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Energy Efficiency: What is the DNO role?

10:00 – 12:00 Tuesday 14th September 2021

WESTERN POWER DISTRIBUTION

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Sustainability *first*

Agenda

10.00 – 10.05	Welcome from Judith Ward, Sustainability First
Session 1 chaired by Benjamin Lock, Everoze	
10.05 – 10.25	Context: Energy efficiency and the DNO role *Matt Copeland, National Energy Action* *Judith Ward, Sustainability First*
10.25 – 11.05	DNO innovation projects on energy efficiency *Stuart Fowler, WPD* *Steve Atkins, SSEN* *Jack Haynes, SPEN* *Zain Habib, UKPN*
11.05 – 11:10	A DNO view on energy efficiency *Stuart Fowler, WPD*
11:10 – 11:15	The consumer perspective *Amy Smith, Citizens Advice*
---- 5 minute break ----	
Session 2 chaired by Felicity Jones, Everoze	
11.20 – 12.00	Roundtable discussion

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Context: Energy Efficiency and the DNO role

- *Matt Copeland, National Energy Action*
- *Judith Ward, Sustainability First*

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Energy Efficiency in ED2

Action for Warm Homes

Matt Copeland
Head of Policy and Public Affairs
@Matt_Copeland1

Why Energy Efficiency and DNOs?

- Energy efficiency has many benefits:
  - Lower bills
  - Warmer homes
  - Reduced costs to the NHS.
  - Optimising system costs

- NEA has worked with most (if not all) of the networks on the call to investigate, through innovation funding, the value of energy efficiency to DNOs as a way to reduce future investment costs, and there has been some good outcomes, both for the households receiving the measures, but also the networks in reducing their costs.

Why Energy Efficiency and DNOs? – A changing context

1. Big plans to increase the uptake of heat pumps + EVs big new demands on the network
2. In particular, heat pump demand is linked to the thermal efficiency of the building, where real gains can be made through investment.
3. There is also a bigger push for energy efficiency:
    - Currently have ECO. LAD, SHDF, HUG with each likely to be extended and expanded
    - Minimum energy efficiency standards for private/social landlords
    - More localised delivery gives the opportunity for networks to be strategic about energy efficiency
4. ED2 also means several new opportunities
    - Greater focus on vulnerability through the Vulnerability ODI.
    - A new vulnerability licence condition
    - A NIA focussed on vulnerability
    - A new licence condition (which is already in place) to promote the uptake of energy efficiency measures
    - An enhanced incentive mechanism for DSO functions

Considering this new context, DNO involvement with energy efficiency presents a win/win for both networks and their customers, helping to alleviate fuel poverty and optimise our energy system

‘What is the DNO role on Energy Efficiency ?’

Judith Ward
Associate. Sustainability First

Everoze, WPD & Sustainability First
Workshop - 14 September 2021

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SF interest in DNO energy efficiency role ?

Our triggers

- RIIO2 price controls : network approaches to decarbonisation, vulnerability
- ED2 : Ofgem sought inputs on 'proactive management of future system growth'
- ED1 Licence Duty on flexibility procurement (LC 31E – Dec. 2020) Also refers to :
  - Promotion of energy efficiency measures – including procuring energy efficiency services – *where this might be a viable alternative to network investment*
  - Possible interpretation ?
- Flexibility outcomes - a main focus to date (Ofgem, companies). Energy efficiency has some different outcomes
- 'Joined-up' thinking (Ofgem, companies) on net-zero, energy efficiency, vulnerability & price control incentives : Sustainability First. Judith Ward & Maxine Frerk (2021) 'Energy efficiency : what is the DNO role in ED2 ?'

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Some headlines

- **DNO interest in energy efficiency to date** : mostly appliances, advice. Less so thermal insulation
- **Heat pumps** : until flexible operation established at scale (in the medium term ?) **thermal insulation** of buildings **likely to be a main tool for tackling electricity demand-growth from heat-pumps** (overall demand, at peak). Esp in homes.
- SF proposal for a small number of **'beacon' energy efficiency projects in ED2**. Aim = to **establish viability of thermal insulation as an offset to network investment**. i.e establish **appropriate approaches to cost-assessment, metrics and evaluation –** & also the **'practical do-ability'** of active DNO involvement in thermal insulation.
- **DNO funding pots** – companies and Ofgem to consider for ED2 (including UIOLI). In readiness for 'real need' in ED3 & beyond

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Some challenges

- Energy efficiency landscape – complex, fragmented.
- Tying this to location of network bottlenecks (for network offset) - won't be simple.
- DNO priorities ? (i.e. support fuel poverty strategy? target vulnerability? off-gas areas? specific housing sectors?)
- New DNO expertise & partnerships
- How best to 'dock' any (modest) DNO contribution to thermal insulation - with the many other actors, funding streams, initiatives & supply-chain ?
- Where might the 'boundaries' of DNO activity might lie ?

The start of a conversation !

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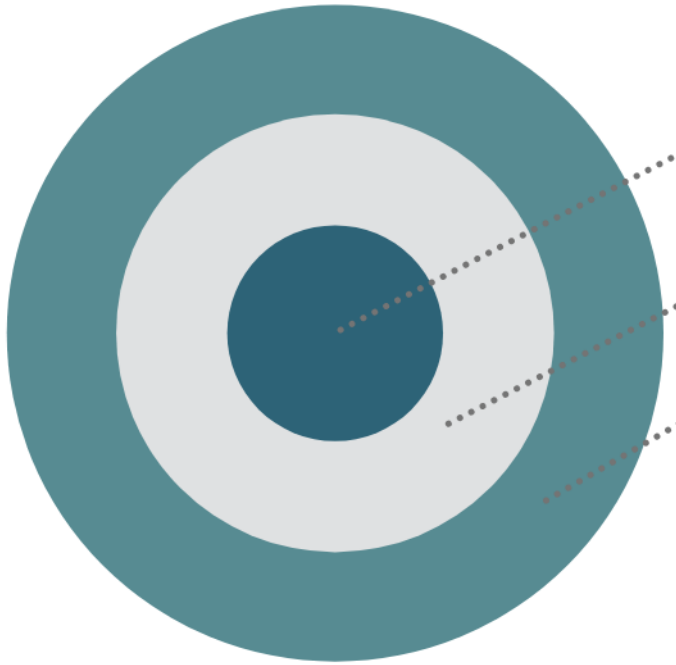
About

Sustainability First

We are a think-tank and charity that works in essential services to promote practical solutions to improve environmental, social and economic well-being. We seek to bring about social and cultural change for a more sustainable future.

Our aims



Shape agendas - bring stakeholders together to drive strategic thinking on key topics

Embed sustainability - push thinking in new directions through informed engagement

Connect, inspire, engage - use creative, collaborative and inclusive approaches to engage broader groups in society on difficult choices and to identify innovative solutions

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DNO innovation projects on energy efficiency

- *Stuart Fowler, WPD*
- *Steve Atkins, SSEN*
- *Jack Haynes, SPEN*
- *Zain Habib, UKPN*

WPD INNOVATION
Transforming the electricity network

Energy Efficiency: What is the DNO role?

Stuart Fowler Innovation Engineer

14th September 2021

WPD INNOVATION
Transforming the electricity network

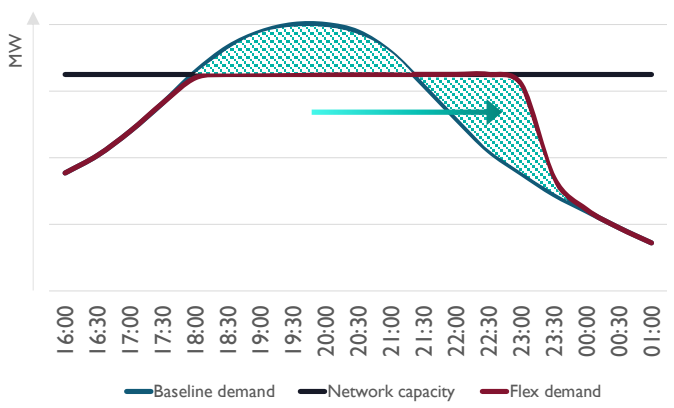
Future Flex

- Future Flex is a NIA-funded project pioneering second generation DSO services for domestic scale assets
- Flexibility is a key part of the energy transition
- Residential consumers are key to releasing benefits of a more flexible energy system
- As part of the project, we have explored the value of domestic energy efficiency in electricity distribution
- Flexibility and energy efficiency are complimentary, not competing technologies
  - **Flexibility** allows home energy usage to respond to appropriate signals, shifting energy consumption outside of peak times.
  - **Energy efficiency** delivers permanent changes to consumption patterns, reducing rather than shifting demand.

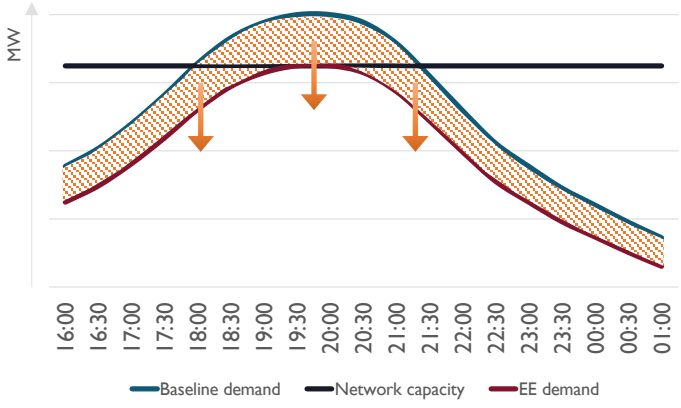
Future Flex

- Flexibility allows home energy usage to respond to appropriate signals, shifting energy consumption outside of peak times.
- Energy efficiency delivers permanent changes to consumption patterns, reducing rather than shifting demand.
- Flexibility and energy efficiency are complimentary, and their combined effect may be required where network constraints are most severe.

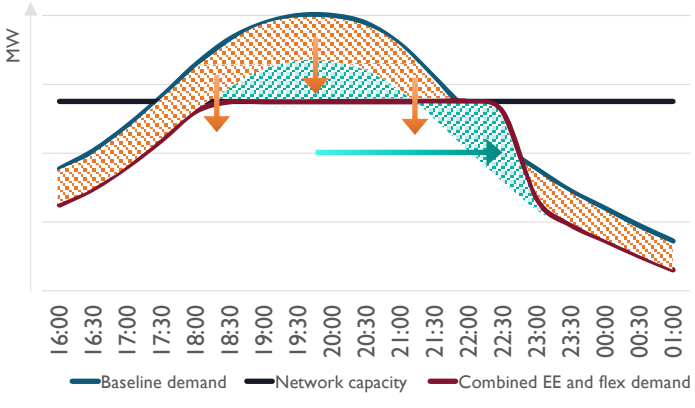
Flexibility protects against network constraints by shifting demand to off-peak times



Energy efficiency can provide the same result by reducing demand at all times



For the most severe network constraints, the combined effect of both flexibility and energy efficiency may be needed



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Transforming the electricity network

Future Flex

- Valuing the network benefits of saving energy
  - NEED
  - Flexible Power
- Three key findings emerged from the analysis:
  1. Energy efficiency could deliver an overall network value of up to £1,000 per home
  2. The size of home and type of energy efficiency measure are secondary factors
  3. Homes with the greatest energy efficiency network value are uncommon but geographically clustered

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Transforming the electricity network

Future Flex

- There are several challenges to designing and implementing commercial and regulatory models that fully reflect the network value of domestic energy efficiency:
  - The existing funding landscape is complex
  - The benefits of energy efficiency are dispersed
  - Network procurement services are designed around the DSO
  - It is unclear how best to incentivise efficiency
  - The available data is insufficient & inevitably impacted by privacy

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Transforming the electricity network

Future Flex

- Conclusion of analysis – “large scale trials” required to establish evidence base
- Future commercial and regulatory arrangements informed by trials
- Partnerships required to deliver
- Key principles:
  - Tailored by location
  - Collaboration and coordination
  - Consumers at the centre, always
  - Commitment to experimentation, learning and innovation
  - Data, data, data

Energy Efficiency

Alex Howison (Whole System & Flexibility Lead – ED2)

Project SAVE

ACCELERATING THE ADOPTION OF LED LIGHTING IN HOUSEHOLDS

Running from 2017-2018 in 1,000 residential properties in the Solent region, this trial aimed to increase uptake of LED lighting and assess the impact on the network and on customers' bills.

TRIAL DESIGN

- Opt-out approach (in-person visits door-to-door)
- Installed by project staff
- Up to 10 bulbs per household available
- Free of charge

HOUSEHOLD UPTAKE 76%

AVERAGE NUMBER OF BULBS REPLACED 7

AVERAGE ANNUAL SAVING PER HOUSEHOLD: 90 kWh

ANNUAL EFFECT SIZE ACROSS VARIOUS METRICS

Household	SAVE project	SSEN customers	UK households
£15.82	37 tonnes CO_2	28,000 cars	1 nuclear power station

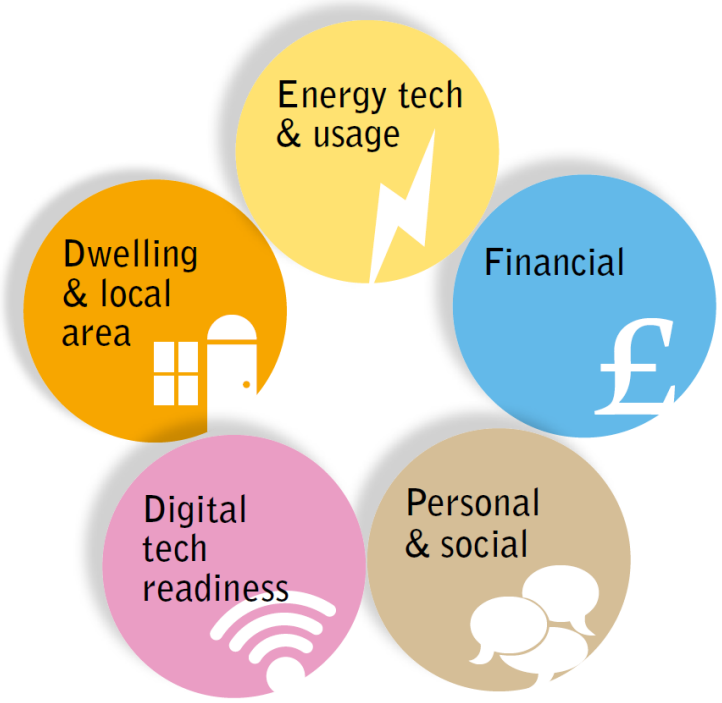
- Cost of national LED rollout £1 billion max
- New nuclear plant £5 billion

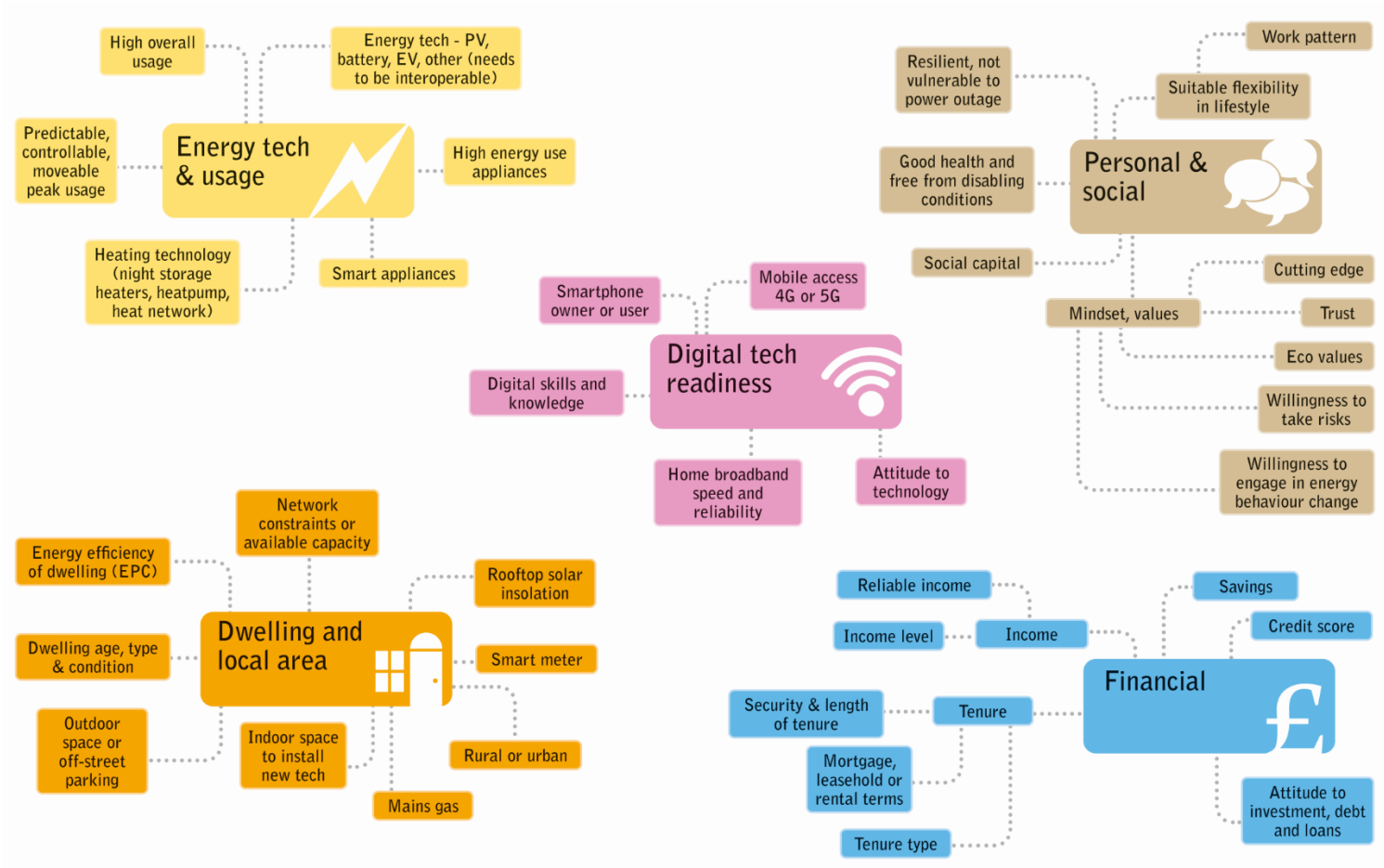
VULNERABLE CUSTOMERS

TREATMENT EFFECT 5%

GREATER FOR VULNERABLE CUSTOMERS THAN FOR THE AVERAGE CUSTOMER

Smart *and* Fair?

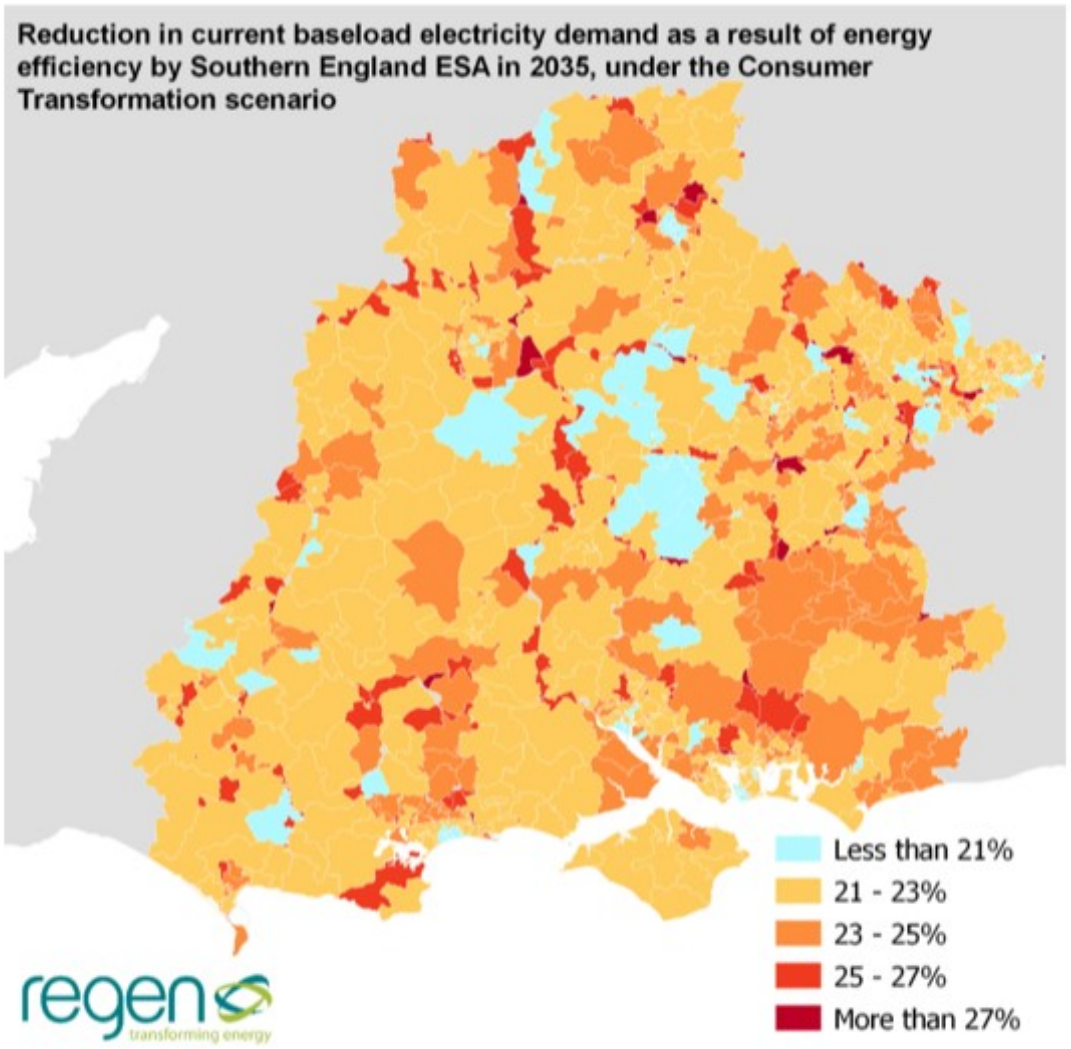


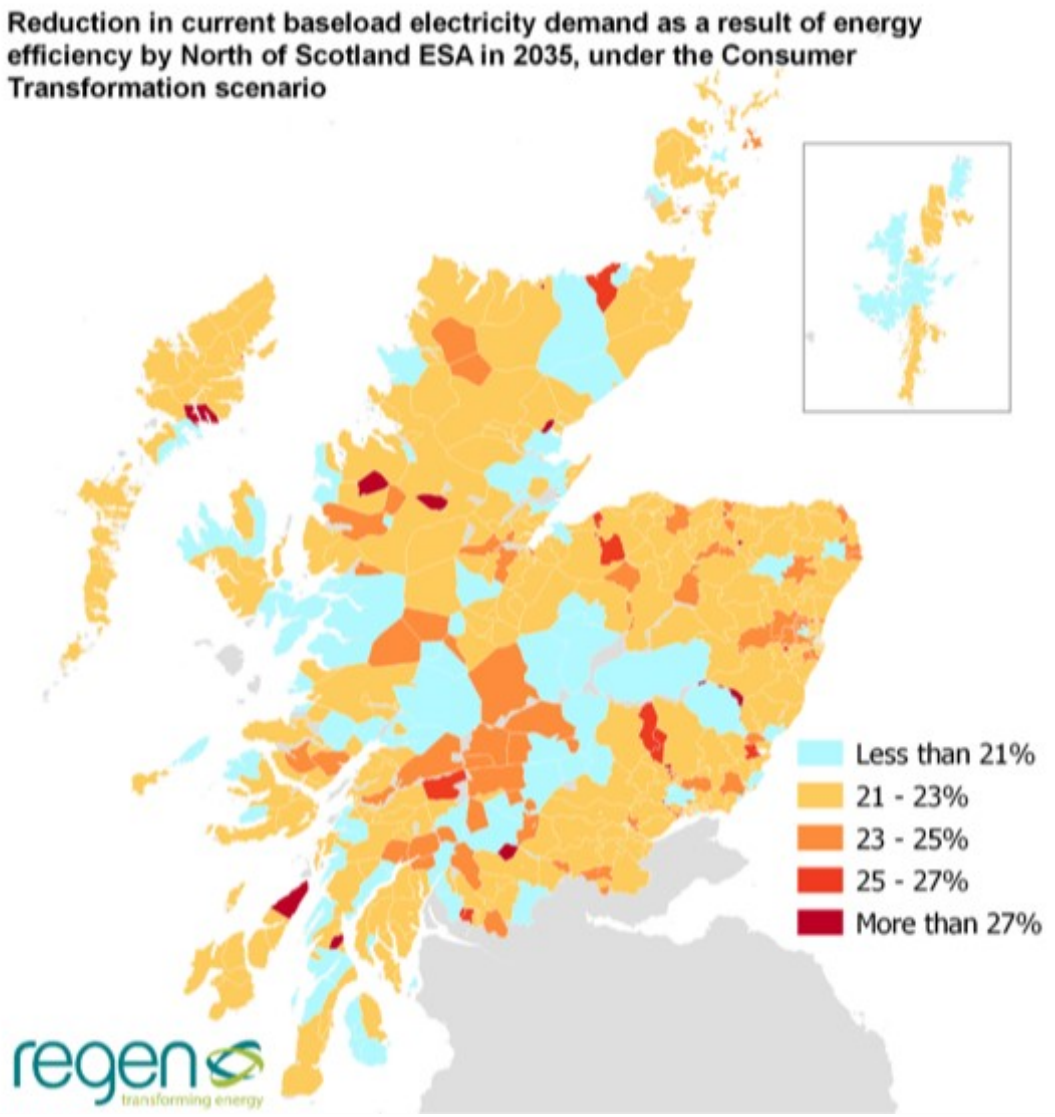


smart and fair?
Exploring social justice in the future energy system

centre for sustainable energy

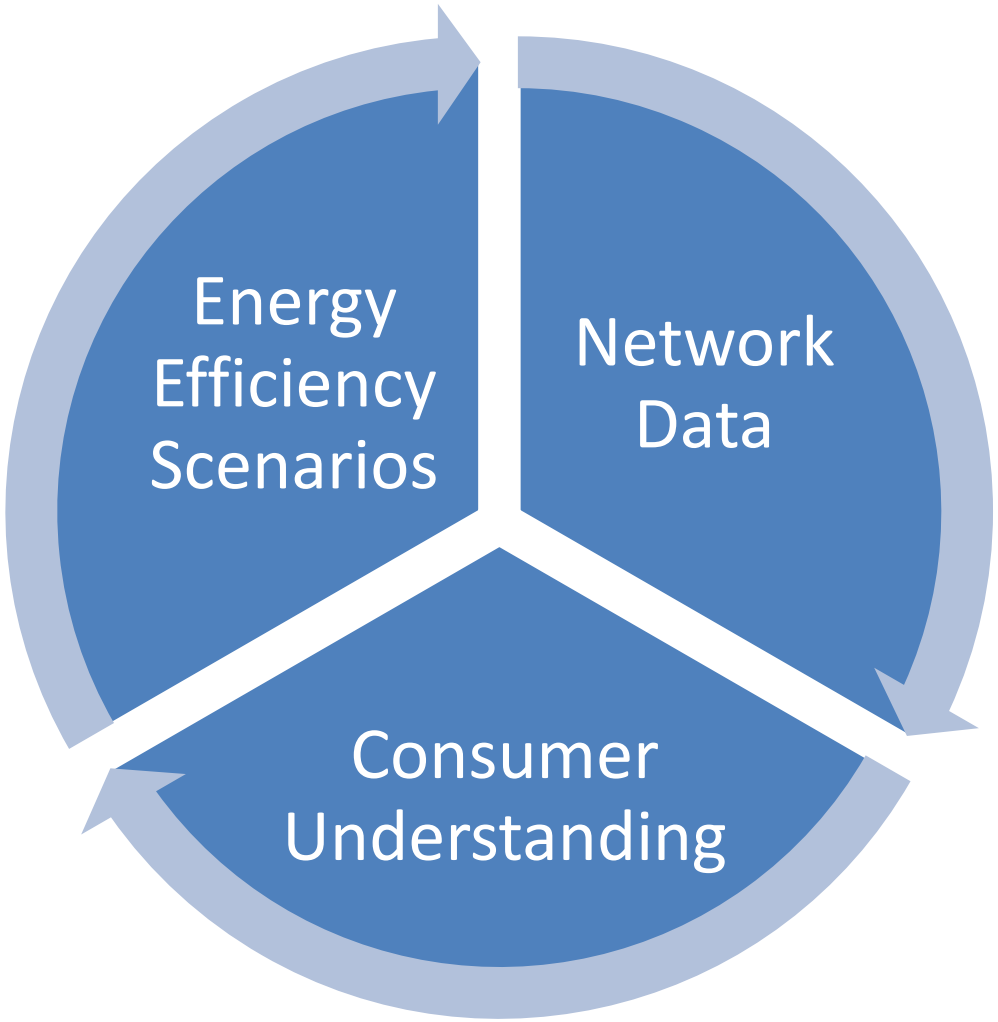
Energy Efficiency (DFES)





ED2 Consumer Value Proposition (CVP)

Energy efficiency accelerator for smarter networks



- Triangulating key datasets to identify targeted network locations where we can slow/reduce demand on the network by improving housing stock in support of vulnerable customers
- Working with locally recognised partner organisations (e.g. LAs) to plan interventions in local areas with co-funding arrangements to deliver outputs

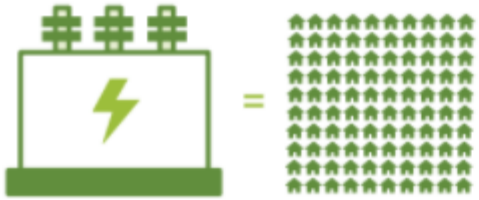
EV & Heat-Up EE Workshop

Who Are We ?

We **transmit**, **distribute** and connect electricity to and from 3.5 million homes and businesses over our network, 24 hours a day, every day of the year. Our distribution network has:

Our distribution network has

30,000
substations;



Supplying
3.52m customers

40,000km
of overhead lines

That's enough to wrap once around the world.

and

65,000km
of underground cables.

All to keep your electricity flowing.

SP ENERGY NETWORKS

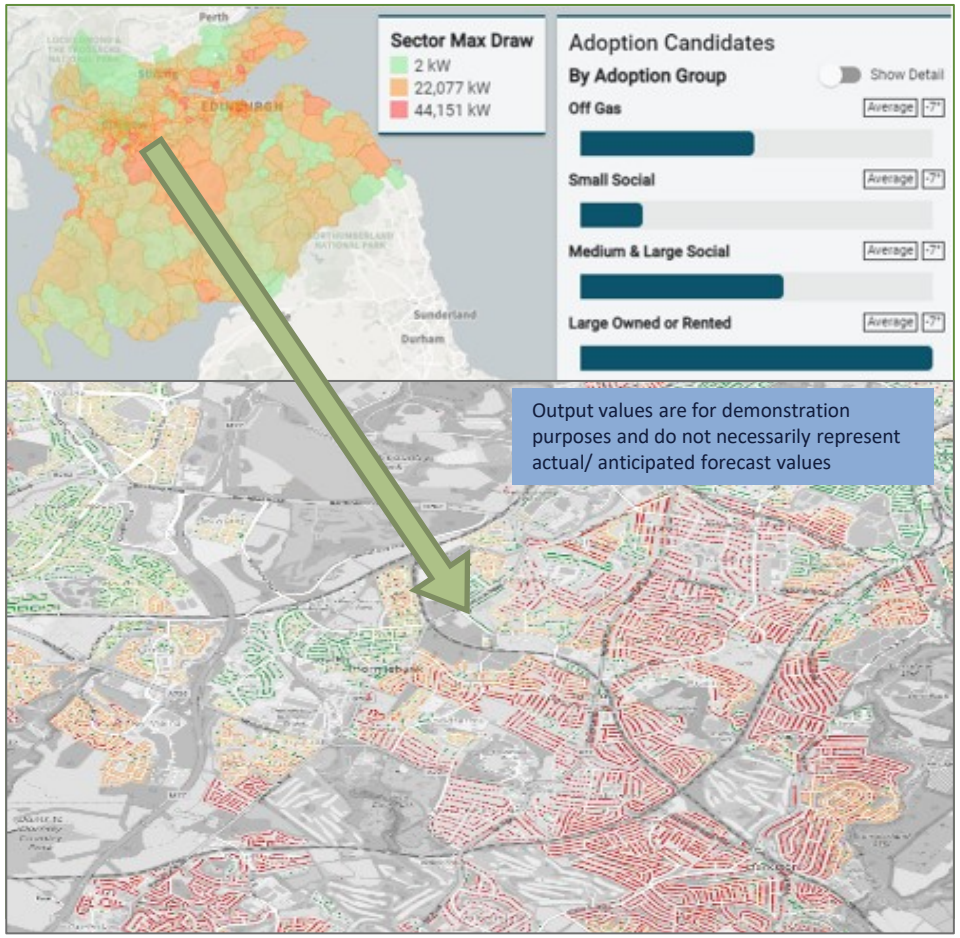
ELECTRICITY DISTRIBUTION NETWORKS

- Scottish & Southern Electricity Networks
- SP Energy Networks
- Electricity North West
- Nothern Powergrid
- UK Power Networks
- Western Power Distribution

The Net-Zero Challenge – Heat-Up

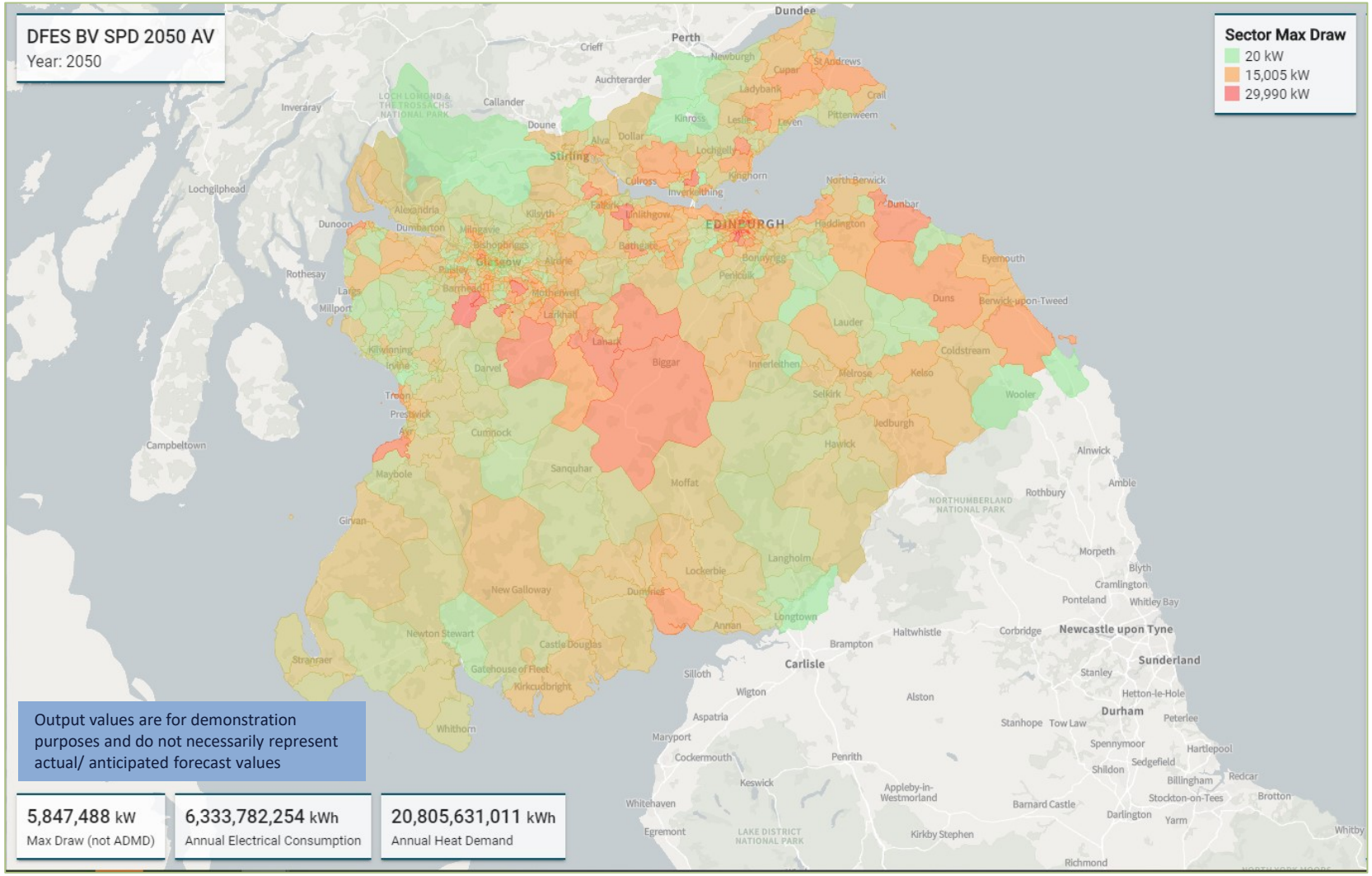
Customer Profile

Property Profile

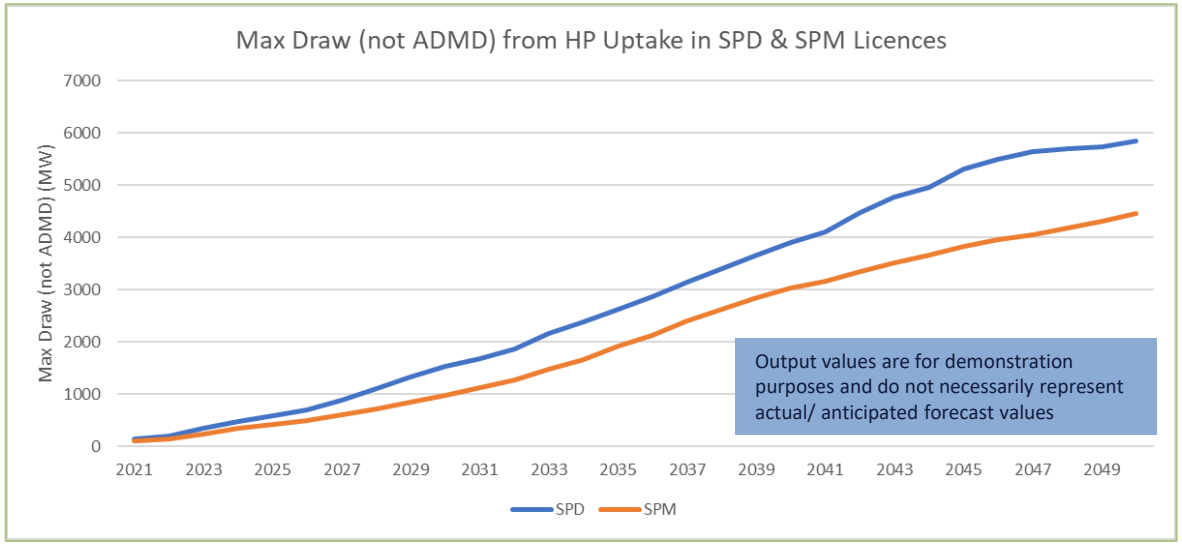


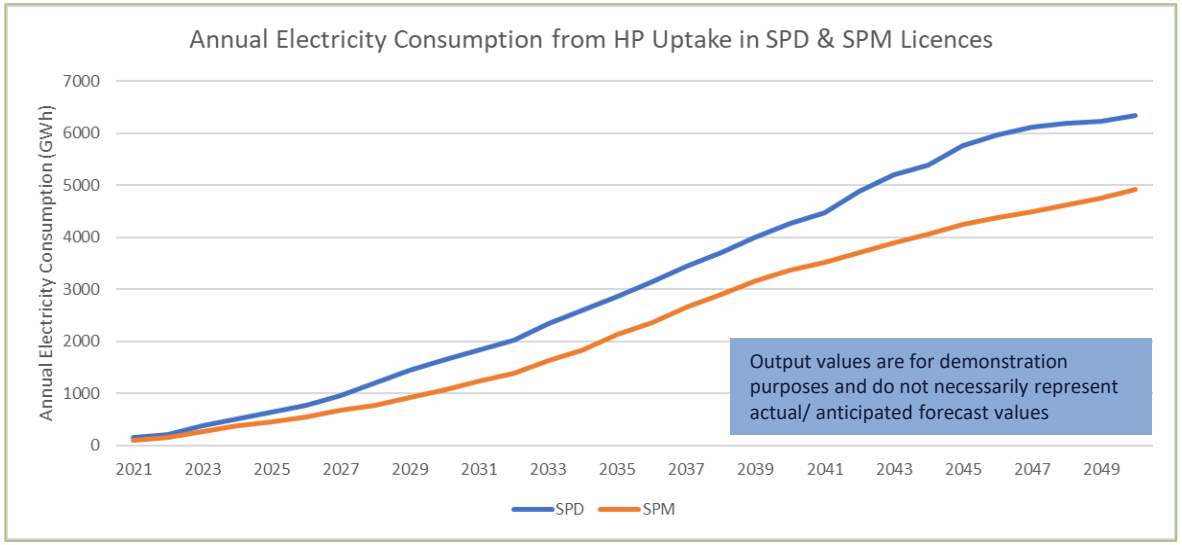
Heat-Up Model Outputs

HEAT-UP



Heat-Up Results





More than the capacity Whitelee Windfarm by 2025 (SPD) & 2027 (SPM)

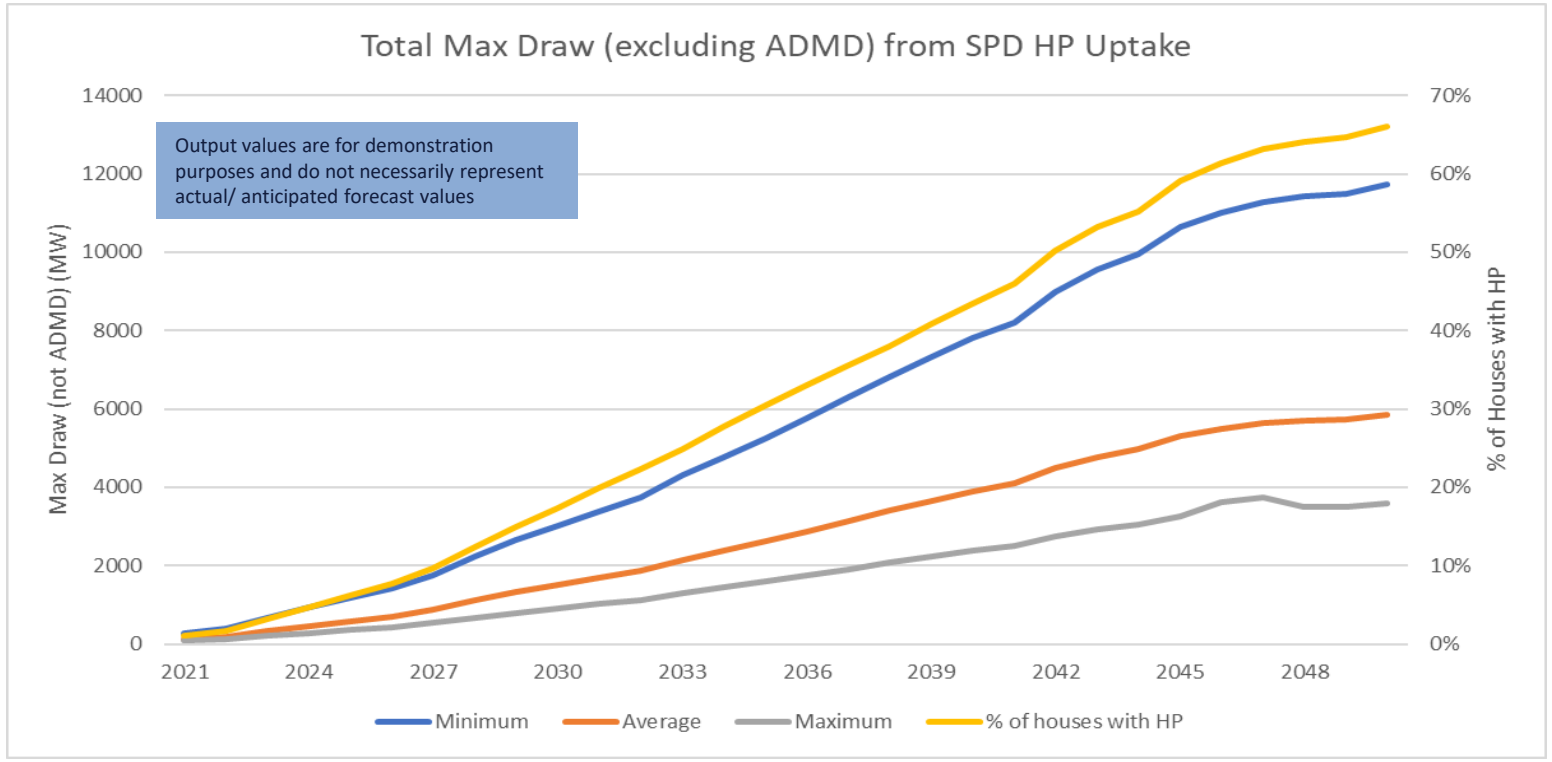
Double Whitelee capacity in 2028 (SPD) & 2031 (SPM)

Equivalent load of 584 (SPD) and 445 (SPM) primary substations by 2050

By 2028, the annual electrical consumption from heat pumps equals 13% and 8% annual output of Longannet Power Station for SPD & SPM licences respectively

This rises to 66% and 52% of Longannet's annual output by 2050 for SPD & SPM respectively

Heat-Up Results



1970s

1990s

2010s

Maximum Insulation

Average Insulation causes 1.6x increase

Minimum Insulation causes 3.3x increase

Thank you

Energy Efficiency at UK Power Networks

Zain Habib
Innovation Programme Manager
UK Power Networks

14th September 2021

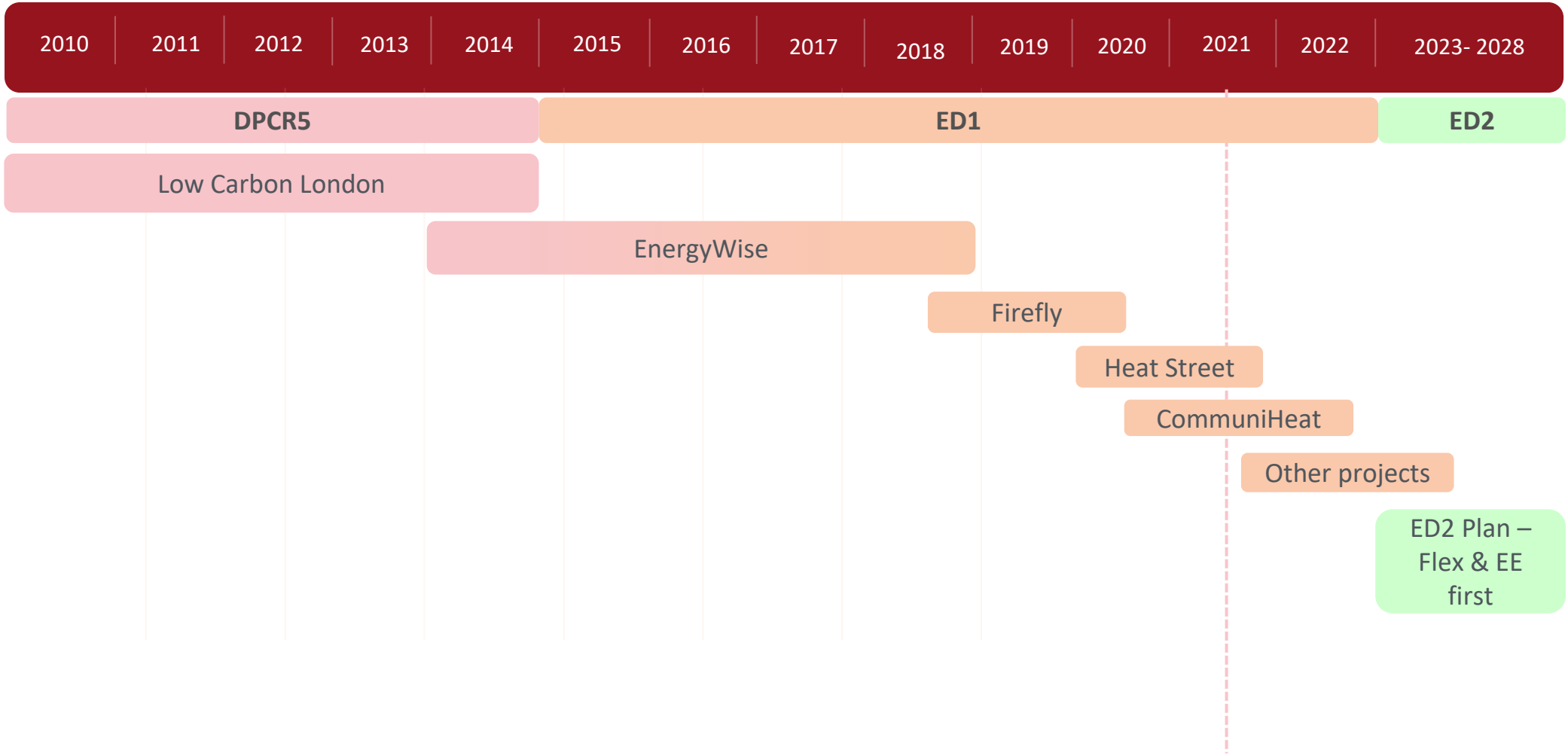
About UK Power Networks

3 Licence areas
London, South East and Eastern Power Networks

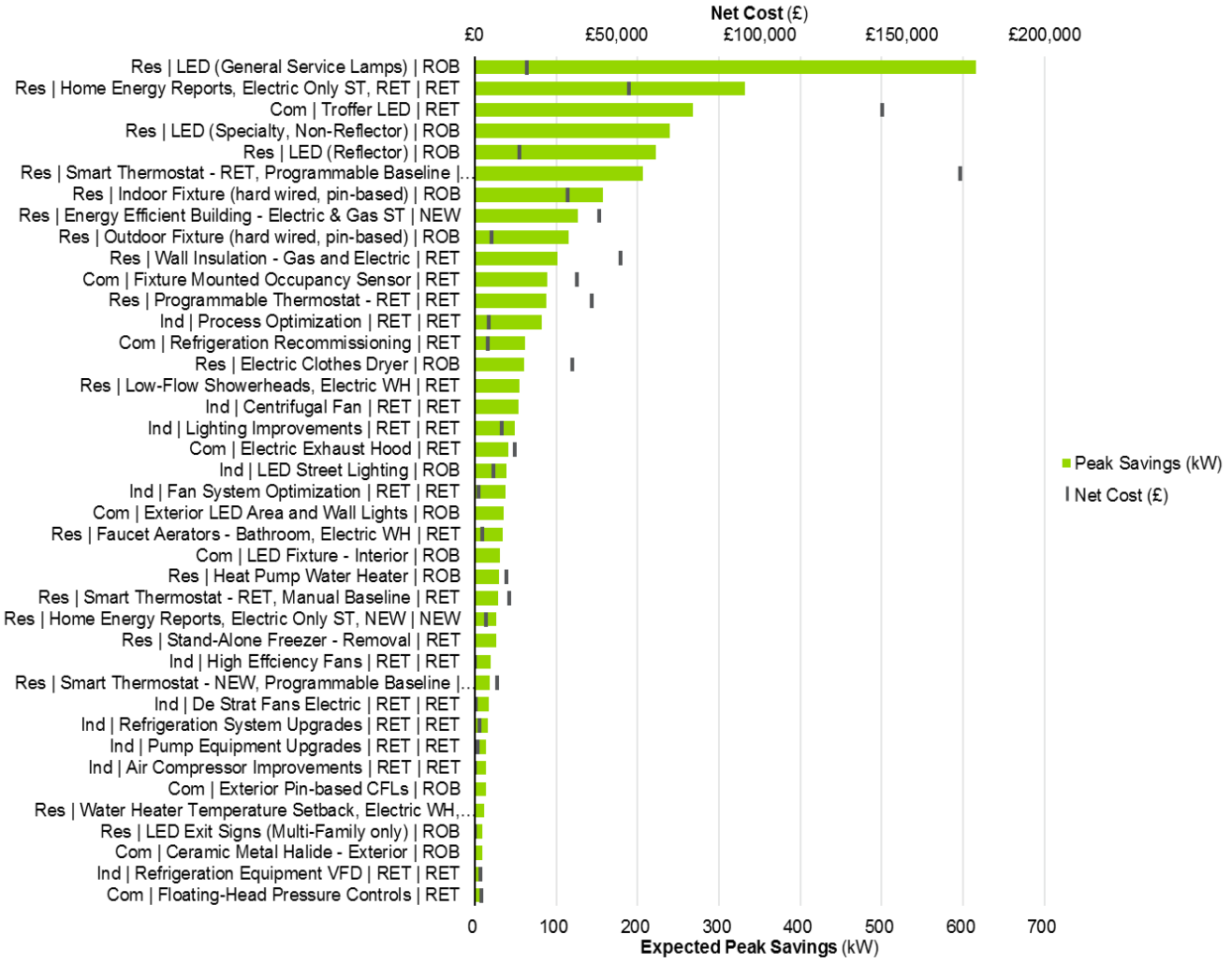
8.3m connected customers
28% of GB Total

16GW Peak Demand
28% of GB Total

Our Energy Efficiency (EE) Journey



Firefly – Overview



Top EE measures ranked by peak savings (decreasing)

- **Objective:** To assess the potential for energy efficiency (EE) to defer network reinforcement of primary substations in the near-term

- **Approach:**
  - Horizon scan of international EE programmes
  - Application of North American models and uptake rates to six selected UKPN primary substations
  - Network studies to analyse potential demand reduction and reinforcement deferral

- **Key exclusions:**
  - Lightning measures as assumed that UK already has a higher uptake of LEDs than North America
  - Thermal efficiency of buildings with gas being the primary fuel for heating

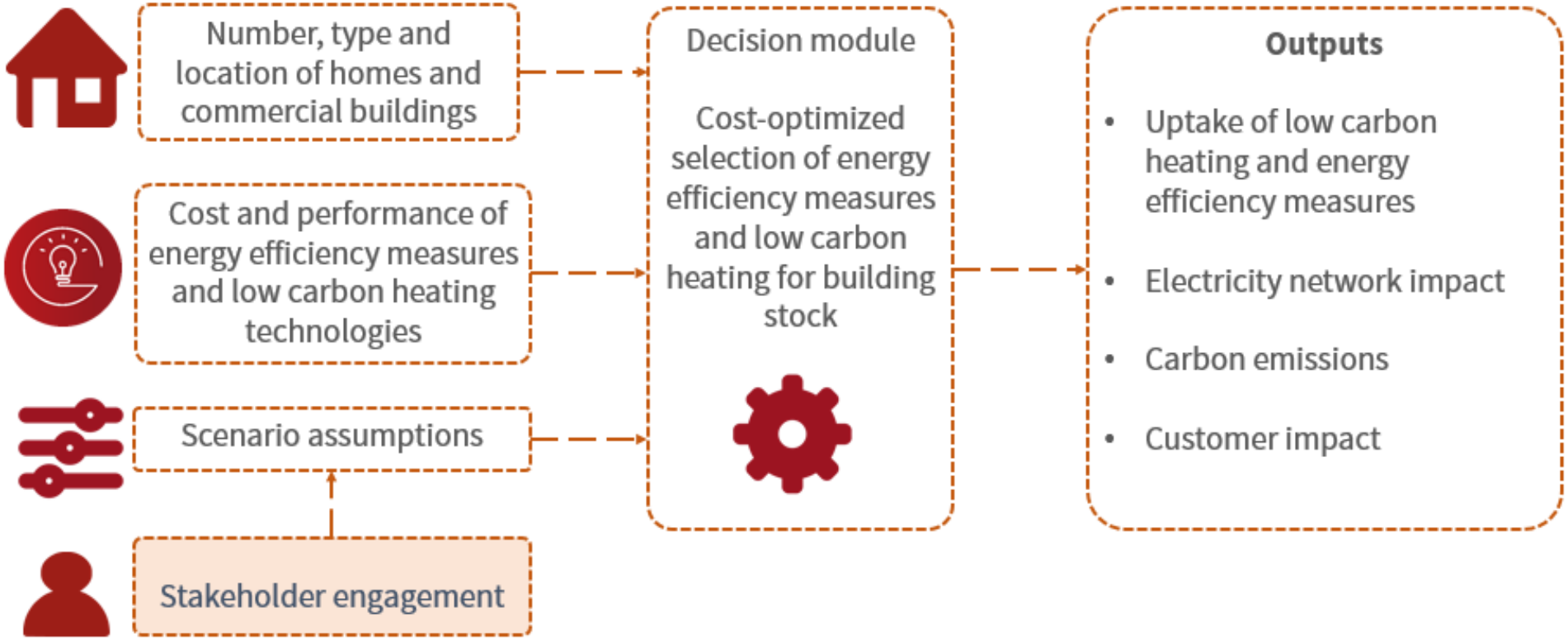
Firefly – Key insights

- International scan showed EE relies on mandated obligations and/or incentives; regulation
- EE measures driven peak demand reductions vary significantly across substations depending on customer/property type; zoning
- Analysis concluded EE should not be considered in isolation but form part of a toolkit – on its own it can only defer reinforcement for a limited time (1-2 years); markets
- UKPN does not have direct customer billing relationship so working with partners to coordinate implement EE programmes would have largest impact; partnerships
- Electrification (inc. transport and heat) could potentially increase primary substation demand by up to ~500%. This could be reduced by half through EE; forecasts

Insights from Low Carbon London , EnergyWise and Firefly informed our future direction of travel on Energy Efficiency

Heat Street: Local System Planning – Overview

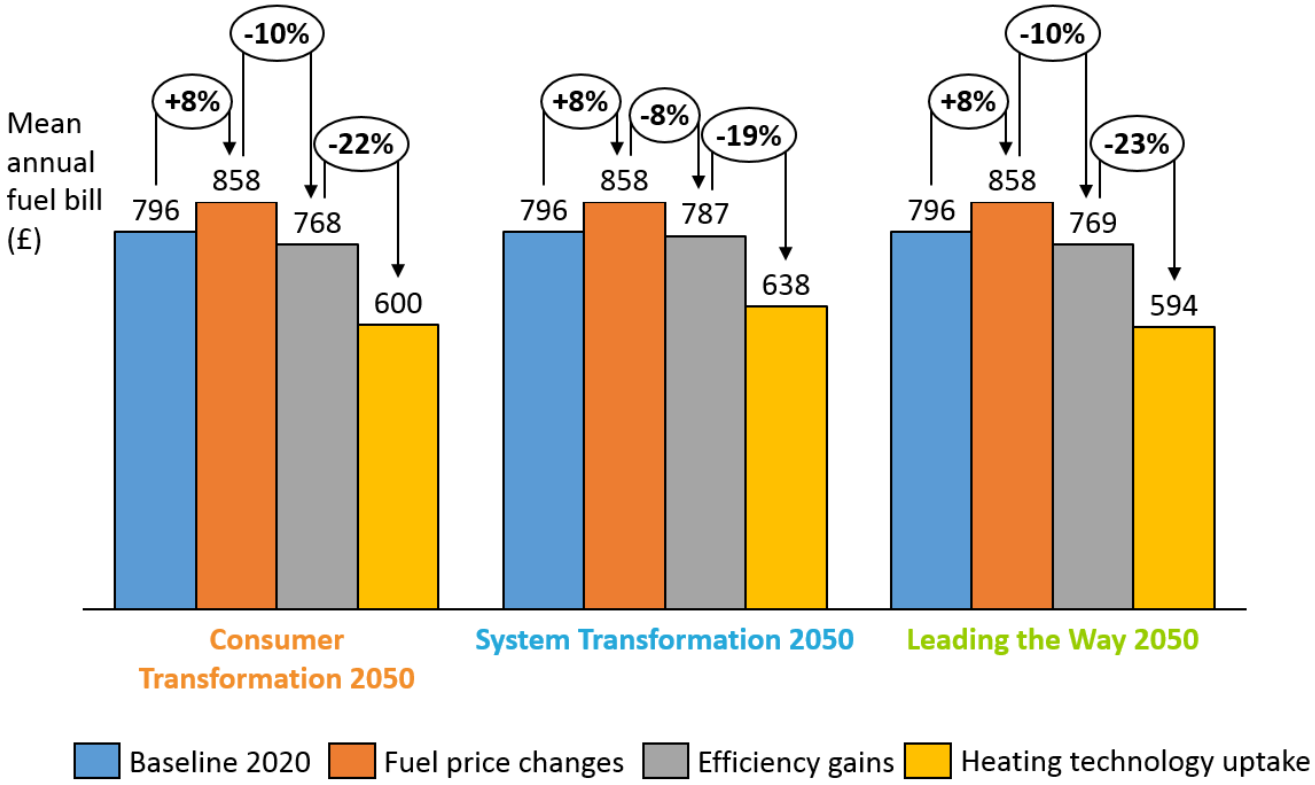
- **Objective:** Identify and forecast most suitable energy efficiency & low carbon heating pathways for localised ‘zones’
- **Driver:** Accelerate the decision-making process
- **Approach:** Zoning assessment underpinned by domestics and non-domestic building stock analysis, techno-economic modelling and stakeholder input applied to DFES scenarios



Heat Street: Local System Planning – Key insights

Upfront cost	£1,700
Heat demand saving	10.4%
Annual fuel bill saving	£83

Illustration of energy efficiency costs and gains for one archetype



Bill Impact Analysis for DFES scenarios out to 2050

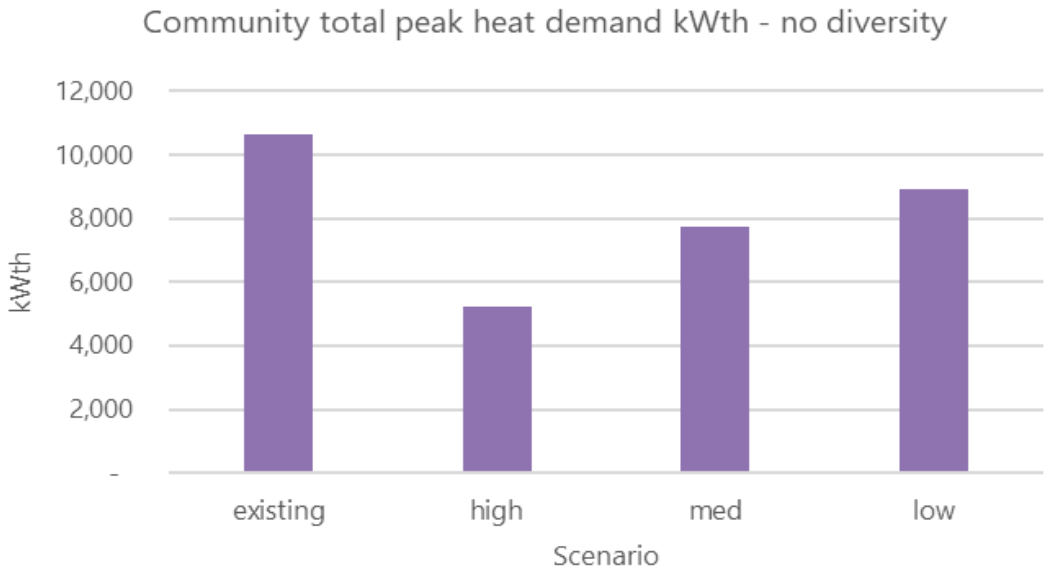
- Across all 2030 scenarios, we find an avg. heat demand reduction of 4-10% depending on EE policy/incentives.
  - Expect higher EE deployment in electrification zones – mainly off-gas grid, new builds and urban areas
  - Within these electrified zones – avg. heat demand reduced by 10% for domestic & 8% for non-domestic
  - Within domestic stock: 0-20% demand reduction depending on archetype and the level of EE measures
- By 2050, overall energy consumption will outweigh EE gains due to increased retro and new builds electrification
- The share of households currently paying >£1500 for heating falls from 13% to under 5% in all our Net Zero scenarios and the average fuel bill falls by up to 23%
- Deployment of energy efficiency has the potential to reduce the cost of network reinforcement for electrification of heat by £0.3-£0.5 billion to 2050

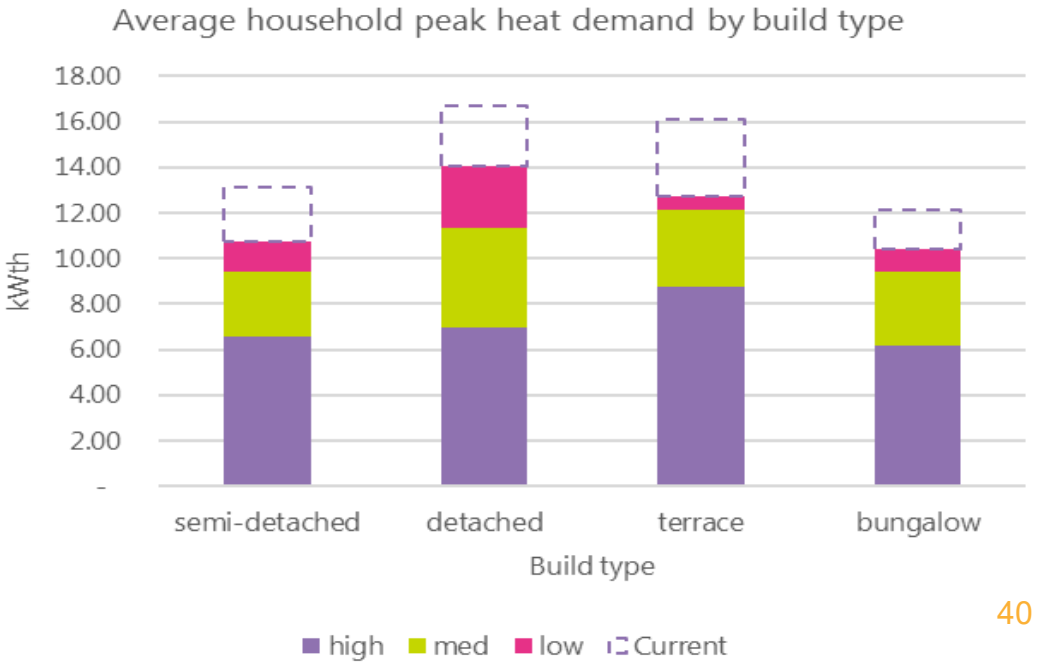
CommuniHeat (live) – Overview & insights

- **Objective:**
  - Develop a framework to decarbonise off-gas grid communities based on the study conducted for Barcombe (Lewes, East Sussex)

- **Approach:**
  - Community engagement to learn and educate with over 700 home owners and business through local trusted partners
  - Archetypes and behaviours studied on an individual household basis to explore potential for EE and heat demand reduction
  - Assessment of ‘gradual’ vs ‘coordinated/zoning’ uptake scenarios supported by a digital twin underway

- **Current EE related insights :**
  - 57% of the existing housing stock is poorly insulated
  - Current assessments show that retrofitting can reduce the community peak energy consumption by over 50%, and annual avg. heat consumption per property by 10-15%





Summary – UKPN's EE journey

Thank you!

Contact: zain.habib@ukpowernetworks.co.uk

A DNO view on energy efficiency

- *Stuart Fowler, Western Power Distribution*

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A DNO view on energy efficiency

- EE a key part of the energy transition
- Consumer Behaviour a large part of ensuring the benefits are realised (c.£17bn pa - Carbon Trust/Imperial College)
- Market Structure means that DNO's are removed from consumer relationship
- Retain keen interest to ensure that EE is a fundamental part of LCT adoption
- Heat Pump without EE is worse case scenario – poor consumer experience and higher energy costs
- Collaboration will be key to this and a successful outcome

The consumer perspective

- *Amy Smith, Citizens Advice*

Energy efficiency: What is the DNO role?

The consumer perspective: Win, win, win...

Amy Smith & Caroline Farquhar
Energy Policy, Citizens Advice

14 September 2021

DNOs have a vital part to play

- To cope with higher demand to support EV and heat pump uptake at least cost to consumers.
- To use their reach and opportunity to effect change.
- To comply with new requirements on DNOs to consider energy efficiency.
- To consider the Vulnerability Strategy, **and** crossovers with the DSO Strategy.

Why use energy efficiency for DSO?

Evidence for strong reductions in energy consumption

- National Energy Efficiency Data Framework, BEIS report, June 2021
  - 4% reduction for loft insulation
  - 18% for solid wall insulation
- Innovation projects = “proof of concept”

Reduction in energy consumption means

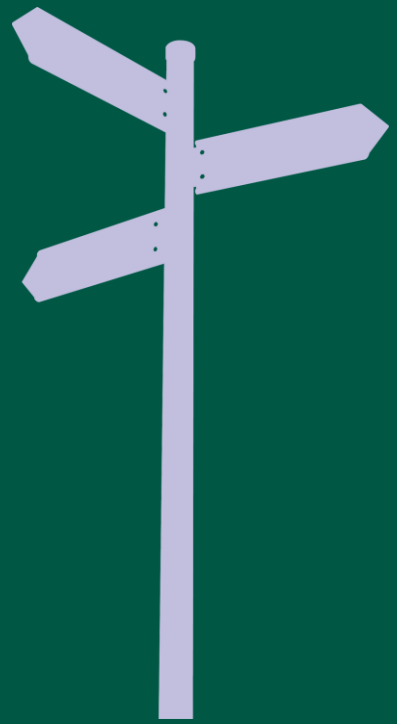
- ✓ Lower generation & lower carbon emissions
- ✓ Less need to increase capacity of the network
- ✓ Cheaper bills for consumers
- ✓ Can be targeted at those in fuel poverty

Longer term solution

- ✓ E.g., No need for consumers to purchase repeated flex contracts.

Consumer perspective: ways forward

1. **ENA workstream** on energy efficiency
2. DNOs implement **flex- & energy efficiency-first policy**
3. DNOs to provide **crossover best value** for consumers by linking DSO Strategies & Vulnerability Strategies
4. DNOs to **use past learnings** - look at all past innovation projects before starting new ones. ENA Innovation Portal has 100 projects with EE.
5. Ofgem to scrutinise ED2 plans to **ensure compliance with licence condition and DSO roles and activities requirements** & look for best value (targeted crossovers in strategies)



Thank you

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Caroline Farquhar

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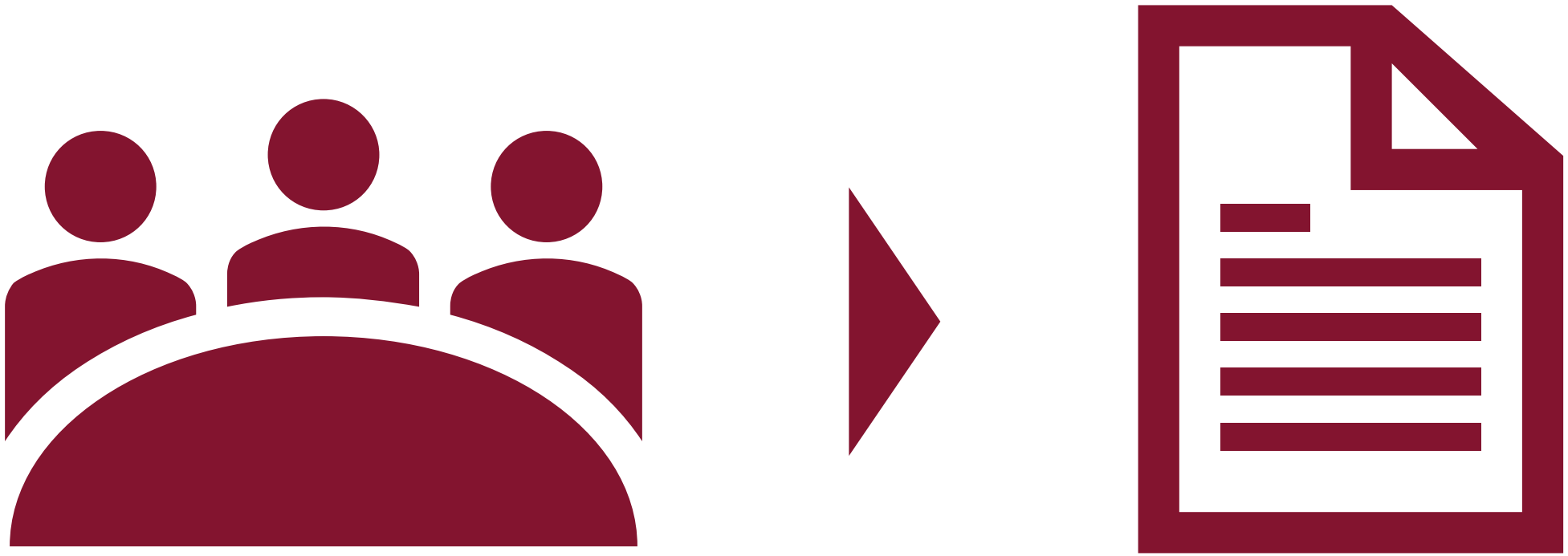
Roundtable discussion



Roundtable discussion

1

In ED2, what **gaps** could DNO energy efficiency schemes or trials fill?
E.g. gaps in knowledge, expertise, partnerships

2

What might the **focus and outcomes** of **DNO involvement** in EE schemes look like? How might these objectives evolve over time?
E.g. avoided network investment, vulnerability, demand reduction

3

How might such schemes be **funded**?
E.g. DNOs, other funding

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Roundtable discussion

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Summary

- *Judith Ward, Sustainability First*

Summary

- DNOs are required to deliver net zero at lowest cost to consumers. Energy efficiency is part of that picture

- Yet energy efficiency is not a core DNO business area. We have seen that energy efficiency and flexibility are complimentary, and together can help DNOs to deliver their remit

- DNO innovation projects are pushing this field forward. However, this work needs to be:
  i. Pulled together and widely shared
  ii. Proven through targeted real-world trials

- Enduring partnerships will form the foundations for DNO energy efficiency schemes. In this the DNO will play a key role, directing efforts, signposting advice, and showing the benefits of improved energy efficiency to all

Sustainability *first*

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