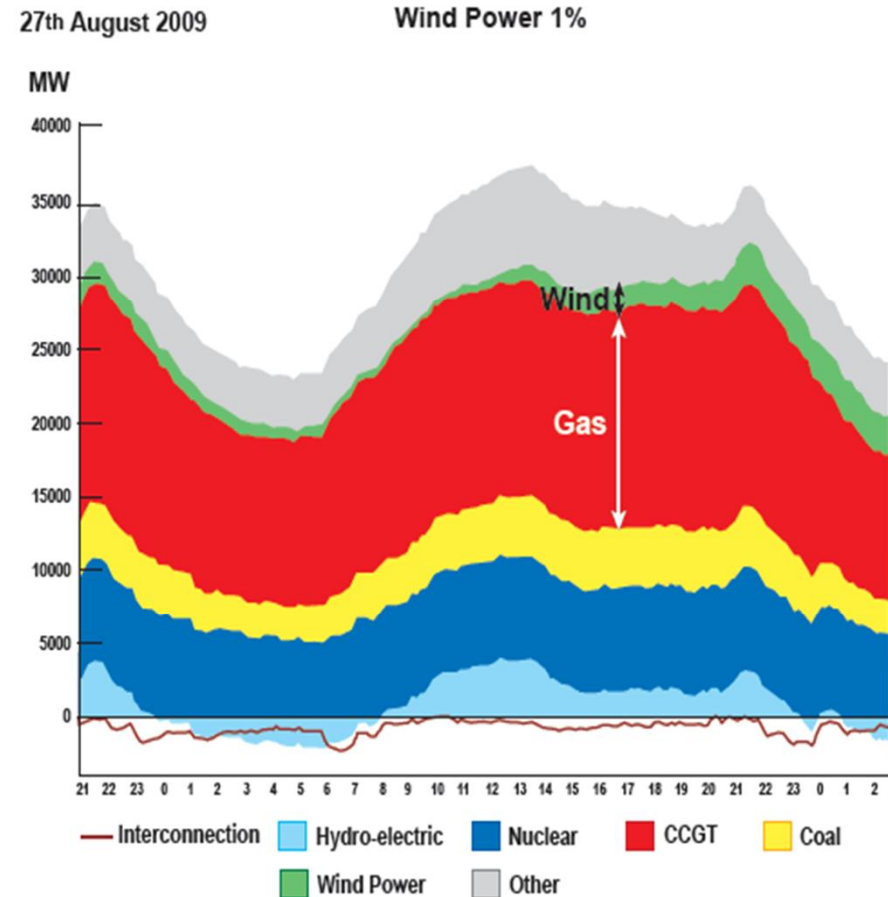
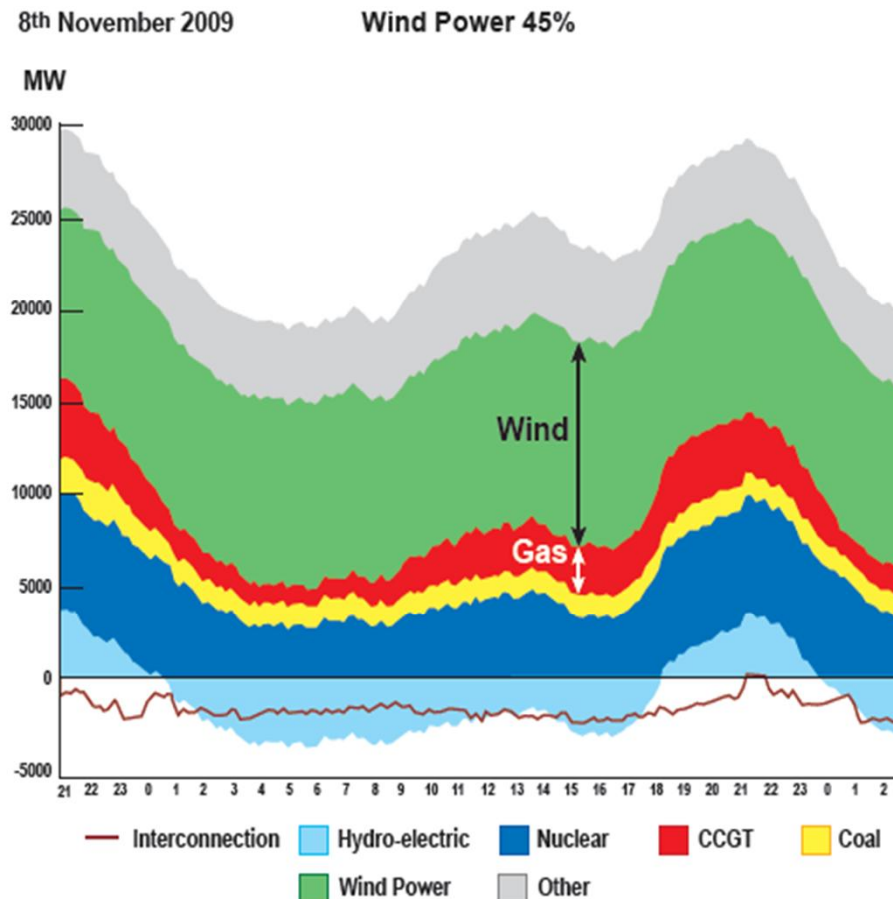
Source: Poyry, *How wind generation could transform gas markets in GB and Ireland*, June 2010

By 2029, gas demand from power generation becomes more volatile, which feeds into overall system demand volatility  
(weather 2003)



Source: Poyry, *How wind generation could transform gas markets in GB and Ireland*, June 2010

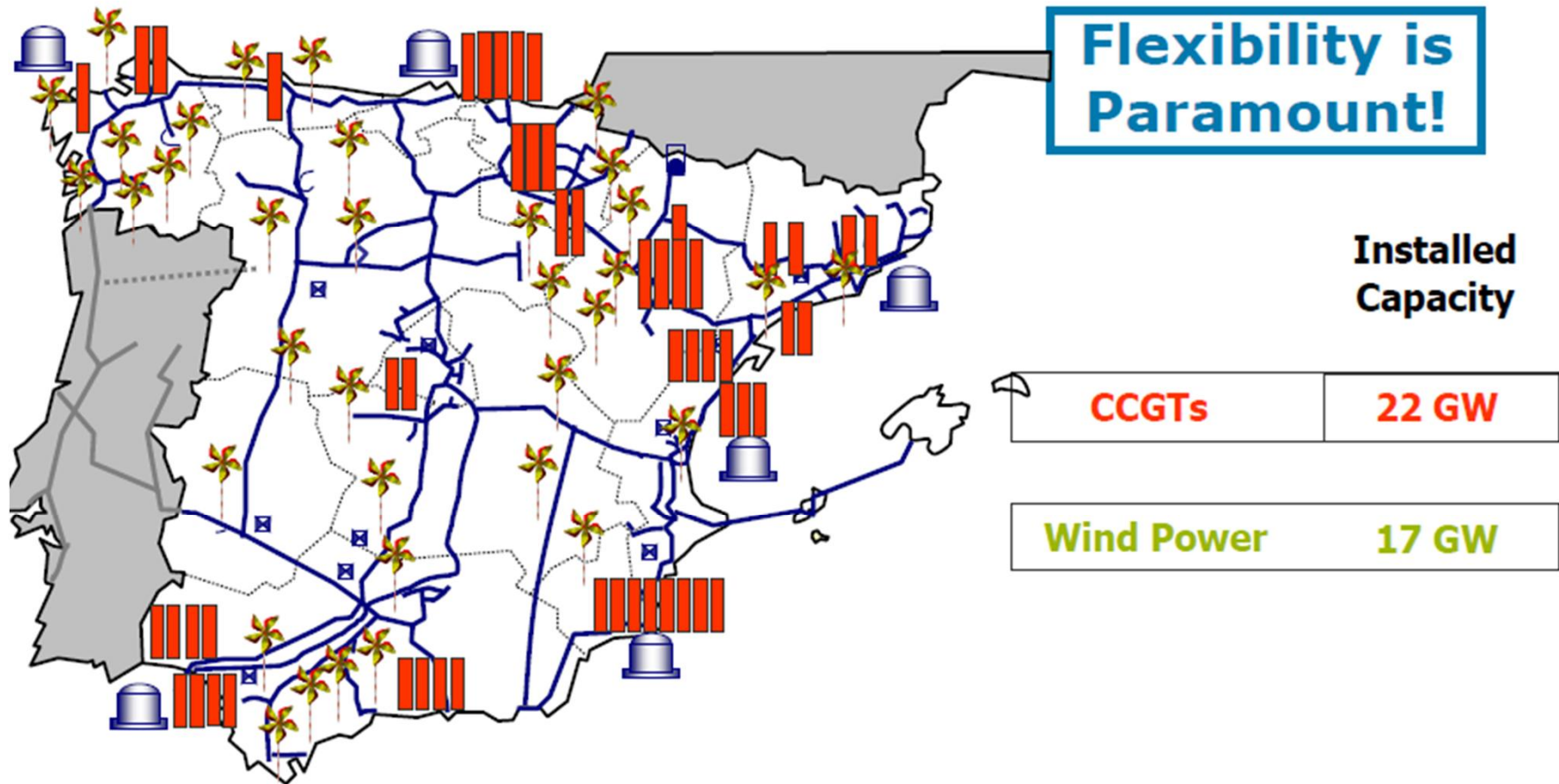
# Influence of Wind Power on Natural Gas Demand for the Power Sector, Spanish market, 27 August 2009 and 8 November 2009



Source: Presentation at Platts 4<sup>th</sup> Annual European Gas Storage, 10 February 2010, Luis I. Parada

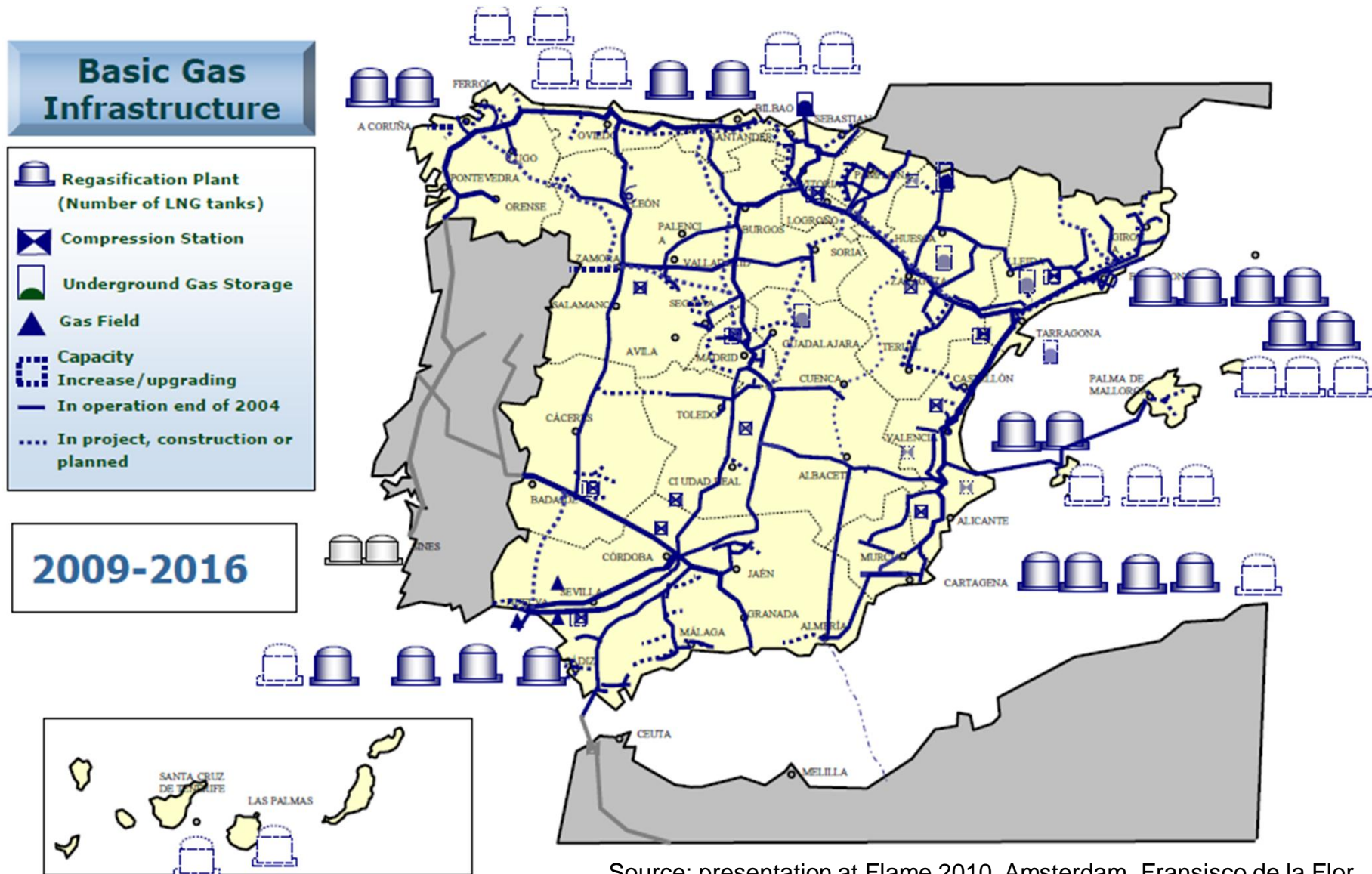


# Wind power and CCGT in Spain



Source: presentation at Flame 2010, Amsterdam, Francisco de la Flor

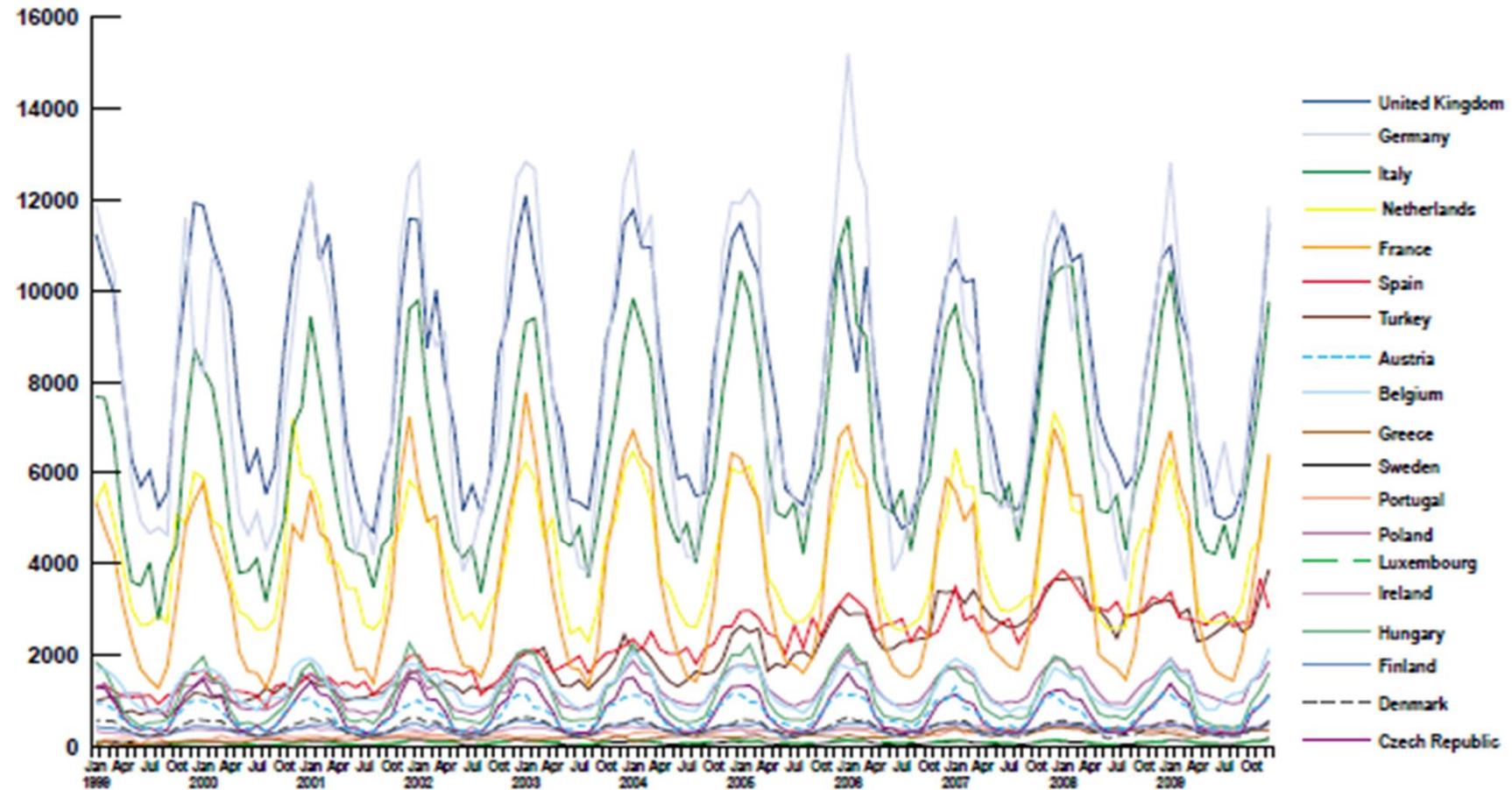
# Infrastructure in Spain, 1969-2016



Source: presentation at Flame 2010, Amsterdam, Francisco de la Flor

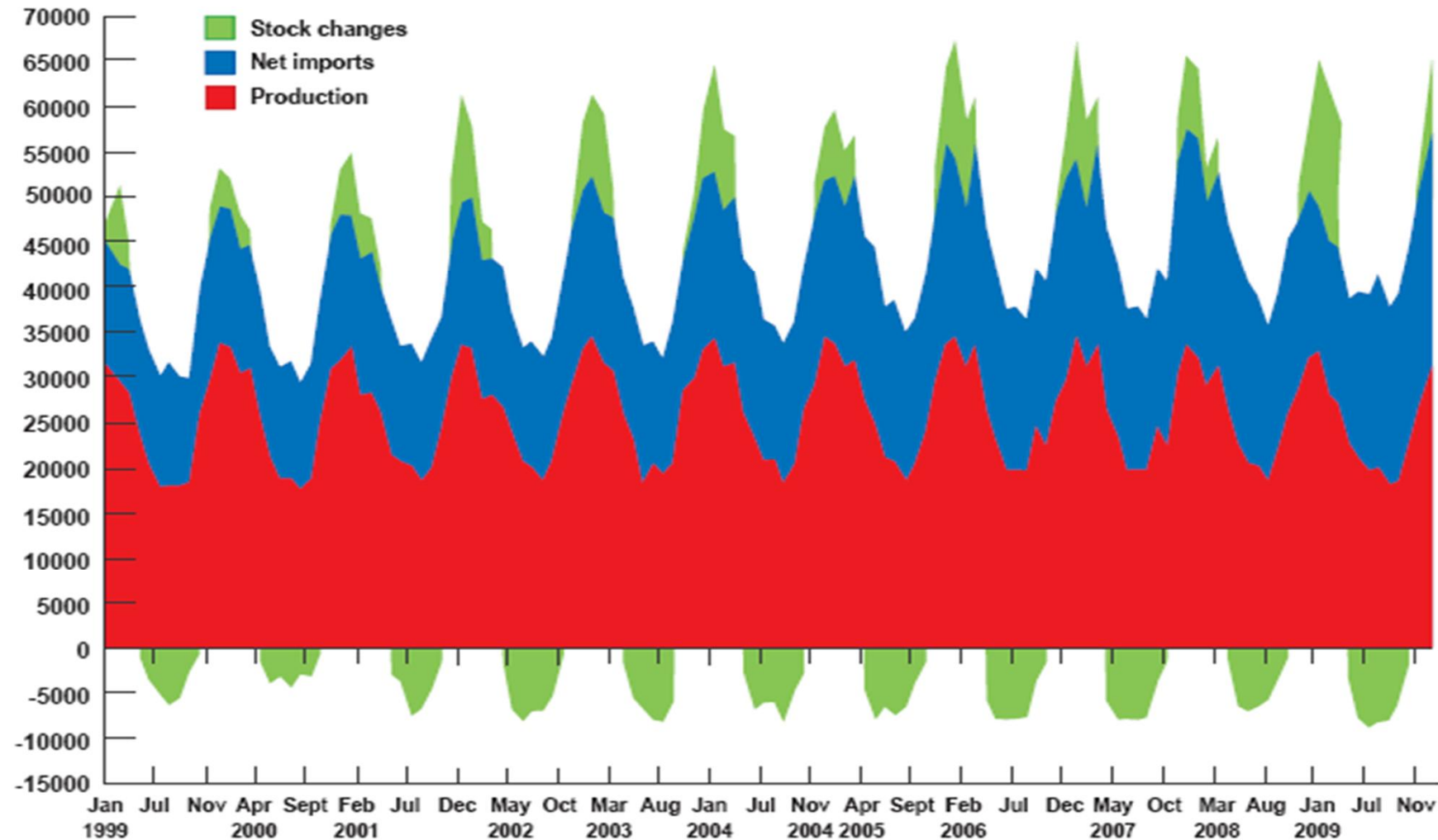


# Natural Gas Gross Consumption in Selected Countries, by month, 1999–2009, in mcm



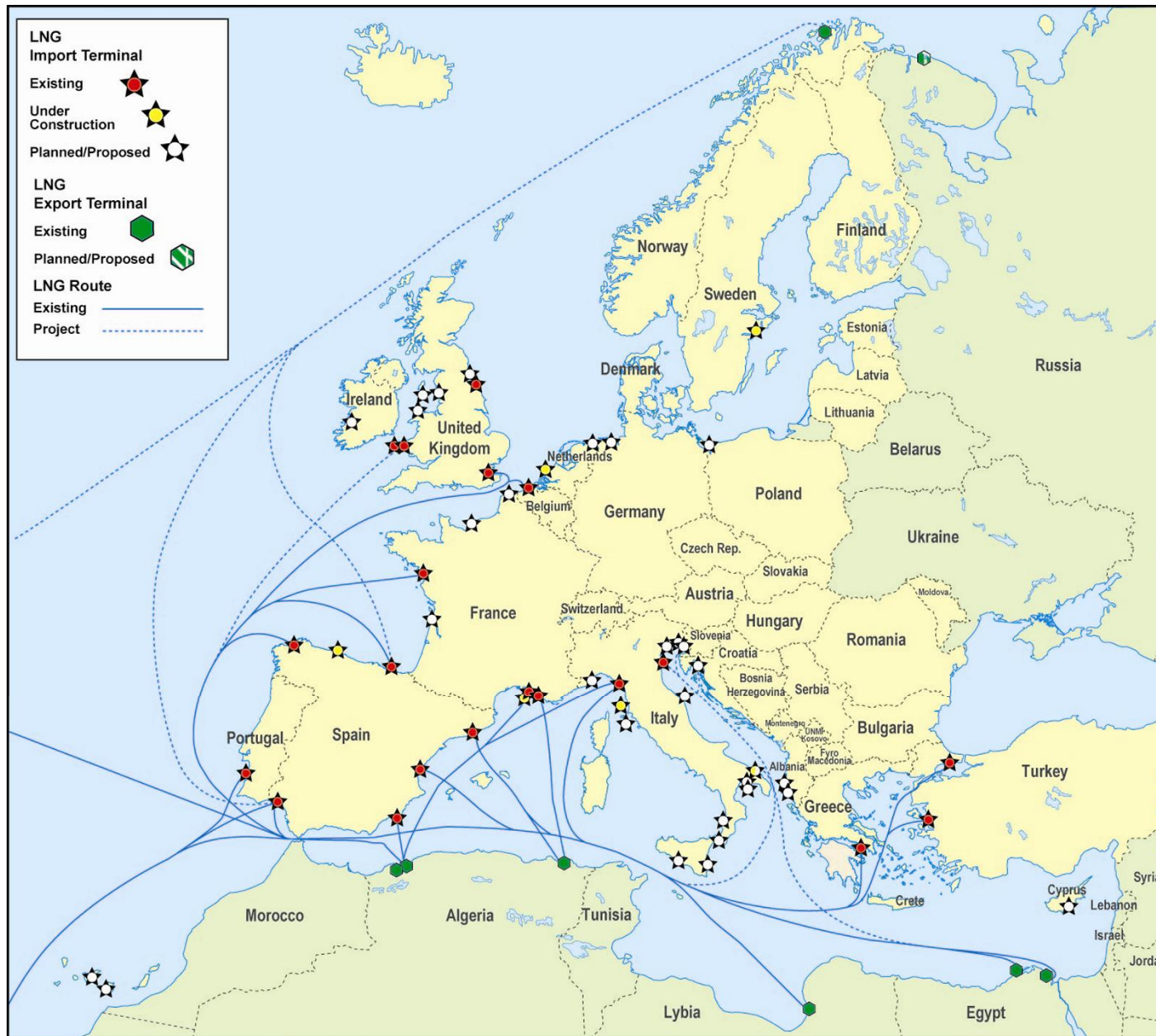
Source: IEA, Monthly Natural Gas Survey

# Natural Gas Production, Net Imports and Stock Changes, in OECD Europe, 1999–2009, in mcm



Source: IEA, Monthly Natural Gas Survey

# LNG regasification terminals in Europe



In bcm

Capacity:

- Existing: 164.2
- Construction: 46.5
- Planned: 260.6

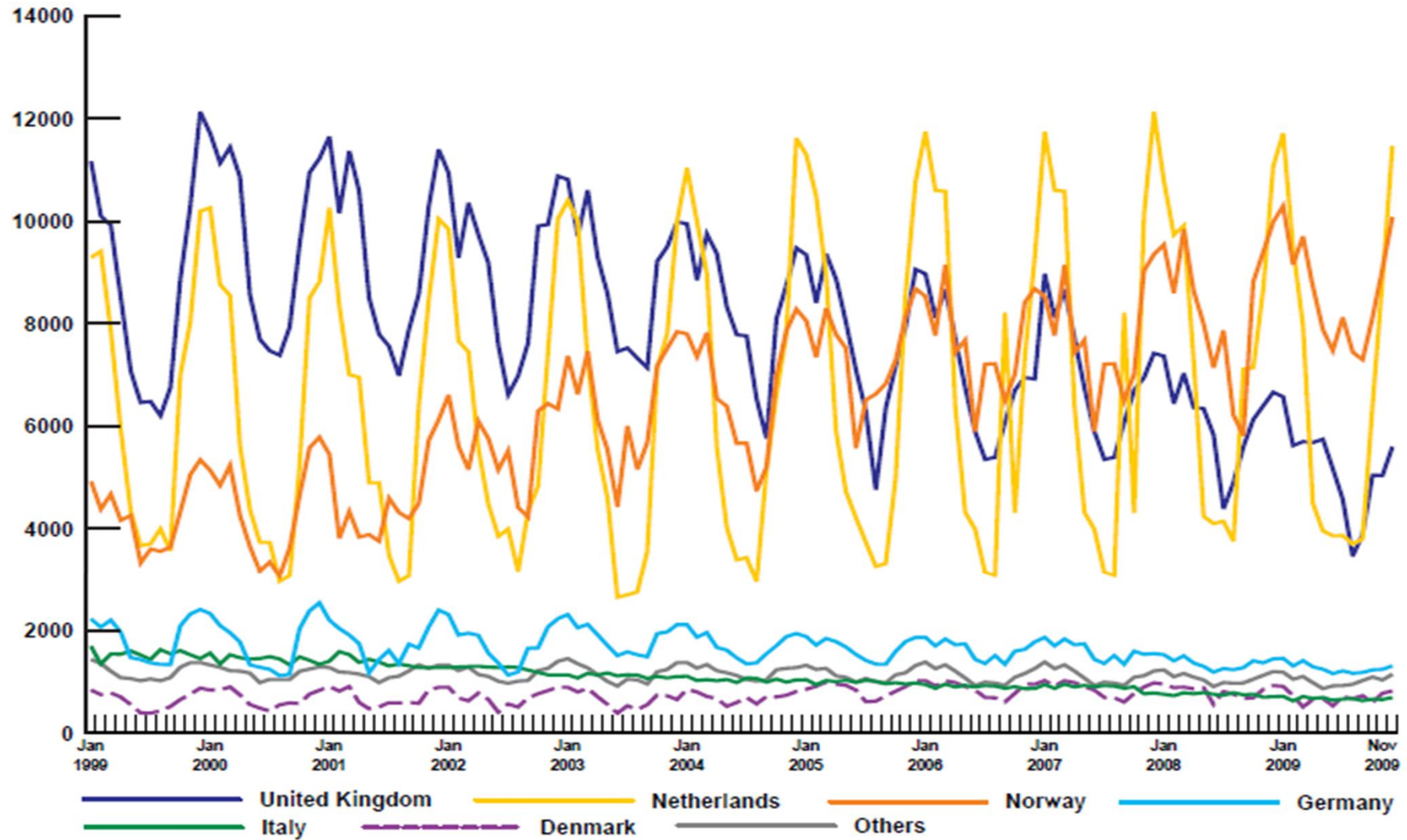
Flows:

- 2008: 59.4
- 2009: 71.7
- 2010e: 85

Sources: GLE (June10) & own analysis

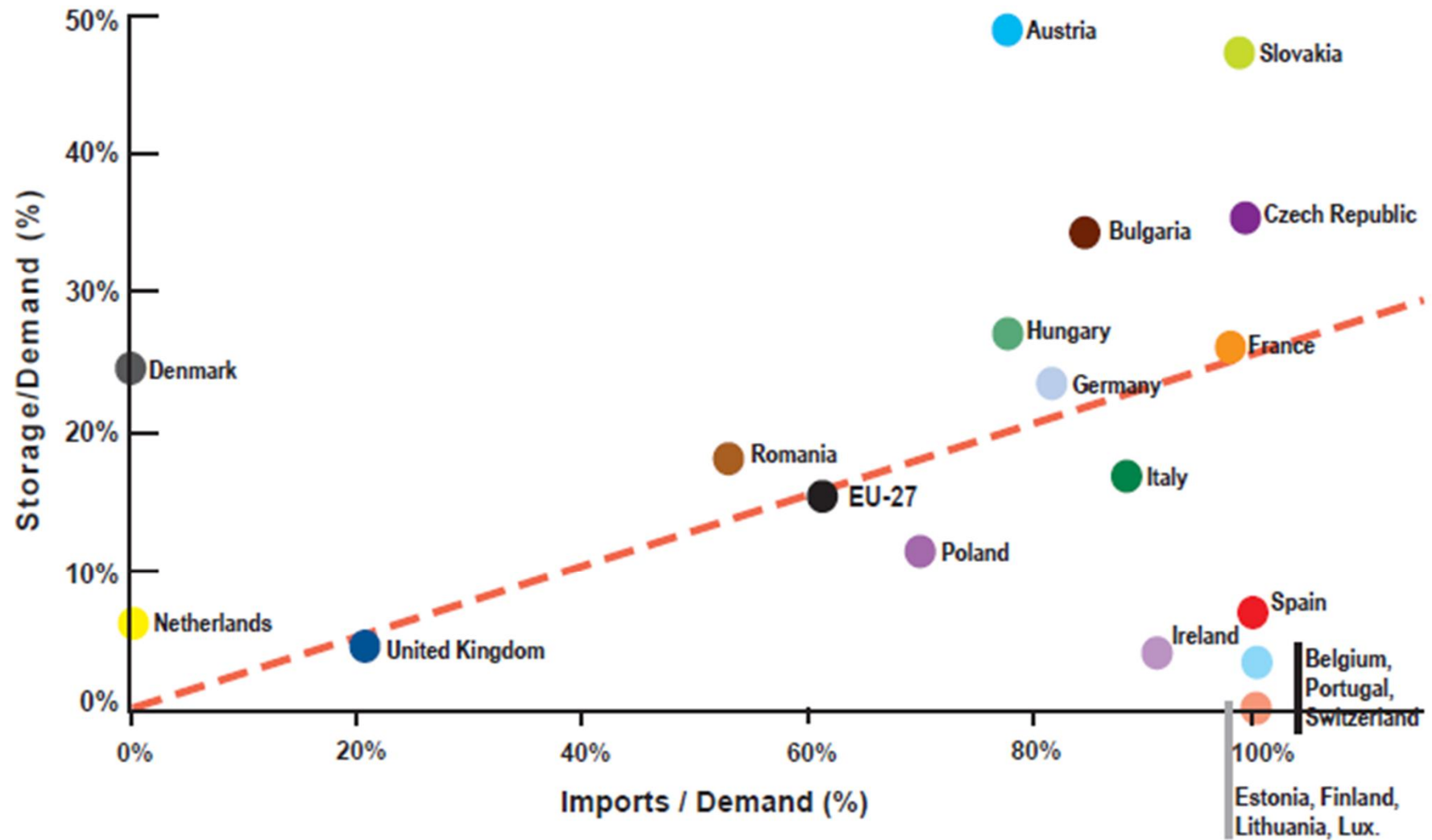


## Natural Gas Production in Europe, in mcm



Source: IEA, Monthly Natural Gas Survey

# Natural Gas Storage in Europe, in 2008



Source: Presentation at 24th World Gas Conference, 5-9 October 2009, J-M Leroy



## Additional needs for peak cycle

	<i>Annual</i>	<i>Seasonal</i>	<i>Weekly</i>	<i>Daily</i>	<i>Hourly</i>
Production flexibility	Yes	Yes	Yes	Yes	No
Import flexibility	Yes	Yes	Yes	No	No
Depleted fields and aquifers	No	Yes	Yes	Yes	No
Salt caverns	No	No/Yes	Yes	Yes	Yes
LNG storage (peak shaving)	No	No	No	Yes	Yes
Small scale local compressed gas	No	No	No	Yes	Yes
Line pack	No	No	No	No	Yes
Interruptible contracts	No	No	Yes	Yes	Yes

Source: Clingendael International Energy Programme (2006), 'The European market for seasonal storage', p.5



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# Conclusions

- Ambitious environmental and renewable energy targets have been set in Europe, but also at the national level
- Wind power is expected to play a major role in electricity generation towards and beyond 2020
- As a consequence, electricity markets will change as they become more and more dependent on intermittent output from wind generation
- But there will also be some major effects on gas markets:
- 1/ Some gas plants will more and more be used as back up for wind power, which means lower annual load factors and therefore lower annual gas consumption for these plants in the future



# Conclusions

- 2/ CCGTs will be needed when the wind is not blowing leading to high gas demand OR switched off when the wind is blowing leading to low gas demand within days/hours
  - ❖ => CCGT gas demand will be more variable inter and intra day
  - ❖ => The intermittency of wind generation is expected to be passed on to gas demand
- 3/ As wind generation grows, overall gas demand growth rate is likely to slow down but peak gas demand will remain high
  - ❖ Gas demand will become more volatile, although because wind power is generally higher in winter, it could also flatten the seasonality pattern (?)
- => Wind could become an important factor in determining future gas demand
  - ❖ Analysis of demand fluctuations will need to not only pay attention to temperatures, but also to wind generation, in the future



# Conclusions

- Wind generation will impact gas demand but it is also expected to translate into significant transformation of the supply side
- CCGTs can be up and running from a cold start in three to six hours, much more quickly than coal or nuclear power stations
- => Sudden surge in gas will be needed to start up CCGTs when wind power drops
- => Need something that can provide an enormous flow of gas in two to three hours
- => Increasing need for daily and within day flexibility
  - ❖ How? Solutions? Problems?
  - ❖ Opportunities for European gas trading development?
  - ❖ Need to operate the gas grids in a more flexible way?



Thank you

<http://www.oxfordenergy.org/gasprog.shtml>