Distribution Service Providers (DSP)

a transformative energy system institution?

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Setting the context: The current framework for innovation in distribution grids

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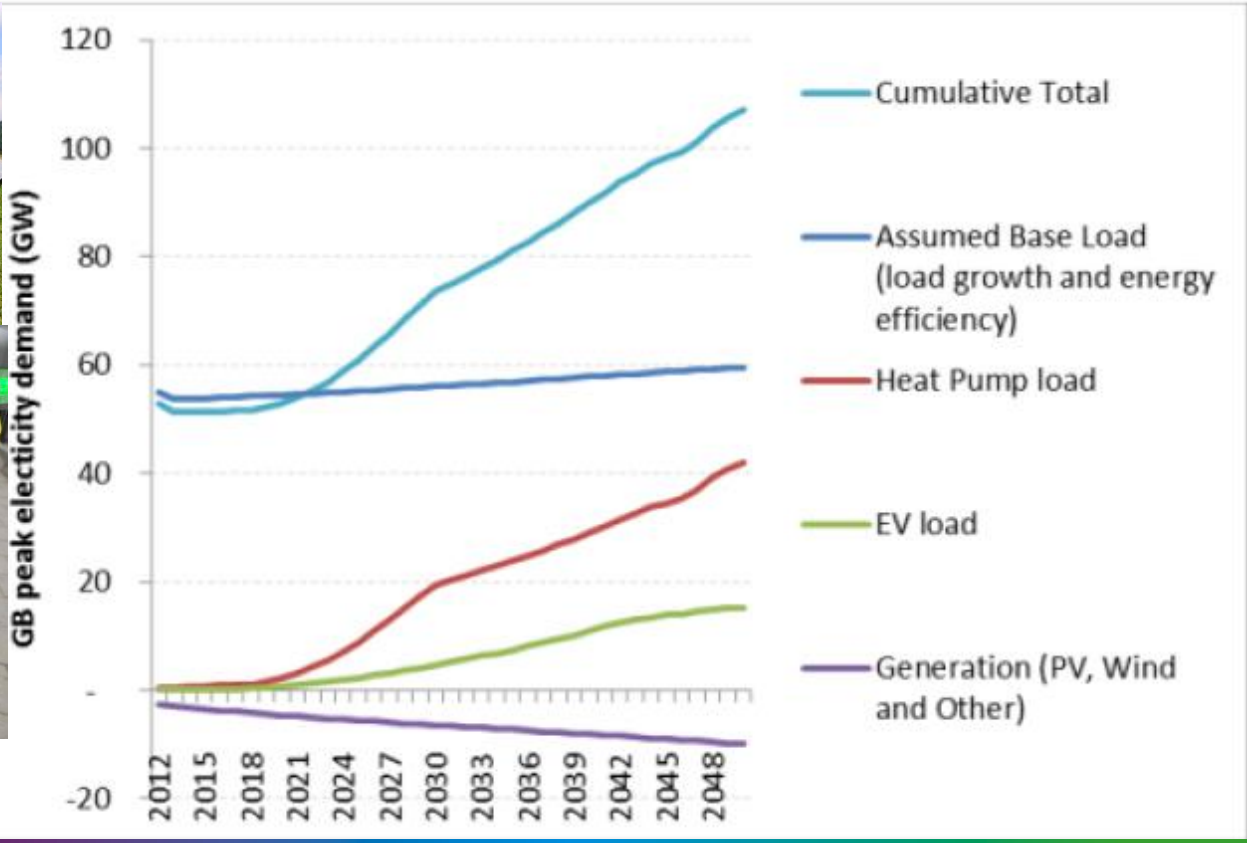
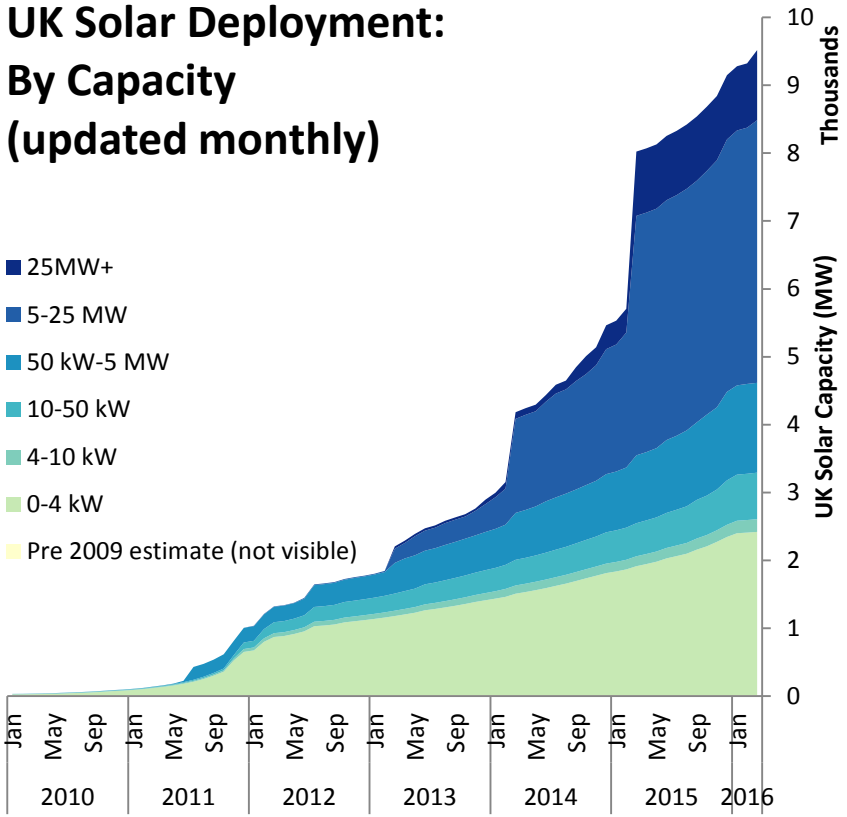
Drivers of change

- Development of ICT for network management and control (‘Smart Grid 1.0’)
- Growth of ‘low-carbon technologies’ in generation (e.g. solar PV) and demand (e.g. electric vehicles) (‘Smart Grid 2.0’)

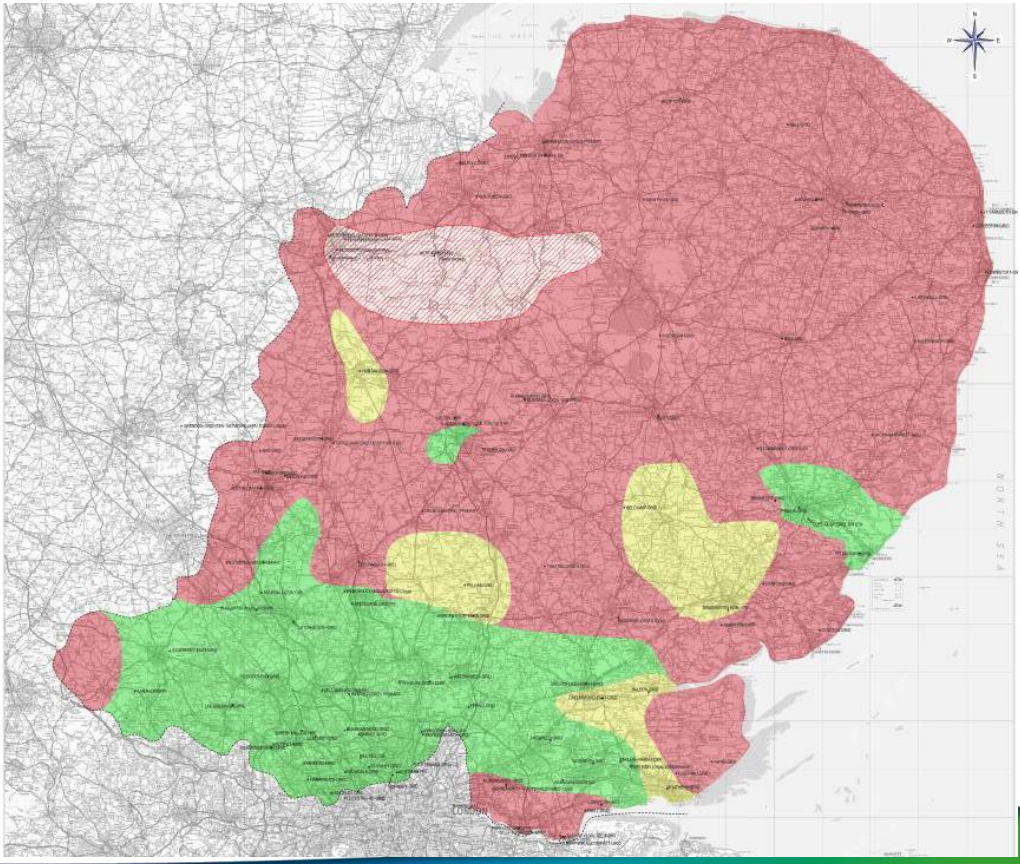
Source: Element Energy 2013



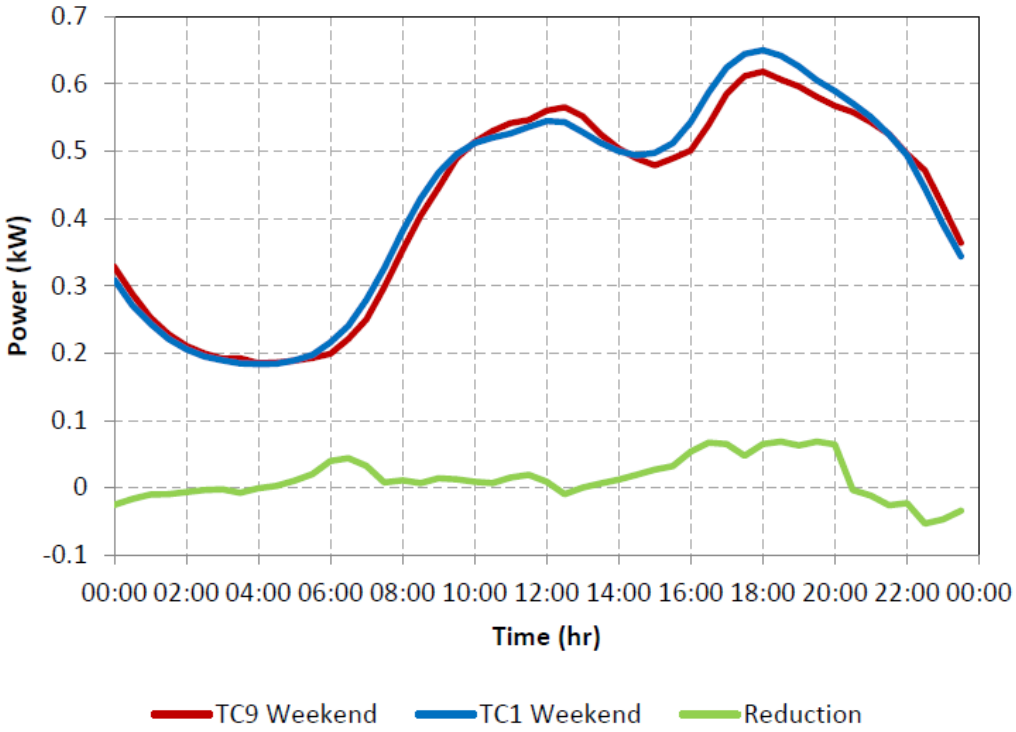
Distributed generation already growing fast



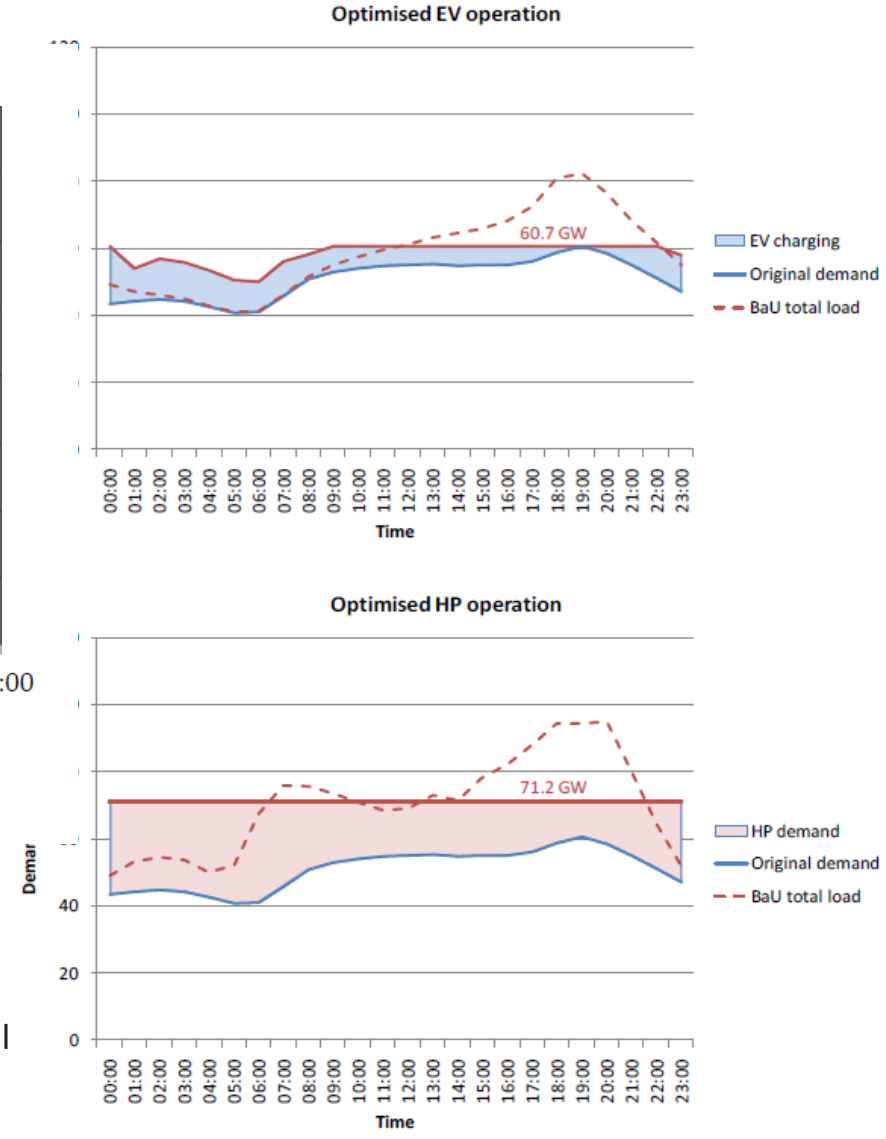
Sources: DECC 2016, Wilson (2013)



DSR for peak reductions?



Source: Jiang et al (2015)



Source: Strbac et al 2010

Smart grids concept

- Use of ICT to monitor and control network operation in near real-time
  - Dynamic line ratings
  - Active network management
  - Voltage management
  - Fault level monitoring and management
- Facilitates and uses local generation (e.g. solar PV), storage, demand-side response to manage power flows and quality and reduce peaks
- Anticipated benefits:
  - Reduced costs to consumers through savings on network costs (est. savings of £2.5bn - £12bn in avoided reinforcement costs by 2050 against BAU) (Smart Grid Forum 2014)
  - Increased energy security and integration of LCTs
  - Growth and jobs (est. £13bn GVA, £5bn potential exports, 9,000 jobs by 2030) (Smart Grid Forum 2014)

Role of network regulation

- Price-cap regulation (RPI-X) from late 1980s incentivised efficiency through short-term cost reductions (< 3-5 years), and focus on reliability (Shaw et al 2010)
- Collapse in network RD&D following privatisation (<0.1% of revenue by early 2000s) (Pollitt and Bialek 2008)
- Culture of solving problems by physical capacity ('fit-and-forget')
- Deterministic engineering planning standards
- "It would be a crude but not an unrealistic simplification to say that the way energy networks are designed, built and operated has not changed significantly since they were built in the post war period." (Smith 2010: 9)

Opening up a space for R&D

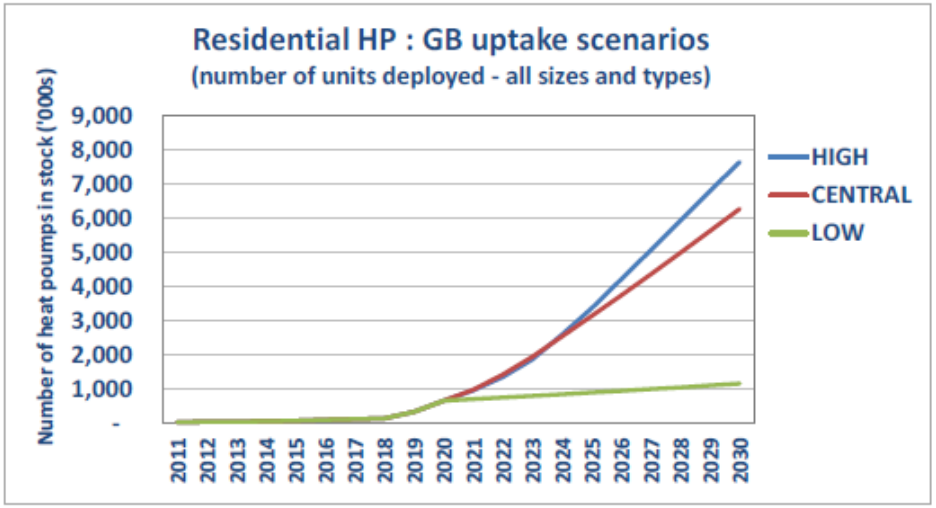
- Creation of 2 funding mechanisms in 2004 for R&D by DNOs: Innovation Funding Incentive and Registered Power Zones
- By late 2000s, senior Ofgem staff recognise need for much larger bolder scheme (“a vehicle for risk-free learning and bringing it into BAU”) (Lockwood 2016)
- Low Carbon Networks Fund, 2010 to 2015, up to £500m over 5 years (~2.3% of allowed revenue); £250m has actually been spent – (EA Technology 2016)
- Network Innovation Allowance/Competition, 2015 to 2023, similar order of magnitude

Amending the regulatory framework

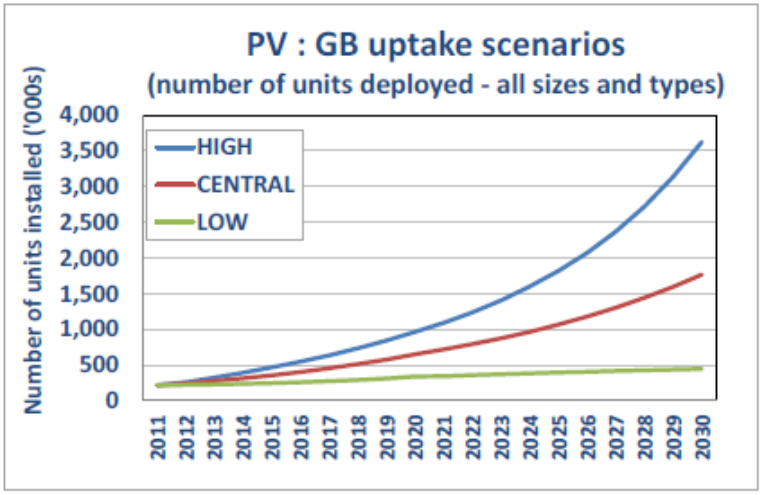
- Major review of network regulation in 2008-10 ('RPI-X@20')
- 'RIIO' = Revenue = Incentives + Innovation + Outputs, from 2010
- Aim is to produce "unprecedented" levels of innovation by network companies
  - Removes perceived bias towards capital spending
  - Longer price control periods (from 5 to 8 years)
  - Allows 'anticipatory investment' on basis on projected LCT growth
  - Requirement for smart grid plan
- Still price cap regulation at core, but with significant output incentives alongside efficiency incentive
- First RIIO price control for electricity distribution networks = RIIO ED1, running from April 2015 to 2023
- ENA-led review of ER P2/6 on Security of Supply under D-Code

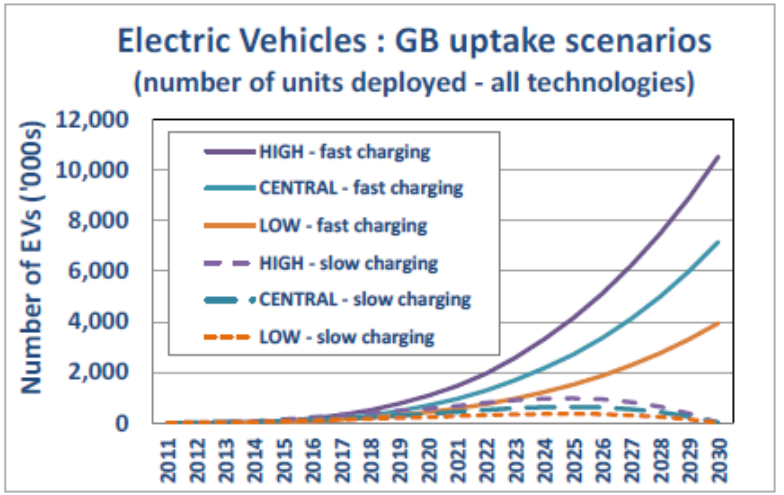
ED1 seen as a preparatory period

Take-up of LCTs expected to be slow before 2020

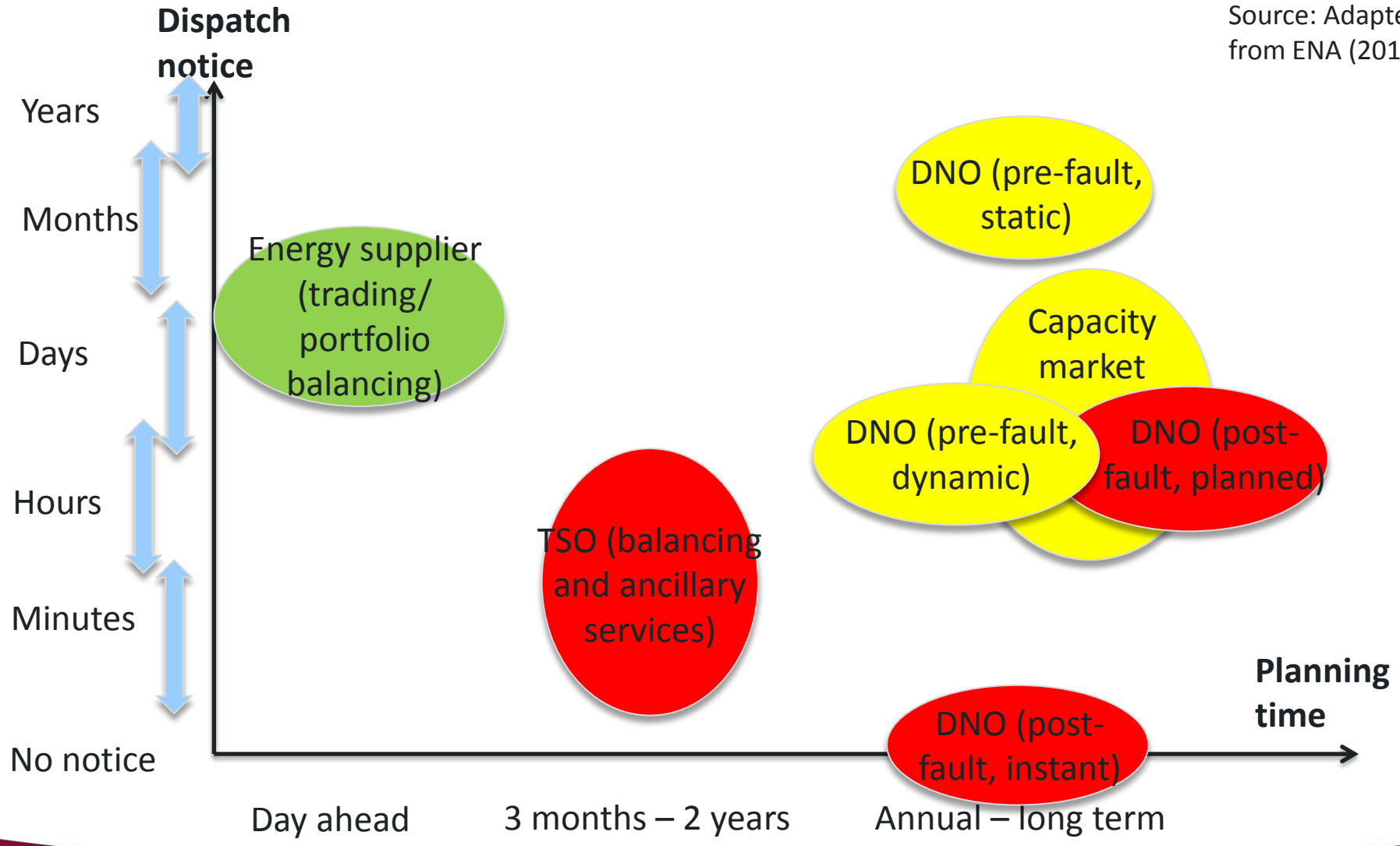


Source: ENA (2012)





DER beyond network needs – Example of DSR



Source: Adapted from ENA (2014)