

What might district heating zones look like?

David Hawkey

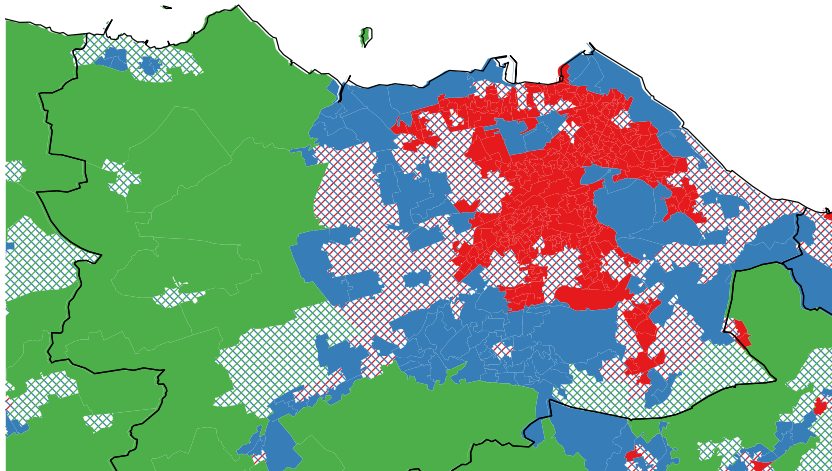
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Planning district heating

CONSULTATION ON HEAT & ENERGY
EFFICIENCY STRATEGIES, AND REGULATION
OF DISTRICT HEATING

- LHEES: long range heat planning
 - Beyond near term opportunities
- Scotland-wide consistency
 - Aggregate view across areas



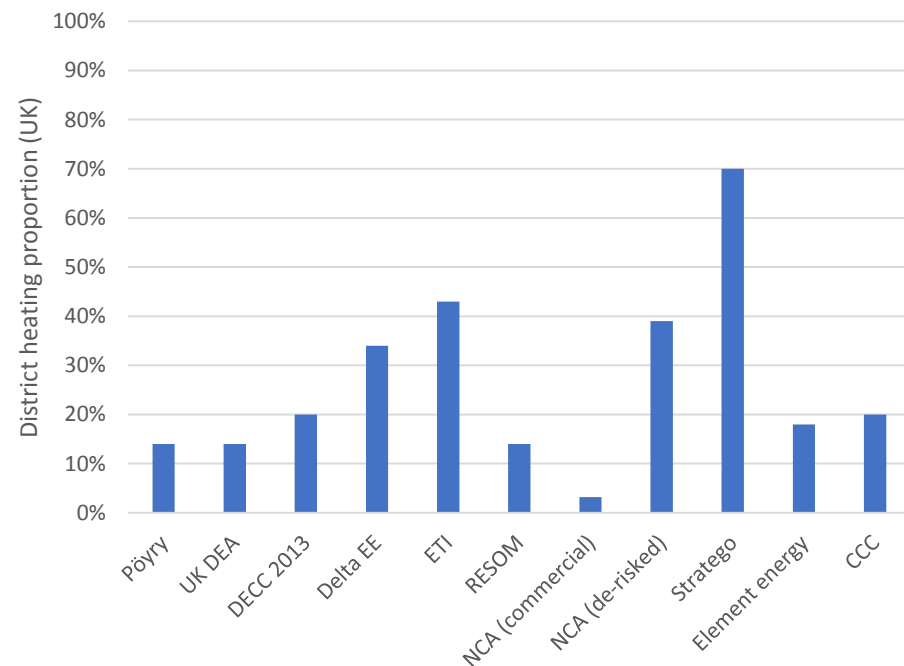
the early history of energy network development in the UK was characterised by fragmentation. [...] we have an important opportunity now to construct a planning and regulatory regime that ensures similar mistakes are avoided with district heating

Overview

- Identifying district heating areas
- Characteristics of domestic heat demand in district heating areas
- Relationship with fuel poverty
- Distribution over LA areas

What is the optimal level of district heating?

- Wide range of estimates for both the UK & Scotland
- Scottish policy references
 - 1.5TWh/year 2020 target (~3%)
 - 7% in 2025 (National Comprehensive Assessment)
 - 20% by 2050 (Committee on Climate Change)
- Other estimates are more optimistic
 - 45% in 2025 (NCA de-risk)
 - 70% in 2050 (UK – STRATEGO)



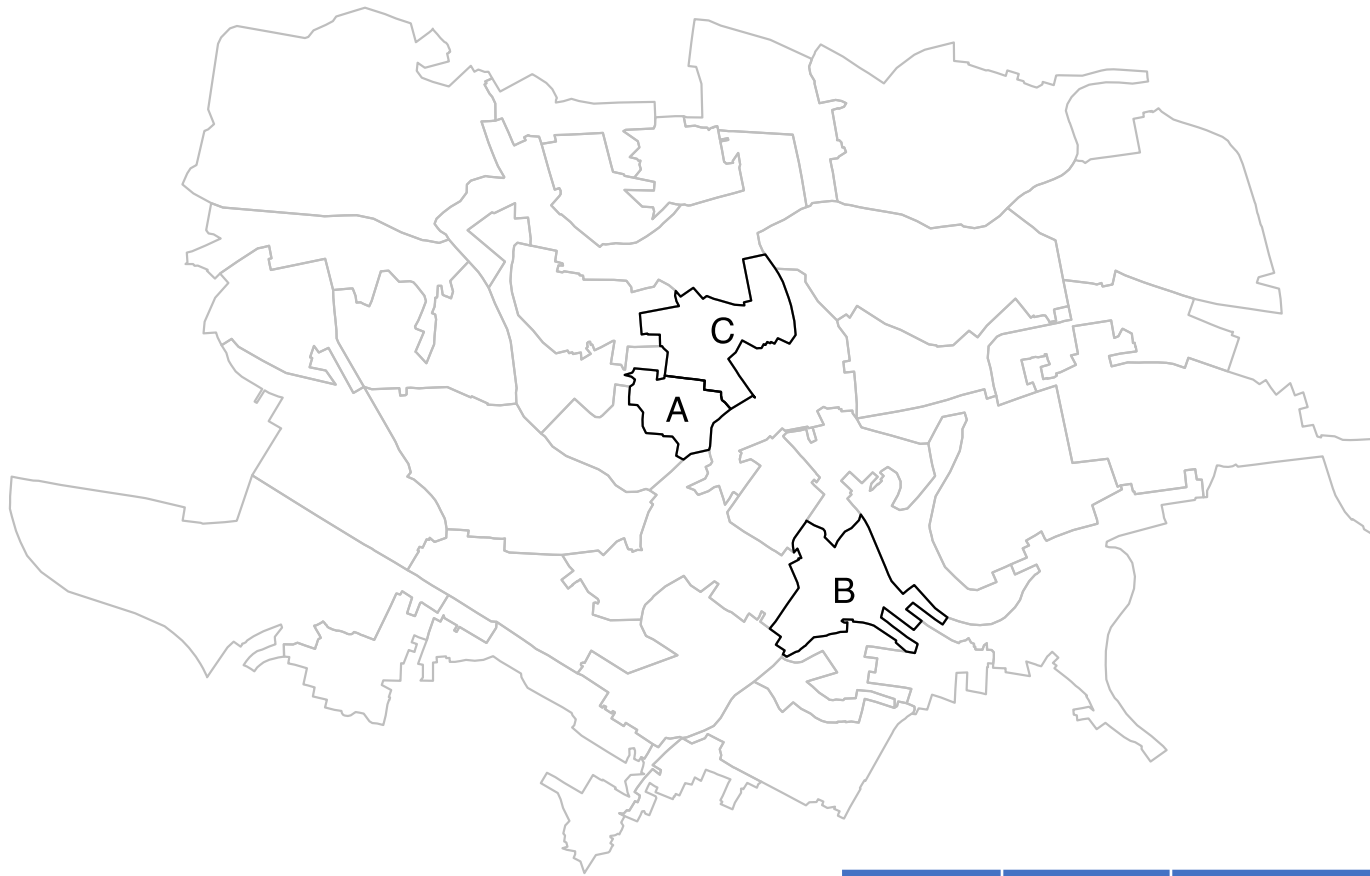
Very simple model

- Broad-brush characterisation of DH areas
- Would district heating be lower price to users than competing alternatives?
 - Assume district heating cost dominated by infrastructure costs
 - Assume these scale with heat density
 - Assume competing price is constant across different areas
 - In particular, independent of heat density
- Put data zones in order of infrastructure costs
- Examine distribution as competing cost rises

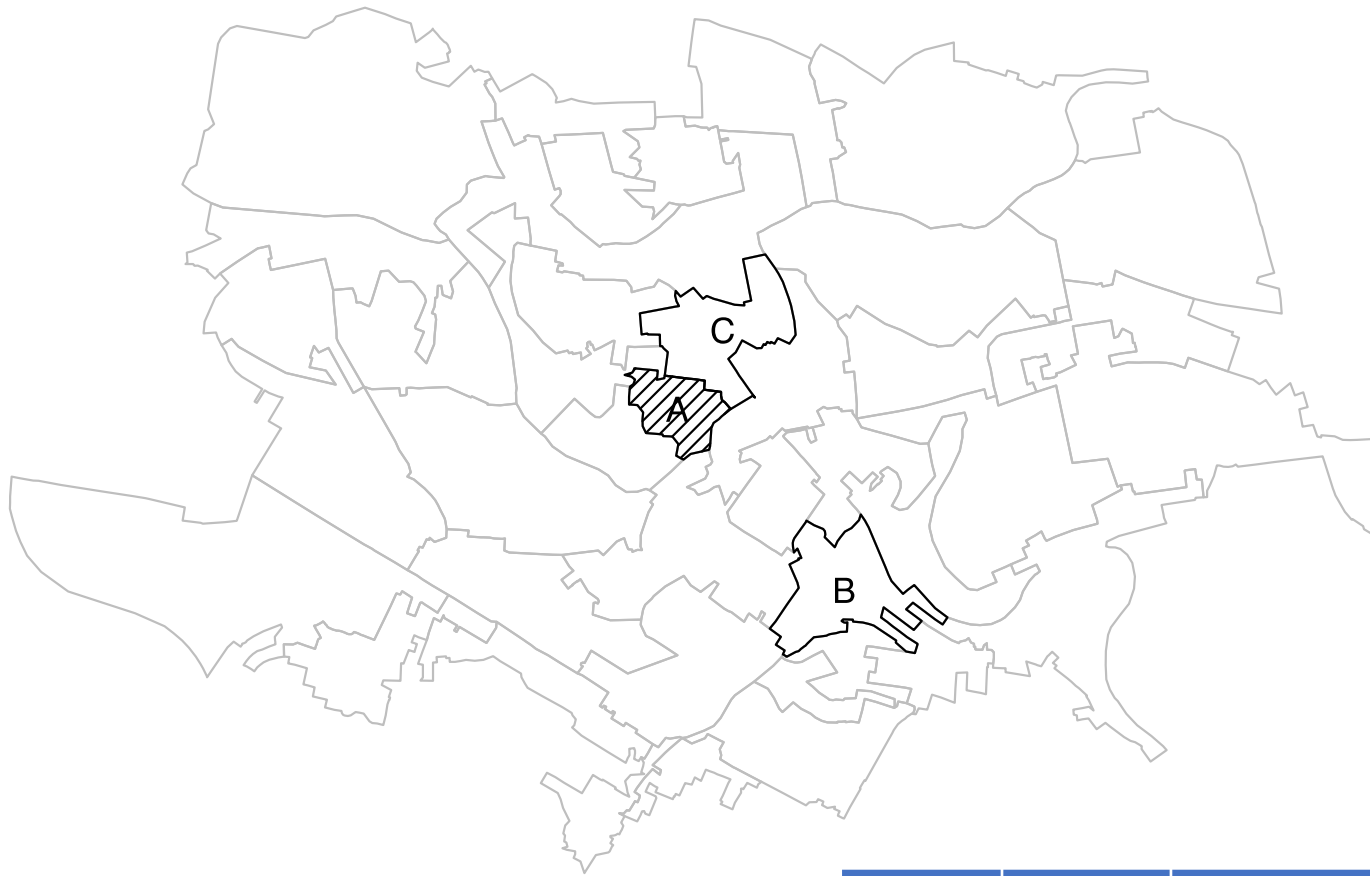
Aims of district heating regulation

- Move beyond piecemeal/fragmented development
- Avoid 'cherry picking'
- Mitigate risk
- Protect consumers
- Use surplus industrial heat

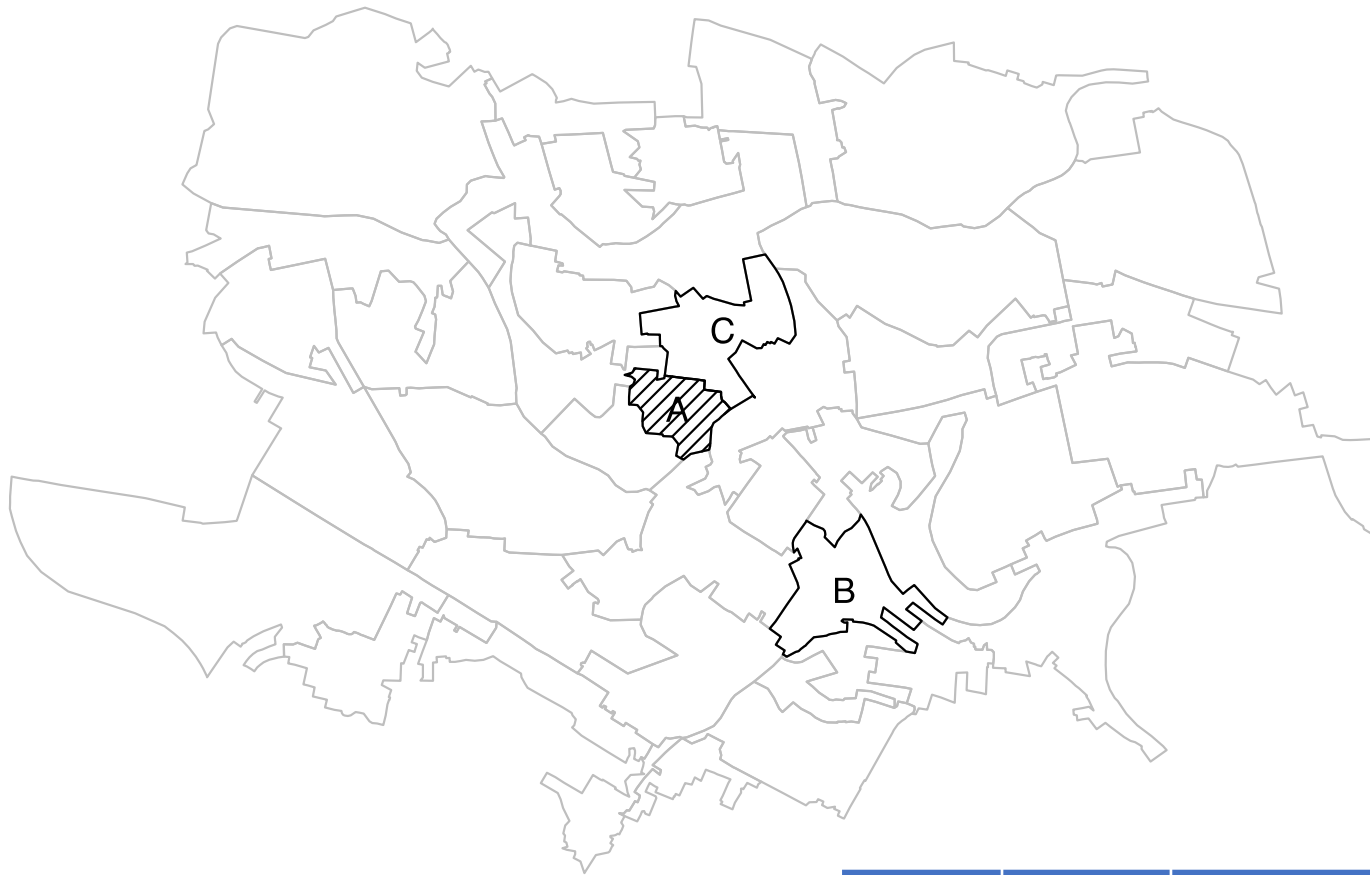




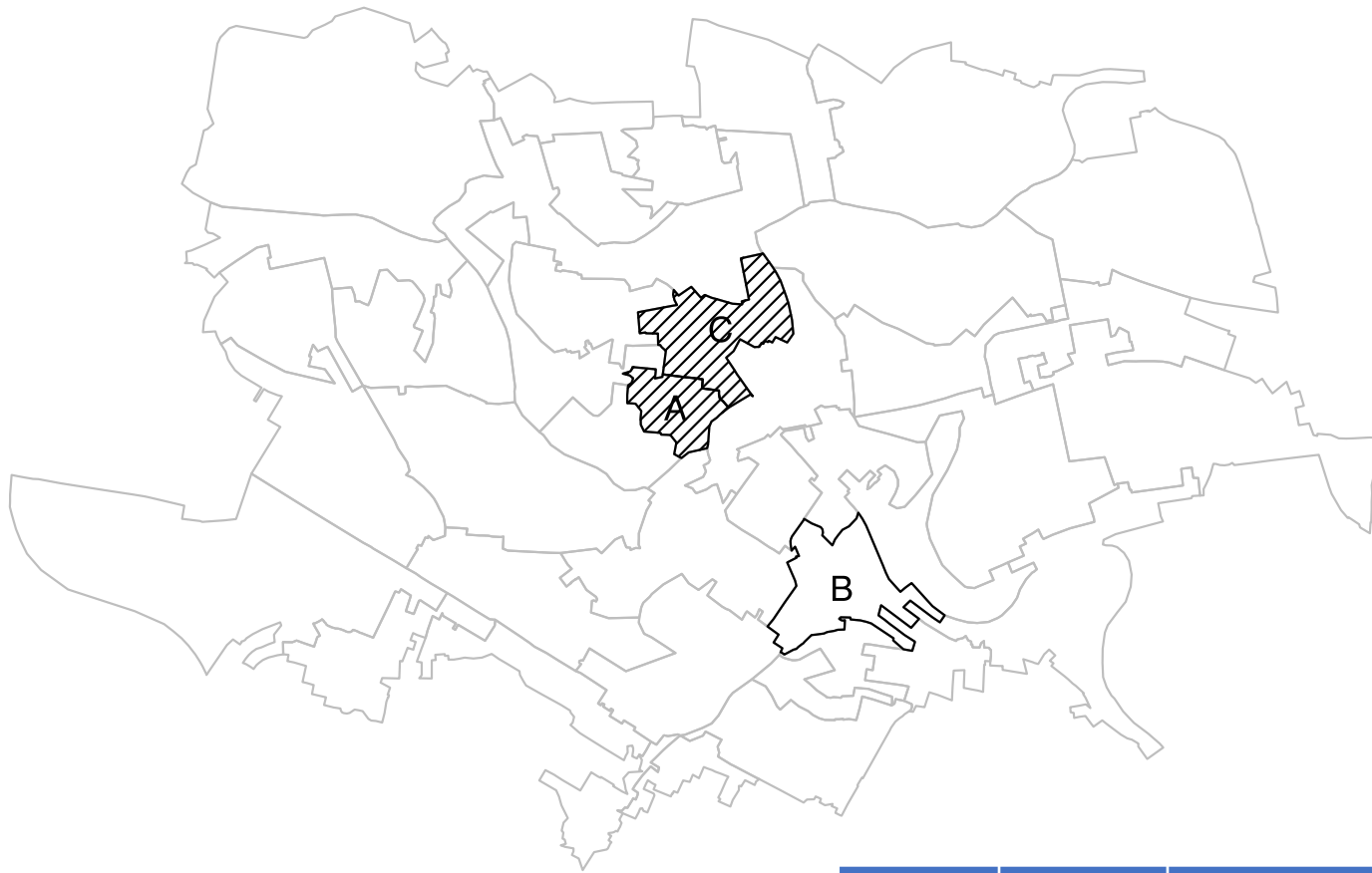
Zone	Area	Demand	Area/Demand
A	5.6	6.2	0.9
B	12.1	6.0	2.0
C	11.4	4.1	2.8



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Cluster density versus zone-internal density

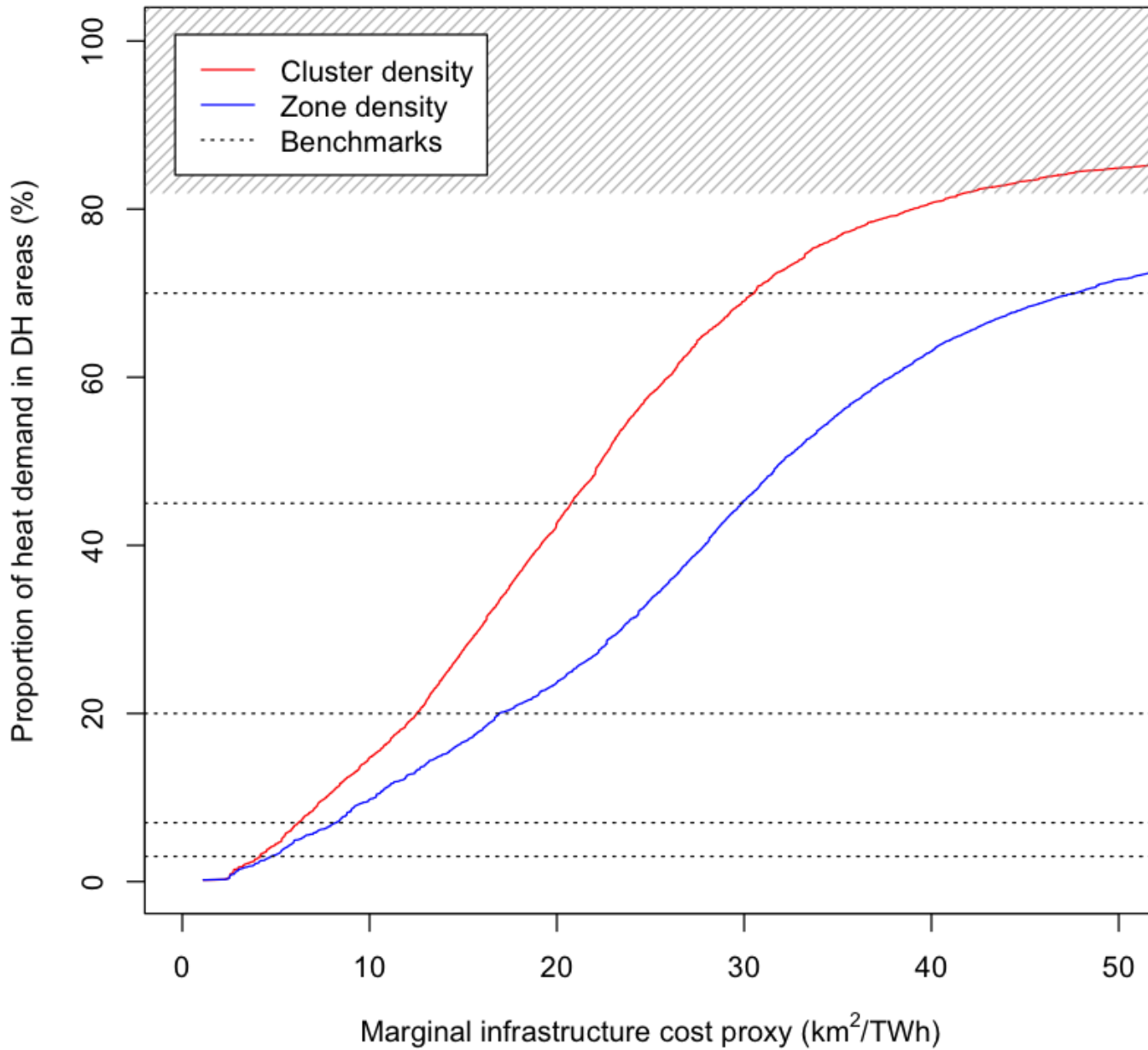
- **Cluster density**

- Increase supply while ensuring aggregate within cluster beats viability threshold
- Implies cross subsidisation

- **Internal density**

- Maximise surplus by only adding a zone if *that zone* beats viability threshold
- Simulates 'cherry picking'
- C.f. fragmented pattern of development to date

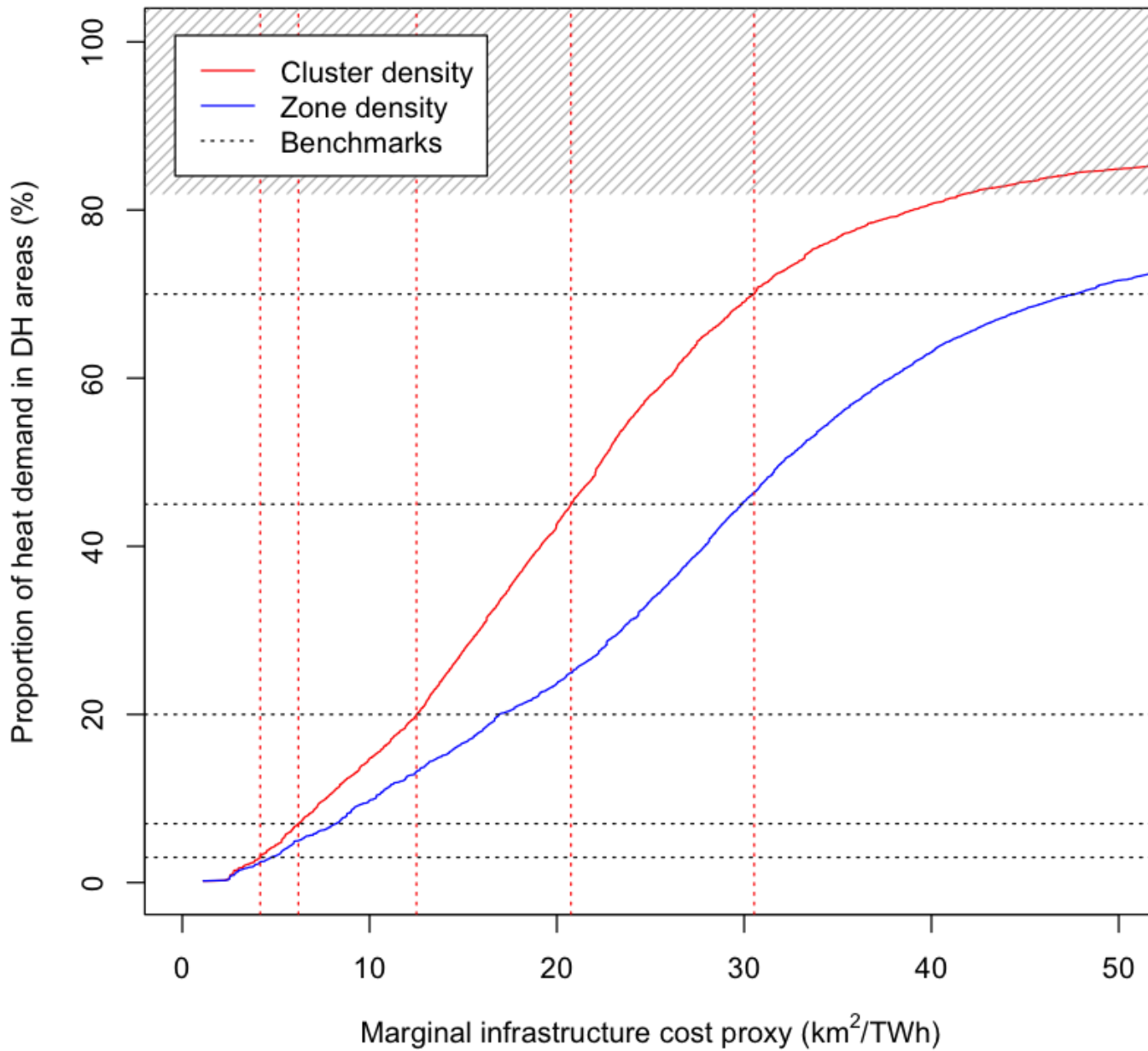
Cluster density vs zone-internal density



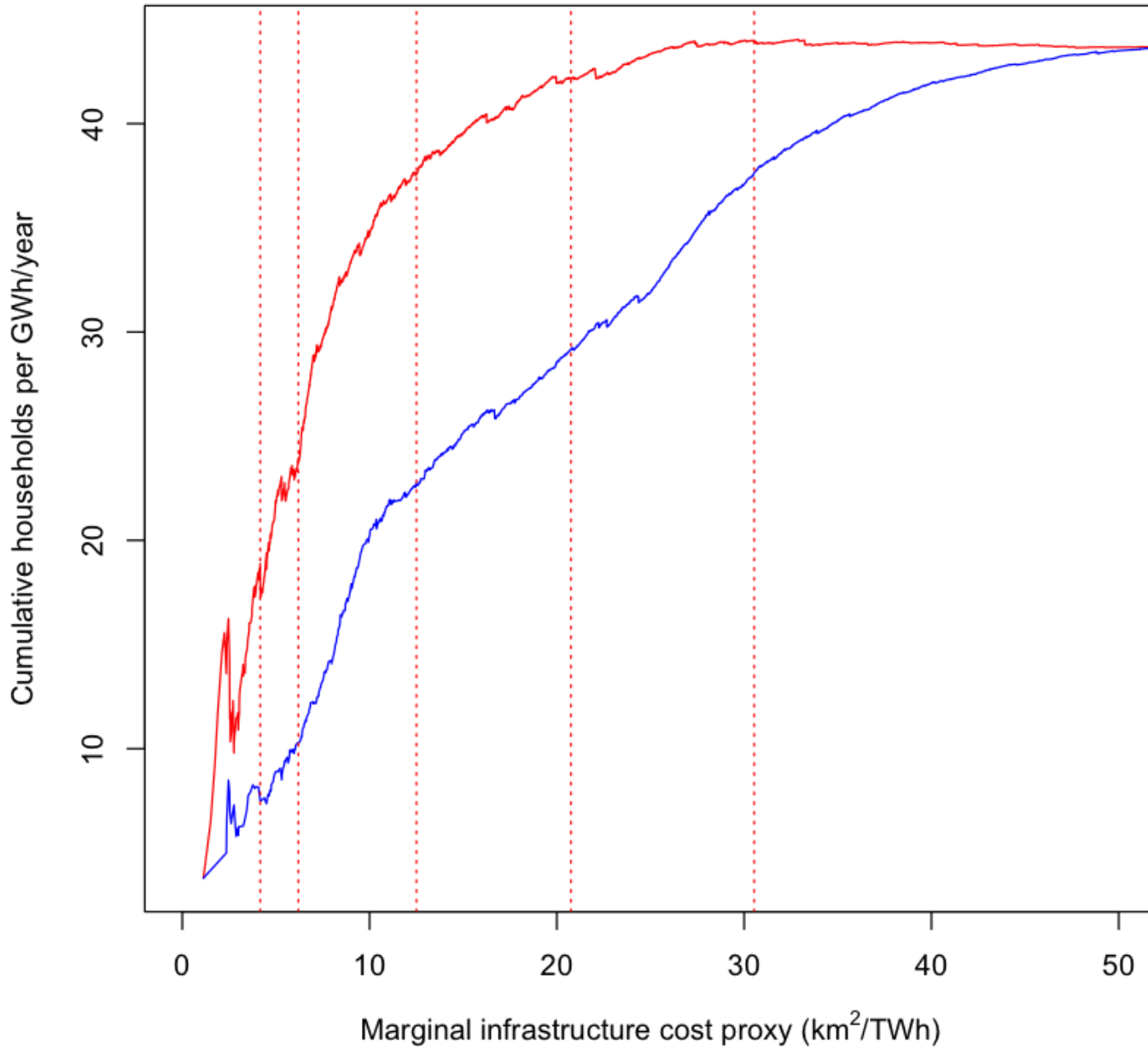
Findings

- Cluster model based on cross subsidy
 - Reaches around 50% more heat demand for a given price level

Cluster density vs zone-internal density



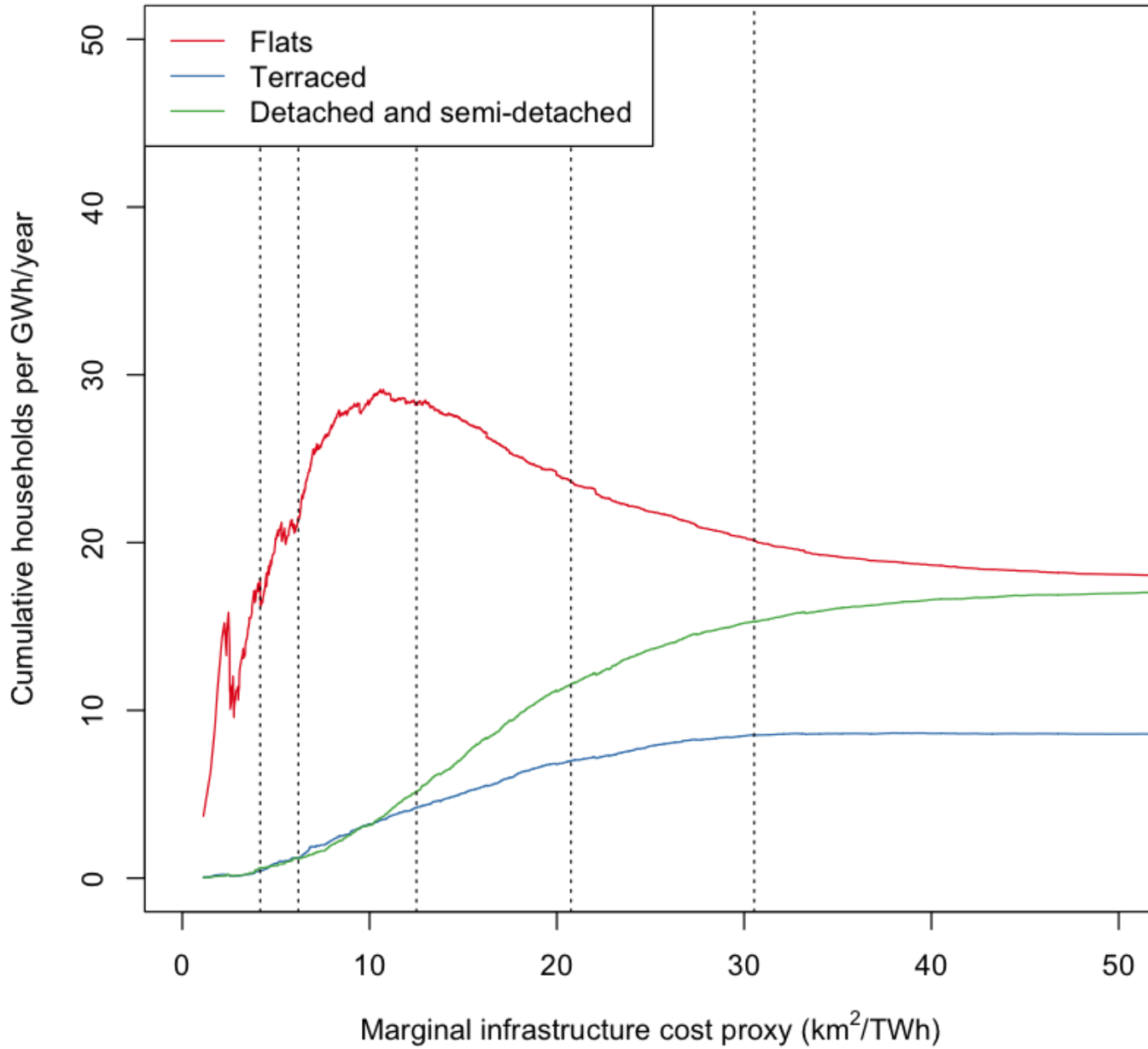
Heat demand diversity



Findings

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 - Reaches around 50% more heat demand for a given price level
 - Connects more households (demand diversity)

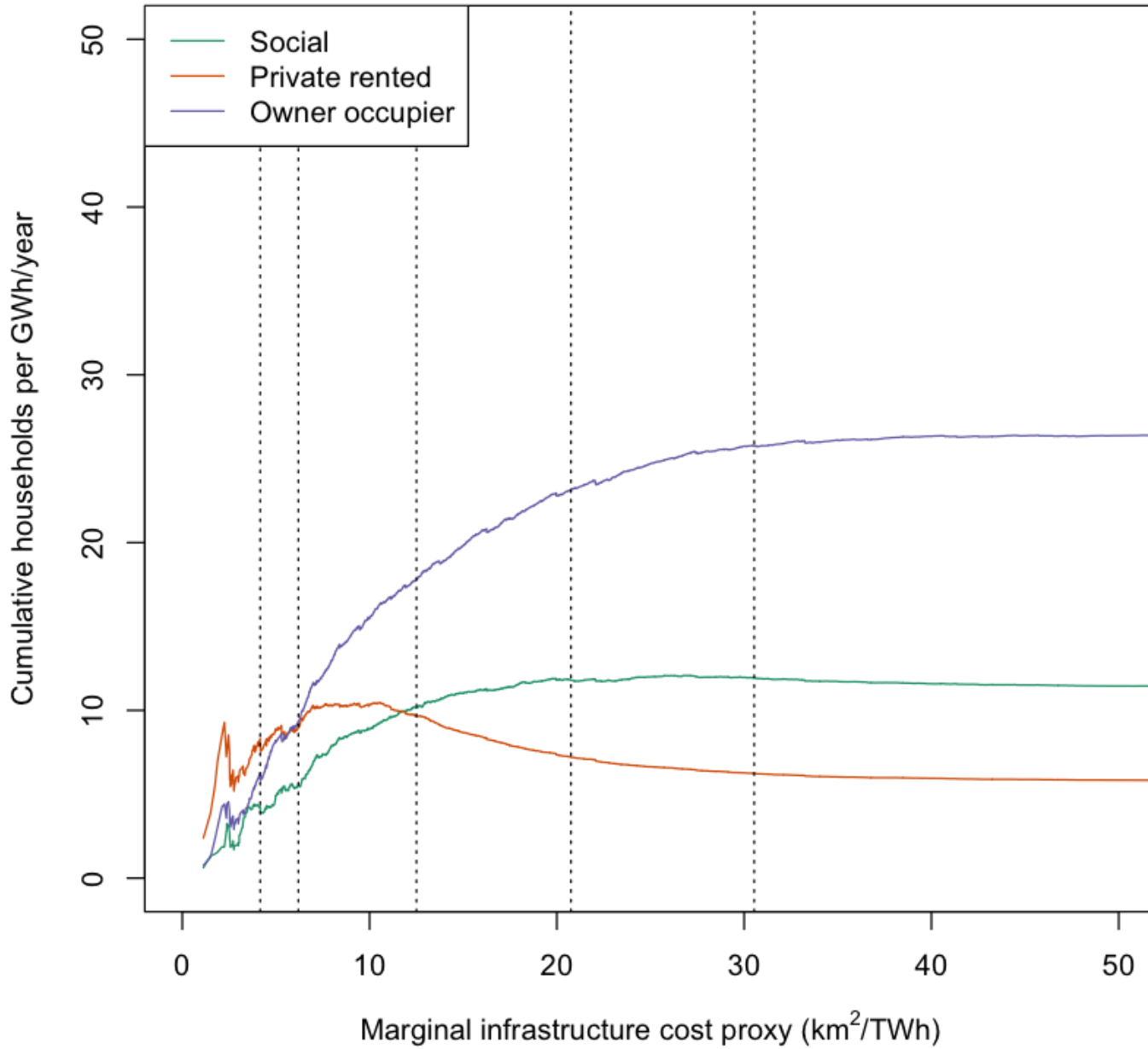
Dwelling type



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- At low DH penetrations high proportions of:
 - Flats

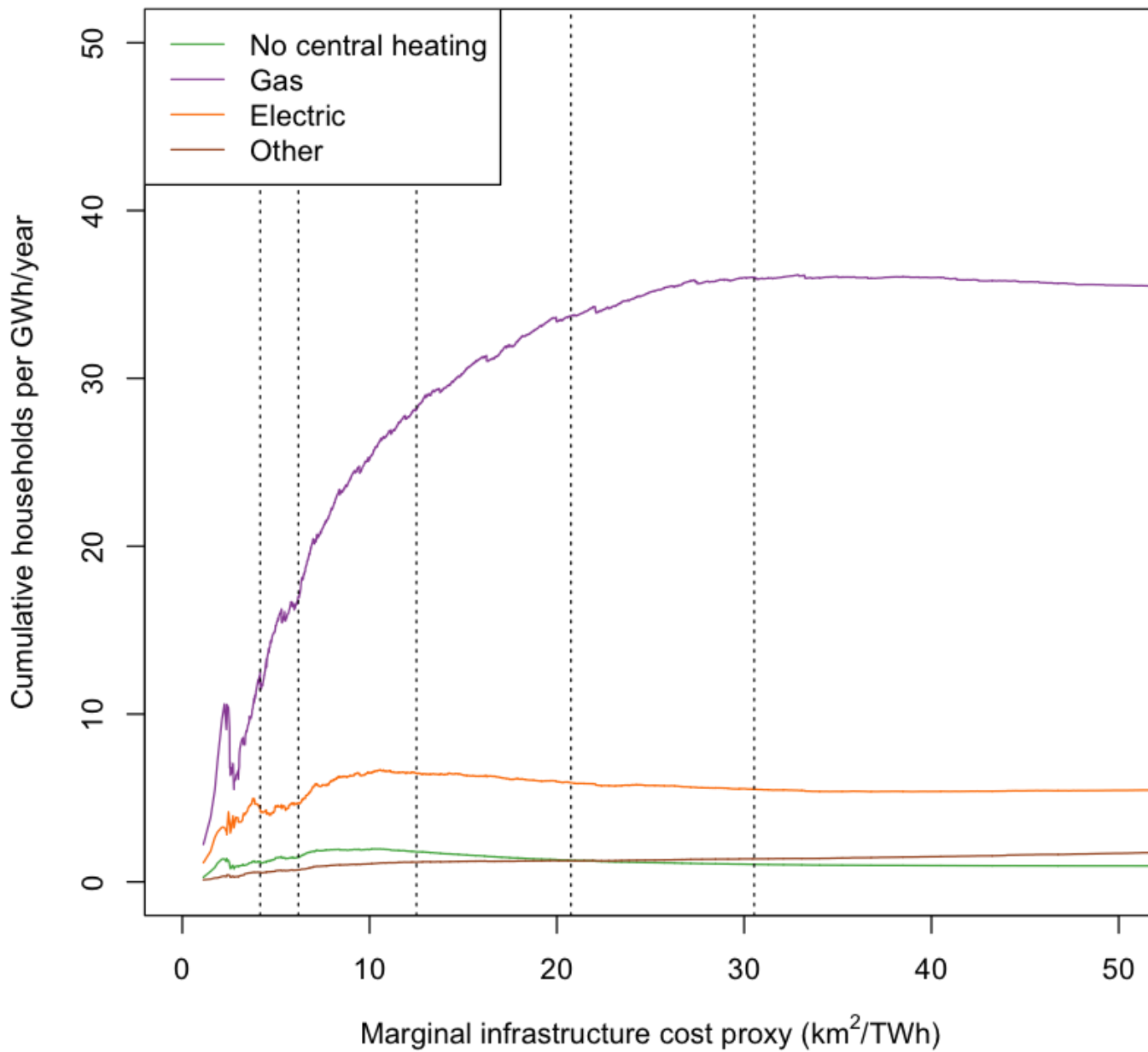
Tenure



Findings

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- At low DH penetrations high proportions of:
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 - Private rent / owner occupier

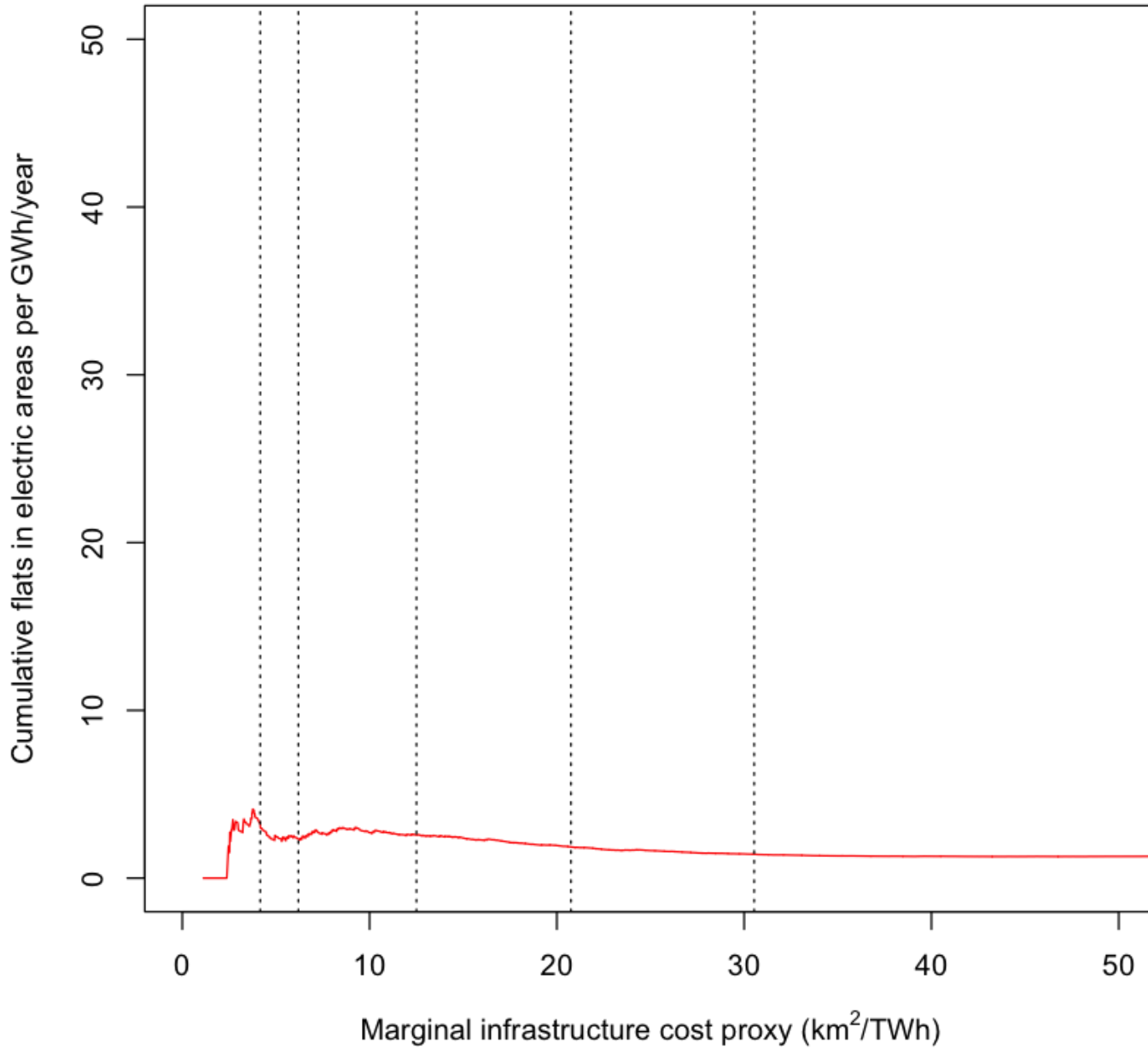
Current heating



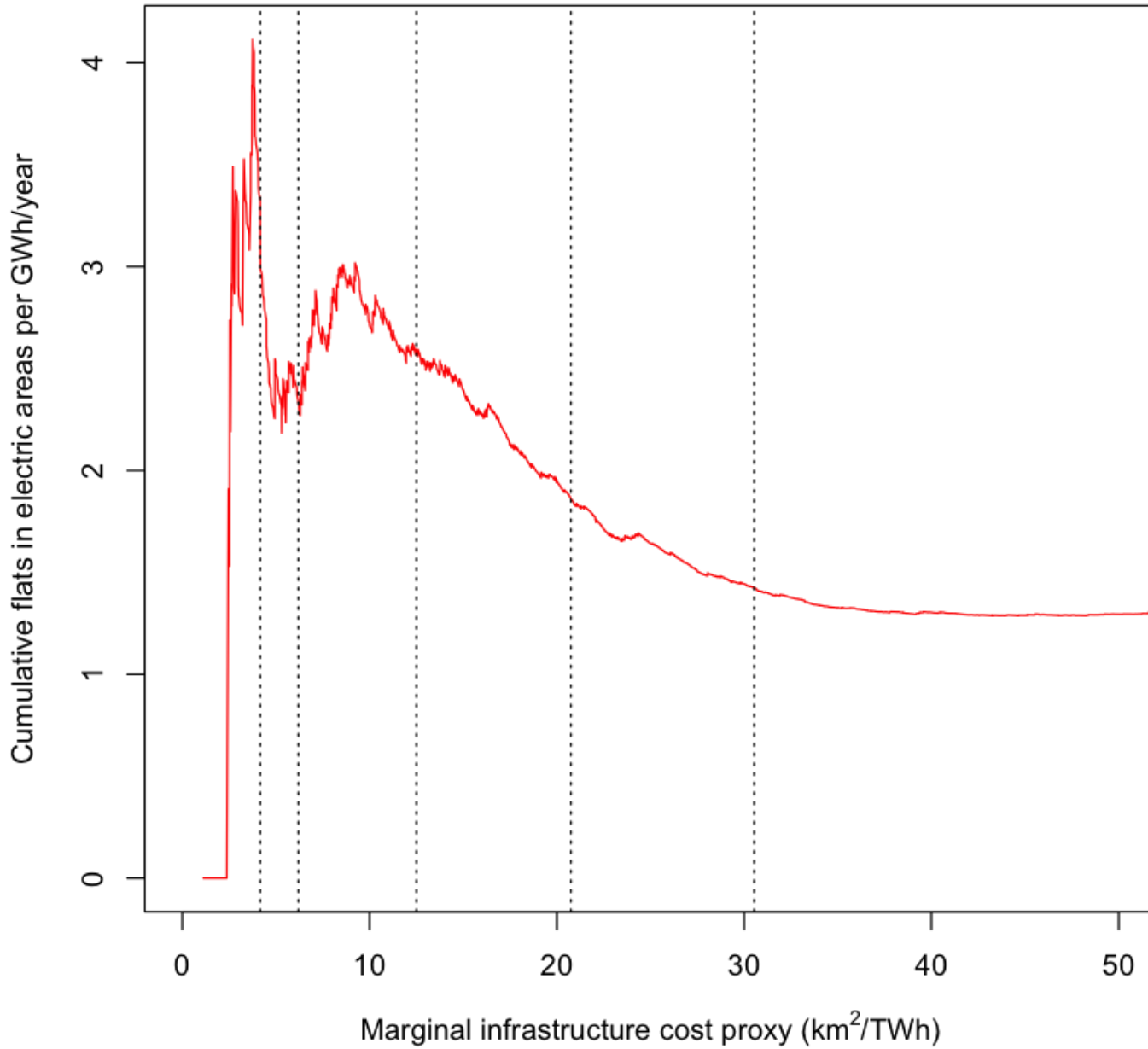
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- At low DH penetrations high proportions of:
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 - Gas central heating

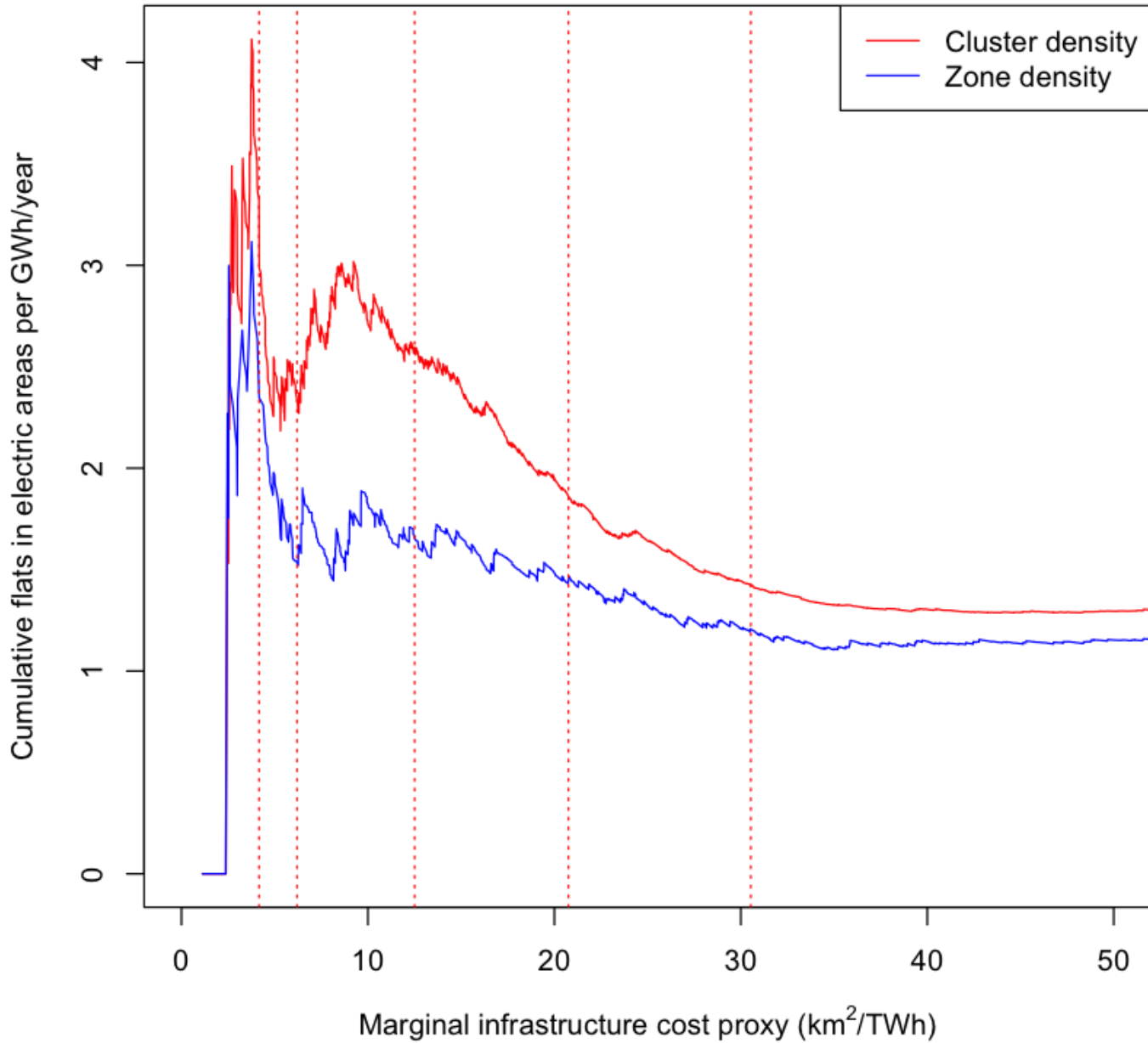
Electrically heated flats



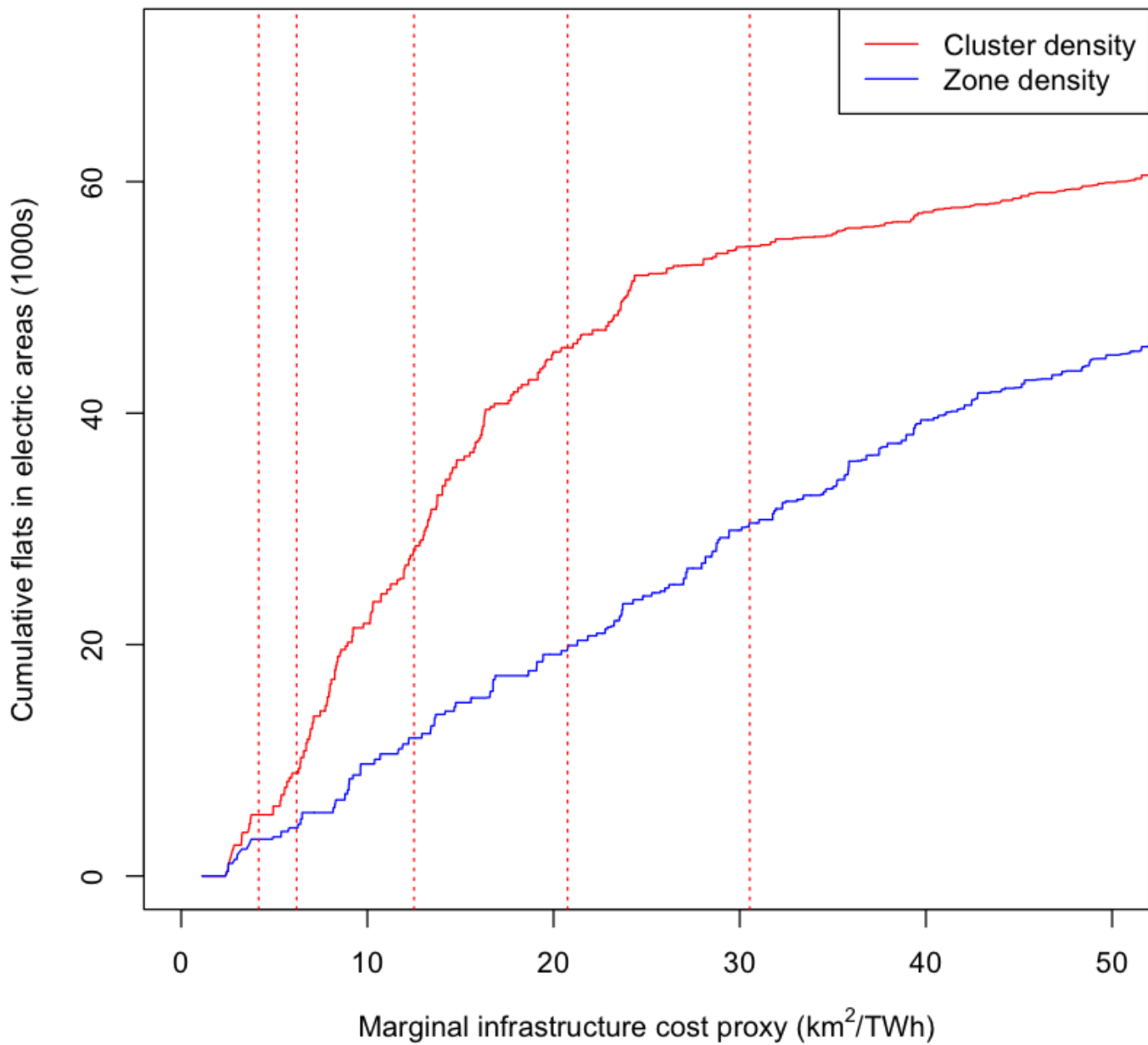
Electrically heated flats



Impact of clustering on electrically heated flats



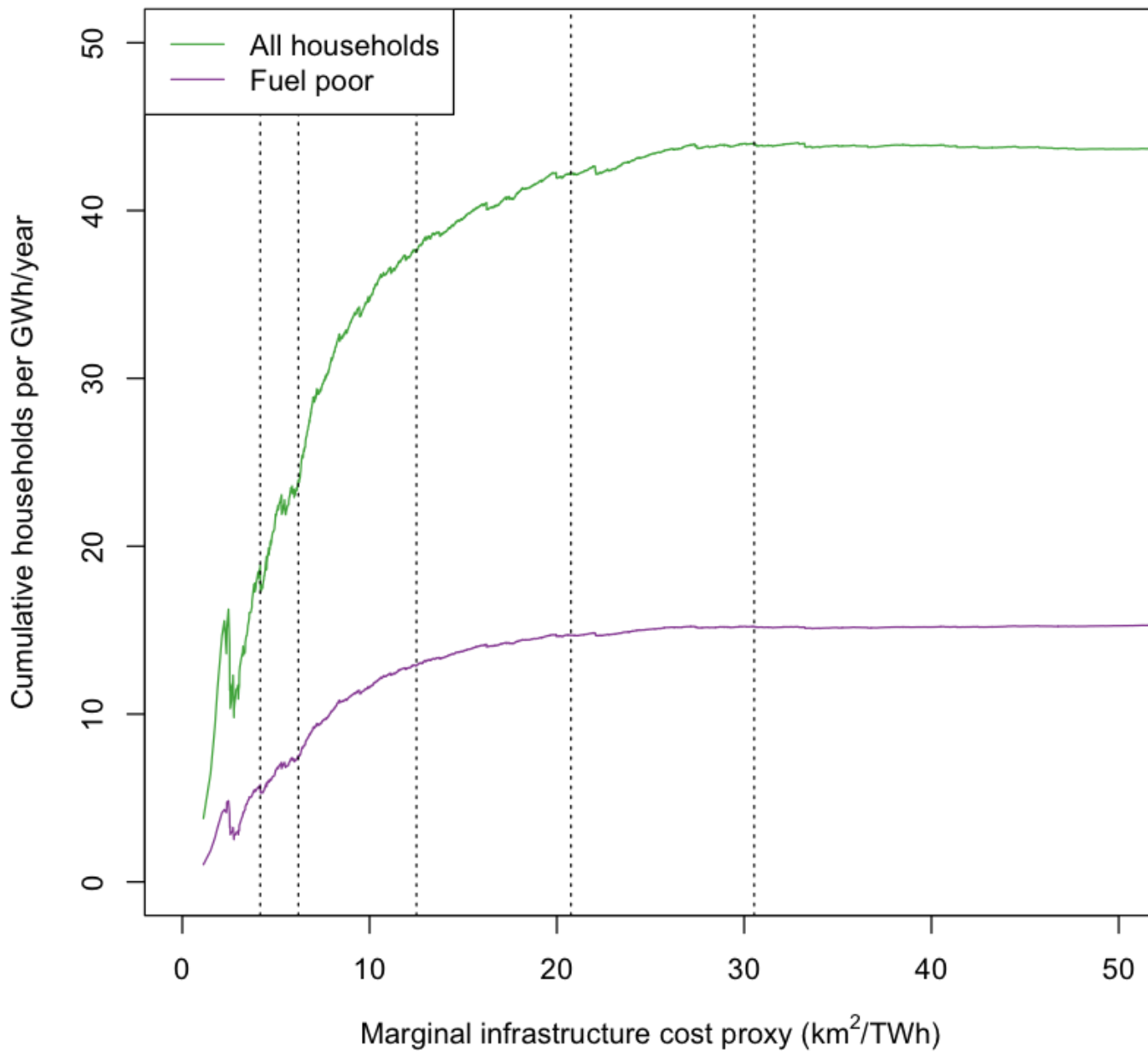
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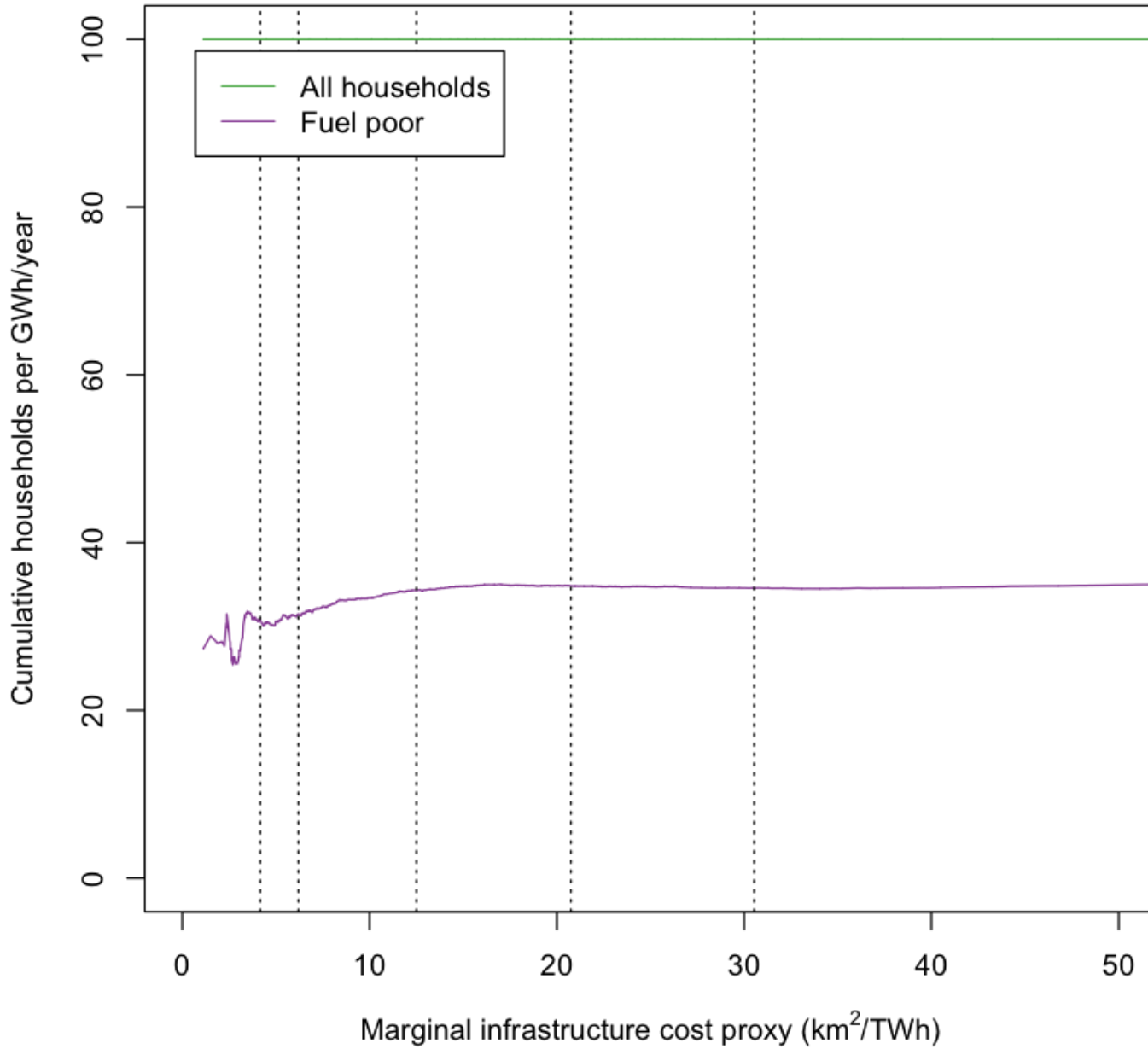
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 - Reaches around 50% more heat demand
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- At low DH penetrations high proportions of:
 - Flats
 - Private rent / owner occupier
 - Gas central heating
- Electric heating in flats is minor
 - Often located close to other heat dense areas

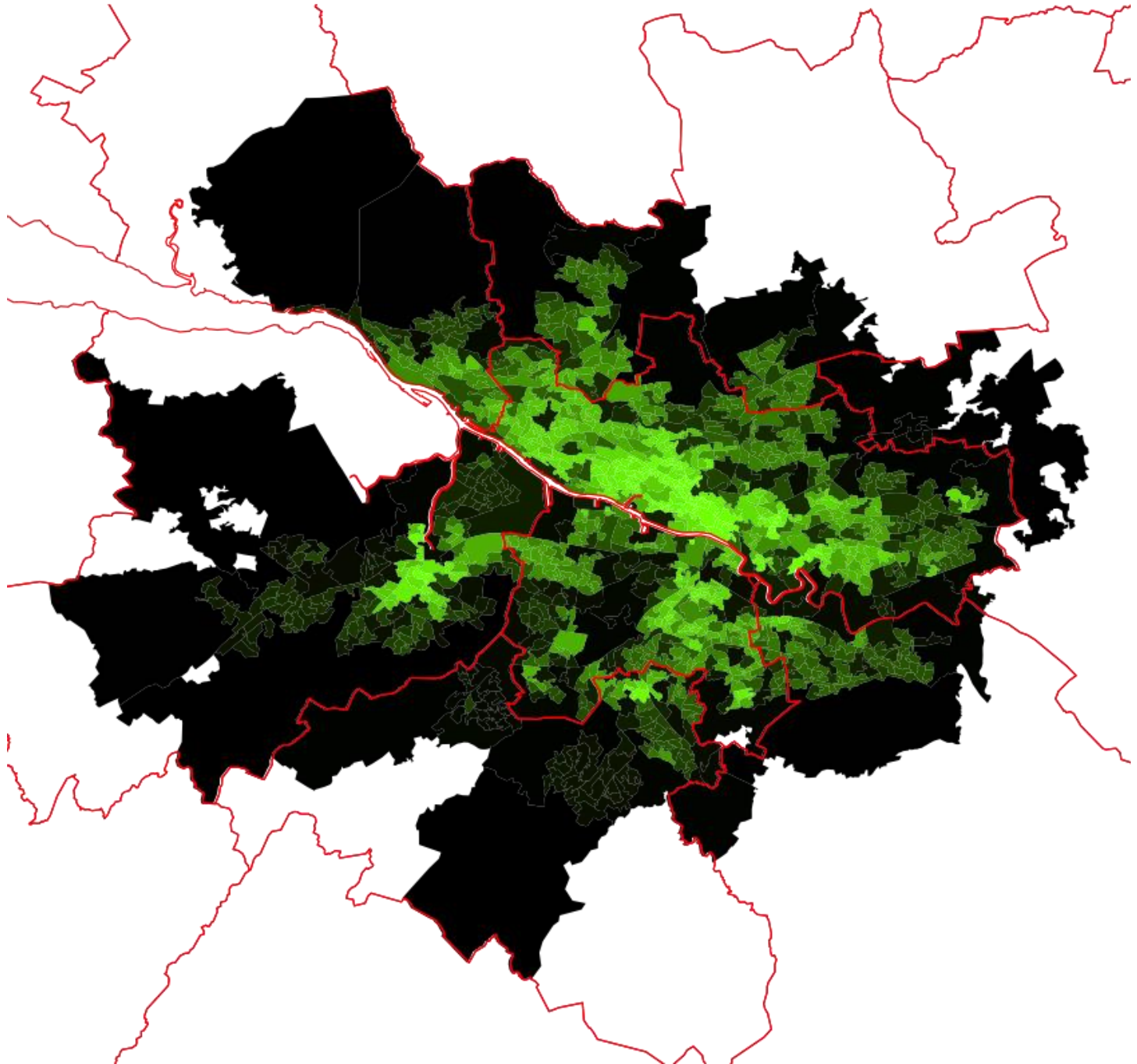
Fuel poverty



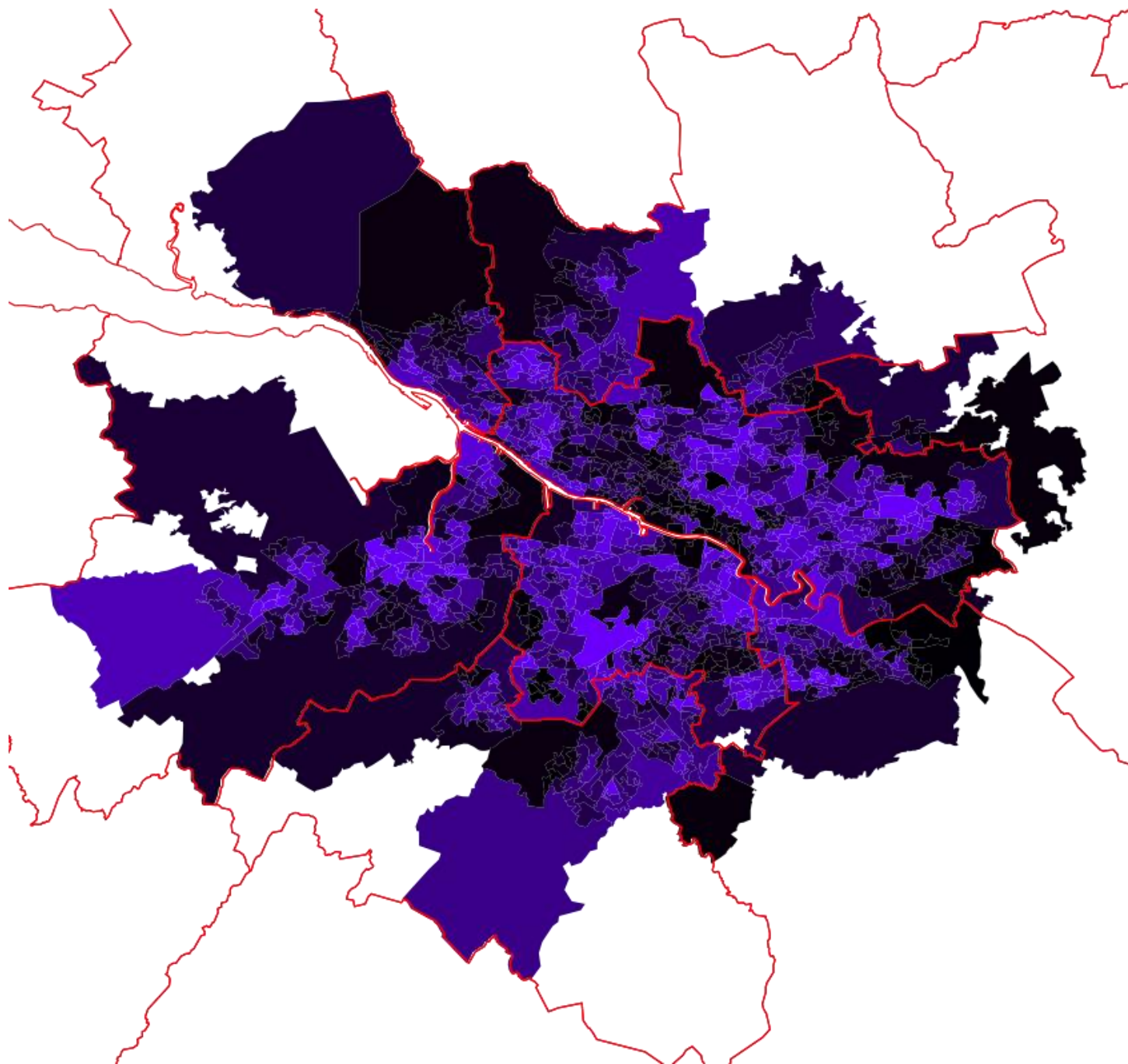
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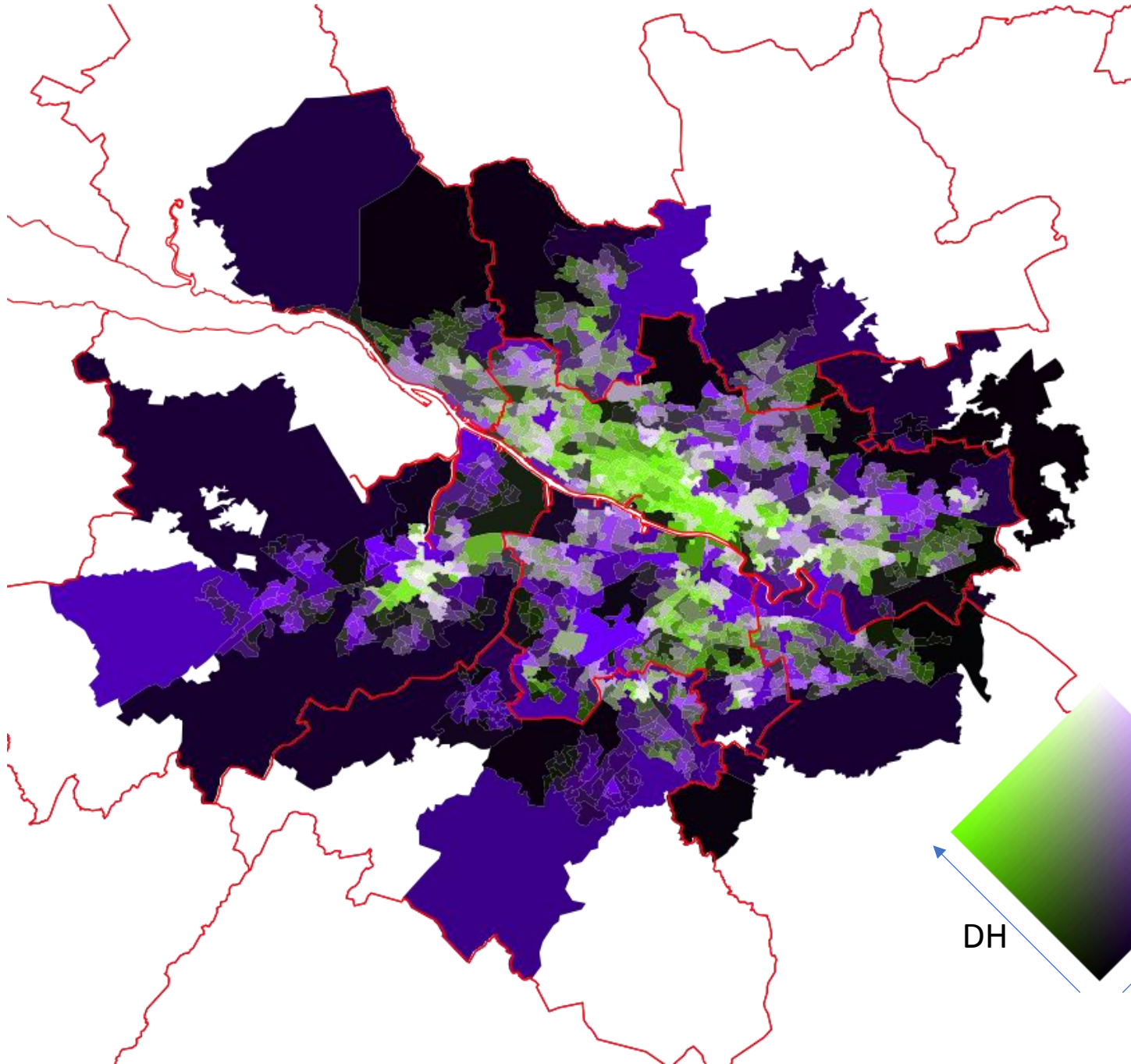
Heat



Fuel poverty



Overlap



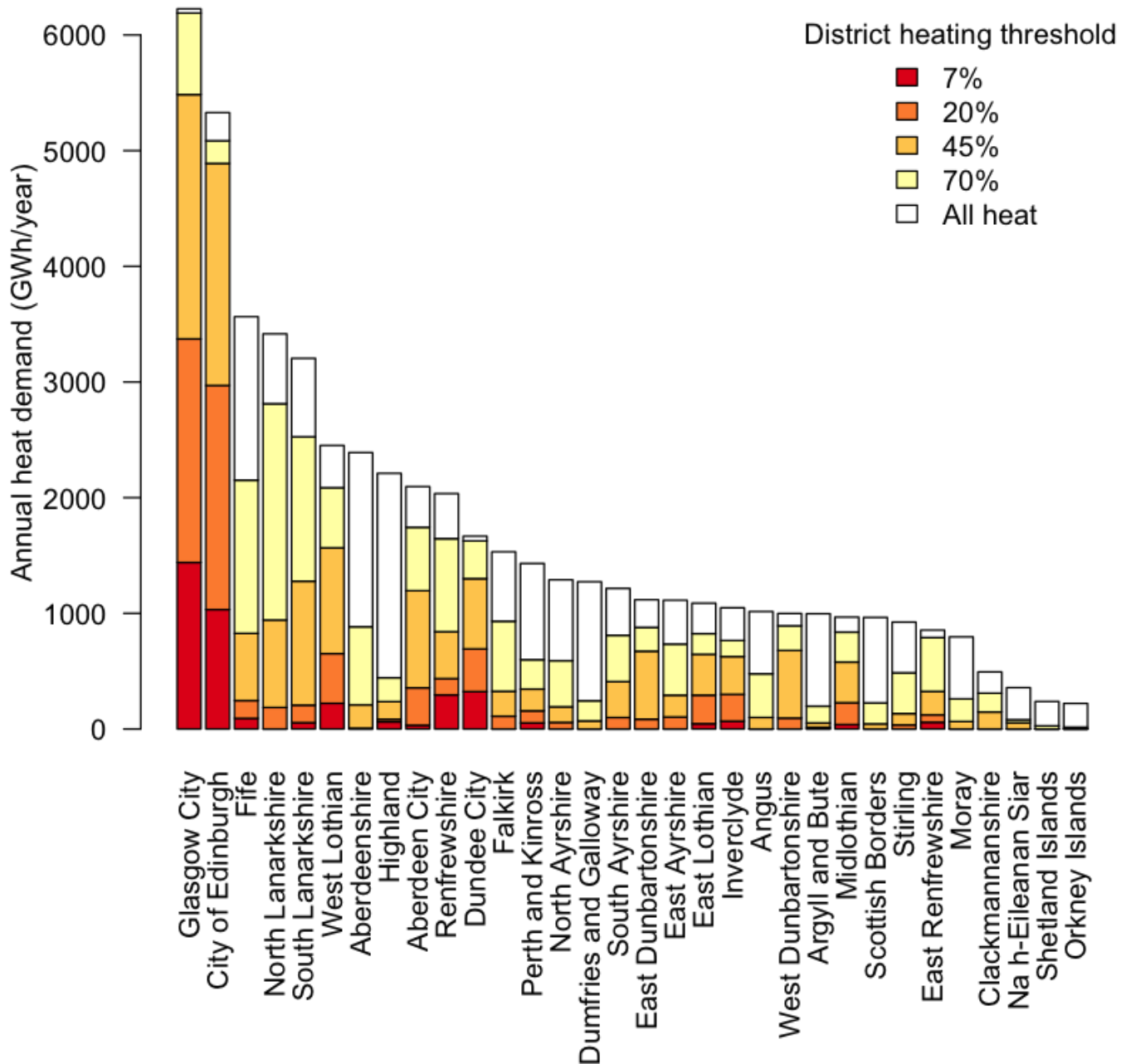
DH

FP

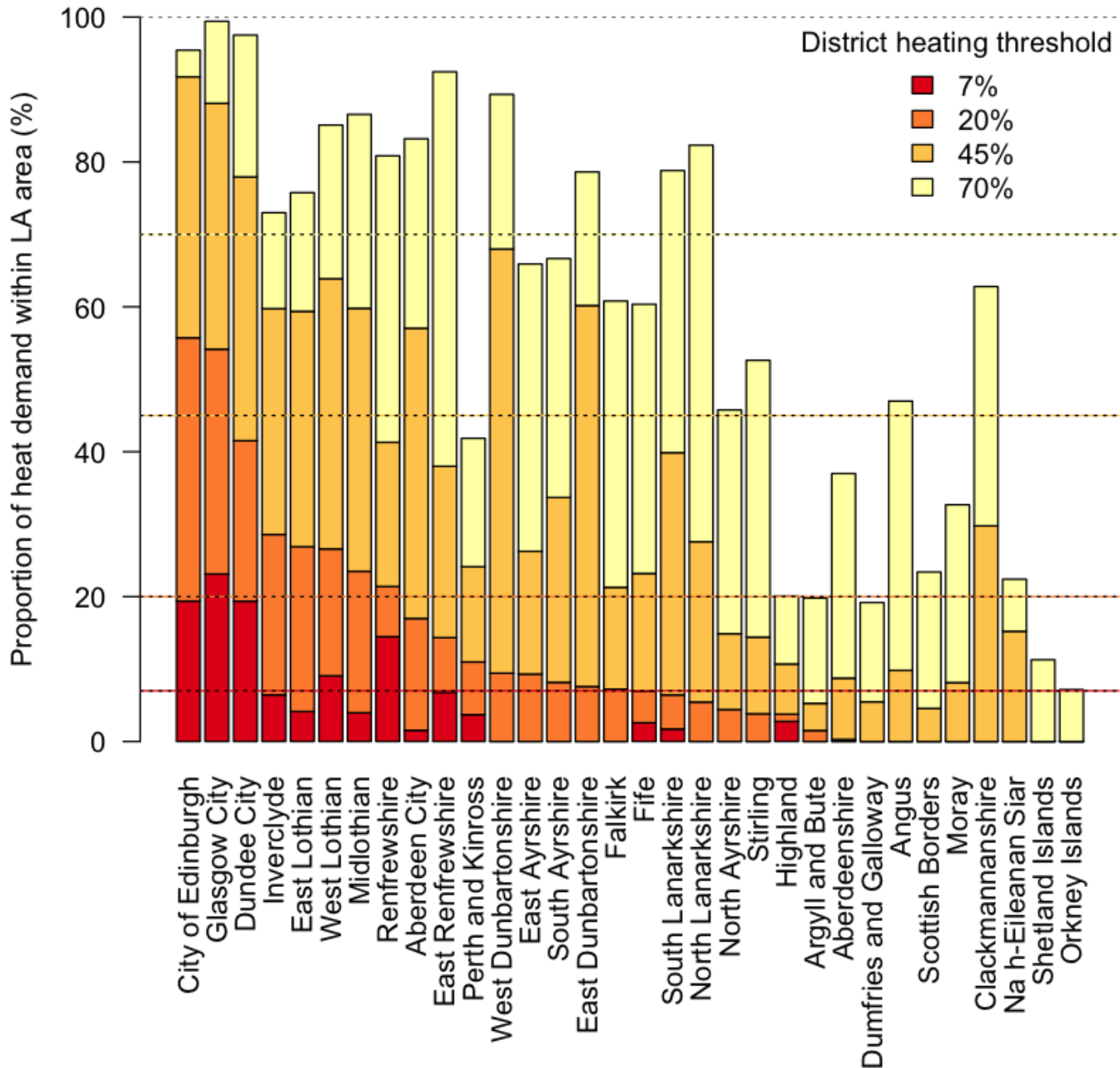
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- Electric heating in flats is minor
 - Often located in proximity to other heat dense areas
- Geographies of fuel poverty and district heating potential do not coincide

LA location of dense heat demand



LA location of dense heat demand – proprtion



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 - Gas central heating
- Electric heating in social housing flats is minor
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- Geographies of fuel poverty and district heating potential do not coincide
- **Wide variation in DH suitability across council areas**