

The energy landscape has been changing

2012

26GW



35GW



9.5GW



8GW



1.8GW



13GW

33GW

9GW

18.5GW

12.5GW

2017

Drivers of change

Decarbonisation

4 times

Increase in all renewable capacity since 2010



Decentralisation

3 times

More distributed capacity connected than in 2010



Digitalisation

12.3 mil

Smart and advanced meters in homes & businesses in GB



A Review of Summer 2018



24 April
GB runs without coal for 76 hours



6 May
Record solar output
28.5% of gen



27 June
Record peak solar output of 9.39GW



13 July
GB passes 1000 hours without coal in 2018

The future is uncertain

Uncertain Demand
3 to 11 million

Electric Vehicles driving on our roads by 2030



Uncertain Supply
37 to 50 GW

Of wind capacity generating on the system by 2030

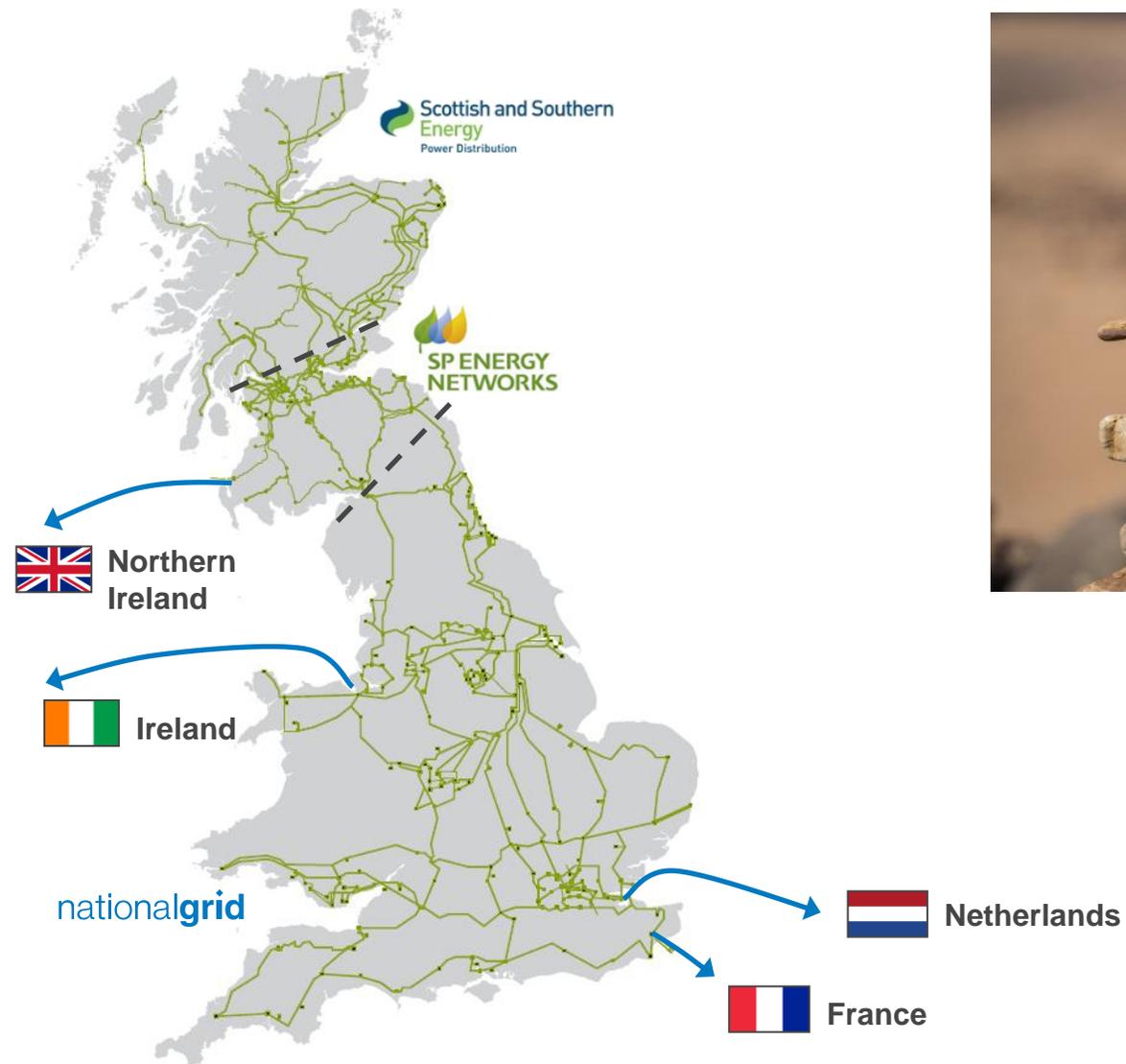


Uncertain Markets
10s to 1000s

Of active energy suppliers across the country by 2030



Role of System Operator



£1bn

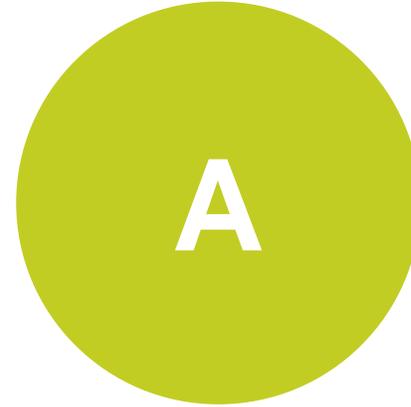
Targets of System Operator



50 Hz
+/-0.5 Hz



+/-10% of
nominal



No thermal
overloads



Within limits to
prevent
disconnection of
embedded gen

Impact on the transmission system

More generation connected to distribution system

Move from small number of large generators to smaller sources

Uncertainty on system increased

Dynamics of system changed

Requirement for more flexibility on the system

Changed understanding of security of supply

Sources of flexibility have changed

**Our old models and rules of thumb for managing the system are no longer valid
Need improved modelling and analysis of the system for safe and economic management**

Key Areas of Interest Include

Forecasting
Demand

Modelling System
Dynamics

Designing new
balancing
services

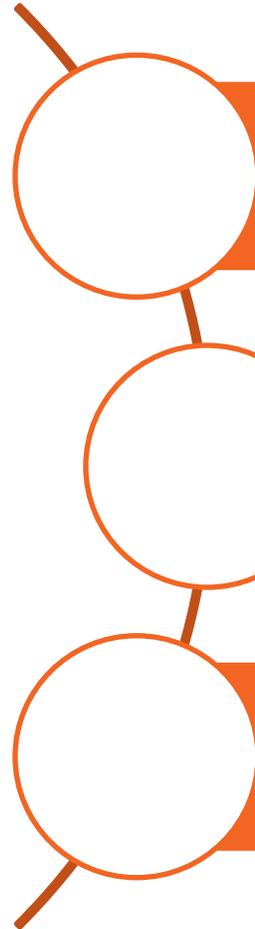
Tenders/Auctions
for balancing
services

System dispatch
and control

Market design

Decision Making
under uncertainty

Summary

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- The electricity system is changing rapidly and this change will continue
 - The ESO needs improved modelling and analysis to manage the system economically and efficiently
 - There are a large number of diverse and interesting problems to solve but progress to date has been promising