



Decarbonising heat: networks, pumps or pipes?

Robert Sansom – Imperial College

UK energy system in transition:
Technology, infrastructure & investment
Edinburgh – 1st April 2014

Towards decarbonising heat

Maximising the opportunities for Scotland

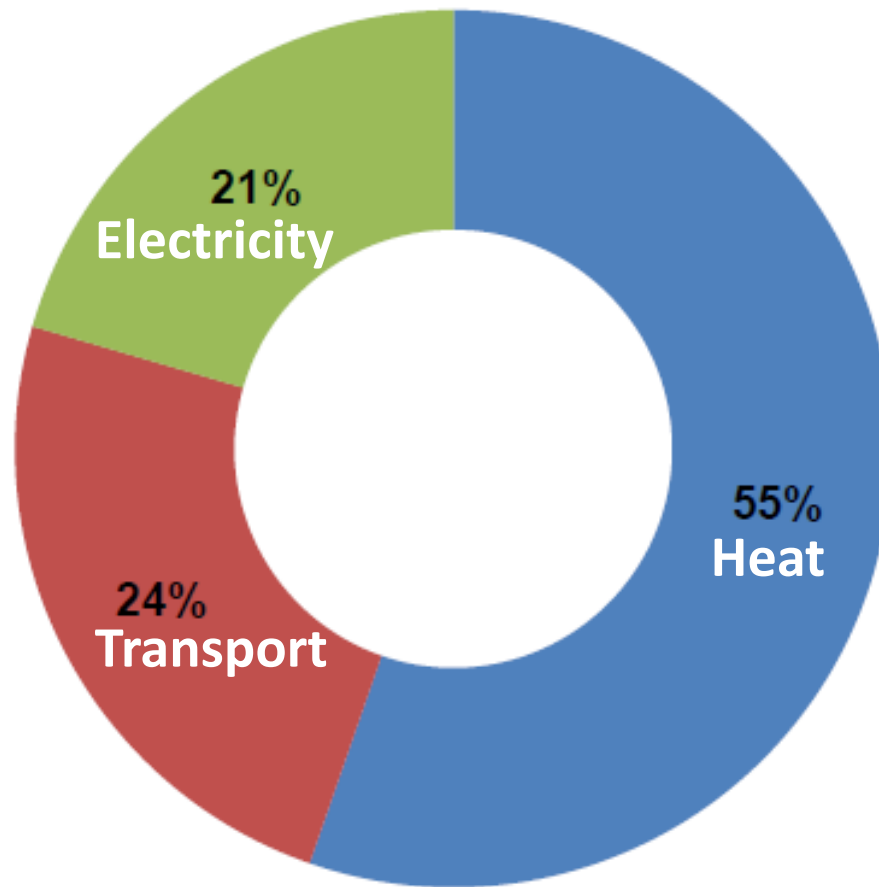
Four key challenges:

- Decarbonising heat
- Diversifying sources of heat
- Reducing pressure on household energy bills
- Seizing the economic opportunities



Decarbonising heat

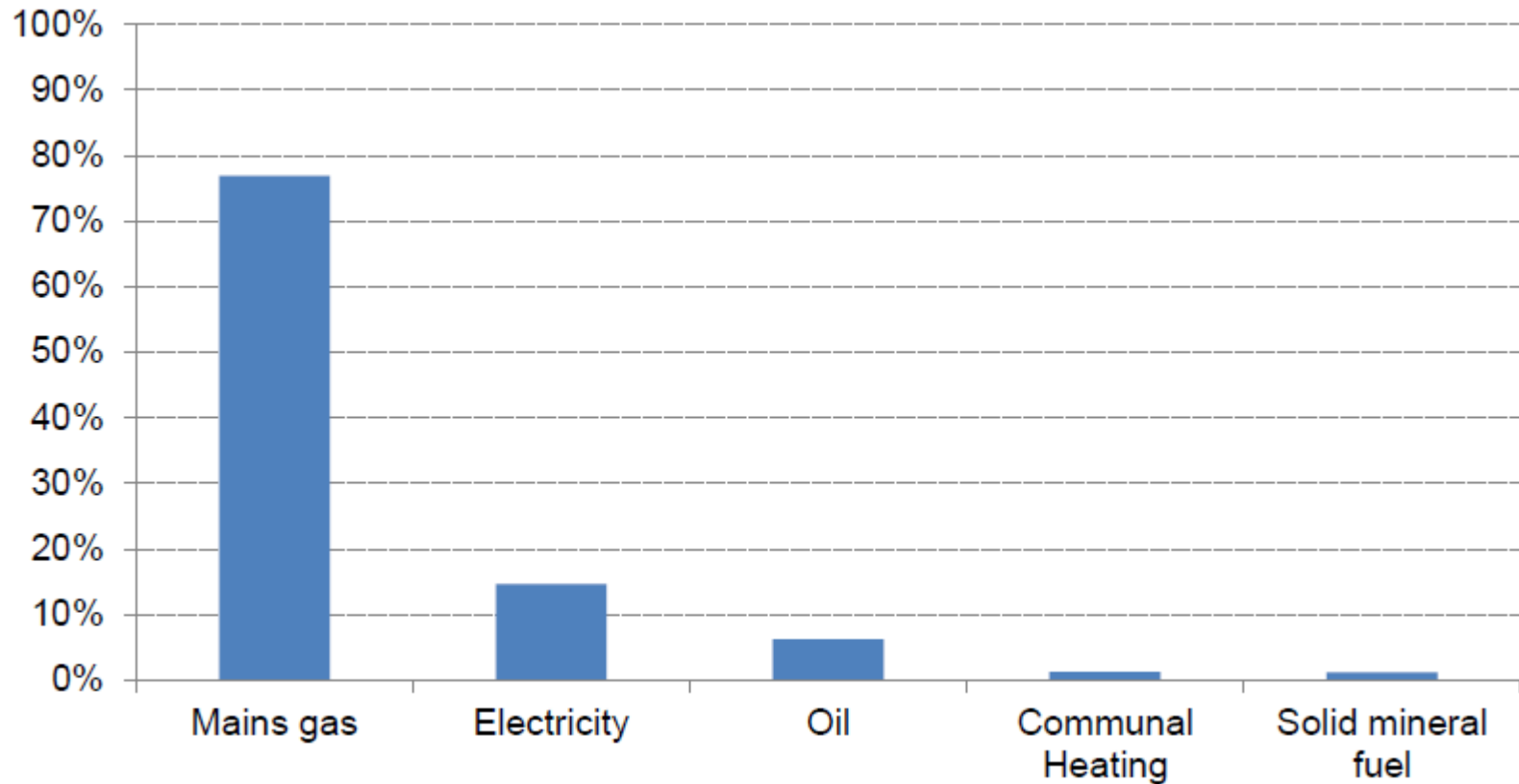
Total final energy consumption in Scotland 2011



Heat accounts for 47% of total CO₂ emissions.

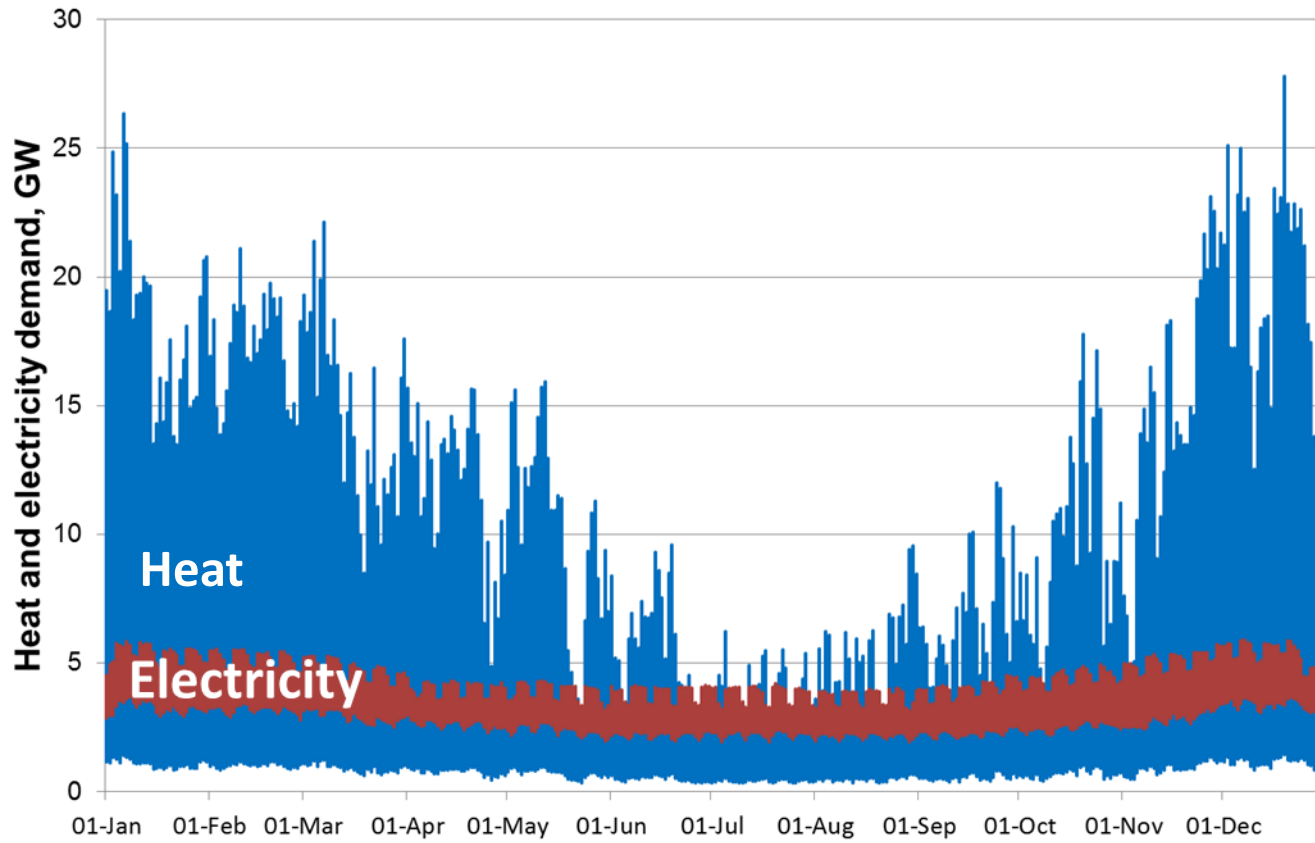
Source: DECC. (2013). *Total final energy consumption statistics (Sub-national): 2011.*

Sources of domestic heat

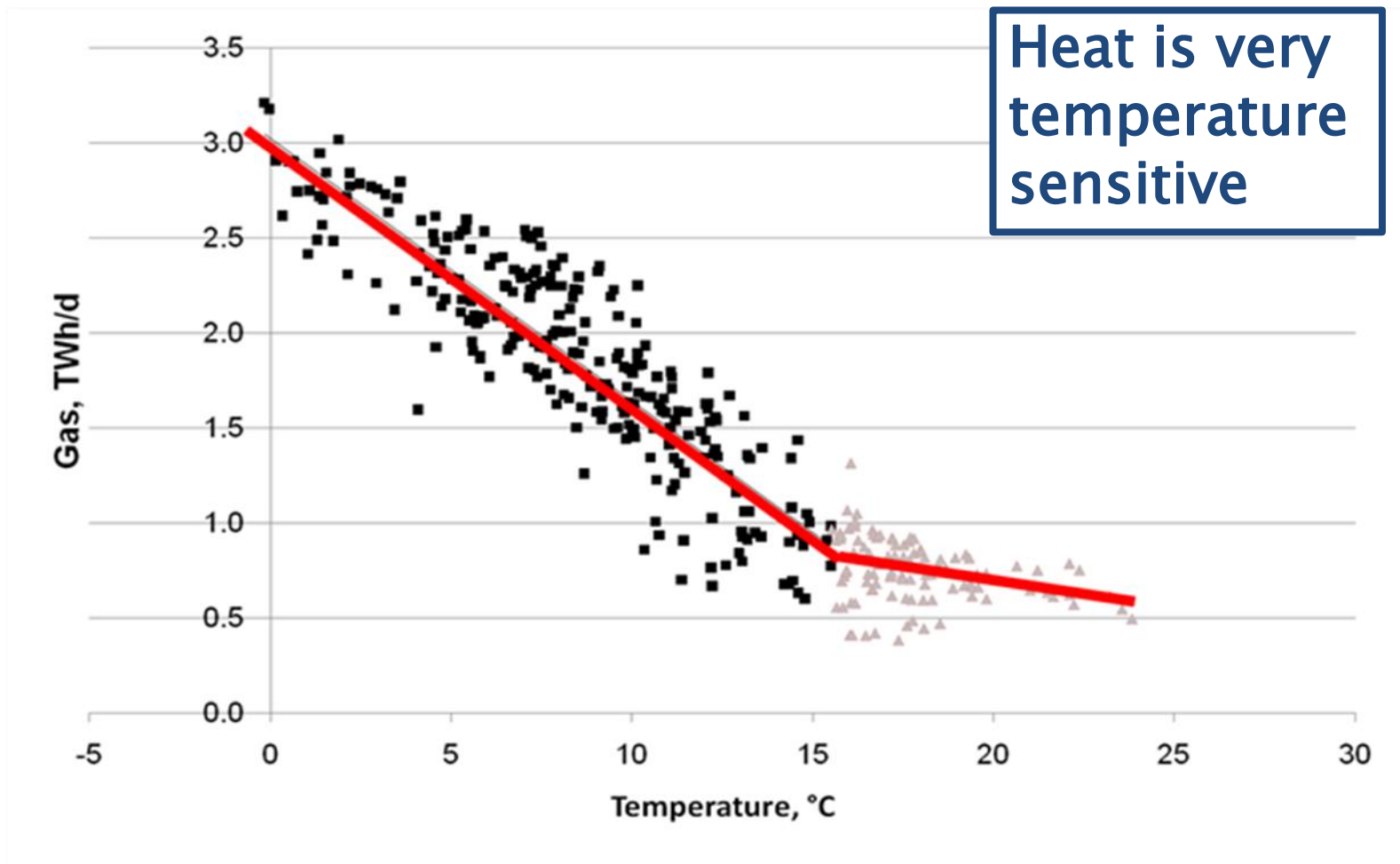


Source: Scottish condition survey using 2012 data.

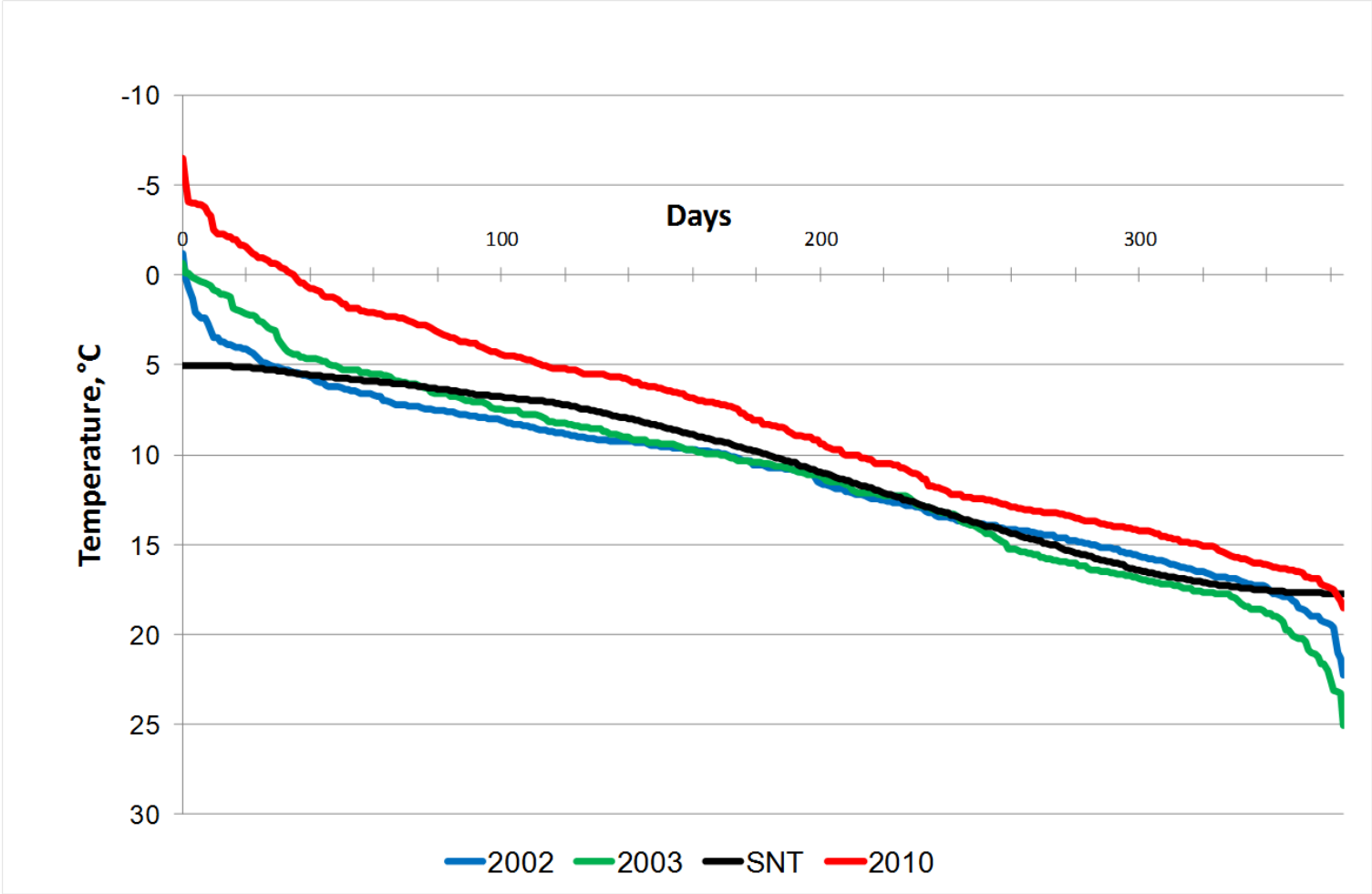
Half hourly heat demand



Impact of temperature on UK gas demand



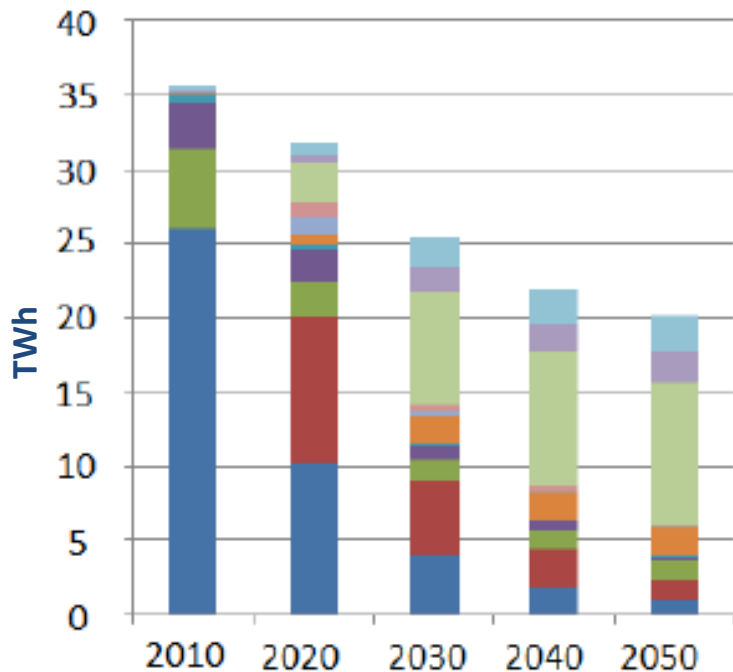
UK daily temperature annual duration curves



Future heat demand

High Government Intervention and Uptake scenario

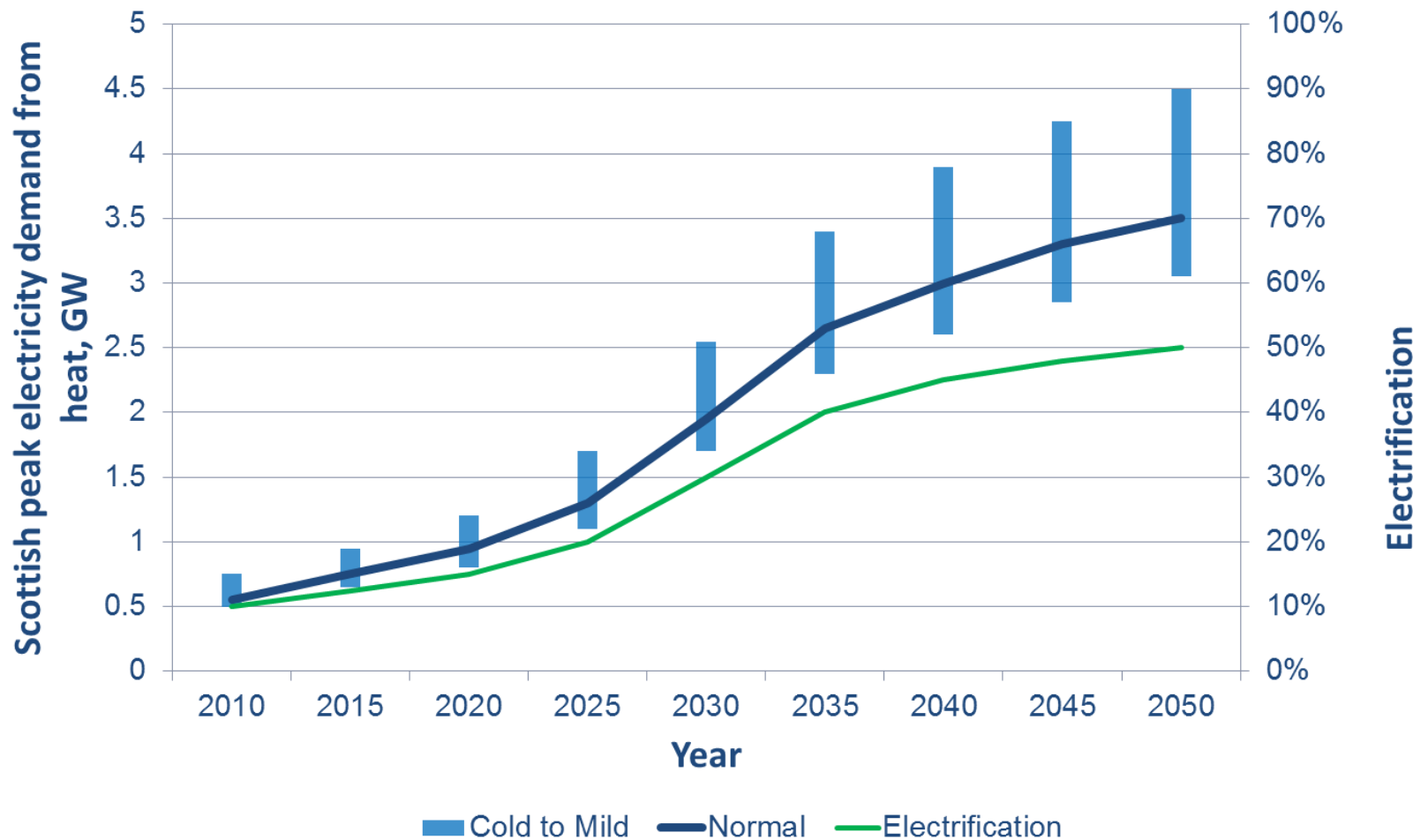
Domestic



- District Heating
- Ground-source heat pump
- Air-source heat pump

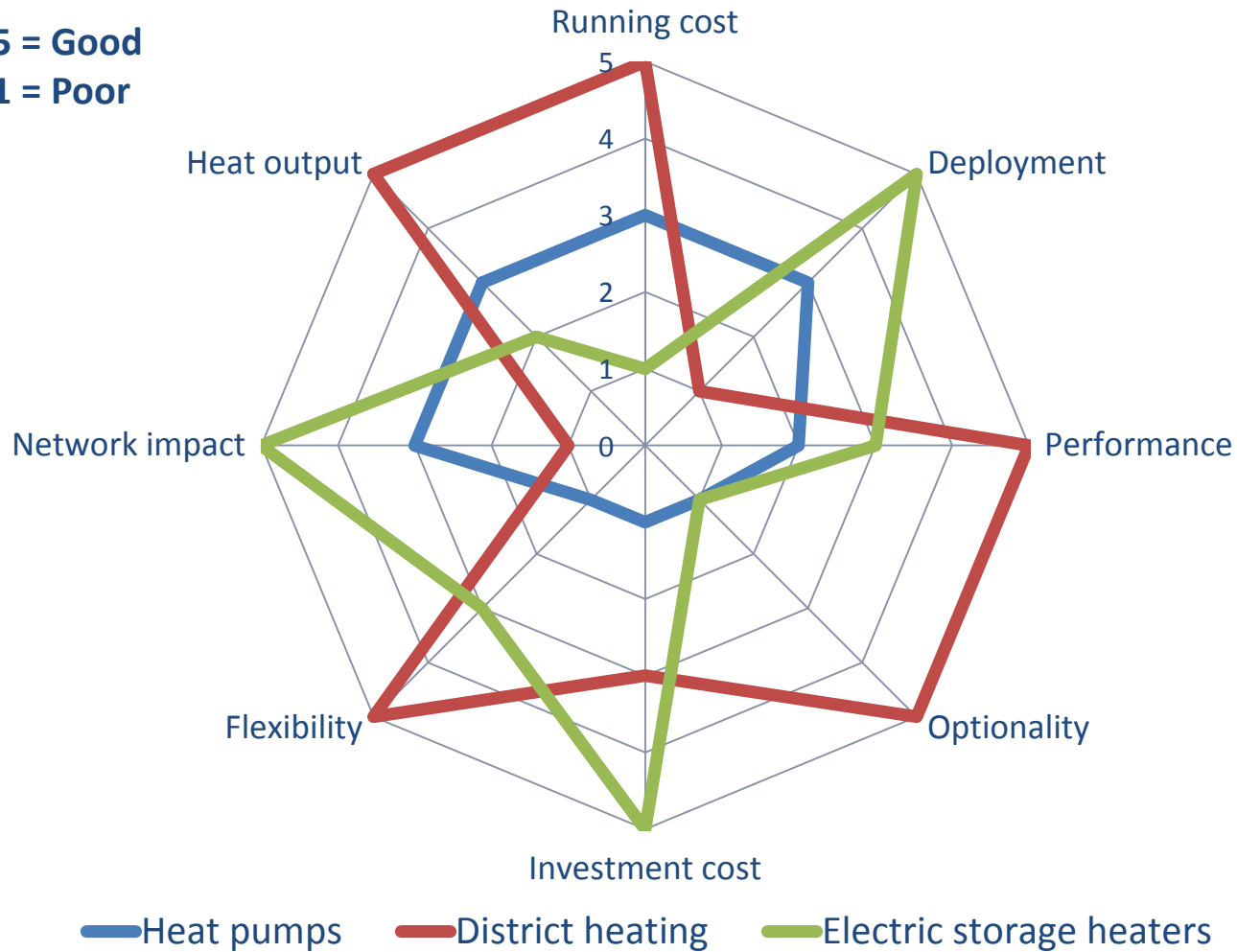
- Very aggressive energy efficiency improvements
- Significant electrification (>50%) of heat using heat pumps
- Modest development of district heating
- No storage heating

Impact on Scottish electricity infrastructure



Comparison of low carbon heat technologies

5 = Good
1 = Poor



Summary and conclusions

- Decarbonising heat is essential to meet Scotland's 2050 CO₂ target.
- A transformation of Scotland's heat sector is required.
- There is considerable uncertainty in terms of costs, performance and deployment of heat technologies.
- A “whole systems” approach is essential.
- Heat storage provides substantial opportunities to support intermittent and inflexible generation.
- Consumer engagement is crucial to deliver:
 - reductions in heat demand.
 - selection of heating technology.

Thank you

...any questions

r.sansom10@imperial.ac.uk