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The Future of Energy Regulation: with reference to DSOs

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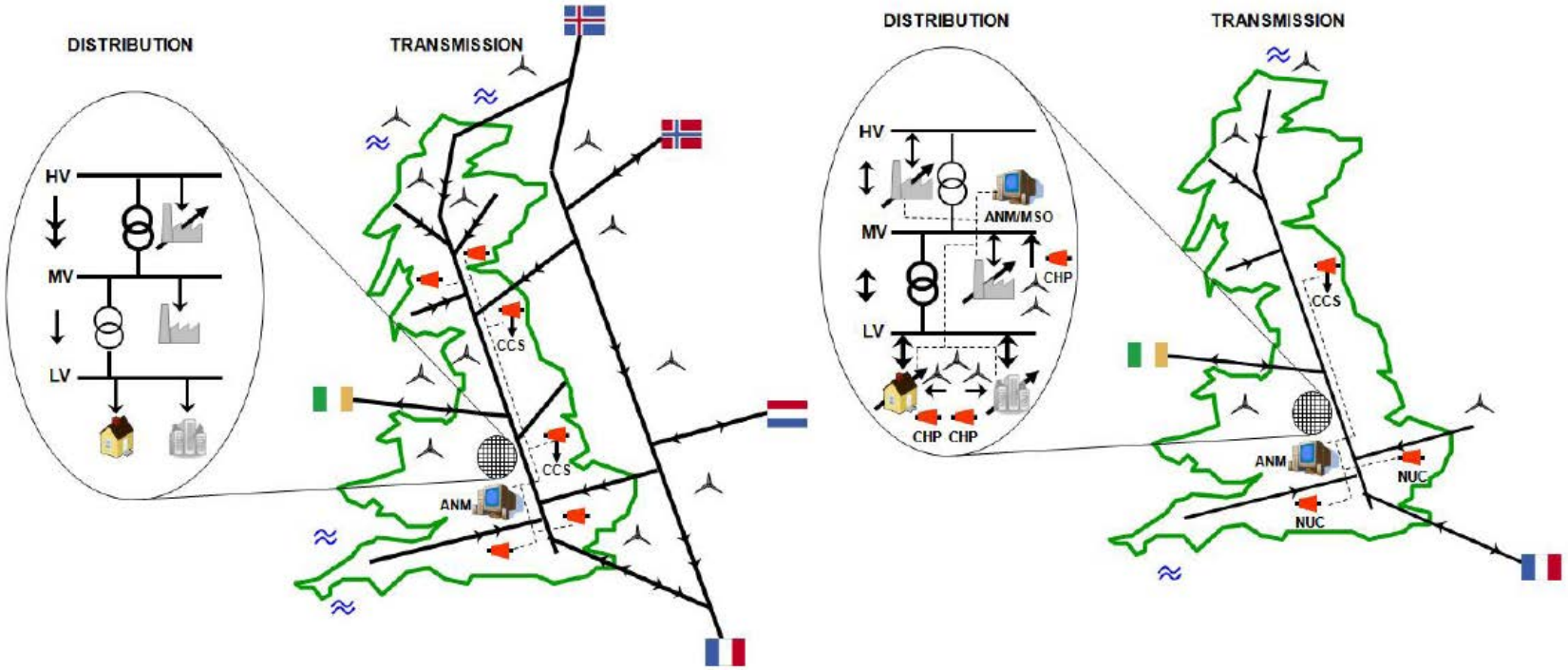
Outline

- Visions of the electrical future
- The objectives of regulation
- The interests of future regulation
- Likely responses of regulators
- Promoting DG in Germany
- Promoting DSPs in New York
- Consumers, Technology and Regulation

A view from 2008: Uncertainty about the Future, The UK power grid in 2050 (two scenarios)



Big transmission and distribution

Micro-grids

LENS: Long Term Electricity Network Scenarios

See: Ault et al., 2008

Table 1: The LENS scenarios

Big Transmission and Distribution (T&D) – in which transmission system operators (TSOs) are at the centre of networks activity. Network infrastructure development and management continues as expected from today's patterns, while expanding to meet growing demand and the deployment of renewable generation.
Energy Service Companies (ESCOs) – in which energy services companies are at the centre of developments in networks, doing all the work at the customer side. Networks contract with such companies to supply network services.
Distribution System Operators (DSOs) – in which distribution system operators take on a central role in managing the electricity system. Compared to today, distribution companies take much more responsibility for system management including generation and demand management, quality and security of supply, and system reliability, with much more distributed generation.
Micro-grids – in which consumers are at the centre of activity in networks. The self-sufficiency concept has developed very strongly in power and energy supplies. Electricity consumers take much more responsibility for managing their own energy supplies and demands. As a consequence, microgrid system operators (MSOs) emerge to provide the system management capability to enable customers to achieve this with the new technologies.
Multi-purpose Networks – in which network companies at all levels respond to emerging policy and market requirements. TSOs still retain the central role in developing and managing networks but distribution companies also have a more significant role to play. The network is characterised by diversity in network development and management approaches.

Source: Ault et al., 2008, Forward by Stuart Cook.

LENS scenario implications: Some principles

- Value in keeping options open at start
- Presumption of engagement between players
- Use of competitive mechanisms where possible
- Vertical unbundling of supply/distribution/system operation remains a key issue
- Private wire and horizontal wire unbundling possible
- New kinds of licenses needed (e.g. for heat/ESCOs)

- Observations:
  - Elements of all LENS scenarios visible.
  - However disruptive technologies exist: IT, batteries and PV.

Future infrastructure economics

- Assume networks might compete, be duplicated or bypassed (gas, electricity and telecoms for parts of energy services).
- Monopolist capital/hardware (i.e. wires / transformers / switchgear) will get more expensive relative to software/consumer equipment.
- Information processing (and perhaps labour) will get cheaper relative to monopoly capital.
- Legitimacy of regulated charges will subject to increasing scrutiny as more components are potentially competitive.

Future infrastructure regulation

- Regulators will be become more competitive and more subject to comparative regulation themselves.
- Regulators will face the choice between becoming more or less involved in corporate decision making in the face of rising complexity.
- Regulators should rightly encourage ‘smart’ and ‘labour’ based (i.e. local) solutions rather than expensive unique capital investments.

The interests of future regulation

- If the future will be characterised by more DG and DSM (i.e. distributed energy resources - DERs).
  - This must mean active DSO networks.
- **Economic Regulation** will focus on:
  - Monopoly power of DSOs with respect to both
  - Development of competition for DSO services
  - Quality of service effects of DG/DSM
  - Financial regulation of entities selling to consumers
  - Implications for vulnerable consumers

What do DSOs do? (EPRI, 2014)

- Provide reliability in face of intermittency
- Startup power via peak current
- Voltage support
- Equipment efficiency via harmonics
- Energy transactions with rest of system

- *Do all these need to be provided (rather than procured) by a wide area monopolist?*

How will regulators do future regulation?

- At the transmission level we already see the emergence of ISO/thin regulator vs TSO/thick regulator split (Strbac et al, 2013).
- Is this choice even possible at the DSO level as distribution systems become more active networks? Regulators may have no choice but to delegate to trusted third party/market.
- As distribution network owner, customer and third party assets compete regulation looks challenging.

Five likely responses of regulators

(Pollitt, 2008a, Haney and Pollitt, 2009, 2013a)

- More use of negotiation between buyers and sellers of network services to deal with regulatory complexity.
- Attempts to increase competition for the provision of network services by creation of markets or use of procurement auctions.
- More focus on access terms and bottlenecks created by DSOs, i.e. quality of access to DG and DSM.
- More use of innovation funding mechanisms and incentives to use smarter solutions.
- More use of horizontal and vertical unbundling within distribution networks.

Likely regulatory developments

- More customer engagement generally as this will be expected by all parties.
- Quality of access strongly incentivised (e.g. under ED1 in GB, see Ofgem, 2014).
- Innovation funding from governments and customers (as in GB).
- Regulatory pressure to unbundle e.g. creation of DSPs in NY. IDSOs eventually?
- New business models will emerge and perhaps changes of form of ownership (e.g. Keisling, 2009, Haney and Pollitt, 2013b).

How future proof is RIIO?

- More use of negotiation
  - some progress, but less than in US or Argentina.
- Increase competition
  - limited progress, but less than initially envisaged.
- Focus on access terms
  - some attempt to incentivise responsiveness.
- Innovation funding mechanisms
  - funding as part of DPCR5 but not as proposed.
- Further use of horizontal and vertical unbundling
  - no progress so far.

Promoting DG: The case of Germany

- ‘Unique experience’ (EPRI, 2014):
  - Not a success: worse security, worse environment and higher prices!
  - Interconnected to other grids
  - 68GW of distributed PV and wind (80GW peak)
  - No consideration of integration costs, which were all socialised.
  - Now learning, the hard way.

Promoting DG: The case of Germany

- Recognition that tax arbitrage at work if customers can net off own consumption from electricity they buy from grid, so new charge on own consumption of solar, charge of 4.4c/kWh.
- Voltage control problems of LV circuits due to reverse power flows.
- Risk of mass disconnection to deal with frequency variation.
- Increased generation re-dispatch.
- Lack of stabilising inertia from large power stations.

Promoting DG: The case of Germany

- Regulation changing:
  - Frequency control required on all generators.
  - Voltage control is required from inverters at a retrofit cost of $300m.
  - Upgrade of communications to DG to allow active and reactive power management.
  - Massive increases in grid investment required (27.5-42.5bn Euros to 2030), including expanding distribution circuits by 43%!

- *There must be some learning here in how to avoid much of this cost!*

Promoting DSPs in New York

- New York State regulator launches Reforming the Energy Vision (REV) initiative 22 August 2014.
- The 6 state utilities are to become 'distribution system platform providers' (DSPs):

'The DSP operates an intelligent network platform that will provide safe, reliable and efficient electric services by integrating diverse resources to meet customers' and society's evolving needs. The DSP fosters broad market activity by enabling active customer and third party engagement that is aligned with the wholesale market and bulk power system.'

(State of NY Dept. of Public Service, 2014)

Promoting DSPs in New York

- What the project hopes to achieve:
  - Identification of projects which will use distributed energy resources to reduce costs.
  - Use of DSM projects to serve needs of distribution system.
  - Support development of DERs, such as ESCos.
  - DSP should be widely available, even though provided by incumbent monopolies.
  - Encouragement of a level playing field for new entrants.

Source: Jeff St.John, posted 12 Sept, 2014
http://theenergycollective.com/jeffstjohn/494781/5-key-proposals-new-yorks-grid-transformation

Table 1

Utility and DSP Roles and Responsibilities	Utility	DSP
Market Functions		
Administer distribution-level markets including:		
- Load reduction Market		X
- Ancillary services		X
Match load and generator bids to produce daily schedules		X
Scheduling of external transactions		X
Real-time commitment, dispatch and voltage control		X
Economic Demand Response		X
Demand and Energy Forecasting	X	X
Bid Load into the NYISO	X	
Aggregate Demand Response for sale to NYISO	X	X
Purchase Commodity from NYISO	X	
Metering	X	
Billing	X	X
Customer Service	X	X
System Operations and Reliability		
Monitor real-time power flows	X	X
Emergency Demand Response Program	X	X
Ancillary Services	X	X
Supervisory Control and Data Acquisition	X	X
System Maintenance	X	
Engineering and Planning		
Engineering	X	
Planning / Forecasting	X	X
Capital Investments	X	
Interconnection	X	X
Emergency Response		
Outage Restoration / Resiliency	X	X

Source:
State of NY Dept of
Public Service (2014, p.20).

Real Politics/Economics vs Technological over-optimism?

- Irons laws of price-quality and income - As people get richer they will be more willing to pay for value added energy services, but less interested in given quality adjusted unit price saving.
- The distributional implications of price discrimination by location and time of day – current socialisation of costs between customers in energy bills will be politically difficult to unwind.
- Privacy and cyber-security issues – it is possible that these will dictate the path of technological development (especially if data has to be processed locally).
- .

Customers, Technology and Regulation

- Customers will, likely, value the same elements of distribution service as now and their interest in disruptive change at the DSO level limited.

- The underlying interests of regulators in the future will be as now, with the importation of cyber-security and privacy concerns which already exist elsewhere.

- Regulation should however facilitate rather than prevent socially useful technological developments, thus watching what happens in large scale trials, in Germany and in the US will be important.

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