MITSUBISHI ELECTRIC

ON THE ROAD TO NET ZERO

ON THE ROAD TO NET ZERO

Welcome

Graham Carr
Branch Manager

ON THE ROAD TO NET ZERO

Your Partner On The Road To Net Zero

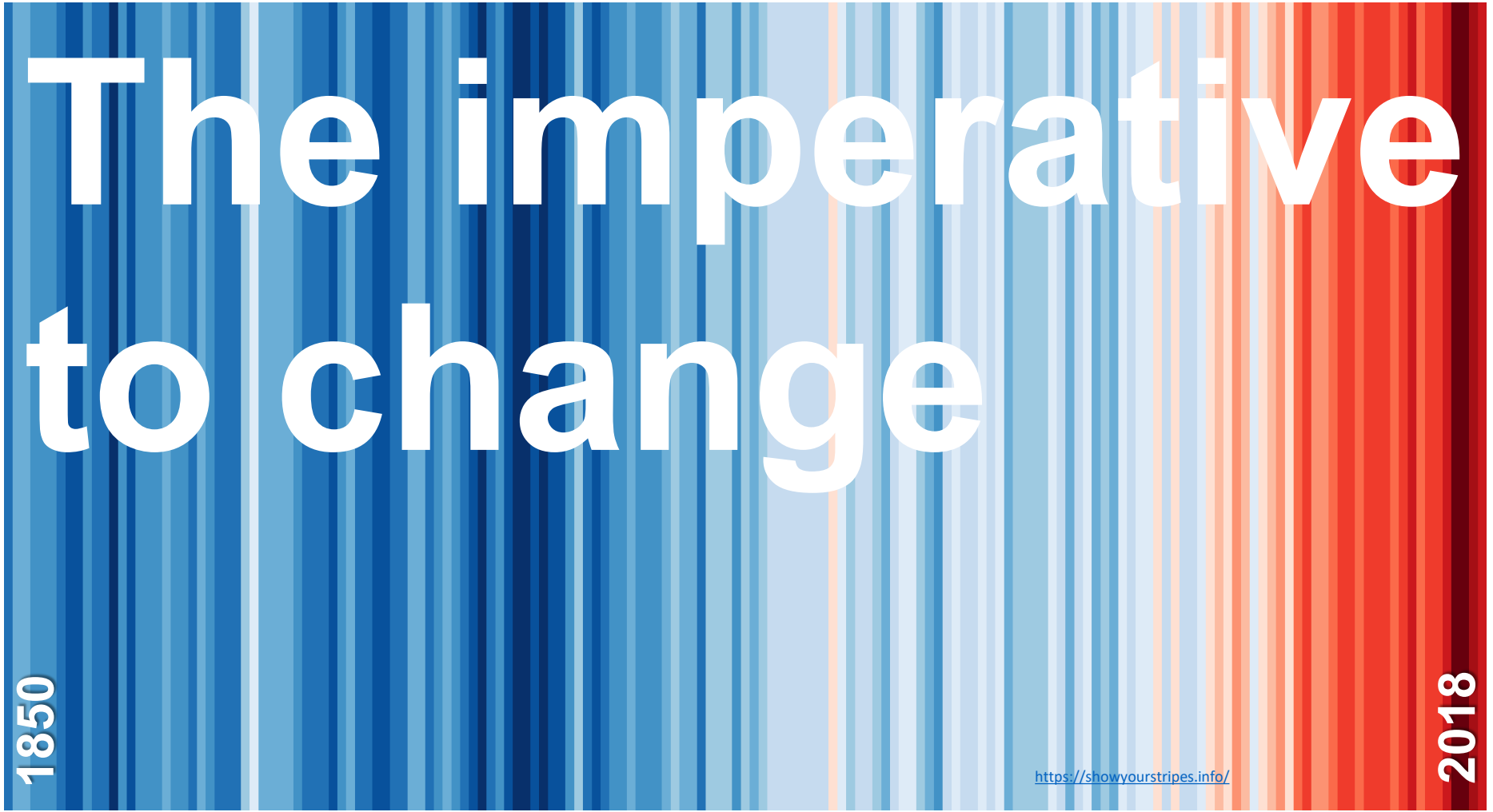
Phil Ord
Commercial Product
Group Director

ON THE ROAD TO NET ZERO

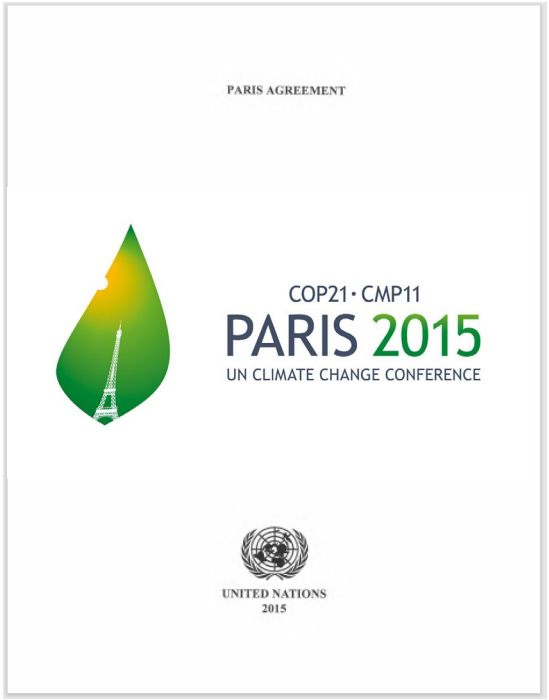
The Imperative To Change

Martin Fahey
Head of Sustainability

The imperative to change



Global



United Nations Framework Convention on Climate Change

UK

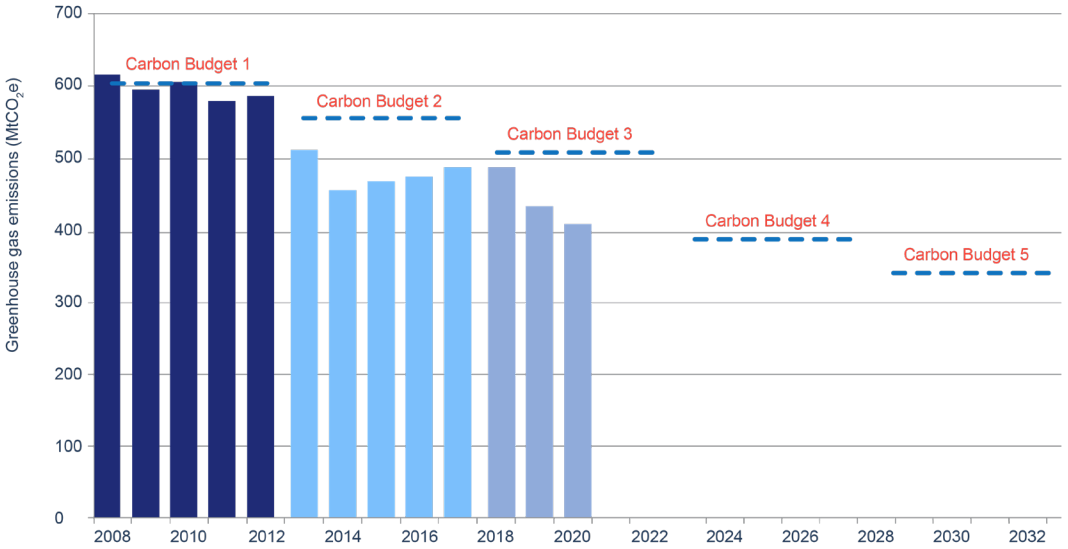
The Paris Agreement - global average temperature increase to well below 2°C, and to pursue efforts to limit the temperature increase to 1.5°C.

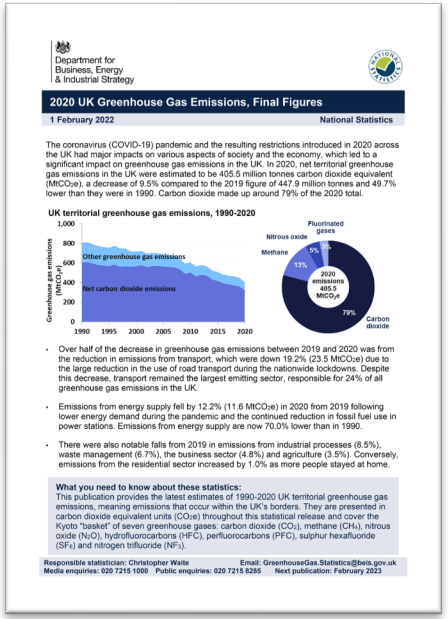
In its NDC (April 2021), the UK is committing to reduce economy-wide greenhouse gas emissions by at least 78% by 2035, compared to 1990 levels.

This includes aviation and shipping for the first time.

UK Progress

These are legally binding limits on the total amount of greenhouse gas emissions the UK can emit over 5 years. Final statement on the 3rd carbon budget will be made in May 2024.





Department for Business, Energy & Industrial Strategy

2020 UK Greenhouse Gas Emissions, Final Figures

1 February 2022 — National Statistics

The coronavirus (COVID-19) pandemic and the resulting restrictions introduced in 2020 across the UK had major impacts on various aspects of society and the economy, which led to a significant impact on greenhouse gas emissions in the UK. In 2020, net territorial greenhouse gas emissions in the UK were estimated to be 405.5 million tonnes carbon dioxide equivalent ($MtCO_2e$), a decrease of 9.5% compared to the 2019 figure of 447.9 million tonnes and 49.7% lower than they were in 1990. Carbon dioxide made up around 79% of the 2020 total.

UK territorial greenhouse gas emissions, 1990-2020

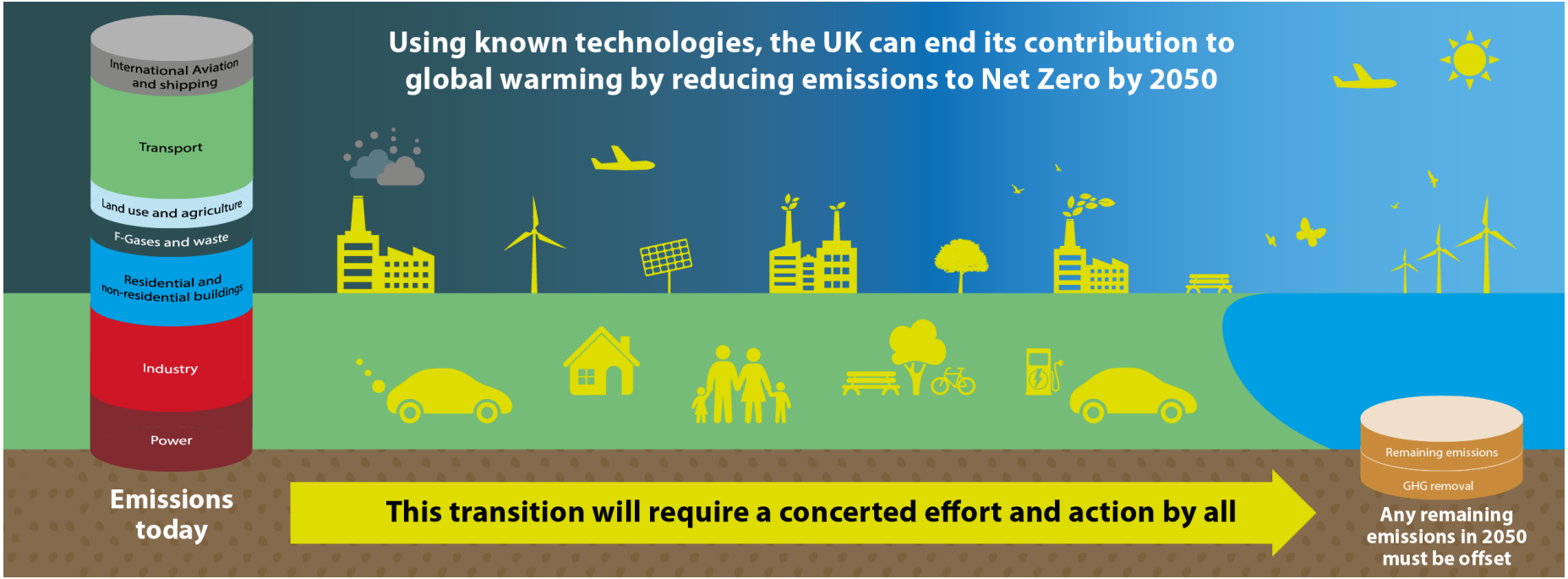
- Over half of the decrease in greenhouse gas emissions between 2019 and 2020 was from the reduction in emissions from transport, which were down 19.2% (23.5 $MtCO_2e$) due to the large reduction in the use of road transport during the nationwide lockdowns. Despite this decrease, transport remained the largest emitting sector, responsible for 24% of all greenhouse gas emissions in the UK.
- Emissions from energy supply fell by 12.2% (11.6 $MtCO_2e$) in 2020 from 2019 following lower energy demand during the pandemic and the continued reduction in fossil fuel use in power stations. Emissions from energy supply are now 70.0% lower than in 1990.
- There were also notable falls from 2019 in emissions from industrial processes (8.5%), waste management (6.7%), the business sector (4.8%) and agriculture (3.5%). Conversely, emissions from the residential sector increased by 1.0% as more people stayed at home.

What you need to know about these statistics:
This publication provides the latest estimates of 1990-2020 UK territorial greenhouse gas emissions, meaning emissions that occur within the UK's borders. They are presented in carbon dioxide equivalent units (CO_2e) throughout this statistical release and cover the Kyoto "basket" of seven greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3).

Responsible statistician: Christopher Waite — Email: GreenhouseGas.Statistics@beis.gov.uk
Media enquiries: 020 7215 1000 Public enquiries: 020 7215 5285 Next publication: February 2023

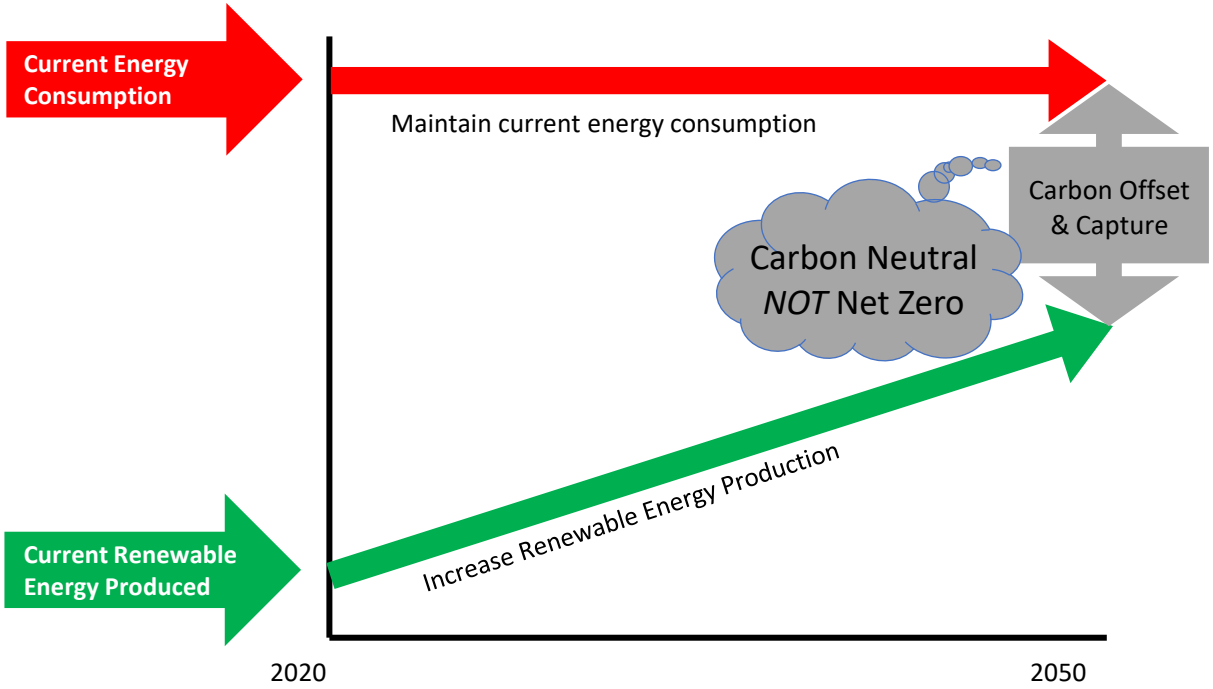
Source; 2020 UK Greenhouse Gas emissions, Final Figures - published February 2022 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachmentdata/file/1051408/2020-final-greenhouse-gas-emissions-statistical-release.pdf

What Is Net Zero?



Source – Climate Change Committee

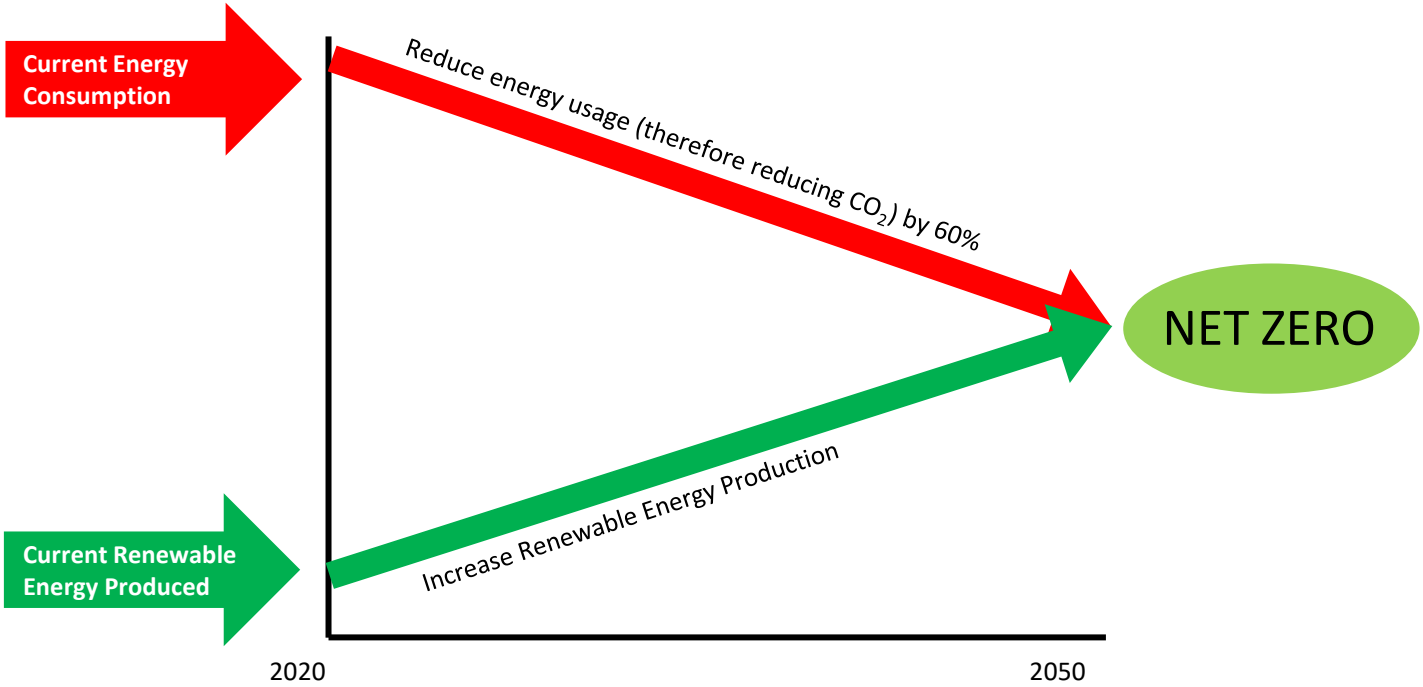
What Is Net Zero?



1 tree off-sets approx. 1 tonne of CO_2 throughout its lifespan (100 years)

We currently capture 40 Mt and need to capture 5635 Mt by 2050

What Is Net Zero?



ME Corporate Action And Direction

ON THE ROAD TO NET ZERO

MITSUBISHI ELECTRIC

Environmental Vision 2050

‘Protect the air, land and water with our hearts and technologies to sustain better future for all’.

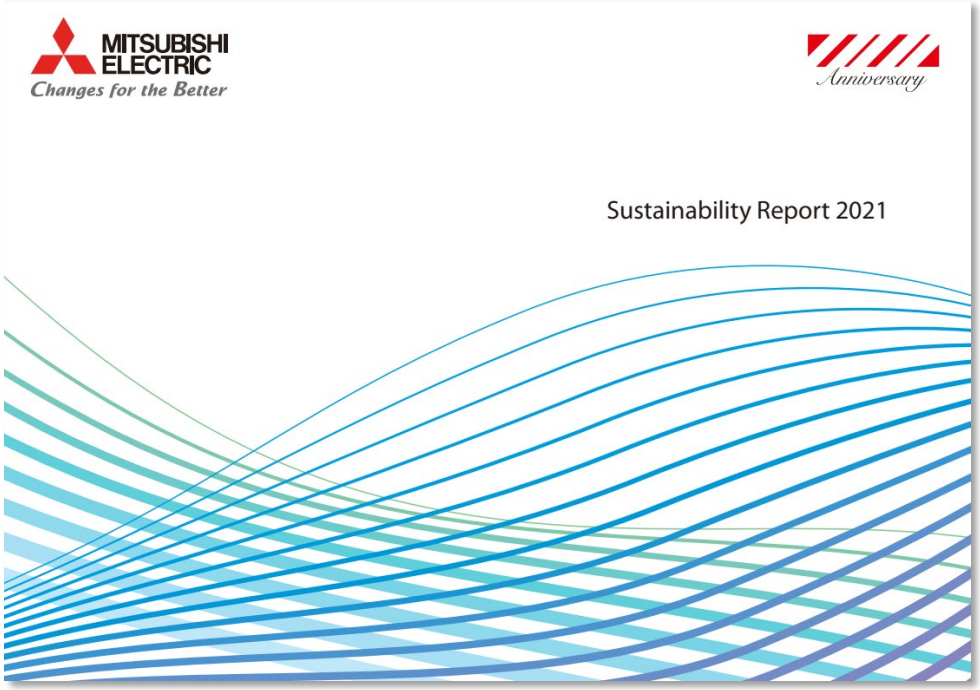
Environmental Sustainability Vision 2050

Social

Governance

CDP SUPPLIER ENGAGEMENT LEADER 2020

CDP DISCLOSURE INSIGHT ACTION A LIST 2021 CLIMATE



Corporate Action And Direction

ON THE ROAD TO NET ZERO

Provide solutions to social challenges through our business

- Realize a sustainable global environment
- Realize a safe, secure, and comfortable society

Strengthen our business foundation to enable our sustainable growth

- Respect for all people
- Strengthen corporate governance and compliance on a sustainable basis
- Create a sustainability-oriented corporate culture

Priority SDG initiatives

- Goal 3 Good Health and Well-Being
- Goal 9 Industry, Innovation, and Infrastructure

Two new goals (SDGs) added

SDGs of particular relevance

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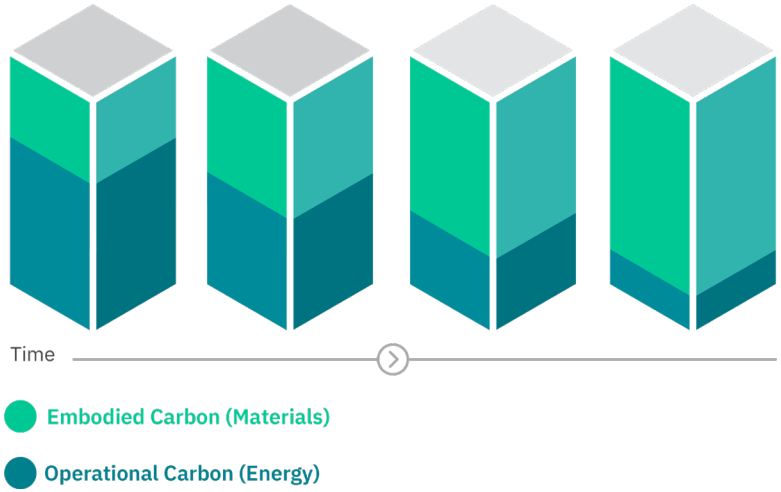
Whole Life Carbon

ON THE ROAD TO NET ZERO

Over time embodied carbon becomes a greater proportion of a building's total lifetime carbon emissions….

Potential breakdown between embodied and operational carbon for new buildings over time:



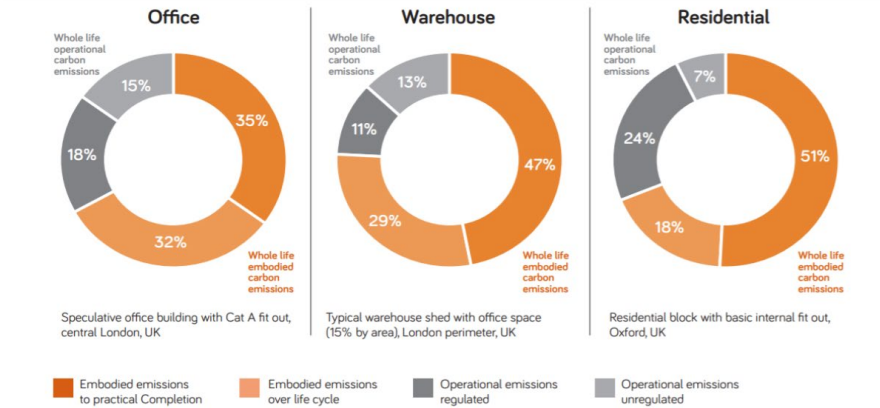


Image credit: from RIBA's *Embodied and whole life carbon assessment for architects*

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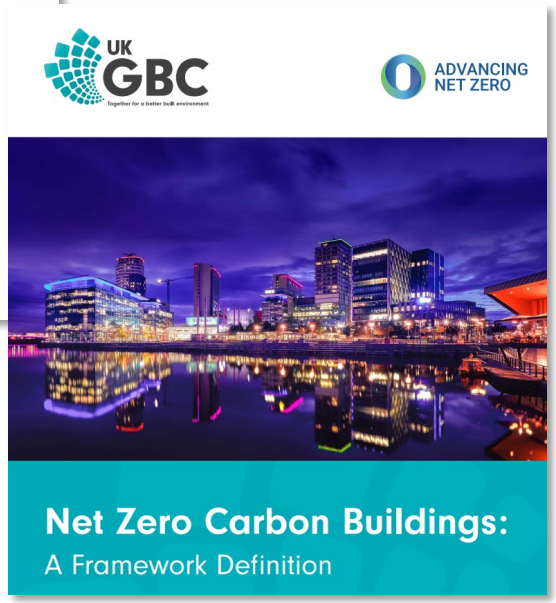
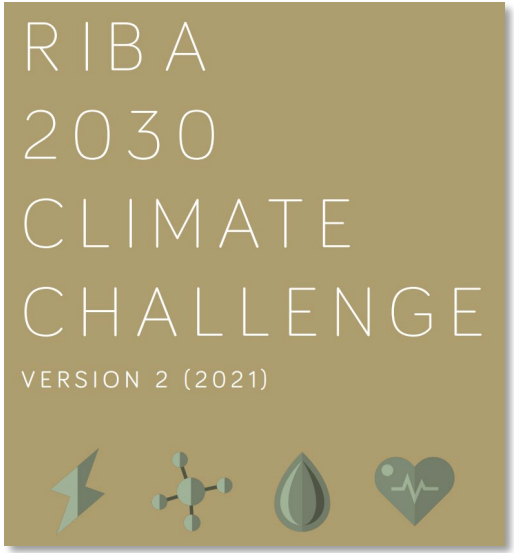
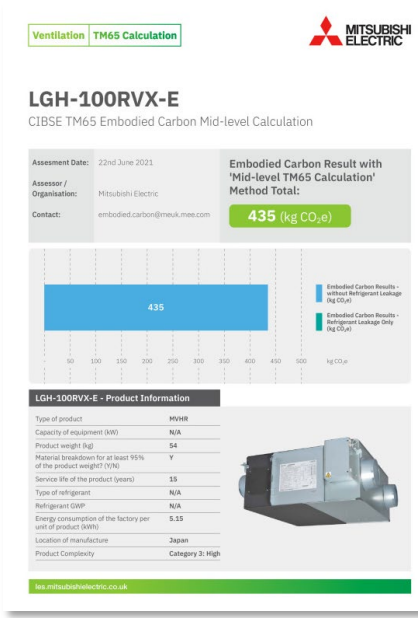
Lots Of Guidance





Whole Life Carbon


Ventilation | TM65 Calculation

MITSUBISHI ELECTRIC

LGH-100RVX-E

CIBSE TM65 Embodied Carbon Mid-level Calculation

Assesment Date:	22nd June 2021
Assessor / Organisation:	Mitsubishi Electric
Contact:	embodied.carbon@meuk.mee.com

Embodied Carbon Result with 'Mid-level TM65 Calculation' Method Total:

435 (kg CO_2e)

LGH-100RVX-E - Product Information

Type of product	MVHR
Capacity of equipment (kW)	N/A
Product weight (kg)	54
Material breakdown for at least 95% of the product weight? (Y/N)	Y
Service life of the product (years)	15
Type of refrigerant	N/A
Refrigerant GWP	N/A
Energy consumption of the factory per unit of product (kWh)	5.15
Location of manufacture	Japan
Product Complexity	Category 3: High

les.mitsubishielectric.co.uk


Ventilation | TM65 Calculation

MITSUBISHI ELECTRIC

LGH-100RVX-E

CIBSE TM65 Embodied Carbon Mid-level Calculation

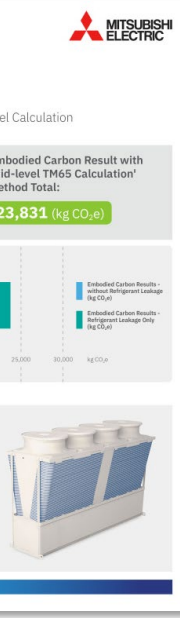
Embodied Carbon Results Breakdown (kg CO_2e)	
A1: Material extraction	237
A2: Transport	43
A3: Manufacturing	9
A4: Transport to Site	13
B1: Use	N/A
B3: Repair	30
C1: Deconstruction	N/A
C2: Transport	1
C3: Waste Processing	1
C4: Disposal	0.23

Embodied Carbon Results - without Refrigerant Leakage (kg CO_2e)	
A1-C4 (excluding B1,C1)	334
A1-C4 with Buffer Factor (excluding B1, C1)	435

Embodied Carbon Result - Refrigerant Leakage Only (kg CO_2e)	
B1 (Refrigerant leakage during use) + C1 (Refrigerant leakage end of life)	-

Assumptions	
A1: Material carbon coefficient source	TM65 Table 2.1 & The ICE Database
B1: Refrigerant annual leakage rate (%)	N/A
C1: Refrigerant end of life recovery rate (%)	N/A
B3: Materials replaced as part of repair (%)	10 (TM65 Assumption)
C4: Percentage of product going to landfill (%)	60 (TM65 Assumption)

Telephone: 01707 282880
email: embodied.carbon@meuk.mee.com
les.mitsubishielectric.co.uk


Chillers | TM65 Calculation

MITSUBISHI ELECTRIC

EAHV-M1500YCL-N

CIBSE TM65 Embodied Carbon Mid-level Calculation

Assesment Date:	10th June 2021
Assessor / Organisation:	Mitsubishi Electric
Contact:	embodied.carbon@meuk.mee.com

Embodied Carbon Result with 'Mid-level TM65 Calculation' Method Total:

23,831 (kg CO_2e)

EAHV-M1500YCL-N - Product Information

Type of product	A2W Heat Pump
Capacity of equipment (kW)	150
Product weight (kg)	1280
Material breakdown for at least 95% of the product weight? (Y/N)	Y
Service life of the product (years)	15
Type of refrigerant	R32
Refrigerant GWP	675
Energy consumption of the factory per unit of product (kWh)	14.95
Location of manufacture	Japan
Product Complexity	Category 3: High

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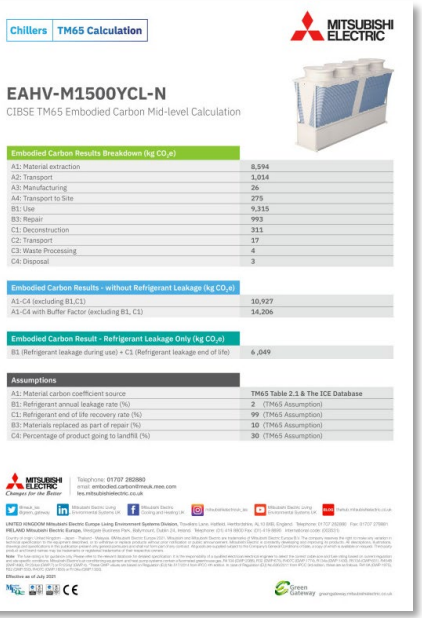
Chillers | TM65 Calculation

MITSUBISHI ELECTRIC

EAHV-M1500YCL-N

CIBSE TM65 Embodied Carbon Mid-level Calculation

Embodied Carbon Results Breakdown (kg CO_2e)	
A1: Material extraction	8,594
A2: Transport	1,014
A3: Manufacturing	26
A4: Transport to Site	275
B1: Use	9,315
B3: Repair	993
C1: Deconstruction	311
C2: Transport	17
C3: Waste Processing	4
C4: Disposal	3

Embodied Carbon Results - without Refrigerant Leakage (kg CO_2e)	
A1-C4 (excluding B1,C1)	10,927
A1-C4 with Buffer Factor (excluding B1, C1)	14,206

Embodied Carbon Result - Refrigerant Leakage Only (kg CO_2e)	
B1 (Refrigerant leakage during use) + C1 (Refrigerant leakage end of life)	6,049

Assumptions	
A1: Material carbon coefficient source	TM65 Table 2.1 & The ICE Database
B1: Refrigerant annual leakage rate (%)	2 (TM65 Assumption)
C1: Refrigerant end of life recovery rate (%)	99 (TM65 Assumption)
B3: Materials replaced as part of repair (%)	10 (TM65 Assumption)
C4: Percentage of product going to landfill (%)	30 (TM65 Assumption)

Telephone: 01707 282880
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ON THE ROAD TO NET ZERO

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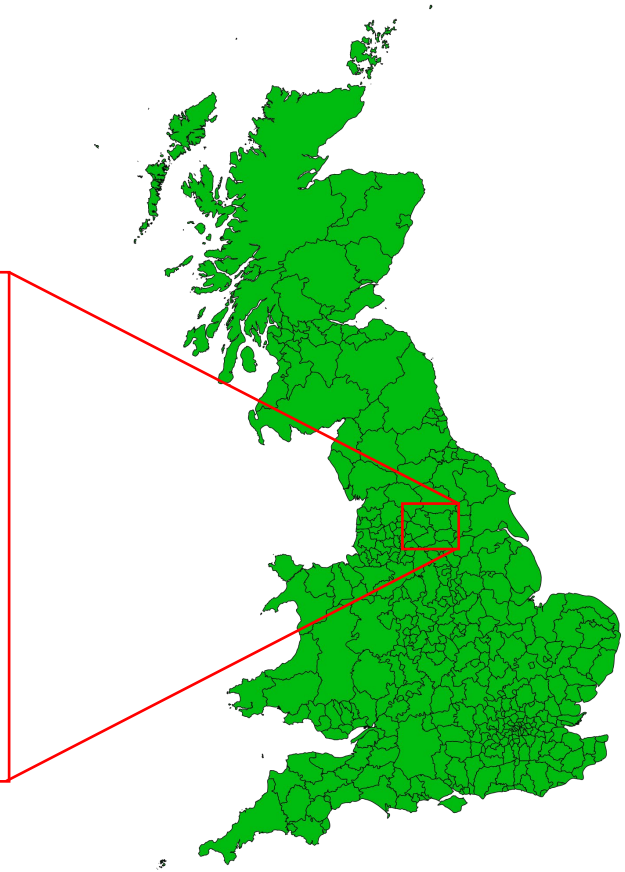
What Does This Mean In Our Region?

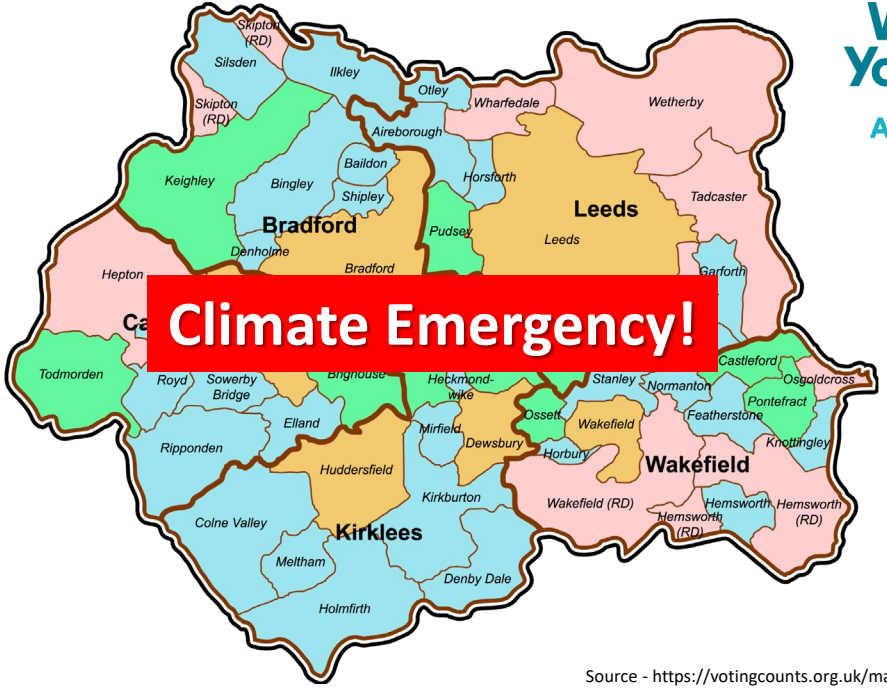
Chris Newman
Net Zero Design Manager

West Yorkshire



Local Authority Declarations

West Yorkshire Combined Authority has declared a climate emergency.

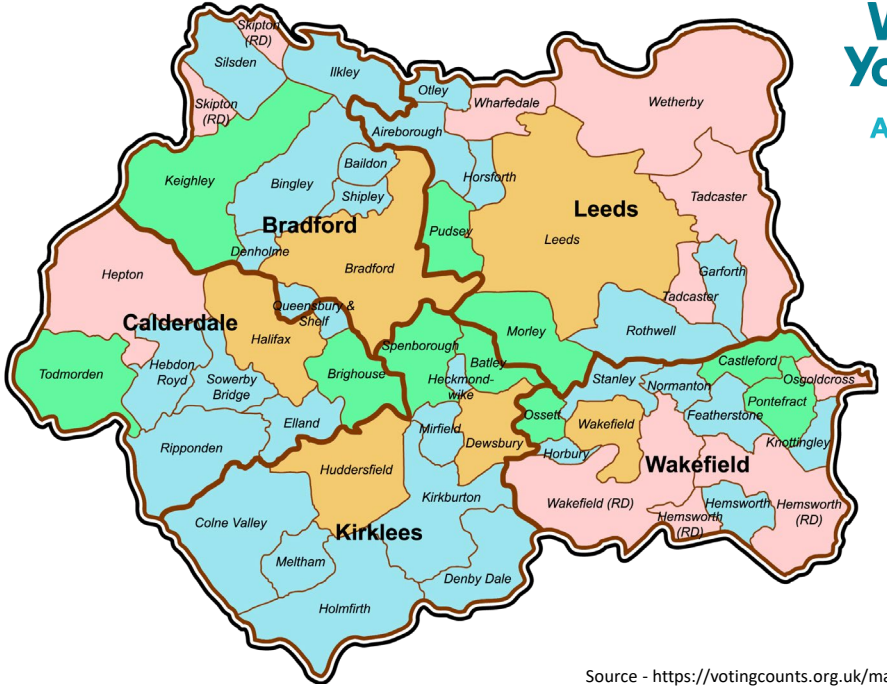


Source - https://votingcounts.org.uk/mayor-of-west-yorkshire

Local Authority Declarations

West Yorkshire Combined Authority has also set a science- based target to be **Net Zero Carbon by 2038**.

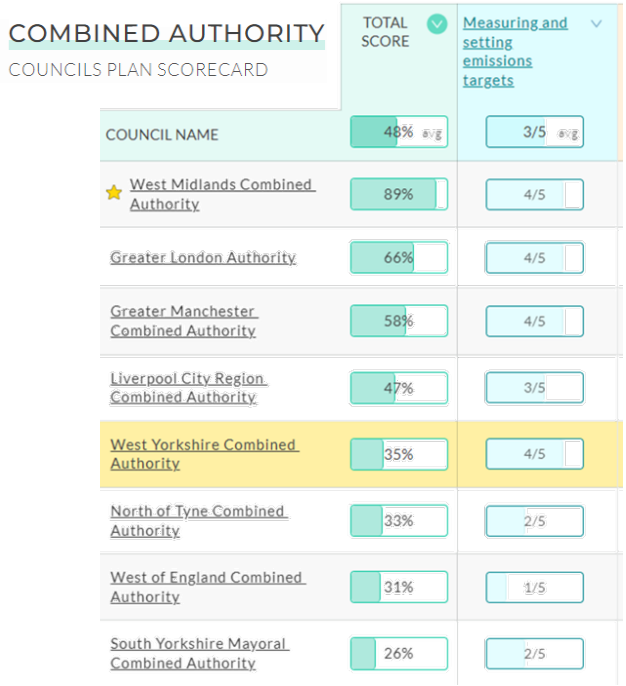
(With “significant progress” by 2030)



West Yorkshire Combined Authority

Source - https://votingcounts.org.uk/mayor-of-west-yorkshire

Local Authority Declarations



COMBINED AUTHORITY

COUNCILS PLAN SCORECARD

COUNCIL NAME	TOTAL SCORE	Measuring and setting emissions targets
	48% avg	3/5 avg
★ West Midlands Combined Authority	89%	4/5
Greater London Authority	66%	4/5
Greater Manchester Combined Authority	58%	4/5
Liverpool City Region Combined Authority	47%	3/5
West Yorkshire Combined Authority	35%	4/5
North of Tyne Combined Authority	33%	2/5
West of England Combined Authority	31%	1/5
South Yorkshire Mayoral Combined Authority	26%	2/5

All 5 Local Authorities have declared Climate Emergencies

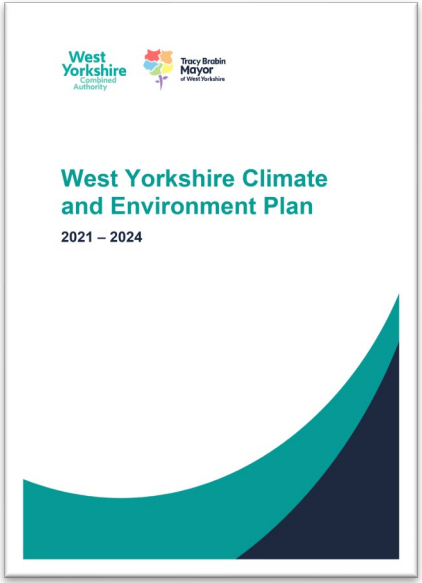
CLIMATE EMERGENCY UK

Rank	Name of local authority	Type of local authority	Score
1	Somerset West and Taunton Council	Non-metropolitan district	0.91
2	West Midlands Combined Authority	Combined authority	0.89
3	Manchester City Council	Metropolitan district	0.87
4	Staffordshire Moorlands District Council	Non-metropolitan district	0.87
5	Solihull Metropolitan Borough Council	Metropolitan district	0.85
6	City of Edinburgh Council	Scottish unitary authority	0.83
7	Newcastle City Council	Metropolitan district	0.82
8	London Borough of Hammersmith & Fulhan	London borough	0.81
9	Wiltshire Council	Unitary authority	0.81
29	Leeds City Council	Metropolitan district	0.71
86	Wakefield Metropolitan District Council	Metropolitan district	0.59
230	West Yorkshire Combined Authority	Combined authority	0.35
253	Calderdale Metropolitan Borough Council	Metropolitan district	0.3
279	City of Bradford Metropolitan District Coun	Metropolitan district	0.23
364	Kirklees Council	Metropolitan district	0

Source; climate emergency UK https://councilclimatescorecards.uk/scoring/combined/

Climate & Environment Plan

West Yorkshire has committed to being a net zero economy by 2038.



The plan has 8 themes for action:

1. Leadership
2. Cross-Cutting
2. Transport
4. Sustainable Homes
5. Business & Industry
6. Energy Generation, Supply & Flexibility
7. Natural Environment
8. Climate Ready

Climate & Environment Plan

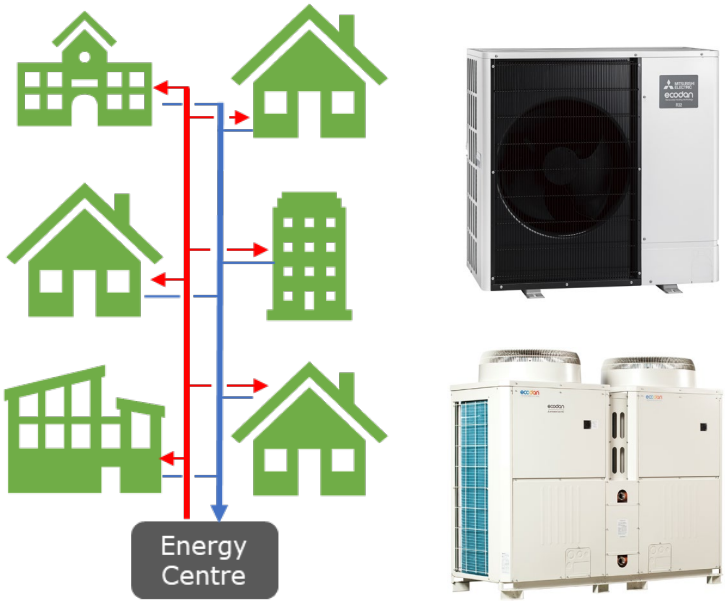
6. Energy Generation, Supply & Flexibility

EG03 Heat Decarbonisation

We will identify the suitable locations for the implementation of different heat decarbonisation technologies and explore mechanisms to accelerate their implementation.

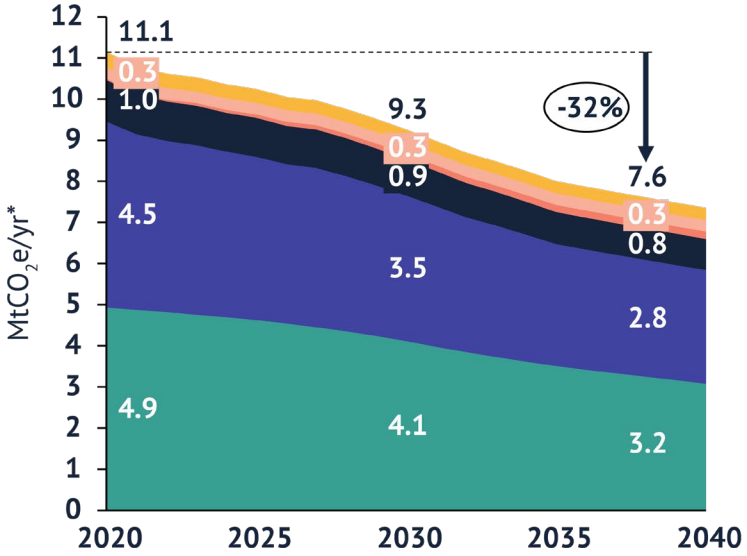
We will do this by:

- Considering the case for establishing a dedicated team focused on the decarbonisation of heat across homes and businesses.
- Refreshing our approach to the delivery of district heat networks.
- Establishing new programmes relating to heat pumps.
- Developing and implementing a heat decarbonisation hierarchy for inclusion, as appropriate, in Local Plans across the region.
- Developing heat zoning plans for West Yorkshire that could be applied to new and existing developments via local planning policy.

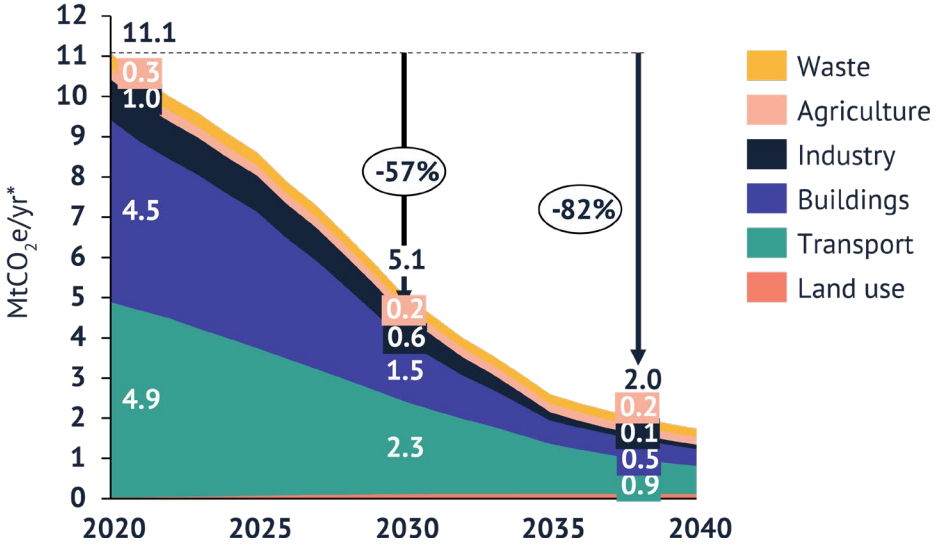


Emissions Pathways

Baseline pathway (i.e. do nothing) results in **32% emissions reduction**.



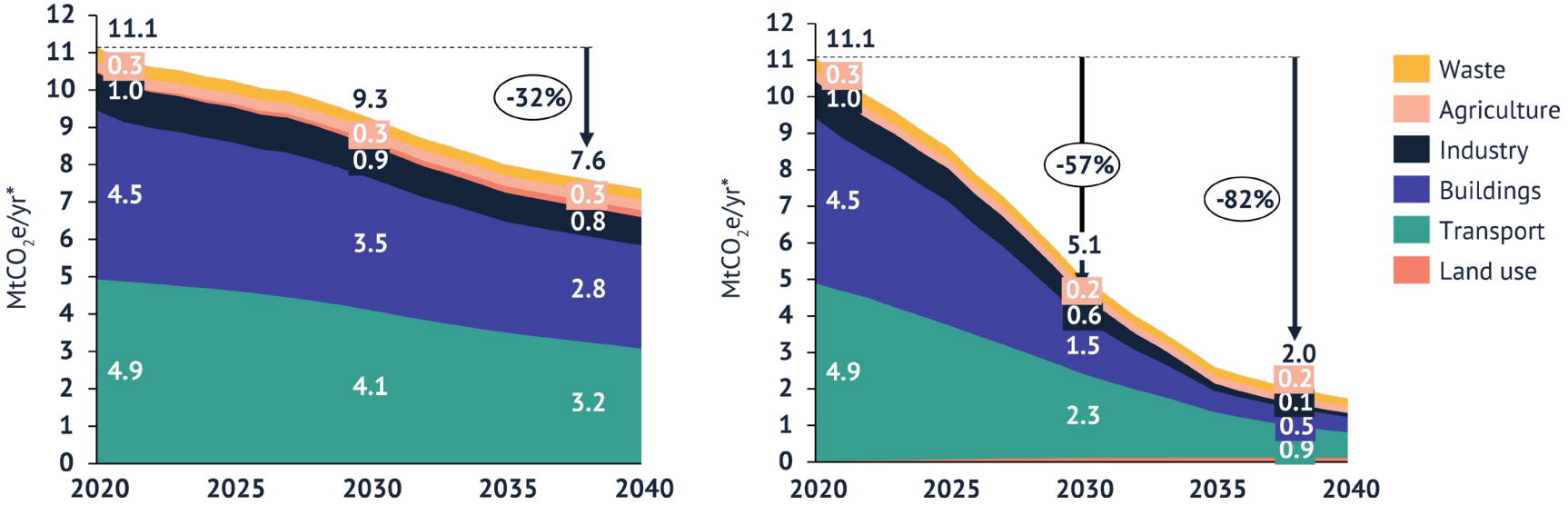
Maximum ambition pathway (i.e. do everything) results in **83% emissions reduction**.



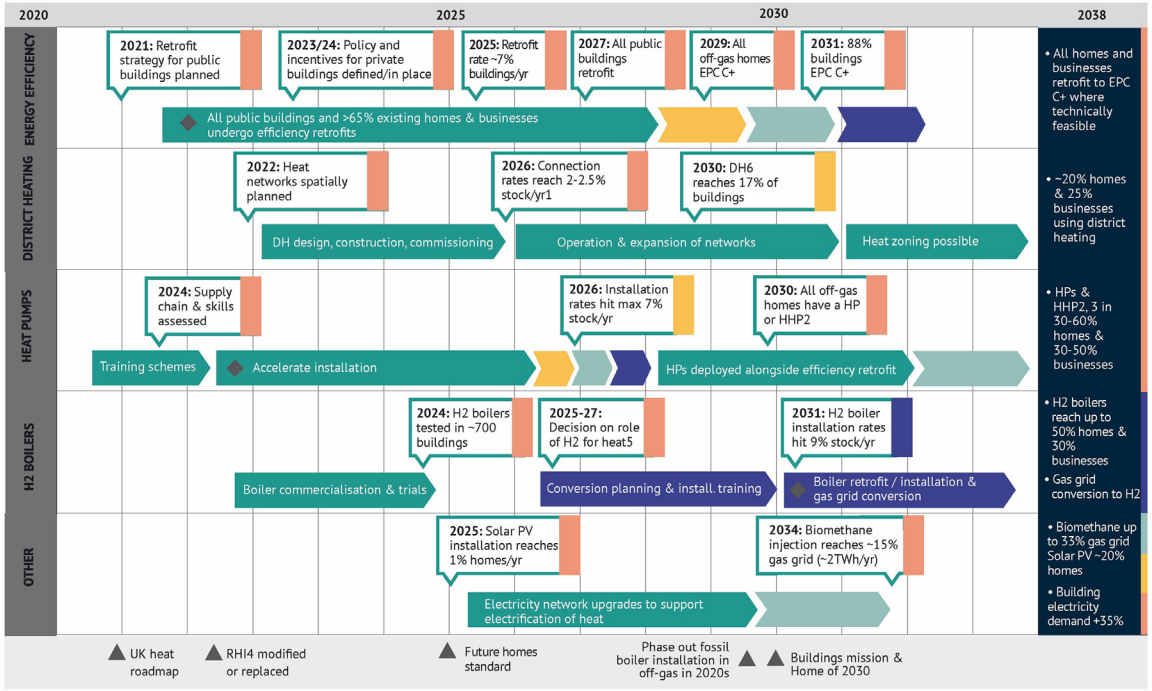
Emissions Pathways

No emissions pathway has been chosen

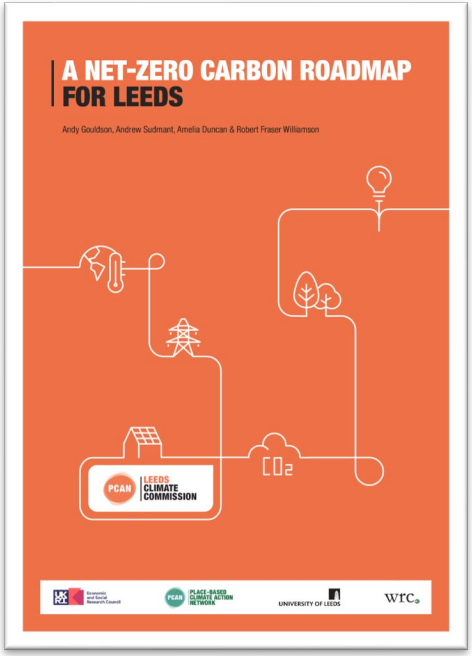
(due to national decisions and further research required)

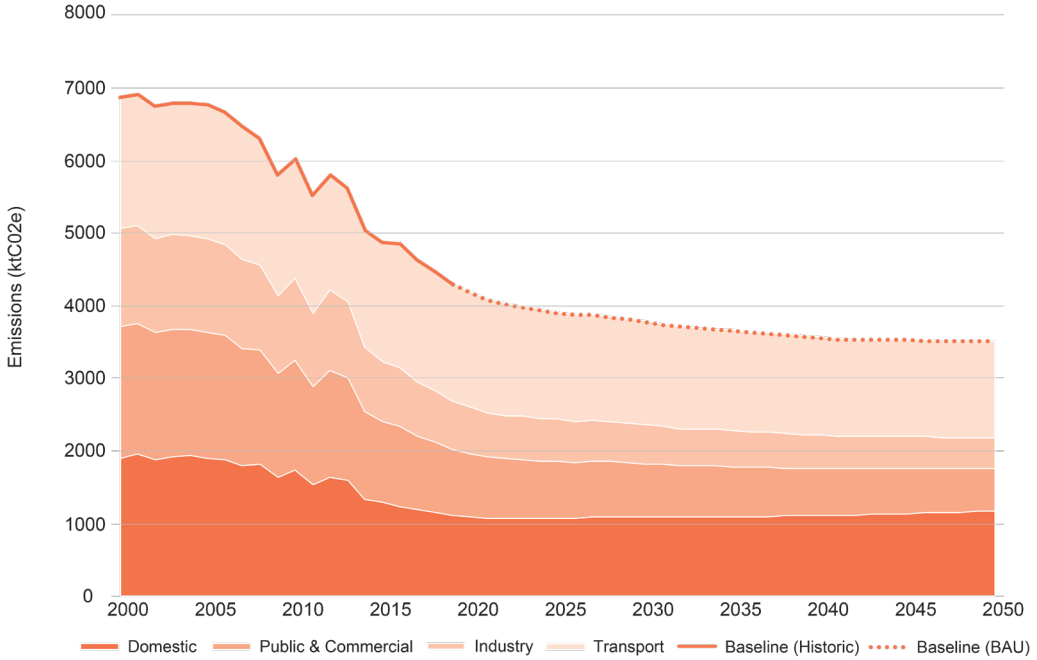


Climate & Environment Roadmap

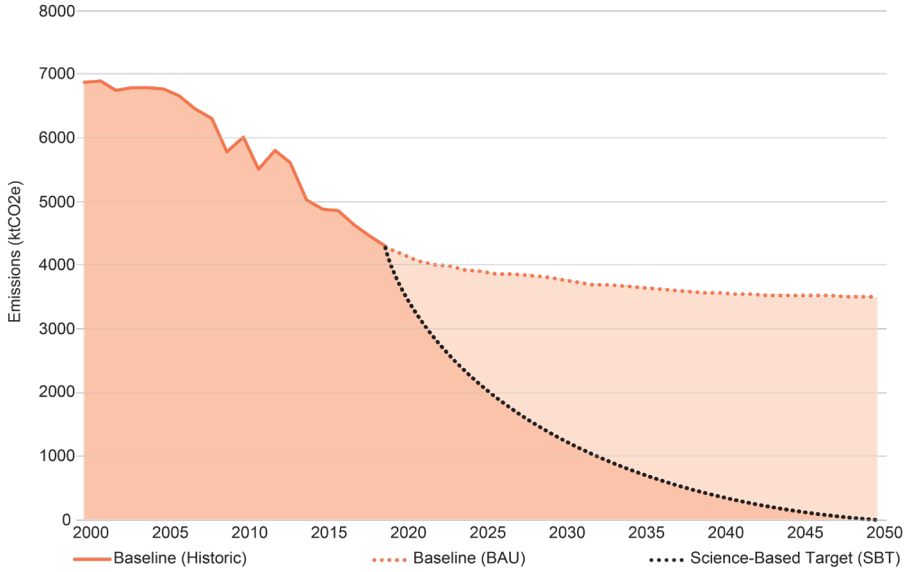


Leeds Zero Carbon Roadmap





Leeds Zero Carbon Roadmap



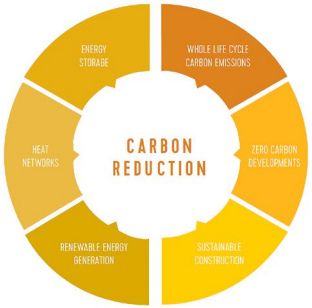
		2025	2030	2035	2040	2045	2050
Cumulative Investment (£M)	**CE**	3,175	5,272	5,484	5,538	5,542	5,542
	CN	5,257	8,329	8,641	8,716	8,719	8,719
	TP	6,740	10,919	11,280	11,355	11,359	11,359

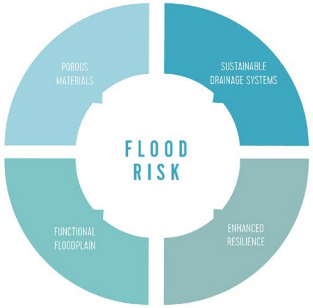
Cost Effective **Cost Neutral** **Technically Possible**

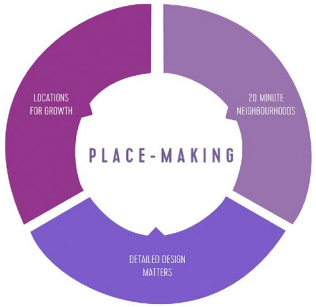
Measure	Floorspace Applied (m^2)	Mean Annual Rate of Installation (m^2)
Office Lighting Upgrades	1,824,991	102,310
Lighting/Heating Controls and Sensors	7,253,707	418,900
Retail Heating Upgrades	7,032,178	410,809
Wind Turbines	4,023,813	223,545
Office Fabric Improvements	1,779,828	102,042
Office Solar PV	612,517	34,617
Office Heat Pumps	612,517	34,547

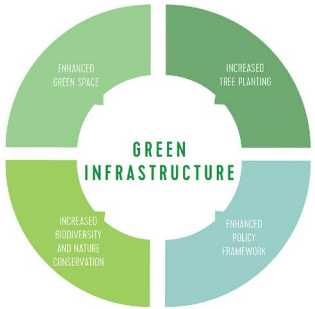
Table 7 (b): Leeds' Sectoral Emissions Reduction KPIs for Public & Commercial Buildings

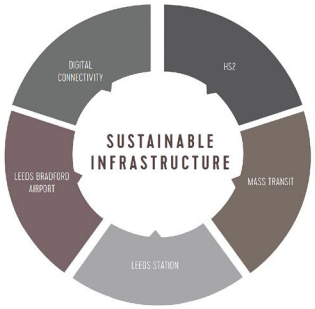
Leeds Local Plan (Draft)







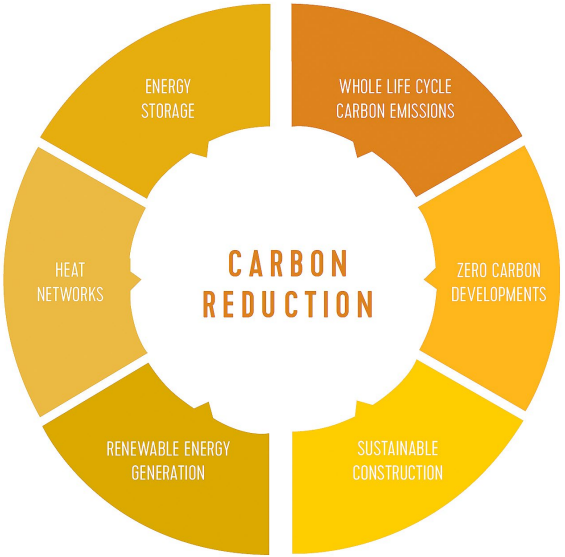




“We’re keen to explore policy options that will deliver zero carbon developments”

Leeds Local Plan (Draft)

“To minimize energy demand and meet all heat and power requirements without increasing carbon emissions”



Topic Area	Policy Areas Covered
Carbon Reduction	• Whole life carbon costs for buildings • Reducing carbon emissions from buildings • Sustainable construction • Resilience to Heat • Renewable energy generation • Heat networks • Energy storage

- We want new developments to measure carbon emissions across the whole life cycle of a building.
- We want new buildings to be sustainable constructed and be zero carbon.
- We want to ensure we've delivered enough renewable and low carbon energy to meet zero carbon aspirations.

Leeds Local Plan (Draft)

Rationale for an Enhanced Policy Framework

We want to influence the following elements of whole life cycle net zero carbon;

1. Reduce construction impacts through whole life carbon assessment.
2. Reduce operational energy use through improvements in the energy efficiency of buildings.
3. Increase renewable energy supply.
4. Off-set any remaining carbon.

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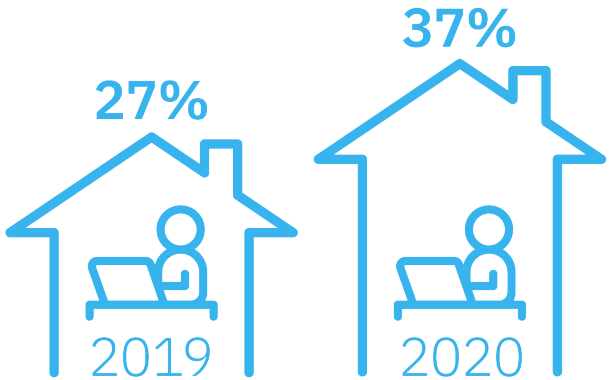
The Future Of Offices

Mike Egan
Corporate Solutions
Business Development Manager

- Work patterns
- Office space
- Building services
- Net Zero Carbon



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3000 workers

78%

78% prefer to work in the office for two days or less each week

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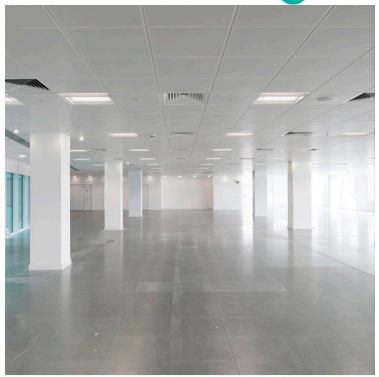
- **Hybrid** working
- “Hub and Spoke”
- Net Zero challenges

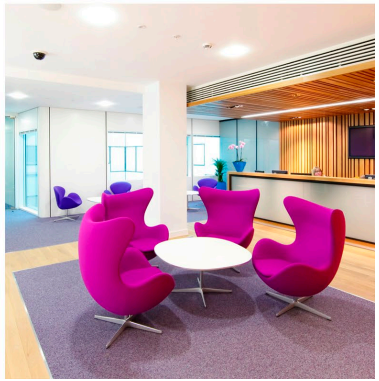
- **Flexible** office space
- Access to **technology**
- Health and **wellbeing**

- Energy efficiency
- Renewable
- Low carbon
- NABERS

- HVAC equipment
- Connectivity

- Air conditioning
- Flexible systems
- Lower GWP refrigerant





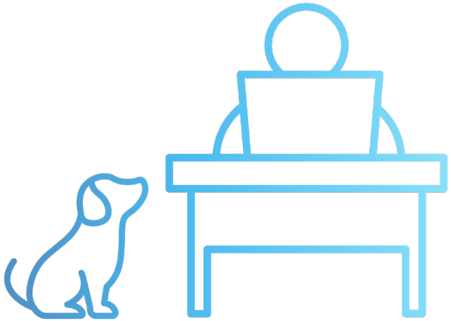
- IAQ
- Ventilation
- Filtration
- Monitoring

- DHW

- More technology
- Business critical
- IT Cooling

- Importance of controls
- Remote monitoring
- Energy apportioning
- Energy usage patterns

- Home office
- Increased CoL
- Residential solutions



- Achievable **now**
- Future proof
- Collaboration

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Decarbonising Heat

James Chaplen
Senior Product Manager

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What Could Net Zero Mean For Commercial Heating?

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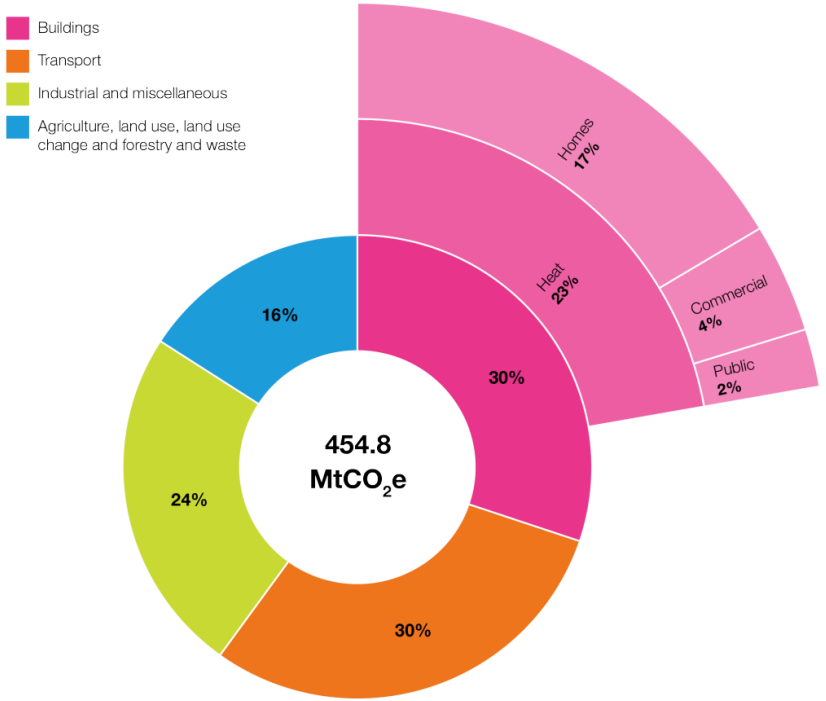
A Significant CO_2 Contributor

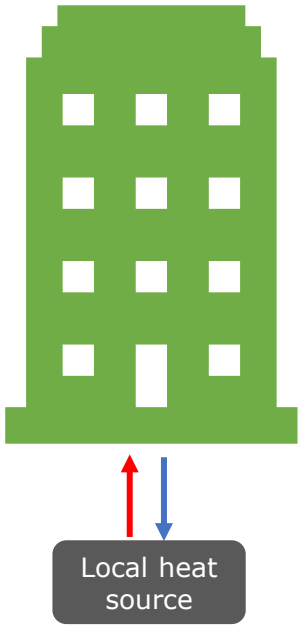
Heating our buildings account for **23%** of all UK emissions.

Significant potential savings can be made with low carbon technologies.



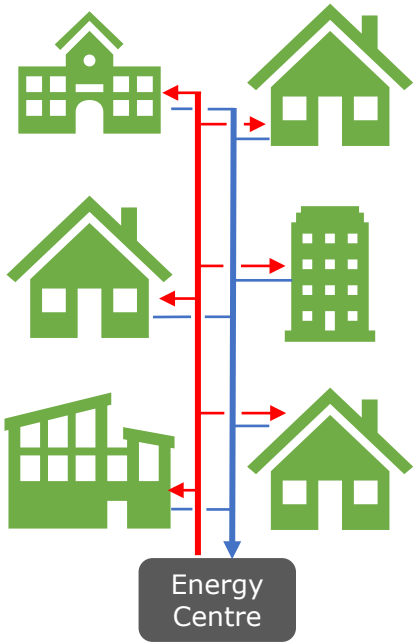
Application Types

Local delivery



- Heat is delivered to a single building using local sources.
- Various types of technologies.

Heat Networks

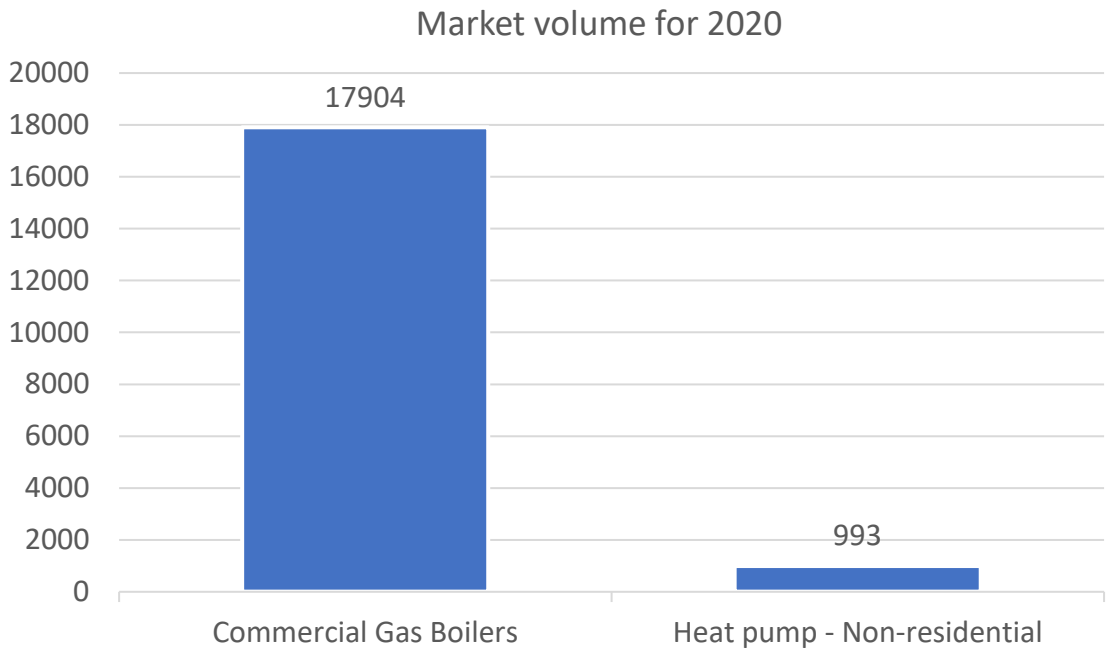


- Heat is delivered to multiple buildings from a single centre.
- Various types and designs depending on temperatures.
- Currently a small part of the market but set to grow.

The Big Drivers Now

- Interim changes to building regs
- Changes to SAP
- Public decarbonisation fund
- Heat network investment fund
- Mounting client awareness

Market Volumes

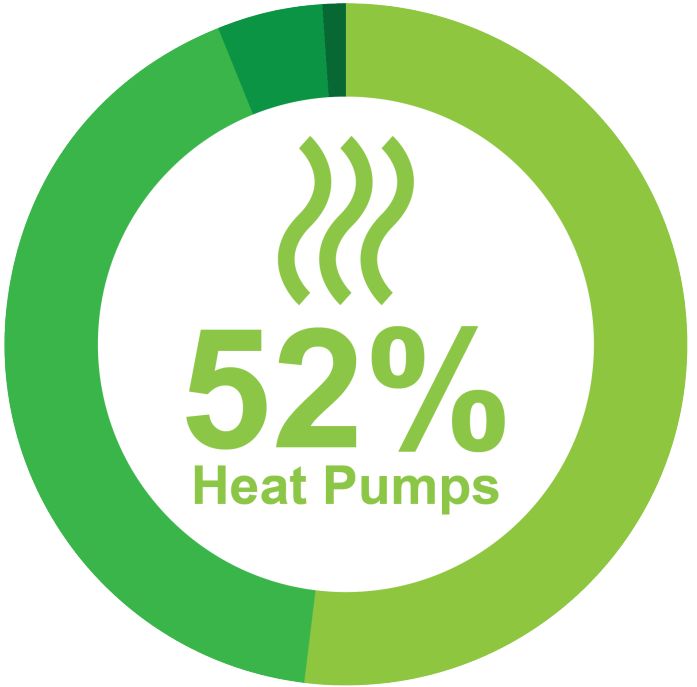


- From 2020 to 21 commercial heat pumps saw a 75% increase to 1747 units.
- Huge change needed to move this market to low carbon technologies.

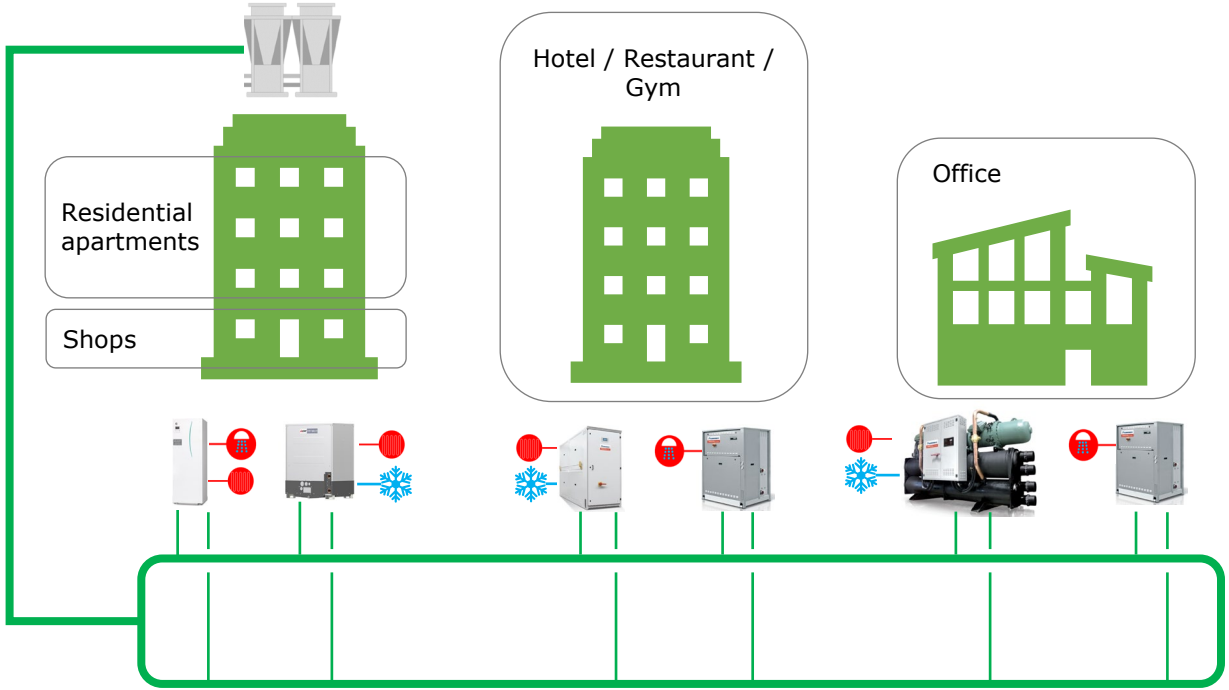
What Could This Market Look Like?

By 2050, the CCC believes that all UK heat demand should be met by low-carbon sources.

- **Heat pumps 52%**
- **District heating 42%**
- **Hydrogen boilers 5%**
- **New direct electric heating 1%**



A Vision For The Future



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Digital Future Of HVAC

Manny Lal
Product Manager,
Controls & Innovations

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Visibility And Awareness

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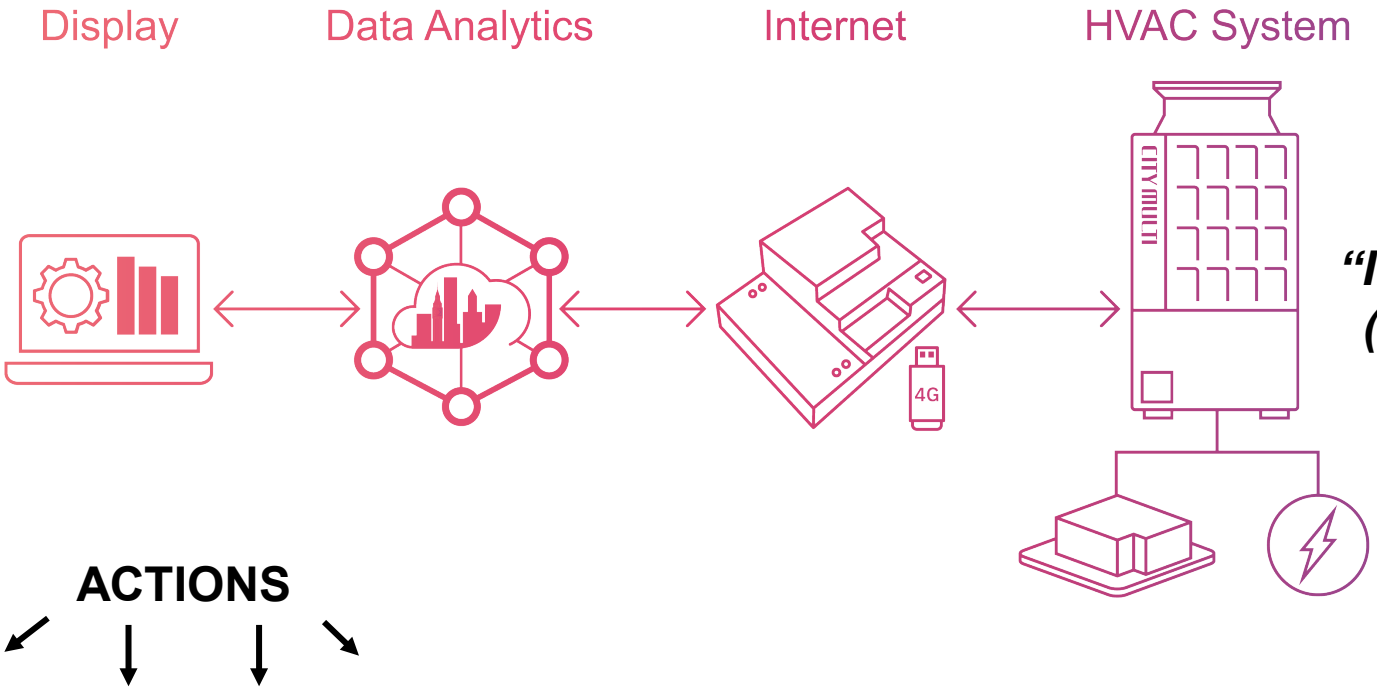
Digital HVAC - What Is It?



"Internet of Things (IoT) movement"

Insight And Knowledge

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Control + Monitor + Energy + Engineering Assistance*

Analytics + Automated Health Check + Engineering Assistance*

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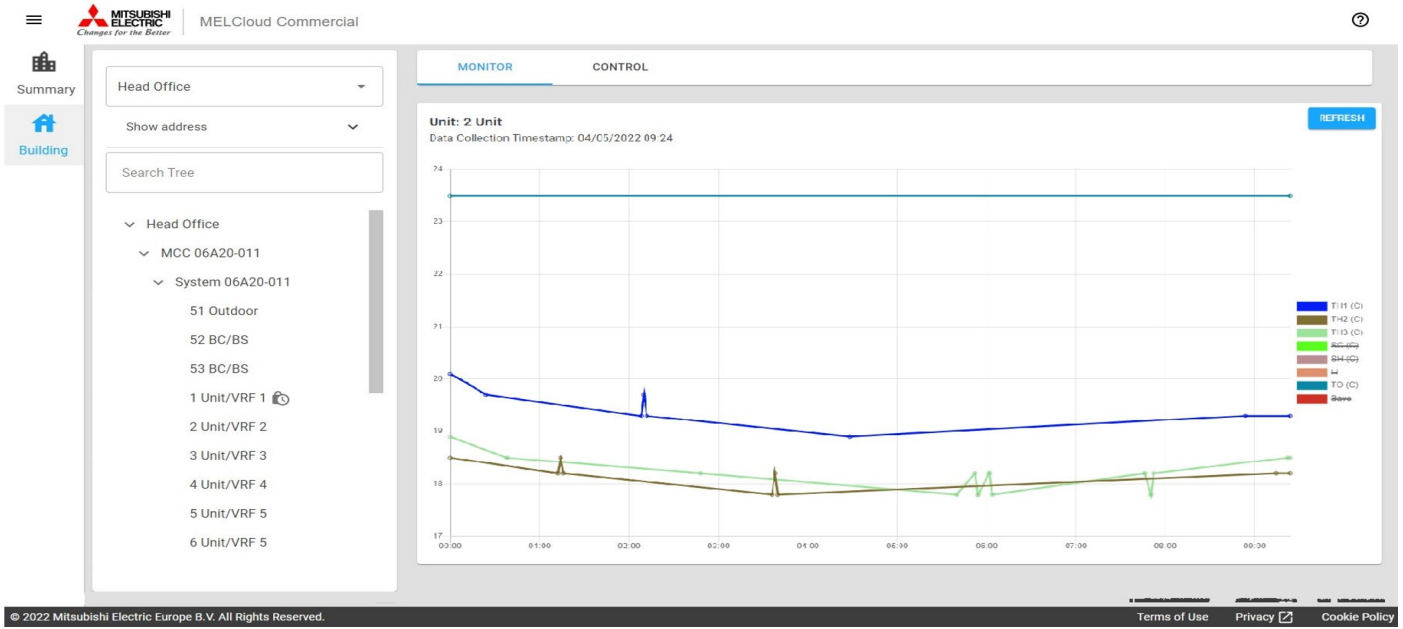
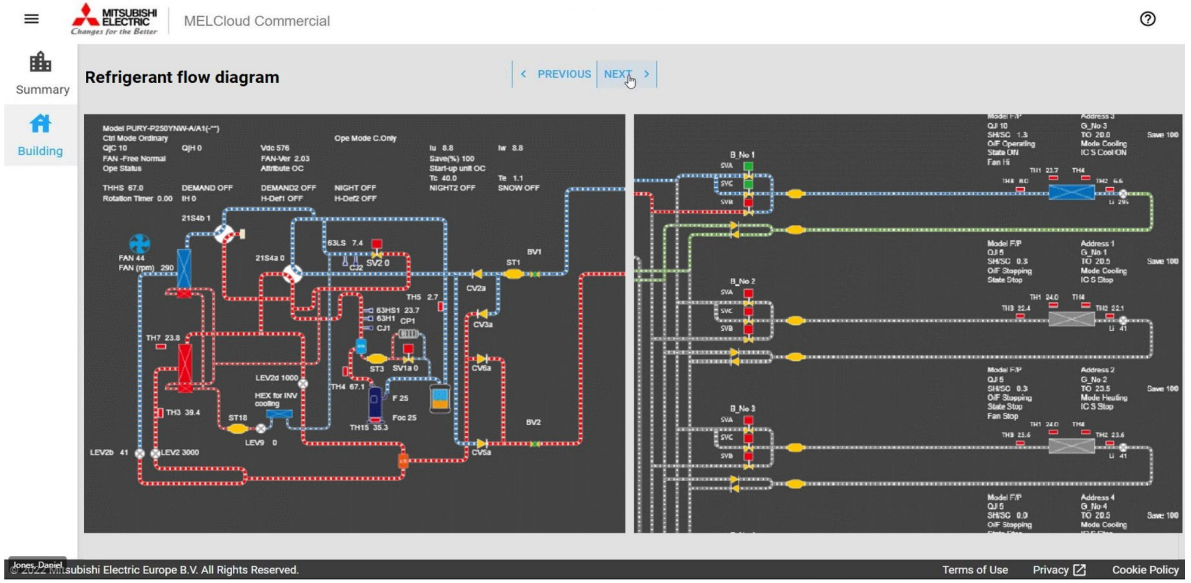
Insight And Knowledge

MELCloud COMMERCIAL

Monitor And Analyse System And Building Data



Wasted Energy Through Faults



Improved Service

Engineers can carry out their work more efficiently, accurately and to higher standards

Service history

Overview of operation of a unit and its application within a wider system

Access product information, for parts ordering and replacement

Smart Buildings. Smart Cities.

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Smarter, Together.

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