MITSUBISHI ELECTRIC

ON THE ROAD TO NET ZERO

ON THE ROAD TO NET ZERO

Welcome

Paul Shelley
Branch Manager

ON THE ROAD TO NET ZERO

Your Partner On The Road To Net Zero

Phil Sloan
Business Manager
Branch Network

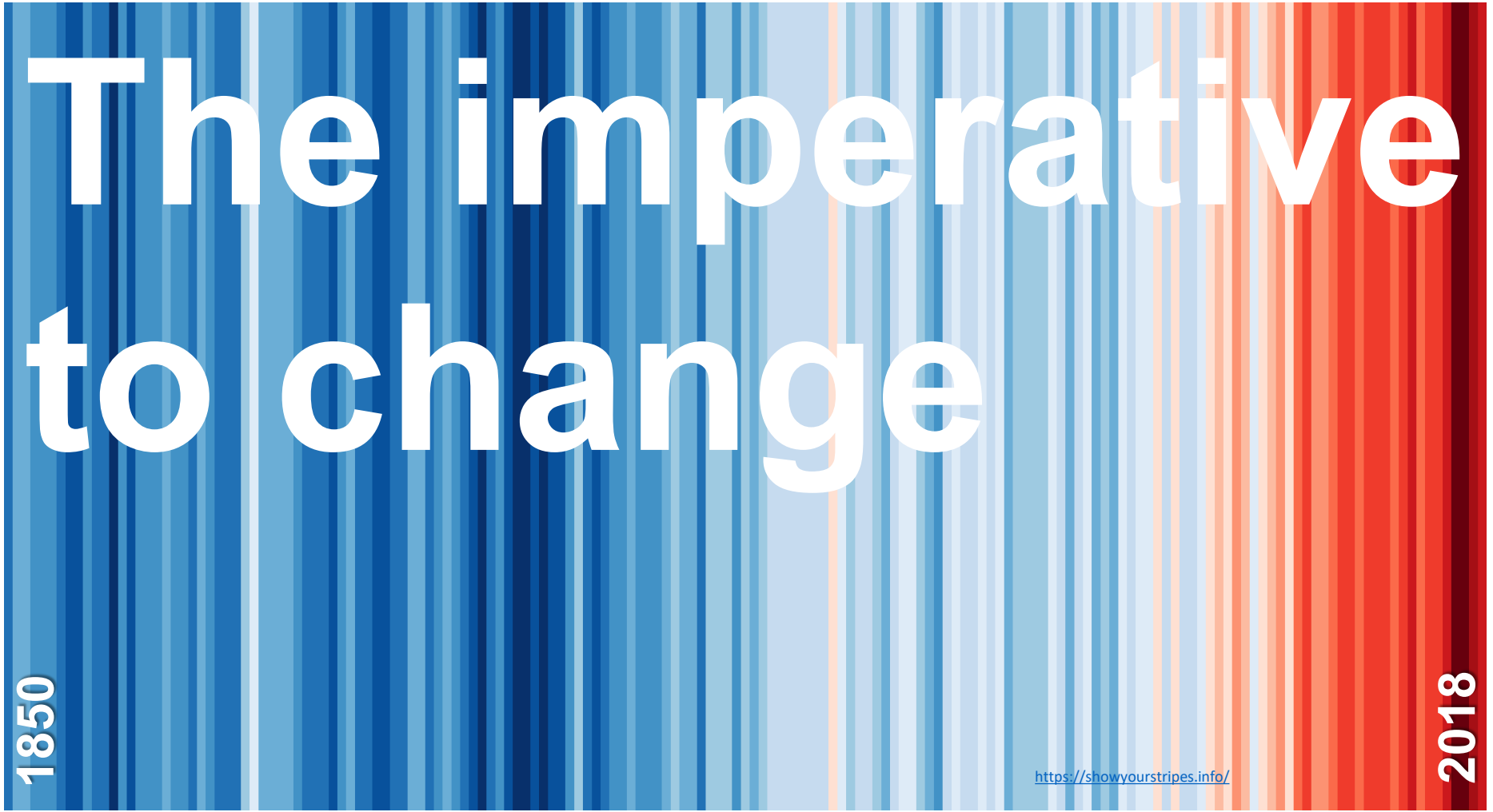
"We, the Mitsubishi Electric Group, have been engaged in manufacturing businesses since 1921. Our Purpose, and indeed our very reason to exist, has been to contribute to the realization of a vibrant and sustainable society through continuous technological innovation and ceaseless creativity."

ON THE ROAD TO NET ZERO

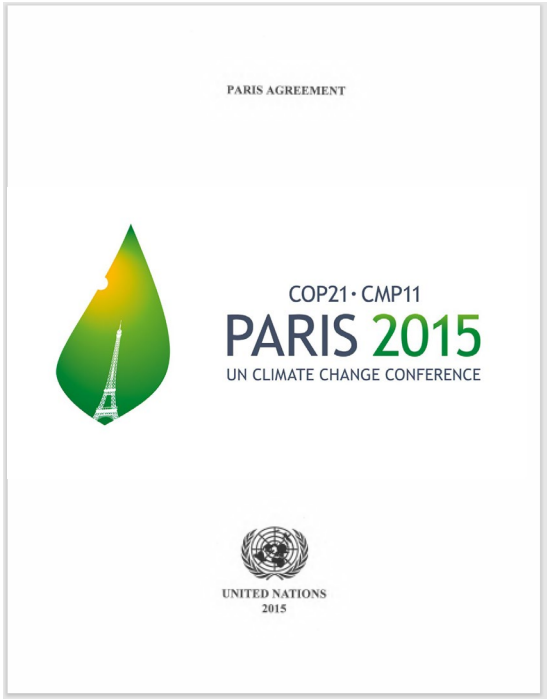
The Imperative To Change

Martin Fahey
Head of Sustainability

The imperative to change



Global



United Nations Framework
Convention on Climate Change

UK

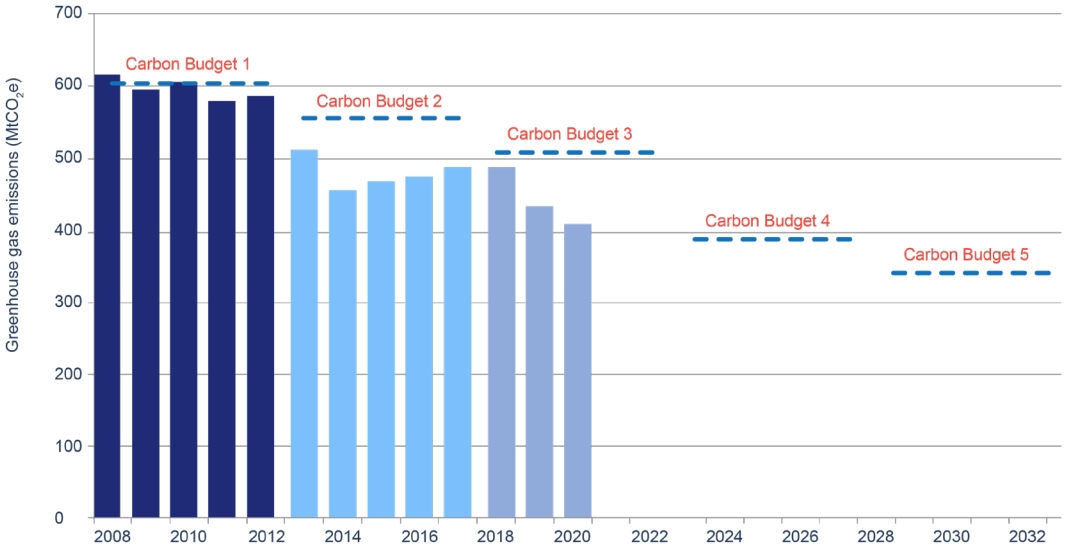
The Paris Agreement - global average temperature increase to well below 2°C, and to pursue efforts to limit the temperature increase to 1.5°C.

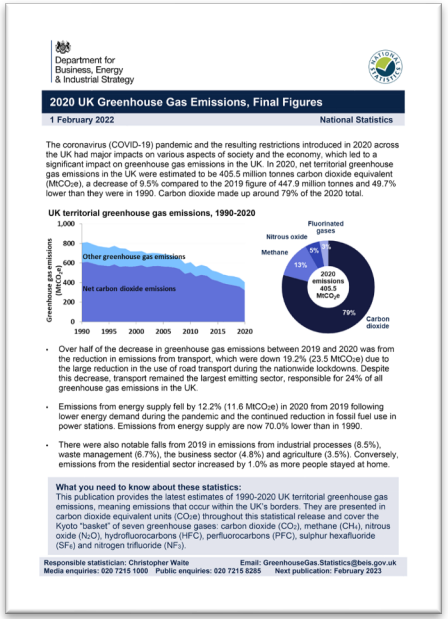
In its NDC (April 2021), the UK is committing to reduce economy-wide greenhouse gas emissions by at least 78% by 2035, compared to 1990 levels.

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

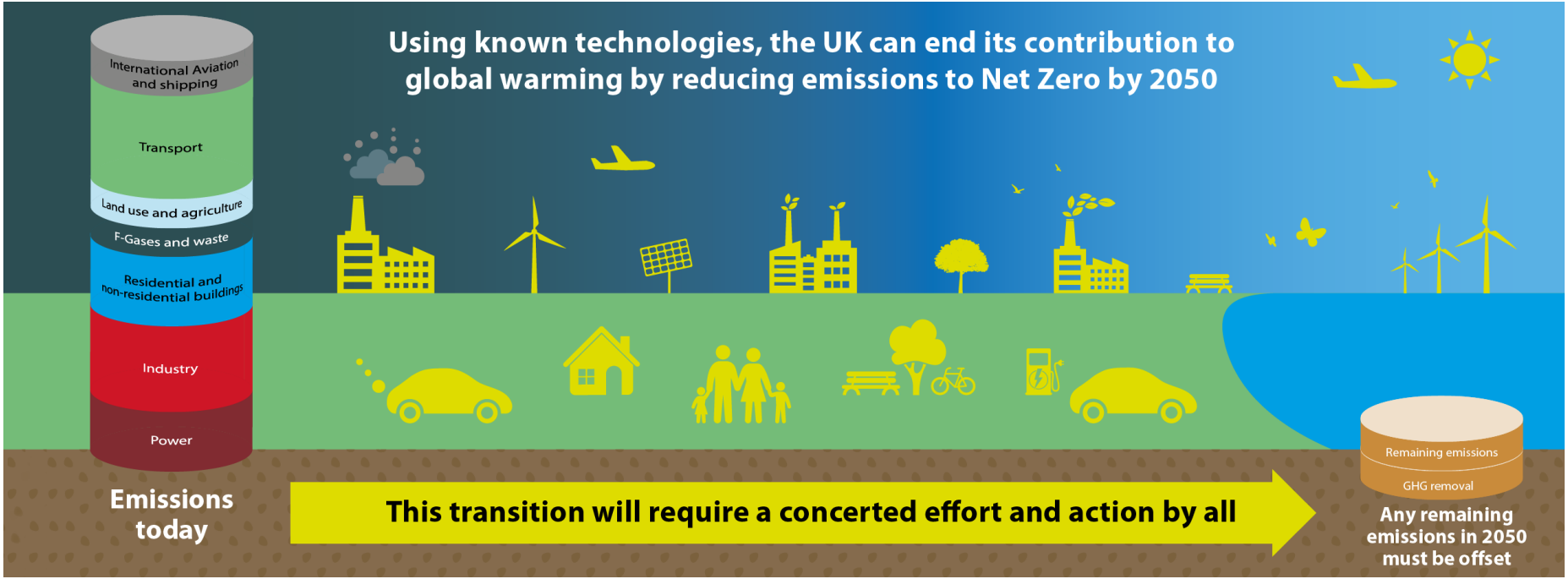
- Over half of the decrease in greenhouse gas emissions between 2019 and 2020 was from the reduction in emissions from transport, which were down 19.2% (23.5 $MtCO_2e$) due to the large reduction in the use of road transport during the nationwide lockdowns. Despite this decrease, transport remained the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

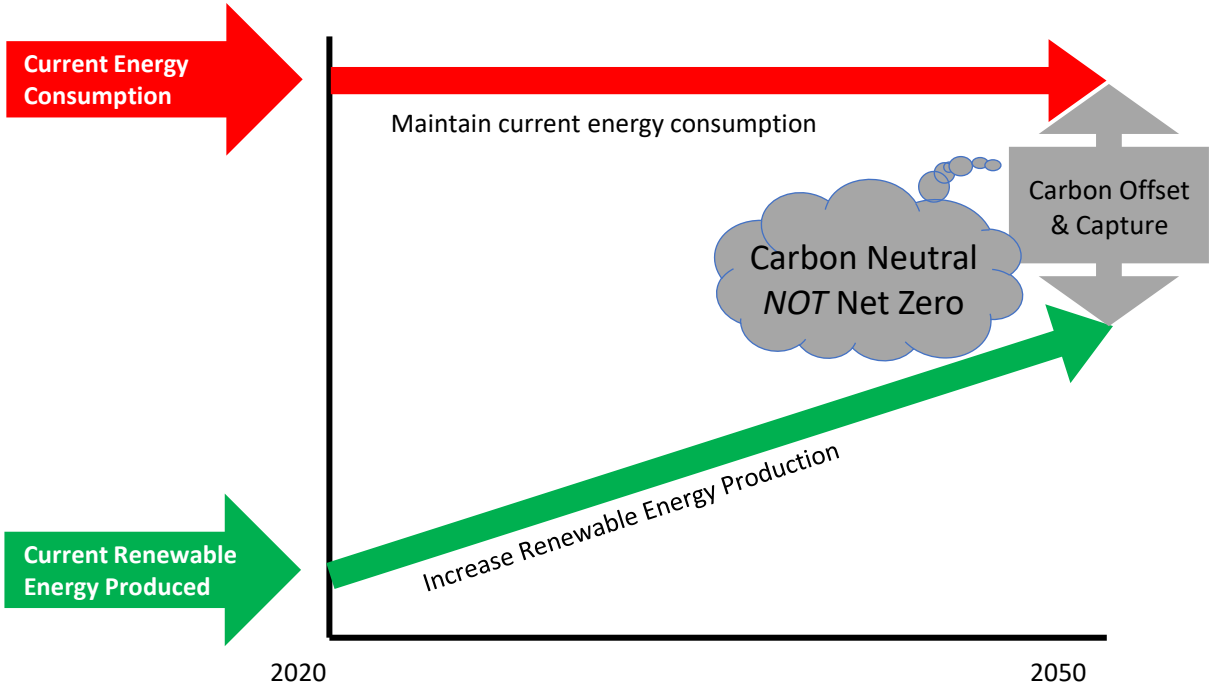
Source; 2020 UK Greenhouse Gas emissions, Final Figures - published February 2022 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachmentdata/file/1051408/2020-final-greenhouse-gas-emissions-statistical-release.pdf

What Is Net Zero?



Source – Climate Change Committee

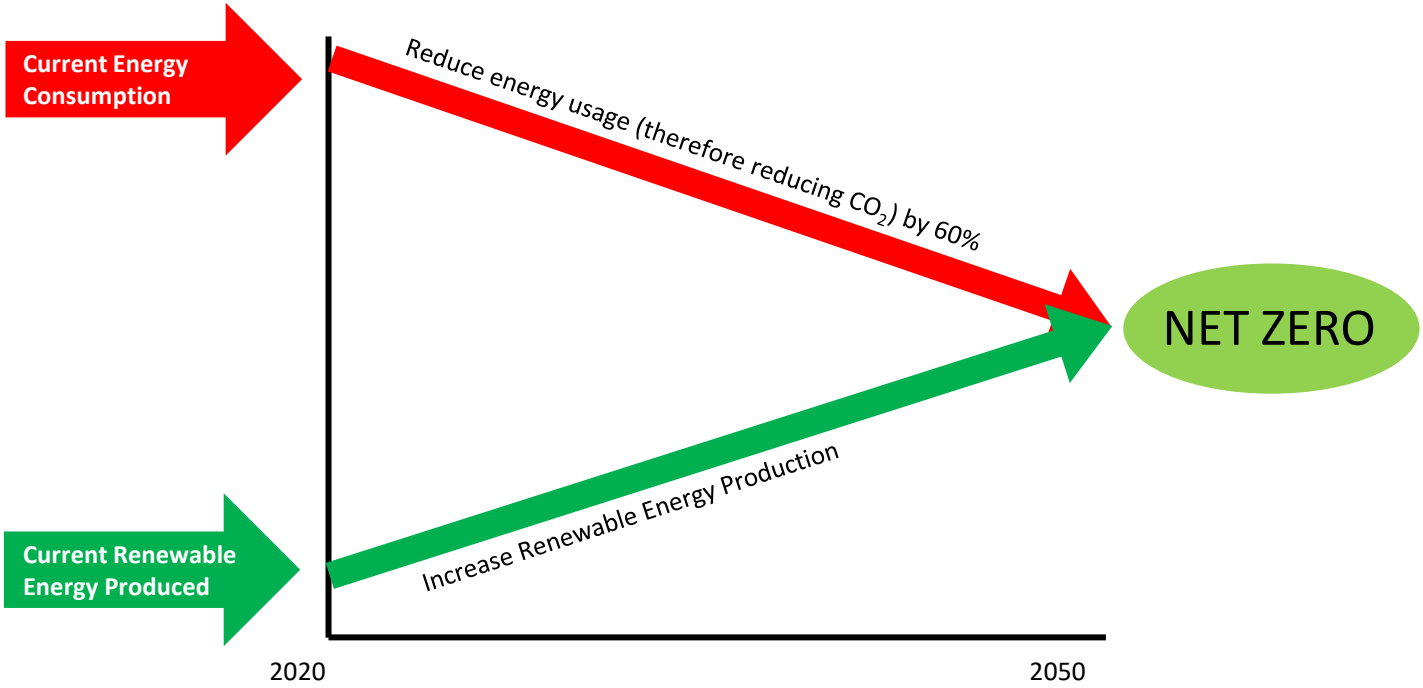
What Is Net Zero?



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

Environmental Sustainability Vision 2050

MITSUBISHI ELECTRIC

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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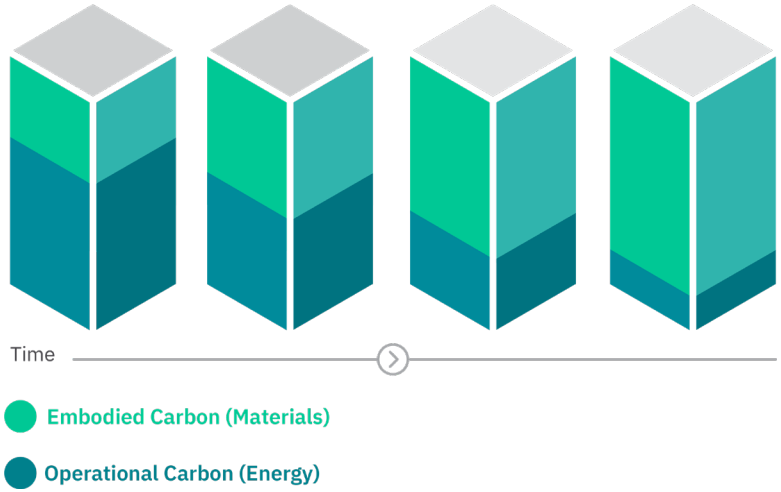
Whole Life Carbon

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:



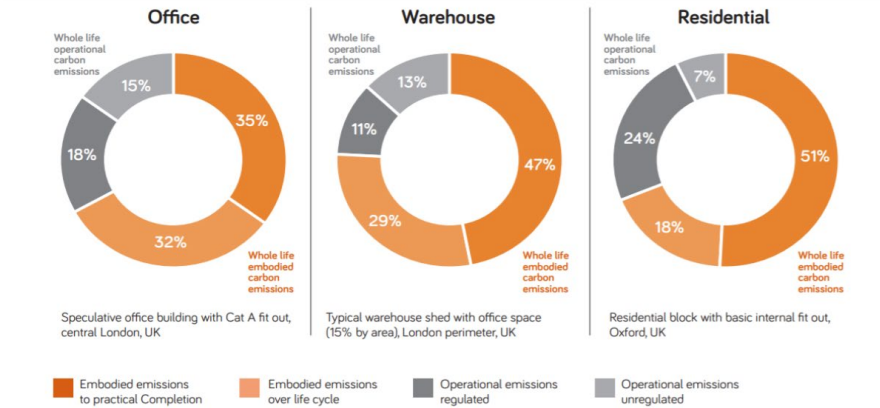
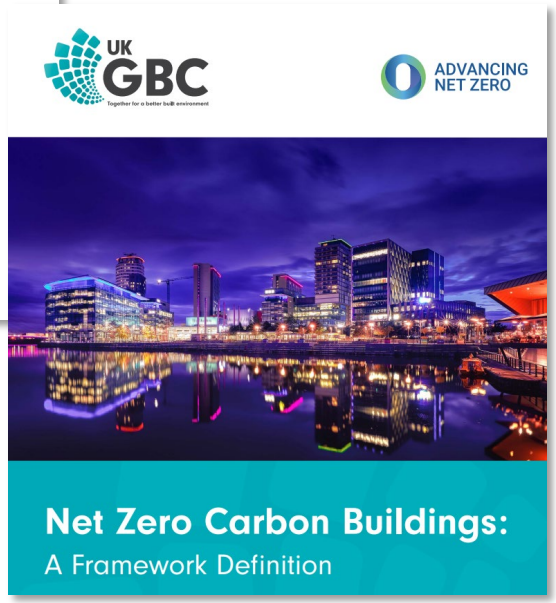
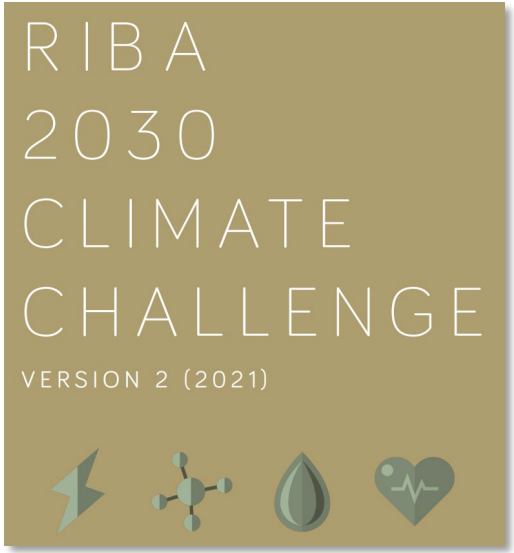


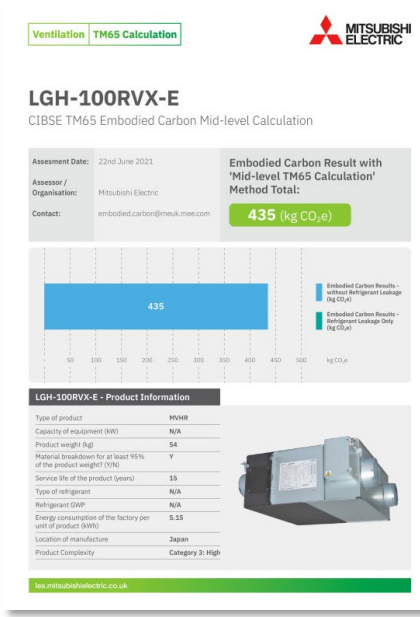
Image credit: from RIBA's *Embodied and whole life carbon assessment for architects*

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

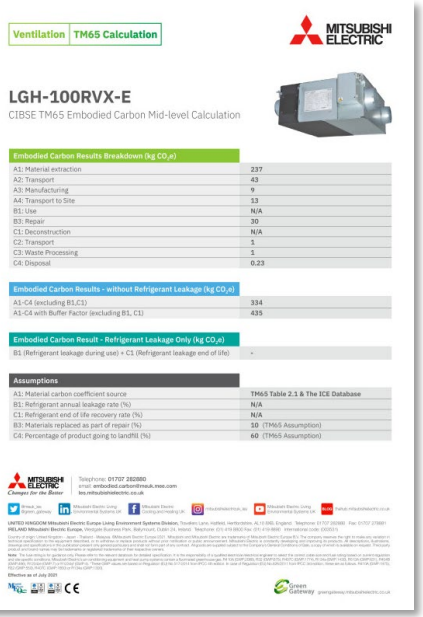
Embodied Carbon Result with 'Mid-level TM65 Calculation' Method Total:

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

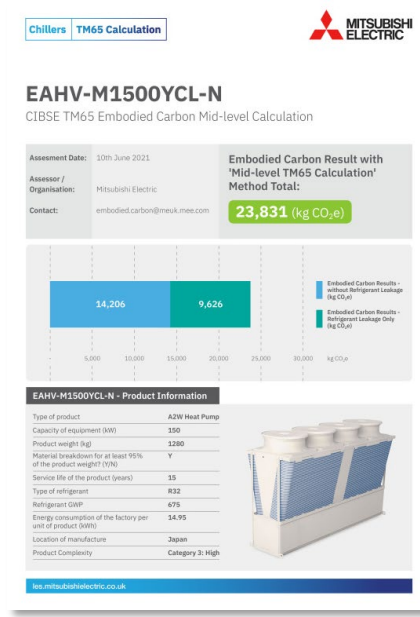
Embodied Carbon Results Breakdown (kg CO_2e)	
A1: Material extraction	237
A2: Transport	43
A3: Manufacturing	9
A4: Transport to Site	13
B1: Use	N/A
B3: Repair	30
C1: Deconstruction	N/A
C2: Transport	1
C3: Waste Processing	1
C4: Disposal	0.23

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?

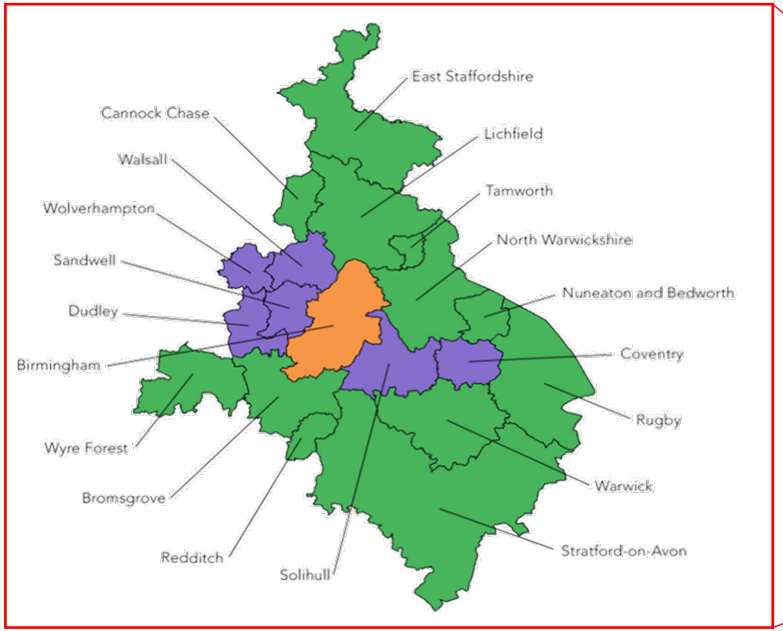
Chris Newman
Net Zero Design Manager

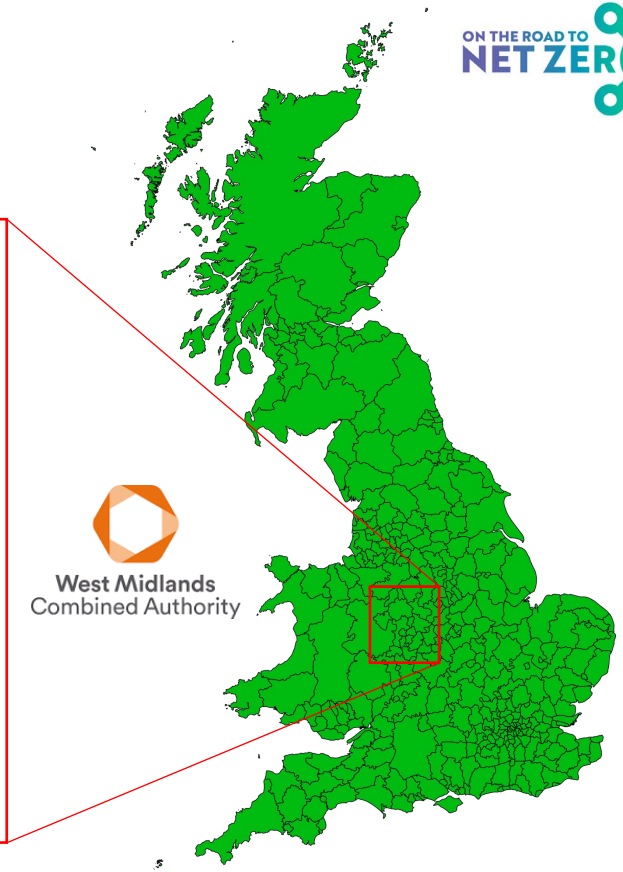
WMCA

Constituent authorities
Birmingham, Coventry, Dudley, Sandwell, Solihull, Walsall, Wolverhampton

Non-constituent authorities
Cannock Chase, North Warwickshire, Nuneaton and Bedworth, Redditch, Rugby, Shropshire, Stratford-upon-Avon, Tamworth, Telford and Wrekin, Warwickshire

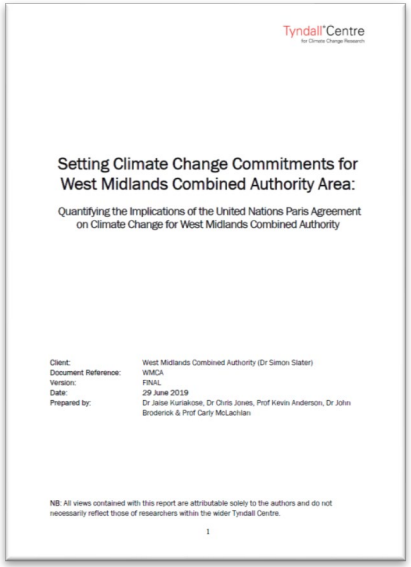
Local Enterprise Partnerships
Black Country, Coventry & Warwickshire, Greater Birmingham & Solihull





WMCA

Tyndall°Centre
for Climate Change Research



Tyndall°Centre
for Climate Change Research

Setting Climate Change Commitments for West Midlands Combined Authority Area:

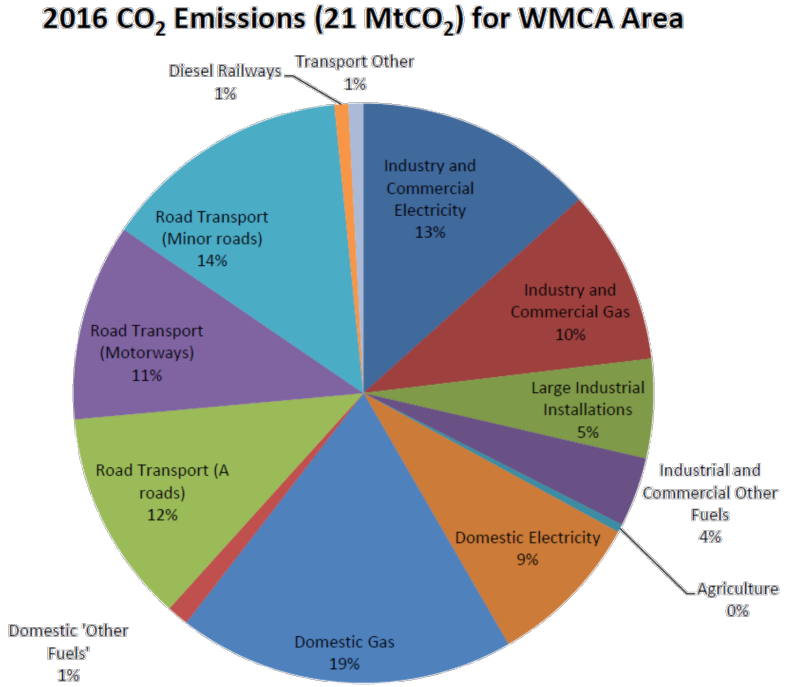
Quantifying the Implications of the United Nations Paris Agreement on Climate Change for West Midlands Combined Authority

Client: West Midlands Combined Authority (Dr Simon Slater)
Document Reference: WMCA
Version: FINAL
Date: 29 June 2019
Prepared by: Dr Jaise Kuriakose, Dr Chris Jones, Prof Kevin Anderson, Dr John Broderick & Prof Carly McLachlan

NB: All views contained with this report are attributable solely to the authors and do not necessarily reflect those of researchers within the wider Tyndall Centre.

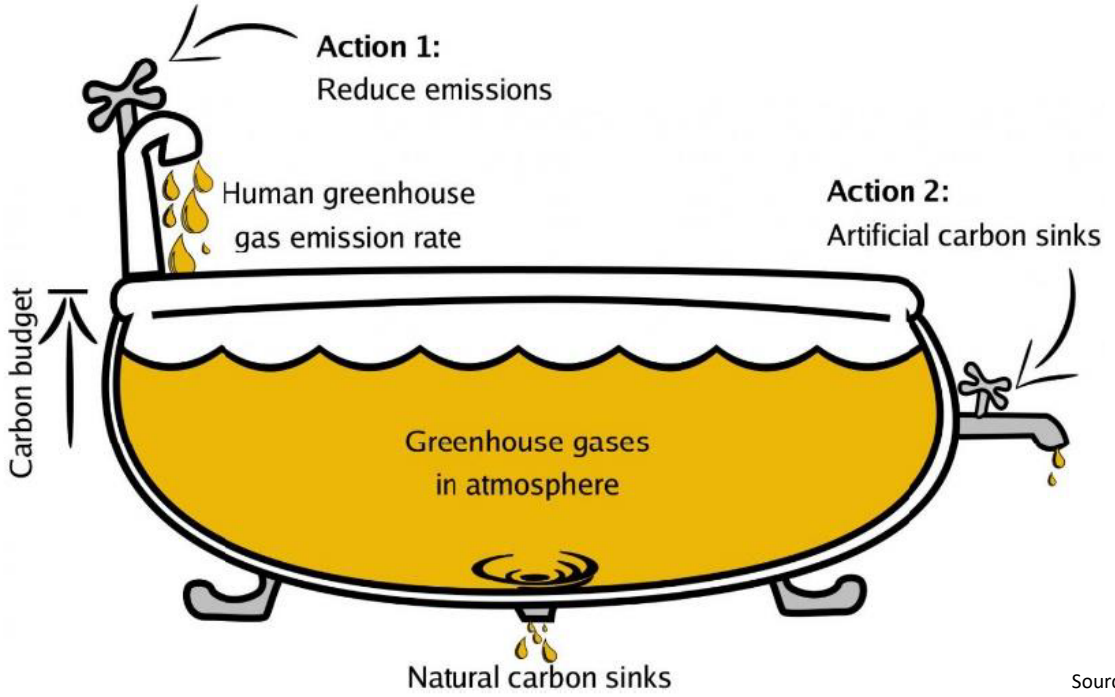
1

West Midlands
Combined Authority



Carbon Budgets

< 2deg of warming



Source: Nottingham carbon neutral charter

WMCA

Net Zero by 2041

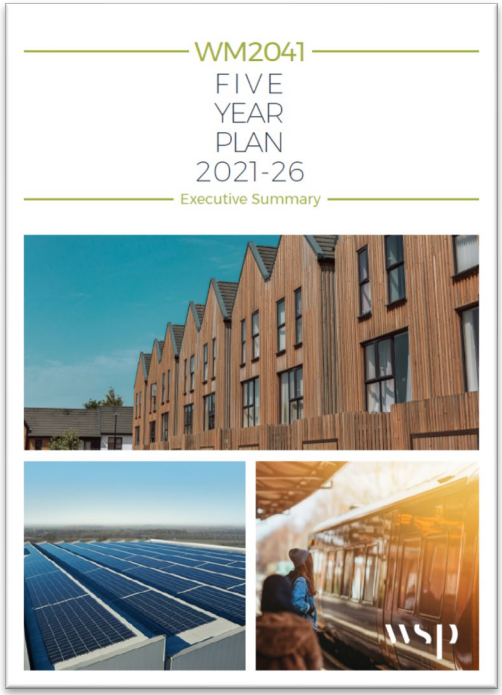
36% Reduction by 2022

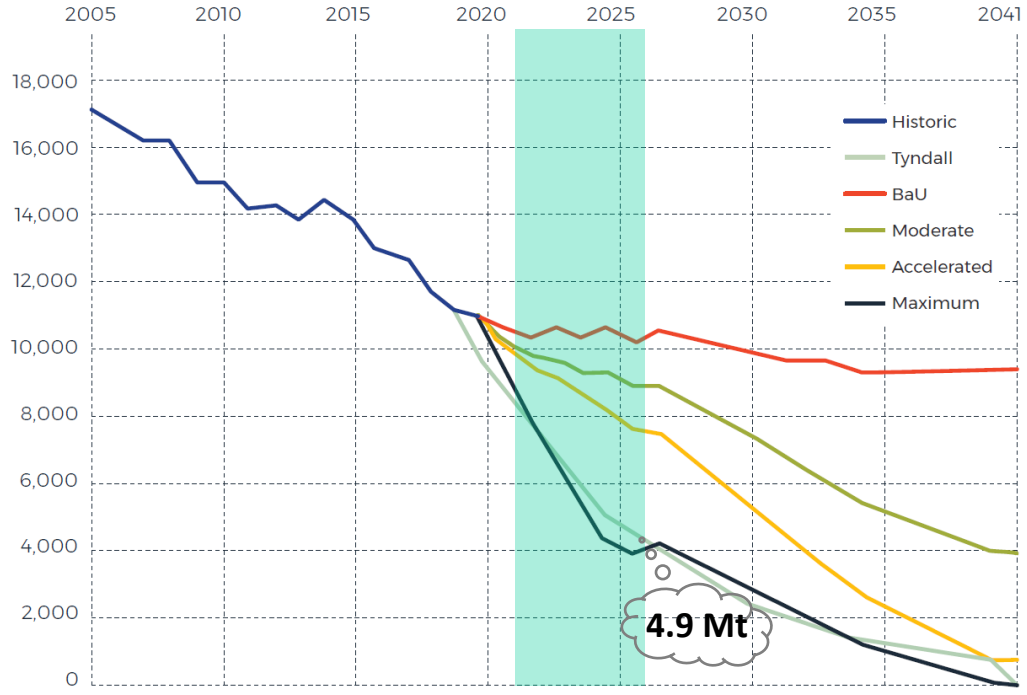
69% Reduction by 2027

Budget of **126 Million Tonnes** cumulative total by year 2100

At current rate of emissions, the entire budget would be used in 6 years!

WMCA





WMCA

What we would need to do reach 4.9Mt CO_2 by 2026?

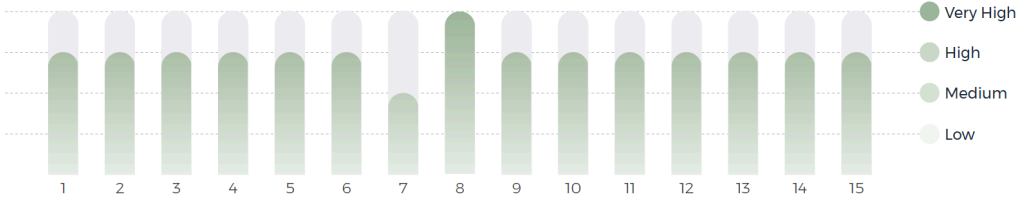
Retrofit 100% of retail, offices and a range of other non-domestic properties to their **maximum potential.**

Retrofit all 1.1 million homes by the end of 2025 and install **heat pumps** at the same time.

Accelerated

A much more rapid and aggressive delivery pace across sectors, with most set at a "High". Energy efficiency and fuel switching for industry is medium as the majority of technologies required are at an early stage of development. Due to its much smaller scale, solar PV in industrial buildings has been set at a very high level. **This is the reference scenario for the plan - it is hugely ambitious.**

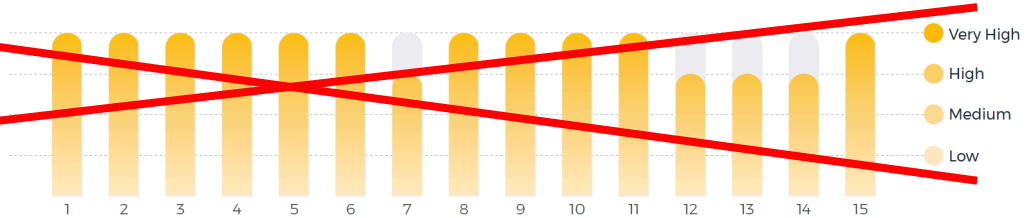
✗ Achieve 2026 goal ✓ Achieve 2041 goal



Maximum

This scenario was developed to illustrate what would be required to meet the 2026 carbon budget identified by Tyndall. It is at the limit or beyond what it is technically possible, even ignoring legislative competence and finance restrictions. It would require large behaviour change from people and could create unintended consequences. It has not been used, but can be explored by those seeking to understand what is required.

✓ Achieve 2026 goal ✓ Achieve 2041 goal

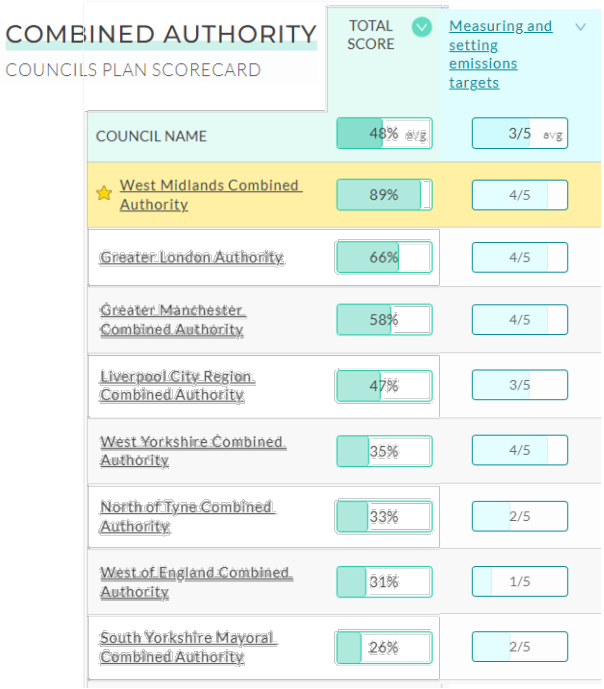


1. Domestic energy efficiency retrofit
2. Domestic heating retrofit
3. Domestic solar PV
4. Commercial energy efficiency retrofit
5. Commercial heating retrofit
6. Commercial solar PV
7. Industrial energy efficiency & fuels
8. Industrial renewables
9. Avoiding travel
10. Shifting travel
11. Improving passenger service fleets
12. Improving freight fleets
13. Improving private vehicles
14. Land use (Renewables)
15. Land use (Natural Capital)

WMCA

WHERE DO WE NEED TO BE?			WHERE ARE WE NOW?	
Goal		**Deployment required for net zero**	**Currently installed in West Midlands**	**Accelerated scenario delivery for 2026**
Domestic	Energy efficiency	1.1m homes (100%)	Smart thermostats at 6% of homes . Smart meters at 31% homes. 27% of homes with cavity walls have them unfilled. 18% of lofts are insulated and easy to treat . 7% of homes do not have double glazing.	294,000 homes
	Heating retrofit	1.1m homes (100%)	Almost all homes are on fossil fuel boilers	292,000 homes
	Solar PV	830MWp	Approximately 63MWp to date.	415MWp
Commercial	Energy efficiency	100%	TBC	37,000 buildings, 50% potential
	Heating retrofit	73,400 buildings	77% of heating and hot water by gas or oil in offices, similarly 63% of heating and hot water by gas for retail	18,400 buildings
	Solar PV	705MWp	Approximately 26MWp to date across non-domestic in total	353MWp

Local Authority Scorecards



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
69	Sandwell Metropolitan Borough Council	Metropolitan district	0.62
119	Birmingham City Council	Metropolitan district	0.53
143	Walsall Metropolitan Borough Council	Metropolitan district	0.5
279	Wolverhampton City Council	Non-metropolitan district	0.24
343	Coventry City Council	Metropolitan district	0
346	Dudley Metropolitan Borough Council	Metropolitan district	0

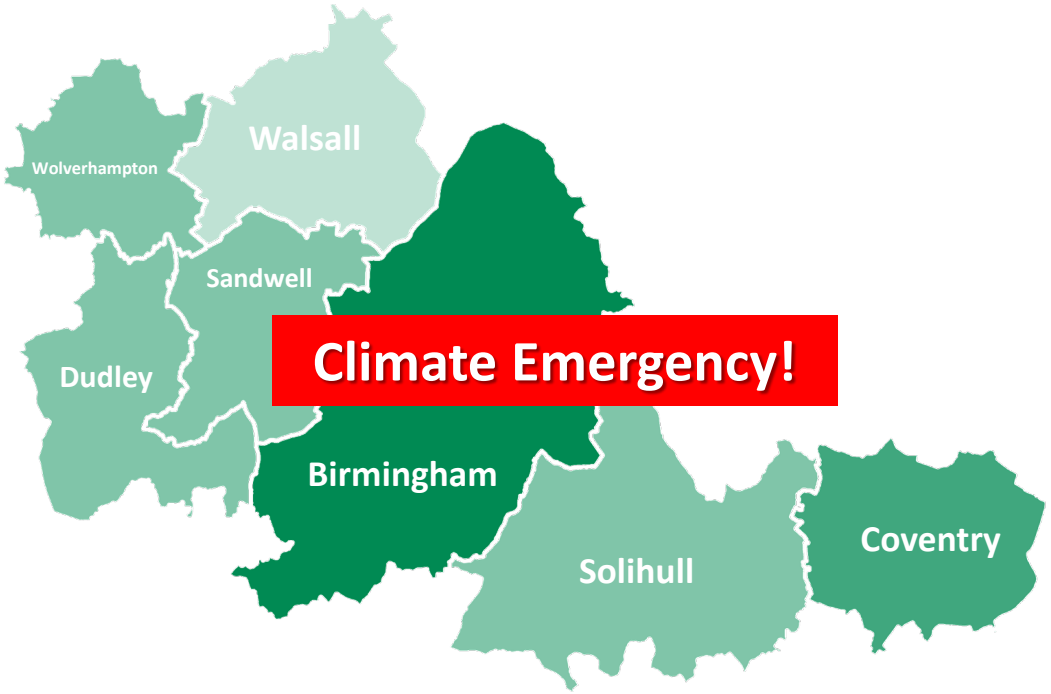
CLIMATE EMERGENCY UK

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

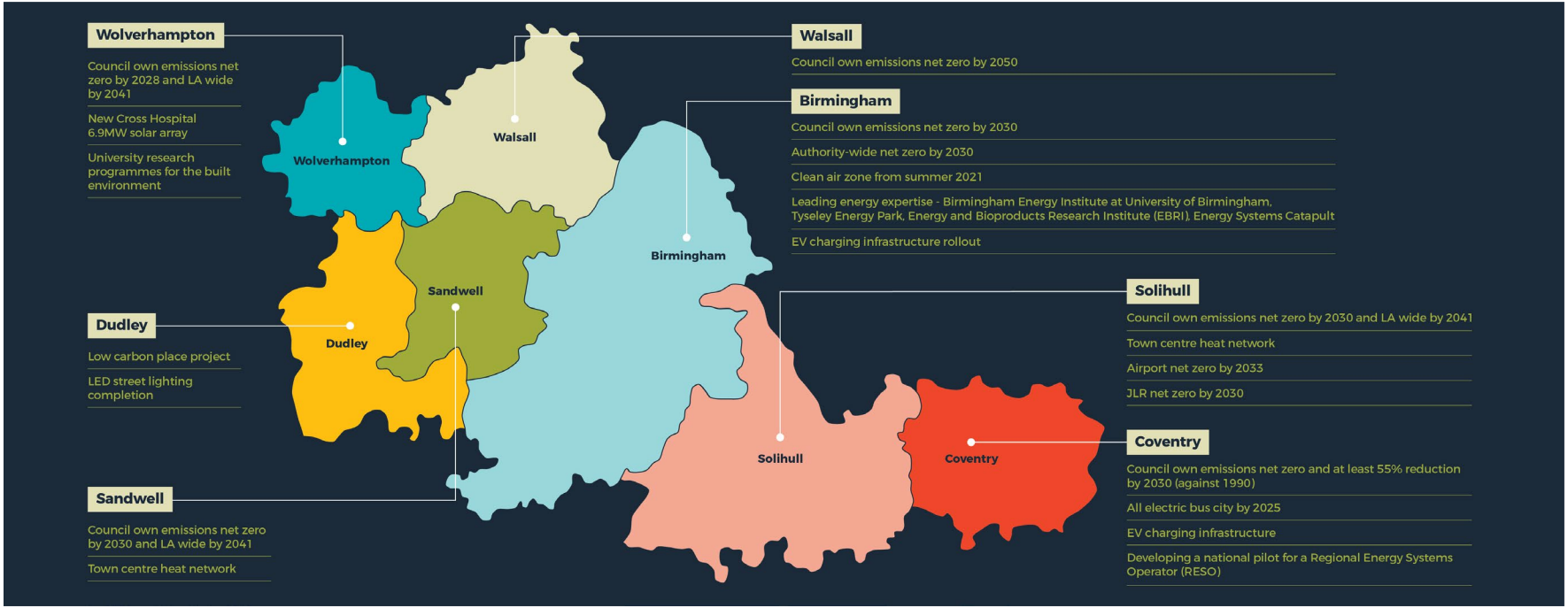
Local Authority Declarations

All constituent councils have declared a climate emergency

- Birmingham City Council
- Coventry City Council
- Dudley Metropolitan Borough Council
- Sandwell Metropolitan Borough Council
- Solihull Metropolitan Borough Council
- Walsall Metropolitan Borough Council
- Wolverhampton City Council



The Region Is Doing A Lot Already



Solihull Climate Action Plan

- ✓ **Council to be Net Zero by 2030**
- ✓ **JLR to be Net Zero by 2030**
- ✓ **Airport to be Net Zero by 2033**
- ✓ **Borough-wide Net Zero by 2030**

Solihull Climate Action Plan

Key Milestones

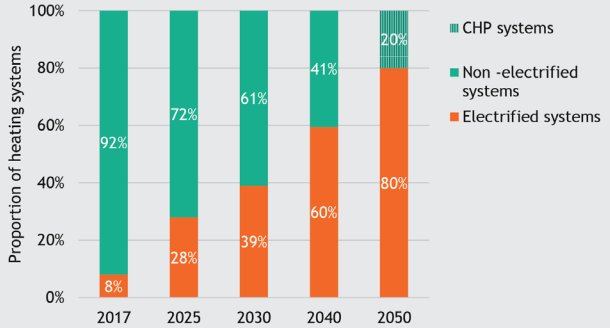


Figure 10: Modelled changes in the technology mix for non-domestic heating technologies. Figures may not sum to 100% due to rounding.

2025	28% of non-domestic buildings have low-carbon heating systems
2030	39% of non-domestic buildings have low-carbon heating systems
2040	60% of non-domestic buildings have low-carbon heating systems
2050	80% of non-domestic buildings have low-carbon heating systems

Key Milestones

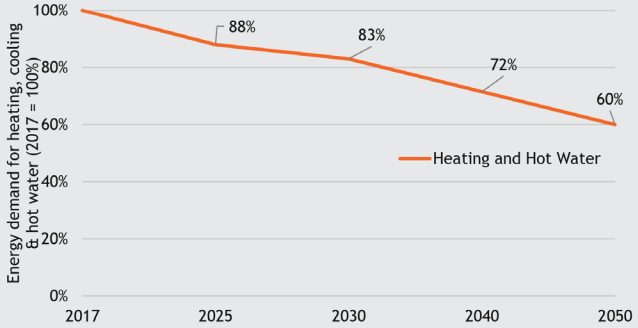
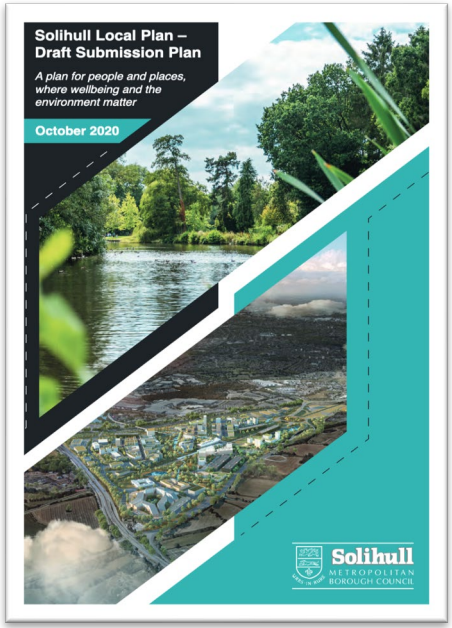


Figure 8: Modelled changes in energy demand for space heating and hot water relative to a 2017 baseline.

2025	12% reduction in overall energy demand for space heating and hot water
2030	17% reduction in overall energy demand for space heating and hot water
2040	28% reduction in overall energy demand for space heating and hot water
2050	40% reduction in overall energy demand for space heating and hot water

Solihull Draft Local Plan

On the 13 May 2021 the Council submitted the Local Plan to the Secretary of State (via the Planning Inspectorate) for it to be independently examined.



3. **At a site level**, development must apply the 'energy hierarchy' to reduce energy demand for heating, lighting and cooling and minimise carbon dioxide emissions as follows:

   i. All new dwellings to achieve 30% reduction in energy demand/carbon reduction improvement over and above the requirements of Building Regulations Part L (2013) at the time of commencement up to March 2025.

   ii. From April 2025 for all new dwellings to be net zero carbon.

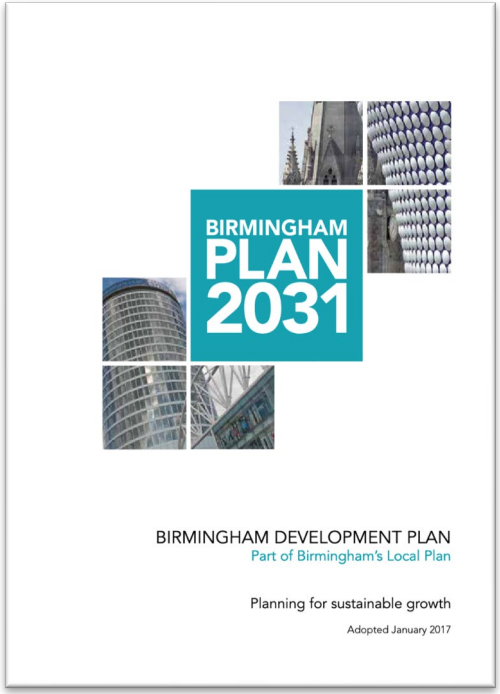
   iii. Minor non-residential development will conform to at least BREEAM Very Good and major non-residential development will conform to at least BREEAM Excellent.

   iv. Provide at least 15% of energy from renewable and/or low carbon sources for all major housing developments and non-residential developments of 1000sqm or more.

   v. Supply energy efficiently and give priority to decentralised and/or district energy supply.

   vi. For all major developments, implement a recognised quality regime that ensures the 'as built' performance (energy use, carbon emissions, indoor air quality, and overheating risk) matches the calculated design performance of dwellings as specified above.

Birmingham Development Plan



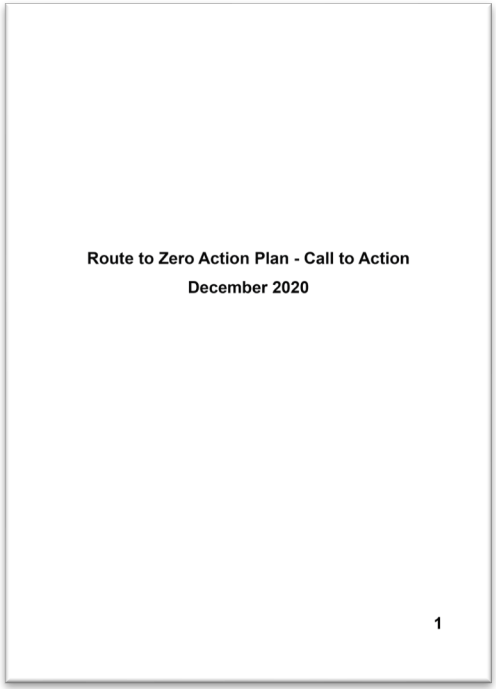
From 2017 - doesn't meet current commitments

Policy TP4 Low and zero carbon energy generation

New developments will be expected to incorporate the provision of low and zero carbon forms of energy generation or to connect into low and zero carbon energy generation networks where they exist, wherever practicable and unless it can be demonstrated that the cost of achieving this would make the proposed development unviable.

In the case of residential developments of over 200 units and non-residential developments over 1,000 sq.m. first consideration should be given to the inclusion of Combined Heat and Power (CHP) generation or a network connection to an existing CHP facility. However, the use of other technologies - for example solar photovoltaics or thermal systems, wind turbines, biomass heating or ground source heating - will also be accepted where they will have the same or similar benefits, there is no adverse impact on amenity and, in the case of ground source heating, environmental risks can be adequately managed.

Birmingham Route to Zero (R20)

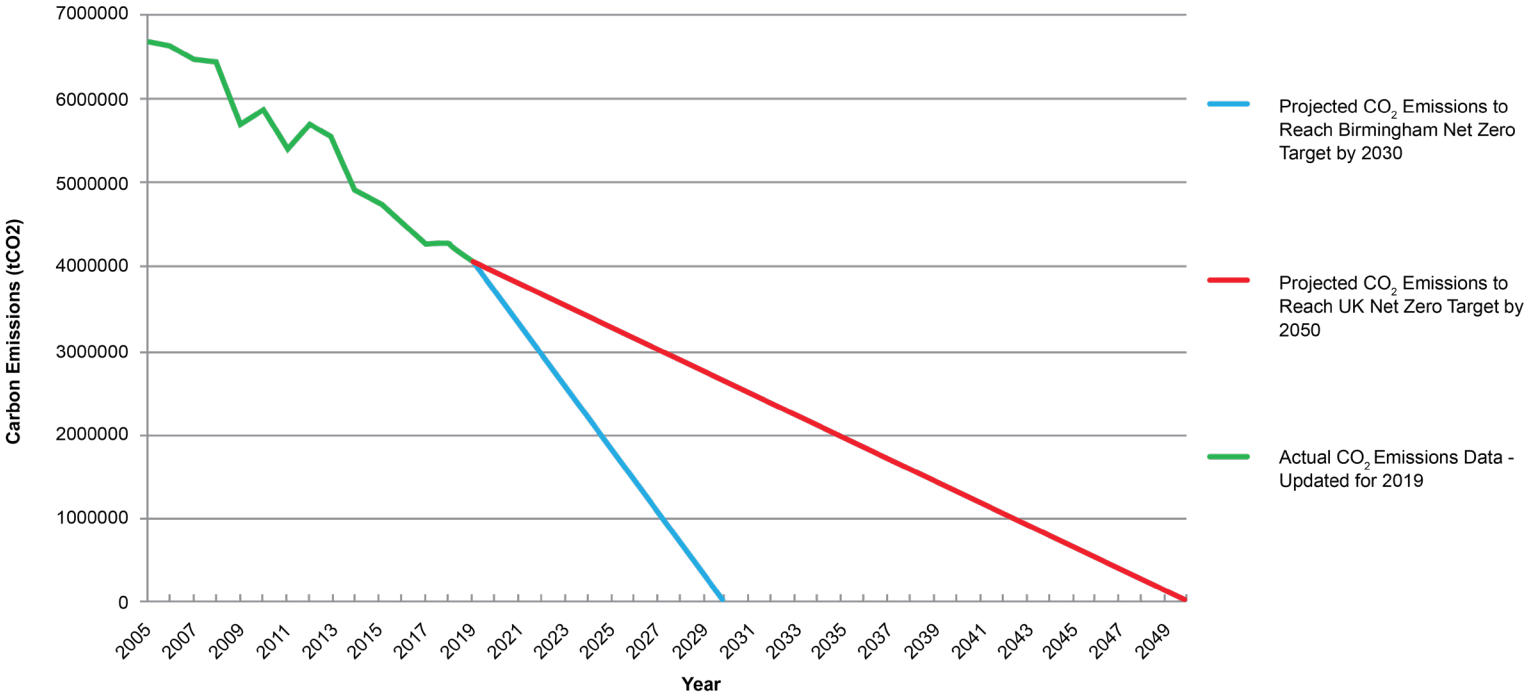

Route to Zero Action Plan - Call to Action
December 2020

1

New expanding team within Council to assist with delivery of commitments and help formulate low carbon policy

- ✓ **Council to be Net Zero by 2030**
- ✓ **Borough-wide Net Zero by 2030**
- ✓ **Review/Amend Development Plan**
- ✓ **“Our Future City Plan” in development** (draft expected 2022)

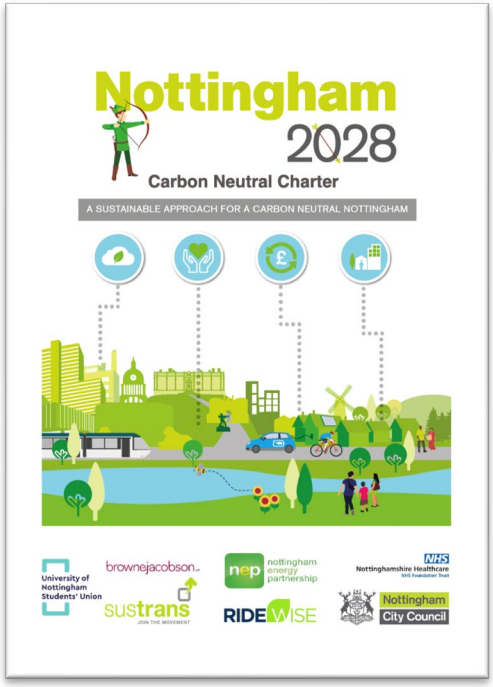
Birmingham Route To Net Zero (R20)

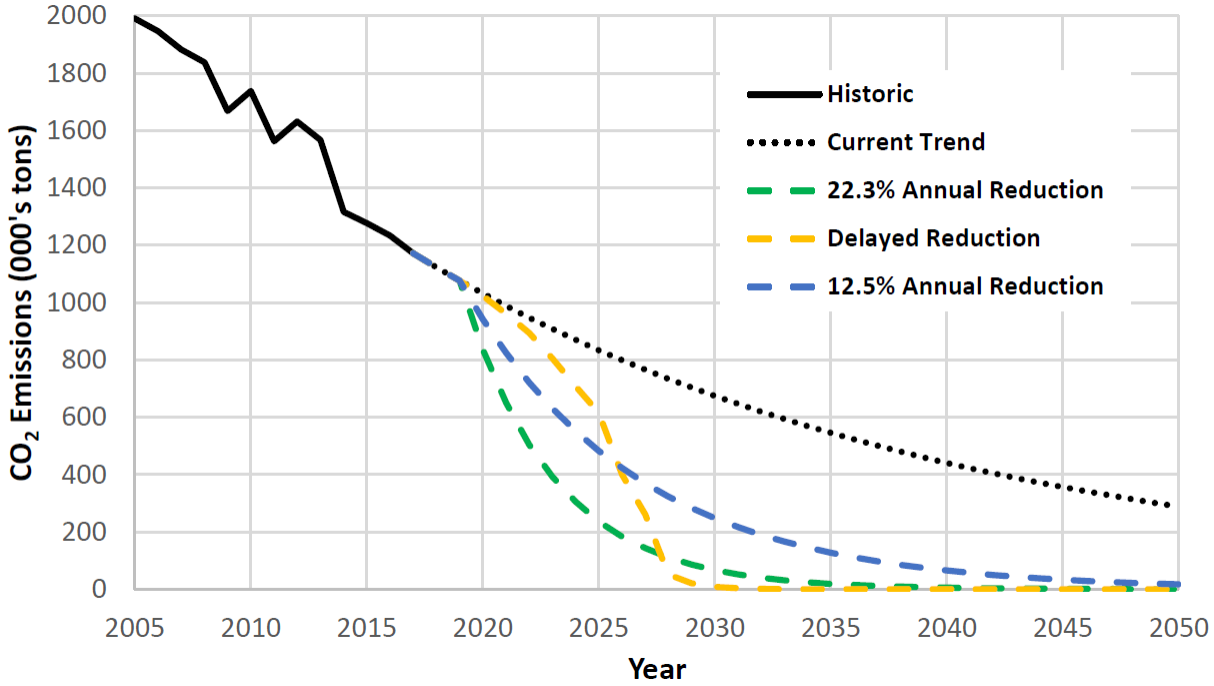


Climate Action Plans

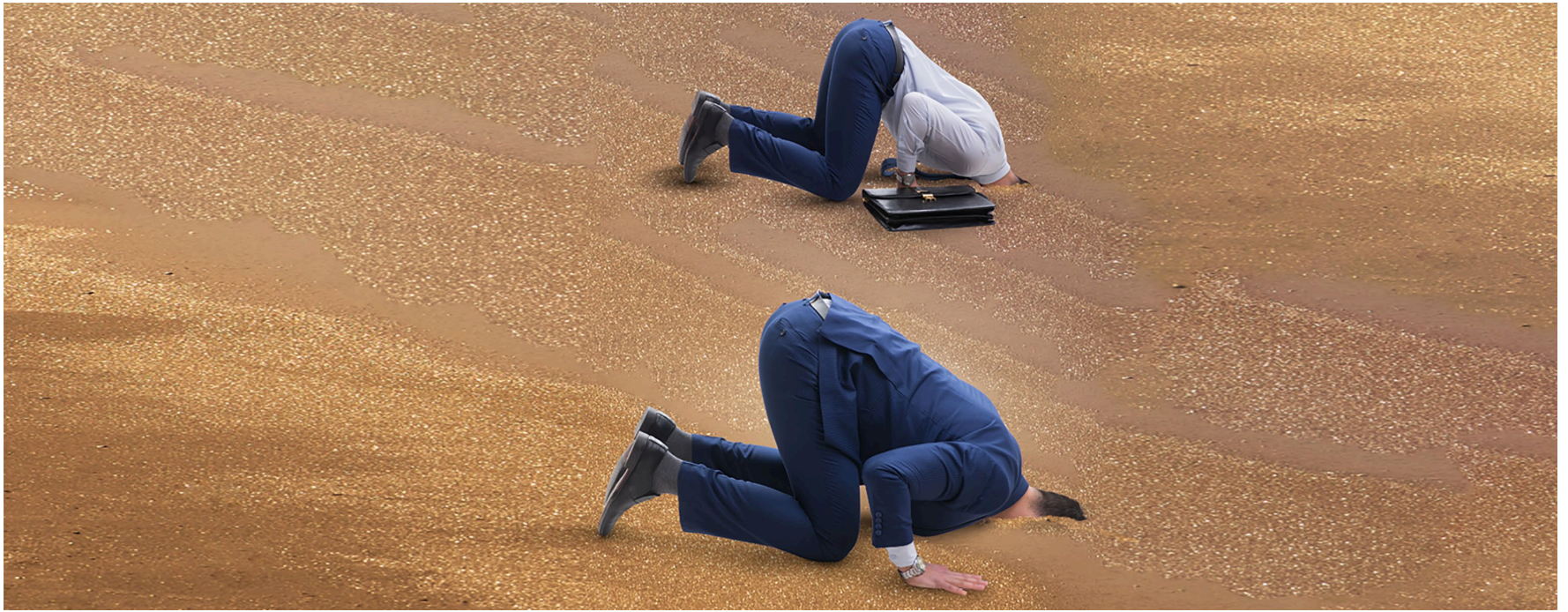
No plan from Dudley yet

Nottingham Plan For 2028





ON THE ROAD TO NET ZERO



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ON THE ROAD TO NET ZERO

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Decarbonising Heat

James Chaplen
Senior Product Manager

ON THE ROAD TO NET ZERO

What Could Net Zero Mean For Commercial Heating?

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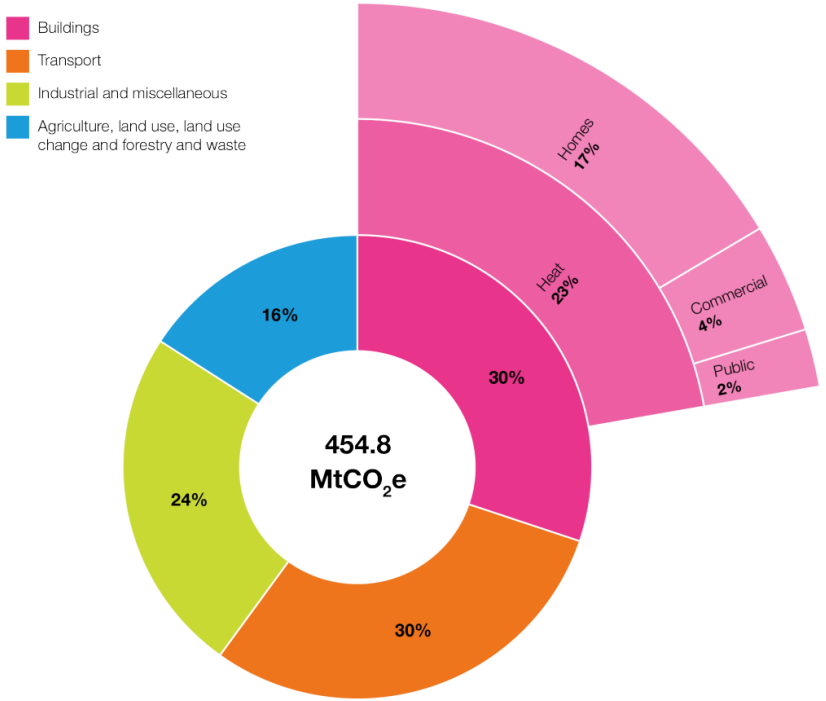
A Significant CO_2 Contributor

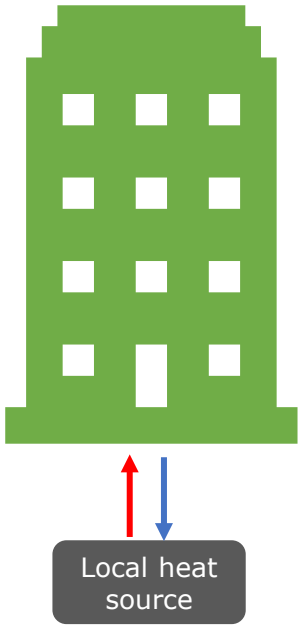
Heating our buildings account for **23%** of all UK emissions.

Significant potential savings can be made with low carbon technologies.



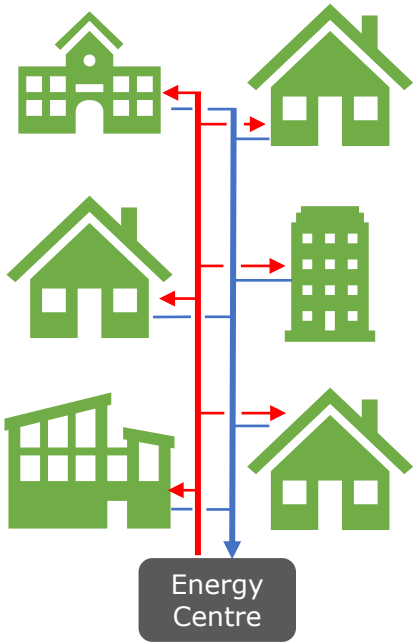
Application Types

Local delivery



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

Heat Networks

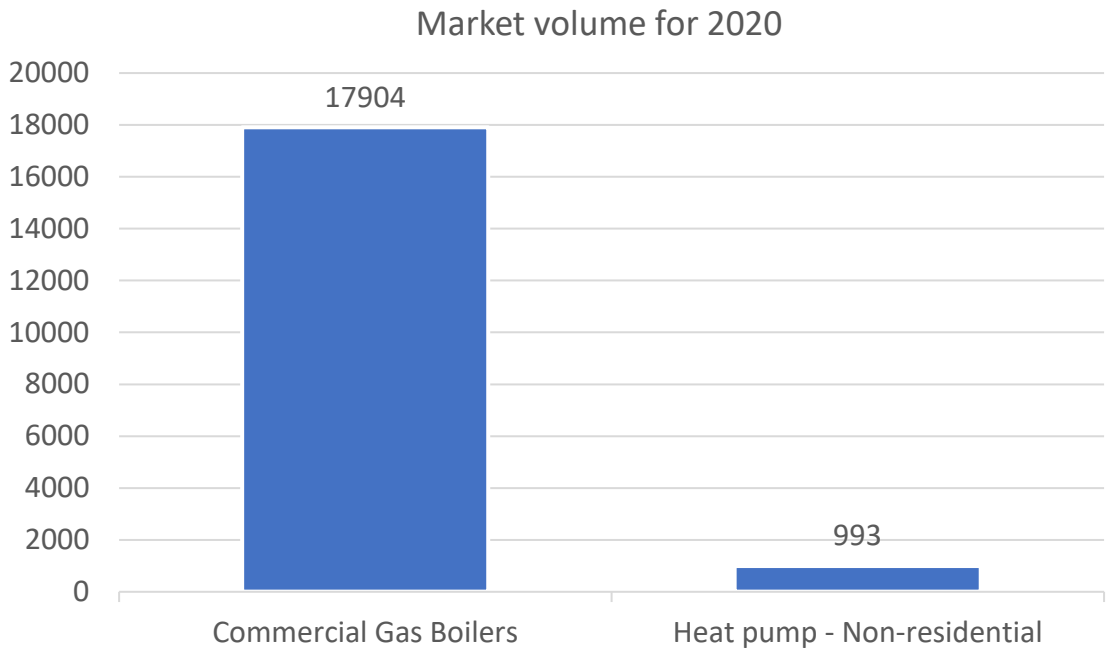


- Heat is delivered to multiple buildings from a single centre.
- Various types and designs depending on temperatures.
- Currently a small part of the market but set to grow.

The Big Drivers Now

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

Market Volumes

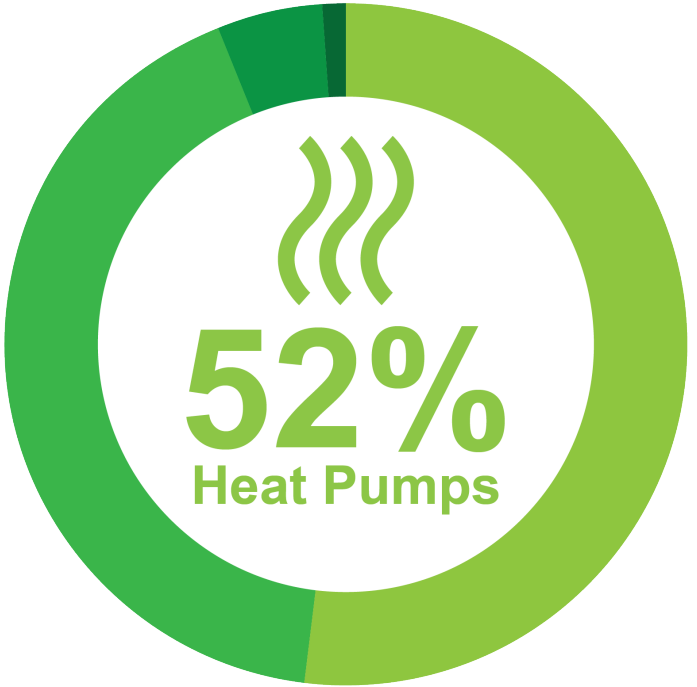


- From 2020 to 21 commercial heat pumps saw a 75% increase to 1747 units.
- Huge change needed to move this market to low carbon technologies.

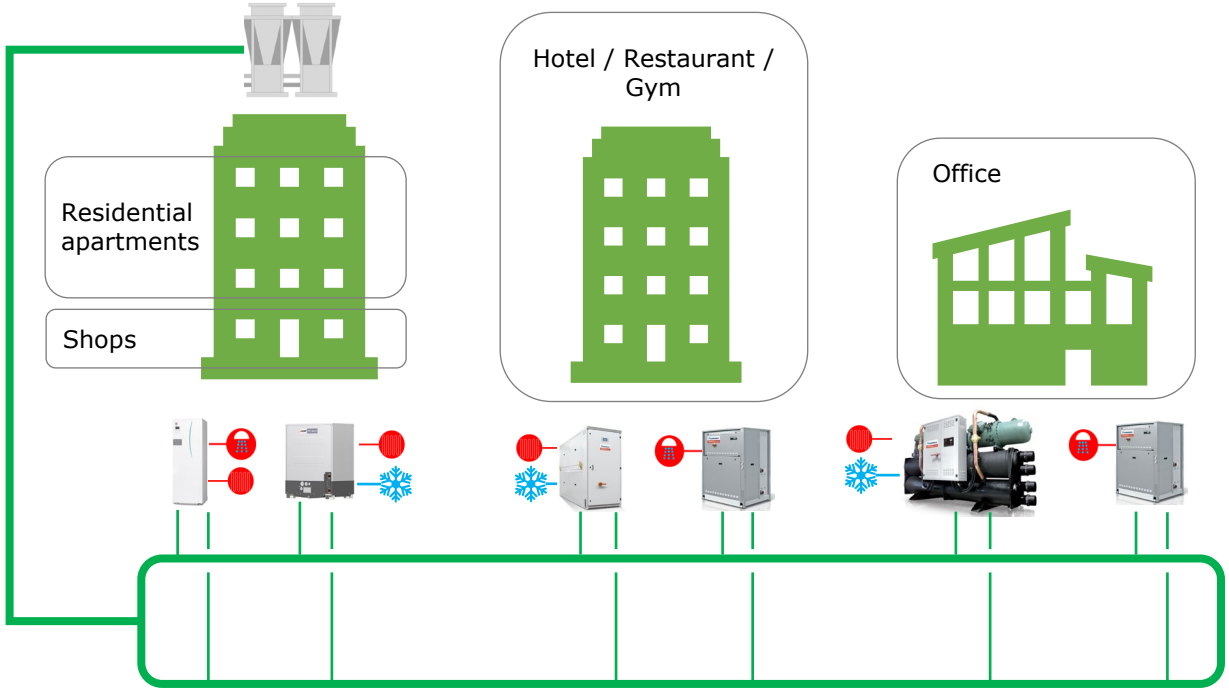
What Could This Market Look Like?

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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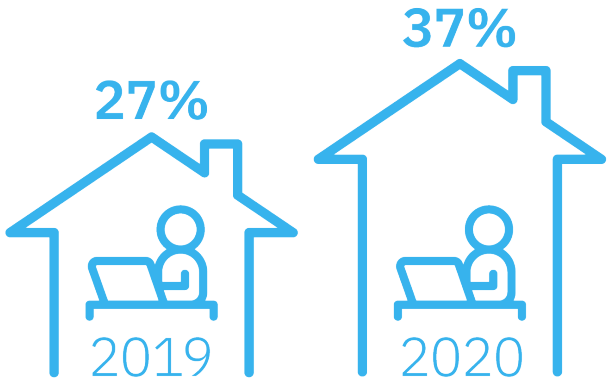
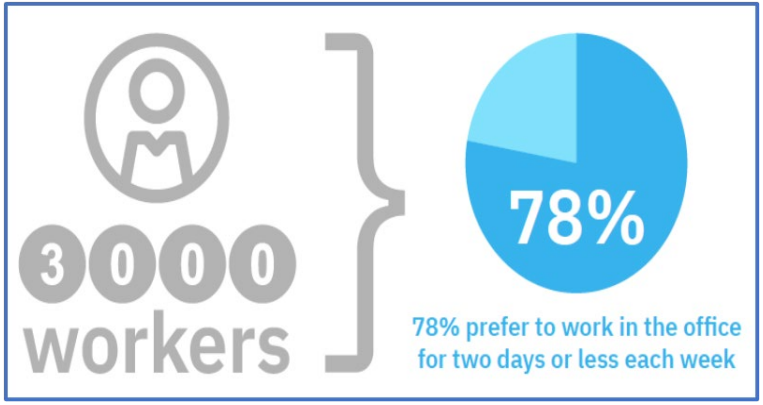
The Future Of Offices

Mel Threader
Product Marketing Manager

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

ON THE ROAD TO NET ZERO





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

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

Achieving Net Zero In The Office

- Energy efficiency
- Renewable
- Low carbon
- IES & NABERS

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HVAC & Connectivity

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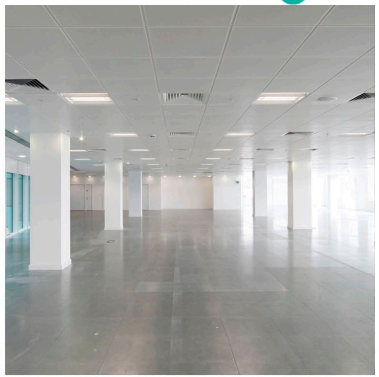
Air Conditioning

- Flexibility
- Future-proof
- Lower GWP refrigerant
- *Hybrid VRF*



Indoor Air Quality

- Ventilation
- Filtration
- Monitoring

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Hot Water

- R744 Heat Pump

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IT Cooling

- More technology
- Business critical

- R32 Close Control

Maximise performance

Remote monitoring

Energy apportioning

Energy usage patterns

- RC with PIR

Residential Solutions

- Energy Efficiency
- Increased CoL

- Air / Water Source HP
- M Series
- MVHR & Filtration

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

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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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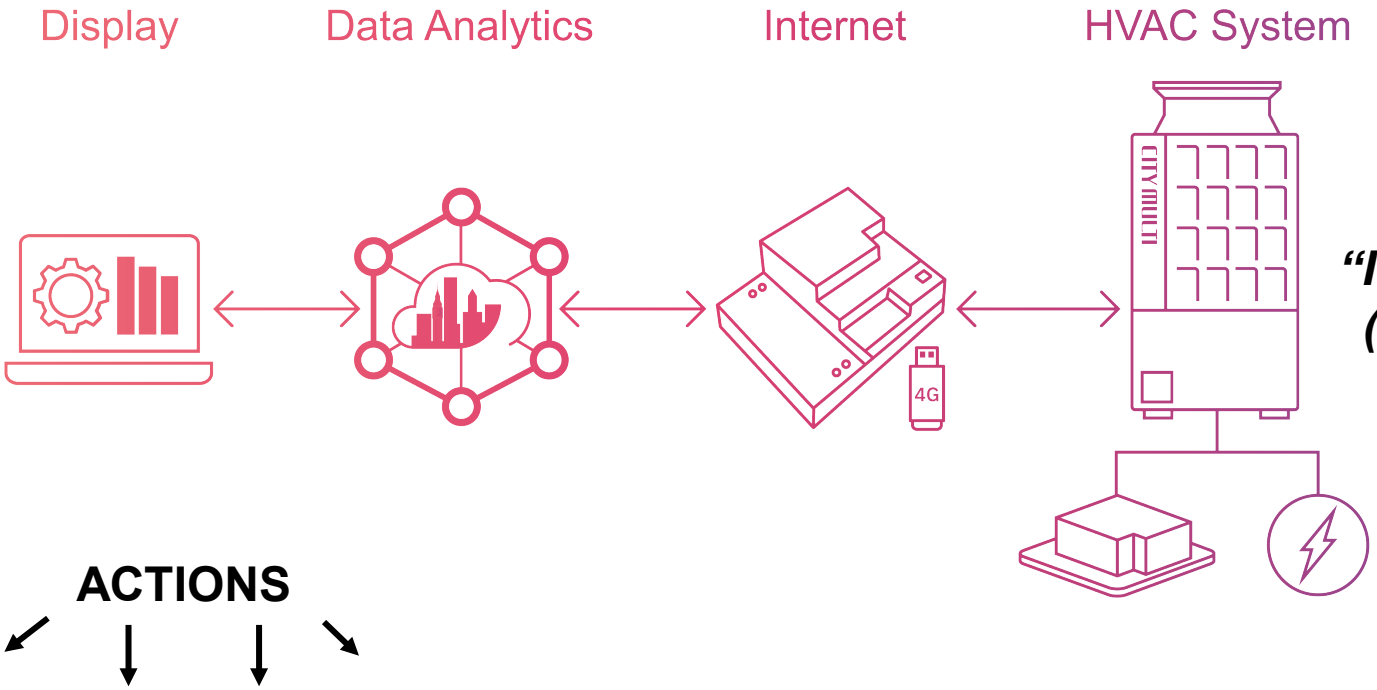
Digital HVAC - What Is It?



"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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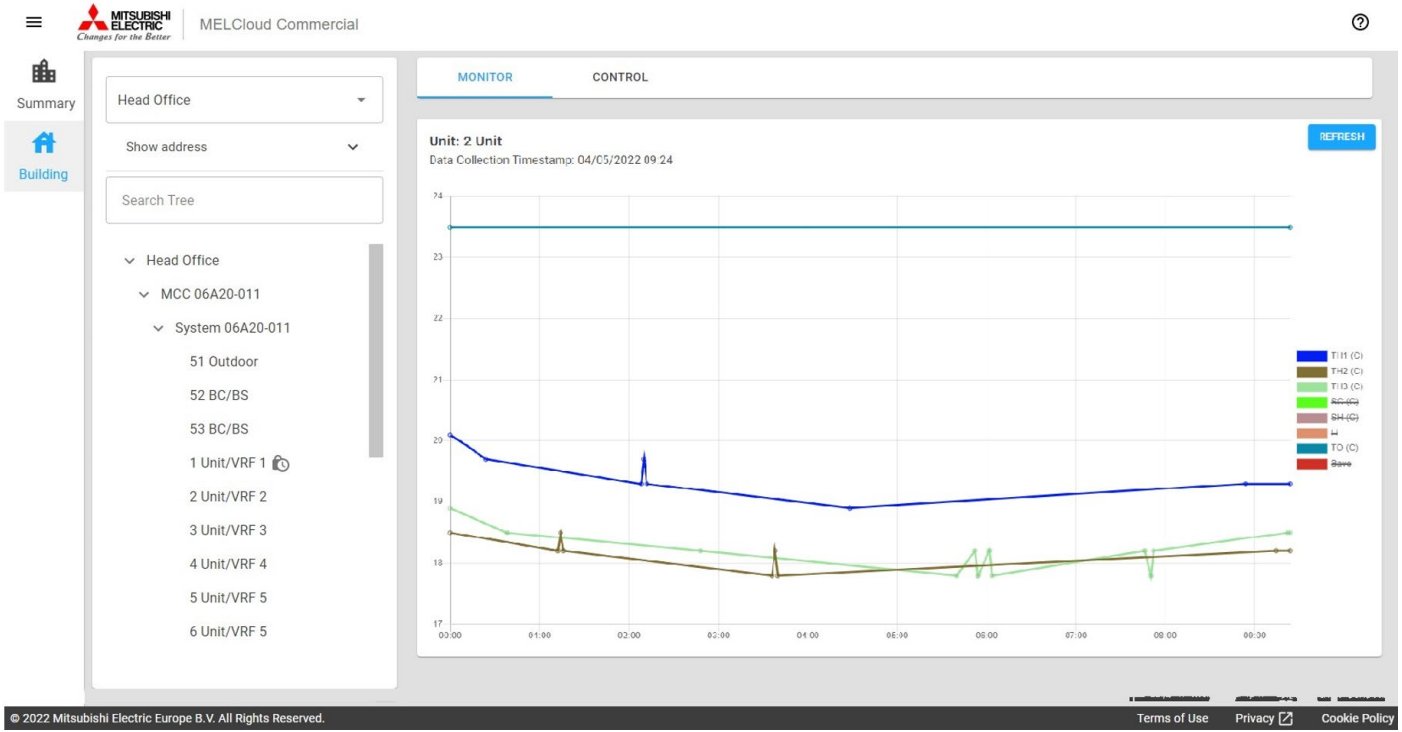
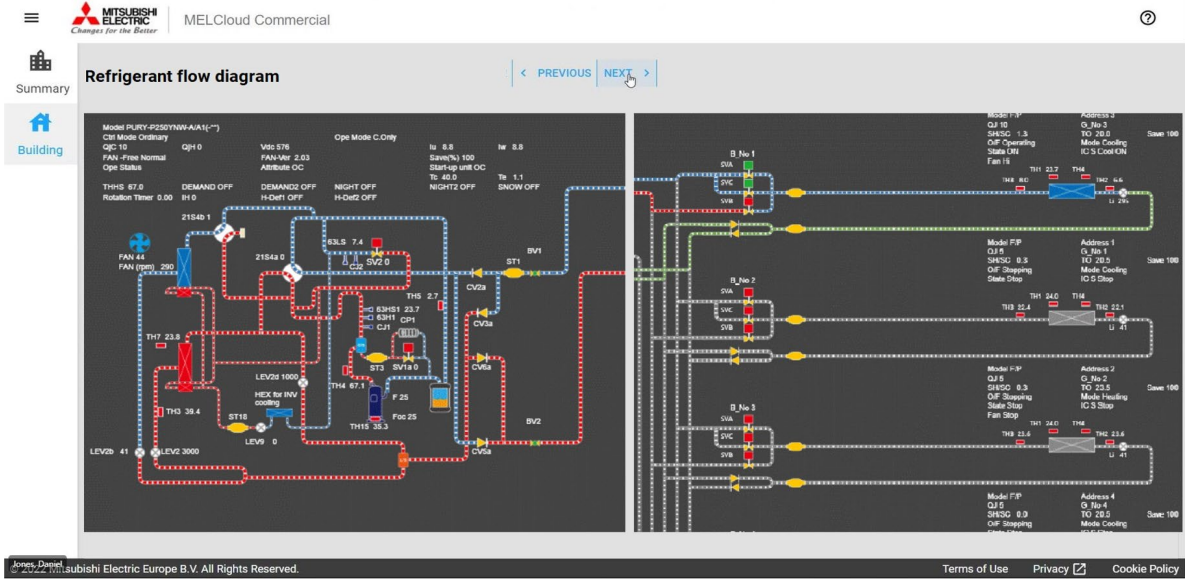
Insight And Knowledge

MELCloud COMMERCIAL

Monitor And Analyse System And Building Data



Avoiding 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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