Electricity Market Reform – a shared complex challenge

Dr. Ronan Bolton

Lecturer in Science, Technology and Innovation Studies,
University of Edinburgh

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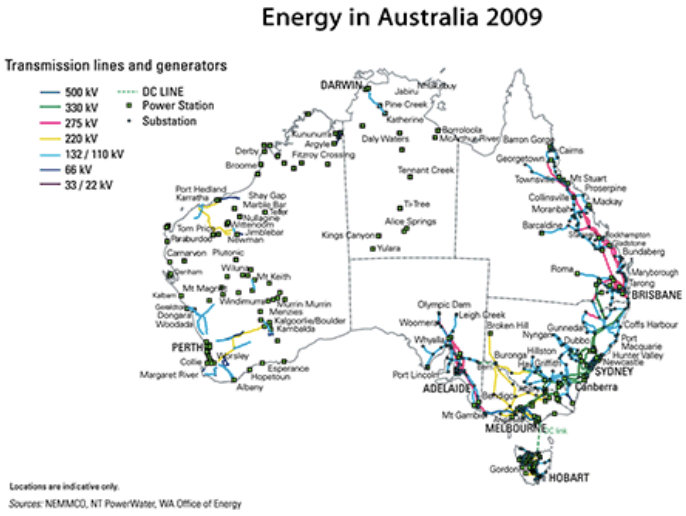
Electricity market design – a shared and complex challenge



Overview

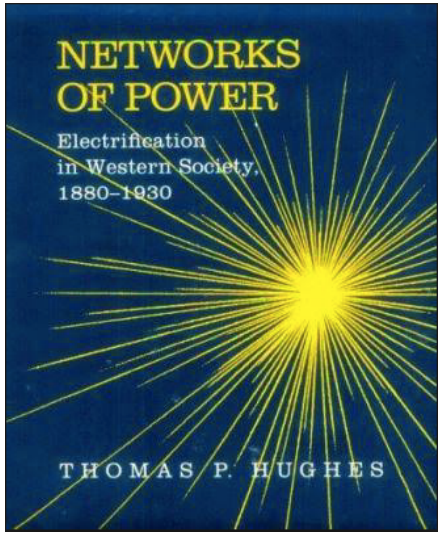
1. Research perspective: socio-technical systems and energy transitions (Science and Technology Studies - STS)

2. Key debate about electricity market design in Europe

3. The need to ‘open the black box’ of electricity system design

Large Technical Systems & Society

"Electric power systems embody the physical, intellectual, and symbolic resources of the society that constructs them...electric power systems, like so much other technology, are both causes and effects of social change." (Hughes, 1983)

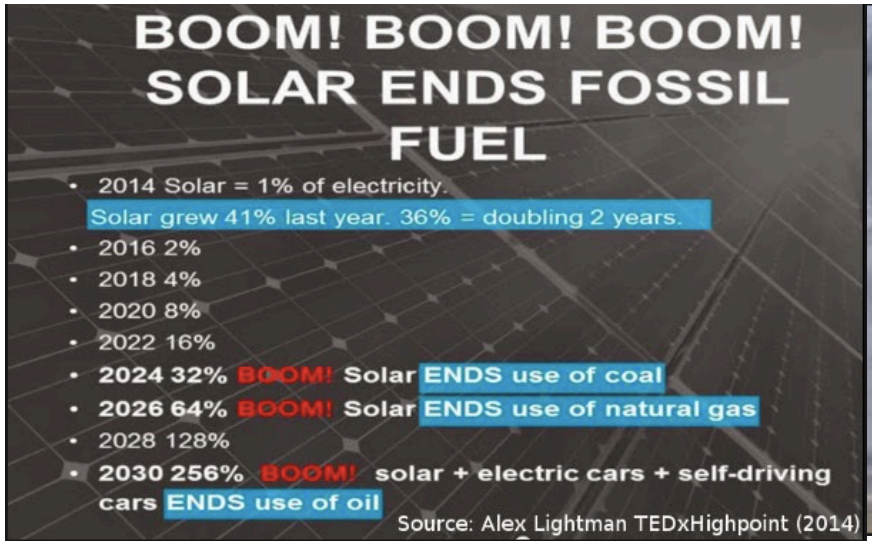


A socio-technical approach

- **The 'seamless web'**: "An artifact-either physical or nonphysical-functioning as a component in a system interacts with other artifacts, all of which contribute directly or through other components to the common system goal" (Hughes, 1987)

- **Socio-technical regimes**: "the 'deep structure' that accounts for the stability of an existing socio-technical system…the semi-coherent set of rules that orient and coordinate the activities of the social groups that reproduce the various elements of socio-technical systems " (Geels, 2011)

Energy transitions: Simple narratives of disruption and decline



Lessons from the history of energy transitions

Energy Transitions: “A study of a fluid process, rather than understanding it as a pretext for establishing rigid barriers between specific energy eras…older sources of energy (muscle power, renewable resources) are not replaced totally by newer sources (fossil fuels, nuclear energy). Instead they are supplemented, complemented, or slowly displaced according to use" (Melosi, 2006)

Melosi, M. 2006. “Energy Transitions in Historical Perspective.” In Energy and Culture: Perspectives on the Power to Work, edited by B. Dooley, 3–18. Aldershot: Ashgate.

Type I and II energy transitions

Evolutionary transition ("type 1")	Transformational transition ("type 2")
Multiple energy transitions Fossil fuels (with or without CCS) Continued/expanded use of nuclear power Partial recourse to renewables	Singular transition to renewable energy 100% renewables
Energy efficiency understood as greater energy intensity	Energy efficiency understood as major energy savings
A "low carbon" economy	A "zero carbon" economy
A slow- and long-term set of transitions	A rapid and near-term transition
An open-ended perspective	A deterministic perspective
A process-oriented frame	A product-oriented frame
Little or no belief in transition management	Strong belief in transition management
Modest policy prescriptions, mainly by incumbent energy majors and established policy communities	Ambitious policy prescriptions, mainly by renewables lobby and environmental NGOs

Szarka 2016

Electricity markets in Europe

European electricity integration

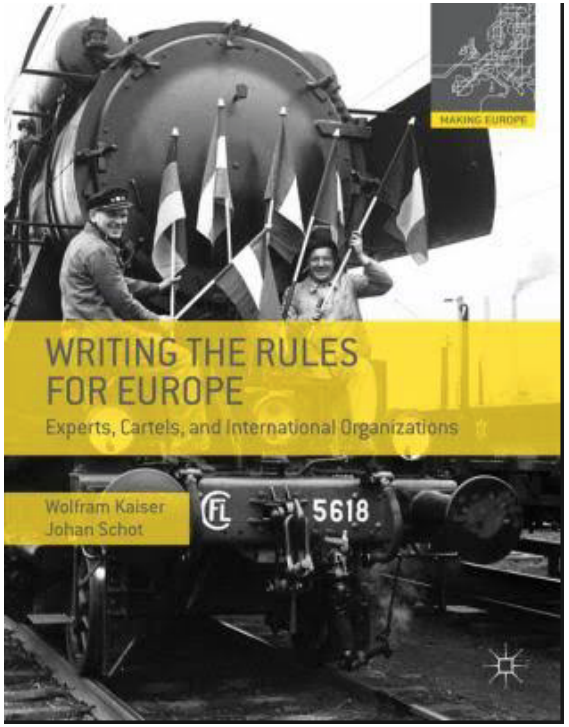
1929: George Viel's 400 kV network for Europe (Vincent Lagendijk)

1920s - Early regional power pools

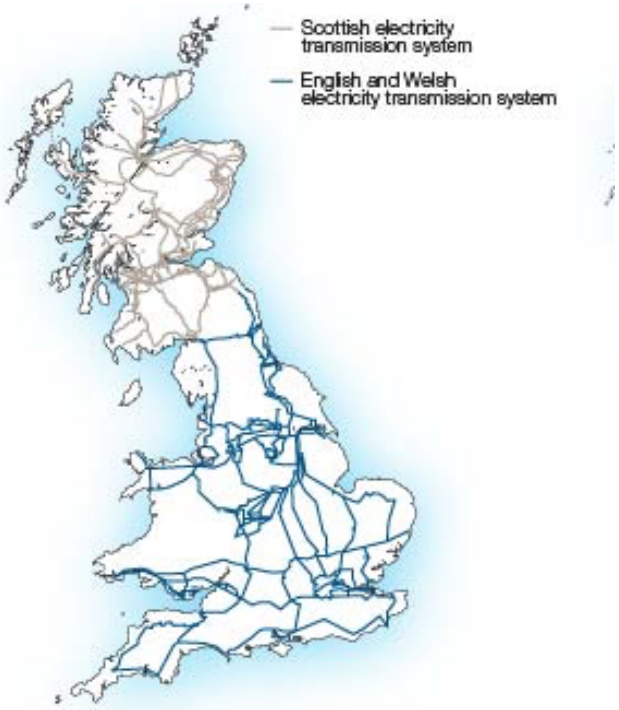
Figure 2.1 – Swiss, French, and German interconnections around in 1926
Source: H. Niesz, 'L'Échange, 1026. Used by permission of the World Energy Council, London, www.worldenergycouncil.org

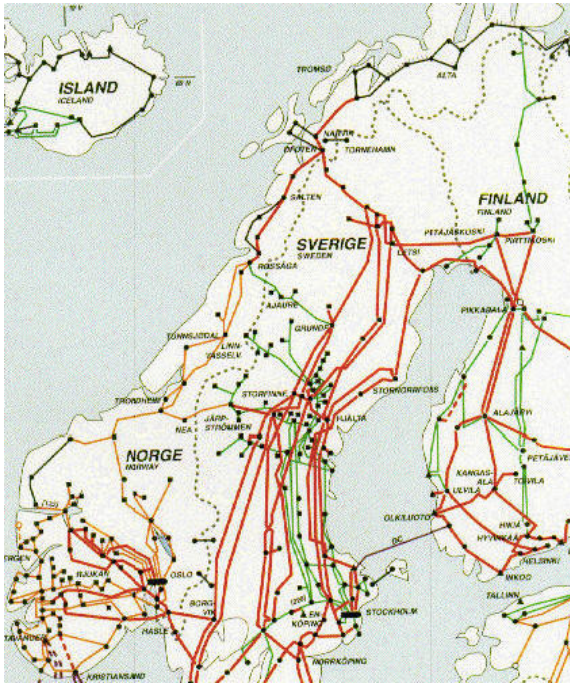
Hidden integration

”The creation of a European electricity system remained for a long time separat e from the processes of political and economic integration that led to the EU. In fact, the notion of such a system was already conceived of during the interwar period and the process that led to its re alization was initiated after 1921" (Lagendijk, 214)

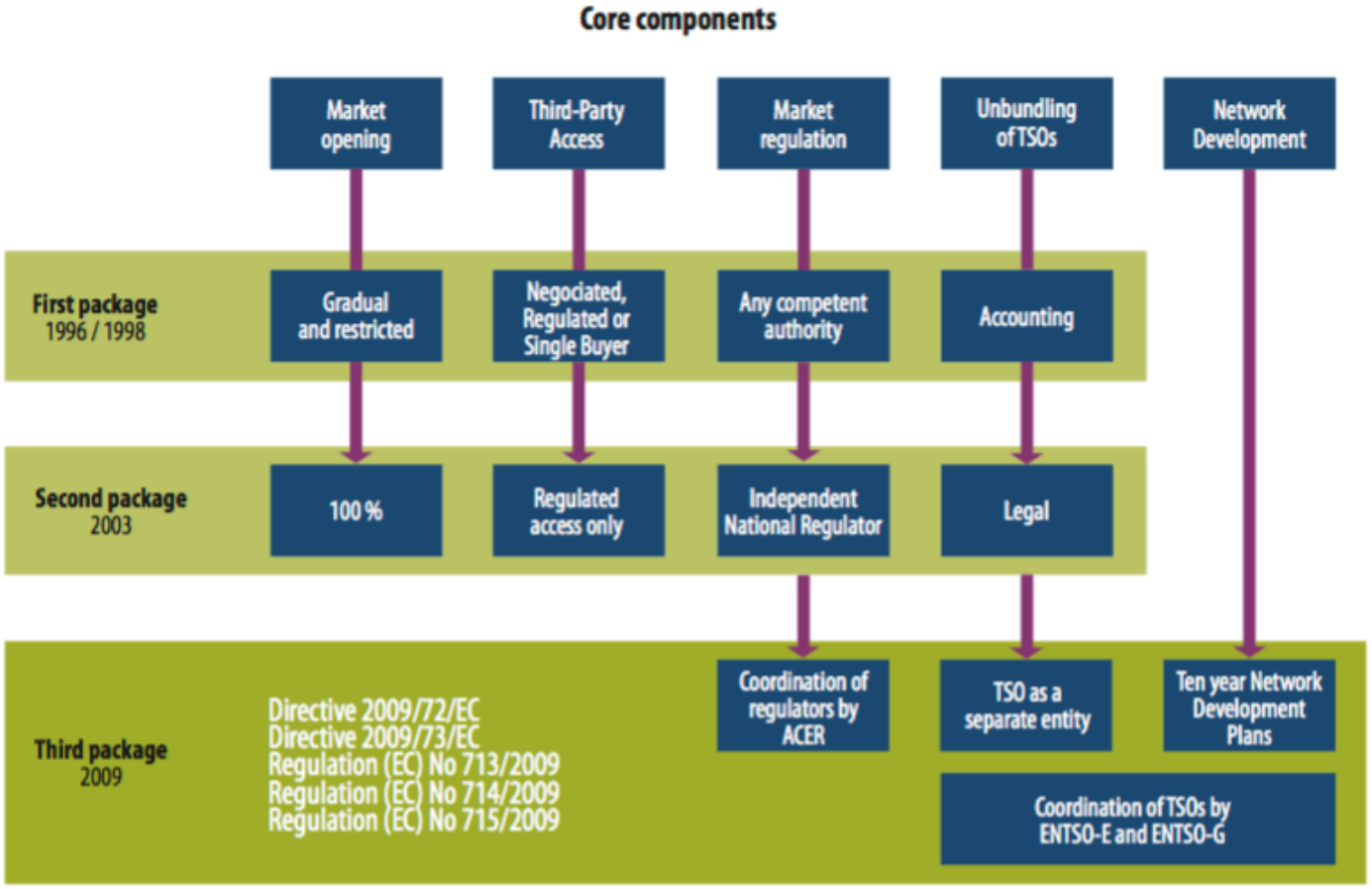


Early 1990s: A new phase of market liberalisation





Three energy packages



Source: European Court of Auditors.

The "target model" and a new institutional architecture

- Practical steps for implementing the 3rd energy package

"The internal market should be completed by 2014 so as to allow gas and electricity to flow freely" (European Council conclusion of February 4, 2011)

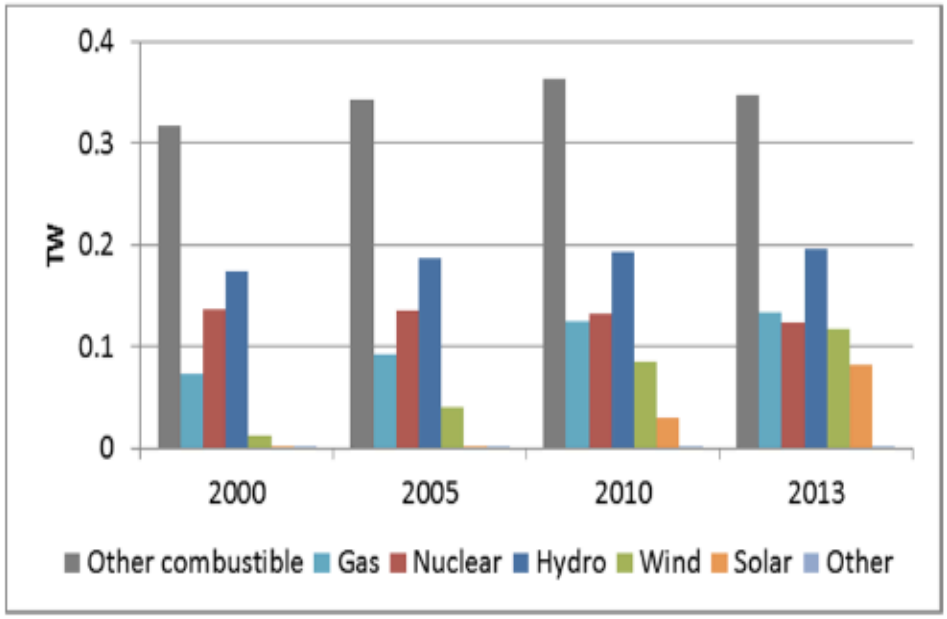
ACER
Agency for the Cooperation of Energy Regulators

entsoe
Reliable Sustainable Connected

Structural changes in the European electricity system

Rise in investment

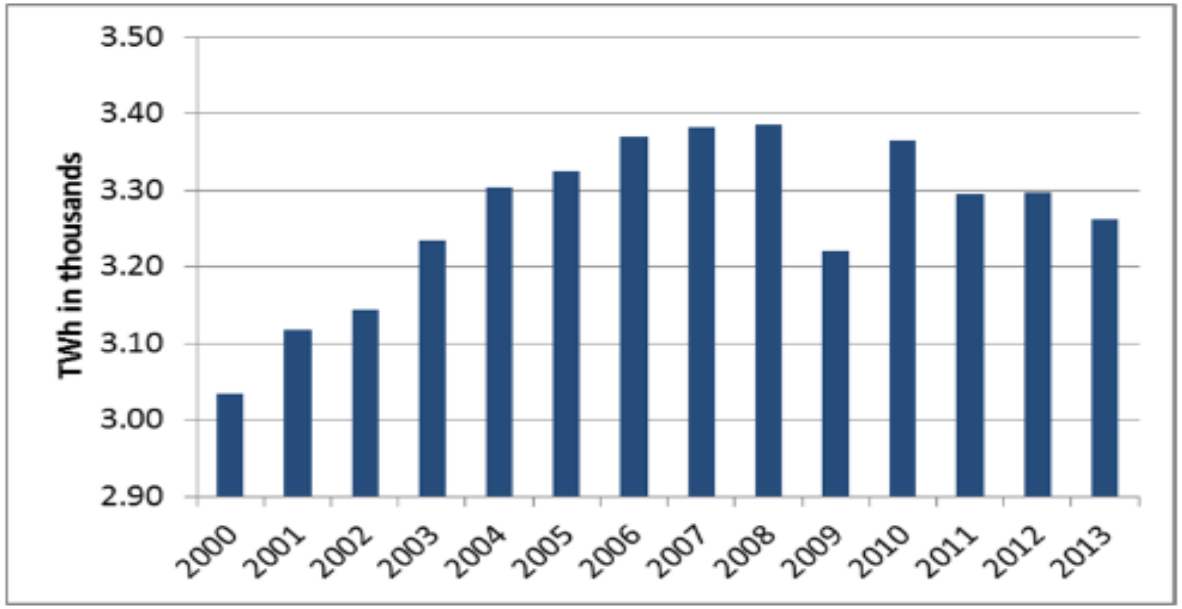
Figure 2: Evolution of installed generation capacity by technology in the EU28 as a whole[12]



Source: Eurostat.

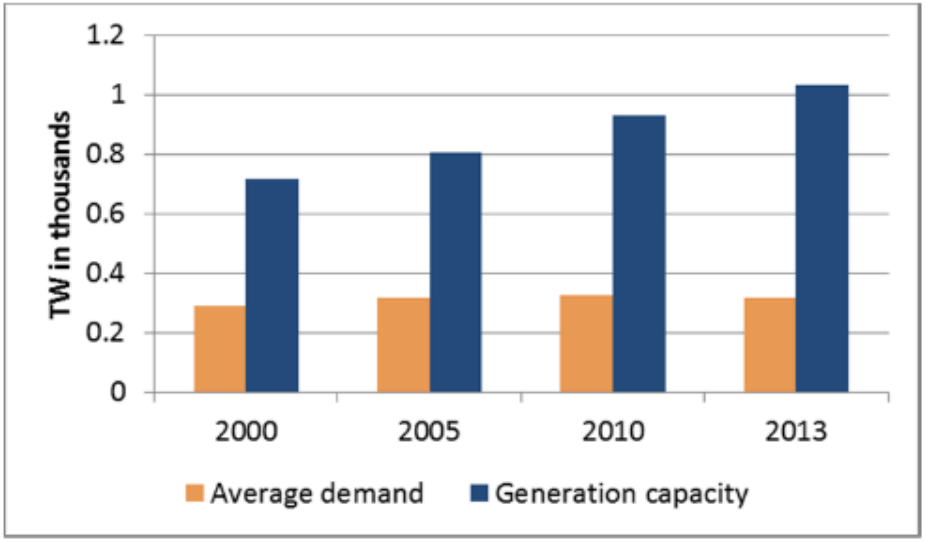
Falling demand

Figure 6: Evolution of generated electricity in the EU28 as a whole



Source: Eurostat

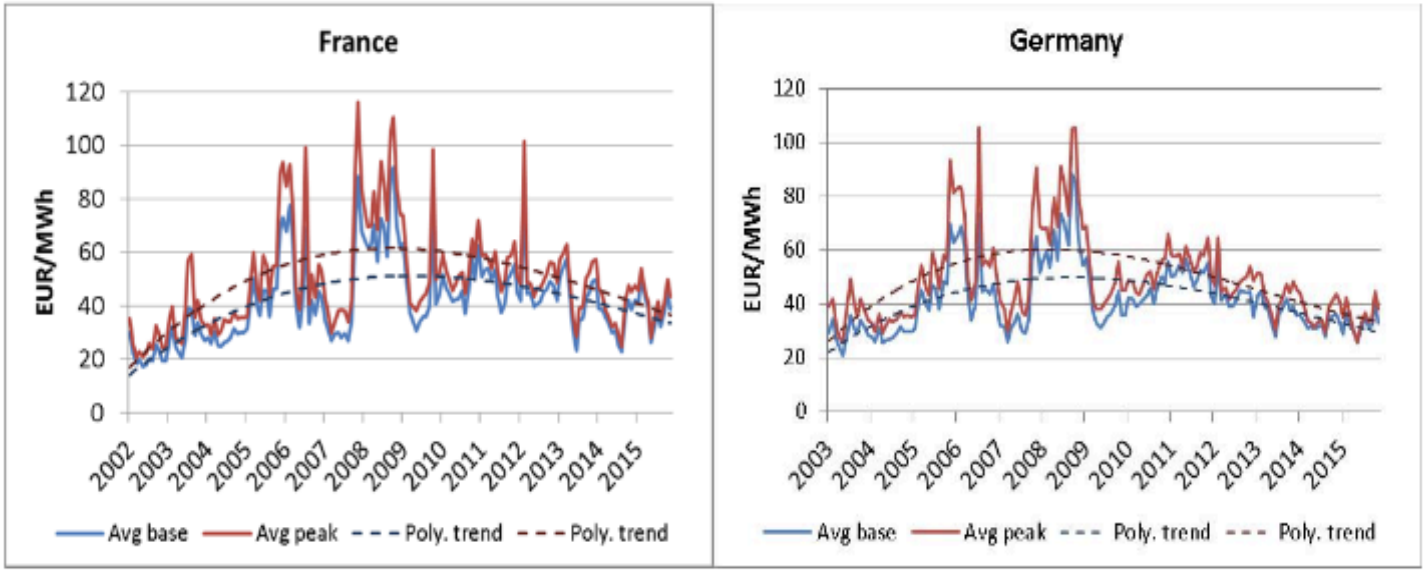
Figure 9: Evolution of average demand and generation capacity for the EU28 as a whole



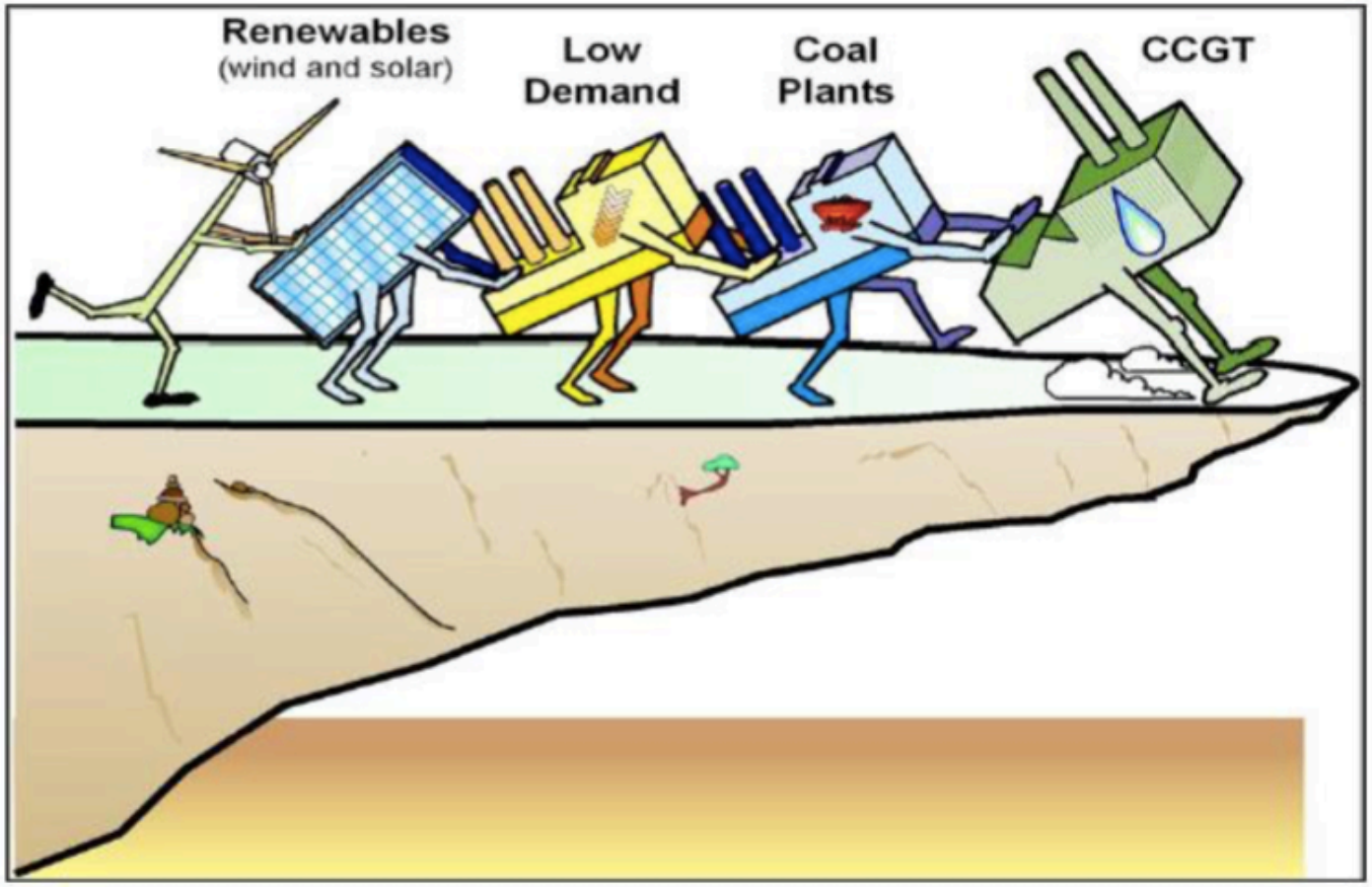
Source: Eurostat

Falling prices

Figure 14: Evolution of spot electricity prices in France and Germany



Source: European Commission on the basis of Power Exchanges data



Source: Prof Mark O' Malley. http://acee.princeton.edu/wp-content/uploads/Presentation-Final.pdf

http://blogs.shell.com/climatechange/wp-content/uploads/2015/01/10-Years-of-the-EU-ETS.jpg

Diverging views on electricity market design

EU Commission investigation

- Launched in April 2015:

"concerns that capacity mechanisms may unduly favour particular producers or technologies and that they may create obstacles to trade in electricity across borders"

- EU also consulting on its 'Market Design Initiative'

An interventionist trend

Tender for new capacity	Strategic reserve	Targeted capacity payment
Belgium **	Belgium	Italy
France	Denmark **	Poland
Ireland **	Germany ***	Portugal ***
	Poland	Spain ***
	Sweden	
	Germany (Interruptibility Scheme)	
	Ireland (Interruptibility Scheme)	
	Italy (Interruptibility Scheme) ***	
	Poland (Interruptibility Scheme)	
	Portugal (Interruptibility Scheme)	
	Spain (Interruptibility Scheme)	
Central buyer	**De-central obligation**	**Market-wide cap. payment**
Ireland *	France *	Ireland
Italy *		

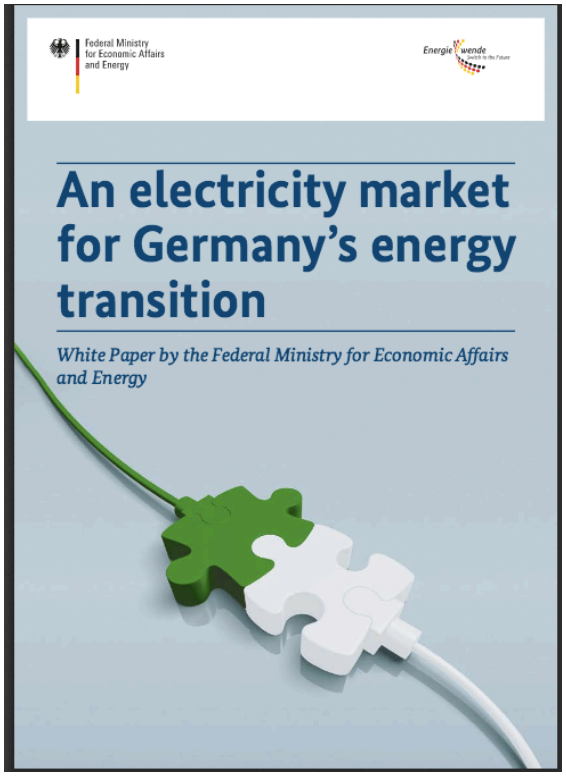
* Planned Mechanism (or being implemented)

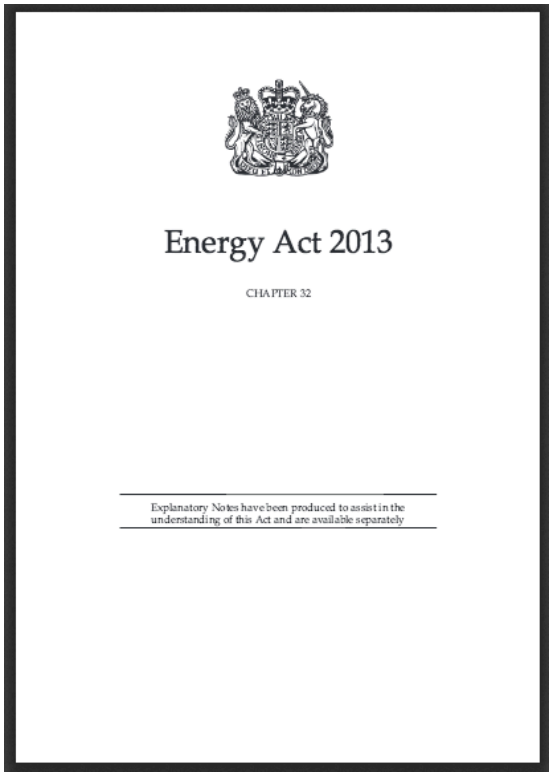
** Past Mechanism (or never implemented)

*** Multiple capacity mechanisms of the same type

Source: European Commission based on replies to sector inquiry

Electricity market reform processes

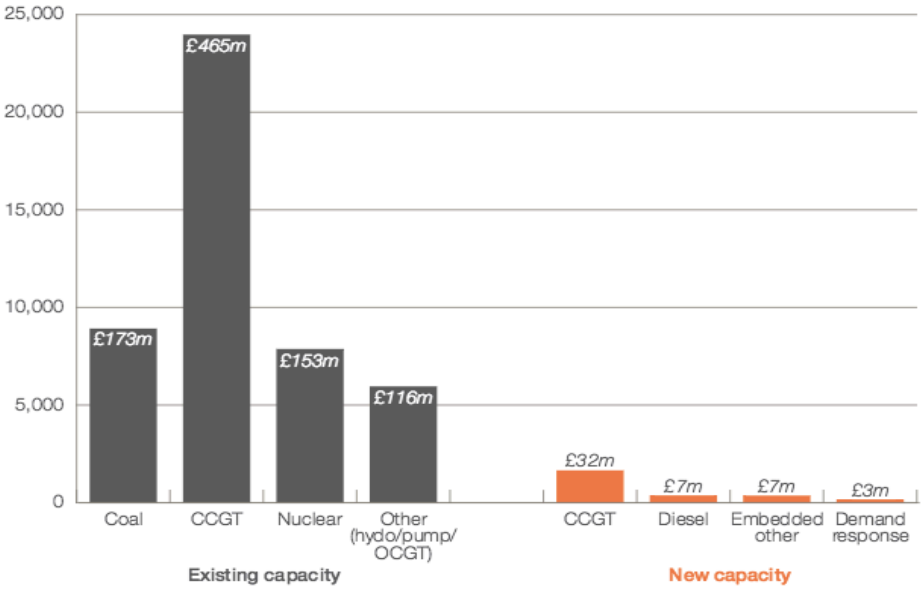




UK EMR – innovation friendly?

"Encourage the investment we need to replace older power stations and provide backup for more intermittent and inflexible low-carbon generation sources" (Amber Rudd)

Figure 3.1
New plants lost out in the 2014 capacity market to older generators
Size of contracts (MW and £m) awarded to new and existing plans in the 2014 T-4 auction, by generation type for delivery year 2018/19 (2012 prices)



Source: Jones 2014

Germany's 'Electricity Market 2.0'

The Electricity Market 2.0 OPTION *"An optimised electricity market guarantees security of supply"*	The Capacity Market OPTION *"The state must take action to ensure security of supply"*
How it works	**How it works**
• The electricity market provides incentive for the maintenance of capacity. The necessary maintenance of capacity is refinanced through the electricity market.	• The capacity market provides incentive for the maintenance of capacity. The necessary maintenance of capacity is refinanced through an additional capacity market.
• The state sets the rules of the market. Through their specific demand, the electricity customers are independently responsible for determining the capacity level.	• The state ensures a higher level of capacity than the electricity market.
• Implicit payment for capacity on the electricity market and explicit payment on the balancing market and in options and delivery contracts, for instance.	• Explicit payment for capacity on the capacity market.

- Capacity reserve for extreme events – key difference is plants taken out of energy market
- 2.7GW Lignite reserve – achieving climate target and phase out by 2020

BMWi, 2015

The new politics of electricity market design – towards hybrid markets

- **Market purists** - "remove all policy intervention that distorts market prices and internalise the climate externality with a strong carbon price"

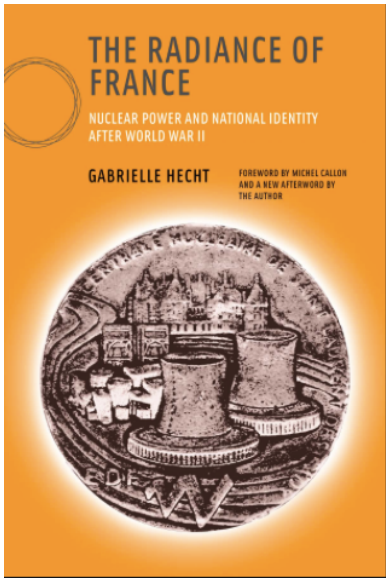
- **Climate change planners** - "minimise the financing cost of low-carbon generation investments by insulating investors from market risk, introducing procurement auctions for power purchase agreements for low-carbon generation projects. Ultimately, following this logic would lead to the abandonment of competitive markets"

IEA, 2016

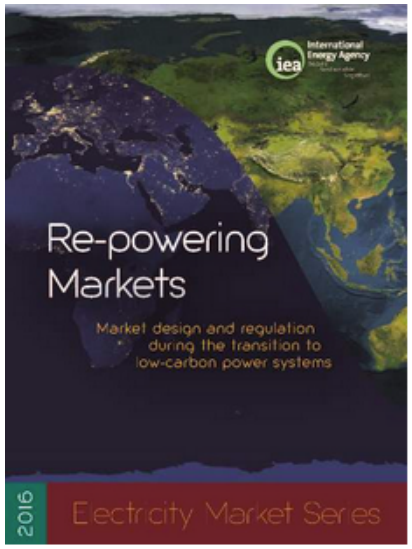
Concluding remarks

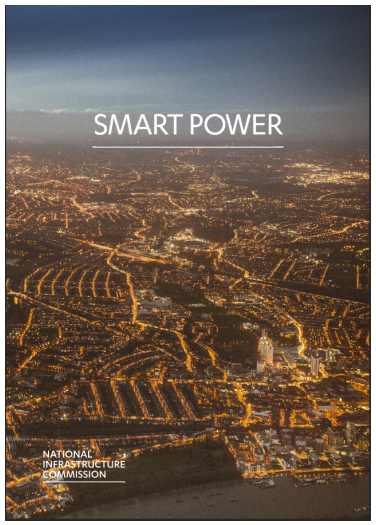
Electricity market design as a form of 'technopolitics'

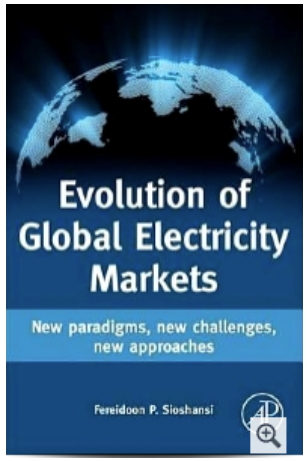
"Many fundamental technical choices – such as choices about system design and programmatic development – have significant and inseparable political dimensions" (Gabrielle Hecht)



Electricity markets and system transition







Thank you!!

- **Contact:** Ronan.Bolton@ed.ac.uk
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