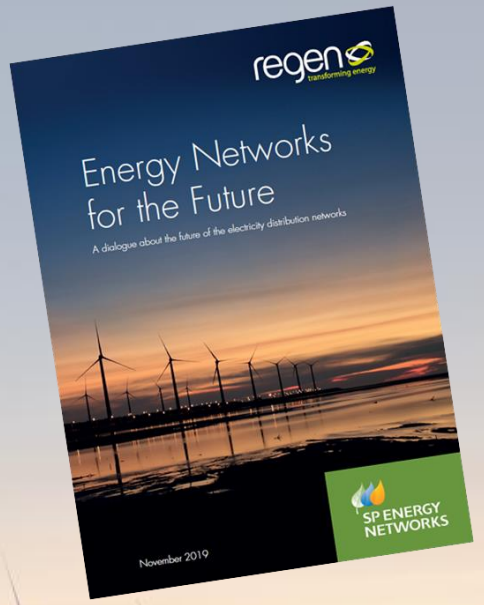
Energy Networks for the Future Paper Launch

Merseyside Maritime Museum, Liverpool

12 November 2019



regen
transforming energy

Energy Networks for the Future

A dialogue about the future of the electricity distribution networks

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Policy Manager

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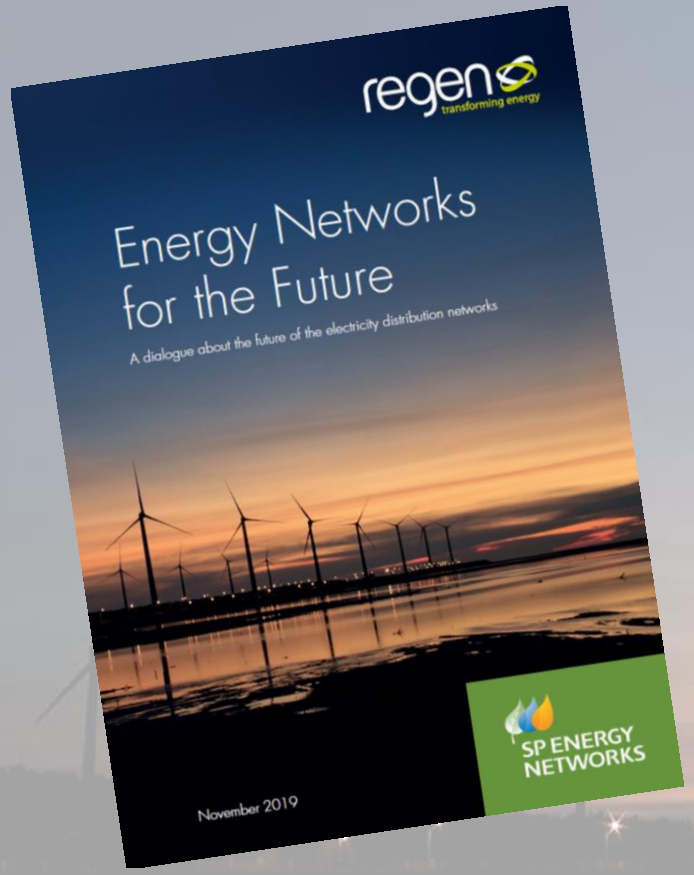
Director

SP ENERGY NETWORKS

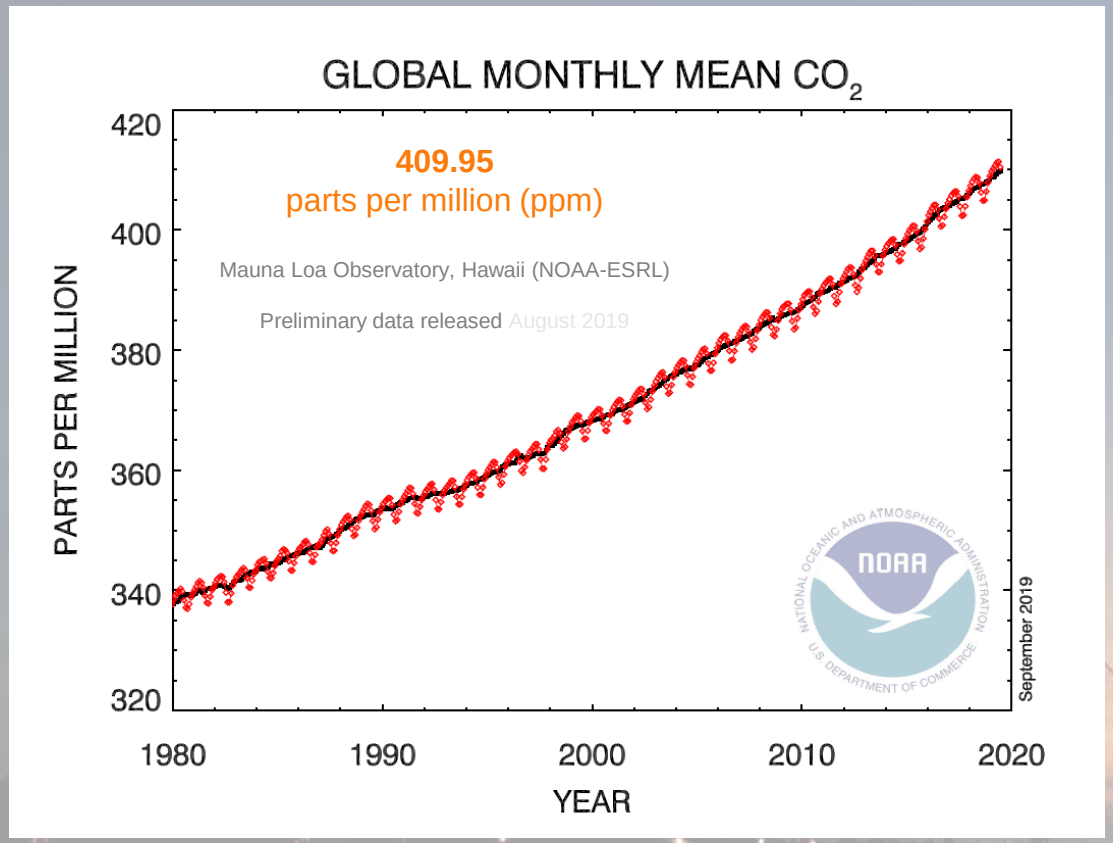
Thinking about the future of energy networks



Key questions:

- How will net zero carbon impact the networks?
- What do we want the networks to deliver?
- How should networks work with local partners?
- Does the regulatory model enable them to do this?
- Can the current model and structure bring forward the strategic investment needed?
- If not, how might it be reformed?
- What role can the networks play to achieve a just and equitable transition?
- And keep costs down and the lights on!

Climate emergency has changed everything



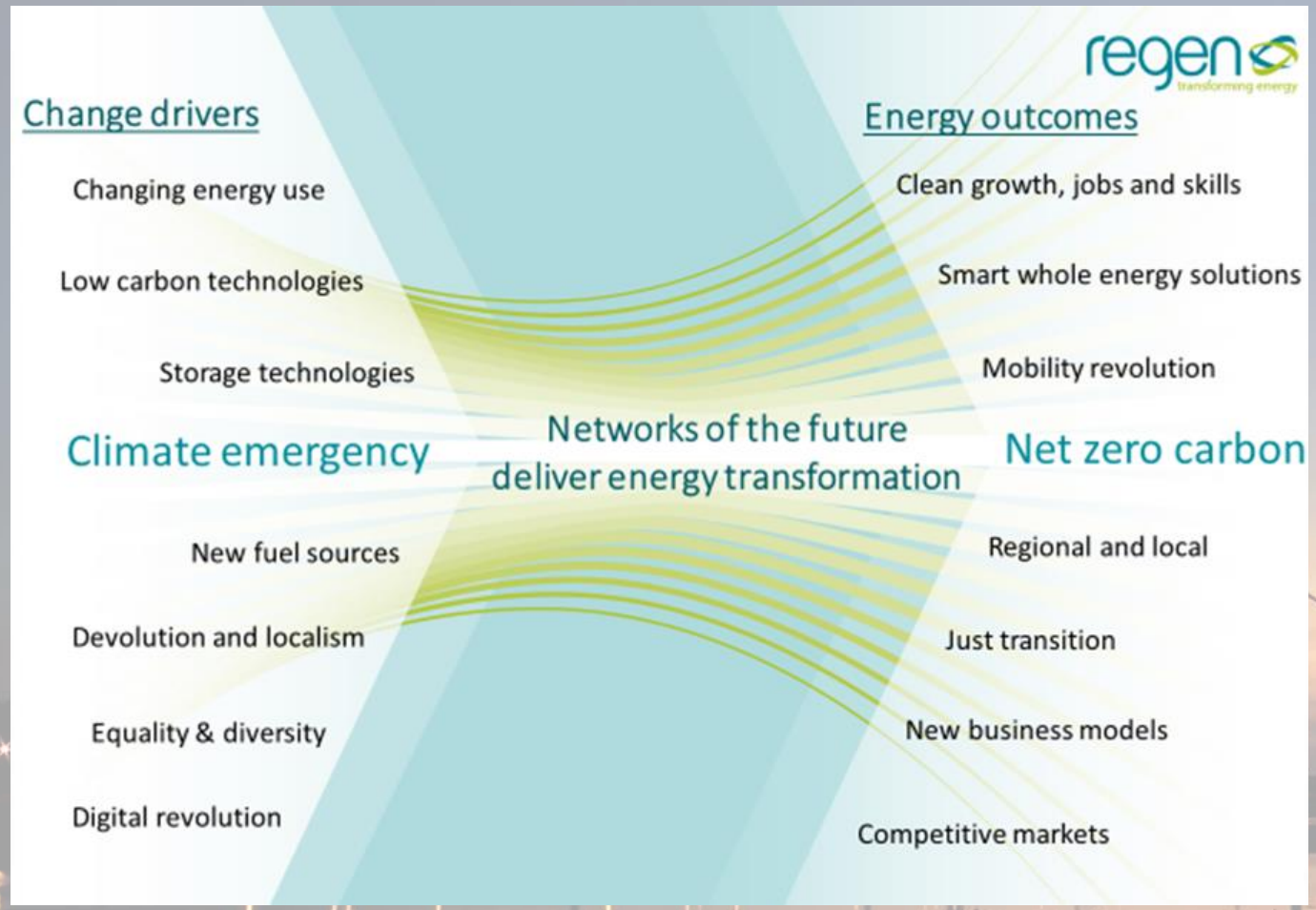
IPCC Special Report
"world is not on track"
October 2018

Global climate emergency protests and school strikes

Local authorities, devolved governments, parishes and communities declare climate emergency

July 2019
Net zero carbon by 2050

Energy is going through a period of transformation

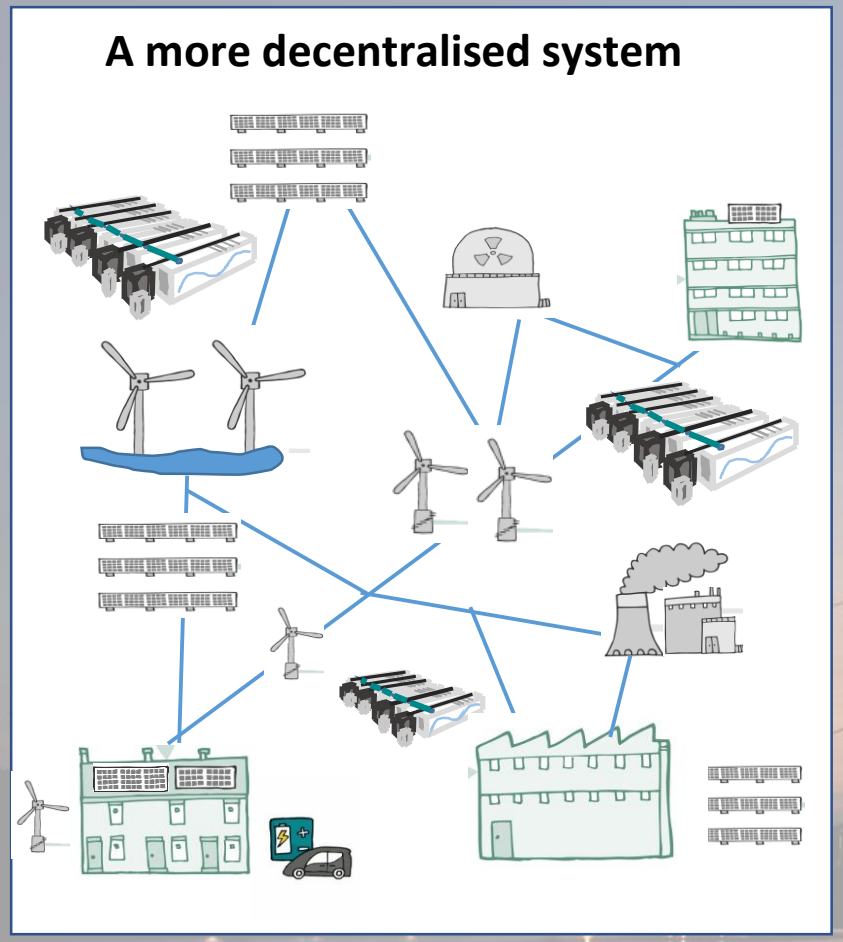


"Networks will be in the spotlight because you are key to delivering the government's low carbon plan including decarbonising Energy transport, and heat.

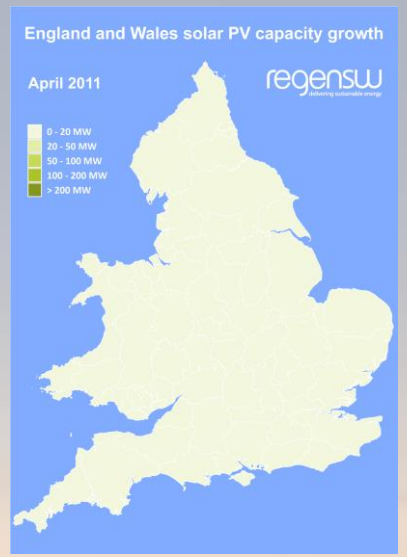
Networks cannot say it cannot be done. Networks must help educate government and people on what it will take to deliver it. "

Lord Deben Committee on Climate Change

Change is already happening



- Renewable energy generation
- Decentralised generation
- Digital and smart energy tech.
- New sources of flexibility
- Changes in demand
- Energy localism



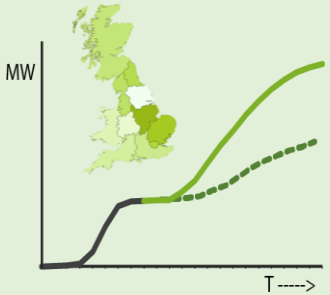
"Our engineers say that 2015 was the last year we operated the system in the way it has operated for the past 50," he says. "The way we are operating now is fundamentally different." John Pettigrew Chief Exec. National Grid

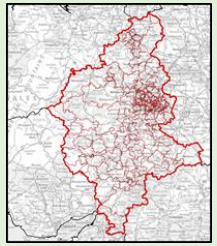
Networks are more proactive and engaged

regen transforming energy

Forecasting → **Network constraints and investment planning**

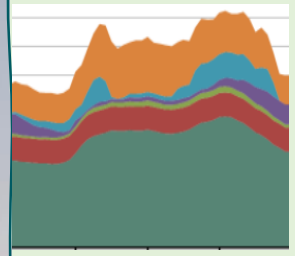
Regional future energy growth scenarios





Load factor by supply area by year

Network constraint and heat mapping



Load profiling | Constraint analysis

Network investment planning

Network and non-network CBA

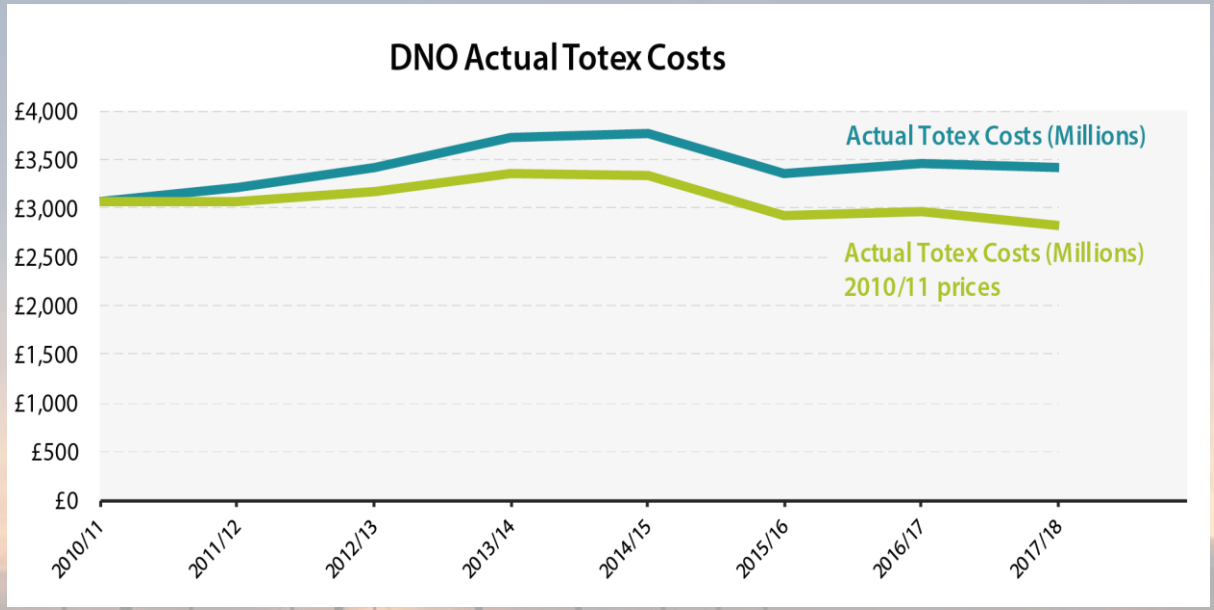
Evidence base and stakeholder engagement

Communities | Customers/developers | Local Authorities/LEPs | City regions & devolved gov

Net zero energy strategy | Housing and development plans | Fuel poverty and social policies | Local economic and industrial strategy

Costs have fallen and service is improving

Customer service measured against a basket of KPIs for customer minutes lost, fault response, connections and customer queries has improved



" Electricity distribution network costs have fallen in real terms by circa 8% since 2010. Average total expenditure (Totex) of circa £115 per customer in 2017/18. "

Future change drivers – massive changes to come

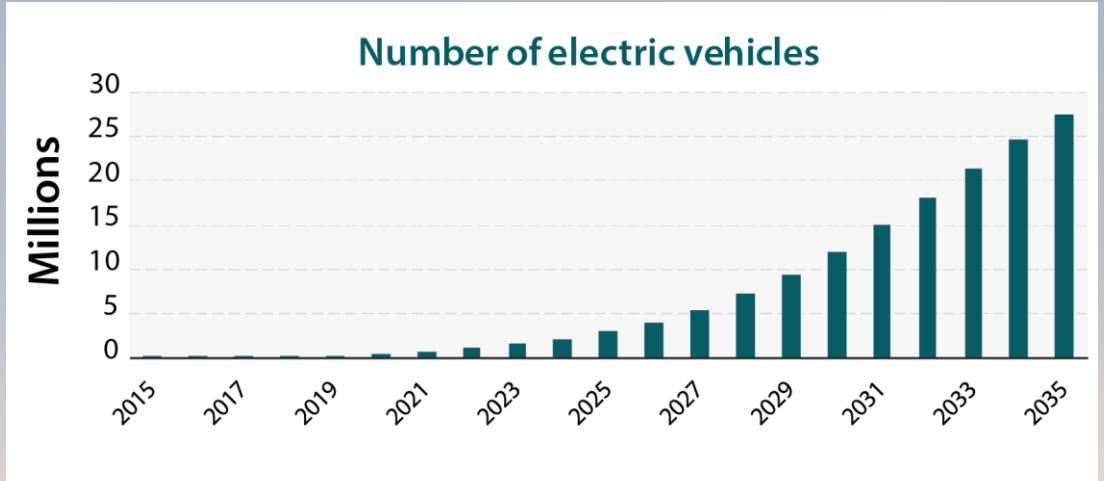
1) Electricity transport revolution which could see 27 million EVs by 2035 requiring 52 TWh of additional electricity annually.

2) Electrification of heat with the potential deployment of 7.3 million heat pumps by 2035, which would require circa 25 TWh per year.

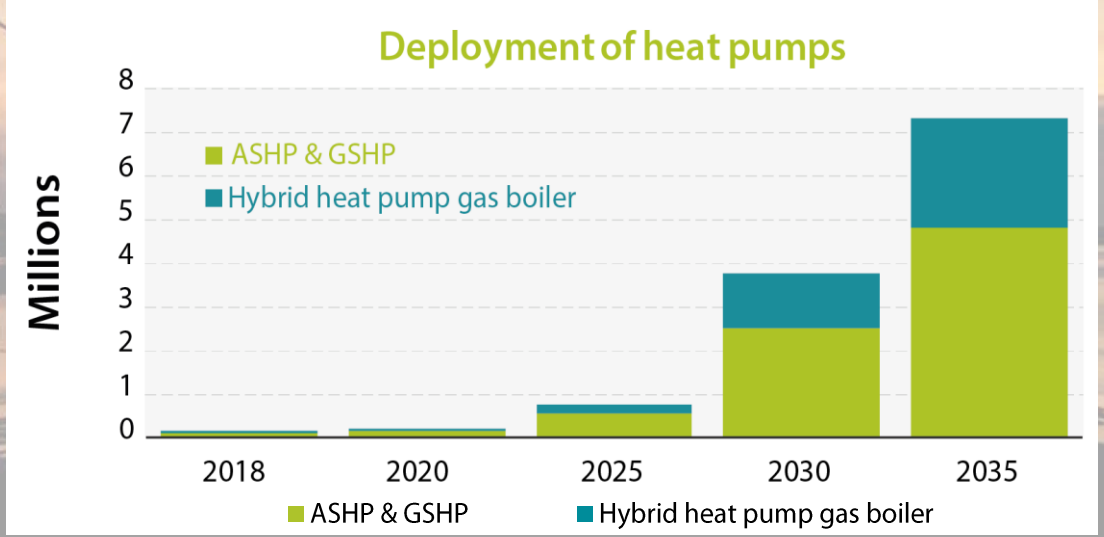
3) Growth of renewable electricity with up to 130 GW of capacity by 2035, compared to 43 GW in 2018, of which up to 50% could be connected to the distribution networks.

4) Increase in industrial demand as industry and commercial properties switch to low carbon electricity to achieve their net zero targets.

5) Potential increase in electricity required to support the manufacture of hydrogen (if via electrolysis).

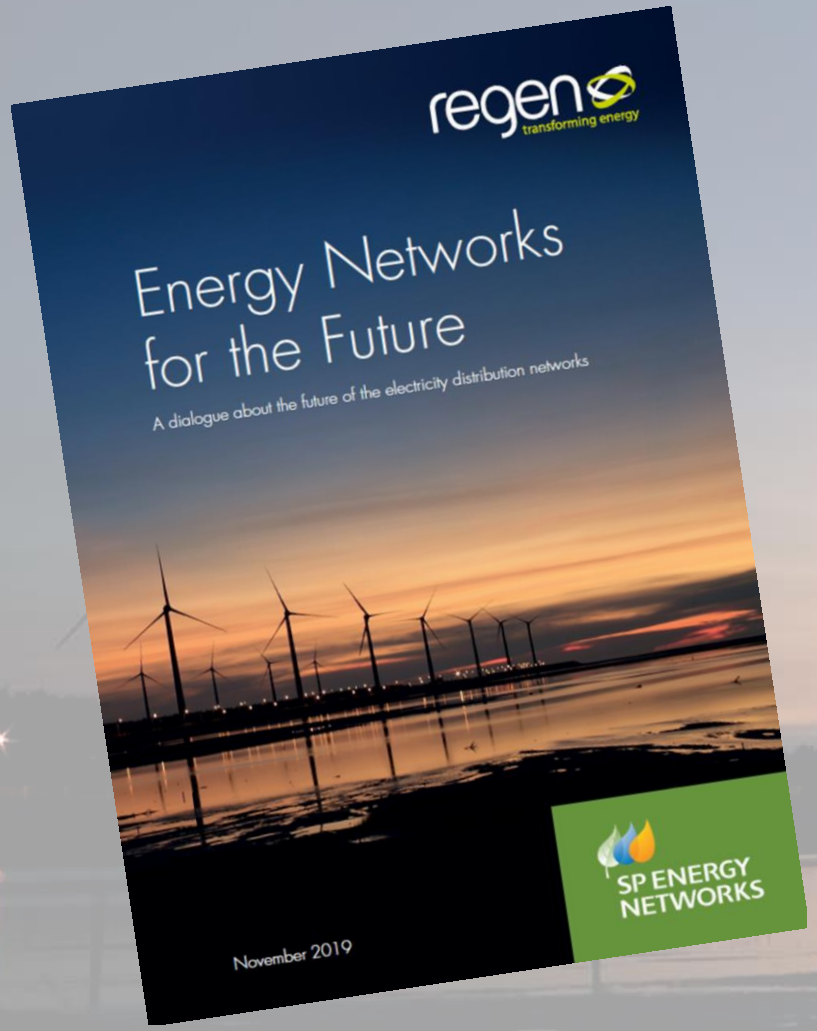


Source: FES 2019 – Net Zero Scenario interpolated to 2035



*Source FES 2019 – Net Zero Scenario interpolated to 2035

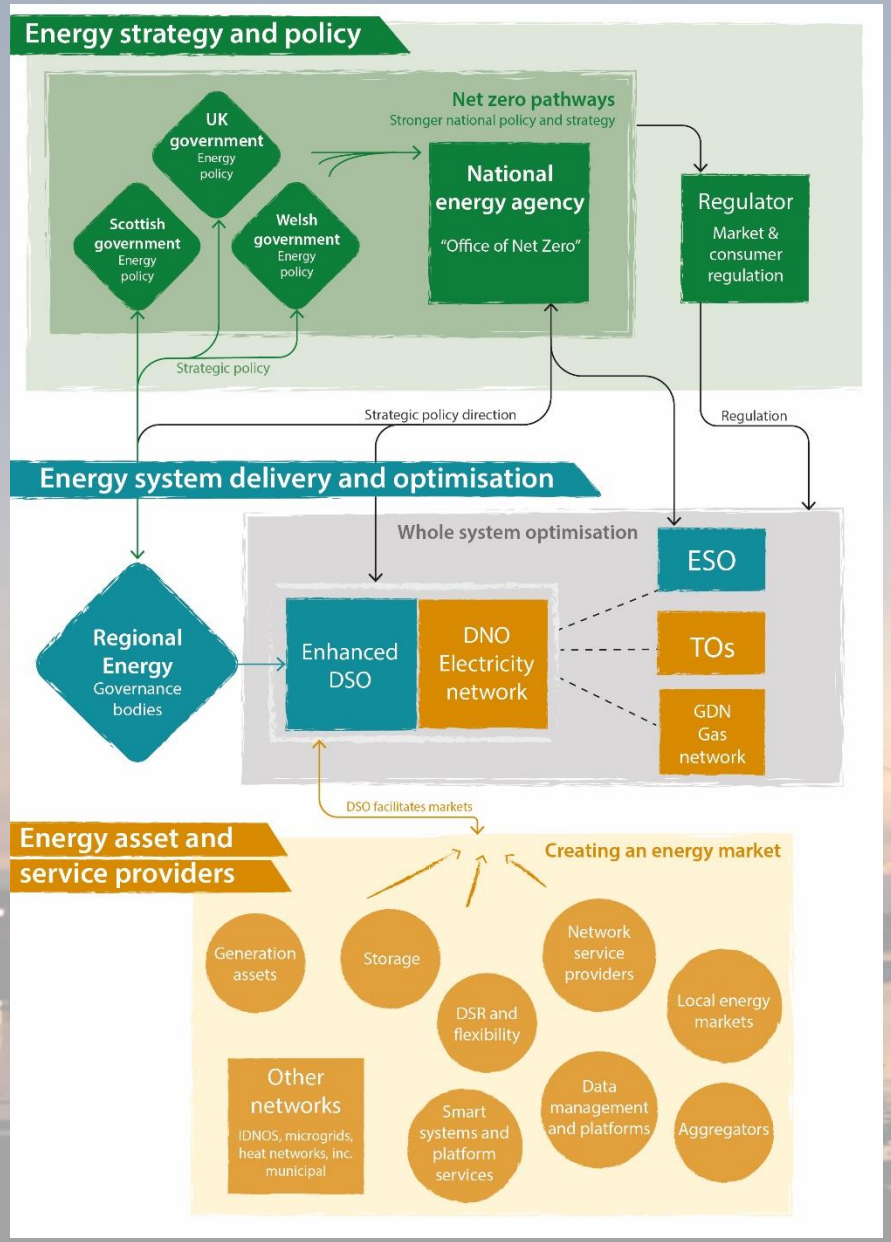
Challenges to the current model



- "Execution gap" - lack of an overall the decarbonisation strategy/pathway
- Decarbonisation objectives and outputs are not explicit
- Networks engage with local partners but struggle to meet their increasing level of ambition both for Net Zero and regional economic growth
- Insufficient support for smart and low carbon flexibility
- Incentives and outputs need to reflect local social objectives from fuel poverty, industrial strategy, health and wellbeing
- Regulatory model is effective for steady state but does not cope well with change, uncertainty and risk
- As a result does not enable long term strategic investment

A sketch of a new model

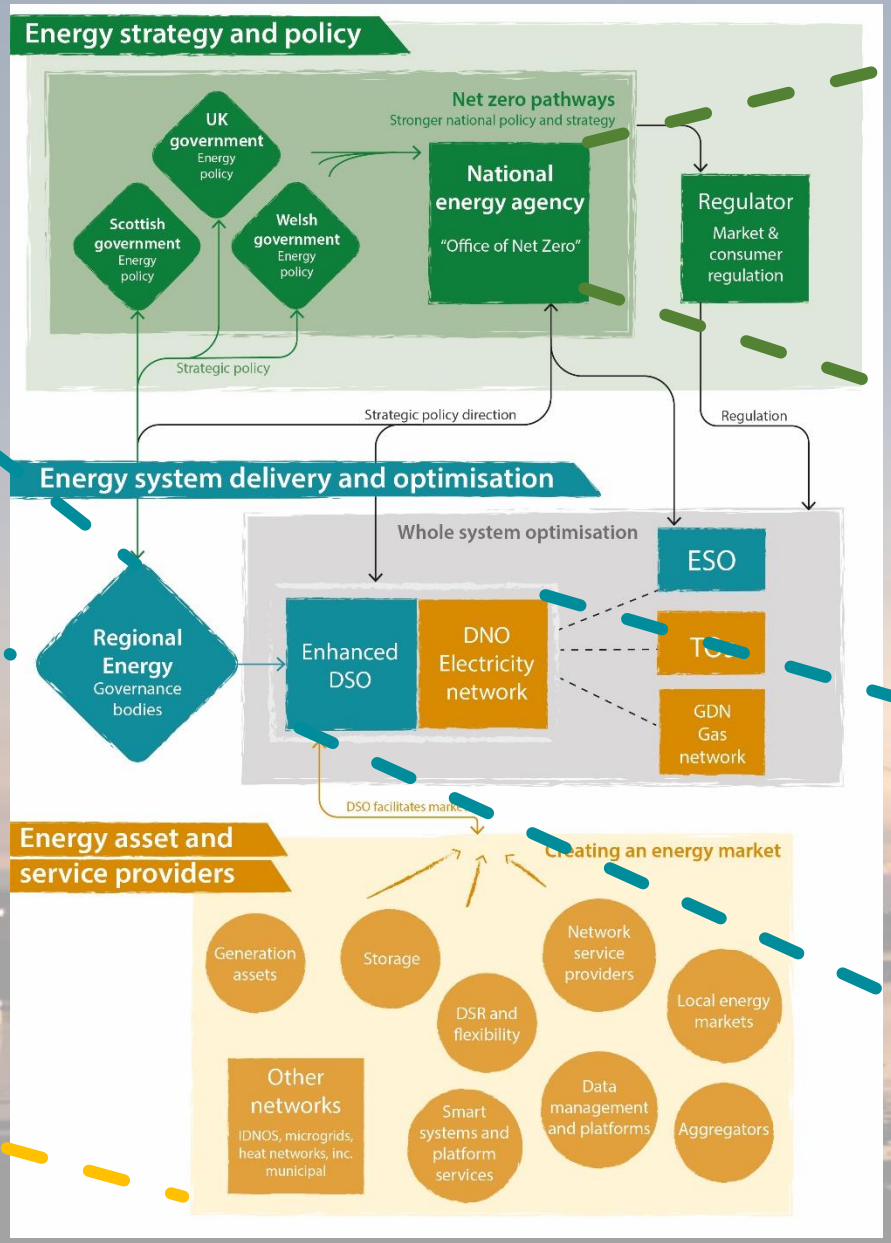
A coherent and joined up energy strategy with actionable decarbonisation pathways

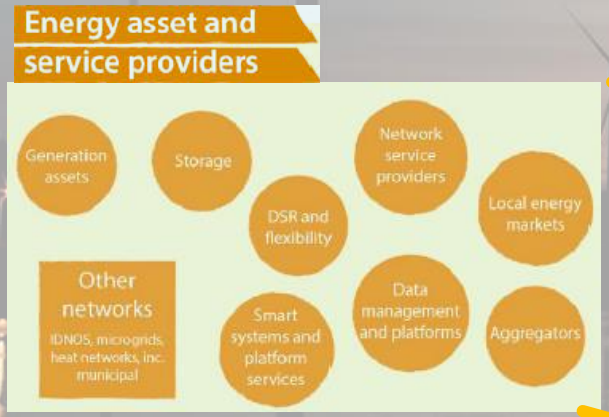


Delivered via devolved and regional partnerships between networks, solution providers and regional bodies and communities

Enabled by competitive local energy markets that bring together technology, asset and service providers

A sketch of a new model





A new enabling role for the networks

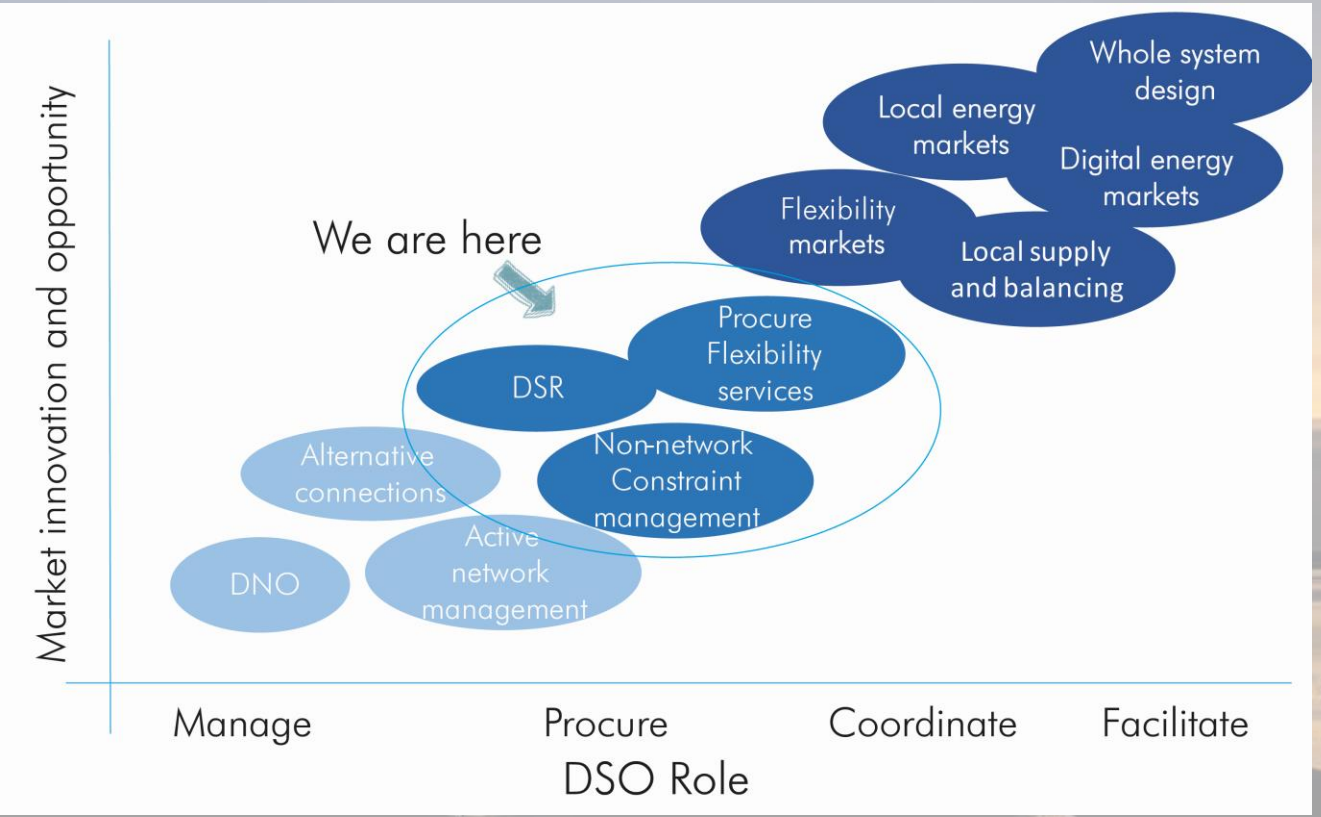
Distribution system operators(DSOs), tasked to optimise the utilisation of both network and non-networks assets and to facilitate new markets for whole energy solutions and services.

Faster more radical transition to a smarter and more dynamic energy system.

Radically expanding the DSO role to work with regional partners to deliver wider energy system objectives including decarbonisation at least cost.

Exploit digital and smart technology to increase consumer value, and to identify energy system optimisation opportunities.

To increase capacity utilisation, facilitating new flexibility markets and business models, while ensuring whole system resilience and optimisation across energy vectors.



6 key challenges and opportunities

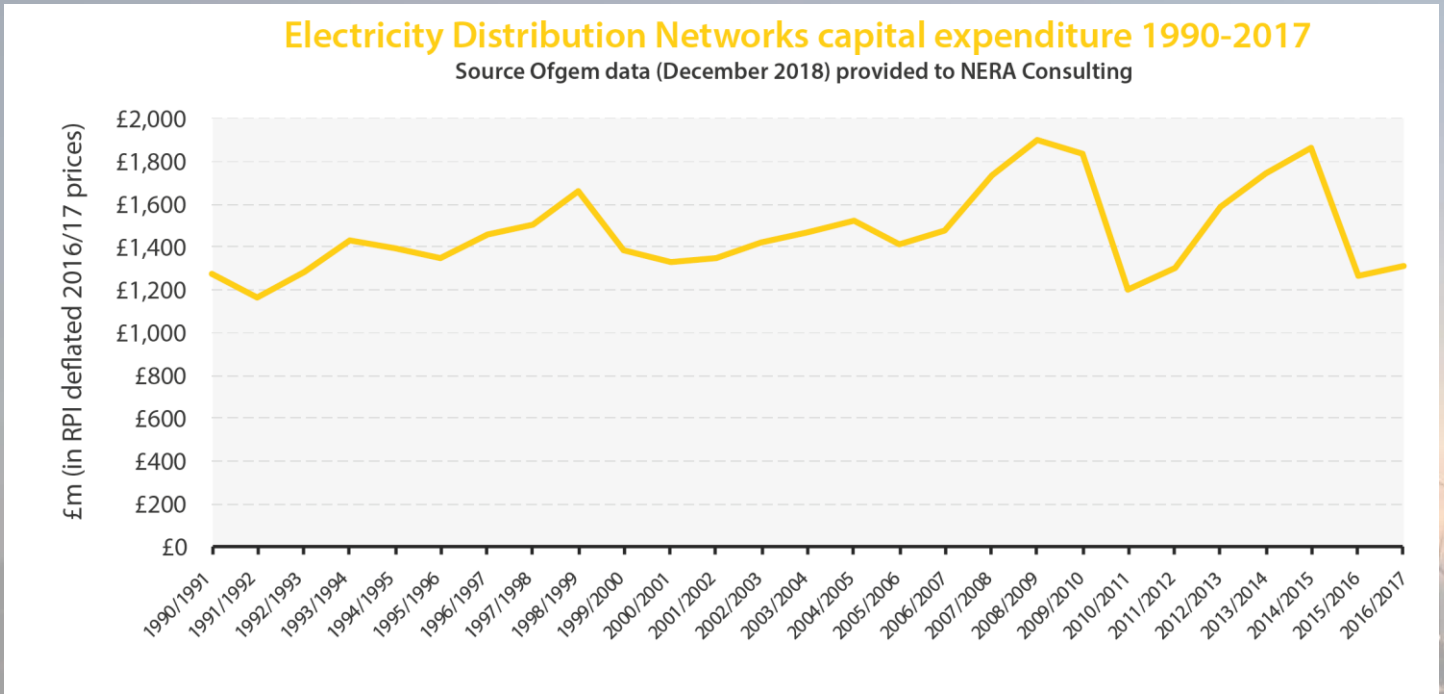
Energy network challenges and opportunities

- Putting the zero carbon challenge at the heart of energy policy
- Enabling a local energy revolution
- Building smarter, optimised and secure networks
- Making strategic investments, managing incentives and risk
- Delivering affordable energy, great service and customer value
- Ensuring a just transition

" The regulatory system must facilitate investment in a strategic way to address these challenges effectively. And public and political confidence in the regulatory system must be improved."
National Infrastructure Commission
October 2019

Meeting the investment challenge

Current incentive framework encourages networks to look for alternatives to asset investment in order to reduce costs to the consumer, it is less equipped to support strategic investment to achieve long term decarbonisation or other economic and socital objectives



- Network reinforcement makes up 5-7% of distribution network total expenditure
- Current reinforcement and refurbishment is significantly less than forecast

"The current regulatory system has generated investment and improved performance. But the system was not set up to provide strategic direction for investment to tackle issues such as achieving net zero greenhouse gas emissions by 2050, transitioning to full fibre digital networks, and managing the increasing risks of floods and drought."
National Infrastructure Commission October 2019

How much investment might be needed?

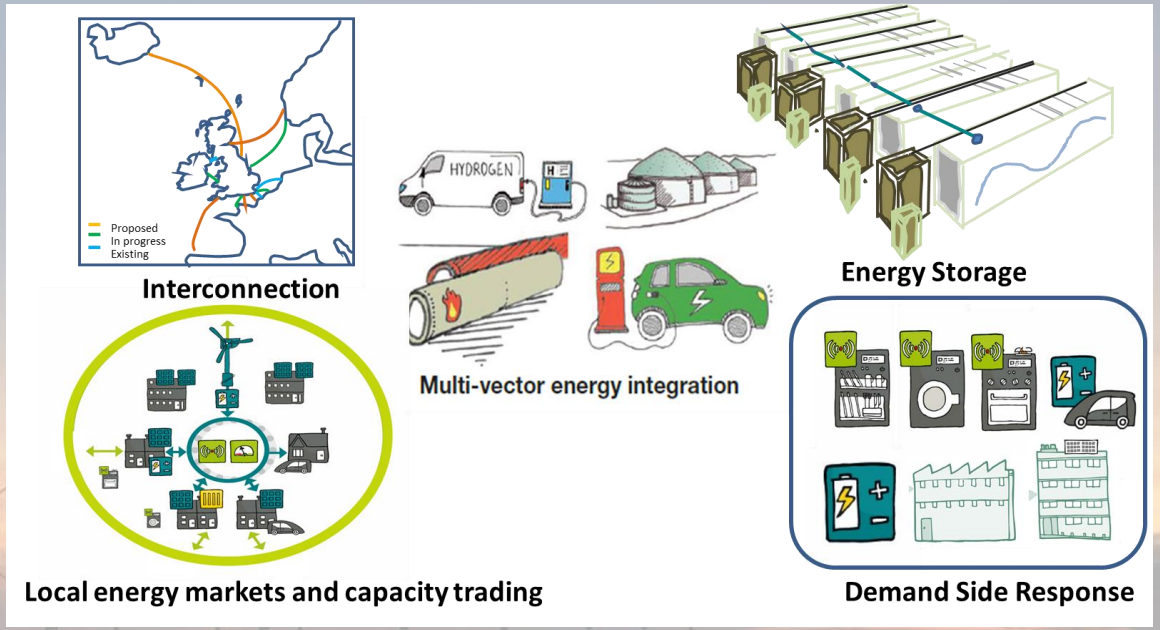
There is a lot of uncertainty and number of key variables especially around the electrification of heat. Not helped by the lack of a clear Net Zero energy strategy.

Committee on Climate Change modelling suggests that annual capital investment in the power sector may rise to £20 billion per year by 2050 to achieve net zero.

That is almost double the current level of capital investment.

An upper estimate of £1.8 billion* per year has been estimated for the reinforcement of the electricity distribution networks. A sevenfold increase.

* Capital Economics



" However, it is also clear that simply increasing expenditure, and therefore consumer bills, cannot be the whole answer. Network investment will certainly increase, but the networks need to become smarter, more integrated, more flexible and crucially open to new business models in order to increase productivity and optimise the use of both network and non-network assets to deliver a system that is affordable and resilient."

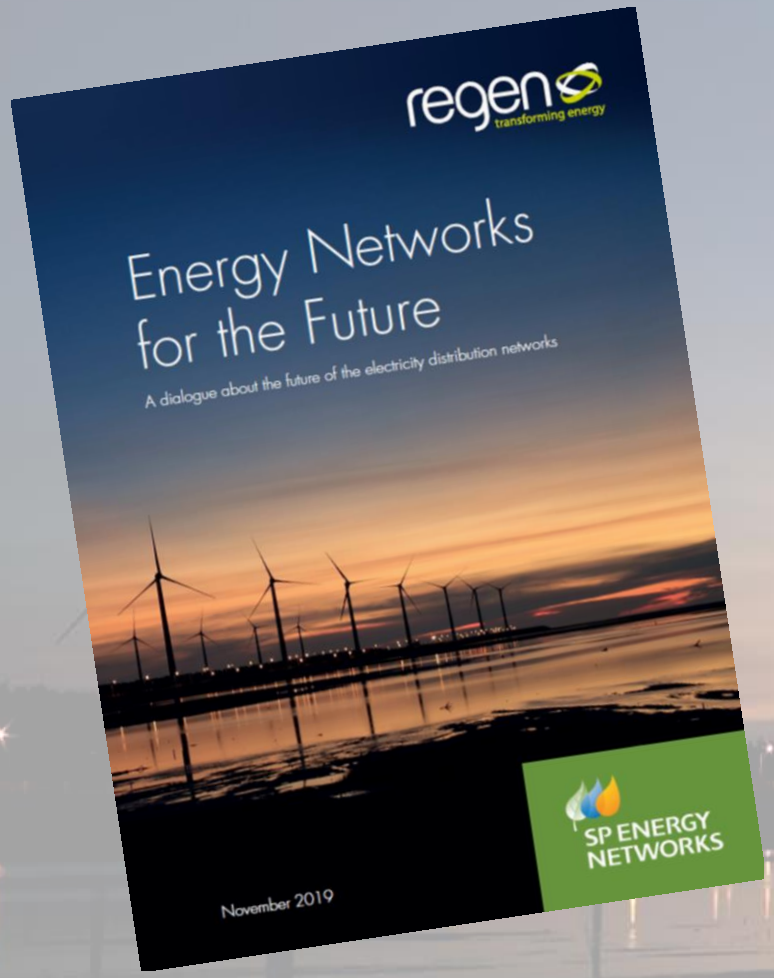
A new approach to investment

- Cost transparency and accountability
- Manage risk and uncertainty
- Enabling strategic investment
- Meeting decarbonisation objectives
- Incentive mechanisms that encourage genuine efficiencies, asset optimisation and whole system outcomes
- Encourage collaboration and whole system outcomes
- Support co-investment and risk sharing models

Class of Investment
"Steady state and incremental investment" **Uncertainty/risk – low**
"Enabling investment" **Uncertainty/risk– medium**
"Strategic investment" **Uncertainty/risk - higher**

" Given the critical importance of getting both infrastructure and non-infrastructure investments in place to support decarbonisation, it is critical that the regulatory model strikes the right balance between encouraging strategic investment and managing costs."

Networks that deliver for consumers and communities



Summary recommendations

- A new national office to drive energy strategy and oversee the net-zero transition
- Devolution of decarbonisation to regional bodies who would work with industry, city regions and communities to lead a local energy revolution
- Embed decarbonisation objectives and outputs within the regulatory model
- Enable networks to include in their business plans a range of net zero carbon options that can be quickly enacted to meet changing requirements
- A new risk sharing model that enables strategic investment, collaboration and co-investment
- Ensure network companies fulfil their role in achieving a just and equitable transition to a low carbon society.

Opening a new dialogue