

Scenarios for the Development of Smart Grids in the UK a DNO perspective on the UKERC Synthesis Report

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UK Power Networks

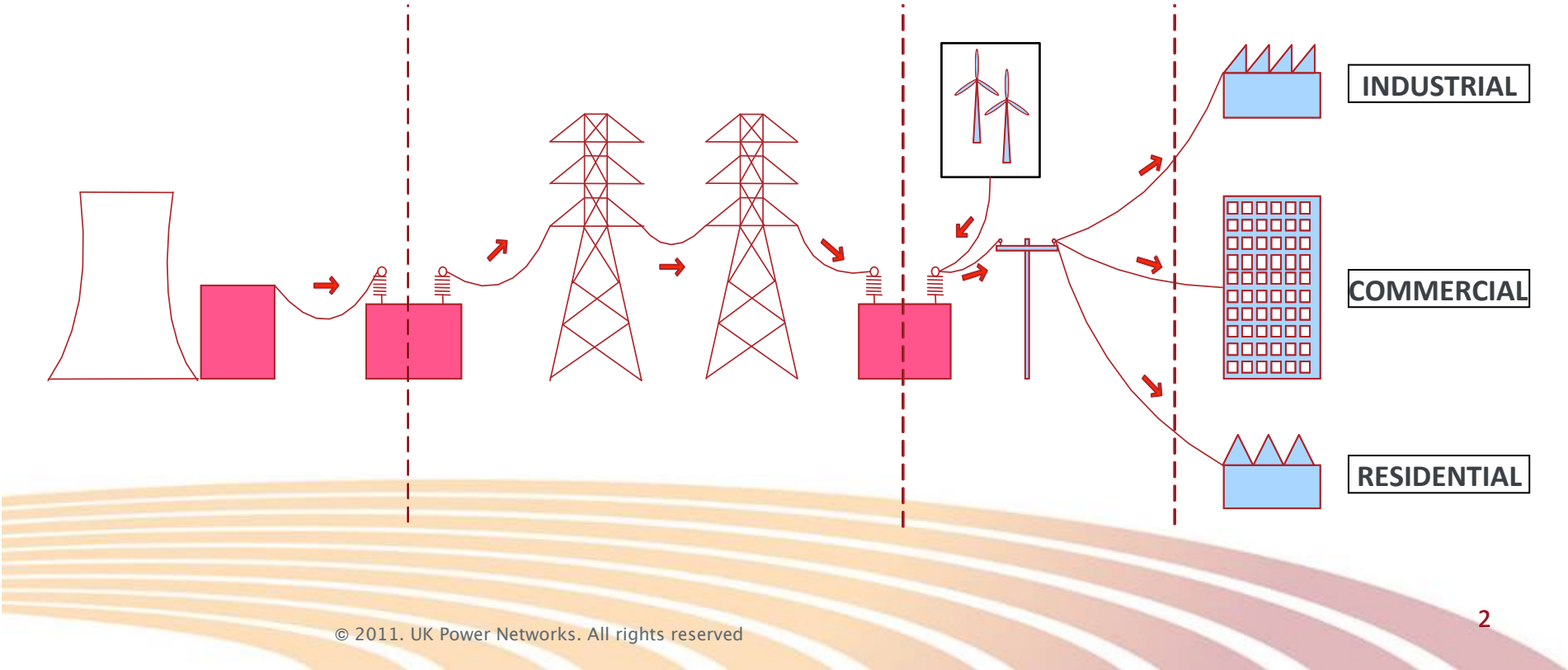


GENERATION

TRANSMISSION

DISTRIBUTION

SUPPLY



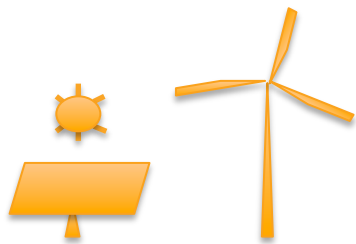
UK Power Networks



	Total	% of industry
Customers (millions)	8	28 %
Service area (km ²)	29,165	12 %
Underground network (km)	134,767	29 %
Overhead network (km)	47,391	15 %
Energy distributed (TWh)	89.4	28 %
Peak demand (aggregate MW)	16,229	N/A

Low Carbon Transition

The challenge for the electricity industry



Variable low carbon electricity generation and DG



LCTs, smart grids, smart metering, and consumer engagement

CHALLENGES

- ❖ Reverse power flow, voltage rise and fault level issues on distribution networks
- ❖ System balancing and stability challenges due to intermittency and reduced inertia
- ❖ Electricity spot price volatility and commercial imbalance risk

SOLUTIONS

- ✓ DSR contracts through Aggregators
- ✓ Active management of DG
- ✓ Reserve and dynamic frequency response from domestic appliances
- ✓ Reserve and frequency response from storage

CHALLENGES

- ❖ Increased electricity consumption above levels networks were designed for
- ❖ Peak demand (power) might increase more than electricity consumption (energy)
- ❖ Cost and disruption impact of major network reinforcement

SOLUTIONS

- ✓ Low carbon technologies could be operated more flexibly (e.g. EV charging)
- ✓ Smart tariffs enabled by smart meters could encourage demand flexibility
- ✓ Smart grid technologies to enhance network capacity and capability

The Scenarios - implications for DNOs

Minimum Start

- Evolutionary network development
- Measured response to technology push
- Network hot-spot management to deal with clusters of DG and LCTs
- Continued R&D effort but weighted towards network performance and efficiency
- Incremental development of smart grids and enablers
- Business focus on cost efficiency and regulatory performance incentives

Groundswell

- Focus on accommodation of DG and integration of micro-grids
- Supporting TSO in balancing actions
- Network hot-spot management to deal with clusters of DG and LCTs
- Continued R&D effort focusing on issues created by DG and network reverse power flows
- Strong consumer engagement
- Leveraging smart meter and residential DSR capability

The Scenarios - implications for DNOs

Smart Power Sector

- Revolutionary network development
- Technology pull to find solutions to LCT challenge
- Focus on technology transfer and risk management of new technology failure modes
- Enhanced R&D effort focused on smart grid solutions to increase network capacity and capability
- Holistic development of smart networks and enablers
- Engineering solutions preside over commercial innovation

Smart 2050

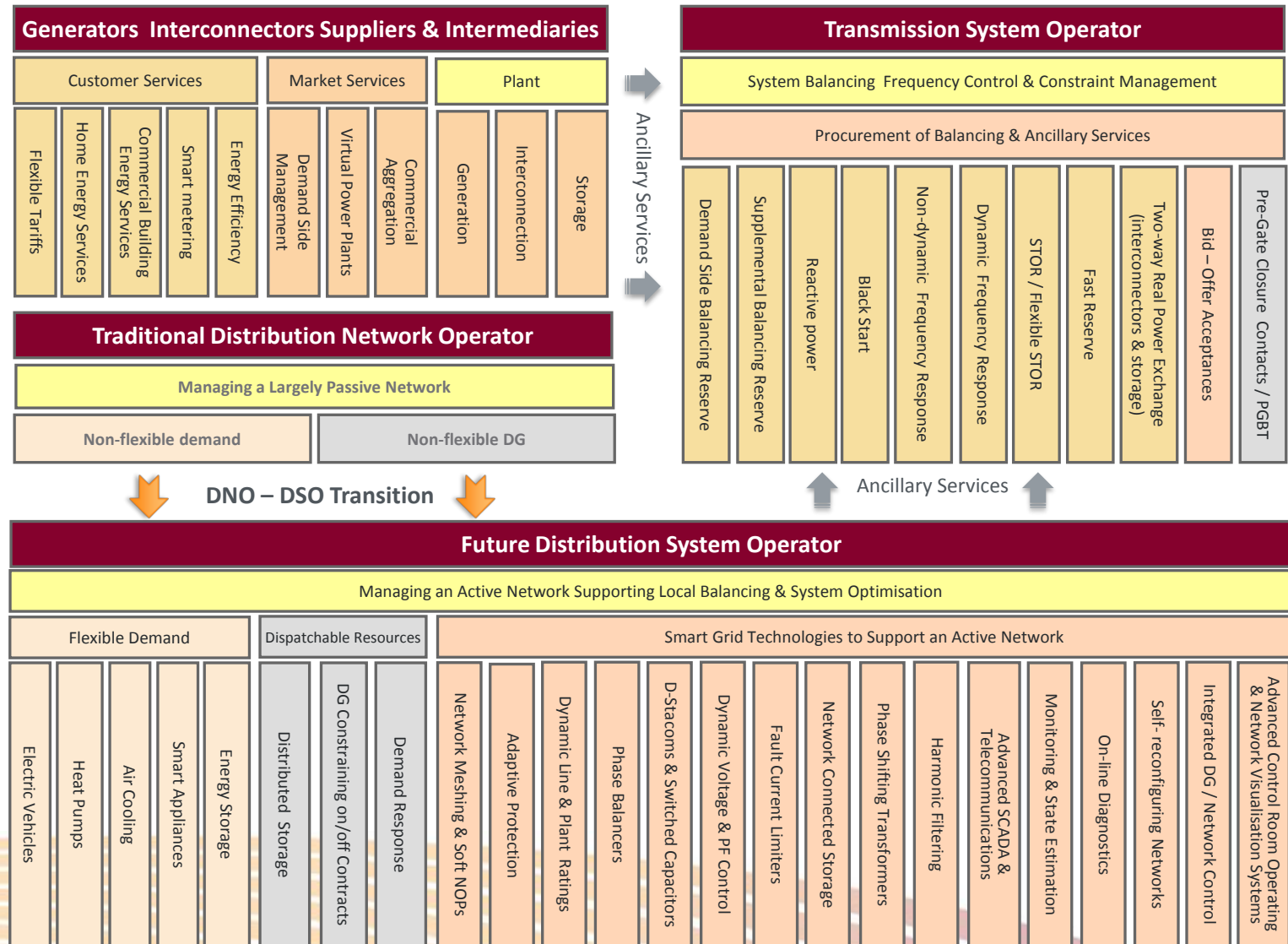
- Revolutionary and rapid network development but with strong focus on consumer integration
- Leveraging upstream capabilities of 'distribution' technological and commercial products
- Holistic development of smart networks and enablers
- Enhanced R&D effort with innovators to support envisaged network transformation
- Leveraging smart meter and residential DSR capability to support distribution networks

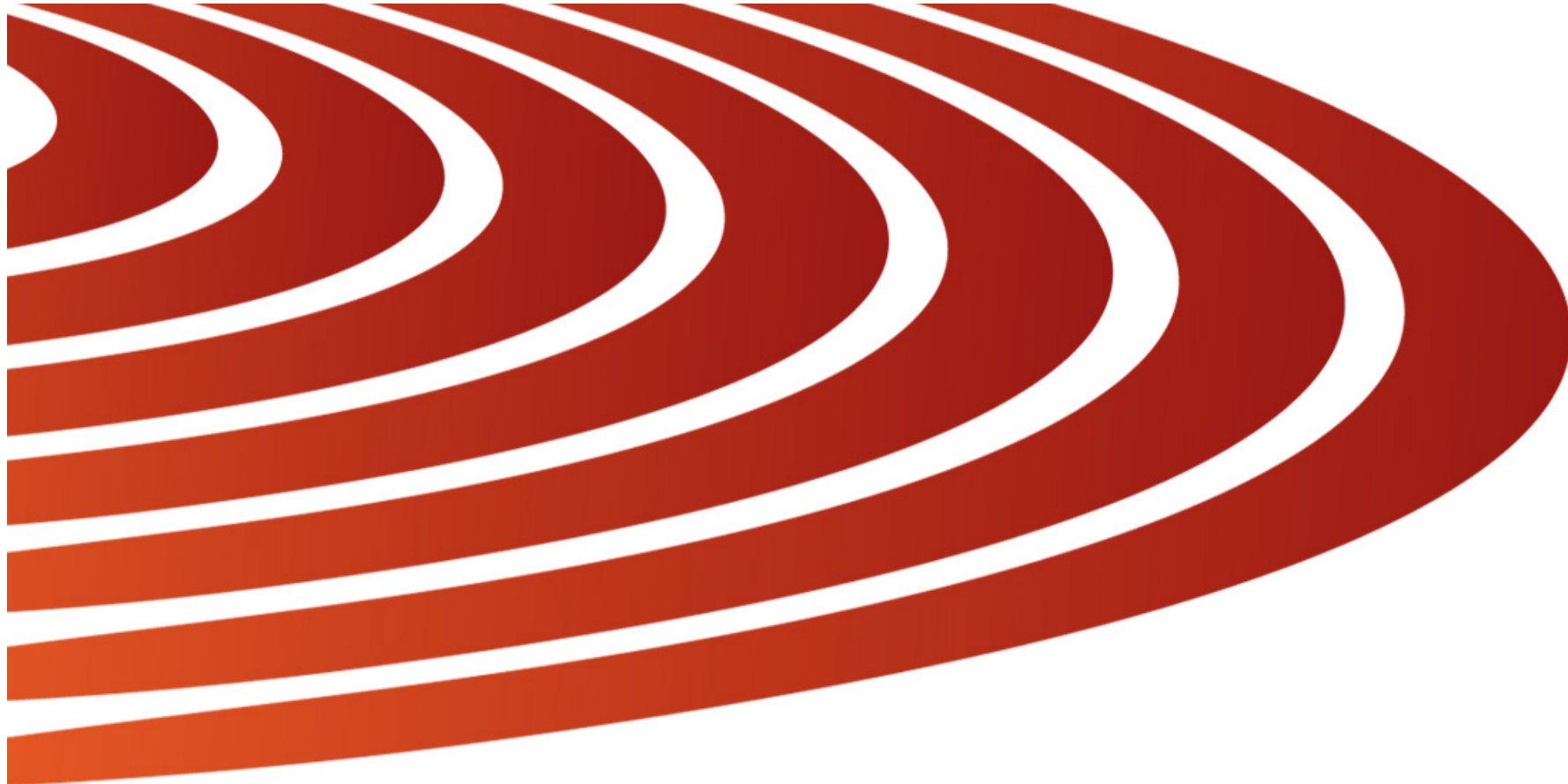
The 'Smart 2050' DNO-DSO transformation

The traditional 'DNO' manages a largely passive network

The future 'DSO' will build and manage an active network:

- exploiting flexibility of demand
- contracting dispatchable energy resources
- deploying a wide range of smart grid technologies
- providing ancillary services to TSO





Thank you

