

# **Ground Source Heat Pump Association**

## **Technical Seminar**

# **Heat Pump Deployment and Electrical Demand Management**

7<sup>th</sup> November 2018

# Programme

Time	Title	Presenter
9:30	Registration and refreshments	
10:00	Introduction	Bean Beanland, GSHPA Chairman
10:05	Presentation 1: The heat pump industry, background & update	Bean Beanland & Robin Curtis (GSHPA)
10:25	Q&A	
10:45	Presentation 2: The Future Energy Scenarios 2018 and Heat	Usman Bagudu (National Grid)
11:05	Q&A	
11:25	REFRESHMENTS	
11:45	Presentation 3: New Process for Connecting Heat Pumps & Electric Vehicles	Randolph Brazier (ENA) & Stewart Reid (SSEN)
12:05	Q&A	
12:30	LUNCH	
13:15	Presentation 4: Octopus Energy time-of-day tariff and its implications	Phil Steele (Octopus Energy)
13:35	Q&A	
14:05	Presentation 5: Creating a consumer driven energy market	Cliff Arnold (PassivSystems)
14:25	Q&A	
14:45	REFRESHMENTS	
15:05	Panel Discussions	Moderated by Shivali Mathur (Daikin)
15:55	Closing Remarks	Bean Beanland
16:00	Close	

# Ground Source Heat Pump Association

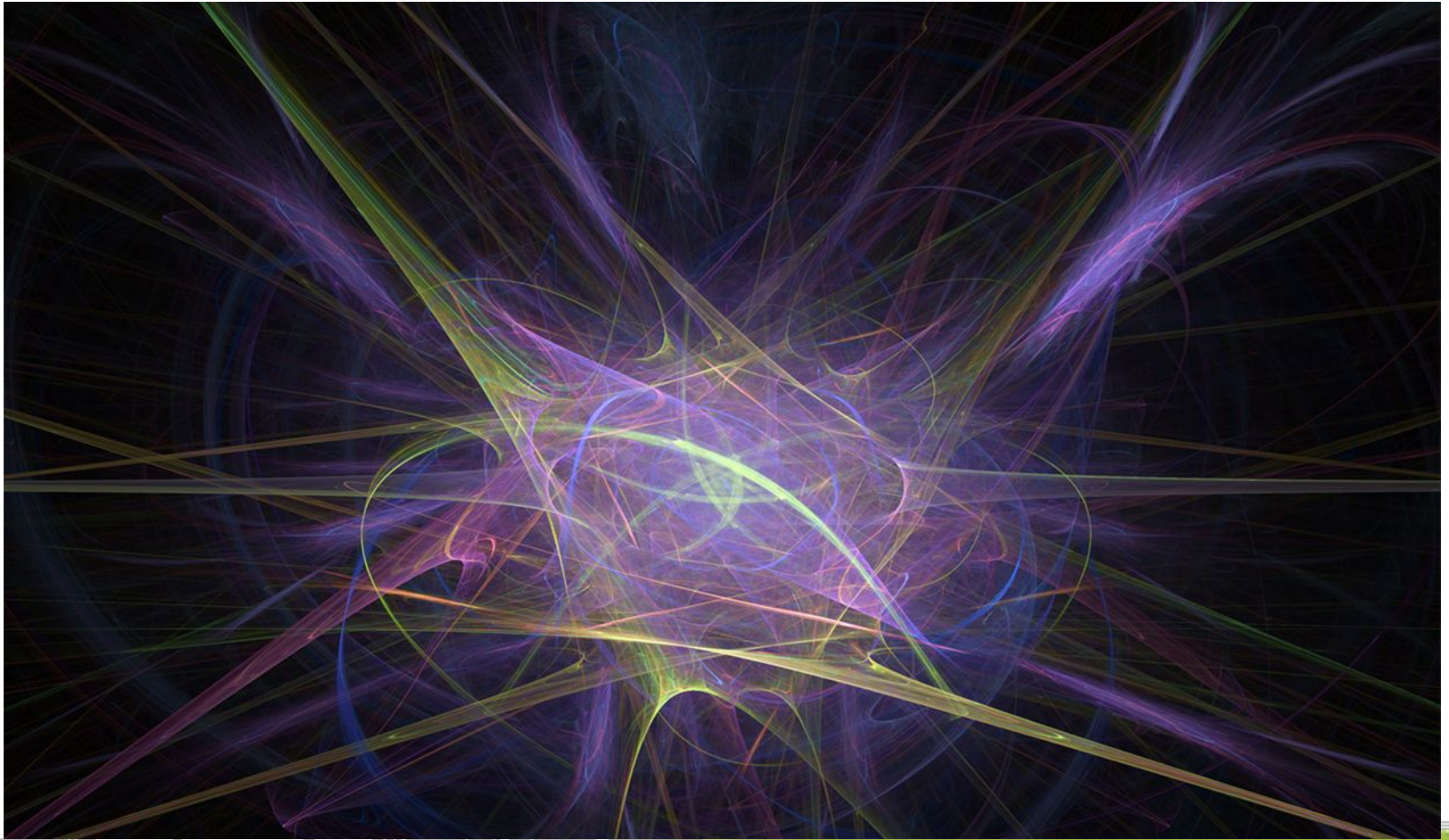
## Background & Policy Progress

## Technical Challenges & Grid Impact

Chairman, Bean Beanland and Chairman of  
Training & Standards Committee, Robin

Curtis

# In The Beginning...

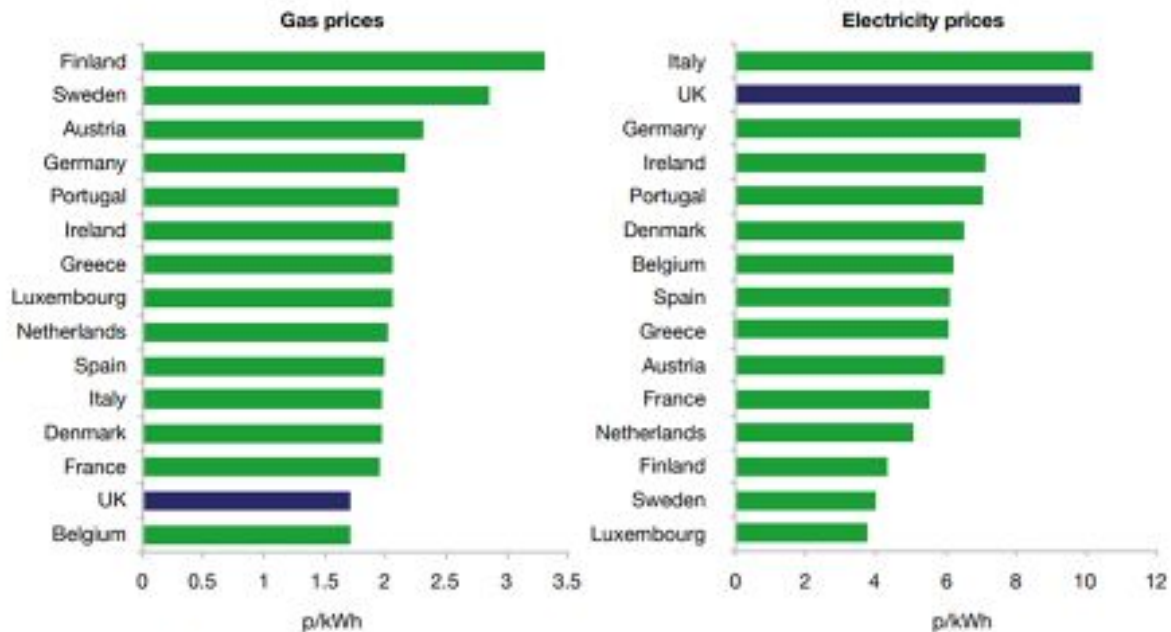


# The Ultimate Renewable Energy Source



# UK Gas & Electricity Pricing Comparison

Figure 12: Industrial electricity and gas prices for large consumers in the EU15 in 2016, including taxes<sup>135</sup>



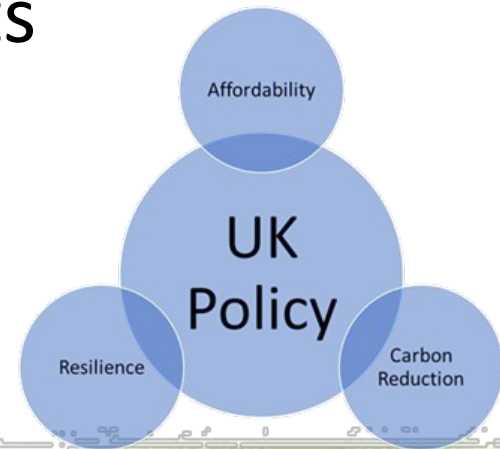
Source: BEIS

# Comparative Technology Deployment

	LCBP 2006-2011		Non-domestic RHI 2011-2018		Domestic RHI 2014-2018	
Air-source	1,461	7.6%	498	3%	32,185	51%
Ground/water -source	1573	8.2%	1,044	5%	9,160	15%
Biomass	752	3.9%	16,767	86%	12,566	20%

# Why Now for the Heat Pump Sector?

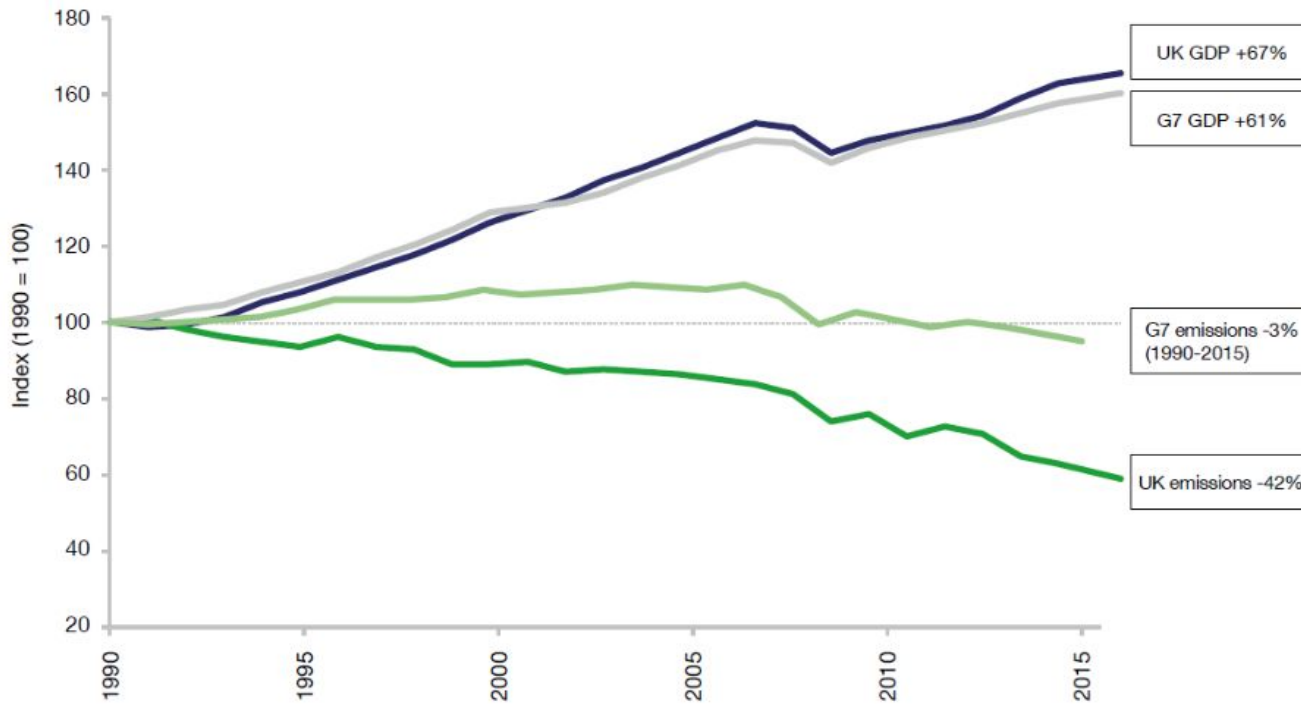
- Climate change
- EU carbon emissions reduction targets & the legally binding UK Carbon Budget
- Ground-source recognised as infrastructure
- UK dependency on fuel imports
- UK balance of payments
- Fuel security
- Fuel poverty





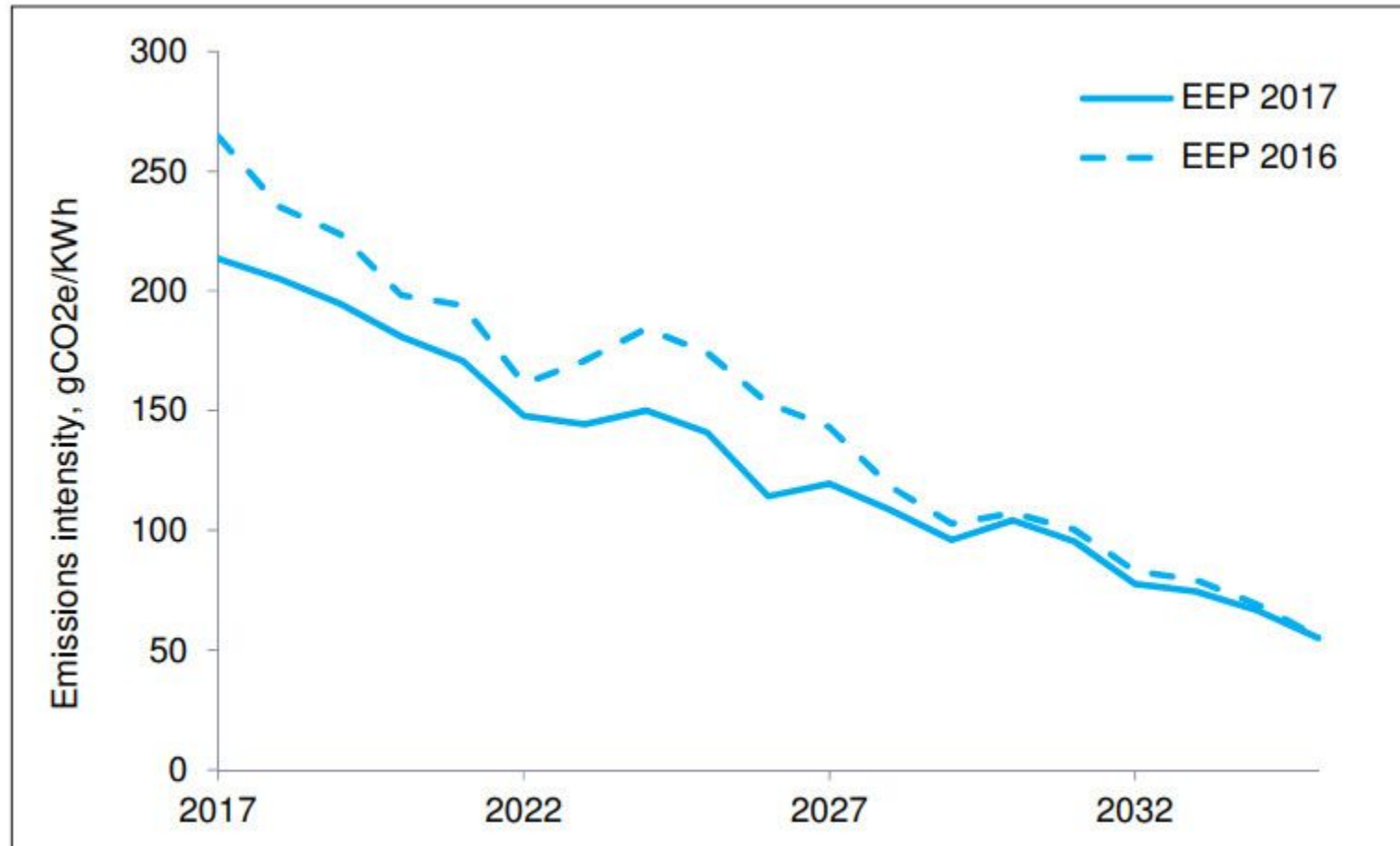


# GDP Decarbonisation Viability



Source: UNFCCC; World Bank; BEIS

# Carbon Emissions Intensity of the UK Grid



# Real Time Emissions Implications

## CO<sub>2</sub> from Heating systems

UK grid at : 2018-10-12 08:30

is emitting : 194 grams CO<sub>2</sub> /kWh

Ground Source Heat Pump (400%):	48	grams CO <sub>2</sub> per kWh delivered heat
Ground Source Heat Pump (320%):	61	
Direct Electric heating (100%):	194	
Gas boiler (85%):	215	
Oil boiler (85%):	320	
Coal (50%):	630	

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# Where London Leads.....



## Energy Planning - GLA Guidance - Air Quality Gets Equal Billing

Fuel type	Fuel Carbon Factor (kWh/kgCO <sub>2</sub> )	
	SAP 2012	SAP10
Natural Gas	0.216	0.210
Grid Electricity	0.519	0.233

# 10 Seconds of Gold Dust



2018-11-03 17:12:02

Drilling Rig

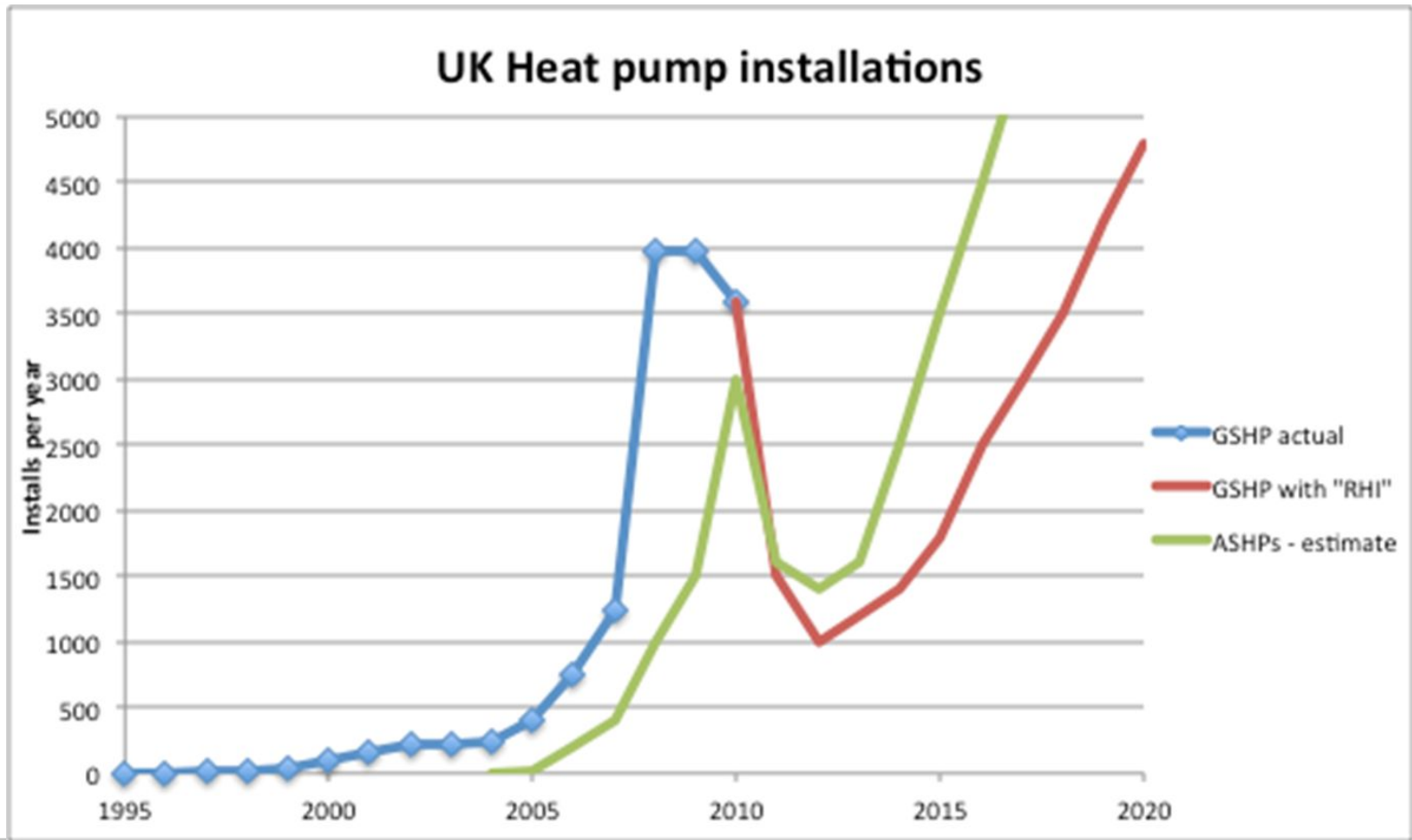


# Heat Pumps 1995 to 2050

- Niche player to mainstream core environmental technology for heating, process heat, potable hot water and cooling
- Mid sixties / seventies > EA sponsored ASHP trial
- BGS / BRE spanner-in-the-works
- everything stops.....



# Heat Pump Market Recovery



# 1st UK CLGSHP Domestic (1995) Devon (~8kW)



# 1st UK CLGSHP Non-domestic Scillies (1999) (25kW)



# Churchill Hospital Oxford Heating & Cooling



# Housing Association Shared Ground Loops



England's Largest District Ground  
Source System Breaks New Ground

# Roll-out Challenges

- NO technical challenges (really !)
- Assume your DNO will connect – 3 phase supply
- Sorted your future decarbonisation path
- Check your M&E consultant's advice.....
- Heating / cooling / heat recovery
- Thermal inertia – to avoid peaking
- Scalability – domestic to very large commercial

# Single-phase DNO Requirements

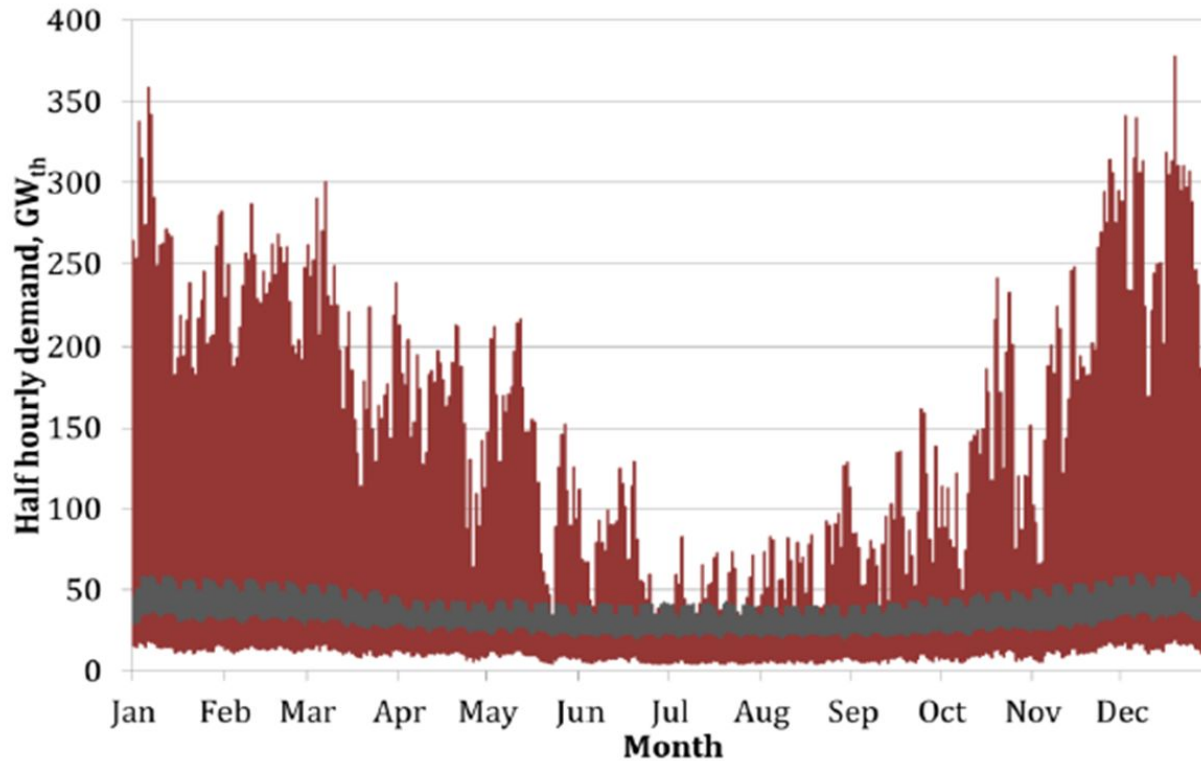
- Biggest motor size? (2.2kW - why?)
- 20kW+ output on single-phase
- Starting currents
- Power factors
- Starts per hour
- Efficiency
- Voltage issues – 250 vs 220

# Single-phase Mitigation

- Inverters? (Harmonics)
- Dual compressor systems?
- Inverter vs fixed speed efficiency?
- Three-phase 220V?
- Upgrade supply to three-phase 400V? Single user asset charges vs socialised investment
- Load shifting



# The Peak Heat Question



Is it what it's made out to be? (after Richard Lowes / Rob Samson – Exeter 2017 )

# Conversation with Generators and DNOs

- Grid capacity?
- Peak amelioration?
- Storage (GFHP)
- Decouple heating & DHW
- Remote inhibit / reduce
- Processes for EVs and PV – heat pump equivalence?

# Interference?



**Thank you all for coming**

**My especial thanks go to our guest presenters and to the Association team**

**Safe journey home and I look forward to continuing contributions to the heat pump story from you all in your various capacities**

# Nature's Way

