

SP Energy Networks Preparing for Net Zero Conference Wednesday 1st December 2021

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



Thank you for your time today

SPEN Preparing for Net Zero Conference

Wednesday 1st December 2021



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

09:40 – RIIO ED2 Update

10:00 – Flexibility Services Tenders

10:30 – Active Network Management

11:00 – Break

11:15 – Demand Shifting with Energy Local

11:45 – Overview of ICE Progress

12:00 – Close

SPEN Preparing for Net Zero Conference

Wednesday 1st December 2021



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 Contact - SPEN Storm Response



Frank Mitchell

CEO
SP Energy Networks

I'm Frank Mitchell,
I'm the CEO of SP Energy Networks

www.spenergynetworks.co.uk/pages/severe_weather_update.aspx

RIIO - ED2

- ▶ Sophie Sudworth
- ▶ SPEN RIIO – ED2 Connections Lead

Enabling the path to Net Zero

Delivering a better future, quicker through our RIIO-ED2 Business Plan

Sophie Sudworth

RIIO-ED2 Connections Lead



PRINCIPAL PARTNER
**UN CLIMATE
CHANGE
CONFERENCE
UK 2021**

IN PARTNERSHIP WITH ITALY

What is RIIO?

Price controls are a regulatory contract for network operators, setting out:

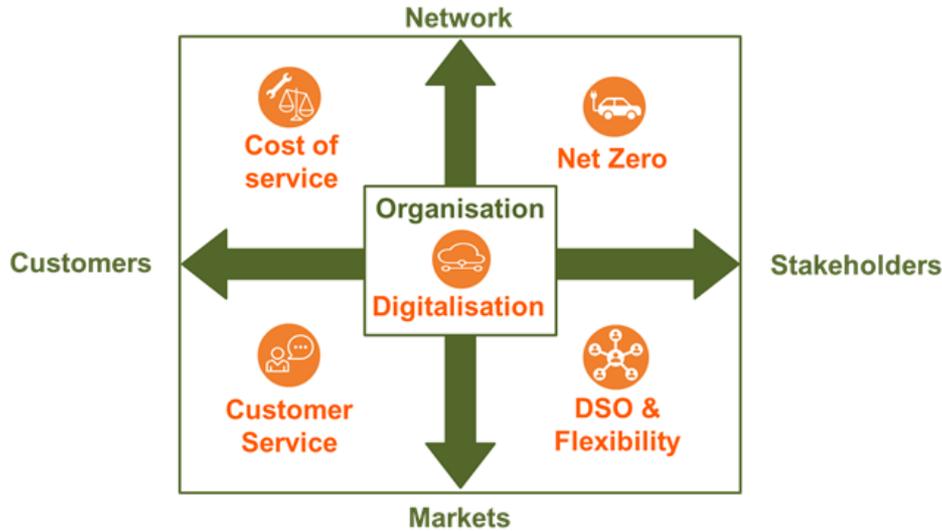
1. **What we must deliver**
2. **How this will be measured**
3. **How much it costs**

RIIO-ED2 is the next price control for electricity distribution companies, from 2023-2028



The Context for RIIO-ED2

RIIO-ED2 will be a time of profound change for Distribution Networks



Our RIIO-ED2 Strategy

We have an ambitious plan for RIIO-ED2, and here we summarise our overarching strategy that we have shaped in response to the priorities of our customers and stakeholders. These priorities have been aligned to three pillars, which provide a consistent focus to our plan and enable us to deliver our ambitious agenda. To support this framework, we have a future vision for our business which articulates the role we must play in RIIO-ED2 and beyond.

We will: **“Work with the communities we serve to enable a just transition to our Net Zero future”**



Our customer and stakeholder priorities



Develop a network that's ready for Net Zero

- We will develop the network of the future
- We will ensure a safe and reliable electricity supply
- We will provide timely and efficient connections



Be the trusted partner for our customers, communities and stakeholders

- We will deliver excellent satisfaction and enhanced services for all customers
- We will support vulnerable customers and communities to ensure no-one is left behind
- We will work with stakeholders to facilitate the energy system transition



Ready our business for a digital and sustainable future

- We will support an environmentally sustainable network
- We will promote an inclusive, skilled and community-based workforce
- We will embed digitalisation and utilise data to unlock benefits for customers and stakeholders



Our plan benefits



Develop a network that's ready for Net Zero

We will enable Net Zero ambitions by connecting 670k Electric vehicles and 370k heat pumps.

>1m



Be the trusted partner for our customers, communities and stakeholders

We will increase customer satisfaction to 9.4 out of 10 – maintaining industry-leading ambition and performance.

9.4/10



Ready our business for a digital and sustainable future

Reduce our carbon footprint by 38% by 2028; and achieve Net Zero by 2040.

-38% CO₂

Our digital enabled connections strategy will allow us to realise £15m of savings to connections customers.

£15m

We'll provide funding and support through our Distribution Net Zero fund and Community Energy activities to enable communities to realise their ambitions.

£30m

We'll create over 400 new jobs, and recruit over 700 new employees to replace retirees.

>1,100 jobs

Innovation and efficiency embedded in our plan will save £173m for customers.

£173m

We will provide support services to more customers than ever before, delivering social benefits of £62.5m.

£62.5m

Embedding new digital approaches, innovation and process redesign will save customers over £60m.

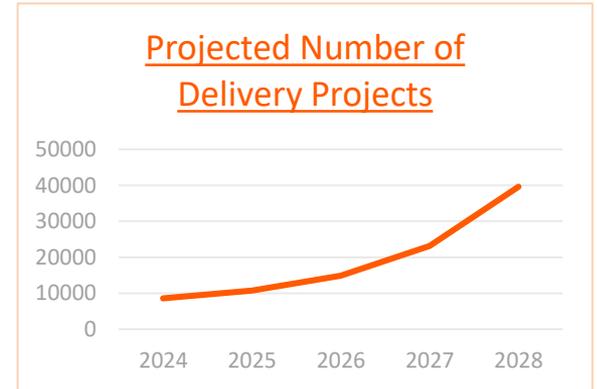
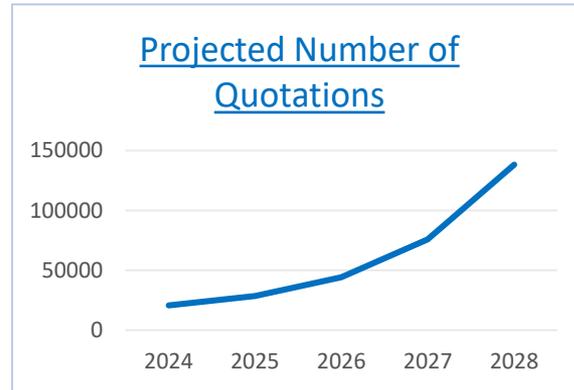
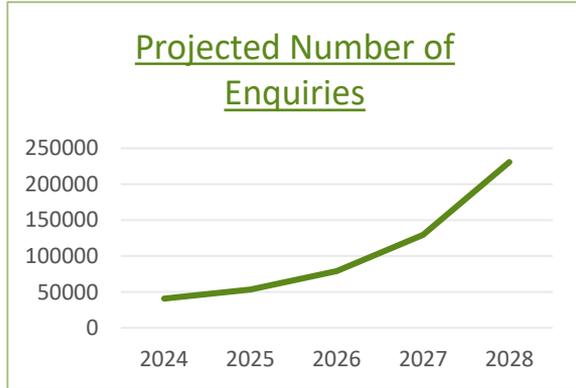
>£60m



Forecasted Increase in Connection Activity

A statistical model based on DFES inputs estimated volume of activity by connection market segment

We expect a five fold increase in connections related activity by the end of ED2



Key Customer Themes and Commitments

<p>Speed....</p> <ul style="list-style-type: none"> Communication Information Provision Early Indicators Quotation Delivery 	 <p>Transparency Upfront Provide clear, revealing information tailored to individual needs, on-line.</p>  <p>Immediate Assessment Provide customers with an immediate assessment of their connection request</p>	 <p>Agile Delivery Improve speed of delivery through smart outsourcing and refined processes.</p>  <p>Timescales to Suit Customers Work to customers timescales for the provision of an offer or delivery.</p>
<p>Ease....</p> <ul style="list-style-type: none"> Contact Process Obtaining Data Quotation Delivery 	 <p>Trackable Progress Allow customers to track their connection online from enquiry, through design, acceptance and delivery.</p>  <p>Process Rationalisation Make our process(es) clear and easily understood. Including ICP & IDNO works.</p>	 <p>Intelligent Assessment Provide tools to enable automated network assessment.</p>  <p>Real- Time Information Make network information available in real-time.</p>
<p>Support....</p> <ul style="list-style-type: none"> Setting Expectations Possible Alternatives Timescales Pre-Quote Advice Repeat Customers 	 <p>Supporting Self Service Offer support for customers during roll- out of our new tools and services.</p>  <p>Supporting an Evolving & Competitive Market Continuous, agile and iterative stakeholder engagement activities.</p>	 <p>Fast Flexibility Provide technical and commercial alternatives at HV & above</p>  <p>Supporting Digitalised Service Ongoing support for customers in using digital suite of tools available</p>



Commitments

We will offer 100% of customers a pre quotation consultation using either face to face or virtual technology, to achieve improved upfront communication with customers by 2025.

We will quote within 70% of guaranteed standard timescales for Major Connections customers using our improved digital solutions. By 2028, 100% of customers to receive a budget offer at the point of enquiry.*

We will nominate a point of contact to all customers requesting 30 or more quotations per year, or have a single project exceeding £1m in value, using dedicated account management to foster better relationships with repeat customers, by 2025.

*commitments changed based on stakeholder and CEG feedback

We will improve connections delivery timescales by 2% year on year from the start of ED2

We will make increasing amounts of connections related network information available in near real time, including capacity and constraint analysis. This will use increased digital data sets by 2025.*

We will offer 80% of HV and EHV customers the choice of a firm and a flexible connection where a known constraint exists to achieve more coordinated network planning by 2025.



Flexibility Services

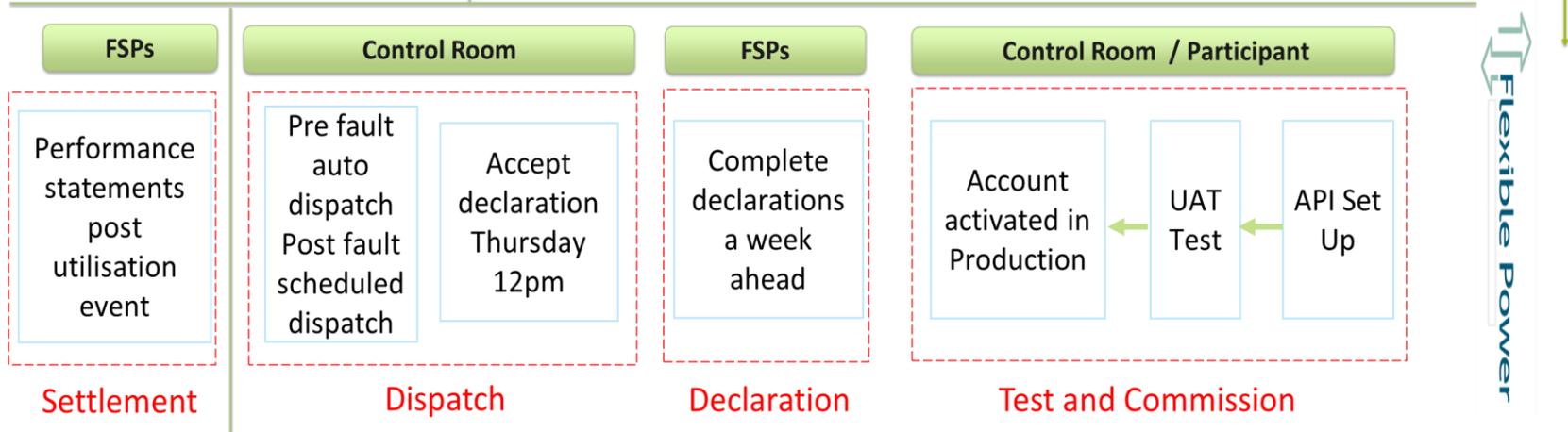
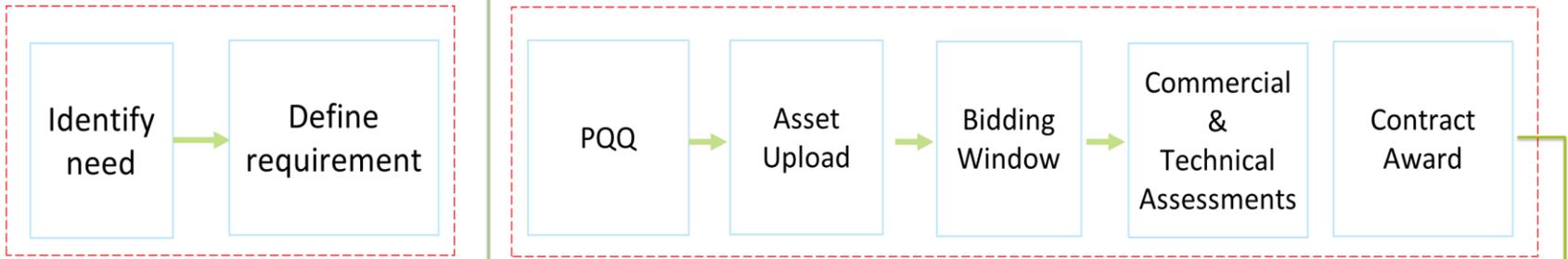
- ▶ Guy Shapland
- ▶ SPEN Flexibility Services Business Lead

Flexibility Services - E-2-E Process



Working out what we need

Tendering for it



Flexible Power

Flexibility Services - E-2-E Process

Four Products have been established in a standardised and consistent format between DNOs

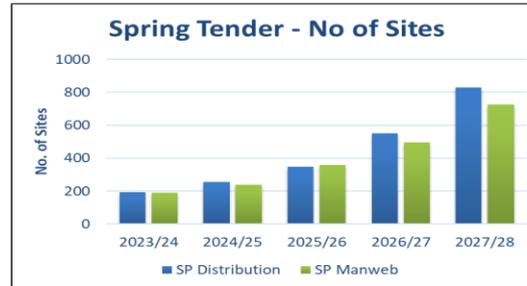
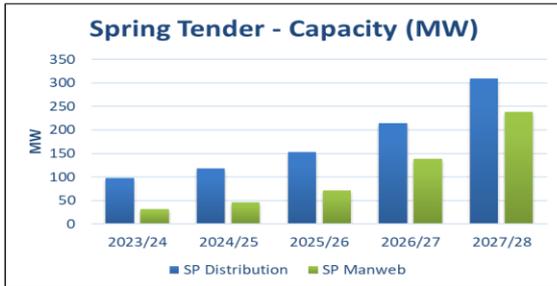
Service	Description	Dispatch	Payment Structure
Sustain	Scheduled to support security of supply during system intact conditions	Scheduled in advance	Utilisation Fee
Secure	Used to manage peak demand loading on the network and pre-emptively reduce network loading	Declaration: Week ahead (Thursday for the following week, commencing Monday)	i) Arming Fee ii) Utilisation Fee
Dynamic	Used to support the network in the event of specific fault conditions	Declaration: Week ahead (Thursday for the following week, commencing Monday) Dispatch Notice: 15 minutes	i) Availability Fee ii) Utilisation Fee
Restore	Used to help with restoration following rare fault conditions, reducing stress on the network	Declaration: Week ahead (Thursday for the following week, commencing Monday) Dispatch Notice: 3 minutes	Utilisation fee

Flexibility Services - Tenders to Date

A Significant increase in the volume of locations and capacity tendered for

Tenders	Spring 2019	Spring 2019	Autumn 2020	Spring 2021
No. of Sites	3	10	1138	1554
Price Control Period	ED1	ED1	ED2	ED2
MWs tendered	116	250	960	1420
MWs awarded	0	53.3	139.6	555

The Spring 2021 tender illustrates the substantial year on year growth in Flexibility Services requirements by licence area during the ED2 period:



Following the large tenders to inform the ED2 business plan, we will now move to more targeted procurement. We will issue tenders twice a year (Spring and Autumn) to fill any outstanding and new requirements.

Our Autumn 21 tender was issued on 31st October looking to procure 111MW at 97 locations for the period 2022/23 and 2023/24

Flexibility Services - Asset Portfolio

Assets to provide Flexibility services include those from existing customer connected to our network and new market participants such as Aggregators who will recruit customers to provide the volumes and services required.

Mix of assets from asset owners and aggregators,



Gas Reciprocators



Electric Vehicles

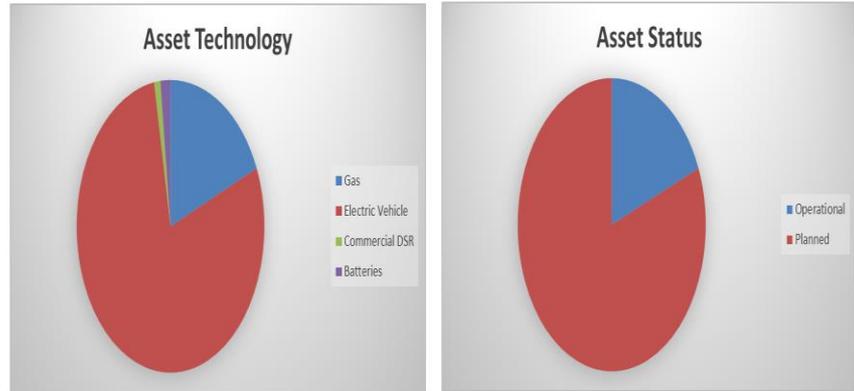


Commercial DSR



Batteries

To date, accepted bids are primarily from planned Electric Vehicle assets (80%):



Contracts will include delivery plans and milestones will be monitored as part of the ongoing contract management to ensure timely delivery / availability.

Flexibility Services - Case Studies

Case studies & pilots

Reactive Power Trial	<p>2 phased trial in Flint (SPM). Phase 1 proved the concept, phase 2 will look at the value of the service, the impact in the network and the impact on the provider.</p>
Demand Turn Up	<p>Working with flex service provider to mitigate generation constraints in Dumfries and Galloway (SPD). 2 phase trial, phase 1 manage their demand in response to market signals. Phase 2 will look at the value of the service.</p>
LV Trial	<p>LV monitoring and control for domestic flexibility services</p>

Flexibility Services - Case Studies

We would welcome your feedback on our procurement process or general feedback on anything related to flexibility services

Please contact:

- Guy Shapland
- Wendy Mantle

Flexibility@spenergynetworks.co.uk

Active Network Management

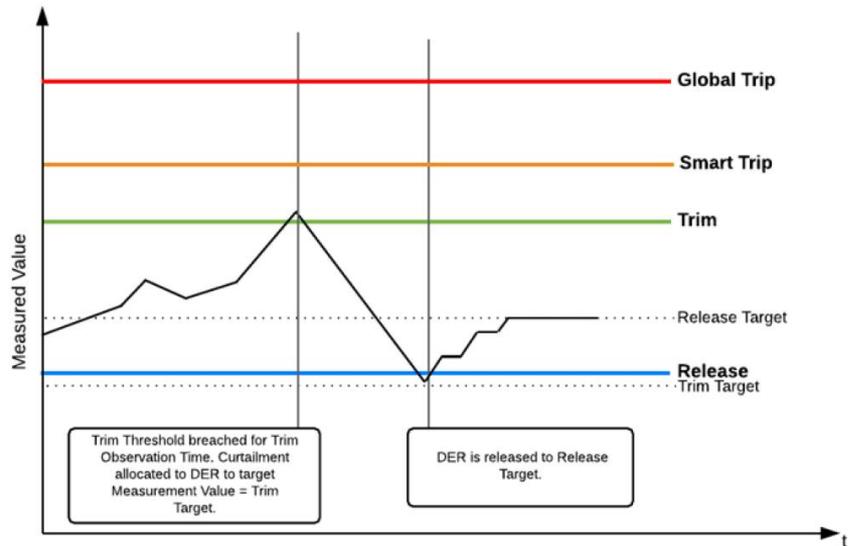
- ▶ Nicol Gray
- ▶ SPEN Business Lead for Active Network Management

Active Network Management

UK Energy Networks Association ANM Good Practice Guide Definition

“Using flexible network customers autonomously and in real-time to increase the utilisation of network assets without breaching operational limits, thereby reducing the need for reinforcement, speeding up connections and reducing costs.”

- ANM is a software tool to manage customers output in real time to ensure that network constraints are not breached; **these constraints could be Real Power, Current or Voltage**
- Several **Distributed Energy Resource (DER)** customers all contributing to a network constraint can be managed at the same time based on the **Principle of Access (PoA)**
- ANM has the ability to “Trim” or “Trip” generators based on severity of network constraint

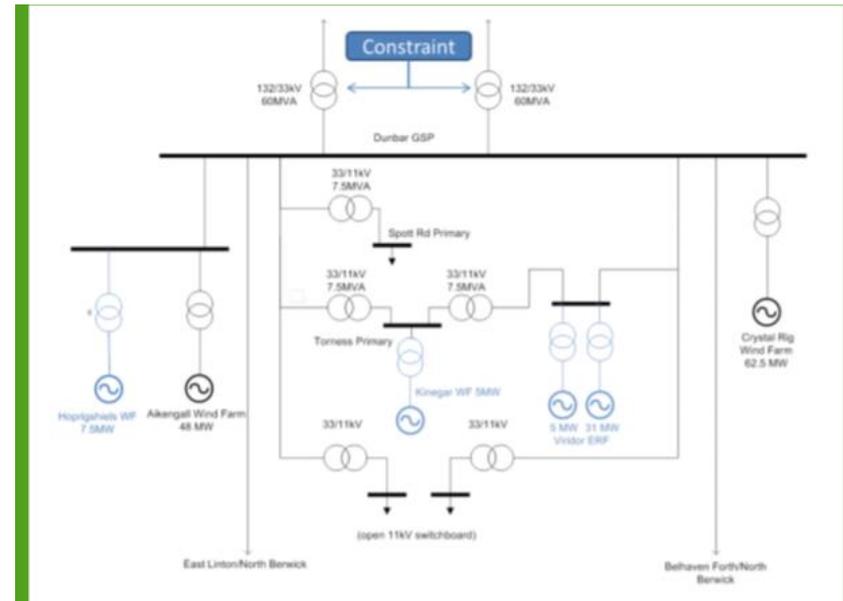


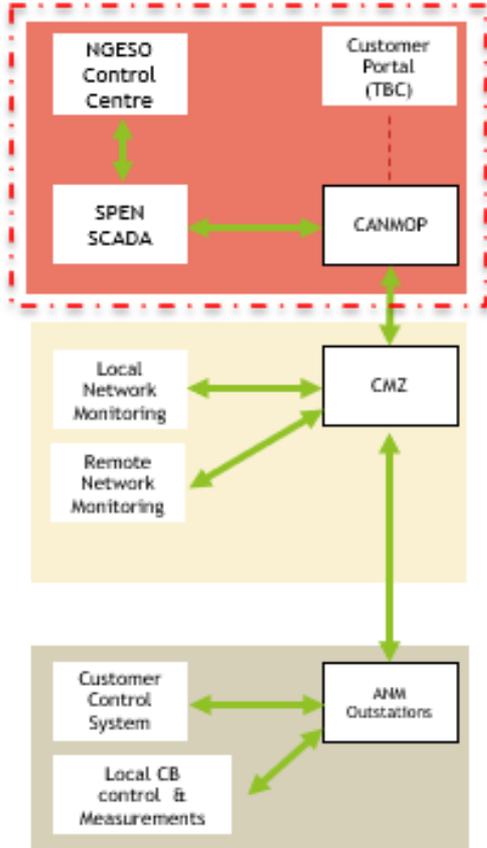
Accelerated Renewable Connections

Between 2012 and 2016, Active Network Management (ANM) was piloted at Dunbar GSP in East Lothian, 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 CO²



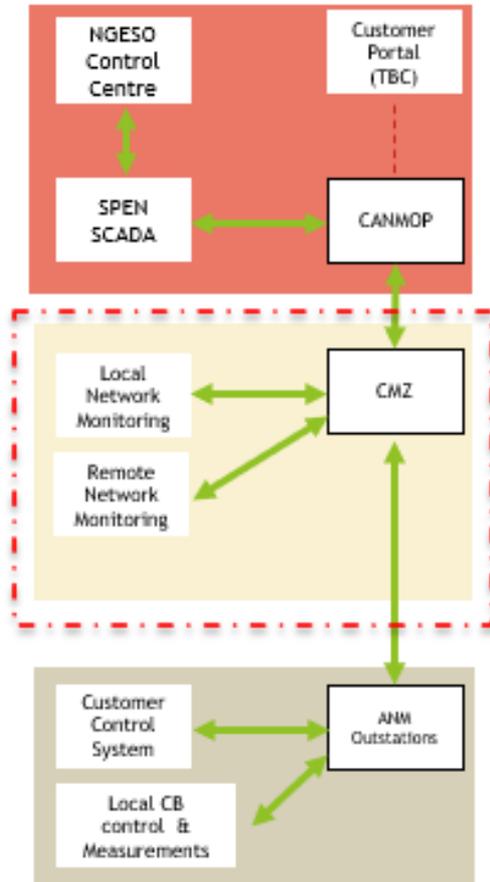


Centralised Active Network Management Operating Platform (CANMOP)

- ❑ **Located within the SPEN secure network**
 - Dual Redundant for increased resilience
 - Cyber Security & Functional Safety key objectives
 - Software based solution

- ❑ **Direct interface with the SPEN Control Room**
 - Real-time networks topology
 - Critical status and alarm information to the control engineer

- ❑ **Shared use asset**
 - Fully funded within Price Control period
 - O&M costs recovered via DCUSA



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))

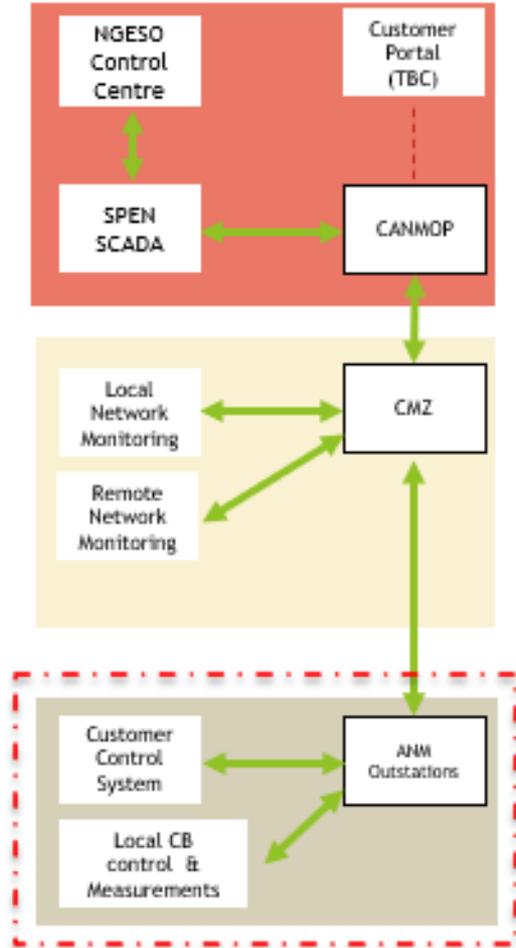
❑ Future CMZ designed and implemented as per the “ANM System Design Methodology”

- For example the Newton Stewart CMZ area will manage 15 constraint points across several circuits

❑ Shared use asset

- Identified CMZs fully funded within current price control period
- Future plans dependant on ED2 determination

Located at the point of connection to the DER



- ❑ Provides set point control to the customer
- ❑ Monitor generator output
- ❑ Provides failsafe logic to protect network

- ❑ ANM Outstation and associated equipment classed as Sole Use asset
 - Paid for by Customer
 - ANM Outstation
 - Small wiring within substation
 - Communication infrastructure





Q4 2021

- Testing & Commissioning of ANM system
- Go-Live
- Newton Stewart & Dunbar CMZs live

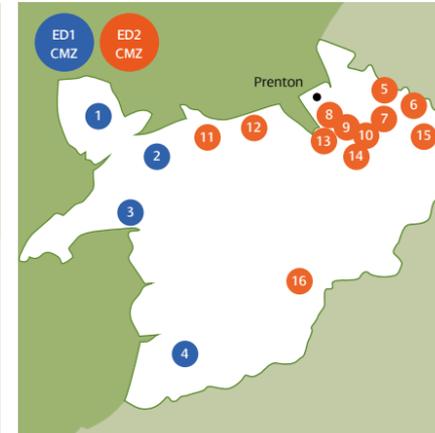
Q1/2 2022

- Coylton GSP CMZ & Berwick GSP CMZ commissioned

Q3/4

- Design & Delivery SPM Central System
- North Wales CMZ

ED2: 2023 - 2028



SPEN Preparing for Net Zero Conference

Wednesday 1st December 2021

Flexibility, DSO and SPEN Innovation Projects

Break

We will resume at 11:25am



Demand Shifting with Energy Local

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

- ▶ Mary Gillie
- ▶ Energy Local

Role of the prosumer



Net Zero targets are driving a rapid increase in domestic electricity demand:

- Up to 1.8m domestic EVs and 1.1m heat pumps on our network by 2030
- Up to three times the amount of distributed generation
- Up to 50 times increased demand from public EV charging infrastructure

Prosumers can help us manage this demand

- Prosumers generate their own electricity and sell excess back to the grid
- Storage options limit how much they need to purchase when generation is lower

Energy Local is a community energy scheme which also looks to align domestic usage with local hydro generation. Key benefit to networks is to shift demand away from traditional peak usage times.

Demand shifting with Energy Local

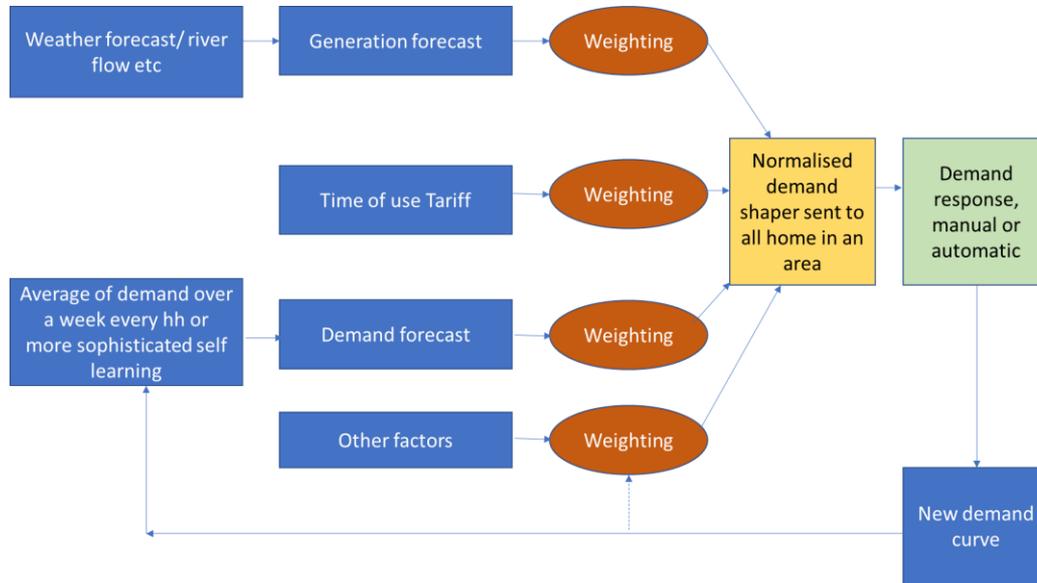
Summary

How Energy Local Incentivises Demand shifting

1. Households and small scale renewables as members form an Energy Local Club (ELC).
2. Households have smart energy meters to show when and how much power they were using.
3. Members (households and generators) agree a price ("match tariff") that will be paid to the generator when they match their electricity use to when it is operating. E.g. turning their washing machine on when the local hydro is going at full pelt.
4. A partner energy supplier (such as Octopus Energy) sells the extra power they need when there is not enough local electricity. Extra power is sold on a 3 band time of use tariff (most expensive at peak times). The supplier sends each household the bill for their total power use.

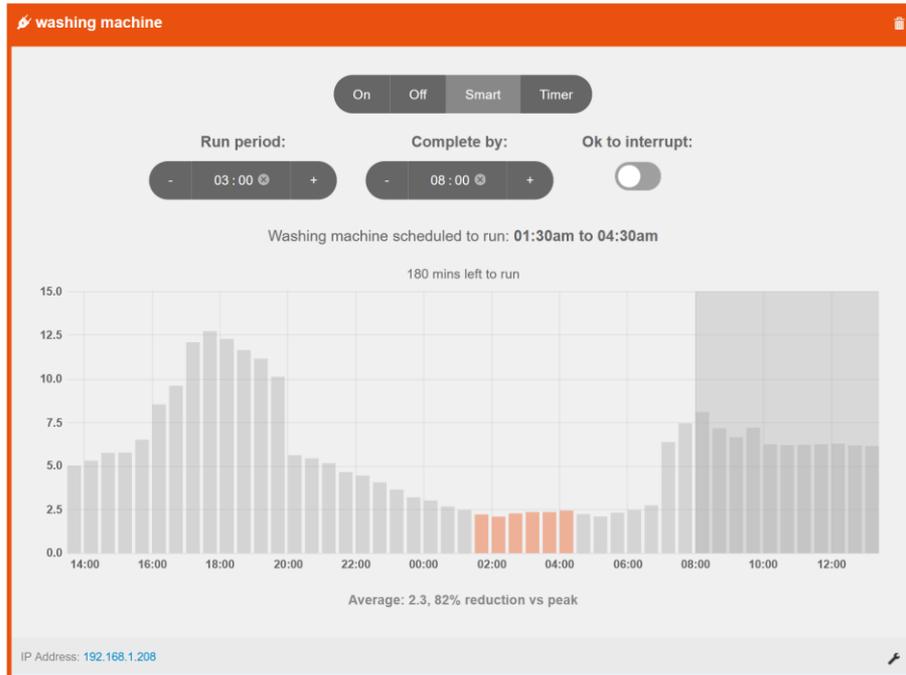
How are we shifting demand?

Create a 'demand shaper' that shows a forecast of how good or bad a time each half hour of the day is to use power based on the generation forecast, demand forecast and 3 band Time of Use Tariff.

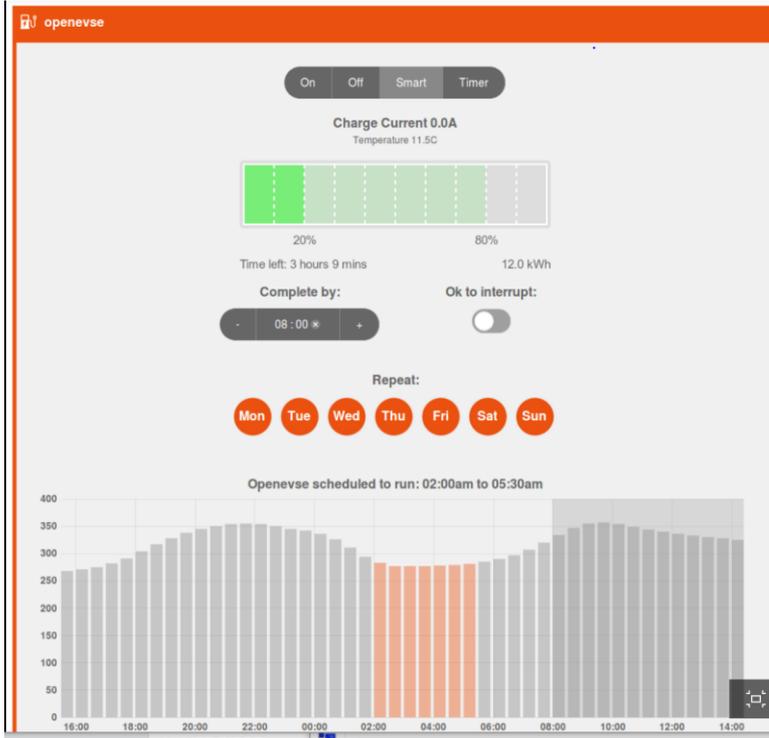


What the user sees.

I need this done by x time, it take x hours –
find the best time to do it.

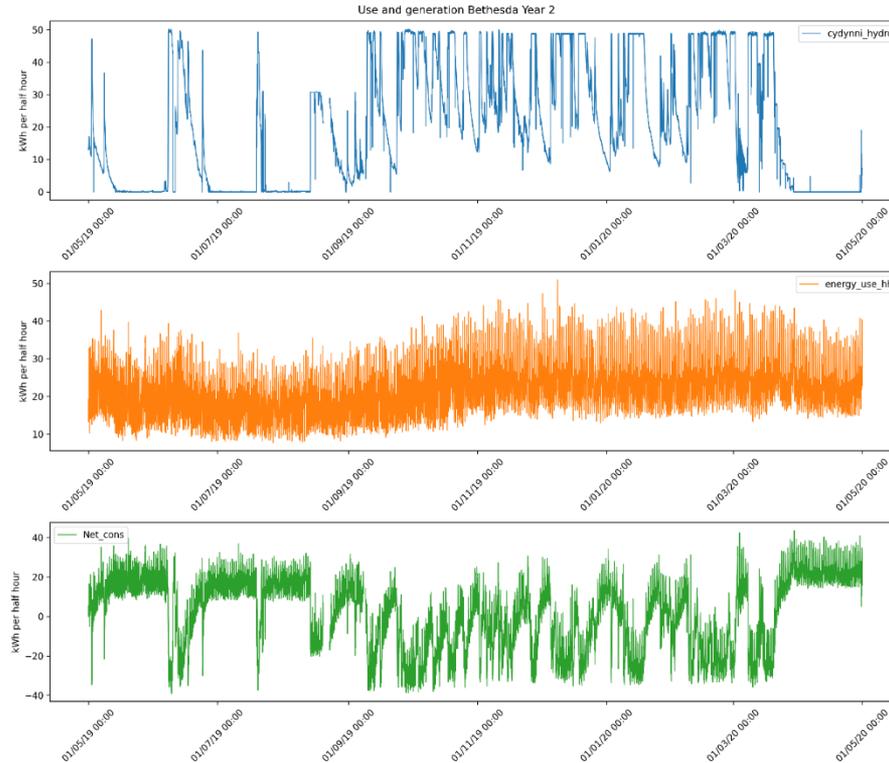


The scheduler – for EVs



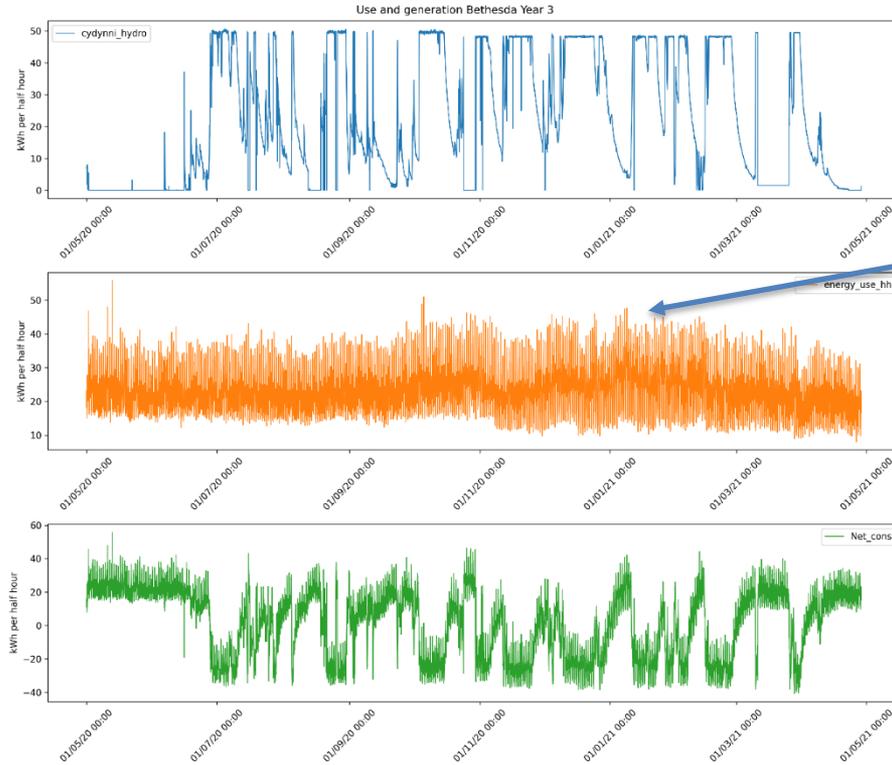
I need X charge by
Y time

Monitoring in Bethesda -Impact of lock down - before



Data analysis of demand and generation from real time monitoring

Impact of lock down - after



Seasonal change in demand is not seen – how much will this continue?

Modelled Scenarios

- Modelled Bethesda Energy Club and 8 other scenarios with more solar, heat pumps and EVs.
- Heat pumps and EVs and some other homes had automated control to shift demand.
- Studied the reduction in peak loading and overall demand.

Modelled Scenarios

Scenario name	Households	Renewable generation	Electrical heat?	Electric Vehicles	How many homes control?
1 – Bethesda	97	100kW hydro, generation profile as per real life data	1 household	None	20
3 – Low heat pump penetration	100	Hydro+15 kW solar distributed among Homes with control	10% households heat pumps	None	Homes with heat pumps + 10% others
5 – high heat pump penetration	100	Hydro+15 kW solar distributed among Homes with control	60% households heat pumps	None	Homes with heat pumps + 10% others
8 – high EV penetration	100	Hydro+15 kW solar distributed among Homes with control	1 household	50% households have EVs	Homes with EV + 10% others

Scenarios designed to test plausibility of model (1) and potential future domestic technology scenarios (3-9)*. 3,5 & 8 shown as exemplars

* Full definitions available in report "Summary of modelling for BEIS domestic demand side response competition"

Scenario Modelling

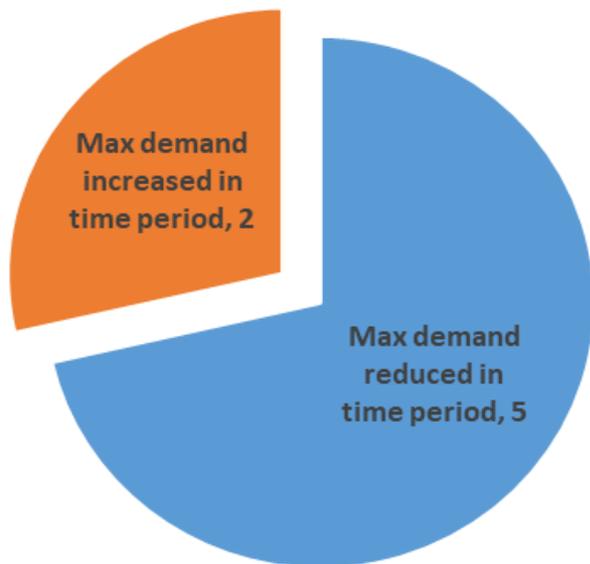


Chart summarises change in **maximum** demand in half-hour slot, for seven modelled scenarios.

DSR algorithm decreased max demand for five scenarios encompassing:

- Low and medium penetration of heat pumps
- Low, medium and high penetration of EVs

An increase in demand was seen for two scenarios:

- High heat pump penetration, no EVs
- High heat pump penetration, high penetration of EVs

Heat pump flexibility more sensitive to unexpected temperature drops

- Customer needs take priority – a cold house should be heated
- Further work: potential improvements for the DSR algorithm to reduce this impact

Coordinated switching within the home

- The Demand shaper helps shift demand to when there is lots of generation and away from peak loading within the community.
- But within one house we need to be sure that we don't schedule the EV Charger, heat pump, washing machine dishwasher etc. all at the same time. Otherwise we make get a peak elsewhere.
- Want to schedule the high demand, long duration loads first.
- Our system is probably the first to try to coordinate multiple loads in one house.

**Examples of
4 homes.
Note
scheduling is
also dictated
by when an
appliances
must be
finished.**

Demand Forecast (demand_forecast)



User 179

Dehum - smartplug3540 (smartplug3540)



Storage Heaters (tasmota_9D647A)



Dishwasher (tasmota_AAAA75)



User 2

washing machine (wifirelay43)



dishwasher (wifirelay4466)



User 53

openevse (openevse)



Washing Machine (tasmota_ABCE49)



Dishwasher (tasmota_A9948E)



User 85

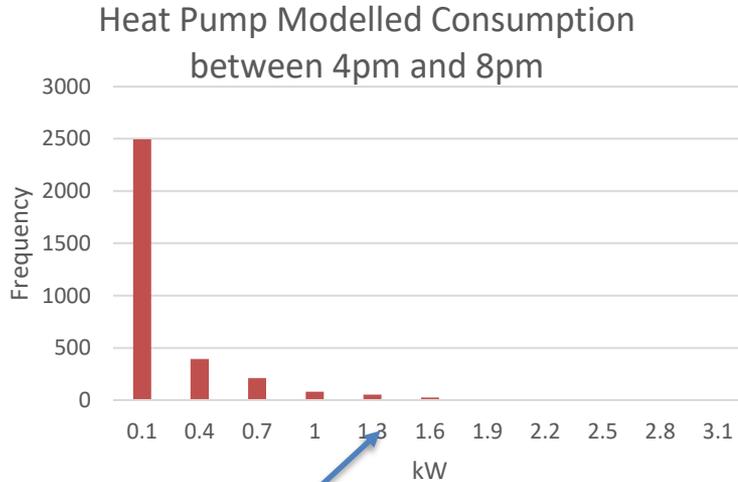
Heat Pump (passiv)



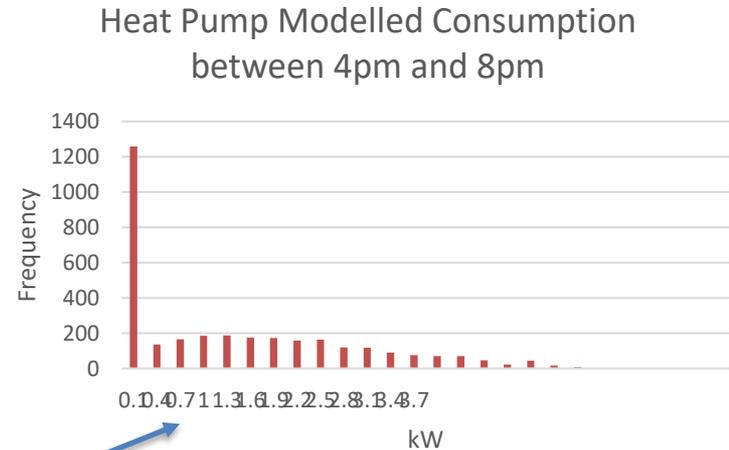
Dishwasher (tasmota_9BD6D5)



Frequency of heat pump consumption during peak hours – controlled with EL

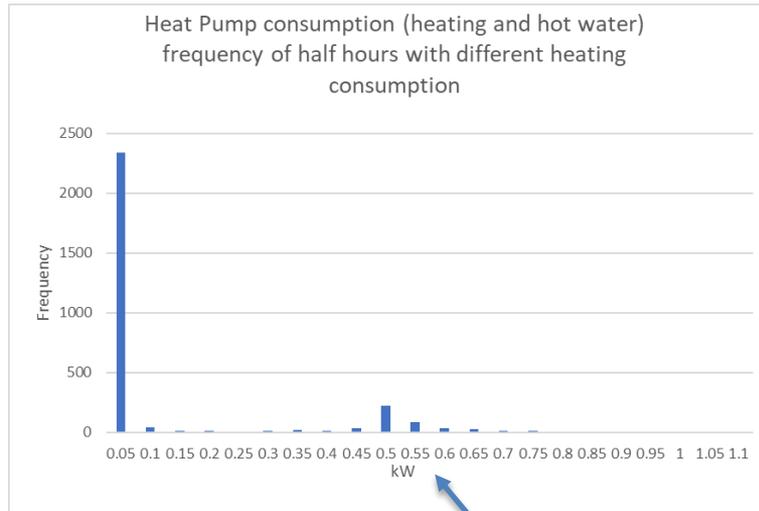


Ex 1: Low number of instances but over some over 1.3kW



Ex 2: Larger house Low number of instances but over some over 4kW

Frequency of heat pump consumption during peak hours – controlled to avoid them



Ex 3: 'leaky' welsh cottage. Low number of instances but over some over 0.5kW, all below. Includes hot water heating but inside air T is lower than previous example)

Ex 4: Large house 1750 with holiday annex, heat pump does not draw more than about 1kW

Impact of heat pumps on peak loading

- Well installed heat pumps with good control have much less impact on the network.
- Emphasis on good installations will ease much of the overloading of networks rather than pay flexibility contracts (better value for the customer too!)
- Small heat store could avoid demand at peak times – this could also mitigate impact of cold starts.

What about EV charging?

- With tariffs encouraging charging during the night and charging available at work. How much EV charging occurs during peak hours.
- Help us find out if you have an EV!
- Please answer this short survey. 🙏🙏🙏

English

<https://survey.energylocal.org.uk/index.php/763175?lang=en>

Welsh

<https://survey.energylocal.org.uk/index.php/763175?lang=cy>

Summary of Results

- Initial data from Bethesda was used to set up a model using De Montfort's powerful Cascade system that can model from appliance to system level.
- Data shows impact of Lockdown.
- With different levels of heat pumps and Evs controlled to benefit from Energy local different amounts of shifting was available.
- Peak and average half hourly values were compared (minimum stayed largely unchanged.)
- Interesting impact on peak loading with 60% heat pumps due to sudden changes in weather. This make become more common and controls need to take this into account.
- Properly installed heat pumps with a small heat store could avoid demand at peak times

Next steps

- What additional flexibility is needed. Can existing settlement data be used (reduce costs)?
- Can the impact of sudden changes in temperature be mitigated in the heat pump control.
- Alternative measures for flexibility (2 weeks before is not very accurate).
- Develop a table of results that can be used to take into account DSR when planning.
- Amount of heat pump use is low with a TOUT. Would we still need a flexibility contract?
- When are EVs, washing machines and dishwashers used with a TOUT – how much is available for flexibility contracts?

Contact

Mary@energylocal.co.uk

07757900408

www.energylocal.org.uk

@energylocal

How do we measure shifting?

	Mean	Standard Deviation
Whole Sample	-0.026	3.883
Year 1	-0.137	4.452
Year 2	-0.135	3.72
Year 3	+0.20	3.38

- **If** 2 weeks prior a good indicator, expect the differences to be low and the variation in differences to also low
- Perfect would be zero difference and zero variation.
- Variation measured as standard deviation.
- Results show mean difference ~ 0 (good – unbiased estimator), but variation high with StD around 10% of the total load (not good – unreliable estimator)

ICE

- ▶ Rachel Shorney
- ▶ SPM Stakeholder Engagement Manager

- ▶ Stuart Walker
- ▶ SPD Customer Engagement Manager

Policy Updates

Our SPEN policy documents can be found at - www.spenergynetworks.co.uk

1. Getting Connected
 - Document Library

2. About Us
 - Document Library

We have recently issued 3 new Policy Documents:

1. Equipment Ratings ESDD-02-007 re-issued March 21
2. Inspection and Monitoring of Networks Constructed by Independent Connection Providers ASSET-04-020 re-issued April 21
3. Ratings and General Requirements for Plant and Apparatus for Connection to The Company's System EPS-03-033 re-issued August 21

We are continually updating our Policies and Standard Documents.

Please send any requests or queries to our stakeholder team so that we can incorporate your requirements into our programme of updates:

- gettingconnectedupdates@spenergynetworks.co.uk

Customer Focus Group

Changes to the application webforms - why the need?

LCT equipment size and location information will enable SPEN to make informed decisions on where reinforcement of the network is required. The webforms will be changed to collect this information.

What's changing?

- Modernised look and feel – mobile friendly
- User experience improved with intuitive flow
- Follows common websites structure
- Simple to answer questions – less jargon
- Progress meter
- Add load calculator

Which forms?

- New Supply – information gathered and used on “energisation”
- Alteration to point of supply – information gathered and transferred to system
- Additional Load – information of existing devices gathered and transferred to system

Next Steps

- Next session Wednesday 12th January 2022

RAdAR- Improvements & Proposed Solutions

Improvements discussed and proposed for progression to IT Design at our last meeting.

SPEN are hopeful that all of these will be approved for implementation:

1. Recommended file size to be uploaded – proposed increase to 100MB
2. POC Expected Offer Date to shown on the POC Registration page
3. Design Approval Date shown against the list of live applications on Design Approval page
4. Improved Search Function for SPEN Staff Contact Details

Additional Improvements that may also be delivered – pending IT Design Review:

1. RAdAR time out to be increased from the existing 5 minutes to 45 minutes
2. Multiple Applications Section for the same site... rather than 3 separate applications
3. Auto Charging for Self Connect – is it possible to end the automatic function?

RAdAR- Suggested Behavioural and Process Improvements

Behavioural Improvements – to be addressed and improved during 2021/22 ICE Plan

1. Improved verbal communication
2. Improved / standardised written communication
3. Improved / standardised flexibility in approach across both SPD and SPM licence
4. Greater responsibility to communicate in a timely manner on complex projects

Process Improvements – to be reviewed with possible implementation in 2022/23 ICE Plan

1. Introduce SLA for non-guaranteed standards items such as Earthing and Diversions etc.
 - Investigate and agree a standard timescale for such requirements
2. Determine an agreed expectation of communication for Design, Land Rights and Delivery
 - Determine best methods across SPD and SPM and agree a standard approach for each activity

Feedback and Q&A Session

- ▶ Rachel Shorney
- ▶ SPM Stakeholder Engagement Manager

- ▶ Stuart Walker
- ▶ SPD Customer Engagement Manager

SPEN Preparing for Net Zero Conference

Wednesday 1st December 2021



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 9th March 2022

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