The future Electricity Market Design: How to integrate RES, secure electricity supply and drive investments?

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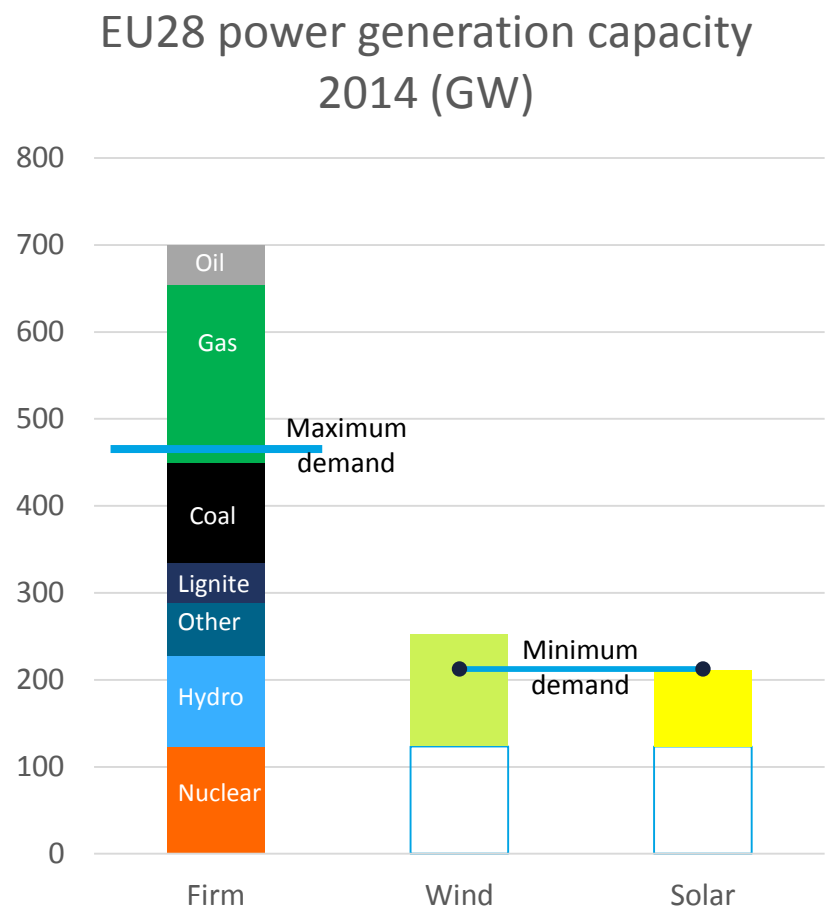
GasNaturally

A useful starting point

- The single market is the foundation of the EU, allowing the free movement of goods, services and people
- Virtually every commodity is traded on open markets with investment driven by the price signals from these

- To be credible, any design of the EU power market must reflect these two points

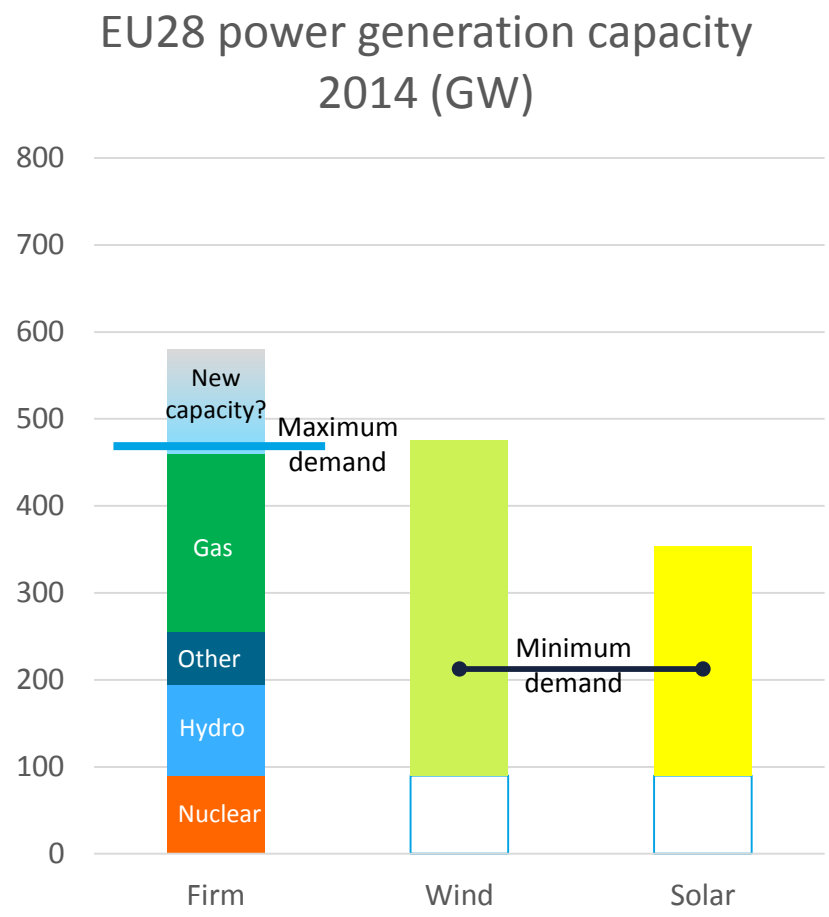
The current power market



- Market price generally set by variable cost of dispatchable plant
  - Plenty of firm capacity to cover peak demand so no scarcity pricing to cover capital costs
  - Insufficient intermittent capacity to set market price except at periods of very low demand
- High levels of emissions as coal often dispatched before gas plant

Sources: ENTSO-E and WindEurope

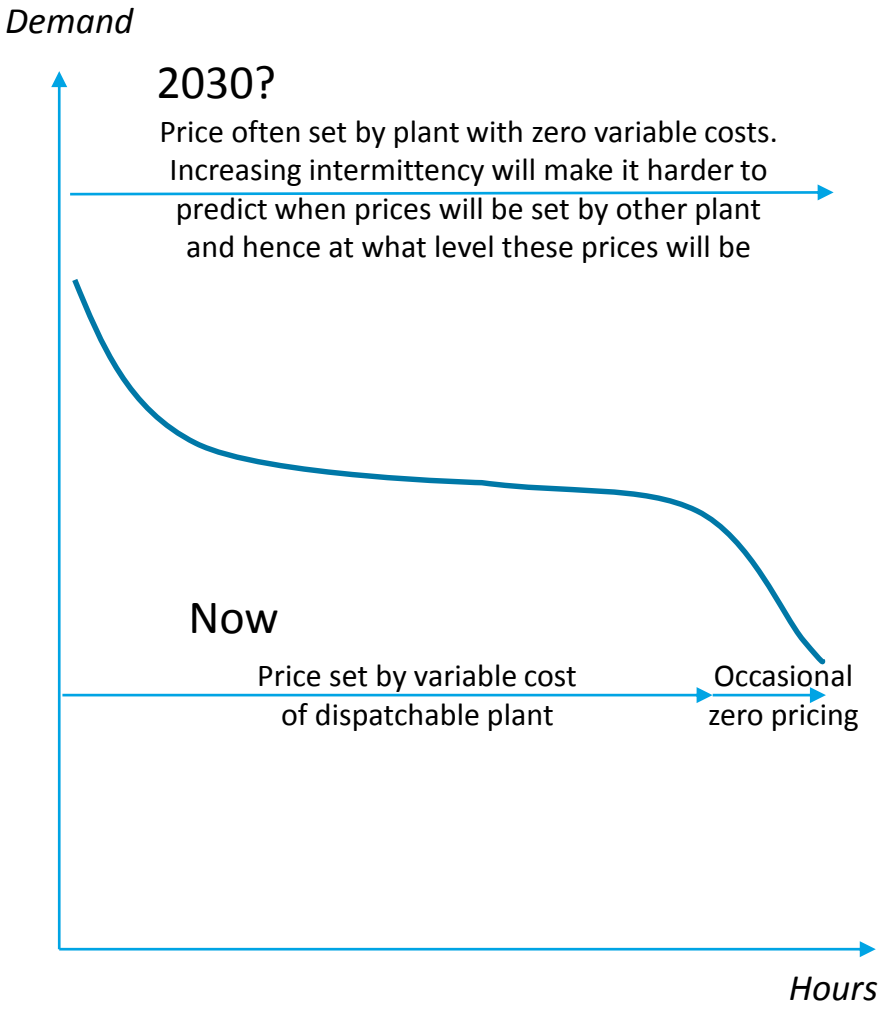
The power market in 2030?



- Market price regularly set by plant with variable costs close to zero
  - Potential for periods of scarcity pricing despite developments in load management and storage
- Emissions low;
  - 50% of production from renewables
  - 20% from nuclear
  - 30% from gas

Sources: ENTSO-E and WindEurope

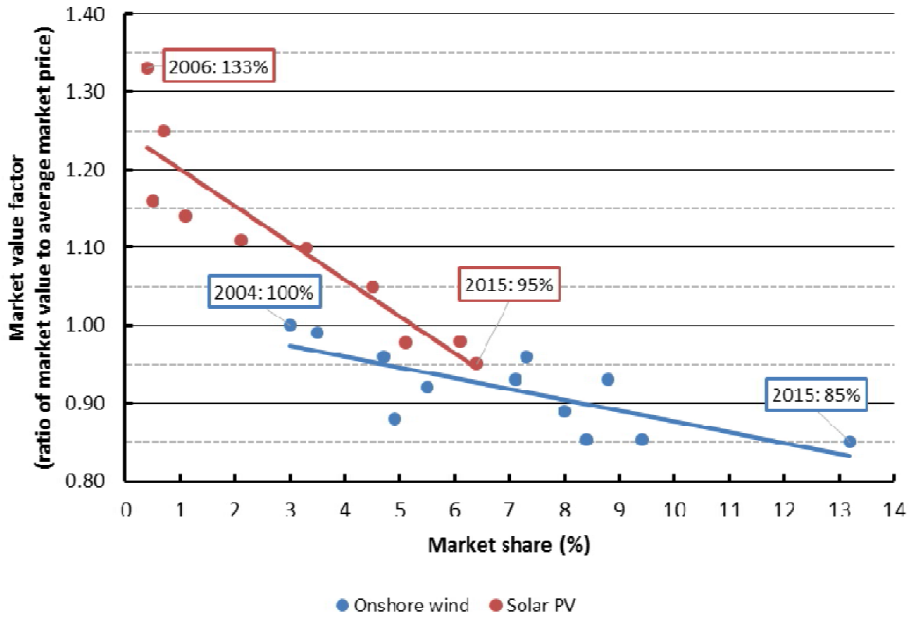
Will firm capacity be built?



- Need for clear pricing signals to encourage investment (and retirements)
  - Ending of subsidies
- Price risk may be managed by;
  - Hedging
  - Diversification
  - Integration
  - Modular v economies of scale
- Let the market work
  - Competitive, cost reflective capacity remuneration mechanisms as a last resort

What about intermittent capacity?

Figure 2. Market value of onshore wind and solar PV in Germany (2004-15)

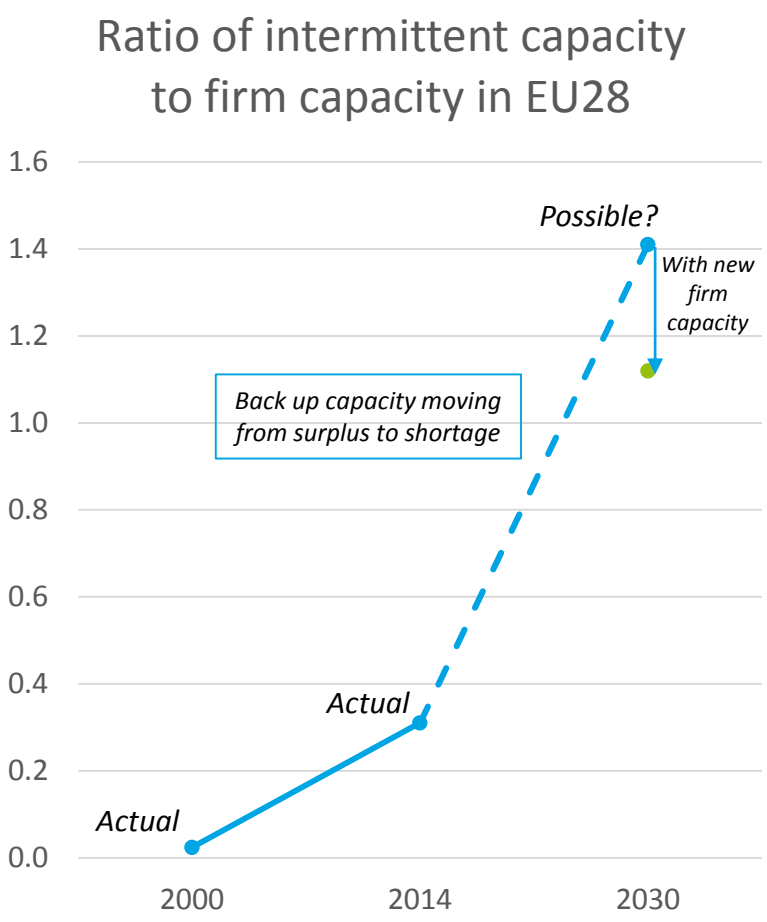


Source: own elaboration based on Hirth (2013), EPEX (2016) & ENTSO-E (2016).

From "The EU power sector needs long-term price signals" April 2016, Centre for European Studies

- High cost no longer an issue; renewables at (or close to) grid parity.
- *But* concern about correlation between production from intermittent capacity and low prices
  - Average realised price less than average market price
- Carbon pricing will help close the gap

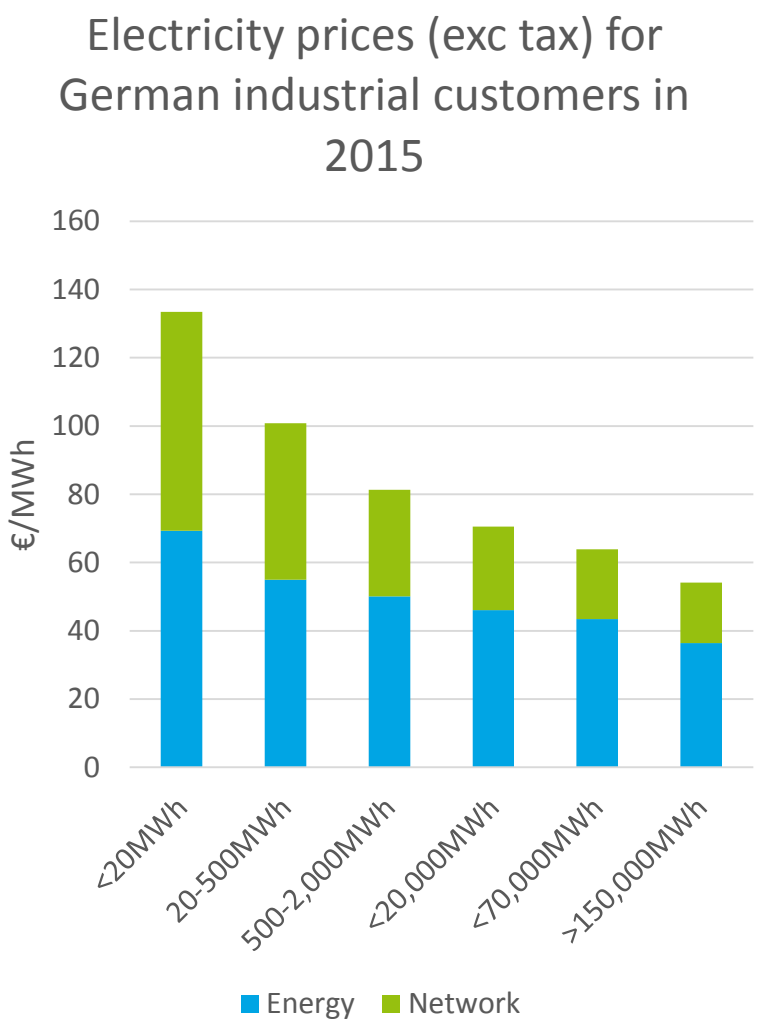
Flexibility as an additional source of revenue



- Establishing the value of different types of flexibility, will be key.
  - Reward providers
  - Target costs at those causing them
- Reliance on markets to provide reliable price signals
  - Remove barriers to entry to increase liquidity
  - Technology neutral

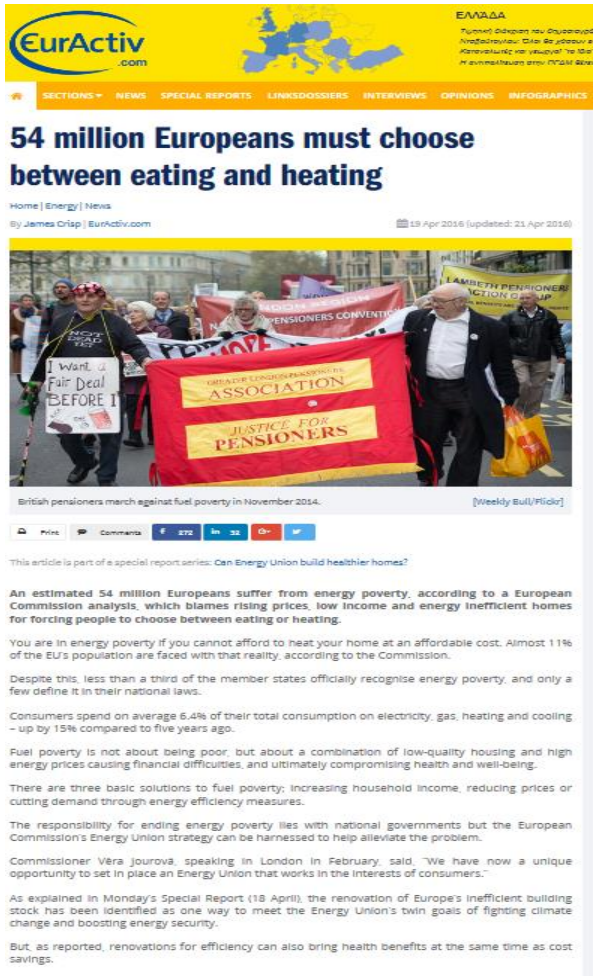
Sources: ENTSO-E and WindEurope

Capturing locational value



- Network costs account for one third to half of pre tax costs
  - Should be targeted rather than socialised
- With strong local opposition to grid expansion, the premium for generation located close to demand will grow
  - Current grid not sufficient to enable electrification of other sectors

Conclusions – put the customer first



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54 million Europeans must choose between eating and heating

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By James Crisp | EurActiv.com

19 Apr 2016 (updated: 21 Apr 2016)

British pensioners march against fuel poverty in November 2014. [Weekly Bull/Flickr]

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This article is part of a special report series: Can Energy Union build healthier homes?

An estimated 54 million Europeans suffer from energy poverty, according to a European Commission analysis, which blames rising prices, low income and energy inefficient homes for forcing people to choose between eating or heating.

You are in energy poverty if you cannot afford to heat your home at an affordable cost. Almost 11% of the EU's population are faced with that reality, according to the Commission.

Despite this, less than a third of the member states officially recognise energy poverty, and only a few define it in their national laws.

Consumers spend on average 6.4% of their total consumption on electricity, gas, heating and cooling – up by 15% compared to five years ago.

Fuel poverty is not about being poor, but about a combination of low-quality housing and high energy prices causing financial difficulties, and ultimately compromising health and well-being.

There are three basic solutions to fuel poverty: increasing household income, reducing prices or cutting demand through energy efficiency measures.

The responsibility for ending energy poverty lies with national governments but the European Commission's Energy Union strategy can be harnessed to help alleviate the problem.

Commissioner Vera Jourova, speaking in London in February, said, "We have now a unique opportunity to set in place an Energy Union that works in the interests of consumers."

As explained in Monday's Special Report (18 April), the renovation of Europe's inefficient building stock has been identified as one way to meet the Energy Union's twin goals of fighting climate change and boosting energy security.

But, as reported, renovations for efficiency can also bring health benefits at the same time as cost savings.

- Need to start from the perspective of the customer. They want electricity production that is;
  - Low cost
  - Low carbon
  - Reliable
  - Flexible
  - Locally produced
- Let the technology mix be decided by the market and not the other way round!

Backup

Some steps to improve liquidity

- Trading should be allowed over as broad a geographic area as possible
- Power can be traded as close as possible to the time of delivery
- Subsidies should be removed
- Costs should be recovered from those that caused them
- There is a level playing field for all flexibility providers
- Grid (ancillary) services are commoditised

Power plant flexibility

- The investigation covers nuclear power plants ('NPP' in the table below), hard coal-fired power plants ('HC'), lignite-fired power plants ('Lign'), combined cycle gas-fired power plants ('CCG') and pumped storage power plants ('PS'). As such, it does not rule shutdown because it takes time to refill the reservoirs, i.e. to pump the water up from the lower to the upper reservoir. If one would use other storage technologies such as compressed adiabatic air or simply batteries the time constant would be even longer.

TABLE 3: FLEXIBILITY OF CONVENTIONAL POWER GENERATION TECHNOLOGIES

	NPP	HC	LIGN	CCG	PS
Start-up Time "cold"	~ 40H	~ 6H	~ 10H	< 2H	~ 0,1H
Start-up Time "warm"	~ 40H	~ 3H	~ 6H	< 1,5H	~ 0,1H
Load Gradient ↗ "nominal Output"	~ 5%/M	~ 2%/M	~ 2%/M	~ 4%/M	> 40%/M
Load Gradient ↘ "nominal Output"	~ 5%/M	~ 2%/M	~ 2%/M	~ 4%/M	> 40%/M
Minimal Shutdown Time	← NO →				~ 10H
Minimal possible Load	50%	40%	40%	<50%	~ 15%

Source: EURELECTRIC/VGB enquiry

P19 http://www.eurelectric.org/media/61388/flexibility_report_final-2011-102-0003-01-e.pdf

Table ES.1: The load following ability of dispatchable power plants in comparison

	Start-up time	Maximal change in 30 sec	Maximum ramp rate (%/min)
Open cycle gas turbine (OCGT)	10-20 min	20-30%	20%/min
Combined cycle gas turbine (CCGT)	30-60 min	10-20%	5-10%/min
Coal plant	1-10 hours	5-10%	1-5%/min
Nuclear power plant	2 hours - 2 days	up to 5%	1-5%/min

Source: EC JRC, 2010 and NEA, 2011.

http://www.oecd-nea.org/ndd/reports/2012/system-effects-exec-sum.pdf