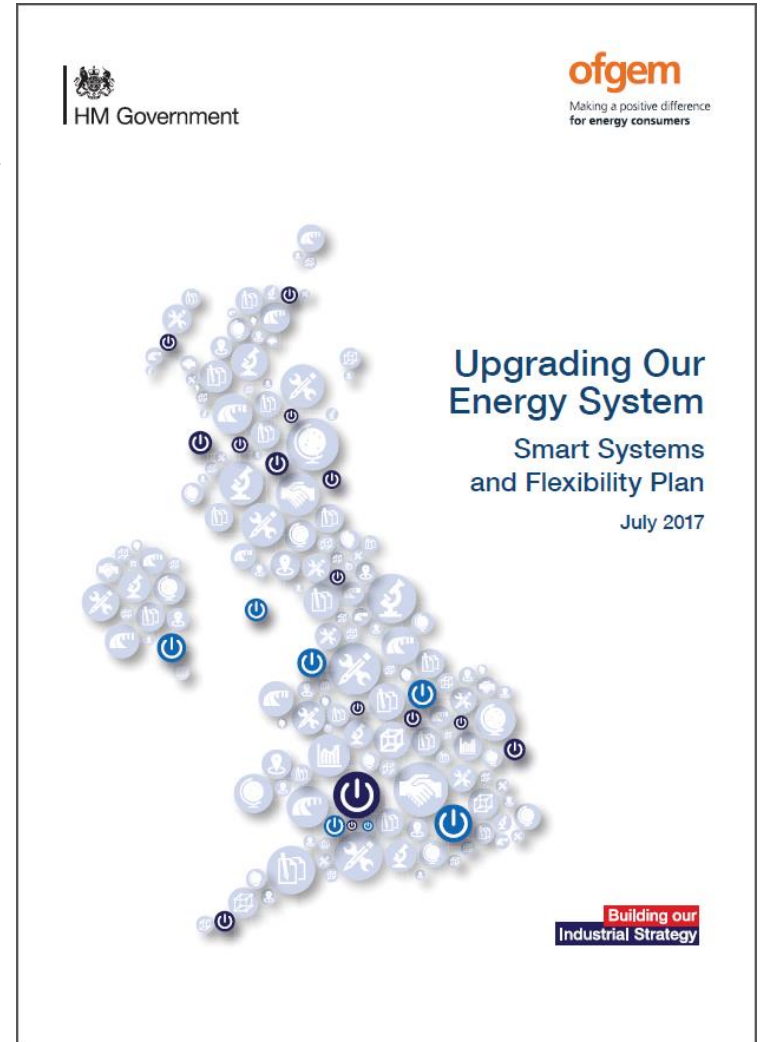


Whole System Approaches for Smart, Flexible Energy Systems

Dr Edward Nelson
Senior Policy Advisor
Smart Energy team, BEIS

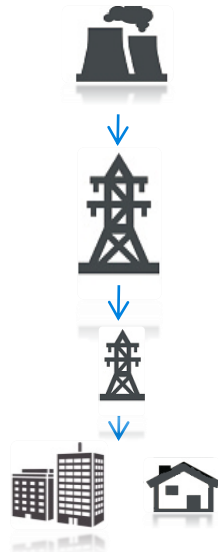


HM Government



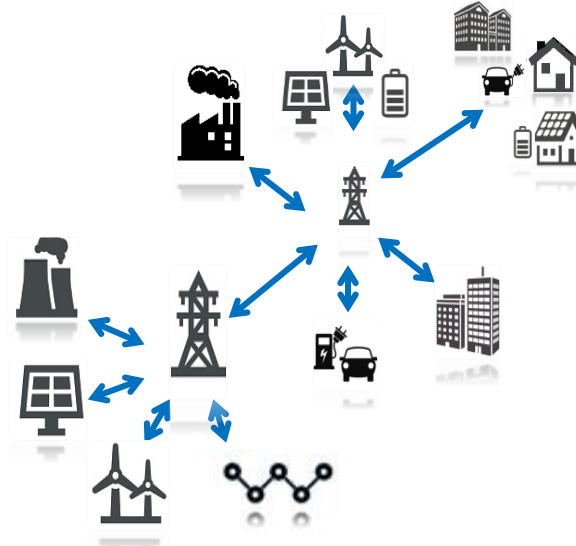
Our electricity system is undergoing fundamental change

Yesterday



- Carbon intensive
- Centralised generation
- Predictable supply to consumers

Emerging System – increased dynamism



- Distributed
- Low carbon
- Interconnectors
- Storage & DSR
- Electric vehicles/heat
- Smart grids, IoT

Research by the Carbon Trust & Imperial College estimates the benefits of a smart, flexible energy system at **£17-40bn** to 2050.

Our vision

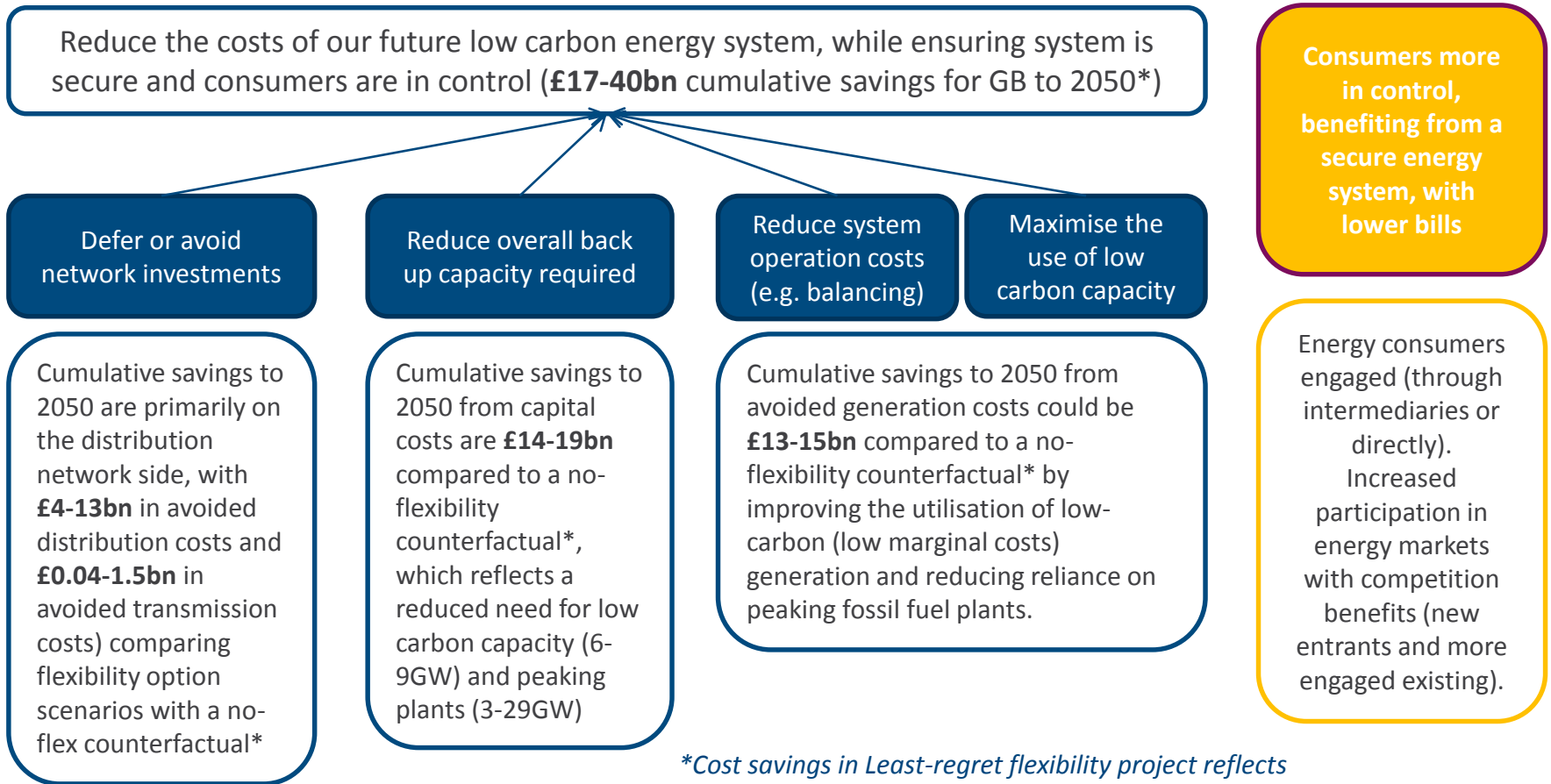
What is a smart, flexible energy system?

A smart energy system uses information technology to manage generation, storage and demand in a flexible, safe and coordinated way; making the system more secure, affordable and clean for consumers.

Our vision is that by 2025...

- All consumers benefit from participating in a smart energy system
- The value of flexibility is reflected within prices, markets and contracts
- New entrants, innovative technologies and disruptive business models can compete on a level playing field with incumbents
- Institutional and market frameworks deliver whole system benefits

Why is it of value to the GB energy system?



Source: Least regret flexibility project (2016)

**Cost savings in Least-regret flexibility project reflects the benefits of all flexibility options, i.e. not just storage and DSR but also interconnection and flexible CCGTs*

Rapid technology change, new business & consumer opportunities

Lithium-ion battery costs have fallen by more than 50% since 2012.



EV sector growing; charging hardware deploying, and can help manage grid demands with V2G

Smart meter roll out underway – more choice and control in the home

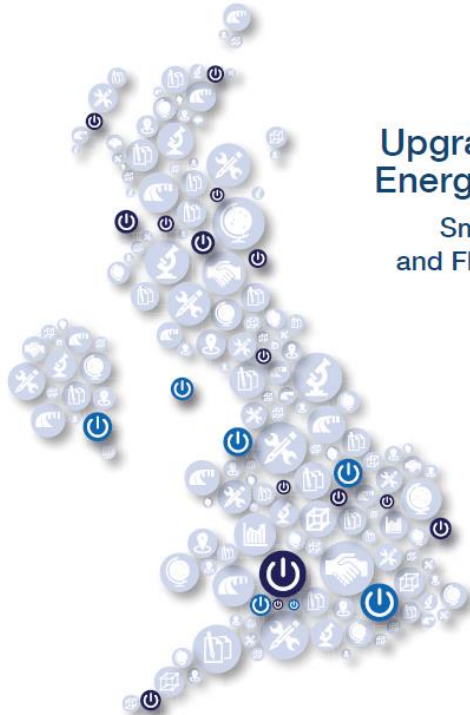


Aggregators working with market leaders to deliver / monetise demand response

Upgrading Our Energy System

Smart Systems
and Flexibility Plan

July 2017



Building our
Industrial Strategy

Approach:

- Remove barriers and create a level playing field
- Ensure markets work for flexibility
- Support innovation

However:

- Cyber-security
- Consumer engagement and protection
- Changing relationship with technology

Removing
barriers to
smart
technologies



Smart
homes and
businesses



Markets that
work for
flexibility



*Deliver regulatory clarity
and ensure fair charges
to create a level playing
field*

- Define storage and ownership rules
- Deliver a storage licence
- Planning reform
- Recalibrate policy/network charges
- Enable co-location with renewables

*Enable greater demand
response participation
among domestic and non-
domestic consumers*

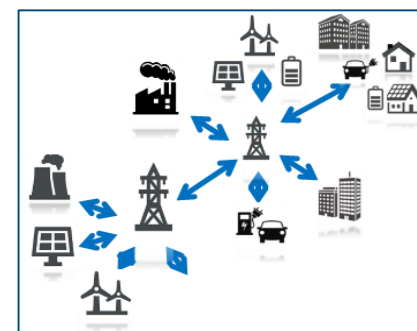
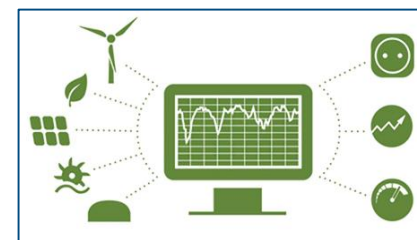
- Deliver smart meters
- Enable time of use pricing
- Appliance standards to enable automation & ensure cyber security

*Ensure markets allow the
best flexible solutions to
emerge and compete
fairly*

- Improve access to markets (e.g. Balancing Mechanism & Ancillary Services)
- Enable value stacking from different markets
- Create new local markets for flexibility

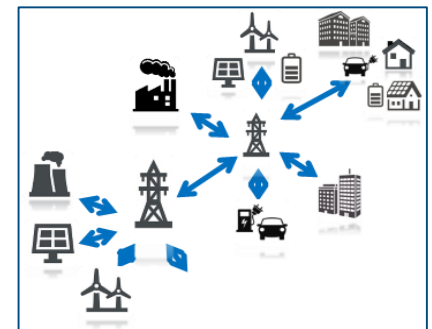
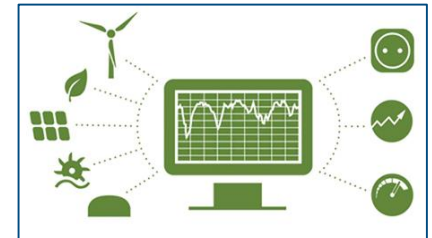
Whole systems thinking

- Industrial Strategy
- Clean Growth Strategy
- Decarbonisation of power, heat and transport
- Changing relationship with technology
- Multi vector (power, heat, transport)
- Generation, storage, consumption
- Decision making and optimisation of energy assets
- Price, markets and revenue
- Business models
- Data
- Scale, scalability and replicability
- Consumers (role, engagement and protection)
- Security of supply, and data



Prospering From the Energy Revolution

- Industrial Strategy Challenge Fund
- £102.5 million
- Focusing on the integration of electricity, heat and transport vectors
- Using smart and other technologies / business models
- Innovate UK – Role to support businesses with innovation
- Careful of bias towards power (Whole Systems thinking)
 - Upfront analysis about *energy* challenge
 - Electricity, heat and transport
- Replicability
 - Be clear how to apply elsewhere/ scale up your project
- Huge consumer aspect to this
 - Multi disciplinary, multi stakeholder



Thank you for listening

