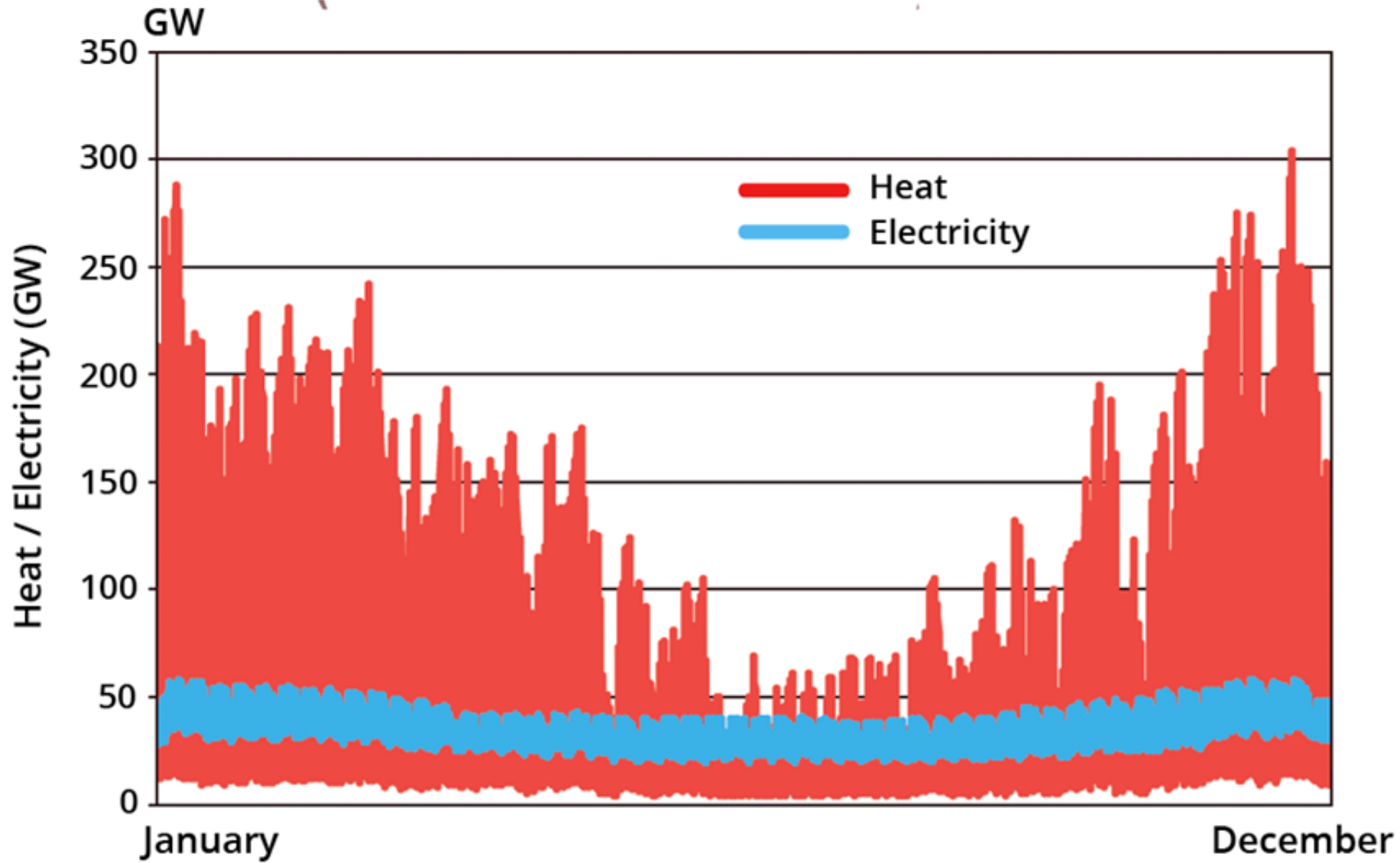


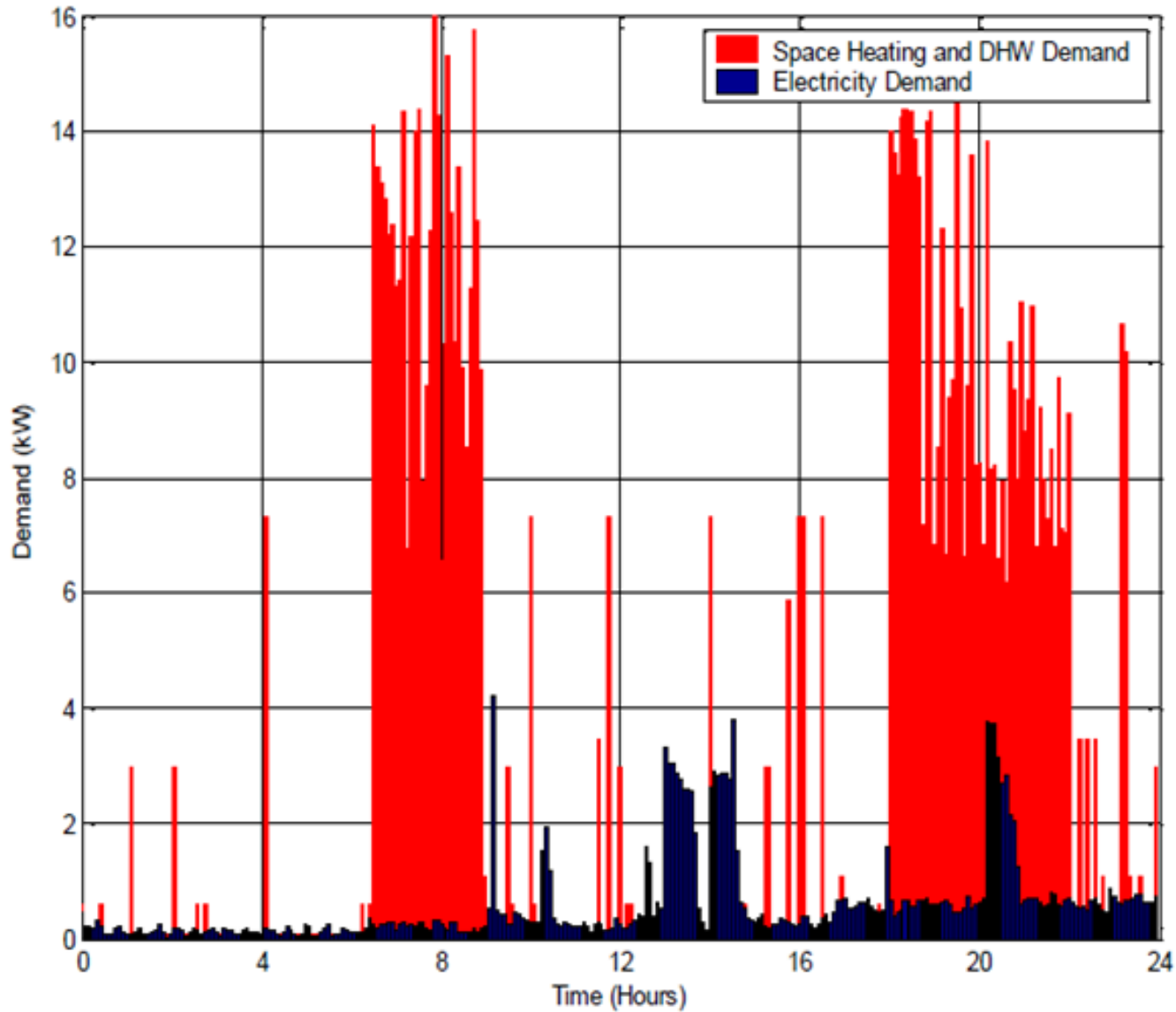
Energy system challenges - heat decarbonisation

Dr Keith MacLean
15 September 2016

Annual heat and power demand



Residential heat and power demand



Heat and Power Demand over 1 Day in a Typical UK Dwelling

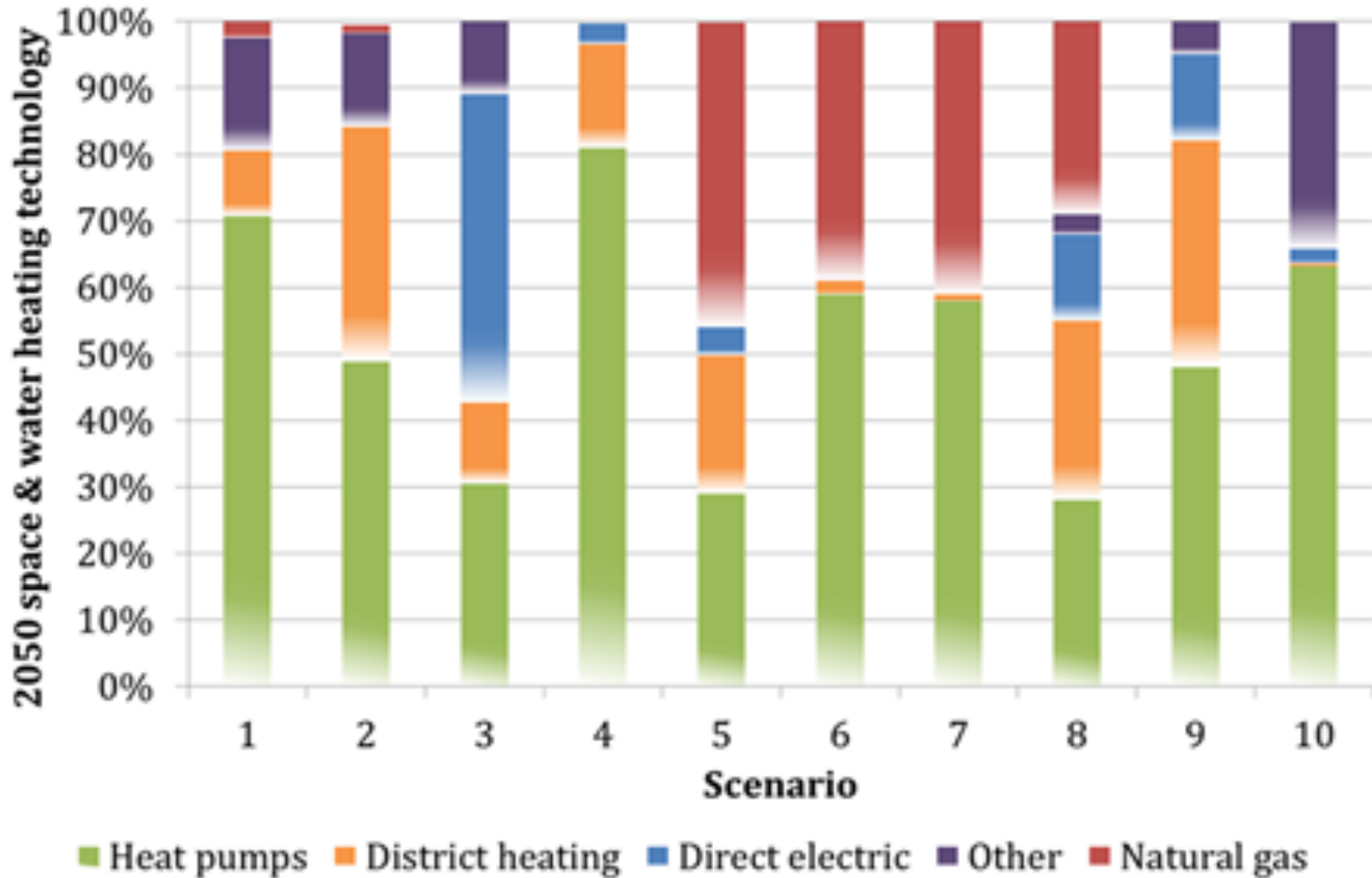
Heat - the challenge

- ▶ >Twice as much energy use as electricity
- ▶ Six times peak in winter (100 HPCs)
- ▶ Seasonal challenge for resilience/storage
- ▶ Lowest renewable heat in EU
- ▶ Worst housing
- ▶ People are happy
- ▶ Least understood/resourced

Mix of carbon reduction solutions

- ▶ Lower consumption through
 - ▶ building efficiency improvements
 - ▶ operational efficiency through e,g, district heating
- ▶ Decarbonisation of heat generation
 - ▶ repurpose gas grids with hydrogen
 - ▶ electrification (as grid carbon intensity reduces)
 - ▶ others? (bio-sources, solar thermal, geo-thermal)
- ▶ All major infrastructure investments

No agreement on decarbonisation route



Main options for heat

- ▶ ... are based on network solutions
 - ▶ gas
 - ▶ electricity
 - ▶ heat
- ▶ ... and have one thing in common

MUST DIG A HOLE!!!



Conclusions - general

- ▶ Each solution has a role to play, but none is a silver bullet
- ▶ Choice of solution and/or the rate of deployment depends on
 - ▶ the non-cost impacts
 - ▶ local conditions
 - ▶ customer acceptance
 - ▶ not just simple economics

Conclusions - governance

- ▶ Big task, more manageable with
 - ▶ an early start, good planning and preparation
 - ▶ long term infrastructure investment programmes
- ▶ New governance arrangements should be introduced
 - ▶ strong city and local authority level involvement
 - ▶ skills knowledge and resource will be needed
- ▶ Pilot developments should be initiated

The challenge?

- ▶ 20,000 UK properties per week, every week for 20 - 25 years
- ▶ Investment needed = £100bn - £320bn, depending on solution
 - ▶ Repurposing gas grids = lowest cost
 - ▶ Electrification and district heating = highest cost
- ▶ Main issues
 - ▶ Supply - volume and cost
 - ▶ Distribution - cost and disruption
 - ▶ Customer premises - cost and disruption
 - ▶ Seasonal variations/storage

Main heat report

<http://provpol.com/wp-content/uploads/2016/05/Heat-infrastructure-paper.pdf>

Annexes

<http://provpol.com/wp-content/uploads/2016/05/Heat-infrastructure-annexes.pdf>

Contact

keith.maclean@provpol.com

Thank you for your attention!
Any questions?