The Israeli Energy Innovation Community

UK Power market webinar

January 19th, 2021

info@isea.org.il

Speakers

The Israeli Energy Innovation Community
UK Power market webinar

- Phillip Nicholson, Renewable Energy Team, Department for Intl. Trade
- Randolph Brazier, Head of Innovation at the UK Energy Networks Association
- Carolina Tortora, Head of Digital Transformation and Innovation Strategy at National Grid ESO
- Stewart Reid, Head of Future Networks, Scottish and Southern Electricity Networks
- Ian Cameron, Head of Customer Service & Innovation at UK Power Networks
- Helen Stack, Regulatory Manager at Centrica

Department For International Trade (DIT)

UK Power Market
Webinar for Israeli
Entrepreneurs

Phillip Nicholson MBE

January 2021

HM Government

INVEST IN GREAT
BRITAIN & NORTHERN IRELAND

Phillip Nicholson MBE

Electrical Networks Specialist

Renewable Energy Team

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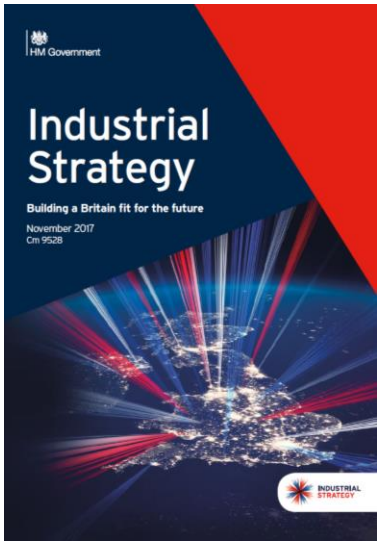
UK Policy Landscape & The Commitment to Energy Transition

The Industrial Strategy



The Clean Growth Strategy

Upgrading Our Energy System

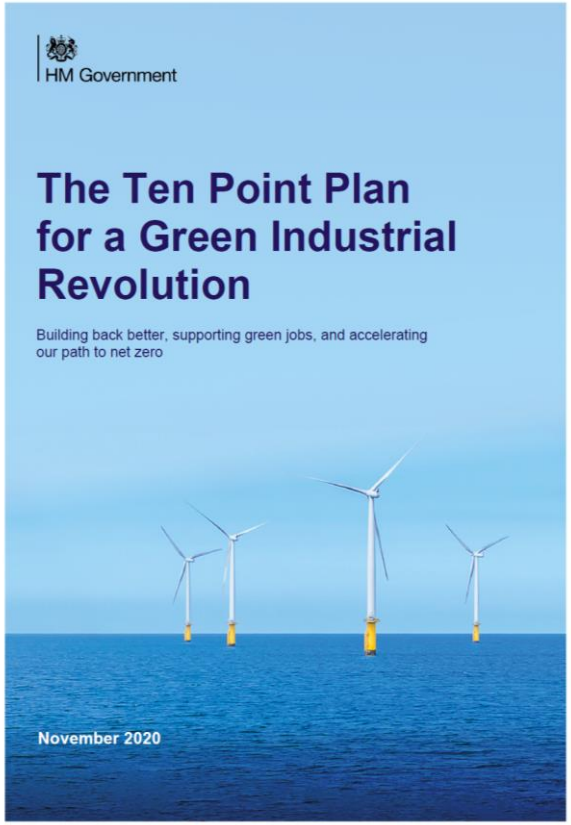
Ofgem Decarbonisation Programme Action Plan

Innovation Strategies

WESTERN POWER DISTRIBUTION
nationalgrid
SP ENERGY NETWORKS
NORTHERN POWERGRID
electricity north west
Scottish & Southern Electricity Networks
UK Power Networks
Delivering your electricity

UK Government Commitment to Net Zero by 2050

Energy Policy & Regulation provide the back bone that underpins the UK Governments plan to **Decarbonise, Decentralise & Digitise** the UK Energy System with this long term commitment to transition



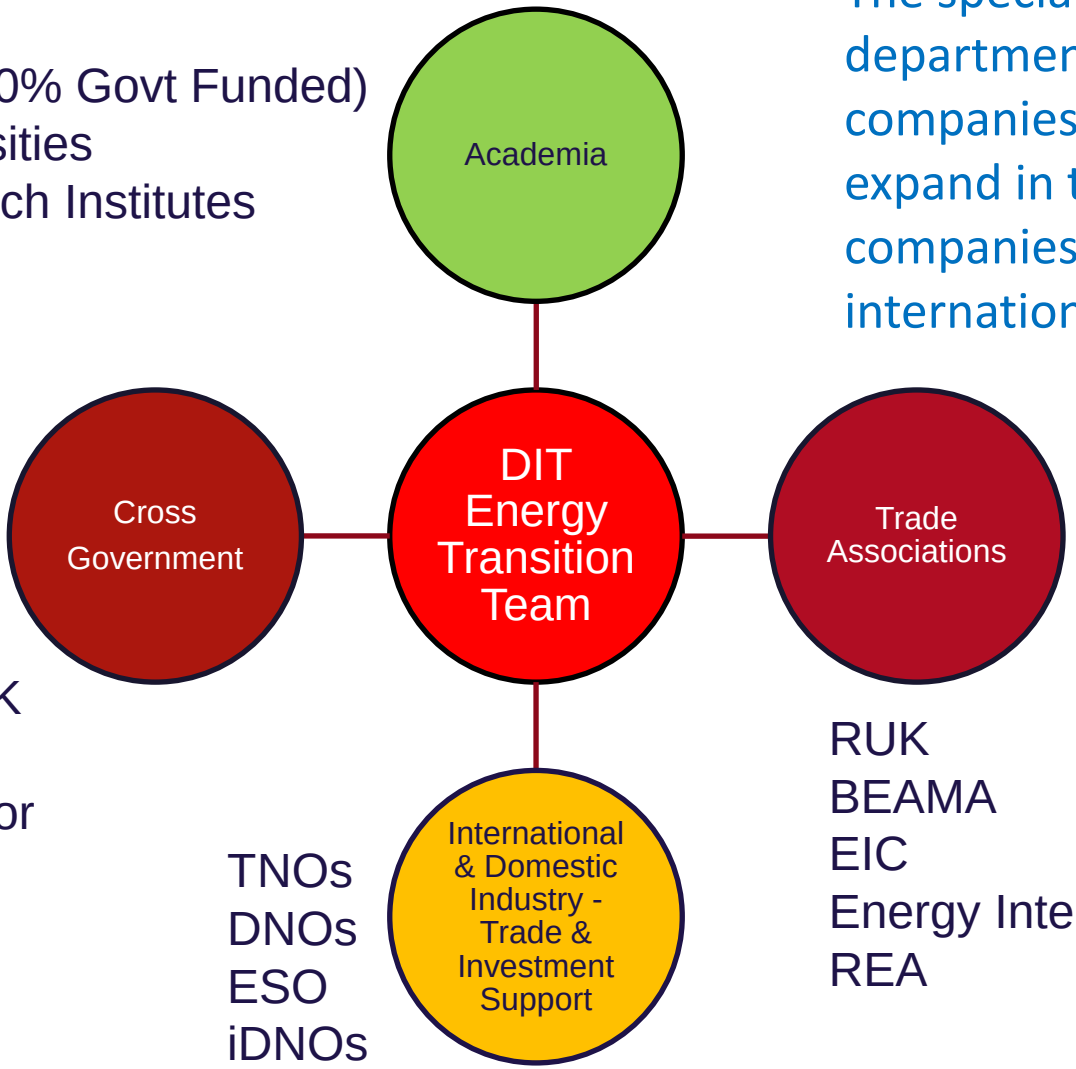
10 Point Plan - November 2020

Energy White Paper December 2020

Department for International Trade

Department for International Trade (DIT)

The specialist Government department that supports foreign companies seeking to set up or expand in the UK and UK-based companies seeking to trade internationally



- NPL (50% Govt Funded)
- Universities
- Research Institutes

- Ofgem
- BEIS
- DfID
- Innovate UK
- Catapults
- Cross Sector
- Overseas Posts

RUK
BEAMA
EIC
Energy Intensive User Group
REA

TNOs
DNOs
ESO
iDNOs
Energy Intensive Users

Introduction to UK Energy Networks

Randolph Brazier, Director of Innovation & Electricity Systems

January 2021

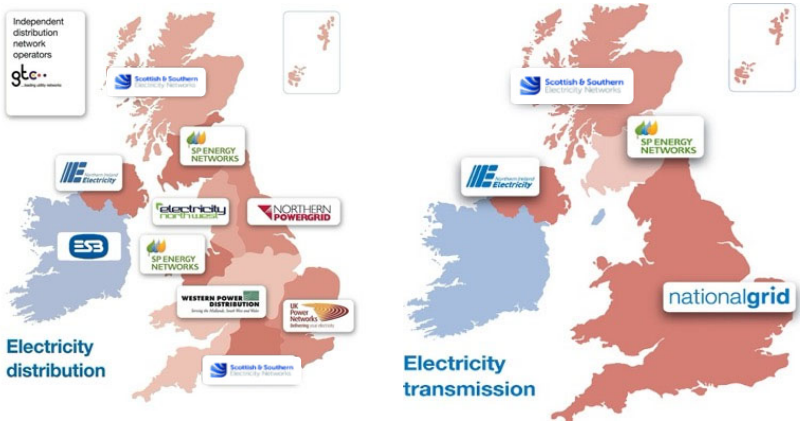
Introduction to ENA

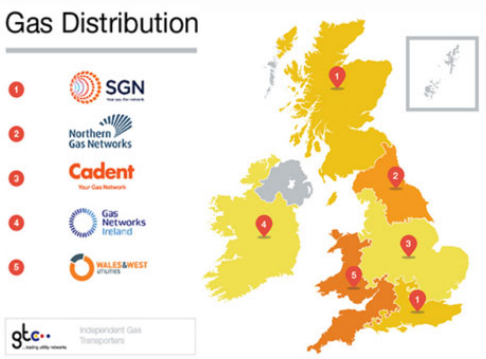
The voice of the networks

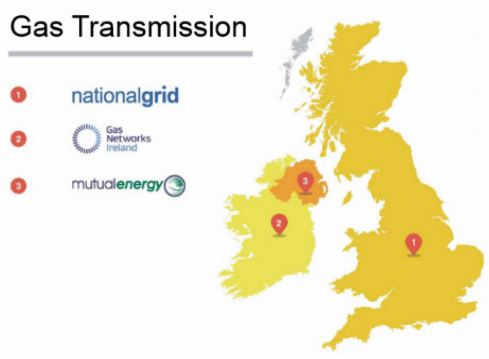
- 29 million electricity customers
- 21.5 million gas customers
- 180,000 miles of gas network
- 519,304 miles of electricity network

Distributed Energy Resources (DER)

- Over 30GW of distributed generation is currently connected
- DER uptake (especially EVs!) is increasing rapidly







UK Policy & Regulation

- The UK has signed and ratified the COP21 Paris Agreement
- In 2019, the UK became one of the first major economies to legislate for net zero greenhouse gas emissions by 2050
- Government has a dedicated smart grids policy: Smart Systems and Flexibility Plan
- However, regulatory support is critical throughout the entire journey
- Gas and Electricity Networks are governed by the 'RIIO' model: Revenue = Incentives + Innovation + Outputs
- Performance-based framework that includes a 'TOTEX' model
- Establishing an agile regulatory framework that encourages smart grid development and flexibility markets is essential

Network Regulation
The RIIO model

Department for Business, Energy & Industrial Strategy

Open Networks – Delivering a Smart Grid

ENA's Open Networks Project is a major energy industry initiative that will transform the way that both local Distribution Networks and national Transmission Networks will operate and work for customers. This is being driven by the 3Ds; digitisation, decentralisation and decarbonisation

The Open Networks Project will help customers connect and realise value; as well as reducing cost for consumers through more cost effective planning

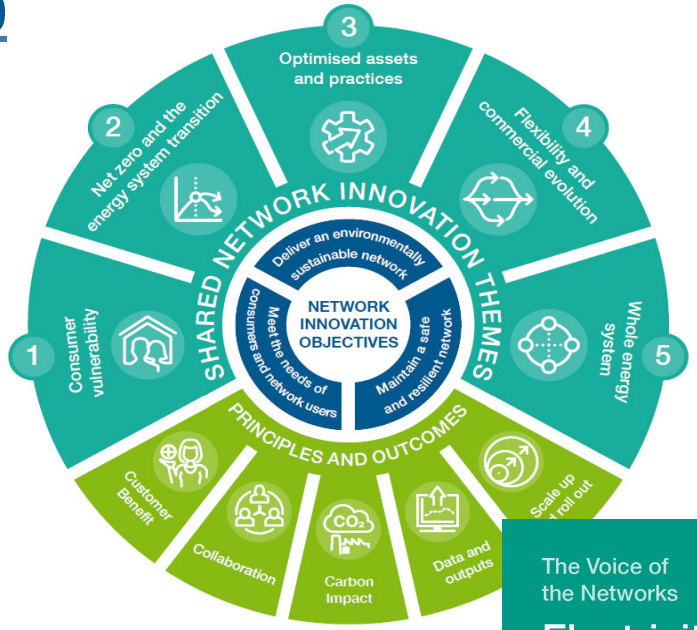
The Open Networks Project is a key initiative to deliver Government policy set out in the Ofgem and BEIS Smart Systems and Flexibility Plan, the Government's Industrial Strategy and the Clean Growth Plan

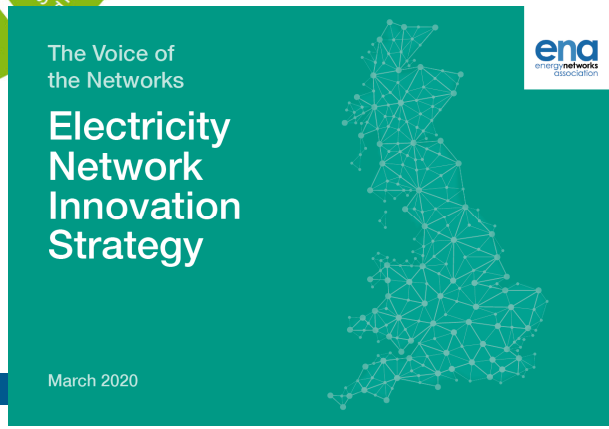
Britain's Networks have made a "Flexibility Commitment"; using cost-efficient 3rd party flexibility to relieve network congestion. Last year over 1.9GW of flexibility was tendered out.

Network Innovation Strategies 2020

- We have created Electricity and Gas Network Innovation Strategies for the UK
- Overall, the revised strategies have set out to: **encourage wider participation within innovation; share learning and collaboration across industry; coordinate action on priority areas that offer significant potential benefits; and to minimise duplication**

We are taking a stakeholder led, 'learn-by-doing' approach; we trial and test all aspects of the various future electricity system, and let the evidence guide our strategy





Thank you!

For more information about the Open Networks project, please don't hesitate to get in touch with us at opennetworks@energynetworks.org

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Introduction to National Grid ESO Innovation

Carolina Tortora
Head of Innovation Strategy and Digital Transformation

We are the Electricity System Operator for GB.

As the electricity system operator for GB, we move electricity safely, reliably and efficiently through the transmission system.

We balance the system in real time, making sure that electricity supply and demand is always met.

We operate 24/7 365 days a year.

We help to make sure that the rules which govern the industry's roles and responsibilities are fit for purpose.

nationalgridESO

OUR MISSION

To enable the transformation to a sustainable energy system, and ensure the delivery of reliable, affordable energy for all consumers.

nationalgridESO

Success

In 2025 looks like:

An electricity system that can operate carbon free

A whole system strategy that supports net-zero by 2050

Competition everywhere

The ESO as a trusted partner

nationalgridESO

The electricity system is evolving - we need to adapt the way we operate the system

1) More renewable, intermittent generation such as solar and wind

2) More embedded generation, at a local or distribution level

3) Increasing volume of smaller market participants

4) Generation in different locations

5) More asynchronous generation - less inertia

Our five areas of focus

Frequency

Thermal

Restoration

Stability

Voltage

nationalgridESO

We are focussed and committed to achieving zero-carbon

We are undertaking exciting and innovative projects to make sure that we are ready to operate a zero carbon electricity system, by 2025:

- Wider access to the balancing market
- Pathfinder projects
- Optional Downward Flexibility Management
- New frequency response and reserve products and platforms
- Distributed ReStart innovation project
- Power Available

Our 2020-2021 Innovation Priorities

No	Priority (£ scale of spend)	Drivers	Key developments External	Internal	Implications for 2020/21
1	**System Stability** (£££)	Synchronous generation supports the stability of the system. As we transform to a zero-carbon electricity system, synchronous generation capacity is decreasing, and the system is becoming less stable. This results in faster system frequency changes, less voltage and fault ride-through stability, and makes it more difficult for both synchronous and non-synchronous generators to operate safely.	• The events of August 9th highlighted that improvements to system stability should be made • GB system continued to decarbonise with new renewable generation records broken	• ESO launched its Stability Pathfinder, procuring £328m of stability services • Progressed innovation projects to forecast inertia and test technologies to allow inverter-driven generation to support system stability, e.g. Virtual Synchronous Machines	Remains top priority
2	**Whole Electricity System** (£££)	New decentralised energy resources are connecting to distribution networks, turning them into active networks and transforming the role of Distribution Network Operators. Many of these new resources can provide valuable services to us, increasing competition in our markets as well as to those of emerging Distribution System Operators (DSOs). In addition, smart technologies mean many consumers won't just passively use power – they can become active players of the system too.	• ENA's **Open Networks project**[18] continues to develop frameworks for DSOs, as well as for whole electricity system operation and planning • Ofgem published DSO approach and regulatory priorities	• Widespread activity across ESO to support delivery of whole electricity system outcomes (see WES Development paper)[19] • Significant investment in whole electricity system innovation e.g. Distributed Restart, Power Potential, RecorDER • Continued work on Regional Development Programmes with DNO partners around GB to solve location-specific issues	Decrease in priority
3	**Future Markets** (£££)	As we transform to a zero-carbon electricity system, it is increasingly important to explore markets for new services that can meet changing system needs, as well as markets for new products. It is also critical that we facilitate a level playing field for all participants, both traditional and emerging to further promote competition.	• Burst of activity and innovation happening in distributed flexibility markets • Lower inertia system means things happen faster – need to keep pushing for closer-to-real-time markets	• Ongoing development of suite of markets, including Dynamic Containment • Continued investment in closer-to-real-time markets through Auction Trial • Creating foundation for future whole electricity system markets through RecorDER, Residential Response, and participation in Centrica's Local Energy Market	Slight decrease in priority
4	**Forecasting of Supply and Demand** (£)	This considers both, short as well as long term forecasting. Lack of visibility of intermittent embedded generation on electricity networks, combined with more complex usage patterns, makes short-term forecasting of electricity supply and demand increasingly difficult. Long-term supply and demand forecasting are becoming harder to carry out as new technologies and global market forces emerge. These could lead to dramatically different end-user behaviours.	• Renewable generation records continue to be broken – forecasting wind and solar becomes more important • Increase in urgency of decarbonisation of transport and heat means we need to understand their future impact on the electricity system	• Improvements in short-term renewable generation forecasting, particularly solar, realised through suite of innovation projects • Greater understanding of future EV charging profiles • Kicked off project looking at future of heat demand	Slight decrease in priority
5	**Digital Transformation** (££)	Rapid digitalisation and decentralisation of the energy sector comes with many challenges: • On the electricity system, there is a huge increase in the data available through the proliferation of market players. New decentralised assets are often inherently unpredictable, so being able to harness this data is extremely important. Legacy systems and processes struggle to cope with the rapid increase in participants, emerging Internet of Things (IOT) data and technological advancements. • As the electricity networks become more reliant on data and aging ICT, the risk of cyber-attacks becomes greater. • The ESO is also increasingly a custodian of data on the electricity networks. We have a responsibility to ensure this is collected, analysed and shared with consumers in a transparent, responsible way, allowing everyone to extract the most value.	• The Energy Data Taskforce made clear recommendations that the energy industry needs to work together to improve data openness and visibility • The Wider Access programme brings a large increase in the number of market participants in the Balancing Mechanism, and in the associated data that will need to be managed, analysed and optimised	• ESO launched its Data Portal, a centralised repository for all published data • RecorDER project works to create blockchain-based register for all GB energy flexibility assets • Continued investment in advanced modelling and machine learning tools and techniques for planning and operation	Significant increase in priority
6	**Whole Energy System** (£)	The ongoing conversation around the decarbonisation of heat and transport, combined with electricity systems' increased reliance on gas for flexibility (particularly on the distribution networks), present us with a crucial opportunity to consider the energy system as a whole, across multiple vectors (i.e. electricity and the multiple gas types) and the sectors this supports (e.g. heat, power, transport, industry).	• Strong signals from the Department for Business, Energy and Industrial Strategy (BEIS) and Ofgem that energy transition needs holistic approach • Facilitating acceleration in decarbonisation of other sectors, particularly heat and transport, will need whole energy system approach	• ESO undertaking gap analysis to understand what the big questions to answer are in whole energy • Launched innovation project with National Grid Gas System Operator looking at future of heat decarbonisation • Invested in understanding future impact of EV charging • Kicking off project looking at how electric heating could solve whole system network issues	Significant increase in priority
7	**Constraint Management** (£)	Understanding the risk of constraints occurring and managing these effectively is becoming increasingly difficult due to more uncertainties in supply and demand patterns. If constraints can't be avoided or managed in the most efficient way, costs for consumers can increase dramatically.	• Greater wind generation causing constraints, this is set to continue • Planned interconnectors will increase constraints onshore • DNOs launching flexibility markets for constraints	• Launched Constraints Pathfinder to seek solutions for managing constraints in Scotland and Northern England. • Invested in innovation looking at improving forecasting of voltage constraints	Priority level unchanged
8	**System Restoration** (£££)	The availability of conventional Black Start service providers will decrease as part of the shift away from conventional thermal generation.	• Increased focus on the climate agenda accelerates the need to find low-carbon alternatives to provide Black Start services	• Distributed Restart project shows that there are no insurmountable barriers to Black Start from DER • ESO launched competitive procurement process for NW and NE England, as well as Scotland	Priority level unchanged

Thank You

We are passionate about driving the energy transition and helping GB achieve it’s net-zero target.

We are keen to work closely with others in the industry so that we can continue to deliver clean, green, reliable and affordable electricity to all.

www.nationalgrideso.com

Innovation

UK Power Networks

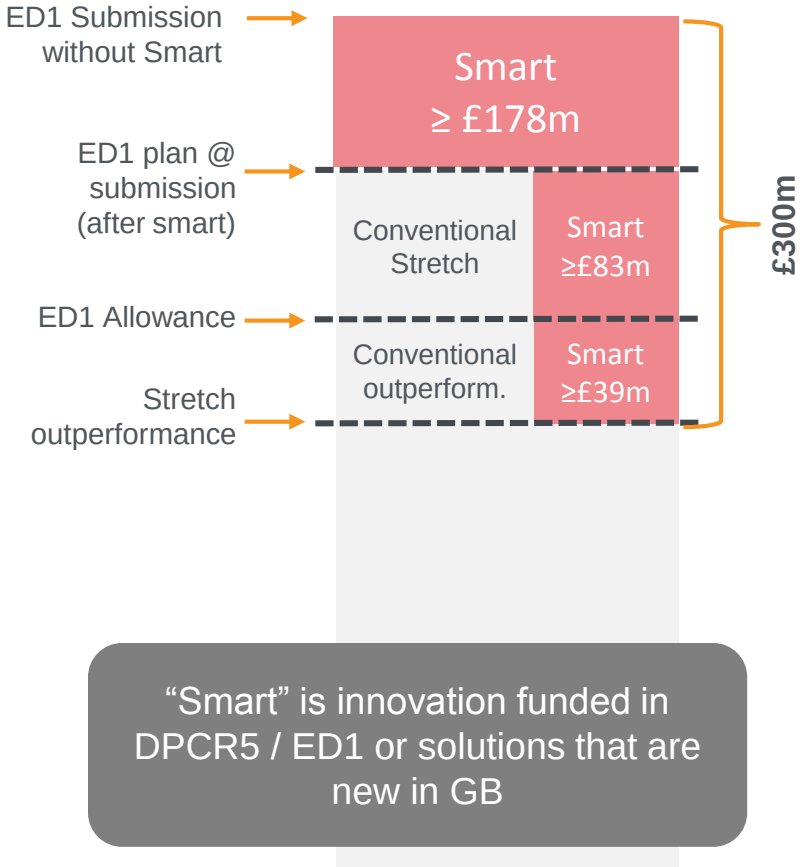
19th January 2021

About UK Power Networks

Measure	Data	% of industry
End customers	8.2m	28%
Population served	20m	28%
New metered connections	46,000	32%
Distributed generation connected	9GW	32%
ED1 totex allowance	£6,029m	25%
Energy distributed	85TWh	29%
Peak demand	16GW	28%

RIIO- ED1 Innovation framework

ED1 Smart Savings



"Smart" is innovation funded in DPCR5 / ED1 or solutions that are new in GB

Network Innovation Allowance

Annual allowance **0.5%** of revenues (£7.3 - £8m)

To fund smaller technical, commercial, or operational projects directly related to the network

Should have the potential to deliver financial benefits to UKPN and its customers

Must have the potential to have a direct impact on the network or the operations of the DNO

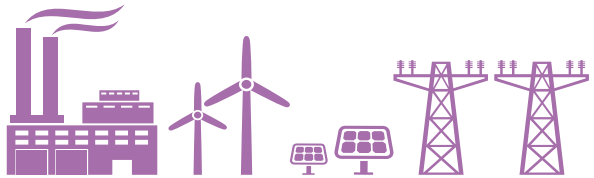
Network Innovation Competition

Annual competition for funding, for the development and demonstration of new technologies, operating and commercial arrangements. £70m available/y

Has the potential to deliver environmental benefits, cost reductions and security of supply

UK Power Networks
Delivering your electricity

Key forces influencing the future of our industry



- Distributed/Renewable Generation
- Energy Storage
- Local Energy

- Smart Meters and the connected home
- Micro generation / storage
- Electrification of heat and transport

Net Zero

- Legally binding targets by 2050
- Ban on the sale of petrol, diesel and hybrid cars by 2035
- 2025 New homes: low carbon heating
- Energy efficiency

Changing regulatory environment

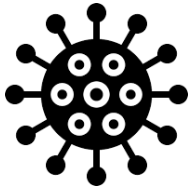
- Market reflective returns
- Greater efficiency
- Managing uncertainty

Digital revolution

- Digitalisation
- Internet of Things
- Connected homes
- Data : presumed open, standardised and visible

Evolving consumer expectations

- Affordability and reliability
- Trust and purpose
- Expectations set by “the best”
- “Producers and consumers”



Covid-19

- Lives
- Livelihoods
- Re-imagining the “next normal” at work and in the home

Our Net Zero Challenge

Distributed Renewables

- **9.4GW** of DG connected, doubled since 2011
- Over **170,000** distribution connected generators

Doubling of capacity by end of ED2

Local Storage

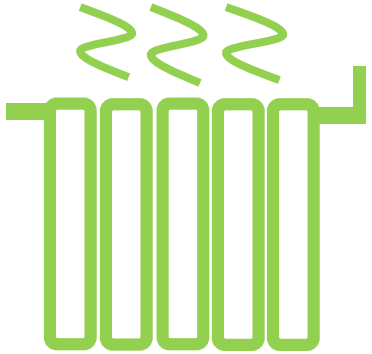
- **77.5GW** formal enquiries
- **2.6GW** accepted offers
- **217MW** connected storage

2GW – 4GW of installed capacity by 2028

Electric Transport

- **360,000+** Plug-in vehicles sold in the UK, **105,000** on our networks
- **12,000+** Public charge points across UKPN

c3.6m EVs forecasted by end of 2028



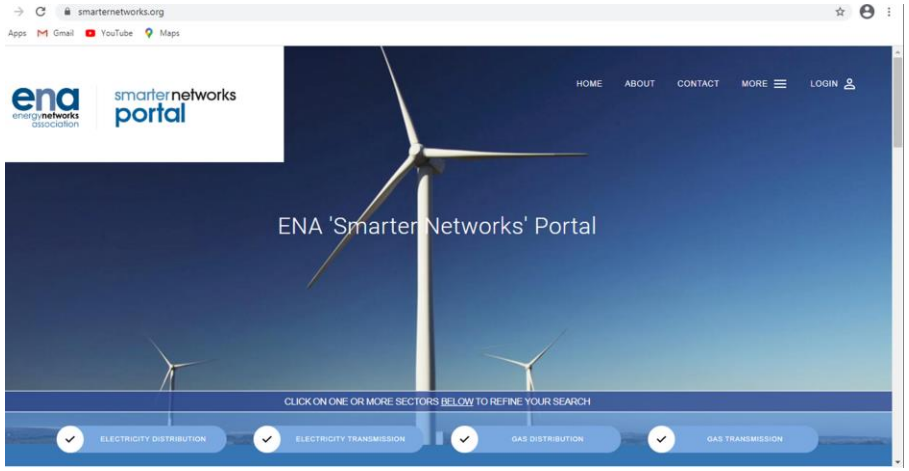
Electric Heat

- **8,000+** heat pumps, **100MW** connected
- DFES forecasts **200k – 1.1.m** heat pumps by 2030
- Home fuel standard change- **No Gas boilers from 2025-** 500,000 new homes forecast

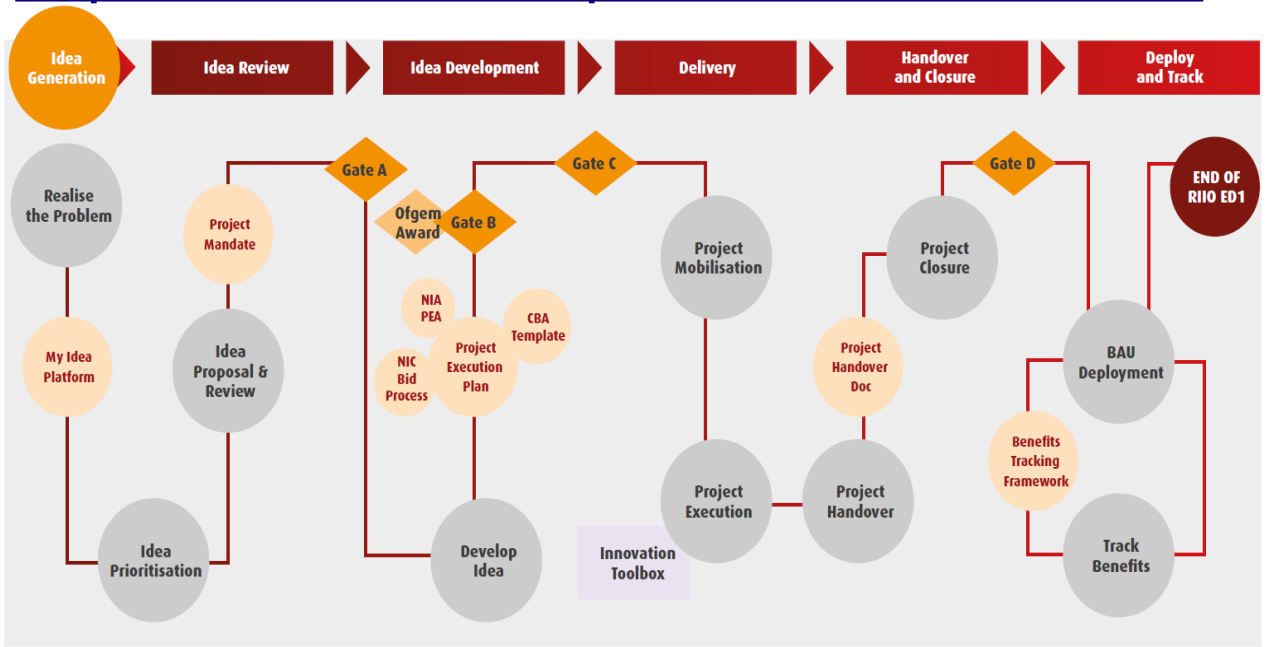
????? 2020

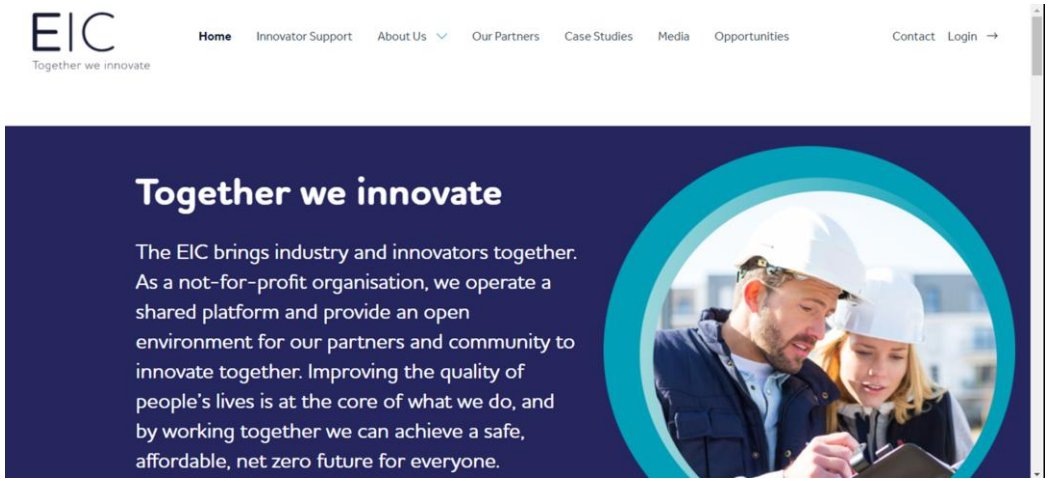
How to Innovate with us

https://www.smarternetworks.org/



https://innovation.ukpowernetworks.co.uk/





https://innovation.ukpowernetworks.co.uk/submit-an-idea/

https://www.ukeic.com/

RaaS - Resilience as a Service

Project Overview

November 2020

RaaS
Resilience as a Service

Scottish & Southern
Electricity Networks

SSEN Overview

We own and operate the Electricity Transmission and Distribution Networks in the North of Scotland and the Distribution Network in Central Southern England.

- SSEN is regulated by Ofgem under RIIO; part of SSE plc (UK FTSE listed).
- We have 4,000 employees, 85 depots/offices across 7 regions
  - serving 3m customers in England and 0.75m customers in Scotland
  - 130,000 km of lines and cables and 106,000 substations
  - over 100 subsea cables, powering island communities
  - we take 550,000 calls from our customers p.a. (over 1,500 a day).
- Strong supporter of the 2050 Net Zero emissions target, and committed to investing in its network to support 10 million EVs in the UK by 2030.
- Accommodated the rapid rise in renewables with 28 GW of local generation capacity connected - enough to power 4 million homes.
- SSE are supporters of the Living Wage and Fair Tax.

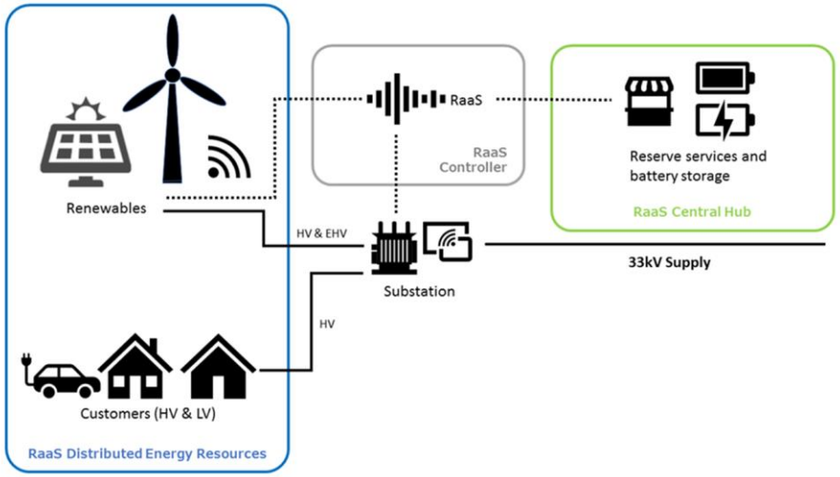
Scottish & Southern Electricity Networks

RaaS - Project Overview

RaaS
Resilience as a Service

RaaS Concept

Providing resilience to the downstream network utilising local energy storage and generation resources to restore supply in the event of a fault



Deployment Potential

Following successful trial, 114 potential sites identified across GB

Project Objective

Develop and demonstrate the delivery of local network resilience through services procured from Distributed Energy Resources

Where did the idea come from?

Established from the joint industry call for ideas
- strong interest from WPD, UKPN and SPEN

Why now?

To harness the growing number of third party owned assets and emerging markets for flexibility in addressing network challenges

What benefits will it deliver?

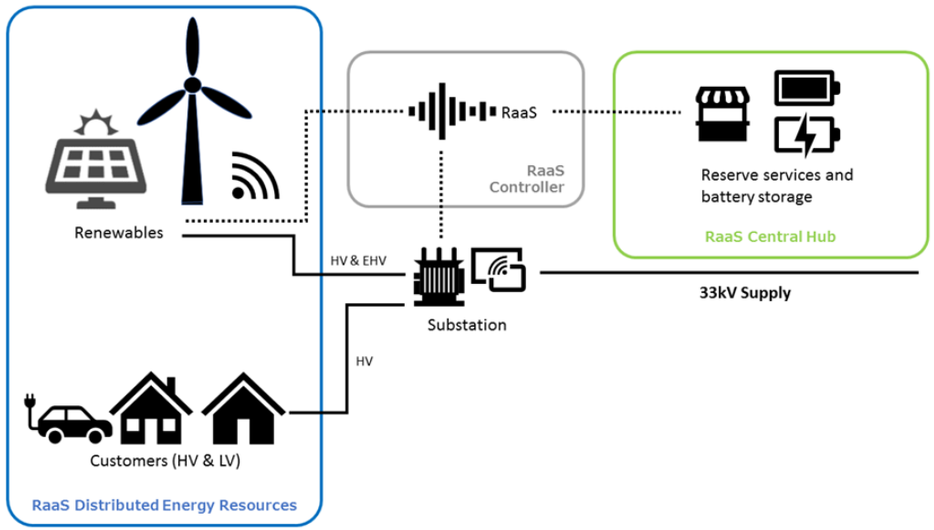
Potential financial benefit of £146m by 2050 with deployment across GB in addition to improved service to local communities

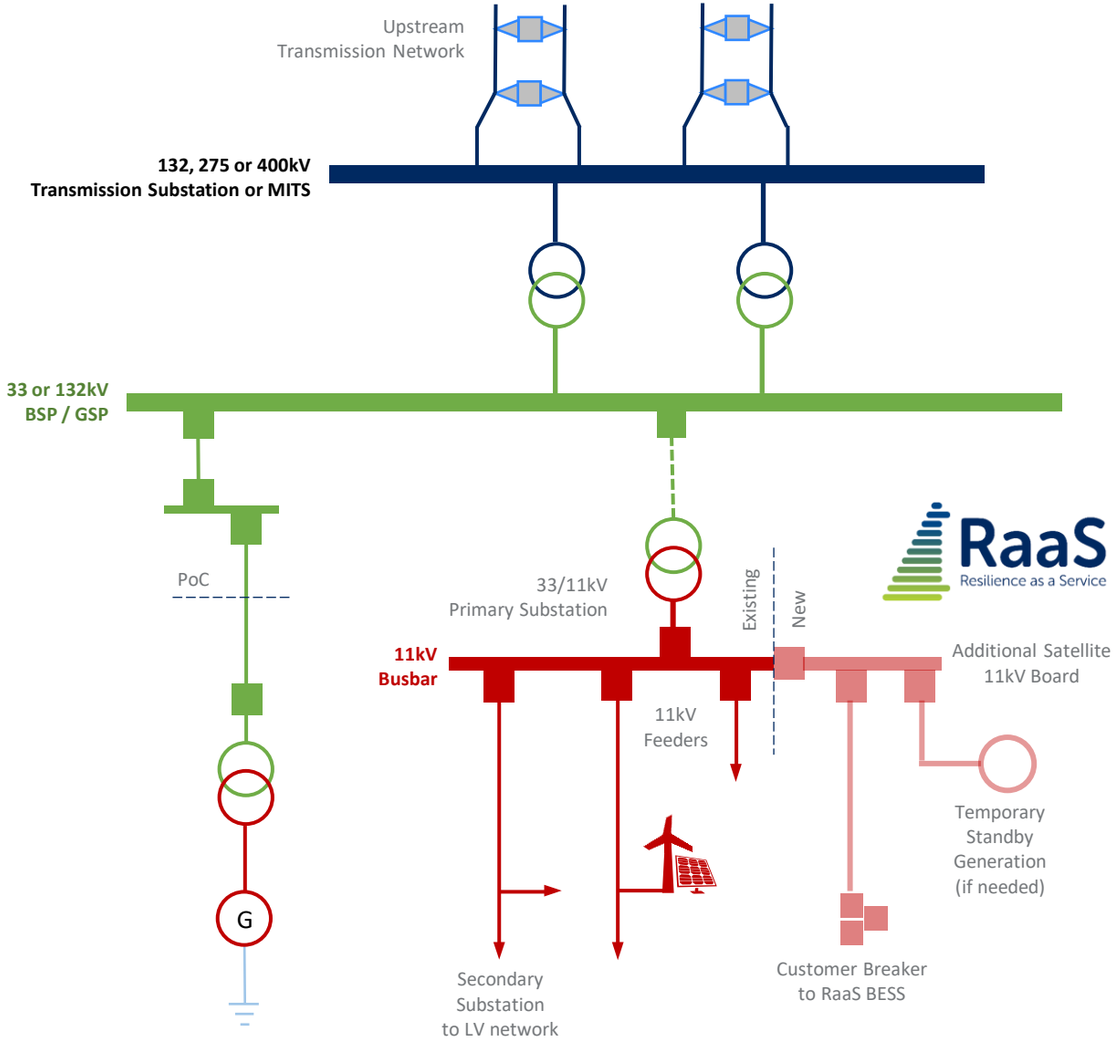
Budget & Funding

£10.2m Network Innovation Competition funded project

COSTAIN e·on Scottish & Southern Electricity Networks

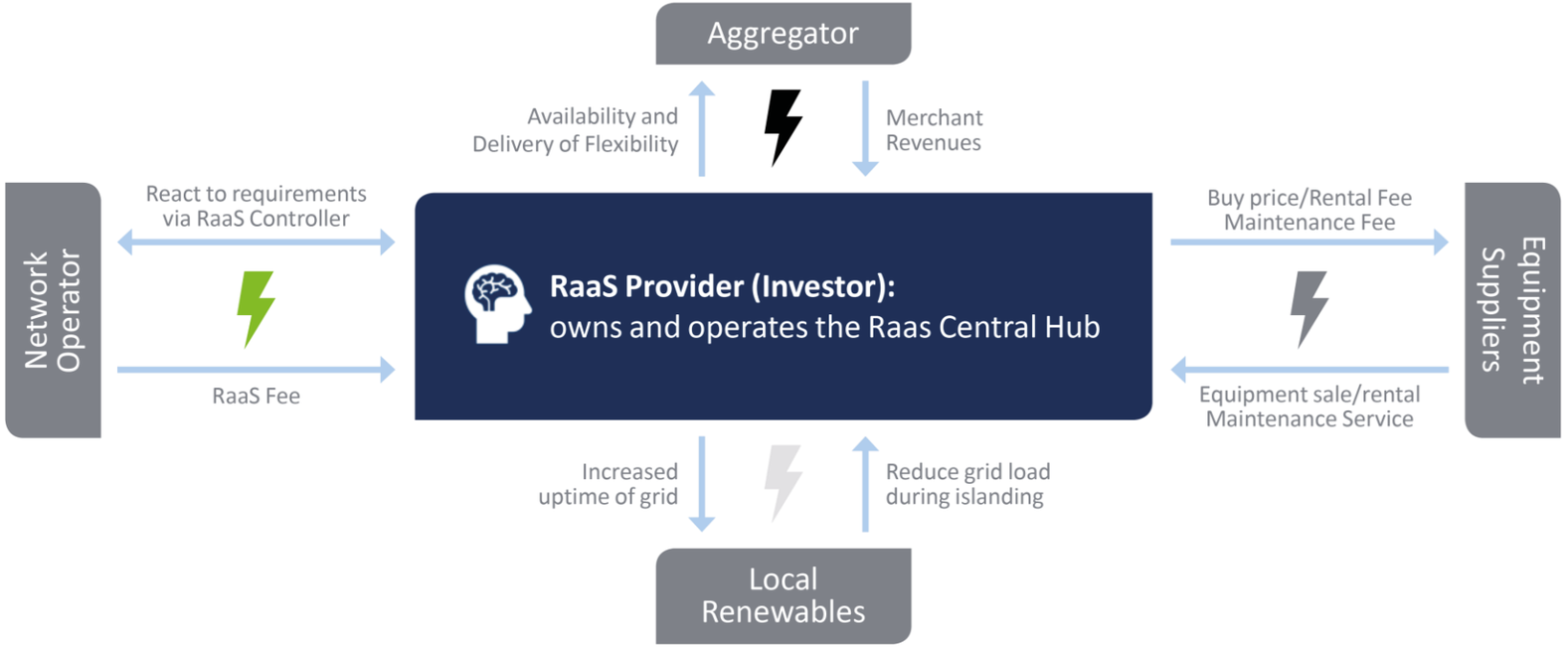
RaaS Technical Solution





RaaS Commercial Solution

RaaS
Resilience as a Service



Challenges to solve to mitigate risk of RaaS provider:

- Standardisation of requirements
- Operational optimisation
- Inclusion of local renewables
- Equipment Supply Chain

RaaS Supply Chain:

- RaaS Provider as single contractor to DNO
- Technology agnostic and cost optimized procurement structure

COSTAIN e·on Scottish & Southern Electricity Networks

GB network innovation – supplier point of view

- Centrica supplies energy and services to UK consumers via the British Gas brand, and connected products and smart services through our Hive brand. Centrica Business Solutions helps large energy users harness the power of distributed energy solutions. Our EM&T business provides risk management and trading services.
- We have already leveraged the Israeli “innovation culture” via our investments in Panoramic Power and Driivz
- Network opportunities
- Centrica supports the UK regulated networks harnessing new, smart, innovative approaches to deliver secure, reliable, non-discriminatory networks at least cost – and help network users transition to net zero.
- **Key areas** – facilitating development and interoperability of flexibility markets; improved network monitoring; moving data sharing and flexibility procurement closer to real-time; efficient connection of low carbon technologies (EV-s, heat pumps, low carbon generation etc); pan-network systems e.g. central data publication platforms.
- Challenges
- Meeting network security standards – regulated networks have additional requirements over regular businesses
- Valuing innovative approaches against traditional solutions
- Balance between the goal of standardisation (easier for users) and trialling different approaches

centrica