

# SP Energy Networks Preparing for Net Zero Conference Wednesday 9<sup>th</sup> March 2022

Preparing for Whole System Approach:  
Flexibility, DSO and  
Innovation Projects



Thank you for your time today

# SPEN Preparing for Net Zero Conference

## Wednesday 9<sup>th</sup> March 2022



### Agenda

Flexibility, DSO and SPEN  
Innovation Projects

*Thank you for taking the time to attend  
today.*

*We value your opinions,  
and we are keen to generate an open  
session with opportunities to hear your  
feedback.*

09:30 – Welcome, Housekeeping & Safety Contact

09:35 – Network Development Plan

09:40 – Preparing for DSO

10:00 – Innovation in RIIO-ED2

10:30 – Active Network Management

11:00 – Flexibility Services

11:20 – Net Zero Knowledge Forum

12:00 – Close

# SPEN Preparing for Net Zero Conference

## Wednesday 9<sup>th</sup> March 2022



### Housekeeping

Flexibility, DSO and SPEN  
Innovation Projects

*Thank you for taking the time to attend today.*

*We value your opinions, and we are keen to generate an open session with opportunities to hear your feedback.*

- *This session is being recorded*
  - *please let Louise know if you are not comfortable with this and we will take your comments in the Chat section*
- *Please try and keep background noise to a minimum by using the mute button when you are not speaking*
- *We are keen for this to be an interactive session as your feedback is important*
  - *please raise your hand electronically or use the chat function if you would like to ask questions to the speakers*

# Safety / Environmental Contact - Zip Ties

Very versatile and inexpensive ..... but at what cost?



430MM X 4.8MM

- £3.73p per 100pack

780MM X 9MM

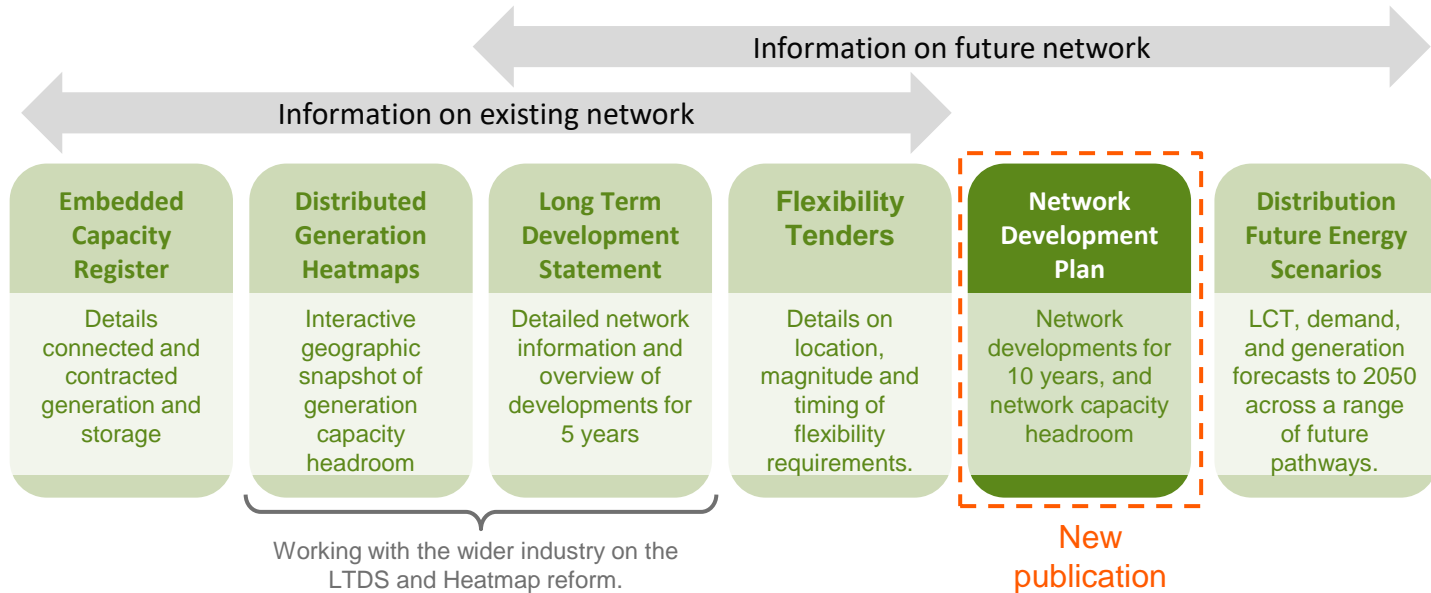
- £15 per 100pack

# Network Development Plan

- ▶ Russell Bryans
- ▶ SPEN Future System Strategy Design Manager

# Enhancing Stakeholder Data Provision

Our **Network Development Plan** is a new publication, including a 10 year view on network developments and a longer term indication of capacity headroom across the range of Net Zero future pathways.



Additional data publication to support our stakeholders in their planning and decision making processes.



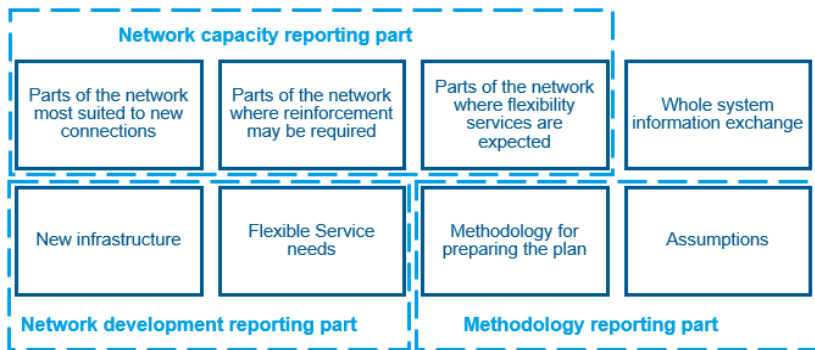
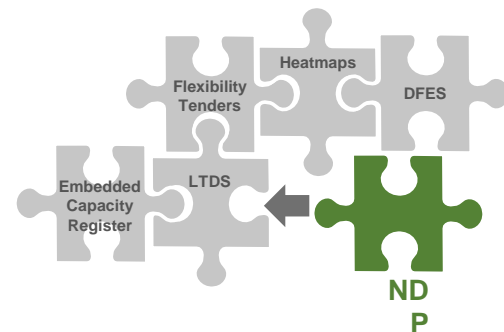


# Network Development Plan (NDP)

NDP aims to provide stakeholders with transparency on:

1. **baseline view of planned network developments up to 10 years;** and
2. **network constraints and capacity headroom.**

This presents the baseline view of planned asset and flexibility interventions in the 5-10 year period.



- **Part 1 Capacity reporting:** Update to our 2021 Network Capacity Headroom Report.
- **Part 2 Network development reporting:** Based on our RIIO-ED1 and RIIO-ED2 intervention plans.
- **Part 3 Methodology report:** Building on our FSS and LRE Strategies.

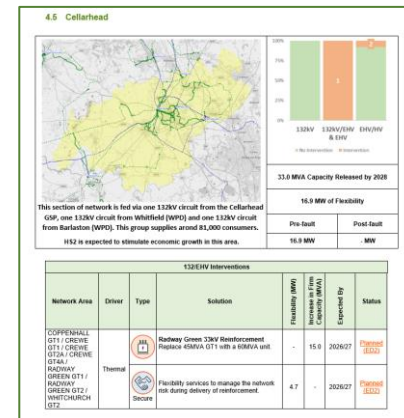
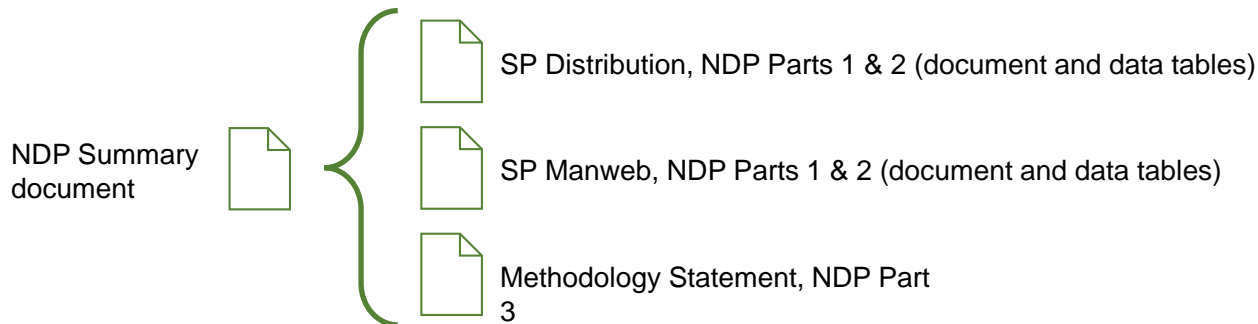
NDP brings together network data (LTDS), long-term forecasts (DFES) and our intervention plan to provide transparency on capacity headroom



# NDP Key Dates

Data and long-term forecasts are key enablers to facilitate decarbonisation.

Publication structure:



Timeline:



Opportunity to provide feedback through online consultation, which will run for 4 weeks.

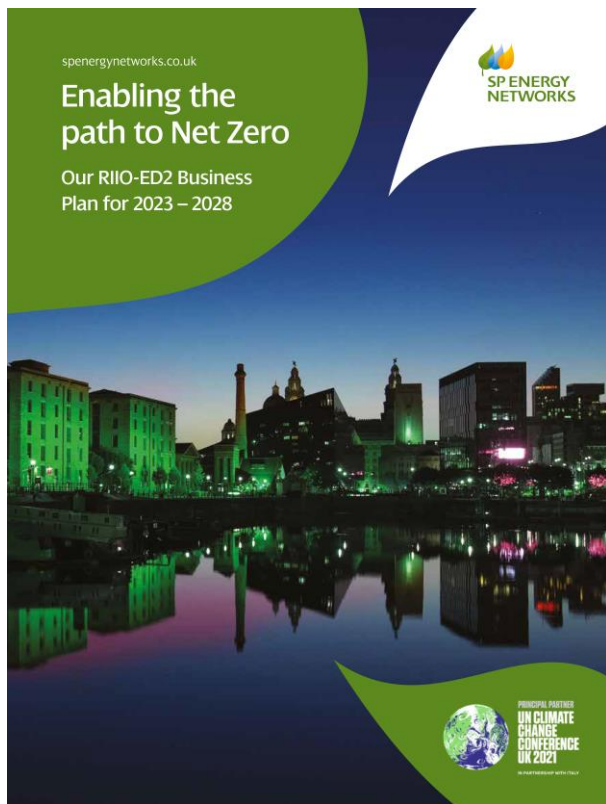




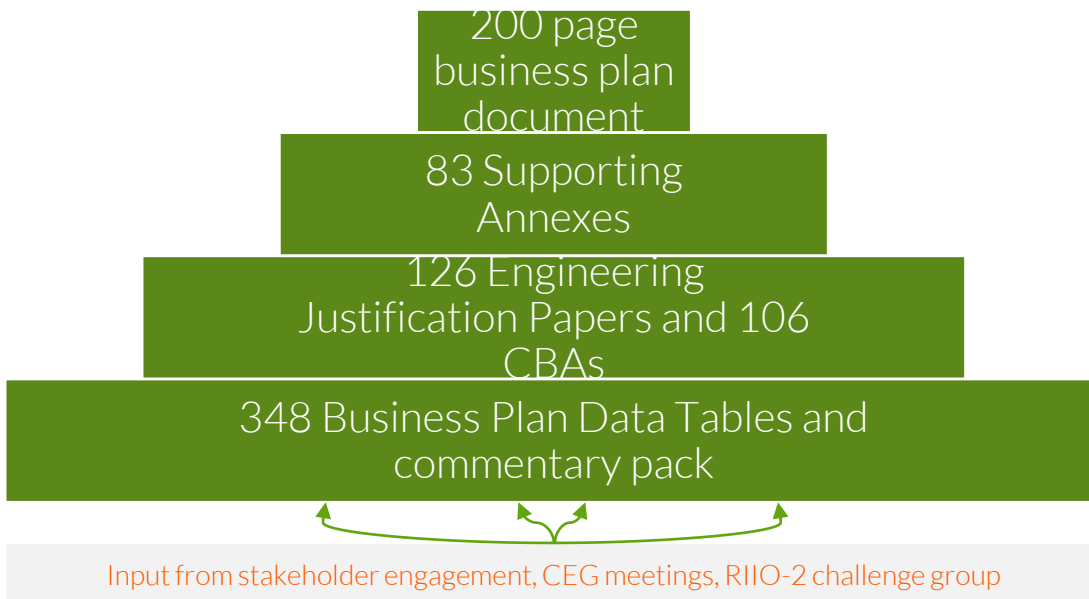
# RIIO – ED2 Submission – Preparing for DSO

- ▶ Mark Goudie
- ▶ SPEN DSO Implementation Manager

# Our RIIO-ED2 submission



We submitted our final business plan to Ofgem and the RIIO-2 Challenge Group on 1 December 2021 – along with publishing this externally for all of our customers and stakeholders.



# What' next in process?

## KEY MILESTONES



**1 Dec 21**

Final RIIO-ED2  
Business Plan  
submitted to Ofgem



**6 Dec 21 – 7 Feb 22**

Ofgem launch Call  
for Evidence –  
chance for  
stakeholders to input



**24 Mar 22**

RIIO-ED2 Open  
Hearing with Ofgem  
and Challenge Group

Jun 22

**Ofgem Draft  
Dertminatio  
n**



**Jun 22 – Dec 22**

Ofgem will consult  
stakeholders and  
companies on  
proposals

Dec 22

**Ofgem Final  
Dertminatio  
n**



# The changing energy landscape

In RIIO-ED2 we have a critical role to enable these evolving customers' needs, deliver a just transition to Net Zero, and ensure the continued safe, reliable, and efficient operation of the distribution network and wider system.



	Electric vehicles	Heat pumps	Generation
Now	ca. 20,000	ca. 1,000	4.8GW
2028	0.7-1m	0.3-0.8m	+4.9-6.4GW

## THE CHALLENGE

These customer-led changes are far beyond what the network capacity, our operational systems, and our internal processes are designed for. This creates four core challenges we must deliver in RIIO-ED2:

### Create additional network capacity

so we can accommodate our customers' EVs, heat pumps, and generation.

### Manage increasing complexity

to safeguard the distribution network and whole system, and to enable new markets and services to operate safely and efficiently.

### Respond to increasing network criticality

as our customers become increasingly dependent on their electricity supply for all their activities.

### Manage deteriorating asset condition

as utilisation and criticality increase due to greater levels of demand and generation.

# Why we need DSO in RIIO-ED2

## Three major System Challenges

### Decarbonisation

The demand and generation we need to accommodate on the distribution network is significantly increasing.

### Decentralisation

The ESO is increasingly dependent on services from distribution-connected providers (known as DER) as their need for services increases and their traditional transmission-connected providers close.

### Democratisation & Digitalisation

Our customers increasingly have the desire and the tools to participate in the energy system, and can respond to an increasing number of different price signals.

## ..give rise to three challenge areas in RIIO-ED2:

### Planning & network development

Decarbonisation is well beyond what the network is currently designed to accommodate, and it increases the interaction between the distribution network and other vectors (e.g. transport).

*We must accommodate Net Zero safely, efficiently, and on time.*

### Network operation

ESO service use affects power flows on the distribution network, and so interacts with our responsibility to operate a safe, reliable, and efficient distribution network.

*We must facilitate the ESO's utilisation of DER services and coordinate it with our own DER service use, to safeguard system stability and operability.*

### Market development

Our toolkit needs to encourage and support solutions from flexibility providers and market innovators (both existing and new third parties) whilst managing the more dynamic power flows and higher peak demands that could result.

*We must enable these markets to grow and operate competitively, whilst safely and efficiently planning and operating the network in this new environment.*

# Enabling the DSO

## Maximising Capacity through Dynamics Grid Operation

### DSO Infrastructure Investment & Planning

- Integrating our **Engineering Net Zero Platform** for whole network analysis & LCT Management
- Utilising **550MW** of Flexibility at over **1,350 locations** (through current tenders)
- Deploying **22** wide-scale **Constraint Management Zones** to release network capacity

### Enabling Efficient, Competitive and Co-ordinated Markets

- New infrastructure & processes to gather, assess, and share data, e.g. our **Energy Data Portal**
- Planning and operational **coordination with the ESO** e.g. dispatch and constraint notifications
- Supporting customer involvement by **lowering participation barriers** and costs e.g. API costs

### Delivering our DSO structure

- Ensuring **open & transparent decision-making**, with audit and stakeholder assurance
- Responsible for network planning, investment, flexibility & system operation decisions
- **Executive level accountability** for delivering DSO outputs & benefits

## Enabling the path to Net Zero for our Communities through DSO

### ED2 DSO CMZs



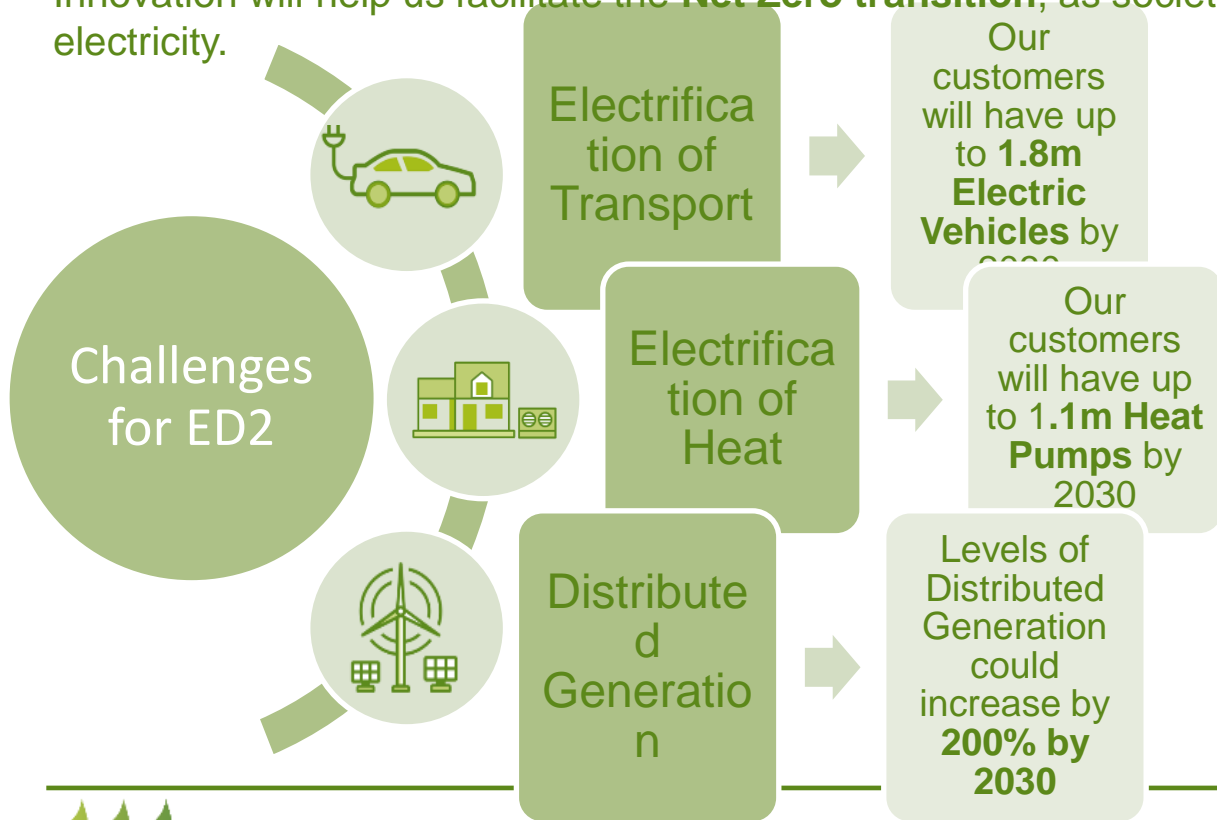


## ED2 Innovation

- ▶ Ralph Eyre – Walker
- ▶ SPEN Environmental & Innovation Manager

# Distribution Future Energy Scenarios (DFES)

Innovation will help us facilitate the **Net Zero transition**, as society becomes increasingly reliant on electricity.



## What does this mean?

Innovation has to be at the heart of a **Just Transition to a Net Zero** economy.

## How are we doing this?

- 1) By delivering **award winning innovation**
- 2) By **embedding successful innovation** developed by us and other networks
- 3) By having a **strong culture and strategic focus** on innovation

# Embedding Award Winning Innovations as Business As Usual

ED1 Track Record

Delivering benefits from proven innovation in ED2

Awards  
(examples)

Solution	ED1 Savings	Solution	Number of deployments	ED2 Savings
Active Network Management	£18m	STATCOM Solutions	1 ±7.5MVar STATCOM 2 ±10MVar STATCOM	£17.4m
LV Monitoring	£1.8m	Fault Level Management	38 Real Time Fault Level Monitors 3 Active Fault Level Management	£42.8m
Novel Substation Solutions	£8.8m	Real Time Thermal Ratings with automation	1 Grid site (SPM)	£8.3m
SINE Post, EV-Up and NAVI	£0.9m	Real Time Thermal Ratings/Monitoring	75 (as part of overall HV and LV Network Reinforcement Strategy)	15.2m
Sniffer Dogs for Oil Leak Location	£0.1m	LV Monitoring	14,000 (as part of overall HV and LV Network Reinforcement Strategy)	
Novel testing and installation techniques	£0.3m	LV Engine	18 (as part of overall HV and LV Network Reinforcement Strategy)	
LiDAR	£0.8m	On load tap changers	19 (as part of overall HV and LV Network Reinforcement Strategy)	£3.5m
Smart Lock Deployment	£0.7m	Novel Transformer Bundings	122 total across SPM and SPD	
<b>£31.3m savings to date</b>		<b>£87.2m total embedded savings in RIIO-ED2</b>		

## Best Innovation Award

Accelerating Renewable Connections (ARC) project – first trial of Active Network Management

Scottish Green Energy Awards 2015

## Best Electricity Network Improvement

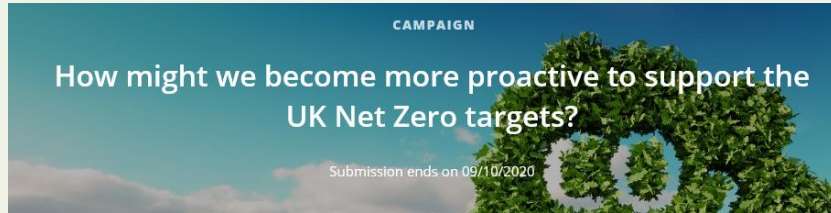
Real Time Fault Level Monitoring

UK Energy Innovation Awards 2019



# Our Innovation Culture

## Our iHub Campaigns



- Internally sponsored campaigns to seek ideas and solutions for specific challenges.
- In ED1, we have generated over **210 ideas** from over **1,200 colleagues** leading to over **50 projects** being delivered via BAU funds.

## Our People & Processes

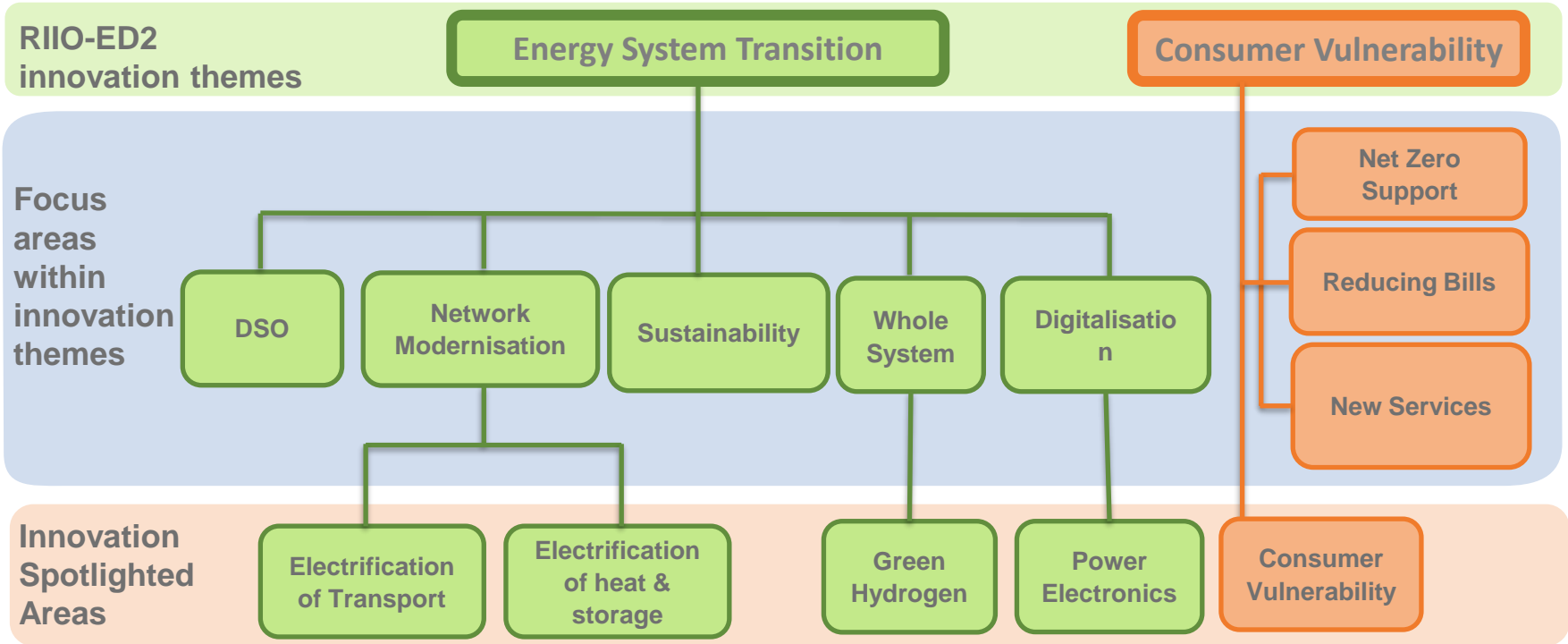


- Recruited over **100 innovation champions** to make innovation real and in our districts and depots.
- Developed clear innovation processes to enable concepts to be **developed, supported and approved.**

We are investing in our **people, processes and technology** to achieve a culture of Innovation.



# Our ED2 Innovation Strategic Themes

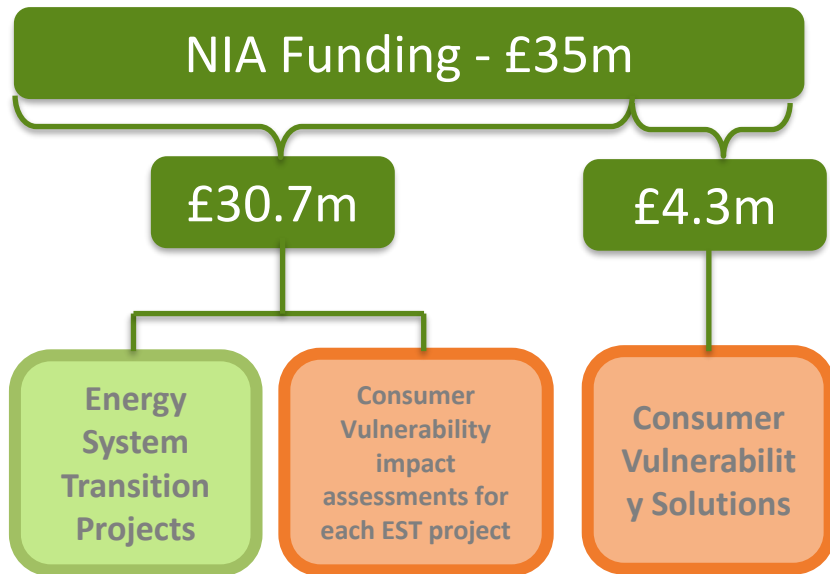


Customers will benefit from a **greener energy system** while we keep **costs as low as possible**



## Highly ambitious innovation investment strategy for ED2

**Our stakeholders told us** that both Ofgem innovation themes should be addressed simultaneously for each project as much as possible. **A positive impact for Consumer Vulnerability will always be targeted.**



**Building on our track record to deliver an industry leading innovation portfolio for RIIO-ED2:**

- Nearly £50m to be invested in deploying innovative solutions
- £61.9m of Totex funded innovation spend embedded throughout the plan
- £35m proposed Network Innovation Allowance
- Potential +£49m from other funding sources (e.g. SIF, UKRI, etc)
- **Target a £4 return for each £1 invested**

Underpinned by **our Values**, with **Safety & Sustainability** central to everything we do



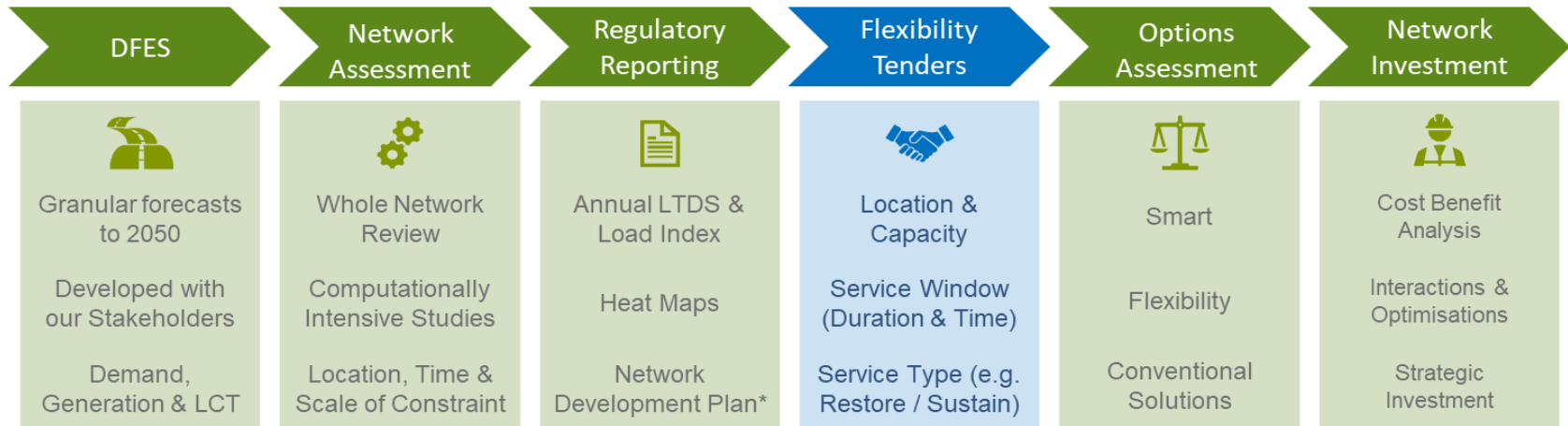


# Flexibility Services

- ▶ Guy Shapland
- ▶ SPEN Flexibility Services Business Lead

# Flexibility Services

- Flexibility tenders look to procure services to manage Primary and Secondary Constraints.
- Network Constraints published annually in LTDS and Ofgem Load Index Submission.
- Condition 31E, introduced in December 2020, requires DNOs to publish a Flexibility Procurement Statement (forward looking) and a Flexibility Services Report (backward looking), both are subject to Ofgem approval.



*\*New EU requirement under Clean Energy Package Bill*

# Flexibility Services Tenders - Volumes

There has been a significant increase in the volume of locations and capacity tendered for:

- ED1 - we tendered for a small number of constraint zones where capex schemes had not progressed and where identified as suitable for flexibility services.
- ED2 - We will consider all solutions to address network constraints due to forecast load growth, with general reinforcement assessed against the procurement of Flexibility Services where it is appropriate to do so.

## Tender volumes to date:

Tenders	Mar 2019	Oct 2019	Oct 2020	Spring 2021
No. of Sites	3	10	1138	1554
MWs tendered	116	250	960	1420
MWs awarded	0	48.57	107.7	555*

\*bids accepted, contracts to be returned

# 2022 Tender Timelines

We recognise that the flexibility services market is still developing and are committed to re-tendering for requirements not met prior to any reinforcement works to ensure we are using the most efficient intervention

## Spring Tender

To procure services for  
2023/24 and 2024/25

Stage	Date
ITT Open	29 <sup>th</sup> April
PQQ	May - June
Bidding Window	W/C 4 <sup>th</sup> July
Commercial & Technical Assessments	July – August
Contract Award	September

## Autumn Tender

To procure services for  
2024/25 and 2025/26

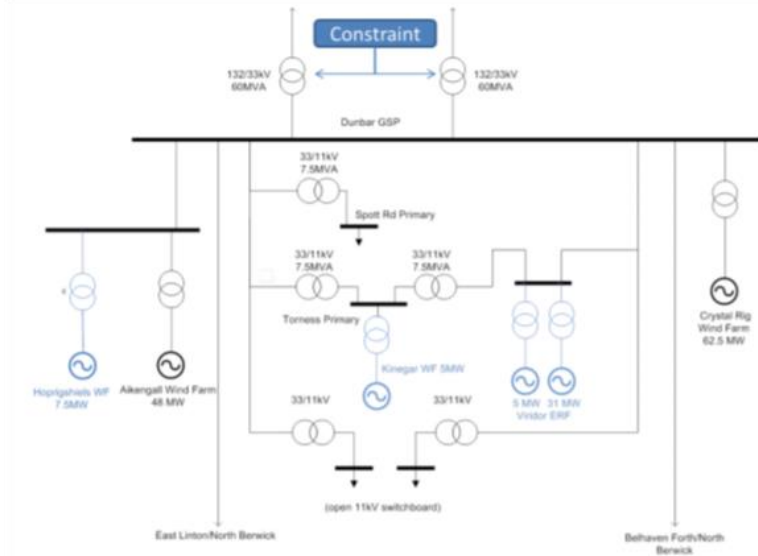
Stage	Date
ITT Open	3 <sup>rd</sup> October
PQQ	October - November
Bidding Window	5 <sup>th</sup> December
Commercial & Technical Assessments	December – January 2023
Contract Award	February 2023

# Active Network Management

- ▶ Nicol Gray
- ▶ SPEN Active Network Management Business Lead

# Accelerated Renewables Connection (ARC)

Between 2012 and 2016, Active Network Management (ANM) was piloted at Dunbar GSP, enabling several customers to benefit and connected to the network several years ahead of planned reinforcement



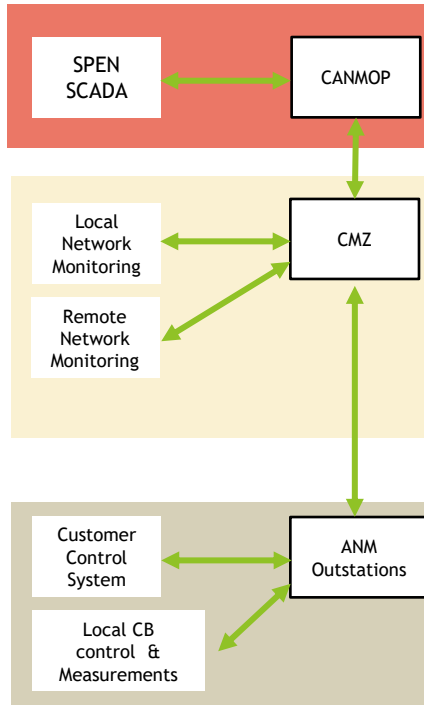
A recent independent economic evaluation of the project concluded the project;

- Directly unlocked £200m of investment
- Supported the creation of 56 FTE per year
- Generate c£500k for local communities over the lifetime of the project
- The connected generators will save over 0.5m tonnes of CO<sup>2</sup>

Learnings directly led to the decision to rollout ANM across our network



# SPEN ANM System Architecture



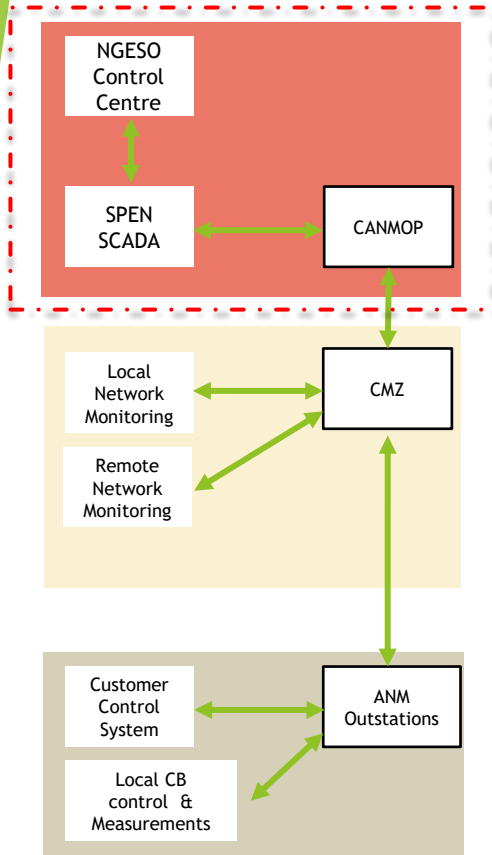
There are two primary **Centralised Active Network Management Operating Platform (CANMOP)** systems, one each for SPD and SPM. Fully funded and delivered during ED1

**Constraint Management Zone (CMZ)** local controllers covering an electrically connected network area - delivered in line with ED1 & ED2 commitments  
(Initial deployments at Dunbar GSP, Newton Stewart GSP, Coylton GSP, Berwick GSP, North Wales)

Located within customer substation  
Directly linked into the customer control system  
Powered via substation batteries (48v)  
**Sole use asset funded by customers**

**3-Tiered architecture to maximise availability, reliability and scalability**

# SPEN ANM System Architecture

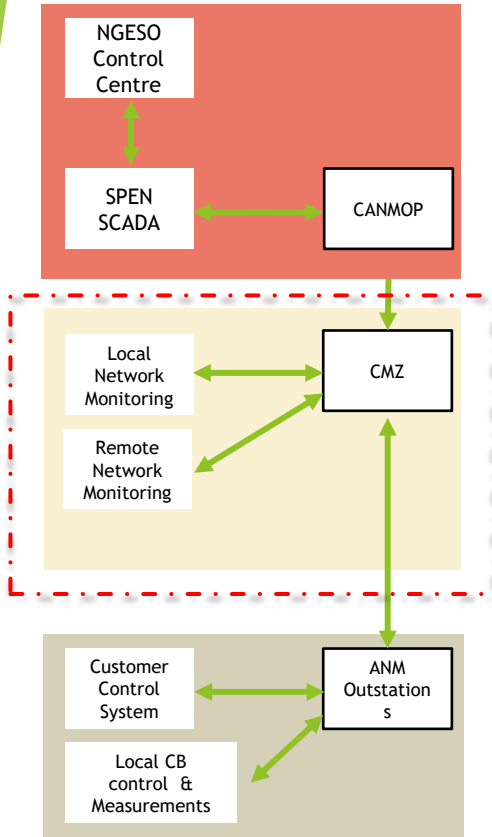


## Centralised Active Network Management Operating Platform (CANMOP)

There are two primary systems, one each for SPD and SPM

- Dual Redundant
- Cyber security & Functional Safety key objectives during design phase
- Networks topology
- Pass critical status and alarm information to the control engineer
- **Fully funded and delivered during ED1**

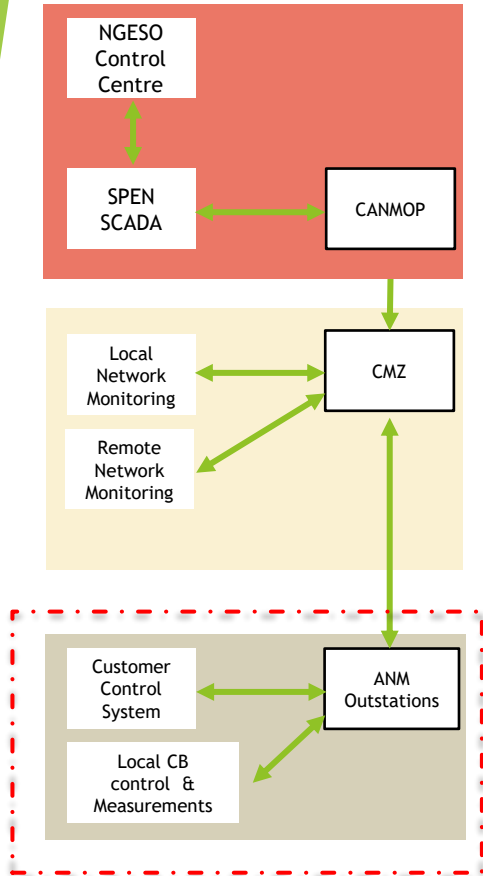
# SPEN ANM System Architecture - CMZ



**Constraint Management Zone (CMZ)** local controllers covering an electrically connected network area

- Each Constraint Management Zone (CMZ) comprises:
  - One or more constraint measurement points
  - One or more DERs have an impact on the measured value at one or more of measurement points
  - Managing an electrically connected part of the network (single or multiple Grid Supply Points (GSPs))
- Newton Stuart GSP CMZ designed and implemented as per the “ANM System Design Methodology”
  - Manage transmission constraints across several circuits
  - 15 constraints points
  - 2 large Windfarms connected
- **Funded and delivered inline with ED1 & ED2\* Commitments**
  - (Initial deployments at Dunbar GSP, Newton Stewart GSP, Coylton GSP, Berwick GSP, North Wales)

# SPEN ANM System Architecture



## ANM Customer Outstation

- Located within customer substation
- Directly linked into the customer control system to provide set point control via 4-20ma hardwire
- Provides failsafe logic
- **Sole use asset funded by customers**



# ANM Deployment Plan

DPCR5

Accelerating Renewable Connections (**ARC**) project, enabled additional **160MW** of generation to connect in constrained parts of the network.

RIIO-ED1

Extensive deployment of **ANM** in Dumfries & Galloway and North Wales, **enabling 500MW of generation** to connect to the network.

RIIO-ED2

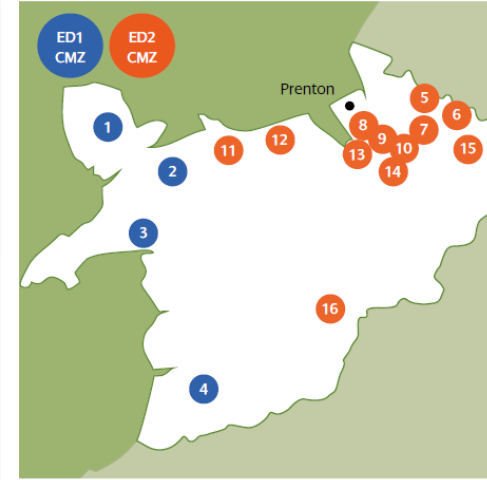
The **DSO platform** will **manage demand, generation and fault-level** in real-time and develop **new markets** (e.g. secondary trading).

Facilitating an additional **1.5GW** of Distributed Generation and **0.5GW** of customer demand.



Kirkintilloch DSO Control Centre  
SP Distribution Network Constraints Management Zones

- |                        |                    |
|------------------------|--------------------|
| 1. Dunbar              | 8. Earlstoun Hydro |
| 2. Dumfries & Galloway | 9. Livingston East |
| 3. Berwick             | 10. Galasheilds    |
| 4. Coylton             | 11. Dunfermline    |
| 5. Bonnybridge         | 12. Dalnarnock     |
| 6. Saultcoats B        | 13. Linnmill       |
| 7. Redhouse            | 14. Kaimes         |



Prenton DSO Control Centre  
SP Manweb Network Constraints Management Zones

- |                  |                |
|------------------|----------------|
| 1. Amlwch        | 9. Capenhurst  |
| 2. Bangor        | 10. Ince       |
| 3. Four Crosses  | 11. Colwyn Bay |
| 4. Aberystwyth   | 12. St. Asaph  |
| 5. Bold          | 13. Deeside    |
| 6. Warrington    | 14. Chester    |
| 7. Percival Lane | 15. Lostock    |
| 8. Rock Ferry    | 16. Legacy     |

# Net Zero Knowledge Forum

- ▶ Stuart Walker
- ▶ SPEN Customer Engagement Manager



# Knowledge Community – Governance Board Invite

---

*This presentation forms part of an invite to determine if you wish to be part of the small Net Zero Knowledge Community Governance Board*

***Governance Board will ideally be constructed of the following***

- 1. Utilities x3 - 4 – SPEN, SSEN, SGN, GTC***
- 2. Academia x 3 - Strathclyde Uni., St Andrews Uni., Edinburgh Uni.***
- 3. Business leads x 3 – EON innovation, Cala Homes, Consultants***
- 4. Local Authorities x 3 – Fife, Edinburgh, East Ayrshire***

***Expectations in the role***

- 1. 2 - 3 hours per month – 1 hour Governance meeting + 1-2 hours action delivery***
- 2. Pull on existing resources to provided known information***
- 3. Provide open honest guidance and wisdom for the wider community***
- 4. Share the platform equally with all other board members and contributors***

# Knowledge Community - Purpose

*To provide information and support for all stakeholders in facilitating the UK, Welsh and Scottish Governments net zero targets*

The Ten Point Plan for a Green Industrial Revolution

Point 1: Advancing Offshore Wind

Point 2: Driving the Growth of Low Carbon Hydrogen

Point 3: Delivering New and Advanced Nuclear Power

Point 4: Accelerating the Shift to Zero Emission Vehicles

Point 5: Green Public Transport, Cycling and Walking

Point 6: Jet Zero and Green Ships

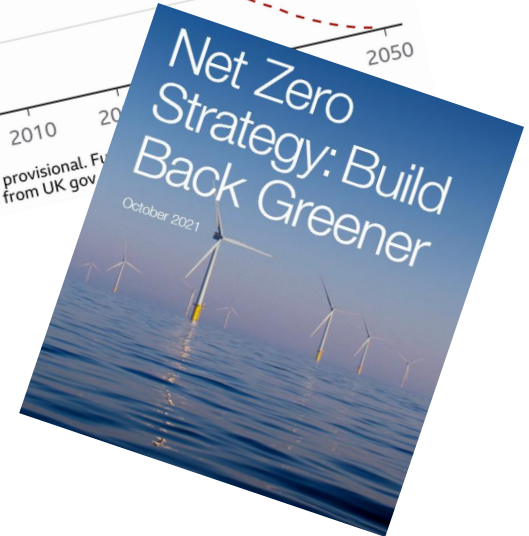
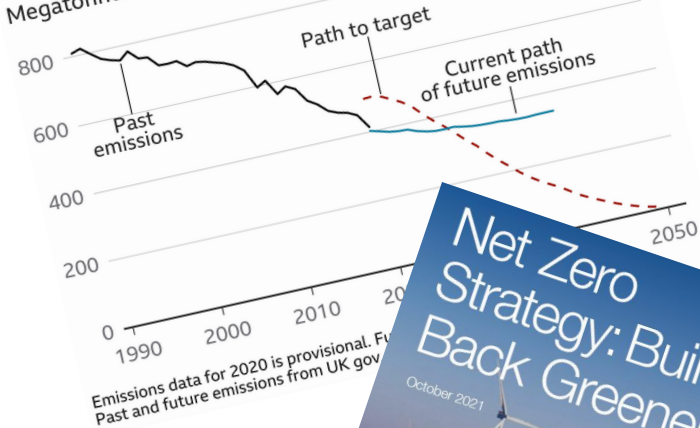
Point 7: Greener Buildings

Point 8: Investing in Carbon Capture, Usage and Storage

Point 9: Protecting Our Natural Environment

Point 10: Green Finance and Innovation

**UK will miss targets without more action**  
Megatonnes of greenhouse gas emissions a year



# Knowledge Community - Governance

*Good Governance to ensure we create a knowledge community that is timely, effective, efficient and fair to all*

## Governance Hierarchy

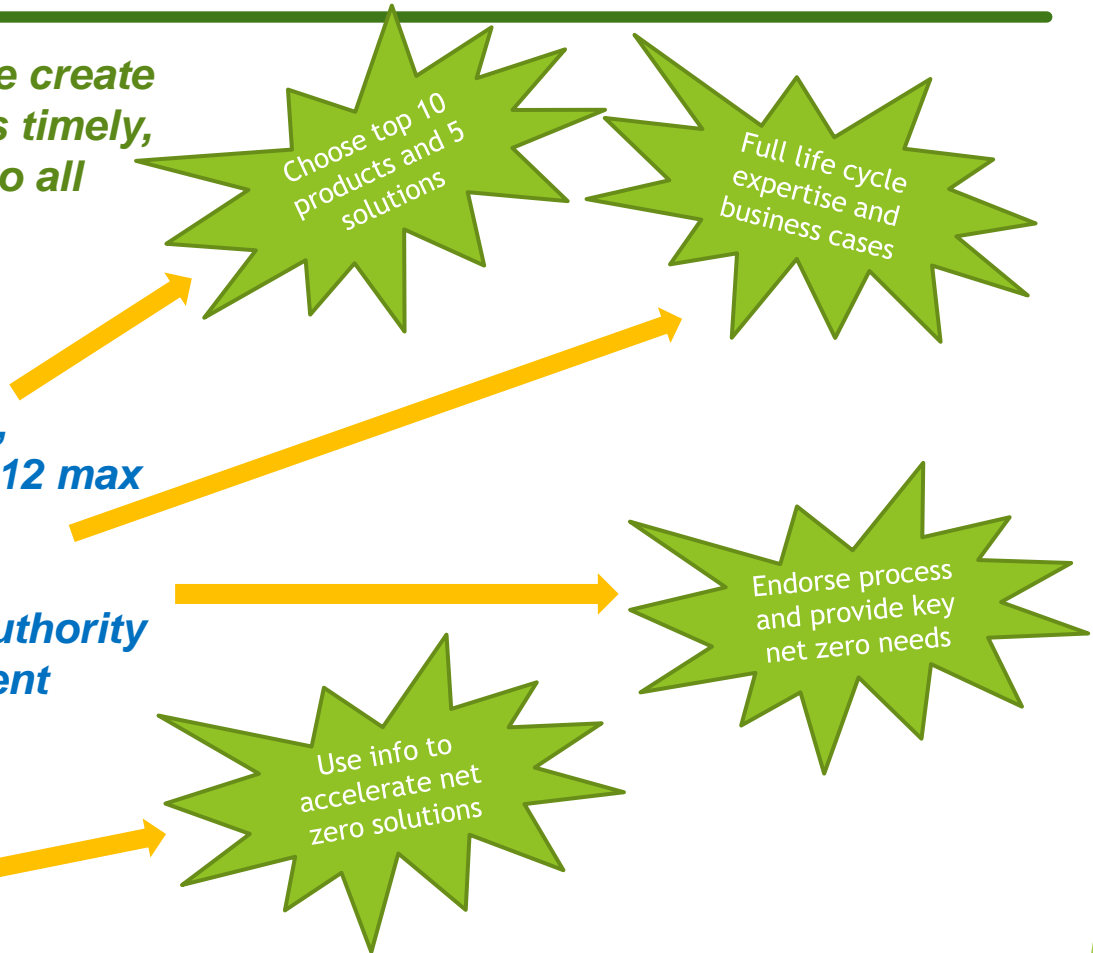
1. **Governance Board – Utilities, Academia, Business leads – 12 max**
2. **Expert Panel – Product and solutions Experts – 30 max**
3. **Contributor Forum – Local authority strategy partners, development associations, connection stakeholders – 100+**
4. **User group to benefit from information – 1000+**

Choose top 10 products and 5 solutions

Full life cycle expertise and business cases

Use info to accelerate net zero solutions

Endorse process and provide key net zero needs



# Knowledge Community – Progress Stages



*Progress so far to be ratified at first governance meeting*

# Knowledge Community – Potential Outputs

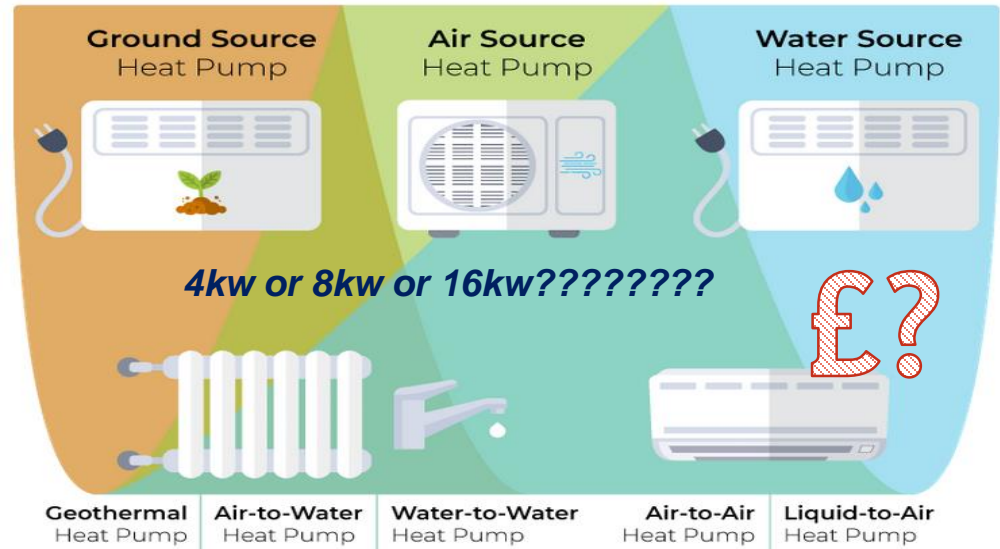
*From Stakeholder feedback so far  
our focus will be on top 10  
Products and 5 solutions – to be  
ratified at 1<sup>st</sup> Governance meeting*

## Net Zero Products (micro / macro)

1. **EV Chargers**
2. **Heat Pumps**
3. **Solar**
4. **Housing Fabric**
5. **Green Hydrogen**
6. **Energy Storage**
7. **Wind**
8. **Bio-Carbon Capture (Trees)**
9. **Hydro**
10. **Sustainability and Local Employment**

## Net Zero Solutions

1. **Heat Pumps, Fuel Poverty**
2. **EV Parking, Solar, Storage vs Demand constraints**
3. **Wind, Solar, Storage vs Generation limitation**
4. **Housing Fabric vs Heat pumps**
5. **Green Hydrogen vs EV / Heat pumps**



# Knowledge Community – Lifecycle Management 1

*Focus will be on the full life cycle of the net zero product or solution, a cradle to grave approach to answer all key questions*



1. **Cost**
  - **Purchase**
  - **Install**
  - **Commission**
  - **Run**
  - **Maintain**
  - **Decommission**
  - **Disposal**
2. **Benefits & Risks**
3. **Impact**
  - **Network**
  - **User**
  - **Community**
4. **Timescales**
5. **Case study examples**
6. **Investment payback**
7. **Net zero benefit**
8. **Comparison with other solutions / products**



# Knowledge Community – Lifecycle Management 2

A “whole of life” approach means moving away from transactional or one-off purchase to an approach which sees the acquisition as a multi-step process to be done slowly and properly.



*This includes:*

1. *Careful Need identification*
2. *Planning what is expected from it once acquired*
3. *Design effort for minimum purchase specifications*
4. *Procurement based on the previous three steps*
5. *Commissioning / installing to make sure that the business gets everything promised in the purchase contract*
6. *Operating, maintaining and monitoring the asset on a continual basis*
7. *Modifying the asset or upgrading it if possible and if this makes good commercial sense*
8. *Decommissioning or retiring/disposing of the asset so that it can be appropriately replaced*

# Knowledge Community – Book of Knowledge

---

*Key output will be a Net Zero Book of Knowledge with Lifecycle Information for the top 10 Products and 5 solutions from March 2022 through to October 2023 in 4 tranches*

*The Net Zero Book of Knowledge seeks to be the foundation of the Information required for Net Zero decision making, assuming a zero base starting point for the audience.*

*In this way accelerating the installation of effective, efficient and timely net zero solutions that fit the need of the user group.*

*Eliminating in the process costly and timely mistakes made through inexperienced decision making.*

*Effectively accelerating the knowledge base of the UK Net zero community*



# Knowledge Community – Next Steps

---

1. *Governance Board to confirm members and hold first Board held... next due March 2022*
2. *Newsletter to communicate Governance Boards plan for next 22 months*
3. *Expert Panel to hold first meeting and commit to authoring their key net zero area – held Yesterday... Next Due April 2022*
4. *Contributor Forum to Endorse product and solution offering and governance process... April 2022*
5. *Expert Panel to produce first tranche of products and solutions for review... March to May 2022*
6. *User Group event April 2022 - Views and improvement suggestions capture in ICE submission 2022 / 23*
7. *Repeat of process until all 4 tranches are completed and top 10 Products and 5 Solutions are capture in the first Net Zero Book of Knowledge*

*We will try to combine staged early releases of these tranches with pragmatic robust of information that can have immediate benefit while we close out each product and solution*

# Knowledge Community – Questions



# Feedback and Q&A Session

- ▶ Rachel Shorney
- ▶ SPM Stakeholder Engagement Manager
  
- ▶ Stuart Walker
- ▶ SPD Customer Engagement Manager

# SPEN Preparing for Net Zero Conference

## Wednesday 9<sup>th</sup> March 2022



Thank you for your time today.

*Your feedback has been useful and we will follow up and incorporate your comments when planning our next session.*

Upcoming events for the calendar:

Preparing for Net Zero Conference

**Wednesday 15<sup>th</sup> June 2022**

- 09:30 to 12:00
  - Preparing for Whole System Approach
- 13:30 to 16:00
  - Preparing for EV and Heat