



Too Hot to Handle?

How to decarbonise domestic heating

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Context

- £32 billion pa spent on heat
- 48% total energy use
- 1/3 GHG emissions
- Gas heating in 23m homes

Figure 1.1: Energy consumption by end use and sector, 2013¹¹

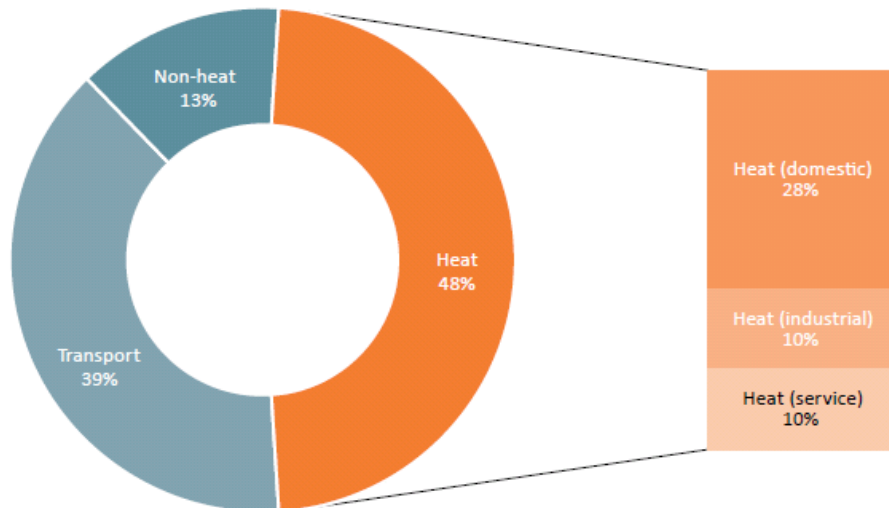
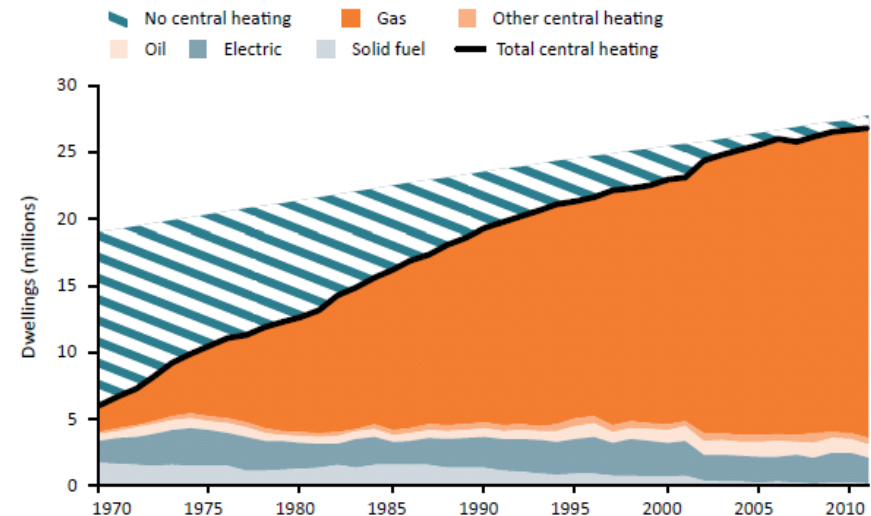


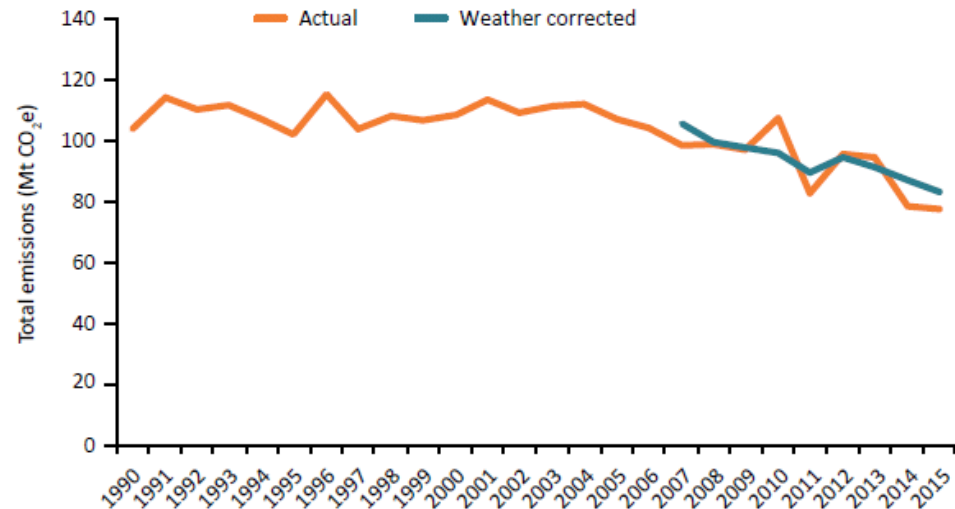
Figure 1.3: Installed central heating by type, 1970–2012



Context

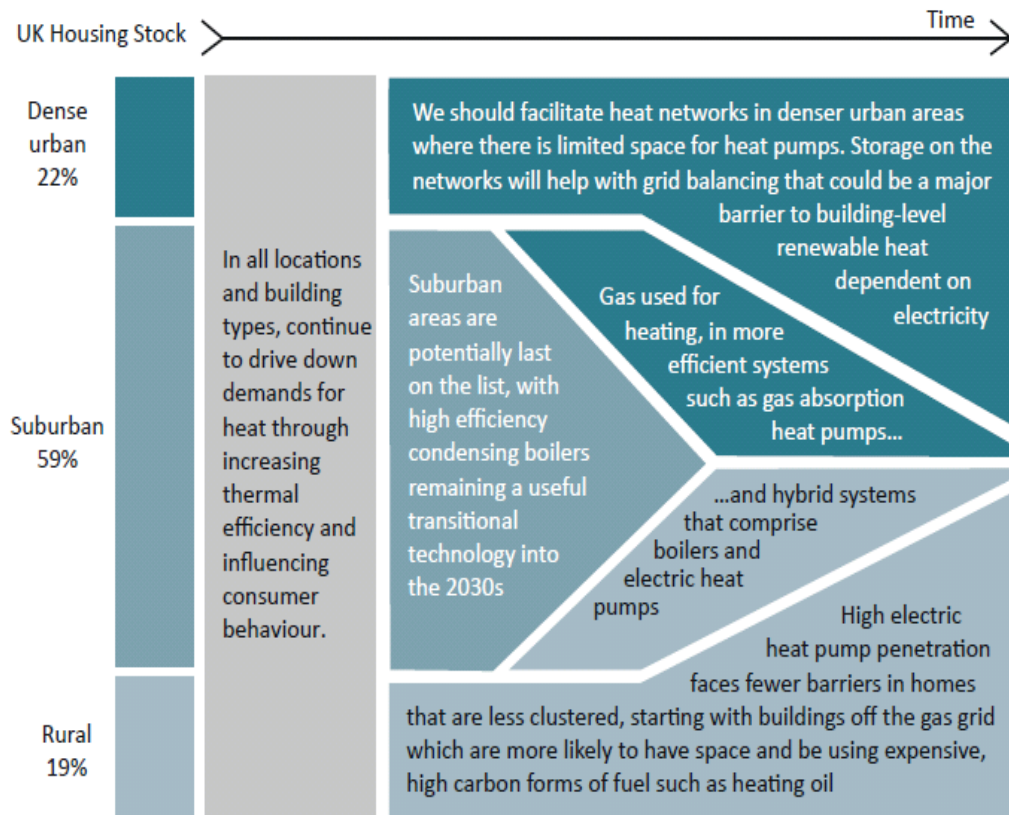
- ↓25% domestic heat emissions 1990-2015 (↓20% weather corrected)
- ↑ # households
- ↓ heat / household
- ↓ carbon intensity of heating fuels

Figure 1.7: Change in emissions from domestic heating (including cooking), 1990–2015



DECC Roadmaps (2012/13)

Figure 2.2: 2013 DECC Heat Strategy⁶⁷

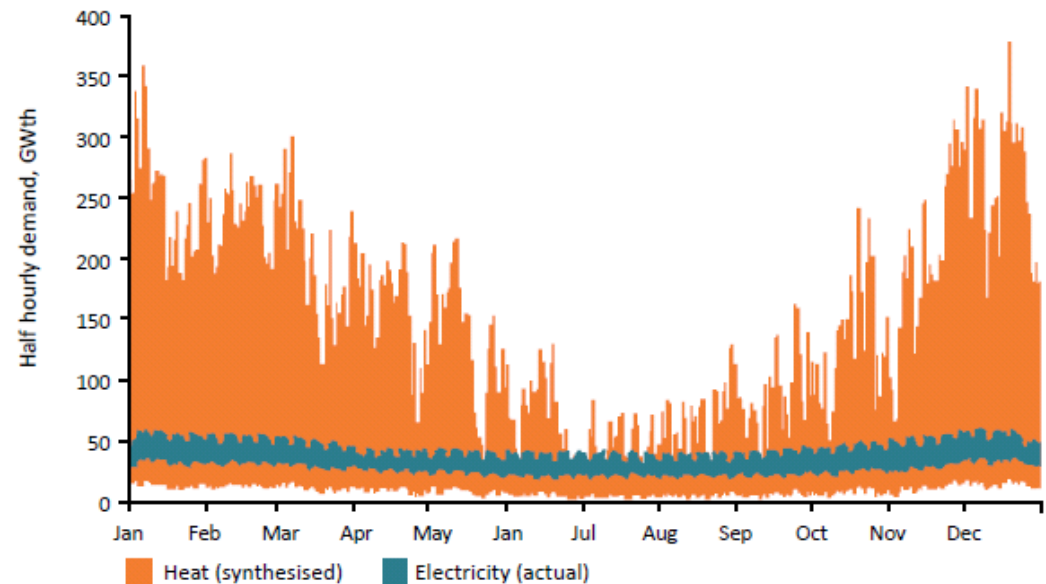


- 2050 mix = 85% heat pump, 10% heat networks, gas <5%
- Issues:
 - Picking winners
 - Peak demand
 - Network challenge
 - Cost/consumer
 - Supply chain

Key challenge: meeting peak demand

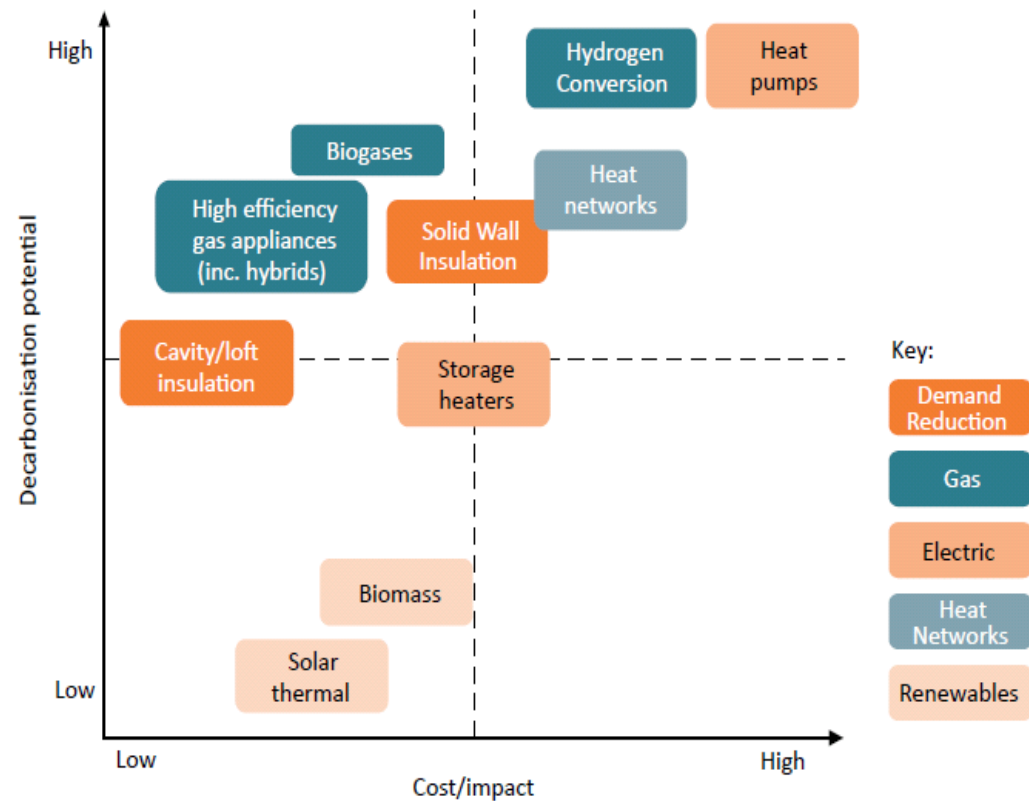
- Peak heat = 300GWs+
 - Peak elec = <60GW
- Supply challenge
- Network challenge

Figure 2.4: Annual heat and electricity demand profile for 2010⁷¹



Assessment of options

- Decarbonisation potential
- Network impact
- Supply impact
- Consumer impact



Energy efficiency

Pros/potential

- Reduce heat demand by 20% by 2050?
- Low-cost measures: insulation/controls
- Co-benefits: reduce fuel poverty, health benefits
- No/low regret option

Cons/cost

- Solid Wall: costly and disruptive
- ↓ Installation rates
- Policy uncertainty
- Behavioural and financial barriers

Recommendations

- Infrastructure priority
- Efficiency standards
- Link Stamp Duty-EPC
- Reform mortgage affordability tests
- Expand fuel poverty schemes

Green gas

Pros/potential

- High consumer acceptance
- High efficiency gas appliances (mCHP, GDHP, hybrid)
- Biogases (AD, bio-SNG, sewage gas)
- Hydrogen conversion = ↓73% emissions

Cons/cost

- Limits to efficiency gains possible
- Bioenergy availability
- Hydrogen conversion
 - Cost
 - CCS requirement
 - Disruption to home

Recommendations

- Efficiency standards
- Boiler scrappage
- RHI: include GDHP
- Bio feedstock - food / waste
- Gas standards
- Investigate hydrogen conversion

Electrification / heat pumps

Pros/potential

- Route to (near) zero carbon heat
- Hybrids gas/electric

Cons/cost

- High capital cost
- Disruption to home
- Performance issues?
- Consumer acceptance?
- Generation capacity
- Network investment
- 80% hholds = £300bn?

Recommendations

- Important role but < suggested by DECC
- Role in new builds / off gas grid
- Cap RHI tariffs (10p/kWh)
- Use carbon prices (gas versus elec)

Heat networks

Pros/potential

- Potential 10-20% domestic heat by 2050?
- Can be as cheap as gas boiler
- Multiple heat sources. Reduce carbon over time.
- Heat storage

Cons/cost

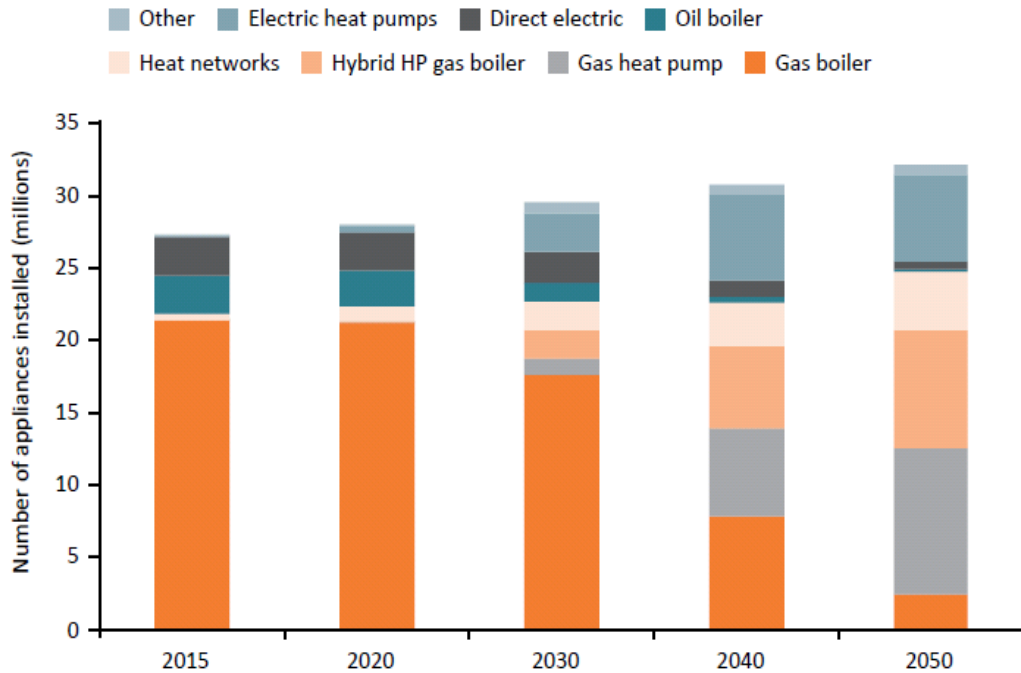
- Consumer knowledge /acceptance?
- Consumer protection?
- Cost
- How to decarbonise heat networks?

Recommendations

- Bespoke regulatory regime (Ofgem)
- Extend HNDU remit to financial close
- Use HNIP to de-risk/ future proof projects
- Wayleave / access rights

80% scenario: 'path of least resistance'

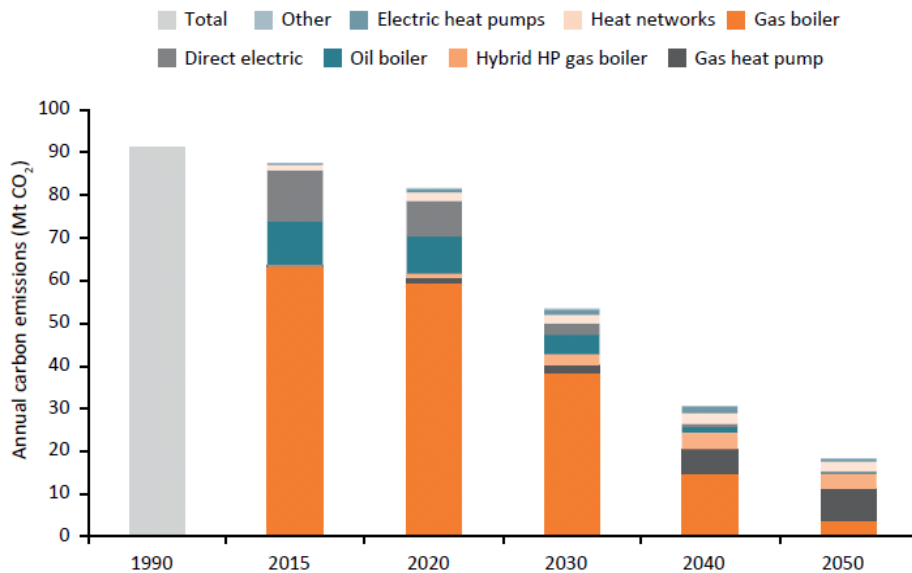
Figure ES2: Scenario 1 – Mix of heating appliances



	2015	2030	2050
Gas boiler	21,350,000	17,600,000	2,410,000
Gas heat pump	–	1,160,000	10,150,000
Hybrid HP gas boiler	10,000	1,950,000	8,170,000
Heat networks	500,000	2,000,000	4,000,000
Oil boiler	2,600,000	1,270,000	150,000
Direct electric	2,710,000	2,110,000	550,000
Electric heat pumps	90,000	2,690,000	6,010,000
Other	50,000	790,000	680,000
Total	27,310,000	29,570,000	32,120,000

80% scenario: 'path of least resistance'

Figure ES3: Scenario 1 – Annual emissions from domestic heating (excluding cooking)



- ↓80% cut in emissions by 2050 (↓42% by 2030)
- Residual emissions mainly gas
- 90%+ cut possible but requires different tech mix – elec / hydrogen

Govt needs a new heat strategy...

1. Long term commitment to decarbonise heat
2. Balanced approach
3. Consumer-focused
4. Avoid picking winners
5. Use carbon pricing / market signals
6. Integrate heat, efficiency, fuel poverty
7. National & localist approach
8. Tackle technology & system challenges