

# Heat decarbonisation – No one size fits all?

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**Grid Edge Policy**

Regulation · Energy · Consumers

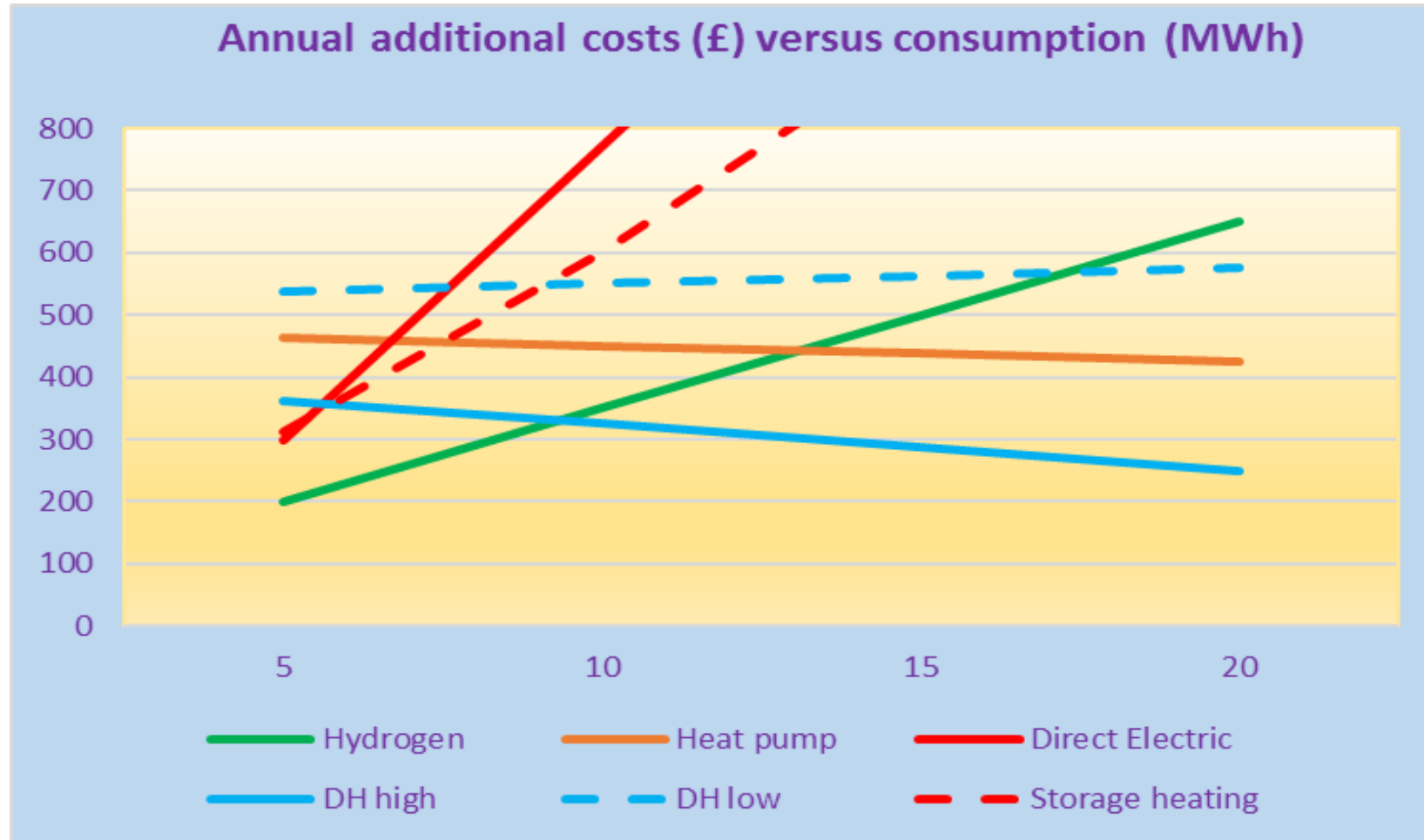
# Context

- Urgent need to de-carbonise heat
- Heat pumps technical efficiency => a key part of the solution

BUT

- Need to take account of:
  - Economics (cost structure)
  - Housing mix
  - People / behaviours
- Just transition - “No-one left behind”

# Report for NEA: Impacts of heat decarbonisation on fuel poverty (2017)



# Significant variations in gas usage (KWh pa)

	<b>Detached</b>	<b>Semi detached</b>	<b>End terrace</b>	<b>Mid terrace</b>	<b>Bungalow</b>	<b>Converted flat</b>	<b>Purpose built flat</b>
<b>Pre 1919</b>	23,000	17,400	14,700	12,100	14,700	9,400	9,400
<b>1919-44</b>	22,400	14,500	12,900	11,300	14,700	8,400	8,500
<b>1945-64</b>	19,500	12,800	11,500	10,800	12,900	8,100	7,500
<b>1965-82</b>	16,500	12,100	10,900	9,700	11,800	7,100	6,500
<b>1983-92</b>	15,400	9,700	8,900	7,900	11,100	6,900	5,800
<b>1993-99</b>	15,300	9,500	9,300	8,300	10,900	6,600	6,000
<b>Post 1999</b>	15,000	9,600	9,700	9,300	10,300	6,500	5,600

Source: BEIS NEED data

# SSEN: Electric Heat Pathways – Beyond Heat Pumps



Smart Electric storage heating – the Cinderella solution

# We don't all live in 3 bed semis

- Size and energy efficiency matter in terms of relative cost
- Size matters in terms of space for heat pump

20% of homes in England are flats - 36% in Scotland

- 9.5% of homes in England are less than 50m<sup>2</sup>
- In England over 30% of households in the bottom income quintile live in 1-bedroom properties
- Tenure matters – is a communal heating system viable?
- Lifestyle and behaviour matter too

# Flexibility increasingly important

- Electrification (heat pump) pathways all assume significant levels of thermal storage
- Assumed to be through (large) hot water tanks / buffer tanks
- In 1996 88% of homes had hot water tanks down to 46% in 2016
- Driven by move to combi-boilers and desire for more storage space
- Innovation in thermal storage could help
- Energy efficiency of building also crucial (ability to pre-heat)
- NB: smart electric storage heaters designed for flexibility!

# Sustainability First PIAG Project on use of smart meter data for the public interest

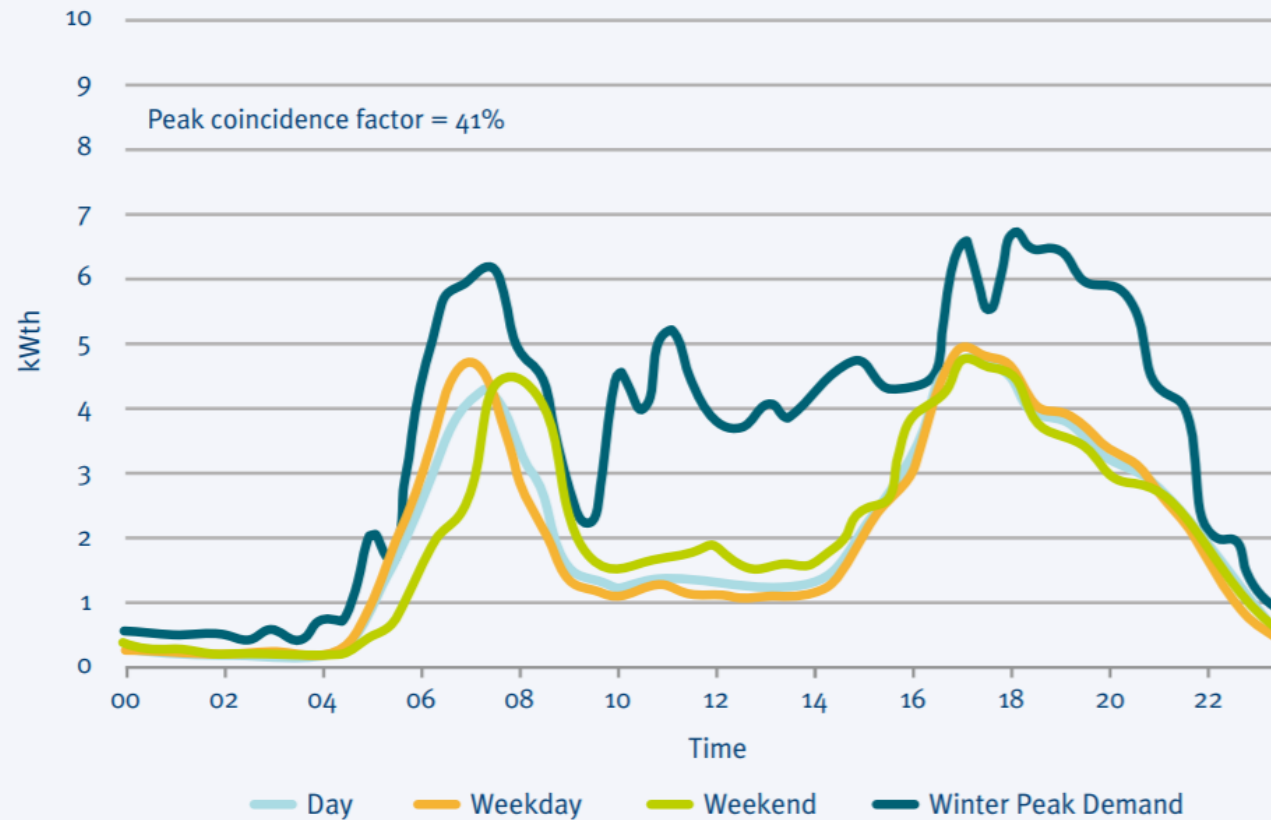
- Lack of understanding around heat usage
  - User behaviour - modelled v actual energy consumption
  - What is gas used for? – 23% hot water ??
  - What is the actual energy consumption of homes with heat pumps?
- Important to inform policy decisions
- Also important for delivery – customer confidence and network planning



# Developing insights around heat usage – user behaviour

- Household preferences: Steady temperature or peaky demand? – what determines preferences (eg age & number in household; out-all-day vs at home; ?)
  - may affect acceptability of different heat solutions
  - may affect how then use new replacement heating system
  - implications for grid and flexibility
- Are desired comfort levels currently being reached? Is hot water being over-provided?
- How do heat behaviours vary by region ~ climatic differences
- Heat usage on coldest day? Snow effect?

**FIGURE 4: DAILY HEAT DEMAND FOR GAS CONDENSING BOILER - DATA FROM 19 UK HOMES 2006/7 (SOURCE: SANSOM 2014)**



Source: Smart and Flexible Heat: R. Carmichael et al (2020)

# Developing insights around heat usage – electrically heated homes

- How much electricity do **heat pumps** use in practice (and when)?
  - Are GB homes with heat pumps using them in the way they are designed / expected to be used?
  - How does this vary with external temperature?
  - What flexibility could they provide?
- When do **hybrid heat pumps** use gas v electricity? What implications does that have for the energy system?
- What role is there for **smart electric storage heating**?
  - What flexibility could it provide?
  - Use in small energy efficient homes?

# Reflections

- Need to keep learning and collecting / sharing data – learn by doing (not “sit tight and analyse”)
- Need to be honest about strengths and weaknesses of heat pumps:
  - Where further innovation is still needed on heat pumps
  - What advice to give to households on options and usage
- Need to keep innovating and don't rule out other solutions for particular property types:
  - Smart electric storage heaters, infra red heat, thermal batteries..?
- Need to prioritise finding solutions for those struggling most with current energy prices

# Report links

- NEA Report:

<https://www.nea.org.uk/wp-content/uploads/2020/11/Heat-Decarbonisation-Report-2017.pdf>

- SSEN report on smart electric storage heating:
- Email [maxine.frerk@gridedgepolicy.com](mailto:maxine.frerk@gridedgepolicy.com)
- PIAG website - <https://www.smartenergydatapiag.org.uk/>
- PIAG heat paper - [here](#)