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

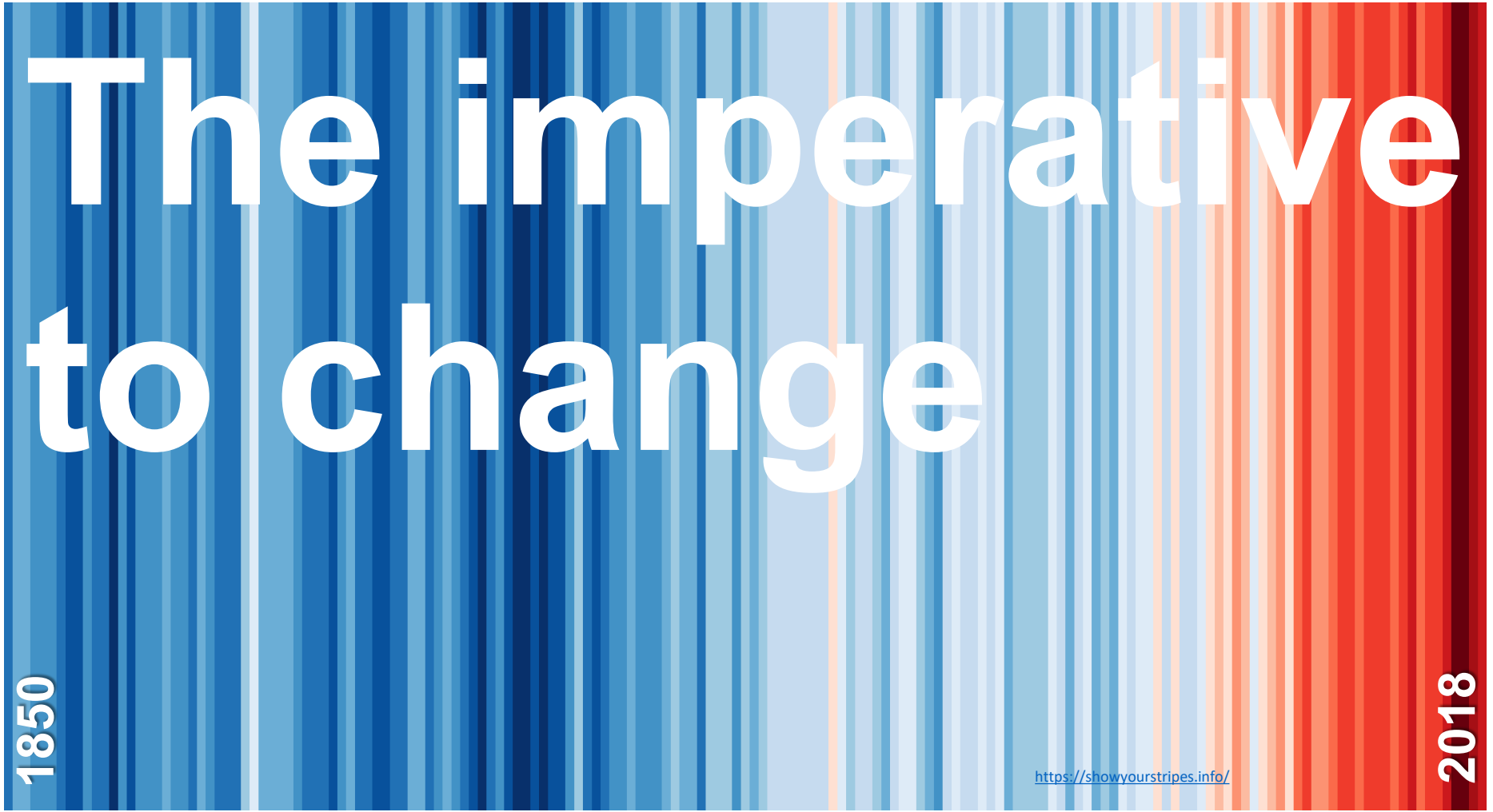
Phil Sloan
Business Manager
Branch Network

ON THE ROAD TO NET ZERO

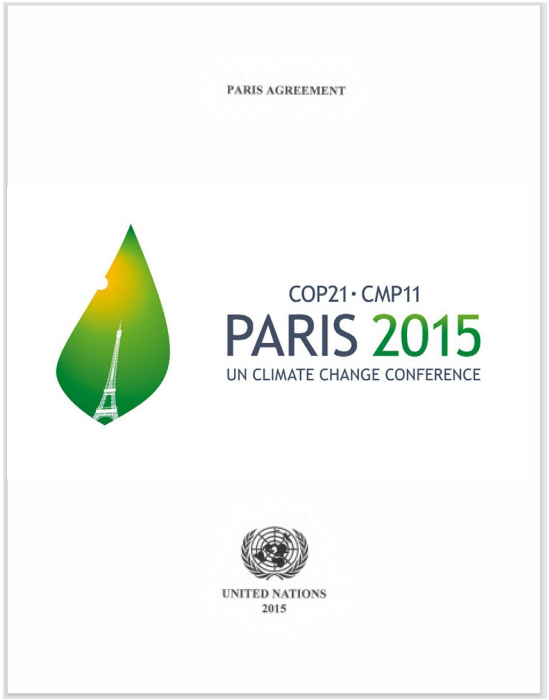
The Imperative To Change

Jack Bain
Sustainability Executive

The imperative to change



Global



United Nations Framework Convention on Climate Change

UK

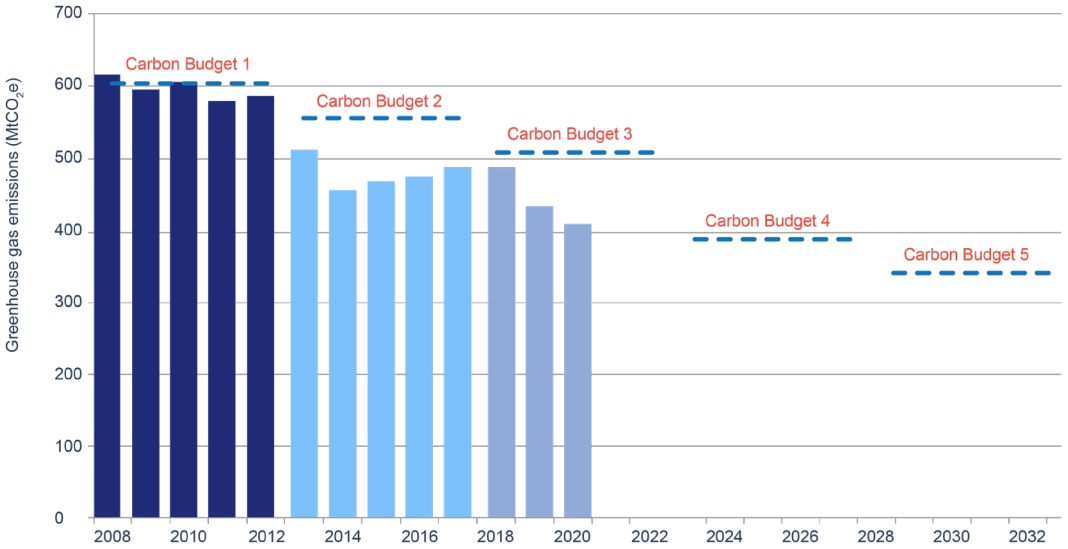
The Paris Agreement - global average temperature increase to well below 2°C, and to pursue efforts to limit the temperature increase to 1.5°C.

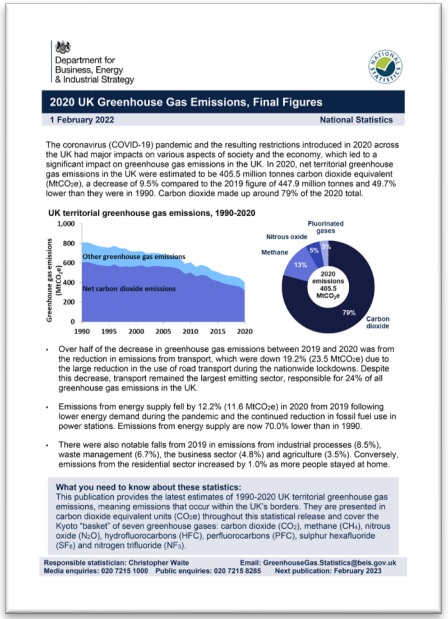
In its NDC (April 2021), the UK is committing to reduce economy-wide greenhouse gas emissions by at least 78% by 2035, compared to 1990 levels.

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

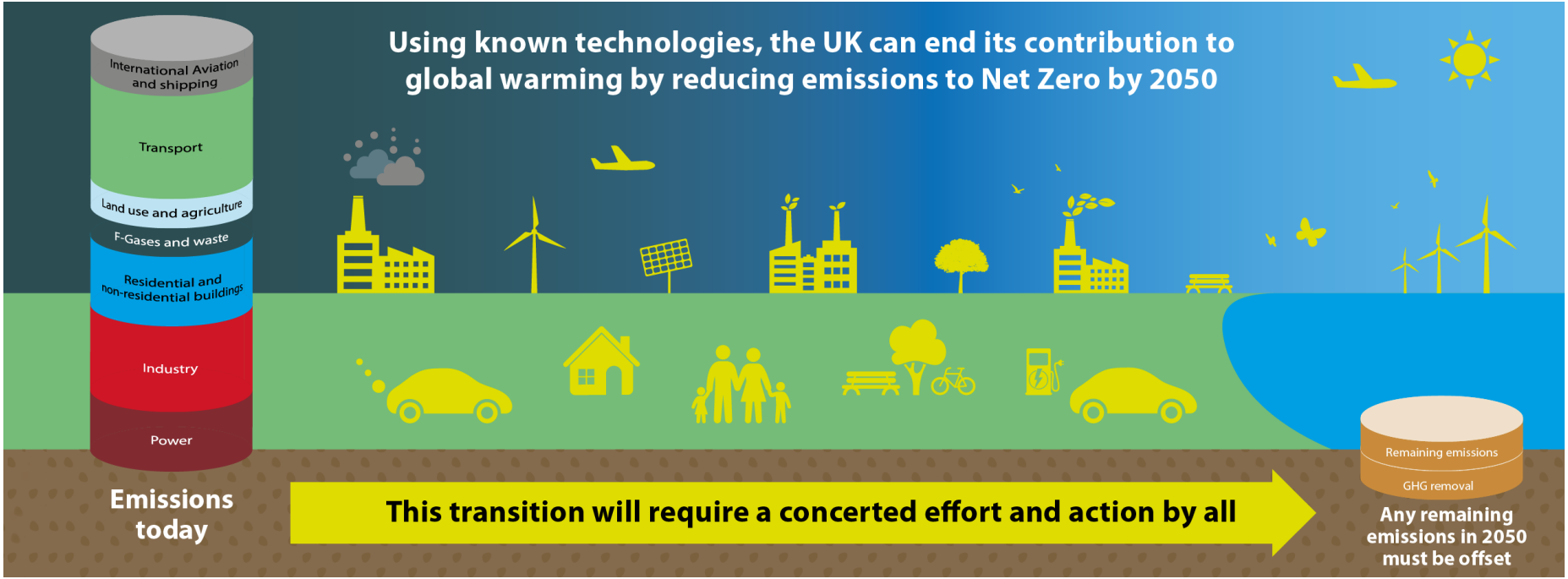
- Over half of the decrease in greenhouse gas emissions between 2019 and 2020 was from the reduction in emissions from transport, which were down 19.2% (23.5 $MtCO_2e$) due to the large reduction in the use of road transport during the nationwide lockdowns. Despite this decrease, transport remained the 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

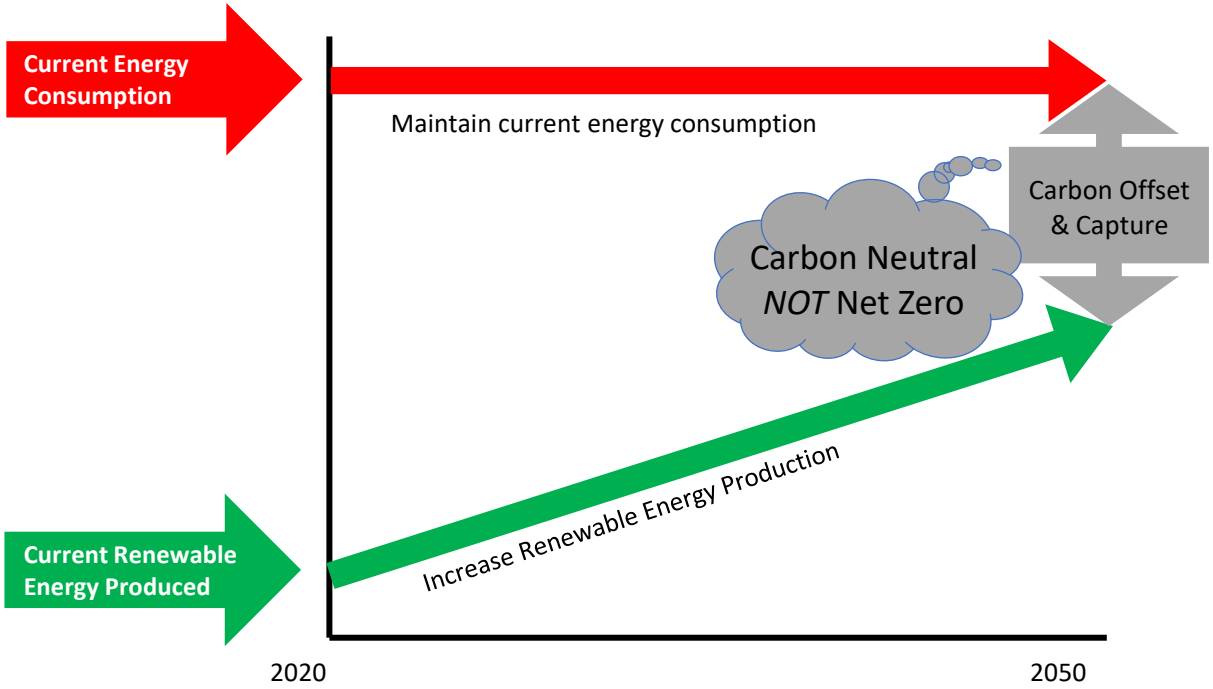
Source; 2020 UK Greenhouse Gas emissions, Final Figures - published February 2022 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachmentdata/file/1051408/2020-final-greenhouse-gas-emissions-statistical-release.pdf

What Is Net Zero?



Source – Climate Change Committee

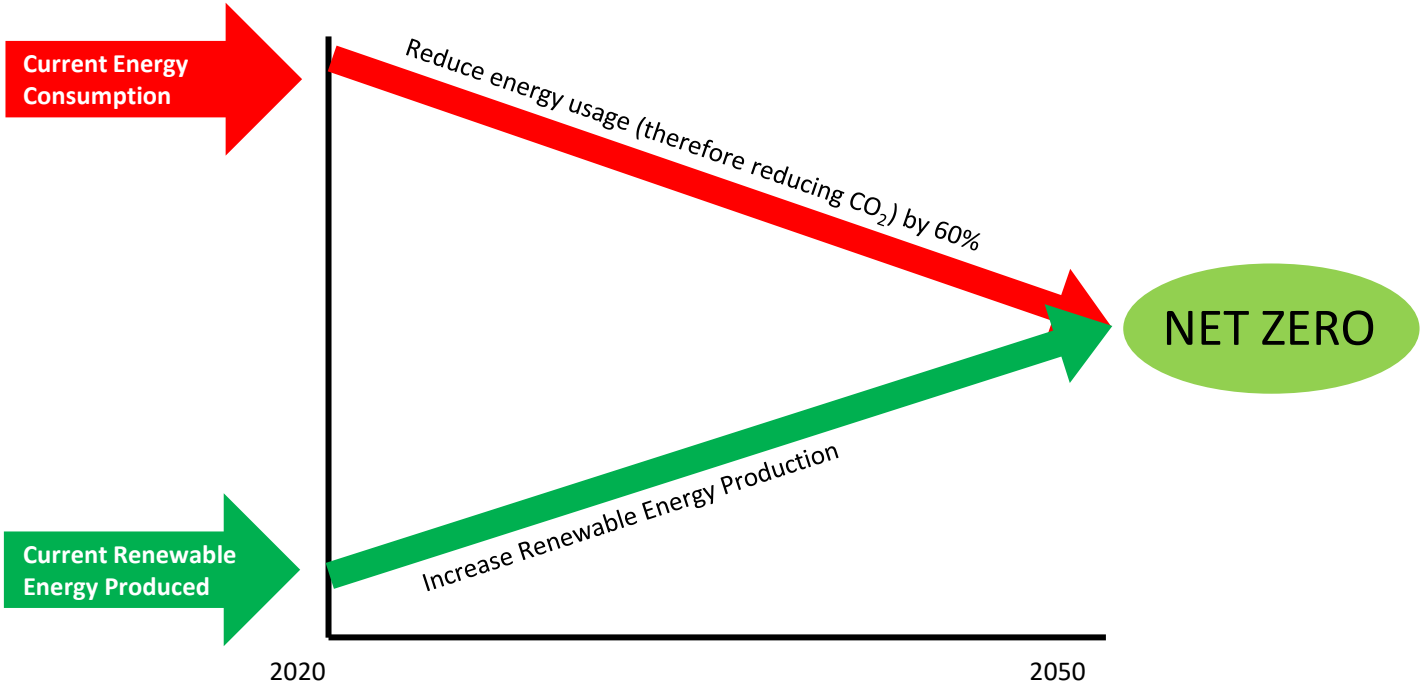
What Is Net Zero?



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

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Environmental Vision 2050

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

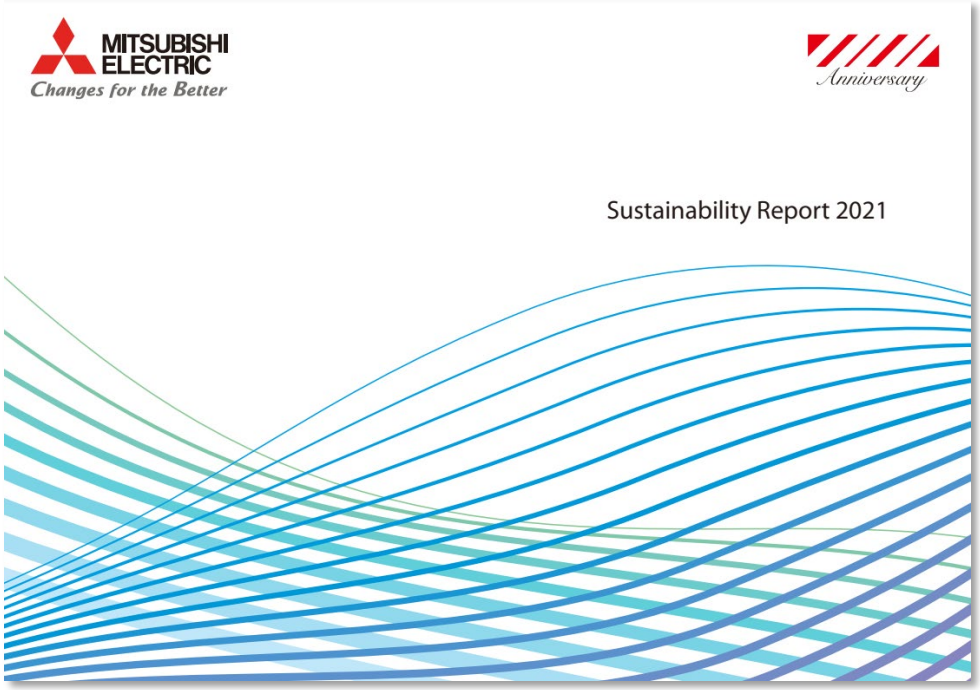
Environmental Sustainability Vision 2050

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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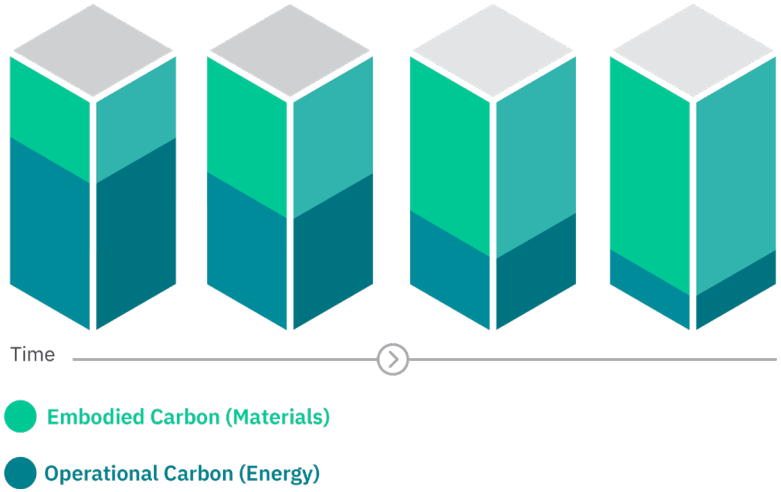
Whole Life Carbon

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:



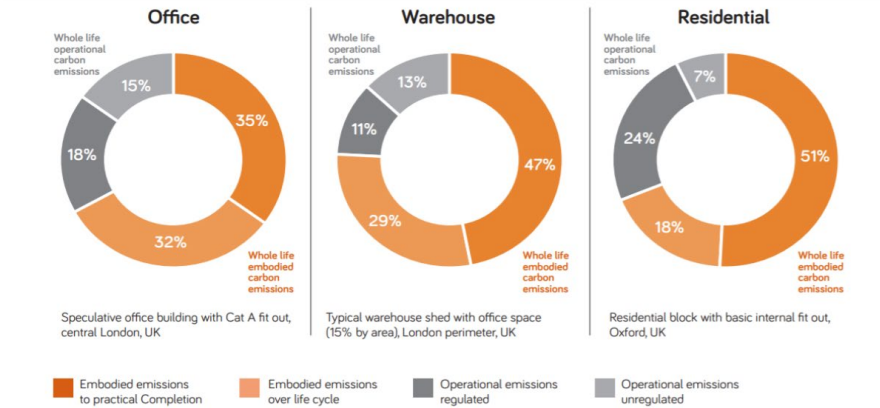


Image credit: from RIBA's *Embodied and whole life carbon assessment for architects*

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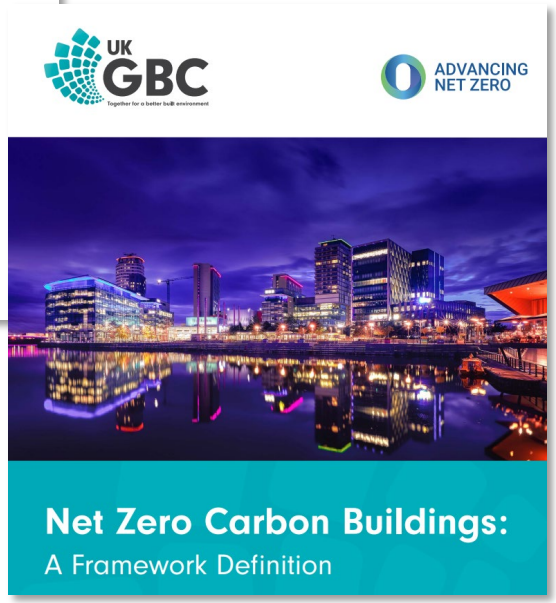
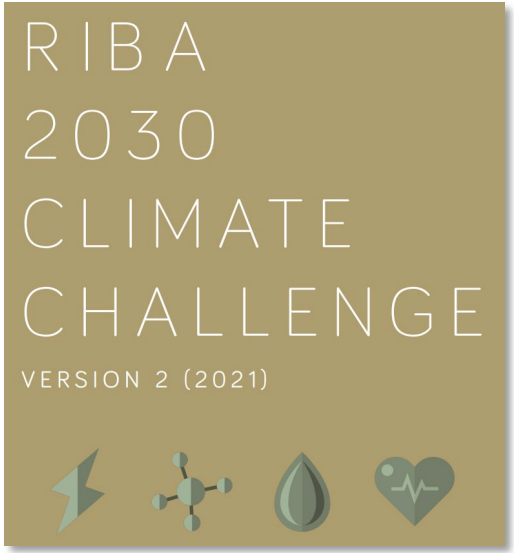
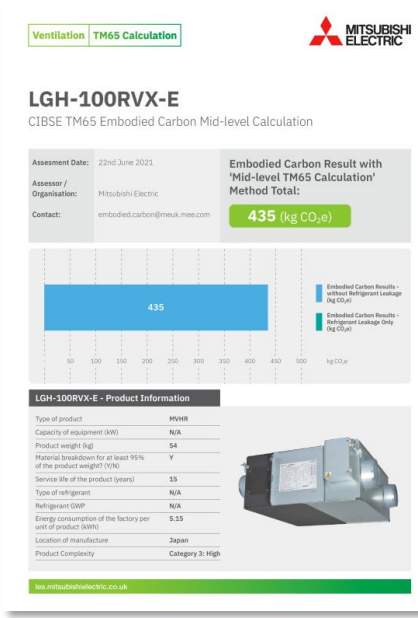
Lots Of Guidance





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

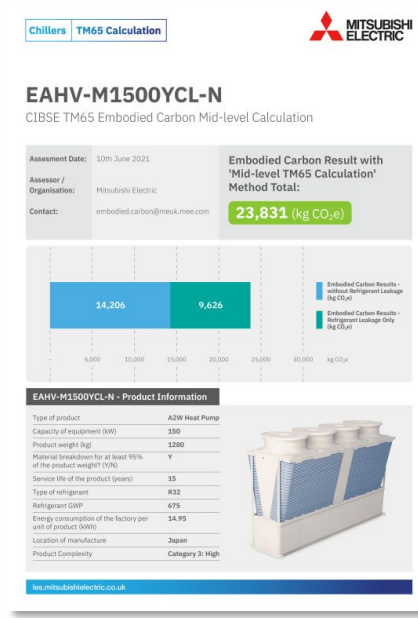
Embodied Carbon Result - Refrigerant Leakage Only (kg CO_2e)

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 (%)	30 (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 (%)	30 (TM65 Assumption)
C4: Percentage of product going to landfill (%)	30 (TM65 Assumption)

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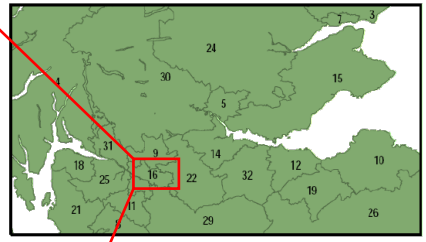
ON THE ROAD TO NET ZERO

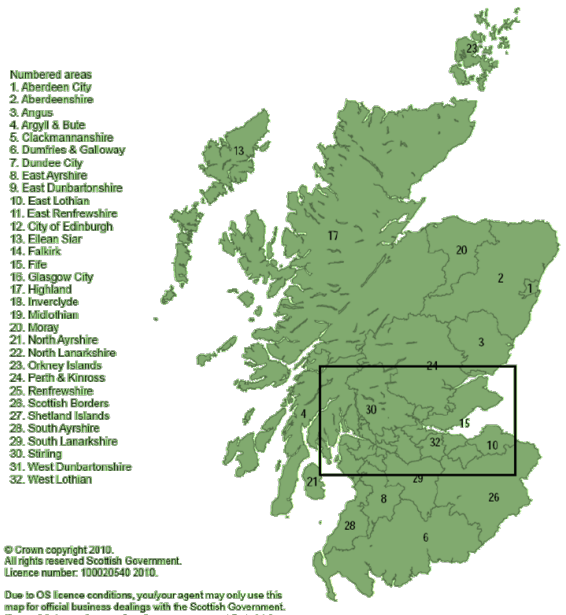
ON THE ROAD TO NET ZERO

What Does This Mean In Our Region?

Chris Newman
Net Zero Design Manager

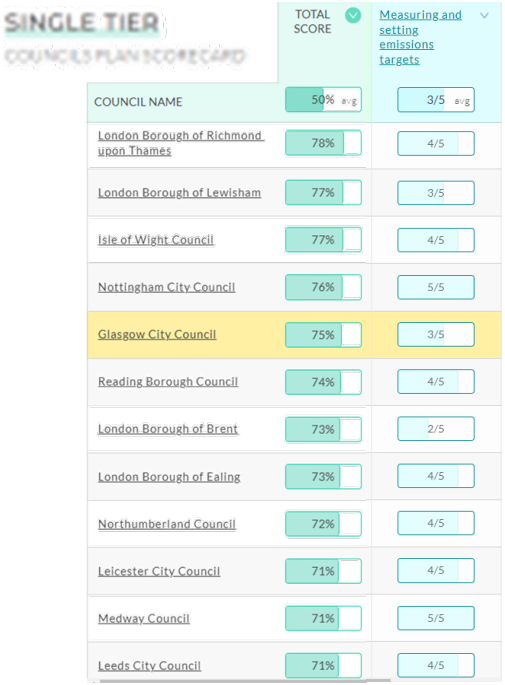
Glasgow





Numbered areas
1. Aberdeen City
2. Aberdeenshire
3. Angus
4. Argyll & Bute
5. Clackmannanshire
6. Dumfries & Galloway
7. Dundee City
8. East Ayrshire
9. East Dunbartonshire
10. East Lothian
11. East Renfrewshire
12. City of Edinburgh
13. Eilean Siar
14. Falkirk
15. Fife
16. Glasgow City
17. Highland
18. Inverclyde
19. Midlothian
20. Moray
21. North Ayrshire
22. North Lanarkshire
23. Orkney Islands
24. Perth & Kinross
25. Renfrewshire
26. Scottish Borders
27. Shetland Islands
28. South Ayrshire
29. South Lanarkshire
30. Stirling
31. West Dunbartonshire
32. West Lothian

Local Authority Declarations



SINGLE TIER COUNCILS PLAN SCORECARD

COUNCIL NAME	TOTAL SCORE	Measuring and setting emissions targets
	50% avg	3/5 avg
London Borough of Richmond upon Thames	78%	4/5
London Borough of Lewisham	77%	3/5
Isle of Wight Council	77%	4/5
Nottingham City Council	76%	5/5
Glasgow City Council	75%	3/5
Reading Borough Council	74%	4/5
London Borough of Brent	73%	2/5
London Borough of Ealing	73%	4/5
Northumberland Council	72%	4/5
Leicester City Council	71%	4/5
Medway Council	71%	5/5
Leeds City Council	71%	4/5

20 of 32 Scottish local authorities have declared climate emergencies

(Glasgow declared in May 2019)

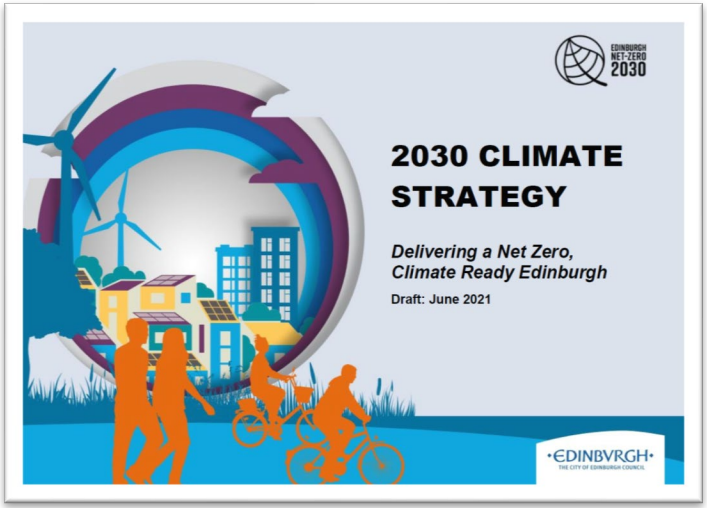
CLIMATE EMERGENCY UK

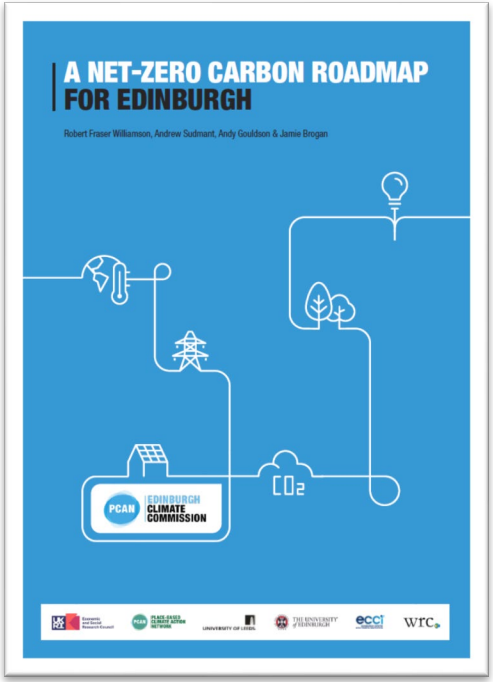
Source; climate emergency UK https://councilclimatescorecards.uk/scoring/combined/

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 & Fulham	London borough	0.81
9	Wiltshire Council	Unitary authority	0.81
10	South Gloucestershire Council	Unitary authority	0.8
21	Glasgow City Council	Scottish unitary authority	0.75
28	Fife Council	Scottish unitary authority	0.71
35	East Lothian Council	Scottish unitary authority	0.7
44	Perth and Kinross Council	Scottish unitary authority	0.66
52	Dundee City Council	Scottish unitary authority	0.64
102	East Dunbartonshire Council	Scottish unitary authority	0.56
104	West Dunbartonshire Council	Scottish unitary authority	0.56
124	North Lanarkshire Council	Scottish unitary authority	0.53
142	Midlothian Council	Scottish unitary authority	0.5
178	South Lanarkshire Council	Scottish unitary authority	0.44
184	West Lothian Council	Scottish unitary authority	0.43
198	South Ayrshire Council	Scottish unitary authority	0.41
108	The Moray Council	Scottish unitary authority	0.39
215	North Ayrshire Council	Scottish unitary authority	0.37
220	Aberdeen City Council	Scottish unitary authority	0.36
221	Argyll and Bute Council	Scottish unitary authority	0.36
232	East Ayrshire Council	Scottish unitary authority	0.34
286	Dumfries and Galloway Council	Scottish unitary authority	0.21
295	Inverclyde Council	Scottish unitary authority	0.2
299	Comhairle nan Eilean Siar	Scottish unitary authority	0.19
311	Falkirk Council	Scottish unitary authority	0.13
315	Orkney Islands Council	Scottish unitary authority	0.11
323	Aberdeenshire Council	Scottish unitary authority	0
324	Angus Council	Scottish unitary authority	0
340	Clackmannanshire Council	Scottish unitary authority	0
347	East Renfrewshire Council	Scottish unitary authority	0
391	Renfrewshire Council	Scottish unitary authority	0
398	Shetland Islands Council	Scottish unitary authority	0
407	The Highland Council	Scottish unitary authority	0

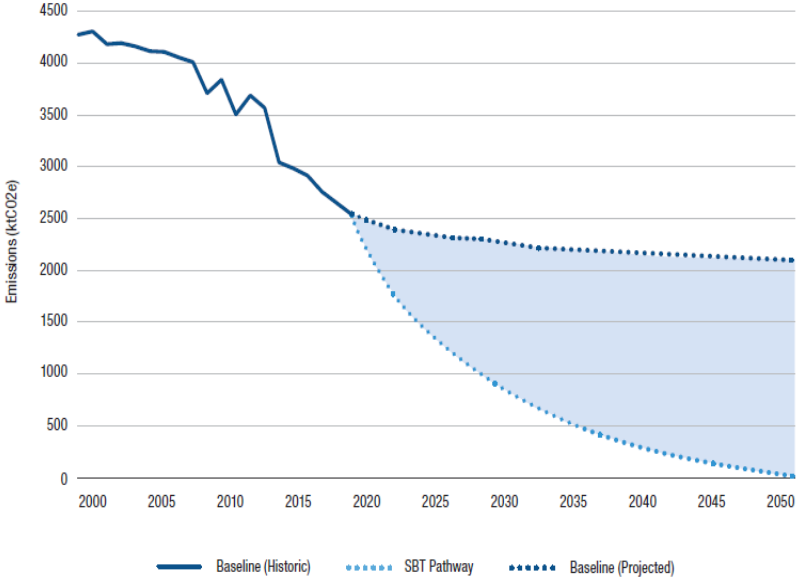
Edinburgh Declaration

The City of Edinburgh Council declared a climate emergency, established an independent Climate Commission and set a target for the city to be net zero by 2030.

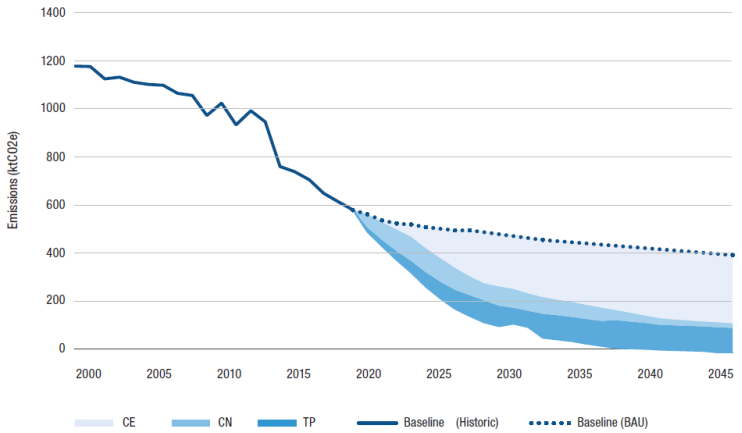




Edinburgh Emissions Data



7(b). Public & Commercial Buildings



		2025	2030	2035	2040	2045	2050
Cumulative Investment (£M)	**CE**	582	859	868	868	868	868
	CN	1,097	1,755	1,781	1,781	1,781	1,781
	TP	1,132	1,780	1,799	1,799	1,799	1,799

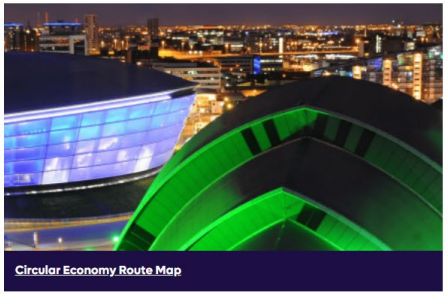
Table 10: Public and Commercial Buildings Emissions Reductions, Expenditure Savings and Investment Levels

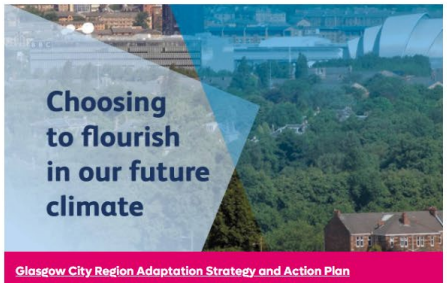
Glasgow Plans And Strategy

The name Glasgow is derived from the Gaelic word Glaschu, which can be translated as **“dear green place”**


Energy and Carbon Masterplan


Sustainable Glasgow


Circular Economy Route Map



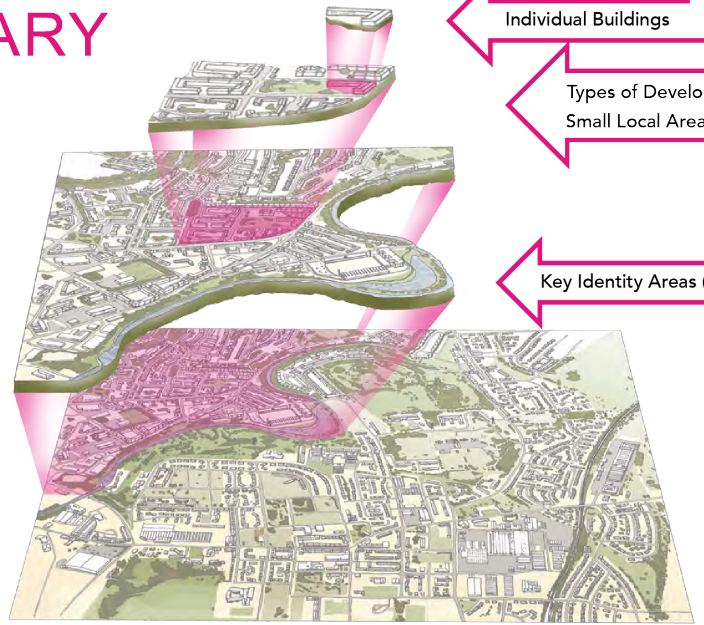
Glasgow City Region Adaptation Strategy and Action Plan


Glasgow Climate Plan


Climate Emergency Report

Glasgow Plans And Strategies

SCALE OF SUPPLEMENTARY GUIDANCE



Individual Buildings
The CDP includes 10 topic based policies. These policies are supported by supplementary guidance which provides further details.

Types of Development and land uses
Small Local Areas (Masterplans)
Masterplans will focus on specific areas such as Health and Educational Campuses. Describes in detail how development will work on the ground in a specific location.

Key Identity Areas (LDF)
Local Development Frameworks will be prepared to guide development at a neighbourhood level.

Large Priority Areas (SDF)
Strategic Development Frameworks will cover large areas of the City which span beyond neighbourhood level.

Figure 8
Types of Supplementary Guidance and their spatial scale

Glasgow Climate Action Plan (JUNE 21)

"One tonne of CO_2 has a persistence of around 100 years in the atmosphere, so a tonne of CO_2 saved now is worth 100 times a tonne of CO_2 saved a century later."

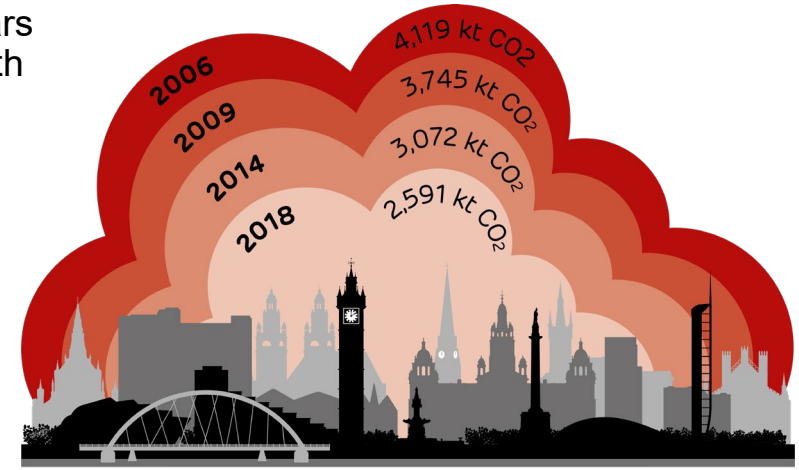


figure 2 - Glasgow CO_2 Emissions (2006 - 2018)

We, therefore, commit to achieving net zero carbon emissions by 2030

Glasgow Climate Action Plan

ON THE ROAD TO NET ZERO

CLIMATE EMERGENCY

2022

2023

Implementing Glasgow Gold Hybrid +20% LZCT or better for all new non-domestic (38% lower BER vs TER)

2024

Annual iterative review of Climate Plan

2025

Ban gas heating in all new buildings within the city boundary

- **3.1 Climate Emergency Theme 1:** Communication and Community Empowerment
- **3.2 Climate Emergency Theme 2:** Just and Inclusive Place
- **3.3 Climate Emergency Theme 3:** Well Connected and Thriving City
- **3.4 Climate Emergency Theme 4:** Health and Wellbeing
- **3.5 Climate Emergency Theme 5:** Green Recovery

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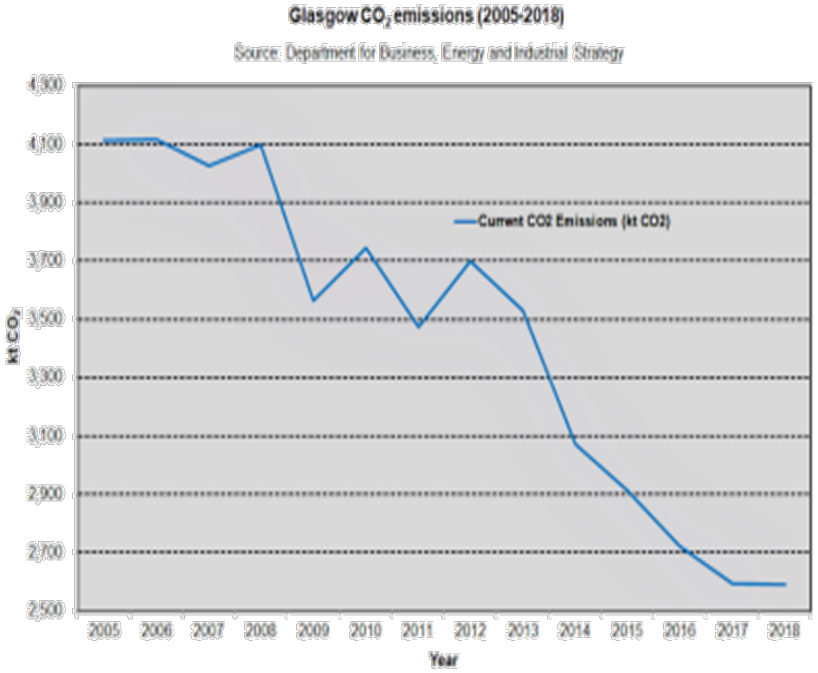
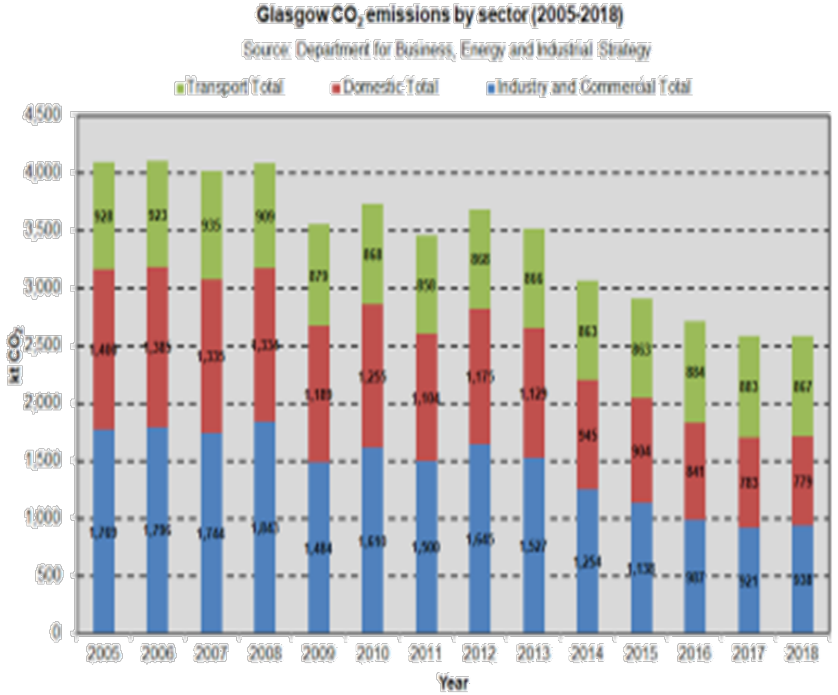
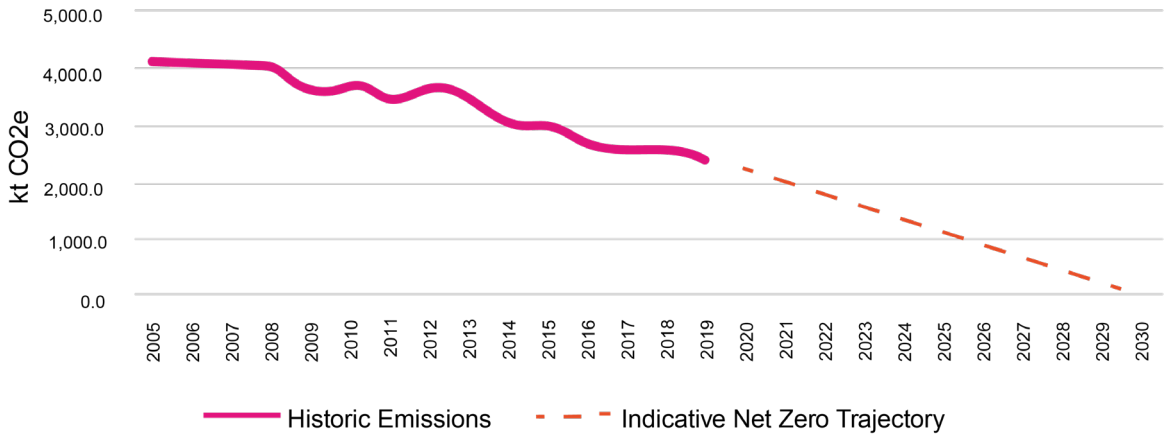
Glasgow Emissions Data (Historic)



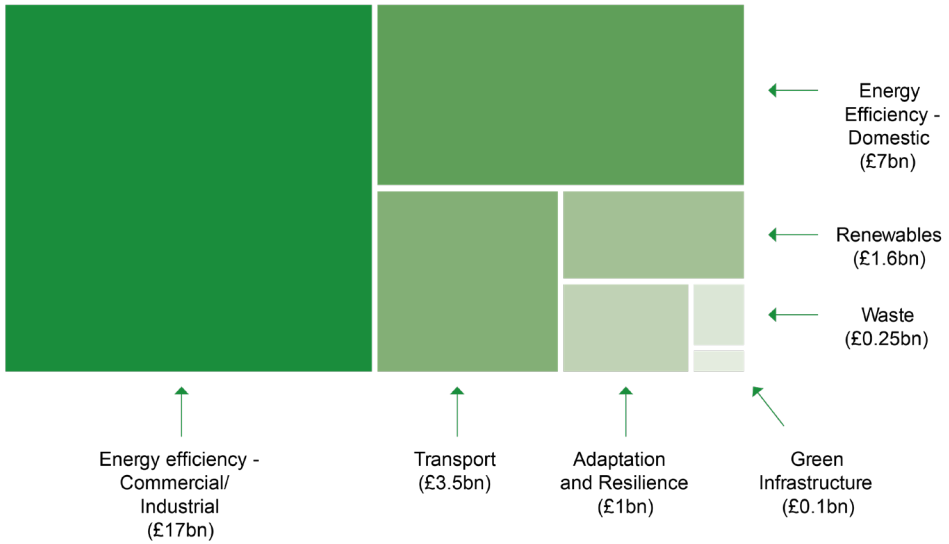


Glasgow Emissions Data (Target)

Equitable, net zero carbon, climate-resilient living by 2030



Emissions Reductions Costing

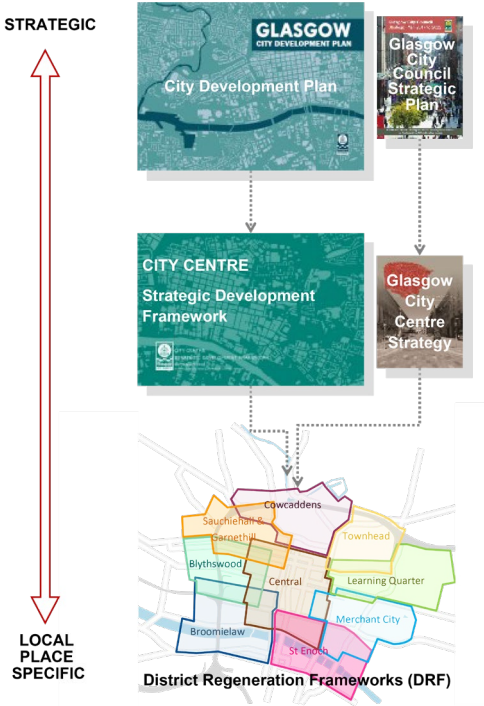


Development Plan SDF

A GREEN CITY CENTRE | SUSTAINABLE ENERGY

Local Heat and Energy Efficiency Strategy

Glasgow City Council is developing its first Local Heat and Energy Efficiency Strategy (LHEES). The LHEES will succeed the Council's existing Energy & Carbon Masterplan and will commence in April 2020 with a target of making an absolute reduction in CO2 emissions of 80% by 2050, whilst supporting the 2030 target of carbon neutrality and the 2045 net-zero target. The LHEES will seek to deploy innovative solutions and delivery mechanisms to improve heat generation/consumption and energy efficiency in five designated zones in the City. The City Centre is one of the five identified zones. The LHEES will work in partnership with existing strategies to enhance the sustainability of the City Centre.

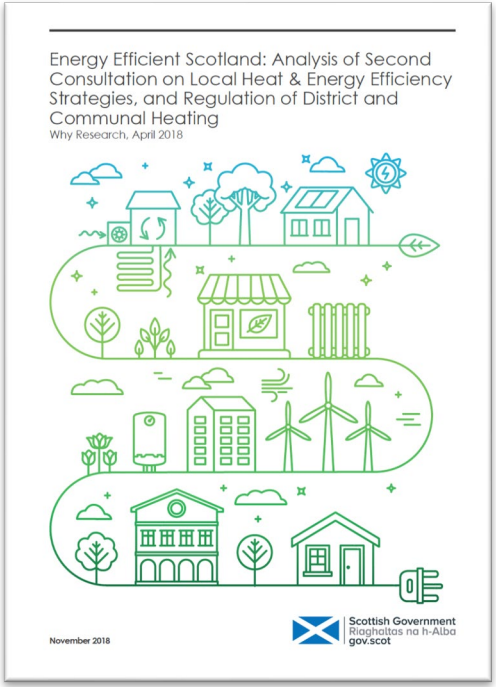


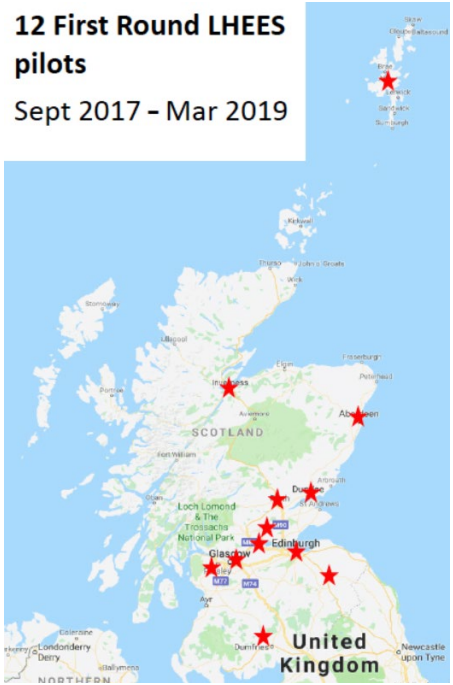
LHEES

The Scottish Government have recently consulted on a draft Order that would place a duty on all **Scottish local authorities to produce Local Heat and Energy Efficiency Strategies and Delivery Plans by 31 December 2023**, and subsequently on a 5 yearly cycle, in line with guidance to be provided by Scottish Ministers.

Glasgow City Council

It is intended that a finalised **LHEES** will be brought to ESCR in summer 2022 though it should be noted that this is earlier than the proposed mandated date of 2023 by the Scottish Government on the production of LHEES





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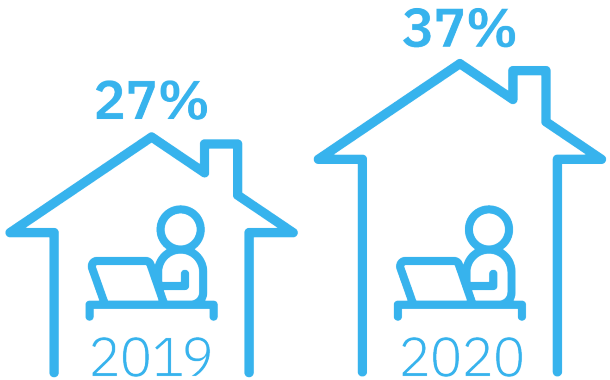
The Future Of Offices

Mel Threader
Product Marketing 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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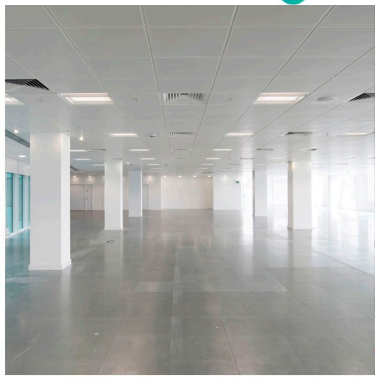
- **Hybrid** working
- “Hub and Spoke”
- Net Zero challenges

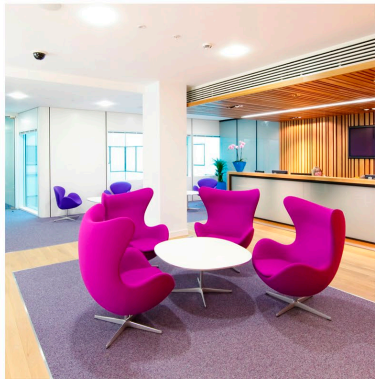
- **Flexible** office space
- Access to **technology**
- Health and **wellbeing**

- Energy efficiency
- Renewable
- Low carbon
- NABERS

- HVAC equipment
- Connectivity

- Air conditioning
- Flexible systems
- Lower GWP refrigerant





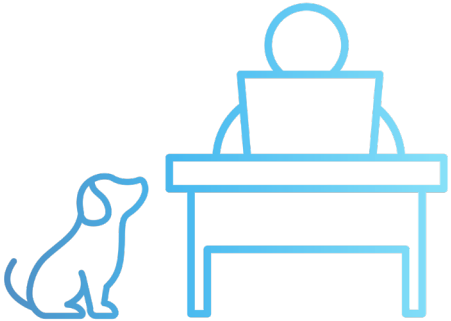
- IAQ
- Ventilation
- Filtration
- Monitoring

- 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

Mark Grayston
Product Strategy &
Delivery Manager

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What Could Net Zero Mean For Commercial Heating?

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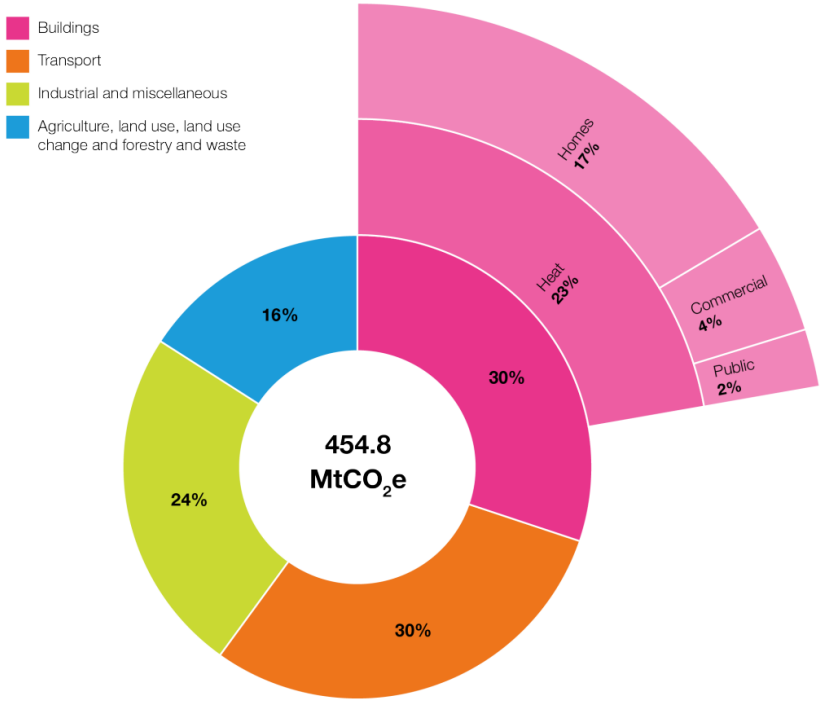
A Significant CO_2 Contributor

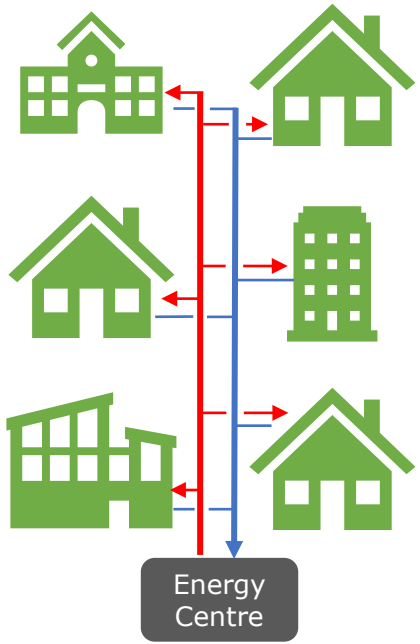
Heating our buildings account for **23%** of all UK emissions.

Significant potential savings can be made with low carbon technologies.



Application Types

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.

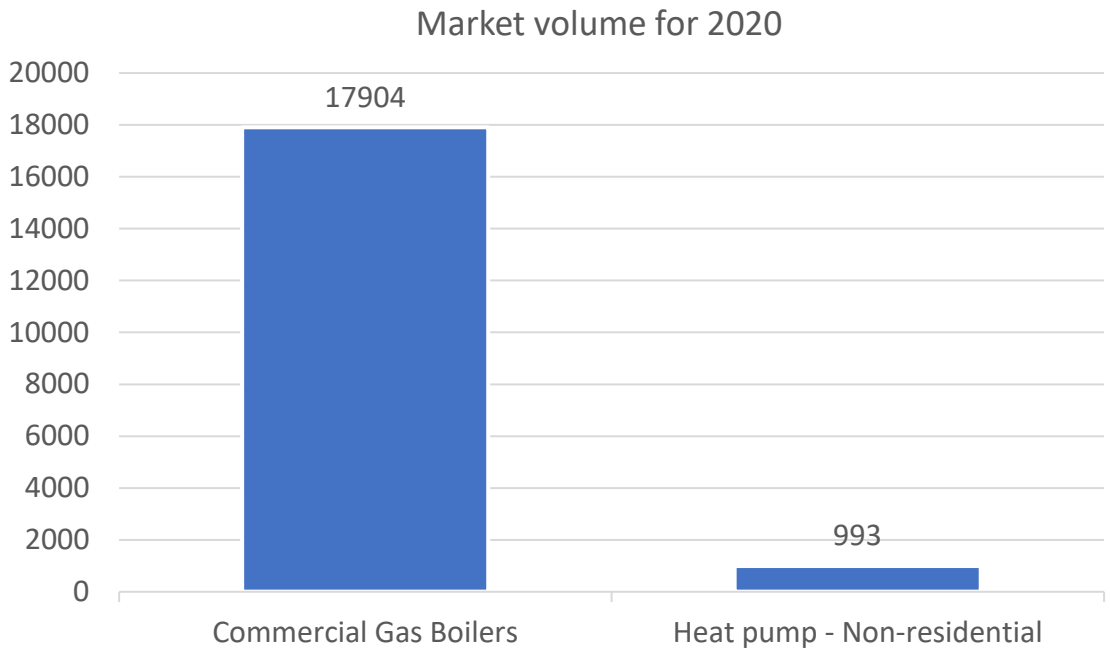
Local delivery

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

The Big Drivers Now

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

Market Volumes

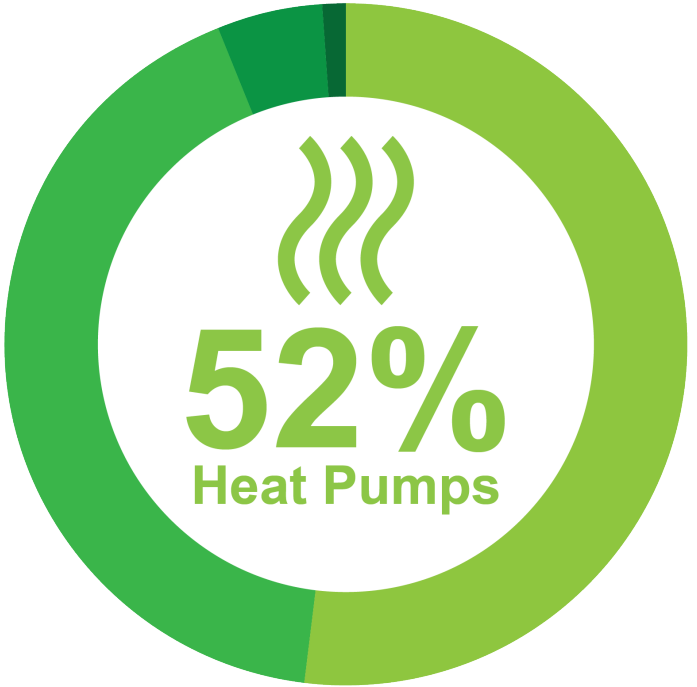


- From 2020 to 21 commercial heat pumps saw a 75% increase to 1747 units.
- Huge change needed to move this market to low carbon technologies.

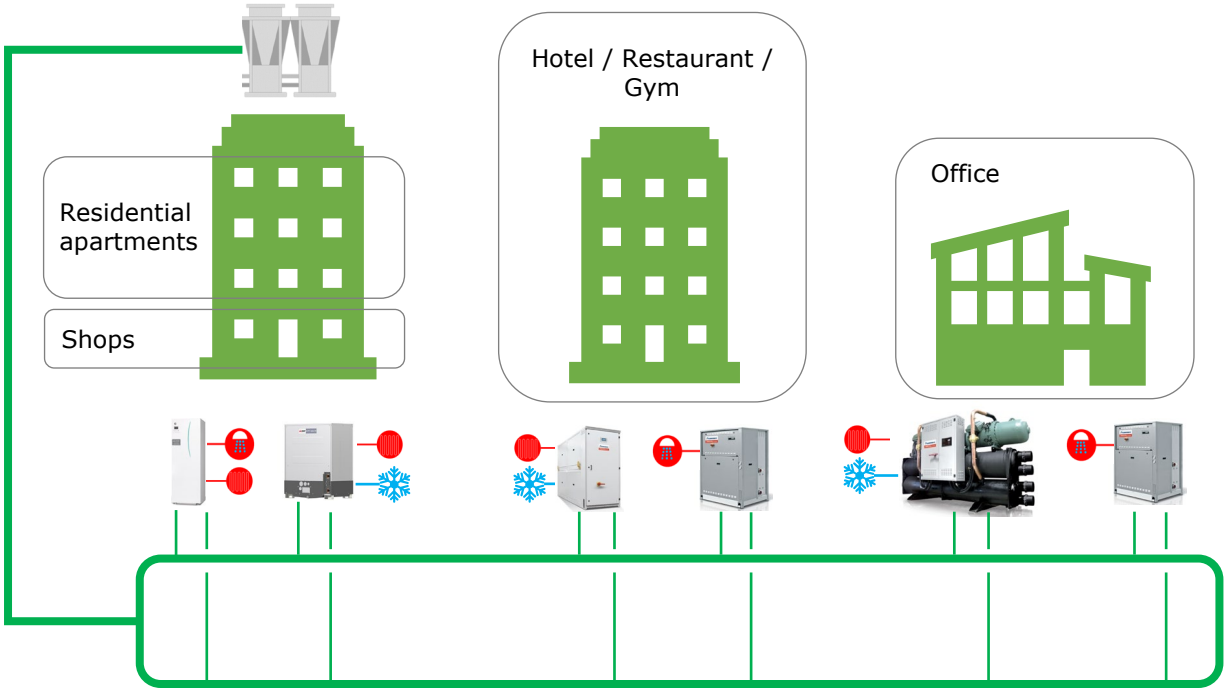
What Could This Market Look Like?

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

ON THE ROAD TO NET ZERO

Visibility And Awareness

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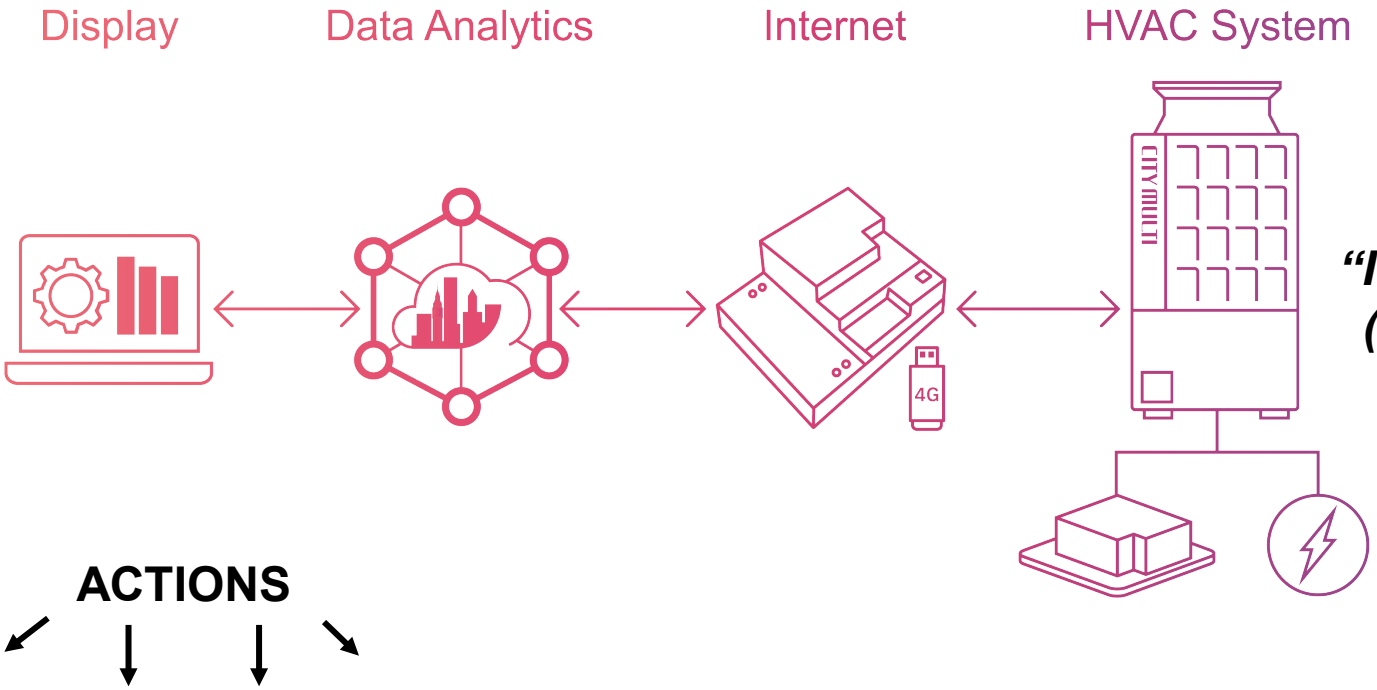
Digital HVAC - What Is It?



"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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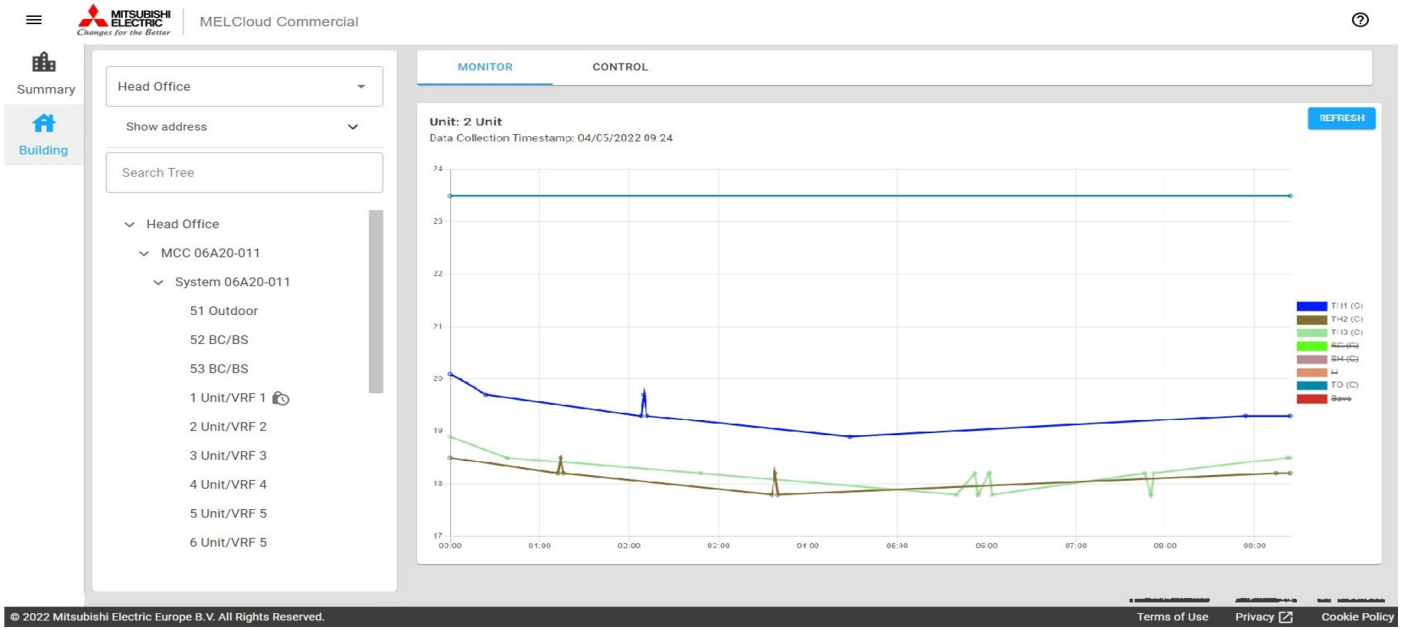
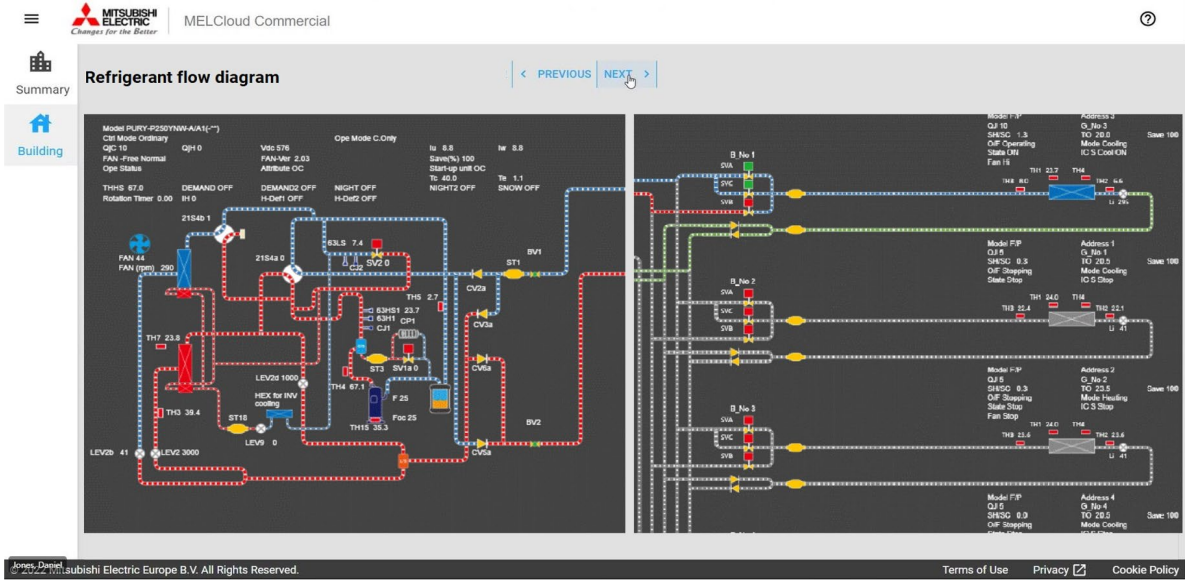
Insight And Knowledge

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.

Smarter, Together

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