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Associate Director Sustainable Places | Bioregional

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Design Manager | Equans

Littlebury Community Energy Project

Community Energy Feasibility Study Findings

25.09.2024

Send us your questions - live

Leave your questions on Post It notes around the room.

Use the link below or scan QR code to left to submit questions online:

https://www.menti.com/almt9zjzcs41

Littlebury Energy Project

FEASIBILITY STUDY

May / June
Kick-off, site visit and energy demand mapping

June
Review options for heat demand reduction

June/July
Appraisal of renewable options and energy infrastructure

July/Aug
High-level financial appraisal

May – Sept (on-going)
Community engagement activities – news, survey & event

September
Project report and final output

The Agenda

Bioregional EQUANS

WHO WE ARE

Bioregional

Championing a sustainable future for all

- A purpose-led, not-for-profit sustainability consultancy
- Support businesses and organisations to transition to a net-zero carbon, circular, and sustainable future
- Work with partners to create homes, workplaces, and communities that enable sustainable living

EQUANS

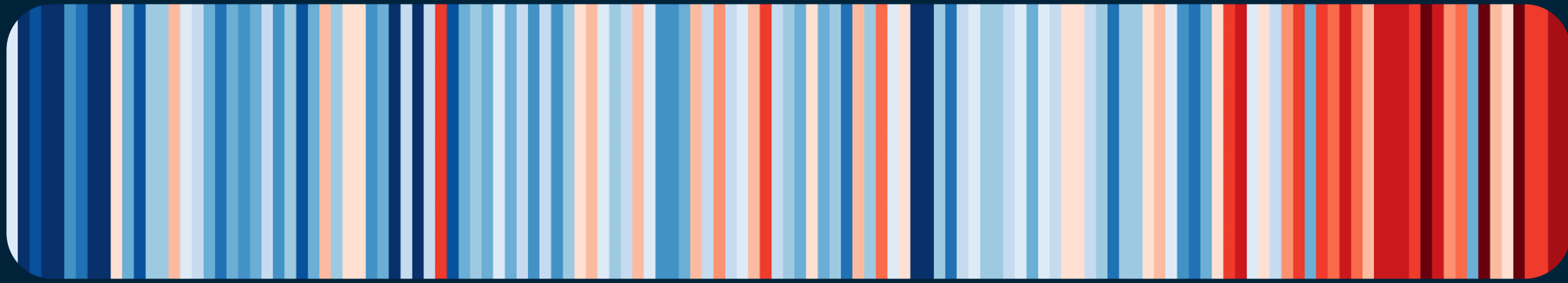
Award winning international renewable energy solutions provider

- Delivered first-of-a-kind rural heat network project in Cambridgeshire
- Local energy engineering specialists
- Capabilities spanning all potential decarbonisation options
- Passion for delivering local change

WHAT'S THE BIG PROBLEM?

Bioregional EQUANS

What's the big problem?



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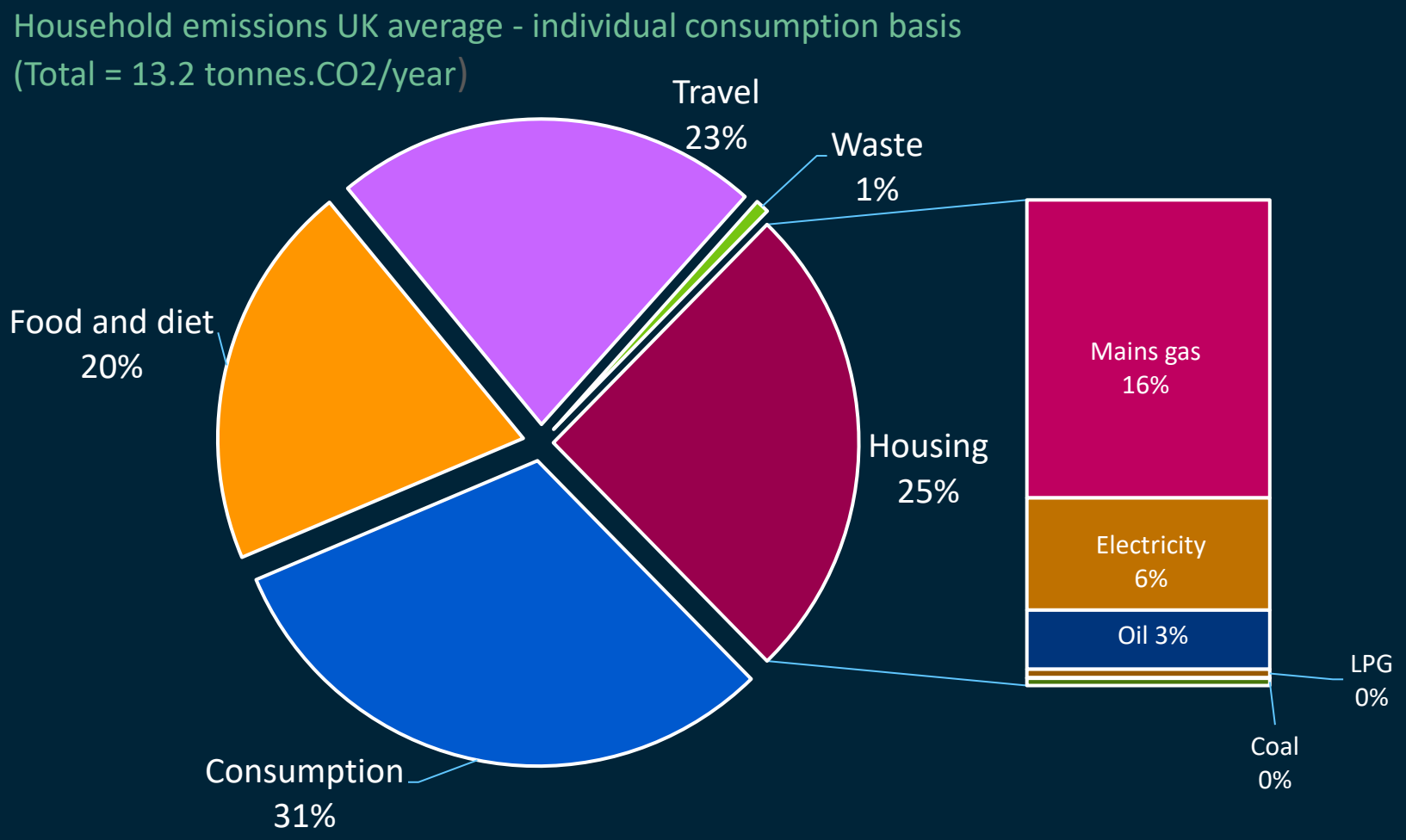
The challenge of heat decarbonisation

Carbon emissions – around 90% of UK homes are reliant on fossil fuel heating



206 $g.CO_2/kWh$ – average carbon content of UK residential heating (2022)

100 $g.CO_2/kWh$ – average carbon content of France residential heating (2021)

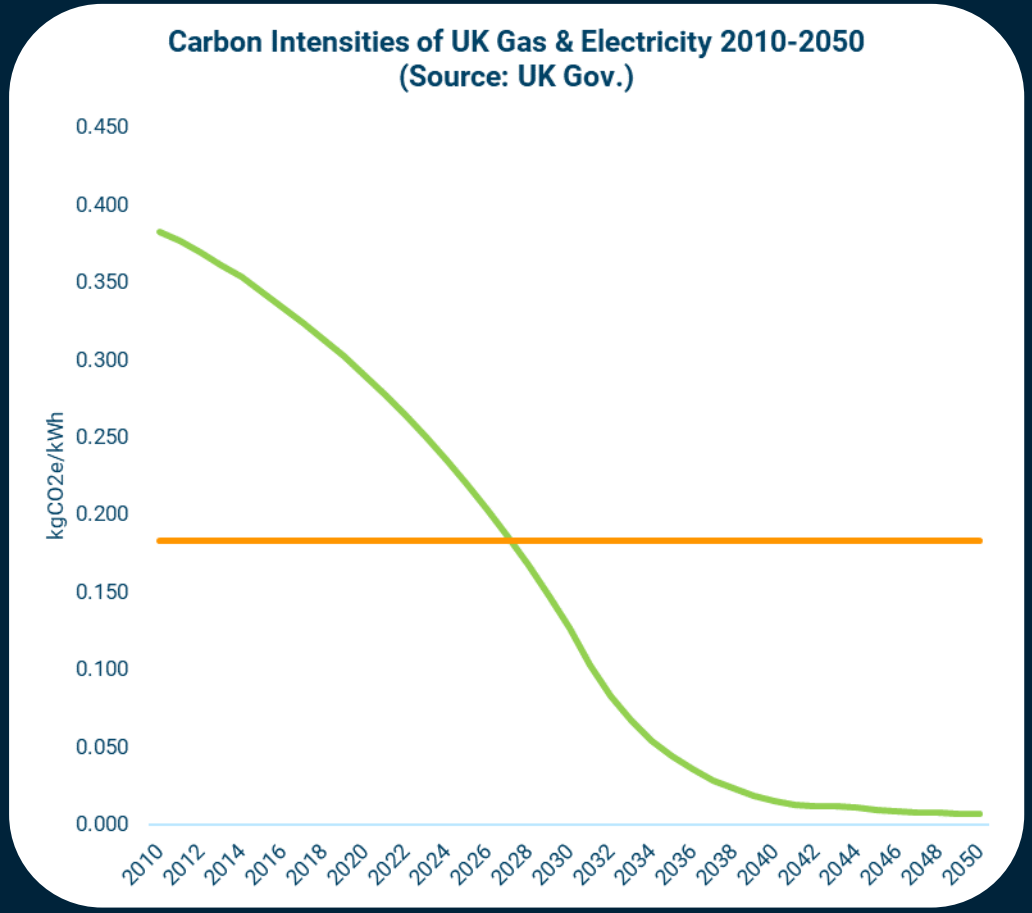
29 $g.CO_2/kWh$ – average carbon content of Swedish residential heating (2021)

What's the big problem?

Mains-supplied **electricity is rapidly decarbonising**

The proportionate contribution that heating will play in a building's carbon footprint will **increase**

We need to stop burning things to heat our homes to mitigate global warming



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WHAT IS THE LOCAL CHALLENGE?

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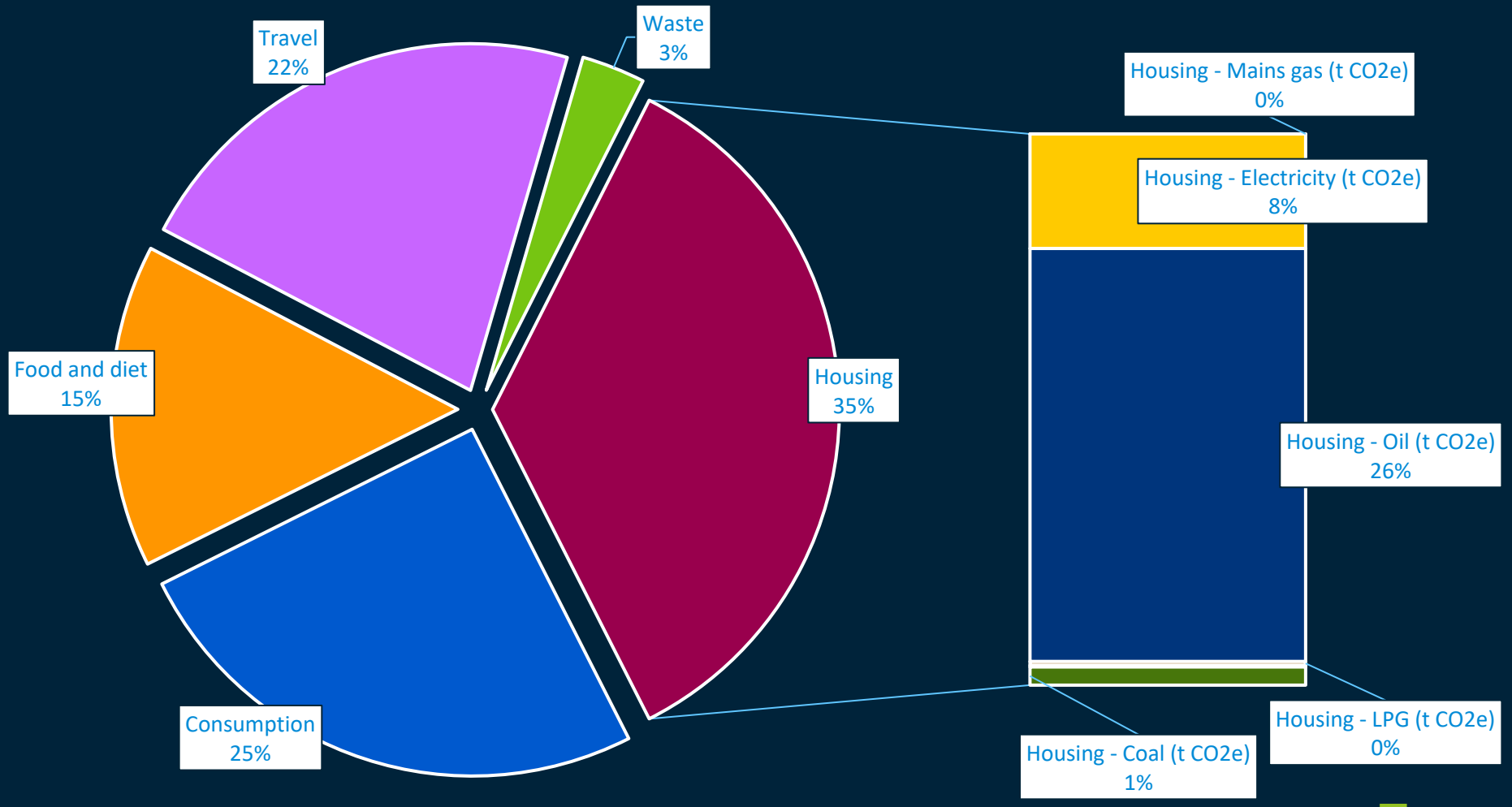
Local emissions are around 50% higher than national averages

Littlebury emissions average- individual consumption basis (Total = 19.4 tonnes.CO2/year)



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What's the local challenge?

There are many, including...

- Price Volatility
- Inconvenience of oil boilers
- Local air quality and smell
- Legislative pressure to remove Oil/LPG boilers (2035 currently)
- Decarbonising your home's heating is expensive and potentially disruptive

WHY LITTLEBURY?

Why Littlebury

Forward thinking – community 'spirit'

Rural community - environment / conservation

Space to do "something different"

= Capability to decarbonise...

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WHAT'S OUR CHALLENGE?

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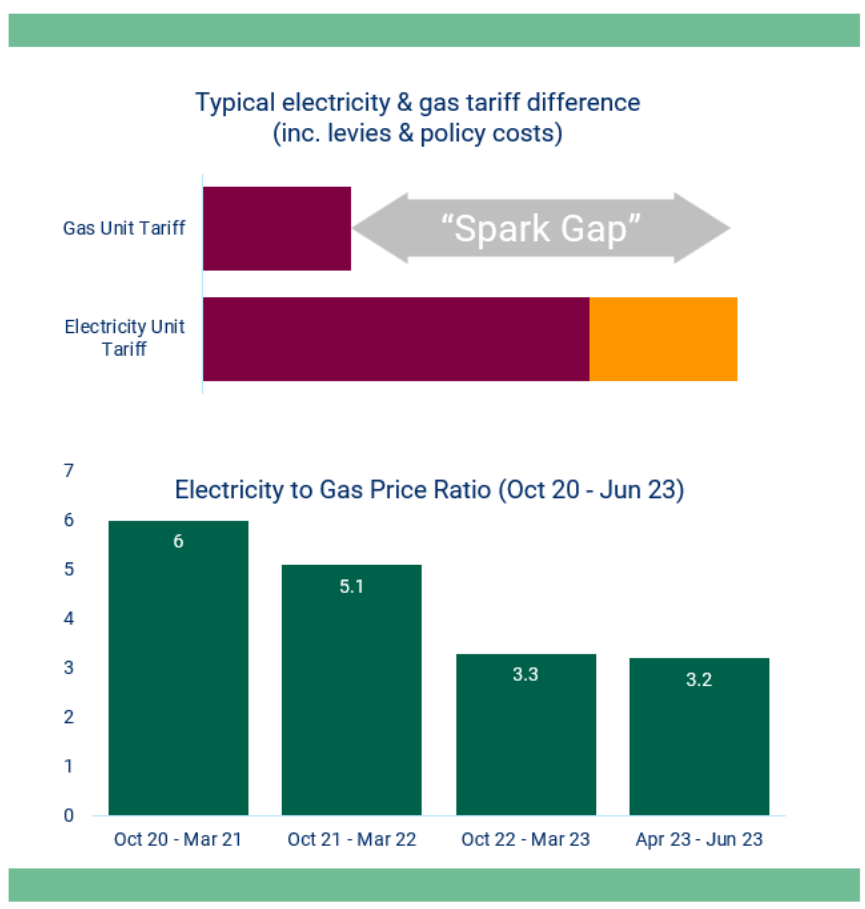
Our Challenge.

Decarbonising heat isn't easy!



- Fossil fuels are cheap (and subsidized!)
- Heat pumps are expensive
- Retrofitting can be complex
- Evolving technologies / design principles
- Evolving regulation and legislation
- Evolving grants / subsidies

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OUR BRIEF

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Our Brief

"to establish **technical and commercial viability** of solutions to **decarbonise heating** for residents of the village"

Cost to property owners / residents

Grant eligibility / investment case

Technical feasibility

Carbon Impact

Environmental impact

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THE DECARBONISATION OPTIONS

The Trilemma

What is the best available technique to decarbonise Littlebury?

Centralised / Community Renewable Energy

VS

De-centralised / Individual Property Renewable Energy

- CO_2 impact
- Economic impact
- Cost of heat
- Speed of execution
- Effort & inconvenience
- Environmental impact

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The Trilemma

What is the best available technique to decarbonise Littlebury?

Centralised / Community Renewable Energy

VS

De-centralised / Individual Property Renewable Energy

AND?

Energy Demand Reduction

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Centralised / Community Renewable Energy

Why?

- ✓ Remote and contained
- ✓ Grant funding
- ✓ Minimal change to property
- ✓ Responsibility outsourced
- ✓ Rationalised design
- ✓ Resilience
- ✓ Power source options
- ✓ Decarbonise ‘all’ in one go

Why not?

- ! High capital cost
- ! Complexity
- ! Invasiveness of construction phase
- ! Loss of space
- ! Incubation time
- ! Uptake risk

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Decentralised / Individual Property Renewable Energy

Why?

- ✓ Tailored solutions
- ✓ Elective
- ✓ Speed to execute
- ✓ Grant funding
- ✓ Comparative low complexity
- ✓ Contained within dwelling
- ✓ Deep decarbonisation

Why not?

- ! Environmental impact
- ! Ownership responsibility
- ! Owner effort / resource intensity
- ! Fragmented decarbonization
- ! Potential necessity for wider building improvements

Energy Demand Reduction

Why?

- ✓ Reduce heating cost
- ✓ Improve thermal comfort
- ✓ Improve property value
- ✓ Improve 'low carbon heating system' efficiency

Why not?

- ! Limited carbon impact
- ! Invasive / disruptive
- ! Economics

THE ANALYSIS

The Analysis (Findings thus far)

Data Acquisition & Analysis

Site Surveys

Stakeholder Engagement

Qualitative Optioneering

Quantitative Simulation Modelling

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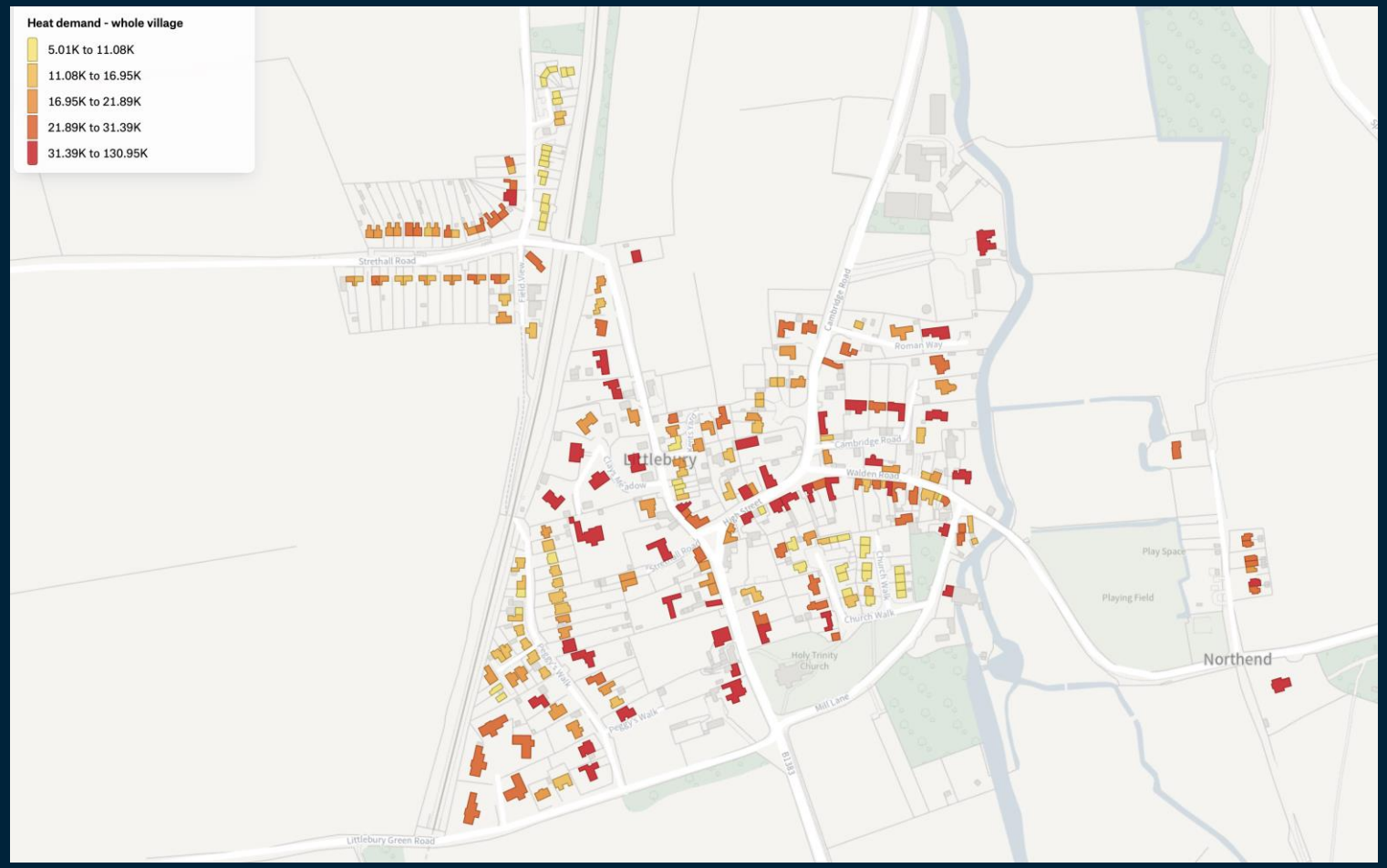
Village Heat Mapping

- No properties in village on gas network (no metering to rely on)
- Estimates drawn from survey data on cost of heat – so we have a wide error margin
- However – heating intensities by property age match previous data we have collected from metered data in the south of UK.
- No SMART meter data, so we have used estimates of time-usage behaviour….



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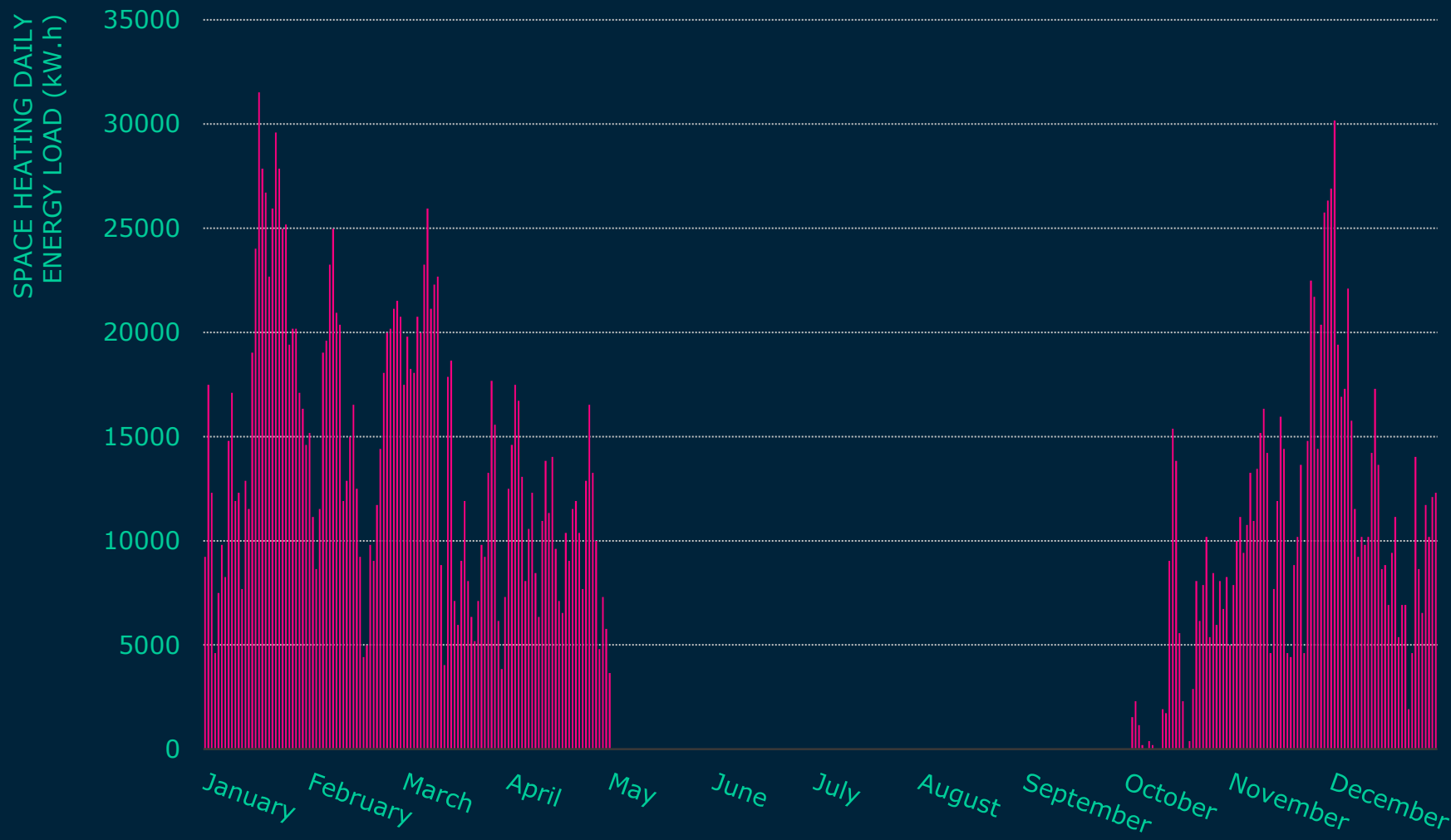
Synthetic annual heating profile

Littlebury space heating daily energy load

Date: 15/07/2024



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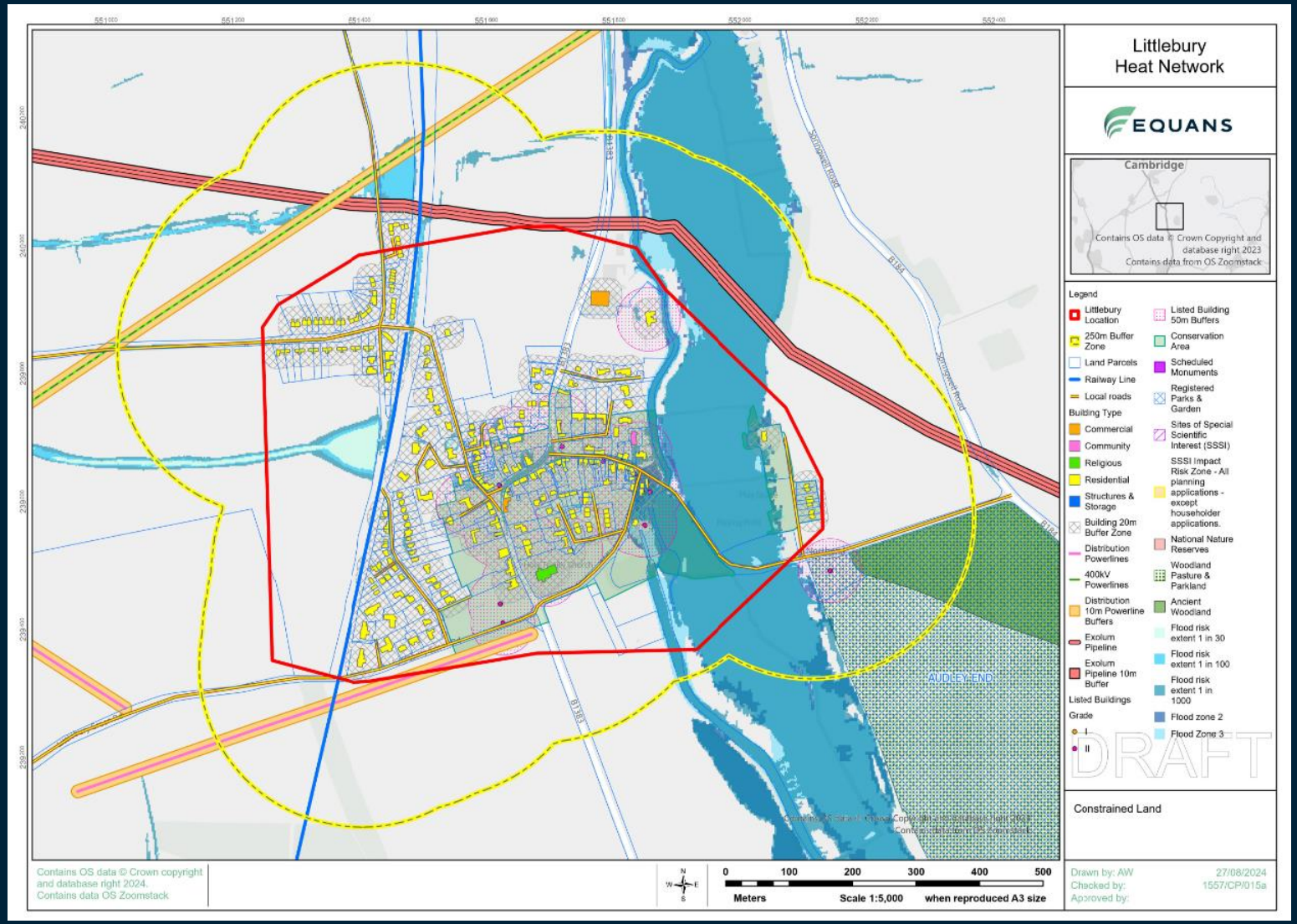
The Analysis (Findings thus far)

- Constraints map
  - Flood risk
  - Scheduled monuments
  - Conservation area
  - Woodland
  - Registered parks & gardens
  - Oil pipeline
  - Etc...

- Purpose is to identify areas with NO CONSTRAINTS



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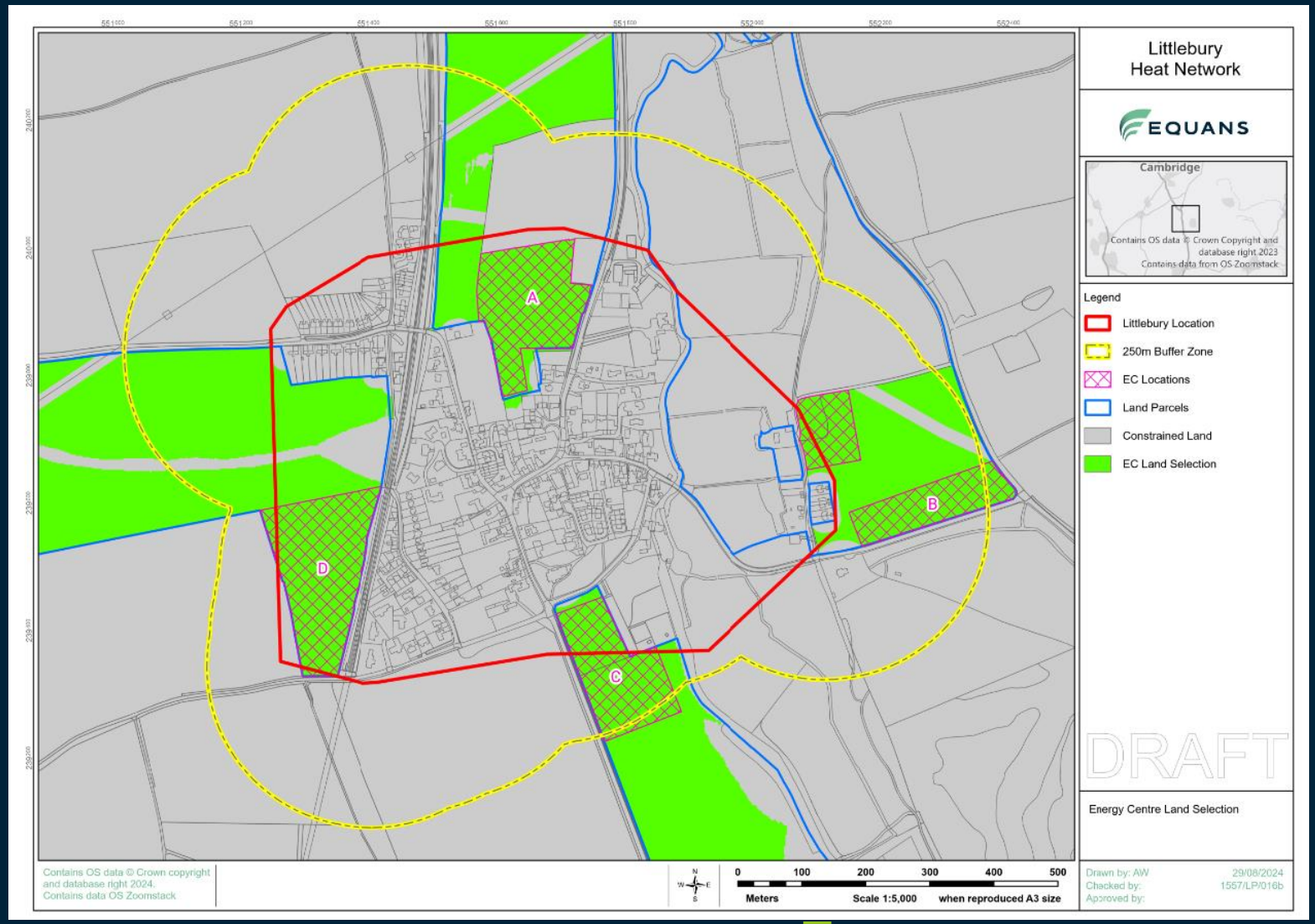
The Analysis (Findings thus far)

- Four potential locations identified A-D
- Informed by 'Constraints' mapping
- Approximate location of Energy Centre – not all of hatched area shown



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The Analysis (Findings thus far)

Qualitative Optioneering

- Qualitative options appraisal
- Subjective only but useful to compare against set criteria
- Sites A & C clear favourites
- Sites B & D further away and some 'red flags'

(✓✓✓✓ preferred site / ✓ least preferred site)

LITTEBURY POTENTIAL ENERGY CENTRE LOCATIONS – DECISION MATRIX

	Site A	Site B	Site C	Site D
	1	3	2	4
Distance from centre of village	✓✓✓✓	✓✓	✓✓✓	✓
Land suitable for development	✓✓✓✓	✓✓✓	✓✓	✓
Visual impact on village	✓✓	✓	✓✓✓✓	✓✓✓
Potential Flood Risk	✓✓✓✓	✓✓✓	✓	✓✓
Proximity to Protected Land	✓✓✓✓	✓	✓✓✓	✓✓

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The Analysis (Findings thus far)

- Possible Heat Network layout (Site A) Total network length: **1.57km**
- Serves buildings not at village extremities and those harder to provide individual solution for
- **Indicative** only (subject to further detailed feasibility)

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The Analysis (Findings thus far)

- Alternative Energy Centre location to the south (Site C)
- Slightly longer total network length: **1.69km**

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The Analysis – Electrification of heat

- Heat – pumps (300%+ efficiency)
  - Air Source
  - Ground Source
  - Water source
  - Waste Heat
- Direct Electrical heating (100% efficiency)

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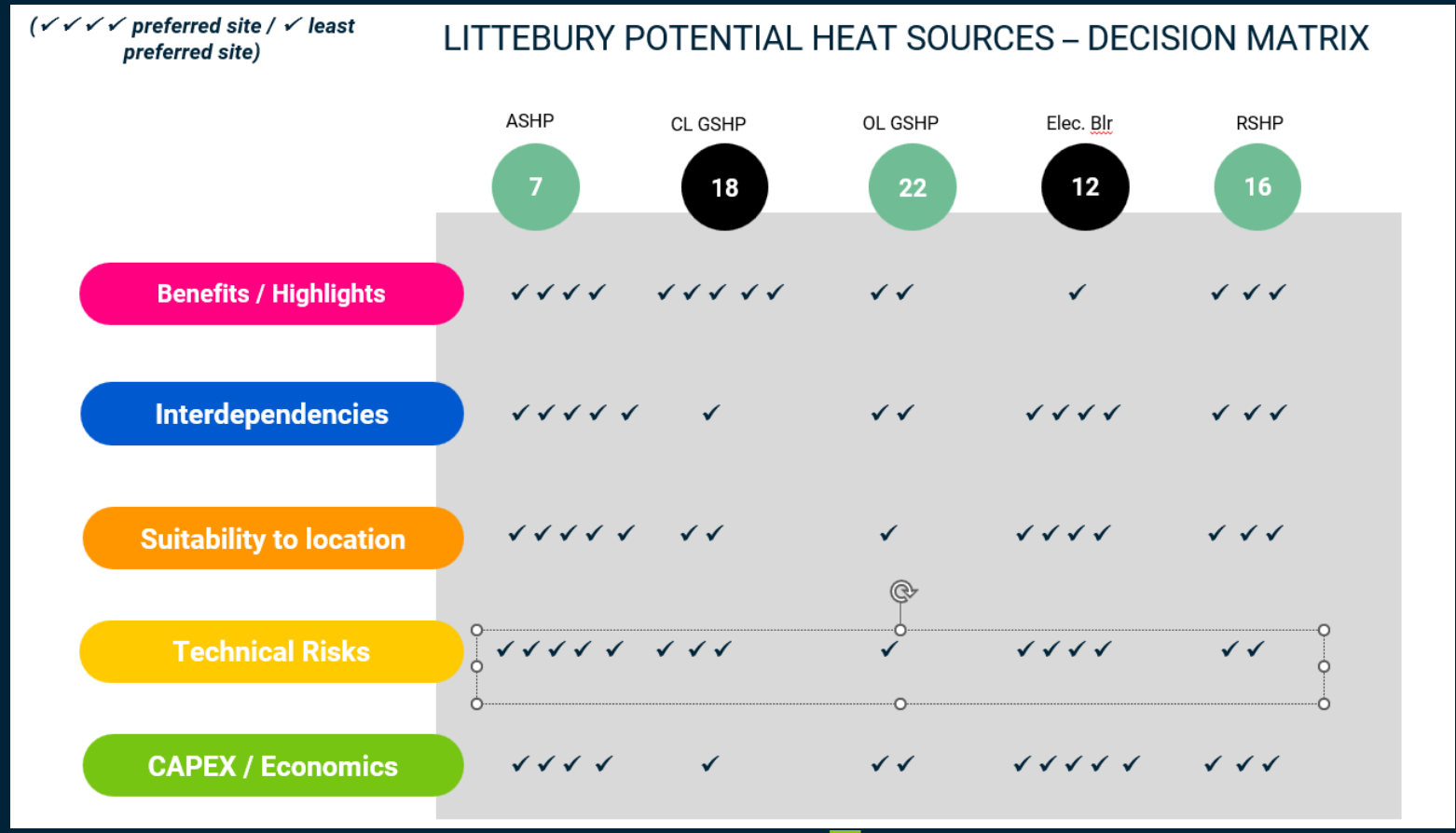
The Analysis (Findings thus far)

Qualitative Optioneering

- **Heat Sources** – Subjective Qualitative Appraisal
- ASHP first or second choice against all parameters
- Elec Boilers ranked 2nd and has low capital costs but highest energy cost
- Ground Source variants would have high capex, land requirements and complexity
- River Source potentially feasible but high cost, performance risk and complexity



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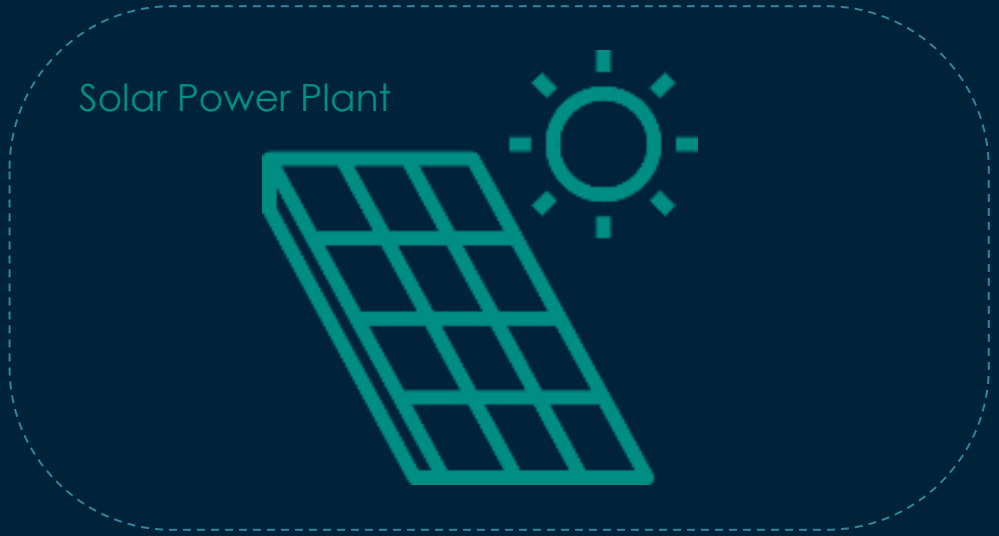
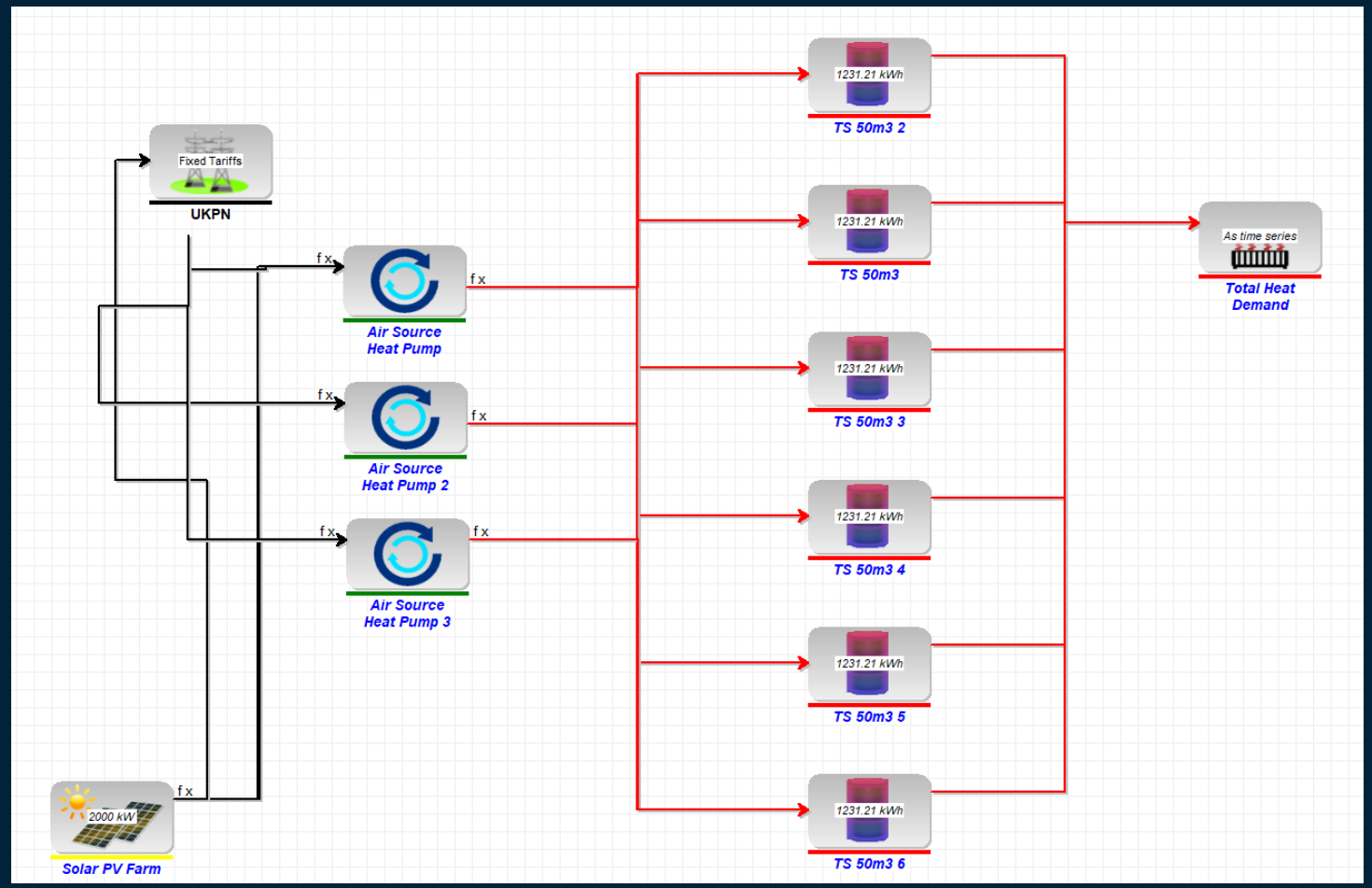
The Analysis (Local electrical generation)

- Grid source electricity can be expensive (and may become more so)
- Local electrical generation can lower costs, lower carbon and provide security
- Local wind and solar has been explored
- Significant impact on project economics (and customer cost of heat)



Bioregional EQUANS

The Analysis (Findings thus far)



Quantitative Simulation Modelling

- EnergyPRO simulation of village (left)
- Variety of options assessed and optimised.
- Combination of air source, thermal storage and some direct electric resilience shown to be most effective

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Domestic heat pumps – at home level

- installed in approximately 40,000 properties in 2024 so far!
- average installation cost is around £12,800 (excl. government £7,500 grant)
- Average heat-pump COP's are now 2.9 (significant improvement on older models)
- High temperature and low temperature heat-pumps are now on the market, but higher temperature heat pumps have much lower COPs (so more expensive to run)
- BUT – requires space and a system which can take it

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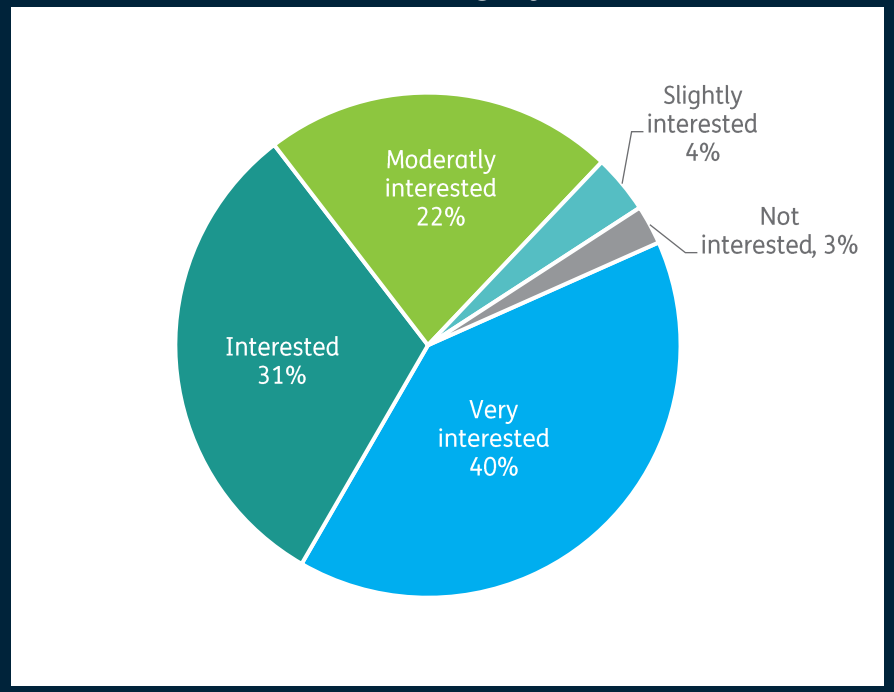
WHERE DO WE GO FROM HERE?

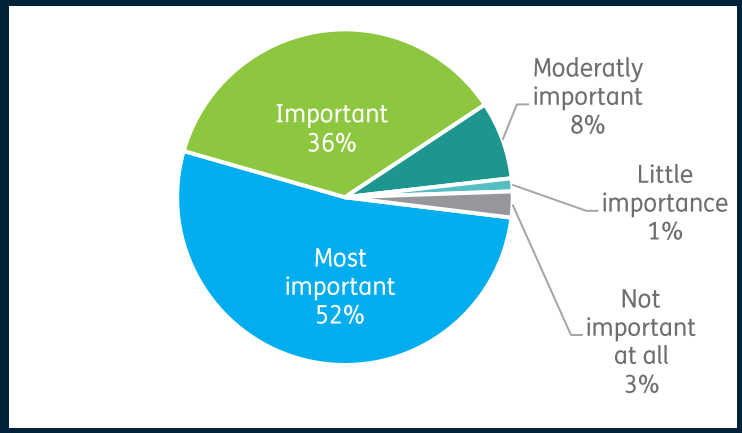
Community feedback

Littlebury resident motivations for the project – key findings

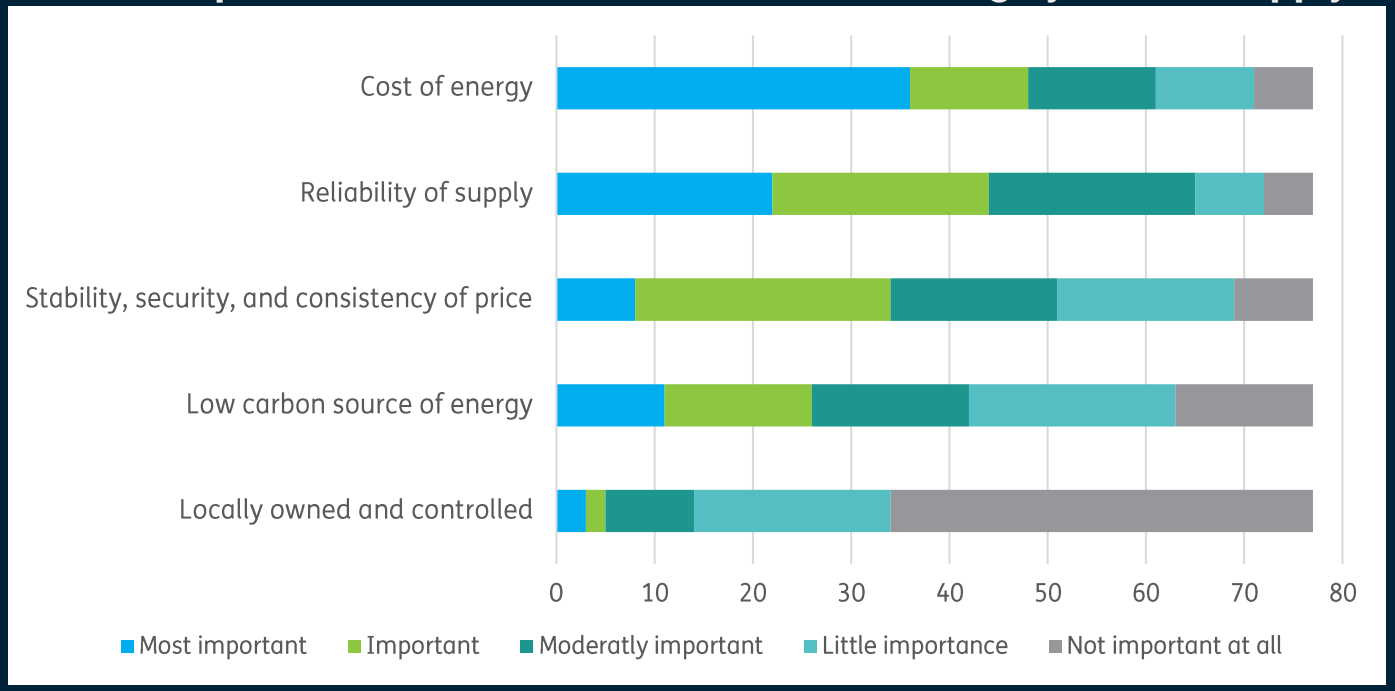
Interest in exploring a community-led low/zero carbon heating system:



Importance of reducing personal carbon footprint:



Ranked importance of five factors related to heating system or supply:



What do we need from you?

- Sign up to receive project updates
- Read the study when published:

https://lep.swce.co.uk/

- Share accurate information about the project, become an advocate!

Ask questions to the project team to get clarity: contact@lep.org.uk or 01799 252501

- Join the LEP working group

Your support enables a village-wide solution to be found

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Q & A

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NORTH ANGLE **SOLAR FARM**

Brief Overview

Overview:

- **Developed in parallel to Swaffham Prior Heat Network**
- **An ‘expansion’ to an existing 12MWp solar farm that we delivered in 2016**
- **A ‘conventional’ solar farm, optimised for long-term revenue generation**
- **Enhanced biodiversity net gain and community orchard – exemplar project**

Key Technical / Development Challenges:

- **Electricity Network Connection**
- **Archaeology and Ecology**
- **Covid 19 Pandemic, BREXIT, Ukraine / Russia Conflict, Suez Canal…**
- **Winter.**