Smart Meter Energy Data: Delivering on a Public Interest Purpose

Public Interest Advisory Group
Workshop (video-conference)

Friday 10th July 2020

The potential value of smart meter data for local energy planning

Sustainability First - Maxine Frerk, Judith Ward, Sharon Darcy
CSE – Simon Roberts, Joshua Thumim, Megan Blyth, Dr Sarah Becker

CSE & Sustainability First

ZOOM - ways of working

- Stay on mute - unless invited to speak
- Switch-off your video. Helps on low bandwidth
- Chat – use for : (1) a technical problem; (2) a specific (short !) question of clarification
- Q&A and general discussion – coordinated via “hand-up”
- You can “put your hand up” if you want to speak
- Those on “dial-in” will also get a chance to speak
- Or you can email us afterwards
- Be tolerant – we are still learning!

ZOOM functions

In the tool bar at the bottom of your screen:

- Mute/Unmute and Start/Stop Video
- Click “Participants” to see participant list
- Click “Chat” to open the chat box

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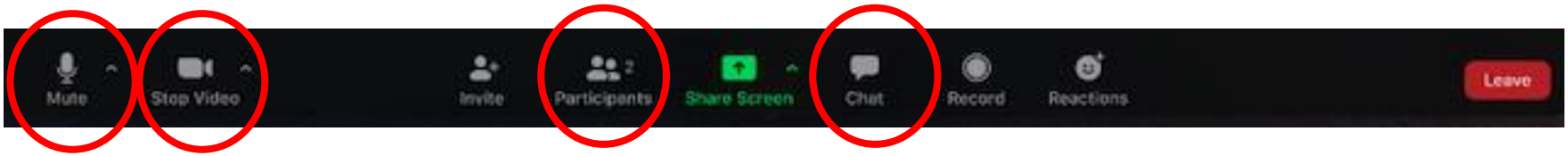

ZOOM functions

- To speak, please use the **“raise hand function”** (found under the participant list), we will then invite you to unmute yourself
- Don’t forget to “**lower your hand”** once you’ve spoken
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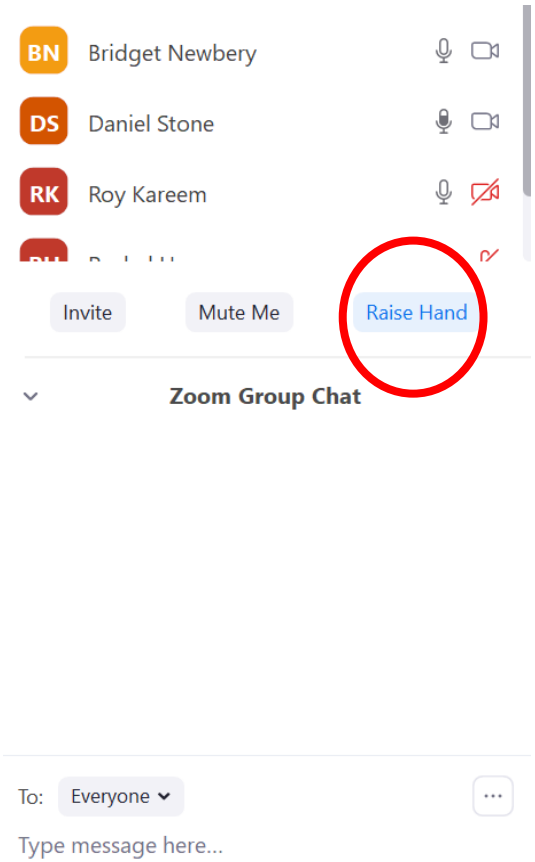


Today : the potential value of smart meter data for local energy planning and projects

Welcome and introduction

Session 1: Practitioners *GLA, Scottish Government, ESC, CSE*

Session 2: Respondents *Welsh Government, SE Energy Hub, University of Exeter, others*

Conclusions

AoB – incl PIAG member update; next workshops, workshop 2 report.

PIAG 2 – aims & outputs

Main aims :

- To demonstrate the ***additionality*** and ***public-interest value*** which access to granular smart-meter data could deliver - in terms of different public-interest uses and for different public-interest actors.
- Build a stronger evidence-base for BEIS, Ofgem & others through in-depth 'user-cases'
- Delivered via:
  - Four half-day workshops in 2020 – 14/1; 23/4; 10/7; 11/11.
  - Workshop reports.
  - A close-down report and event.

PIAG 2 will also:

- Keep the topic of access to smart-meter data for a public interest purpose to the fore
- Disseminate the conclusions & recommendations of PIAG Phase 1 – & track progress.
- Provide continued thought-leadership through an **independent convening** role.
- Through PIAG workshops, continue to provide an active **information exchange**.

PIAG 2 Framework – each workshop framed by four questions – designed to test 'additionality'

i. What customer-side usage data is available now?

ii. What new usage data is expected to become more widely available in the short to medium term?

iii. What might increased access to half-hourly smart meter data offer *in addition to* any such new usage data?

iv. What additional *public interest benefit* might be delivered if (aggregated and anonymised) customer smart meter usage data becomes available? What major public-interest 'data gaps' could half-hourly smart meter data fill?

The potential public interest value of access to smart meter data for devolved governments and local authorities

Introductory comments

Simon Roberts

Building a low carbon Bristol

Introducing cutting-edge infrastructure to improve our city.

What's happening?

We're busy installing Bristol's Heat Network — a new network of underground pipes that will deliver affordable, low-carbon heat and energy across the city. Our Heat Network will eventually cover central Bristol and other areas across the city, powered by low carbon energy centres.

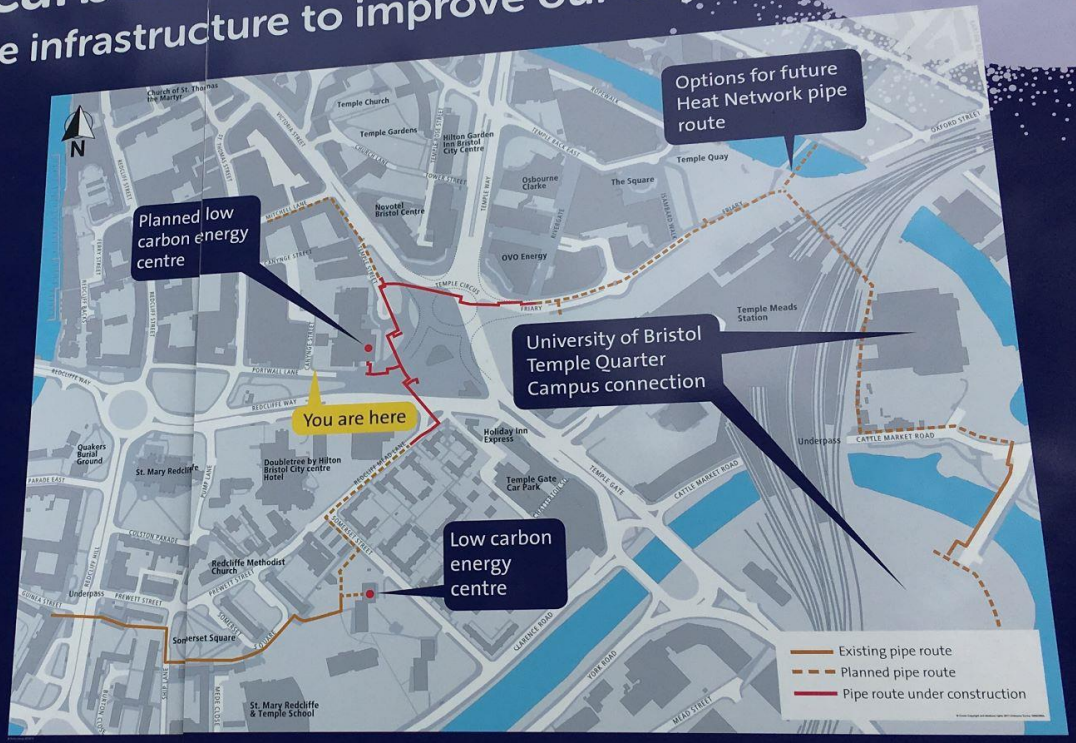
Why do we need it?

To play our part in the action against climate change, Bristol has committed to run entirely on clean energy by the year 2050. The development of our Heat Network will be key to achieving this goal by providing local businesses and housing with heat and power from more sustainable sources.

These works form part of a major programme of infrastructure investment and we're minimising disruption by combining the installation of heat pipes with other major developments in the area.

Where can I find out more?

You can go to **www.energyservicebristol.co.uk** for more information.



Department for Business, Energy & Industrial Strategy

Homes & Communities Agency

Department for Culture Media & Sport

BristolTempleQuarter

BRISTOL CITY COUNCIL

BRISTOL

Observations

- Local energy system planning recognised as vital for key decisions in energy system transition to net zero – see Ofgem, the CCC
- Using data – and computer modelling which relies on it – to inform local area energy planning has been going on for years (and become more sophisticated and 'whole system' in recent years)
- Some key gaps in data – building level consumption, demand patterns (seasonal and daily) and peaks
- Ingenuity in finding 'work-arounds' for gaps is <u>no</u> substitute for having the actual data

MAYOR OF LONDON

The potential 'public-interest' value of access to smart-meter data

Greater London Authority

Agenda

1. **The importance of Data**
2. **How we use Data**
3. **Added Value from Access to Smart Meter Data**

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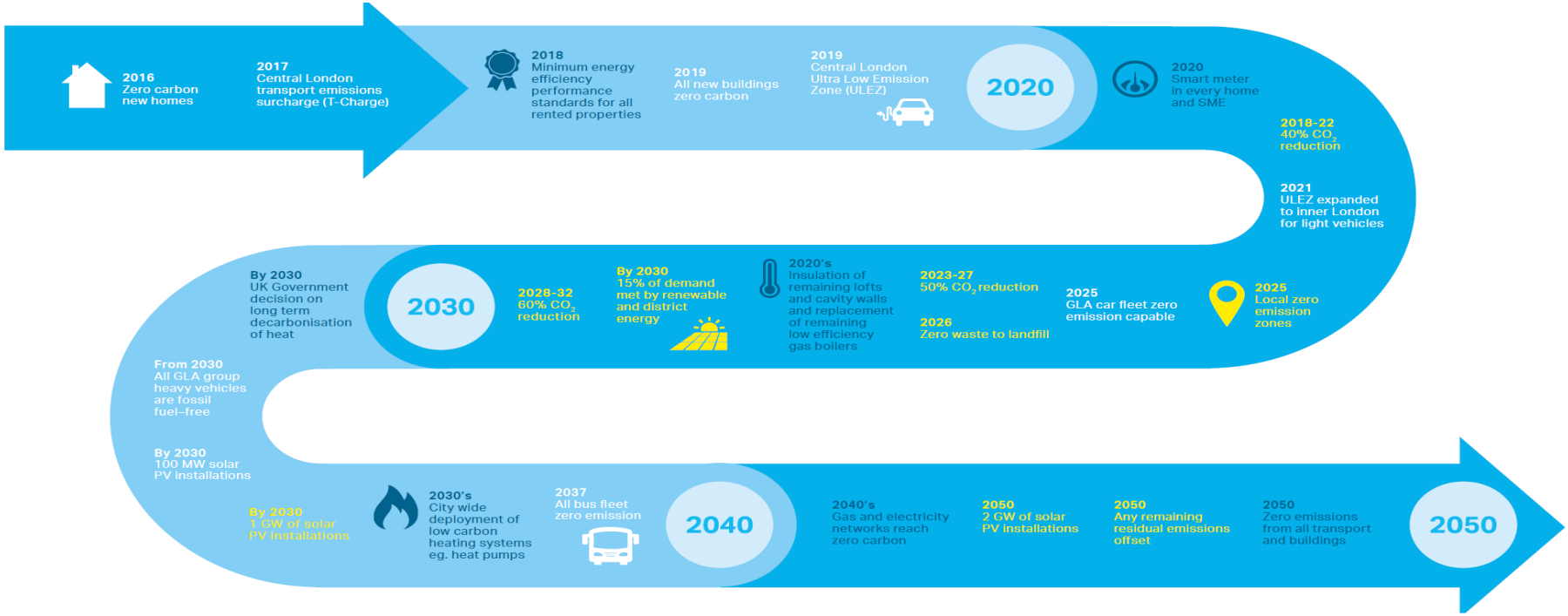
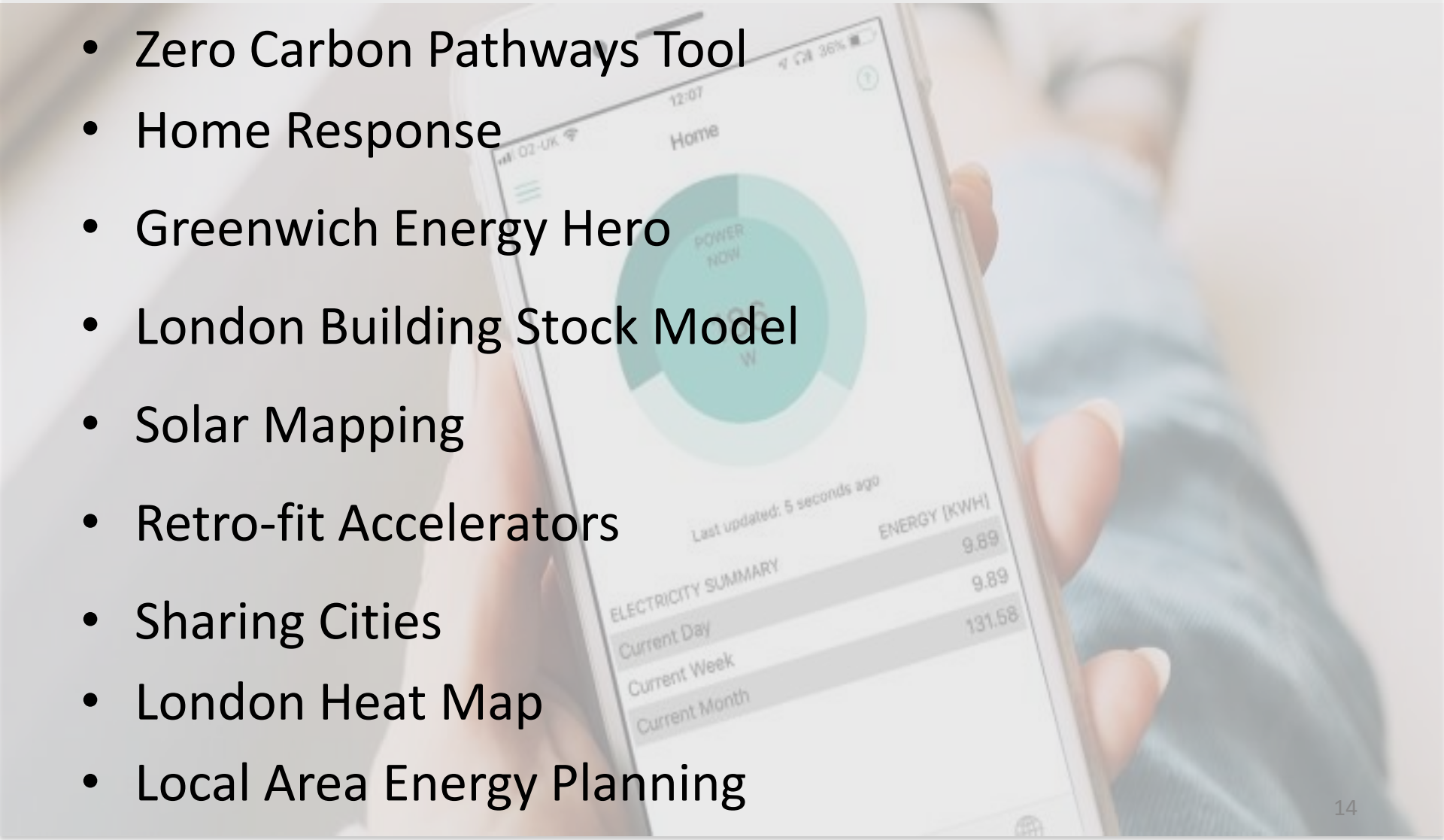
The Importance of Data

- Informing evidence based policy
- Designing delivery programmes and projects
- Evaluating performance
- Reporting progress
- Modelling and scenario planning, i.e. net zero



How we use Data

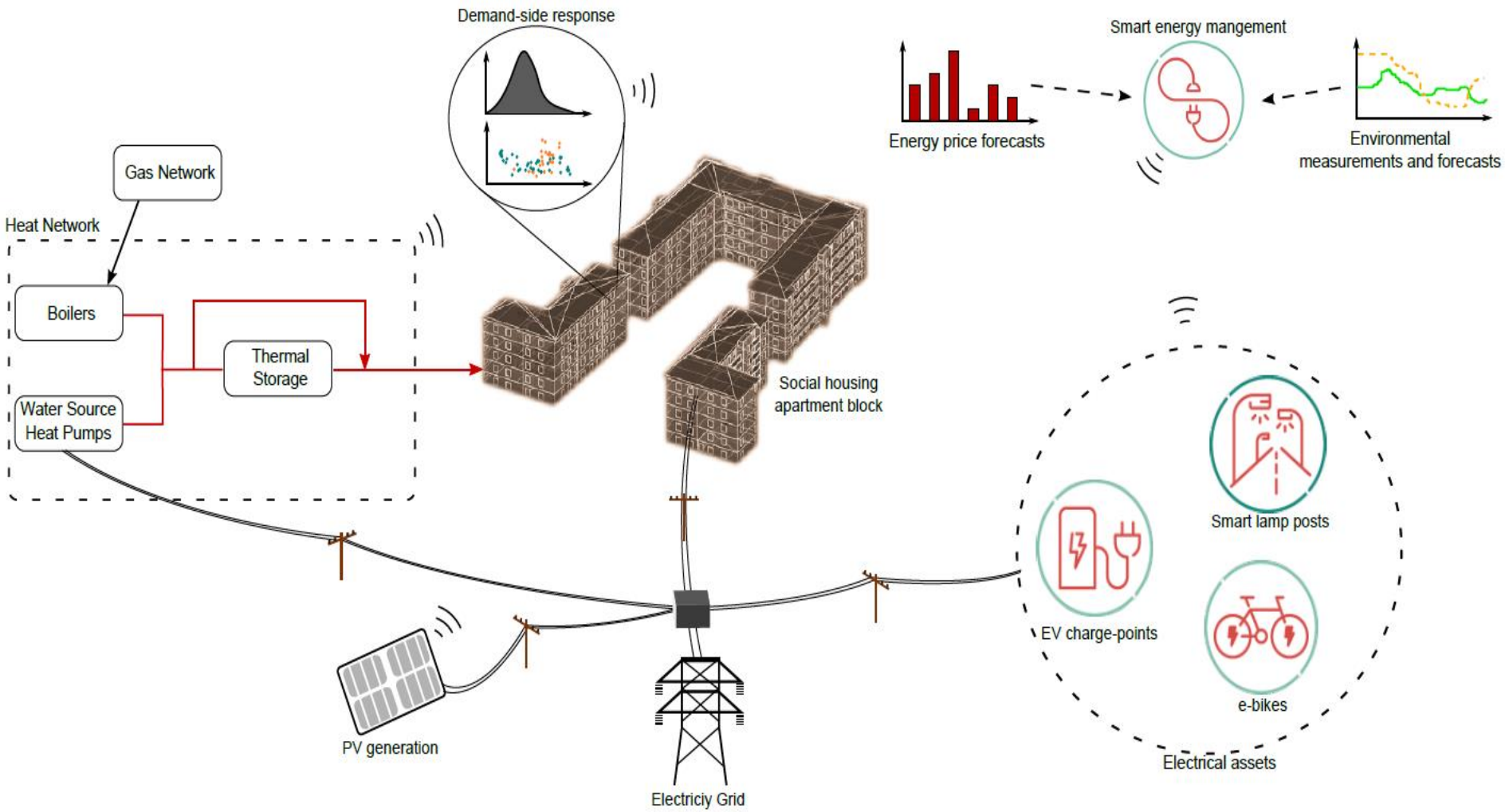
- Zero Carbon Pathways Tool
- Home Response
- Greenwich Energy Hero
- London Building Stock Model
- Solar Mapping
- Retro-fit Accelerators
- Sharing Cities
- London Heat Map
- Local Area Energy Planning



Added Value from Access to Smart Meter Data

- Improved modelling and scenario planning
- Service design for London Power
- Tailored and targeted local energy interventions
- Reducing performance gap of new-builds
- Accessing flexibility revenues
- Supply and demand balancing
- Fuel poverty interventions and indicators
- Accelerate uptake of distributed energy resources
- Integrated, smart and flexible local energy systems

Practical Example: Sharing Cities



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Potential applications of smart meter data for Scottish Government

Paul Matthews
Energy Statistician

Simon Gill
Head of Whole System and Technical Policy

Scottish energy statistics

In December 2017, the Scottish Government published the **Scottish Energy Strategy** which sets out the Scottish Government's vision for the future energy system in Scotland. It sets out six main priorities:

- RENEWABLE AND LOW CARBON SOLUTIONS
- LOCAL ENERGY SYSTEMS
- ENERGY EFFICIENCY
- CONSUMER ENGAGEMENT AND PROTECTION
- SYSTEM SECURITY AND FLEXIBILITY
- OIL AND GAS INDUSTRY STRENGTHS

As energy statisticians our job is to source data to provide evidence across all of these areas

Scottish specific data

The main challenge is to get **Scottish specific** data.

A major focus of our work recently has been to access granular level data to aggregate to a Scotland level – gives us the flexibility to look at things by various geographies.

Smart meter data potentially offers major advantages over existing sources:

- Access to better **quality** data
- Access to more **timely** data
- Access to data of greater **resolution** i.e. half hourly data

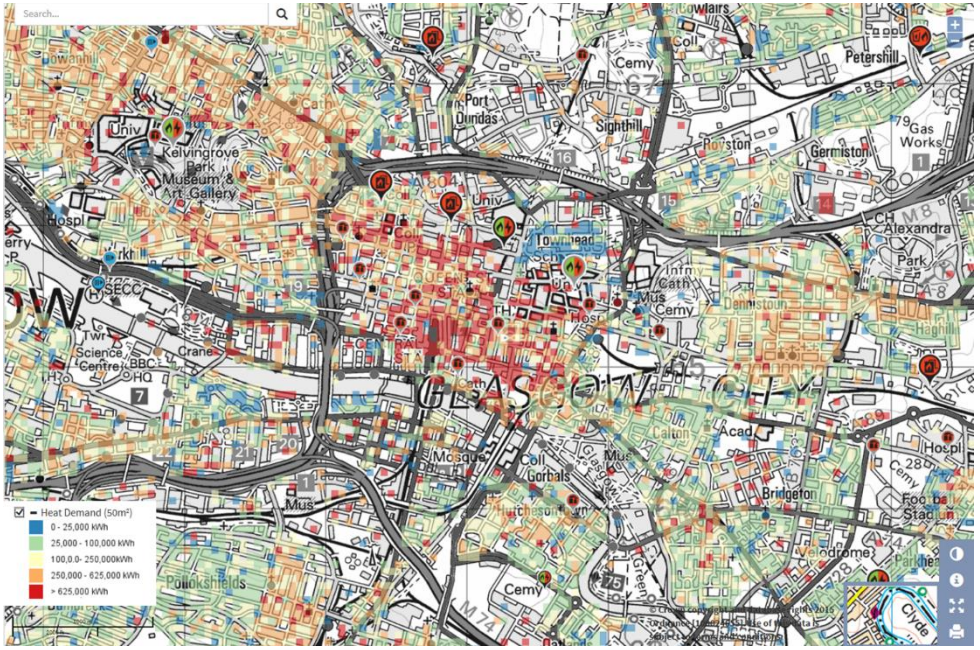
This presentation touches on various work streams in Scottish Government and how the advantages of smart meter data could enhance each.

Better quality data: Scottish heatmap

- Energy Statistics team collate the **heatmap**: a GIS tool for Local Authorities to assess who needs heat (demand) and where sources of heat (supply) might come from.

- Feeds into **Local Heat and Energy Efficiency Strategies** (LHEES) at a local authority level to improve energy efficiency of buildings and assist in decarbonisation of heat in Scotland.

- Key to this is **heat demand estimates** at a building level



Energy supply points in Glasgow City (tear drops) alongside heat demand for each 50m square area.

Better quality data: heat demand estimates

- For the heatmap, we need an estimate of **heat demand** for each of the almost 3 million properties in Scotland

- This is derived from a variety of **sources** at various confidence levels:
  - Building footprint data from Ordnance Survey products
  - Energy Performance Certificate (EPC) data
  - Billing data from public sector buildings

- Actual metered consumption data from smart meters would be key to **calibrate** our heat demand estimates

- Would allow us to assess the **accuracy** of our **current methodology** for heat demand estimates and refine.

- Data from existing meters is available for this purpose, but is subject to estimated meter reads, and under/over-reporting

Better quality data: master buildings dataset

Using similar principles to the heatmap, we can amalgamate individual building level datasets to create a **master buildings dataset** for internal use to provide analytical support to policy teams. The quality of electricity and gas smart meter data can add significant value to this.

Linking datasets can help:

- determine data **gaps**
- inform where **primary data collection** needs to be undertaken
- establish the building blocks to **impute** missing values.

Potential uses:

- Improving **non-domestic building data**
- **Electrical heat demand**
- Better **sectoral disaggregation** of consumption data
- **Energy targets**

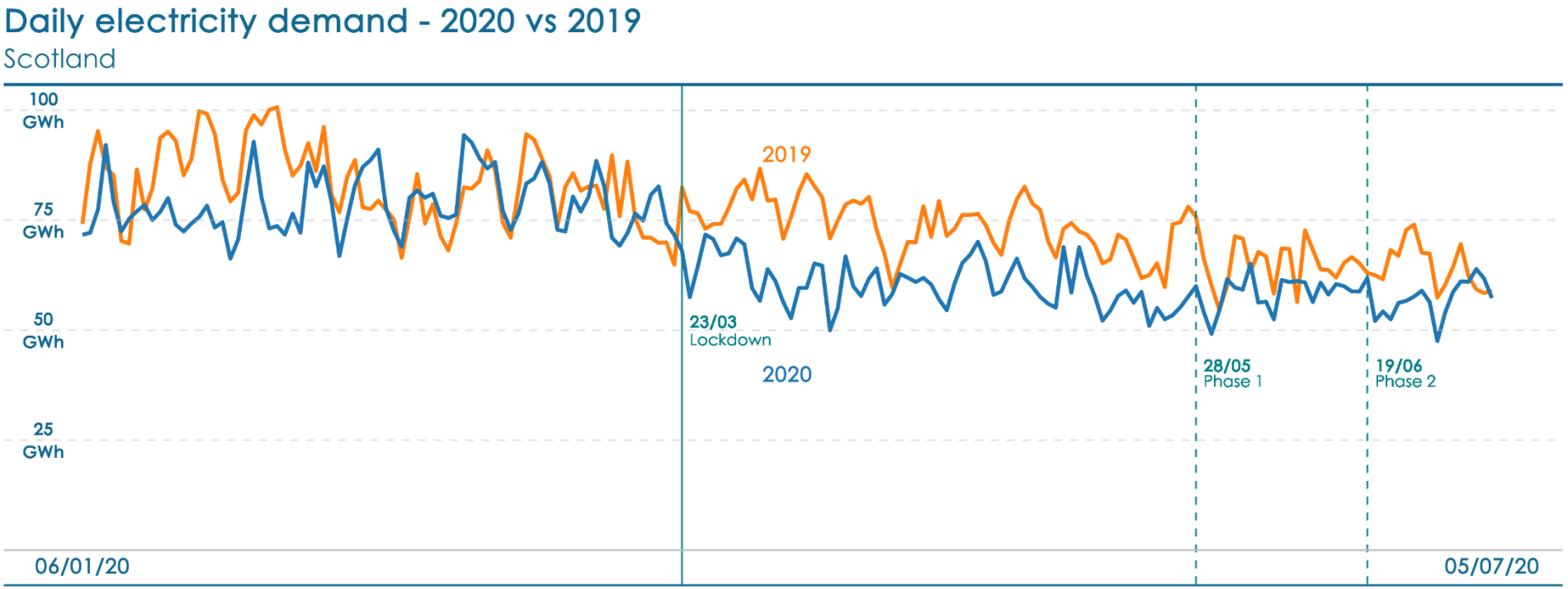
More timely data: target tracking

The Scottish Energy Strategy identifies a number of energy targets:

Energy Targets:	Latest	Target
Overall renewable energy target Total Scottish energy consumption from renewables	21.1% in 2018	50% by 2030
Renewable electricity target Gross electricity consumption from renewables	90.1% in 2019	100% by 2020
Renewable heat target Non-electrical heat demand from renewables	6.3% in 2018	11% by 2020
Energy consumption target Reduction in total energy consumption from 2005-07	⬇ 12.2% in 2018	⬇ 12% by 2020
Energy productivity target % change in gross value added achieved from the input of one gigawatt hour of energy from 2015.	⬆ 0.5% in 2018	⬆ 30% in 2030

More timely data: emergency planning

Analytical demands for response to **covid-19** further reinforces the need for timely quality data.



Source: National Grid

Smart meter data could provide better and more detailed data than we have at present.

More timely data: energy efficiency

More timely data offered from smart meters could be useful to facilitate **new analysis**.

Good data on **energy efficiency**, beyond just demand reduction, is something that will be increasingly important as our energy system evolves.

The timeliness and resolution of smart meter data will allow us to track the **effectiveness** of **energy efficiency measures** installed in buildings in an **impact of measures** approach.

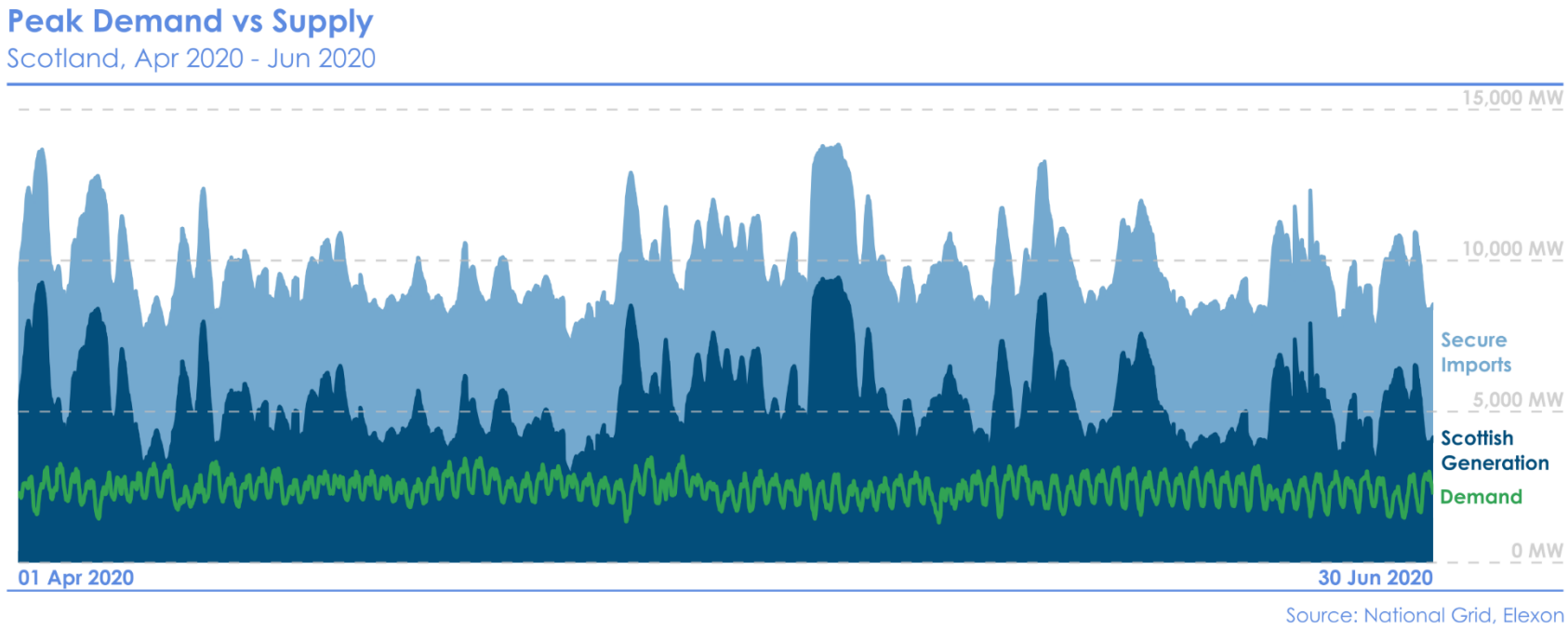
This evidence will be important as Scotland progresses through its route map for the Energy Efficient Scotland programme, will provide better information on which energy efficiency measures are most effective and allow more timely policy interventions.

Half hourly data: peak demand

The potential for smart meter data to provide **half hourly data** opens up analytical opportunities

- Better data on **peak demand** for electricity and gas.
- Linking half-hourly demand data to other half hourly data we have on **generation** and **supply**

Important for system security considerations.



Conclusions

Smart meter data could potentially affect everything we do in Energy Statistics in Scottish Government, and provide better evidence to policy makers. This is because:

- Data is **Scottish specific**
- At a **building level**, and therefore can be aggregated appropriately – local level data and Scottish data
- Is of **high quality**
- Potentially more **timely**
- Better **resolution**

There will be **limitations** to the data (current coverage being an obvious one). We can better mitigate the shortcoming by **integrating** the data with other sources we have.

How Smart Meter data could improve Local Area Energy Planning as an enabler for Net Zero

David Lee

Consultant – Energy Systems Modelling

10th July 2020

@EnergySysCat LinkedIn

About Energy Systems Catapult

Mission: Unleash innovation and open new markets to capture the clean growth opportunity

200 Innovation experts

Hubs in Birmingham and Derby

We work with Innovate UK

Established, overseen and part-funded by Innovate UK. Independent from Government. Not for profit

Bridge the gap between stakeholders in the sector

Supporting innovators

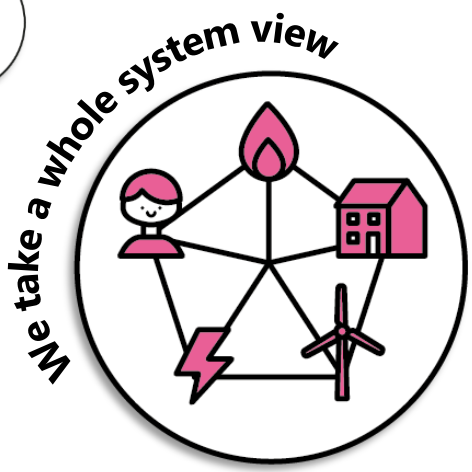
Research

Trials

Systems engineering

Digital

Modelling and simulation



Local Area Energy Planning

- Local Area Energy Planning (LAEP) is a concept developed by the ESC to enable data-driven, spatial and collaborative planning, to help unlock investment and delivery of smart local energy systems – summarised by these 7 steps.

Each local area is different - its people, geography, building stock, energy networks and ambitions and priorities

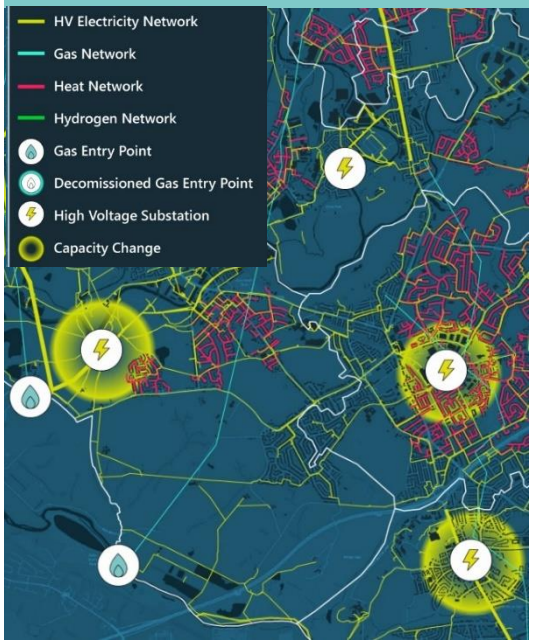
Local Area Energy Planning provides a data driven, spatial and collaborative means, involving local government & network operators, of exploring a range of possible future local energy scenarios to cost-effectively decarbonise

Resulting in the identification of energy network and system choices to support carbon neutral aspirations - informing what local action is needed and where

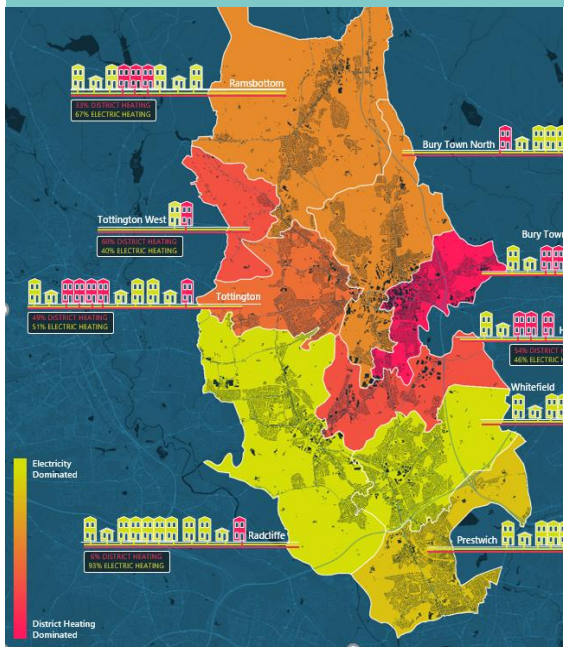
EnergyPath Networks (EPN)

- The ESC has developed EPN, a structured & repeatable framework for this analysis. We have trialled it with three local authorities and network operators

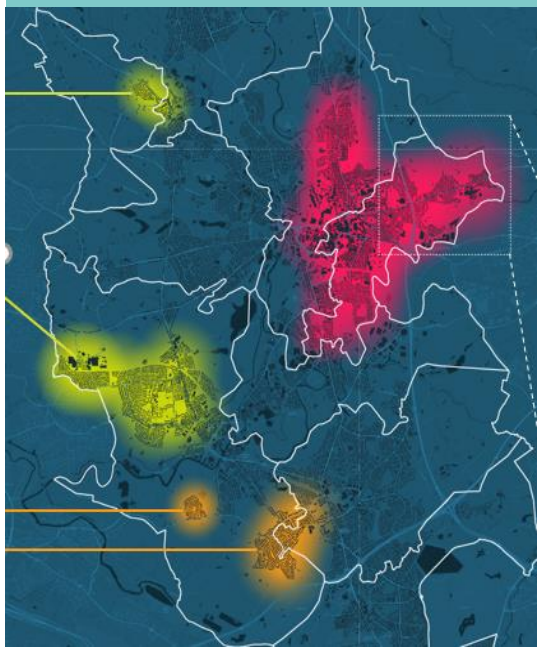
Understand **local options and choices for heat** in whole system context



Collaboratively develop a **long term evidence based plan** to decarbonise



Resulting in data and insight to **target innovation and deployment** projects



How we currently model demand

- Understanding local energy demand is crucial to LAEP – impacts on networks, generation, technology choices
- Currently this involves building a detailed representation of individual building attributes
- Then group into archetypes and then run through dynamic building energy demand models using local weather data
- This gives expected demands for heating, to which we add benchmarks for appliances, lighting etc

Do we get the thermal behaviour of the building correct?

Are we correctly modelling consumer behaviour and target temperatures?

Are our appliance benchmarks up to date with changing home technologies?

Smart Meter data – role for verification and validation

- Currently we validate our demand models against available data:
  - Network load data when available
  - BEIS small area demands
- Access to smart meter data would give much more detailed validation dataset, better at:
  - Capturing differences between buildings
  - Capturing local factors
  - Assessing diversity and validating peak loads – crucial for network planning
  - Capturing changes over time – quicker to react to changes in behaviour
- We need to think about weather effects – Good LAEP needs a long term view of demand
- Still challenges to assess demand under future technologies and changed consumer behaviour

Smart Meter Data as base demand data

- Rather than a building model, it might be possible to use smart meter data as the main demand data input for LAEP
- But this might not be a quick or easy option:
  - Would always need to fill gaps in data
  - Would add significant modelling complexity if used at granular spatial level
  - Would need to interpret in conjunction with other building attributes – e.g. is there already PV?
  - Doesn't necessarily help understand how demand will change under different future technologies

Validation and verification of a building model approach seems the better choice

What is the public interest?

- Net Zero is happening and big decisions will need to be made about the future energy system
- Models are generating some of the evidence that will guide these decisions

Better validation and verification helps get better evidence to guide these decisions and reduces the risk of:

- Carbon targets failing to be met
- Excess costs being incurred as a result of poor decisions

Improving the evidence behind these decisions helps ensure cost effective and desirable outcomes for the public

David Lee

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Smart Meter Energy Data
PIAG local energy planning workshop

10 July 2020

Joshua Thumim
Head of Research and Analysis
Centre for Sustainable Energy

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What is local energy planning?

- The energy system is there to meet our needs for warmth, light, motive power, computing etc.
- It does this by processing primary energy inputs, and sending them to end-use devices over distribution networks
- Management of the system involves a lot of decisions on various timescales
- We are interested in medium term planning for cost-effective decarbonisation

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What is local energy planning?

- ‘Local’ means the set of decisions that must be determined locally:
  - Local zero carbon heat and power supply
  - Demand management in buildings and transport
  - Low and zero carbon heat supply options for buildings:
    - Electrification
    - Heat networks
    - *Maybe* hydrogen
- Local transport and its electrification
- *Not transmission grid decarbonisation*

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Why is demand data important?

- Purpose of the system is to meet demand
- Like many supply systems:
  - running costs are dominated by throughput - annual kWh
  - capital costs are dominated by bandwidth - peak kW
- In the various levels of the system hierarchy, these quantities are the sums of the activity in the levels below
- End-use demand is at the bottom of this tree
- So the size, shape and cost of the system at all levels ultimately depends on end-use annual and peak demands
- Therefore understanding the system's behaviour, and the options and costs for changing it, requires a detailed understanding of end-use demand.

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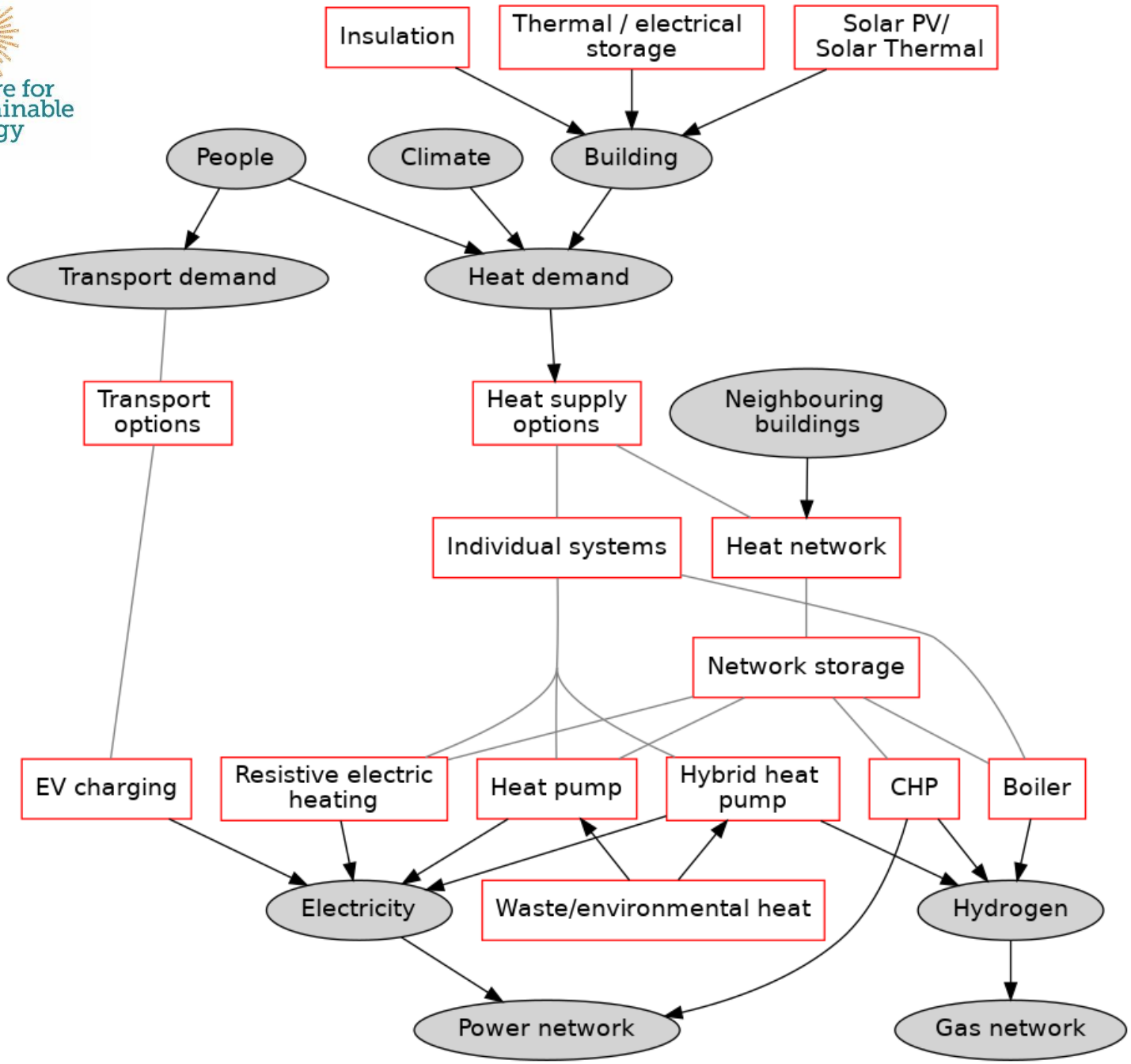

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How do we use demand data?

- For a range of scales (from a single building to a whole city):
  - to model the cost and effect on demand of things like insulation and storage
  - to work out the required size and hence costs for plant and networks
  - to work out the ideal size and cost of building-based renewables

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How do we use demand data?

- Figuring out a sensible, cost-effective combination of the above decisions for anything more than a handful of buildings is really hard!
- And it's impossible without knowing the annual and peak demand for each and every building

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How do we work around the lack of data?

- I've been banging my head against this problem for 20 years!
- In short, we do our best to make estimates in the absence of hard evidence.

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How do we work around the lack of data?

- Slowly getting better at this:
  - 2003: London CO_2 emissions inventory
  - 2004: census output area heat demand map of Greater London using rough estimates for different housing types based on the EHS
  - 2009: London Heat Map on a 50m grid, disaggregating DECC Small Area Stats
  - 2012: National Heat Map: first building-level model, again disaggregating small area stats. Horribly complicated!
- 2020: THERMOS project
  - training ML regression models on annual building level consumption data
  - use of smart meter data from EDRP to predict peak from annual

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How do we work around the lack of data?

- As the methods and tools have improved, they have enabled the development of more detailed models
- BUT: the value of their outputs is still limited by the fact that they are based on estimates
- AND: some things remain hard to estimate because of a lack of data (e.g. peak demands, commercial demand patterns…)

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How would smart meter data improve matters?

1. It would save a lot of resource currently spent developing fancier and fancier ways of guessing. This could be better invested in using real data in improved system planning models

2. It would enable us to create much better building-level models for things like insulation, storage and integrated renewables

3. It would enable us to better understand the options for managing and meeting demand in non-domestic buildings, which is currently very difficult.

COMFORT BREAK

Session 2 – Respondents

Ron Loveland – Welsh Government

Heather Stevenson – Greater South East Energy Hub

Dr Jess Britton – University of Exeter

Others

General Discussion

Today's PIAG workshop - conclusions & next steps

- **Conclusions**
- **Outputs**
  - Informal note & slides
  - **Workshop report** – draft to contributors – July; Publish – September.
- **Workshops 1 & 2 Reports –** published on PIAG microsite -https://www.smartenergydatapiag.org.uk/

PIAG – Member updates & AoB

- **Future PIAG workshops –** dates / times tbc
  - **Heat** – 11 November 2020
  - Broadly, same approach as today (virtual or not - tbc!)
  - To 'build evidence' on additionality from more granular consumption data. Your input needed!
- **Member updates**

Many Thanks for Today !

Smart Meter Energy Data:
Public Interest Advisory Group (PIAG)

https://www.smartenergydatapiag.org.uk/

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Sustainability First - www.sustainabilityfirst.org.uk

PIAG – Phase 1 Outputs

Nov 2017 – July 2019

- **Phase 1 report:** principles, conclusions & recommendations
- **Inputs to:** BEIS DAPF review, Ofgem settlement reform (data access; TOMs; customer impacts)
- **Developed six public-interest 'use-cases'**: to help clarify what data needed by whom – at what level of resolution – to meet use-case needs & related privacy considerations
- **Identified possible 'secure' routes by which to access smart meter data** for a public interest purpose
- **Ten practical background papers:** to inform debate
- **PIAG communications**: consciously 'low key'
- **Other initiatives on smart-meter data-access:** DNO Privacy Plans, UCL's Smart Energy Research Lab, BEIS / Ofgem Energy Data Task Force.
- **PIAG's main focus = separate – but linked:** to future proof / leave open potential future routes for data access for a public interest purpose

PIAG Project Papers

Public Interest Advisory Group papers available at https://www.smartenergydatapiag.org.uk/	
Kick-off stimulus paper	Initial Meeting – 30 November 2017
Working Note	Clarifying what smart meter data could add to the public interest: public interest questions to frame PIAG's work
Stimulus paper 1	Background to ICO Guidance on anonymisation and annex on data access privacy legal framework
Stimulus paper 2	International experience – smart meter data access
Stimulus paper 3	Data ethics – a review of the landscape
Stimulus paper 4	Stakeholder perspectives on smart meter energy data and potential public interest use-cases
Stimulus paper 5	Public interest use-cases: data attributes, data requirements, and associated privacy and access implications
Stimulus paper 6	Consumer research on access to smart meter energy data
Ipsos MORI research report	Customer thinking on privacy in relation to smart meter data for 'public interest' use
Stimulus paper 7	Possible routes to smart meter data for public interest uses
Stimulus paper 8	Capability requirements of public interest data user organisations
PIAG final report	Final Phase 1 paper (Workshop - April 2019. Publication – June 2019)
Annex to PIAG final report	Summary of PIAG project papers