



TRI-COUNTY
REGIONAL ENERGY NETWORK

SAN LUIS OBISPO • SANTA BARBARA • VENTURA

Reducing Carbon Emissions from MEP systems

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In Balance Green Consulting

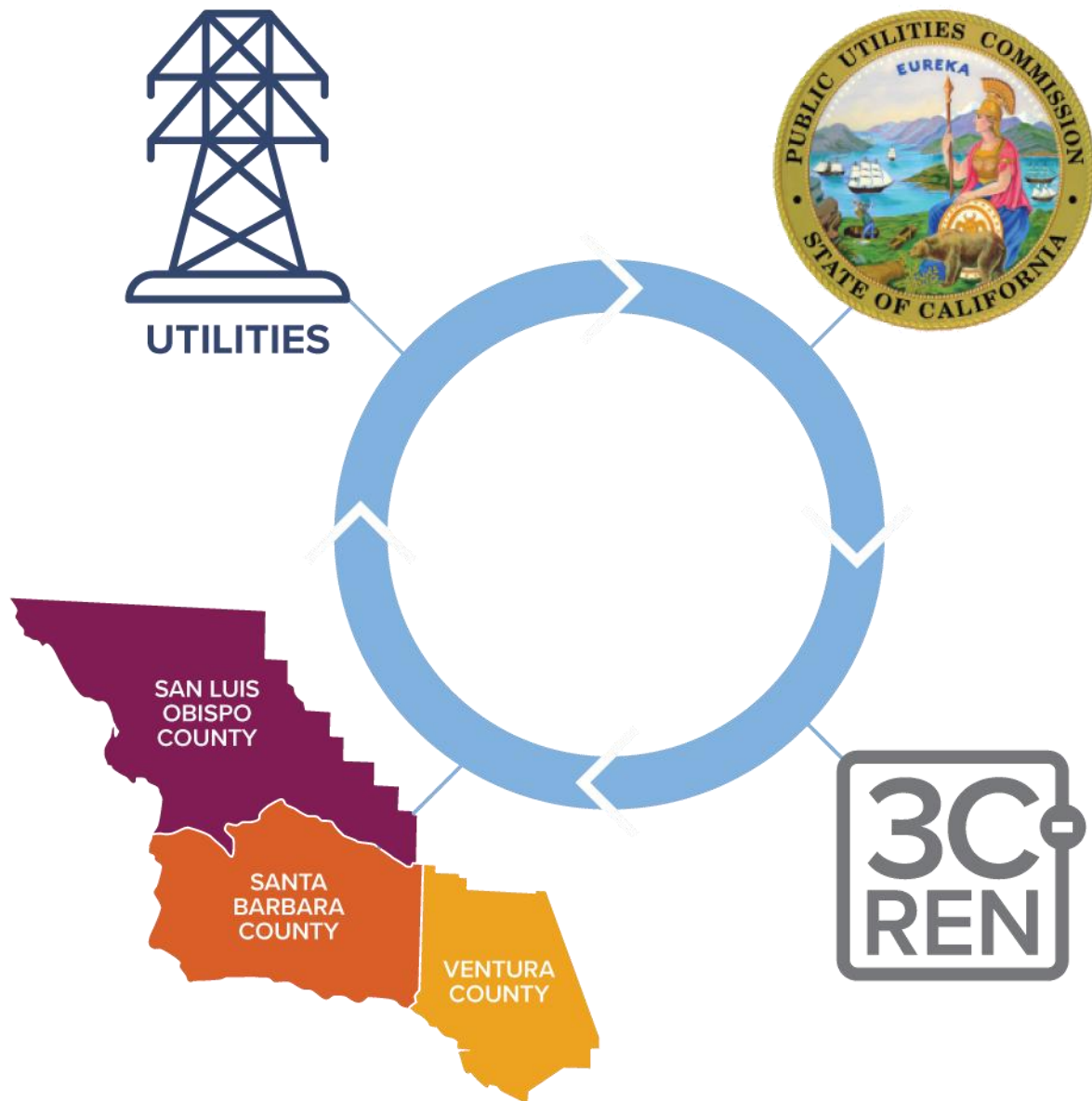


Before We Begin

Here are some quick reminders:

- Call in? Please **share** full name to confirm attendance
- To receive AIA LUs, you **must attend** at least 80% of the training. Attendance will be verified
- Use the "**Chat**" to share questions or comments
- Slides/recording are **shared** after most events and can be found on 3C-REN's on-demand page
- 3C-REN does **not** allow **AI notetakers**, unless used to accommodate a disability





Tri-County Regional Energy Network

3C-REN is a collaboration between the tri-counties

Our programs reduce energy use for a more sustainable, equitable and economically vibrant Central Coast

Our free services are funded via the CPUC, bringing ratepayer dollars back to the region



Our Services

Incentives



HOME ENERGY SAVINGS

3c-ren.org/for-residents
3c-ren.org/multifamily



COMMERCIAL ENERGY SAVINGS

3c-ren.org/commercial

Contractors can enroll at
3c-ren.org/contractors

Training



BUILDING PERFORMANCE TRAINING

3c-ren.org/events
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ENERGY CODE CONNECT

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View past trainings at
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Technical Assistance



AGRICULTURE ENERGY SOLUTIONS

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ENERGY ASSURANCE SERVICES

3c-ren.org/assurance



Learning Objectives

- Understand the Impact of **mechanical, electrical, and plumbing (MEP)** systems to whole-life carbon emissions for buildings.
- Learn about emerging tools and methodologies for measuring embodied carbon in MEP systems, including the challenges and opportunities in data availability and standardization
- Learn near-term strategies to reduce MEP carbon emissions within the context of a whole-life carbon approach to design and engineering
- Become familiar with the state of the industry for assessing and reporting emissions and the work currently in progress.

Learning Units

- 1.0 AIA HSW LUs approved for this course
- 1.0 ZNCD Continuing Education units for CAB



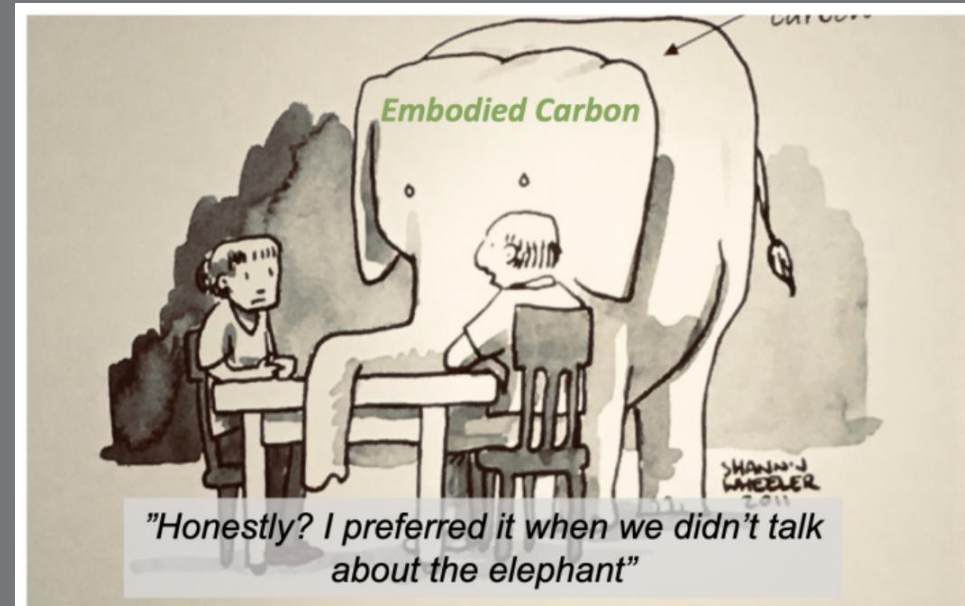
Agenda

1. Carbon Emissions Overview
2. MEP Factors for Tracking Emissions
3. Refrigerants
4. Whole Life Carbon for MEP
5. Strategies for Reducing Emissions
6. Industry Efforts and Resources





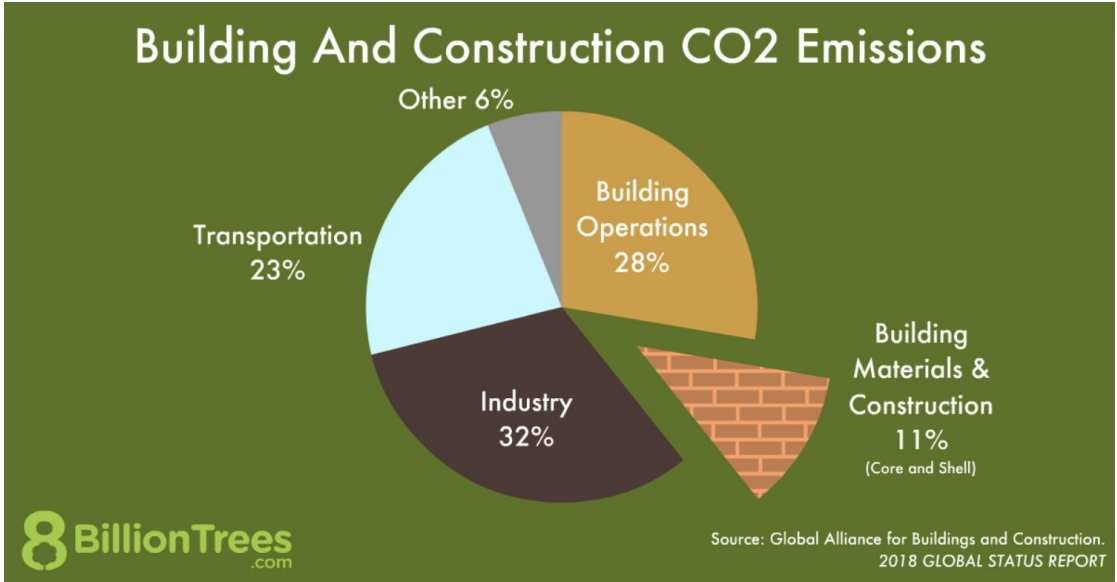
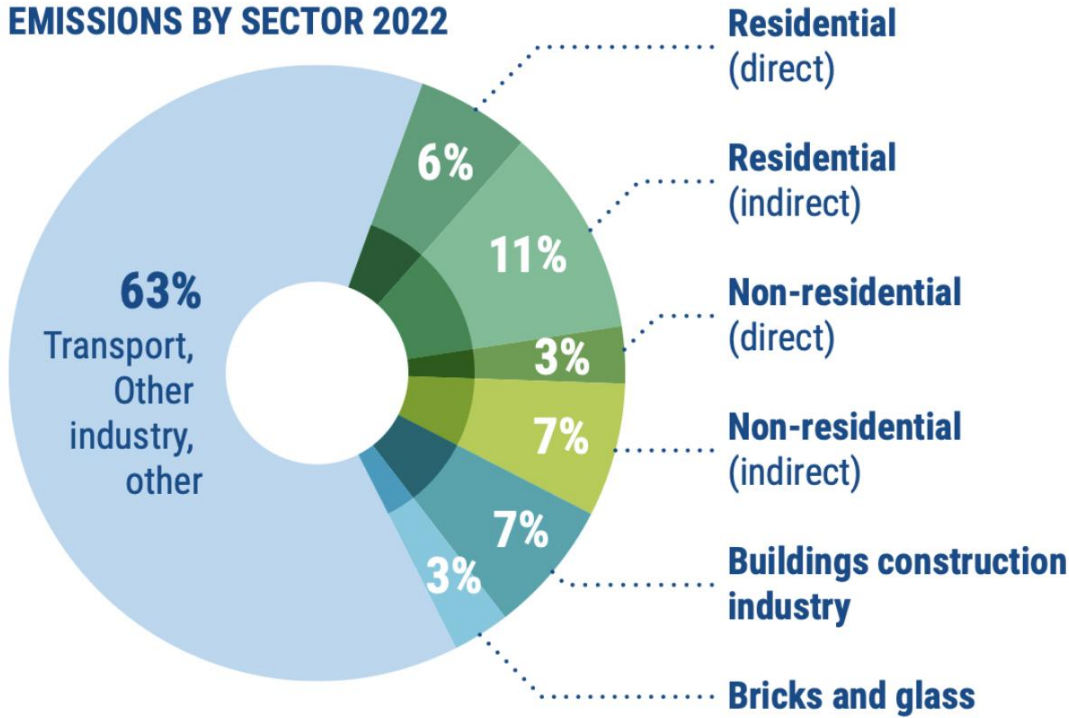
Carbon Emissions Overview



Ed Mazria @ CarbonPositive 2030

Carbon Emissions by Sector

EMISSIONS BY SECTOR 2022



8BillionTrees.com

Source: Global Alliance for Buildings and Construction, 2018 GLOBAL STATUS REPORT

(Source: IEA 2023a. Adapted from 'Tracking Clean Energy Progress')

Notes: Buildings construction industry refers to materials used in construction, including concrete, steel and aluminium. Other materials shown separately.



Understanding Carbon



Embodied Carbon

Manufacture, transport and
installation of construction materials

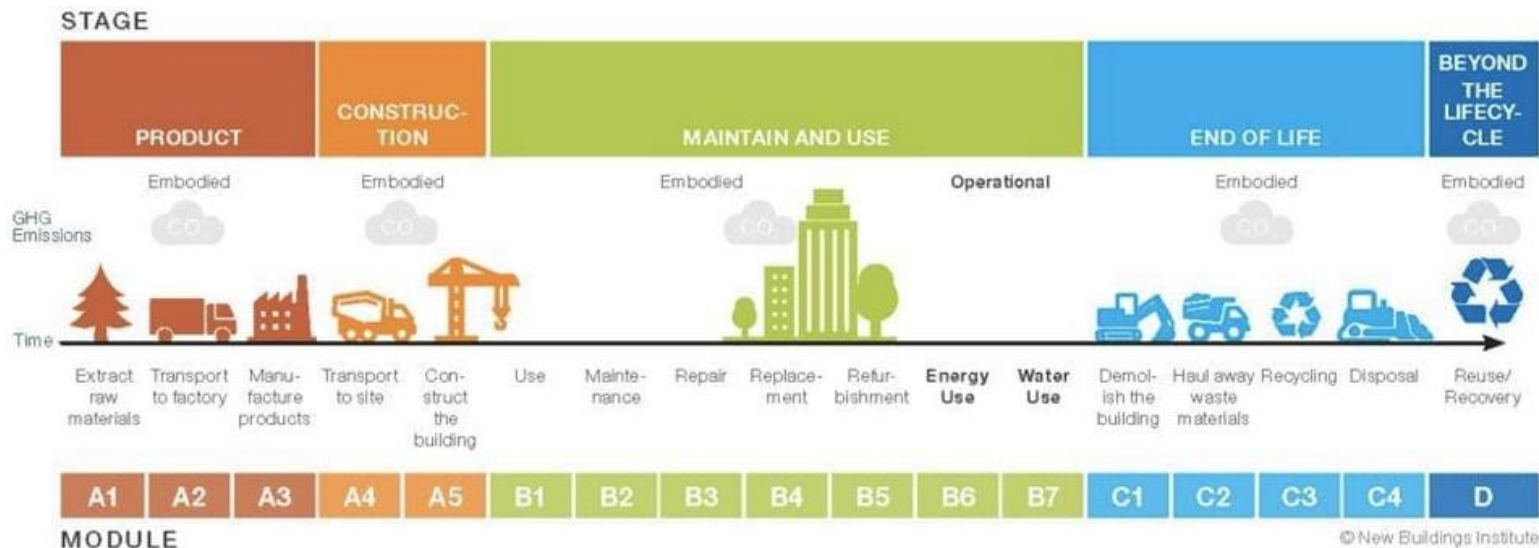
Operational Carbon

Building energy consumption

Tracking Emissions – Life Cycle Stages

FIGURE 1: LIFECYCLE STAGES

Data source: BS EN 15978:2011

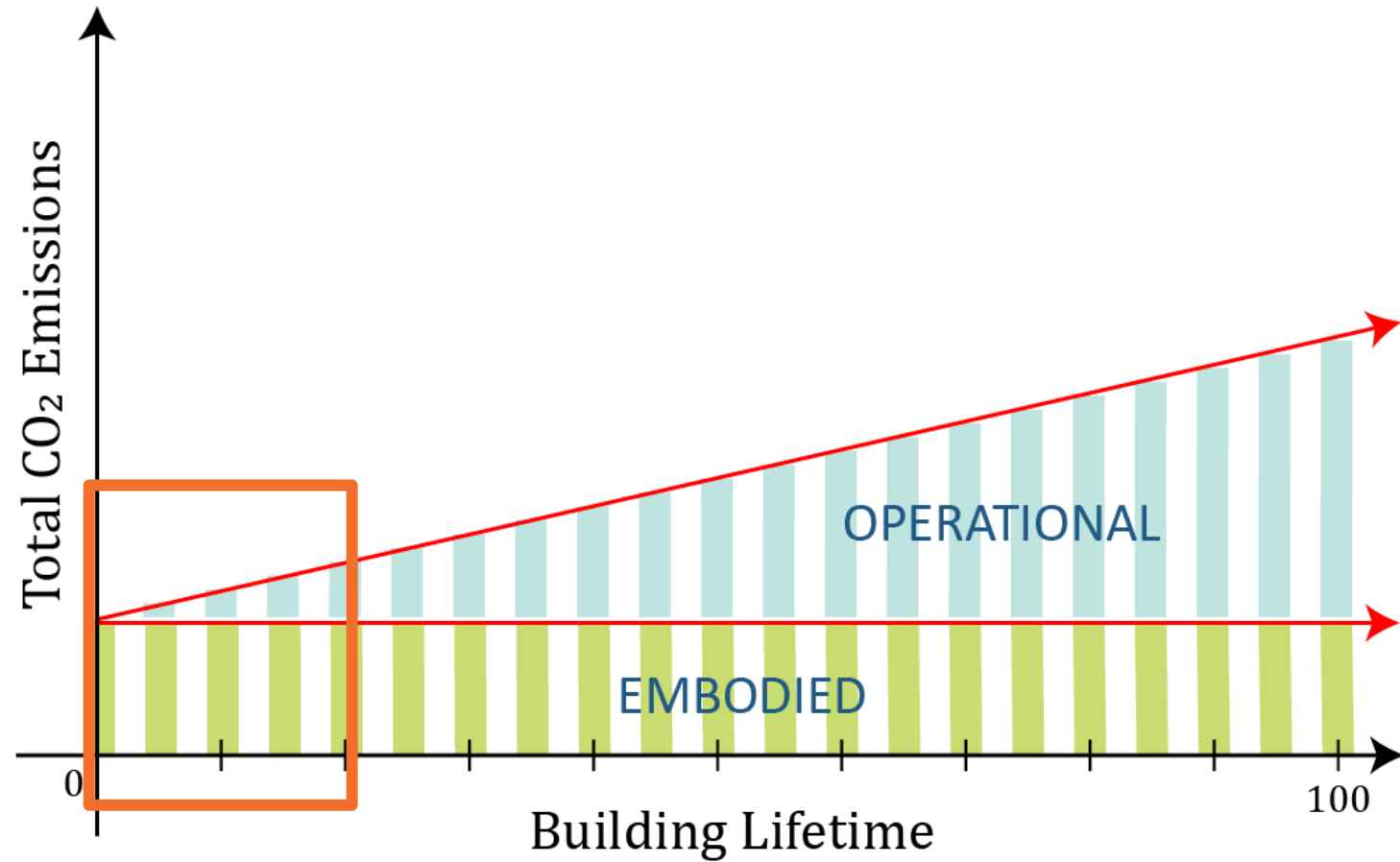


(Cradle to gate)

(_____ Cradle to grave _____)

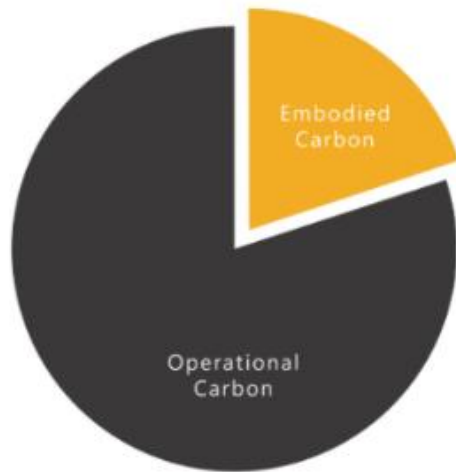
(_____ Cradle to cradle _____)

Time Value of Carbon



A Shifting Focus on Embodied Carbon...

- A bigger piece of the carbon pie



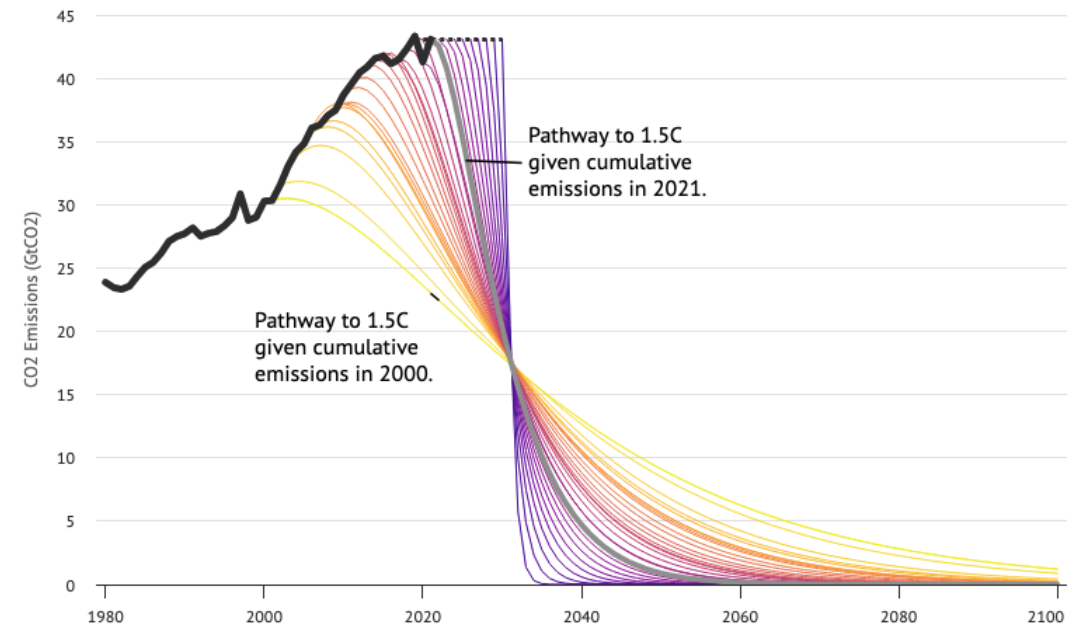
Typical Building



High Performance Building

- And the time factor

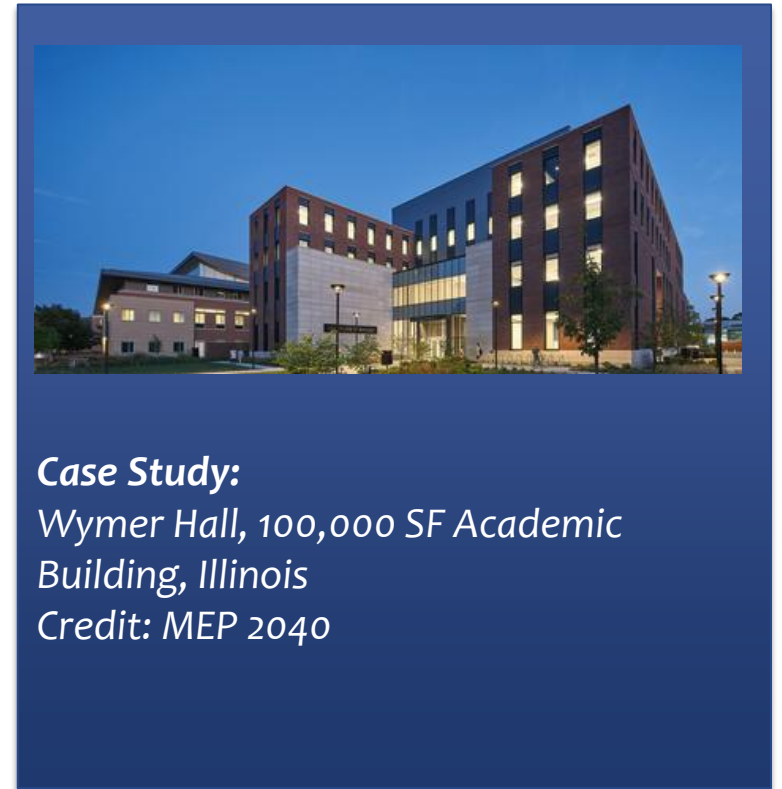
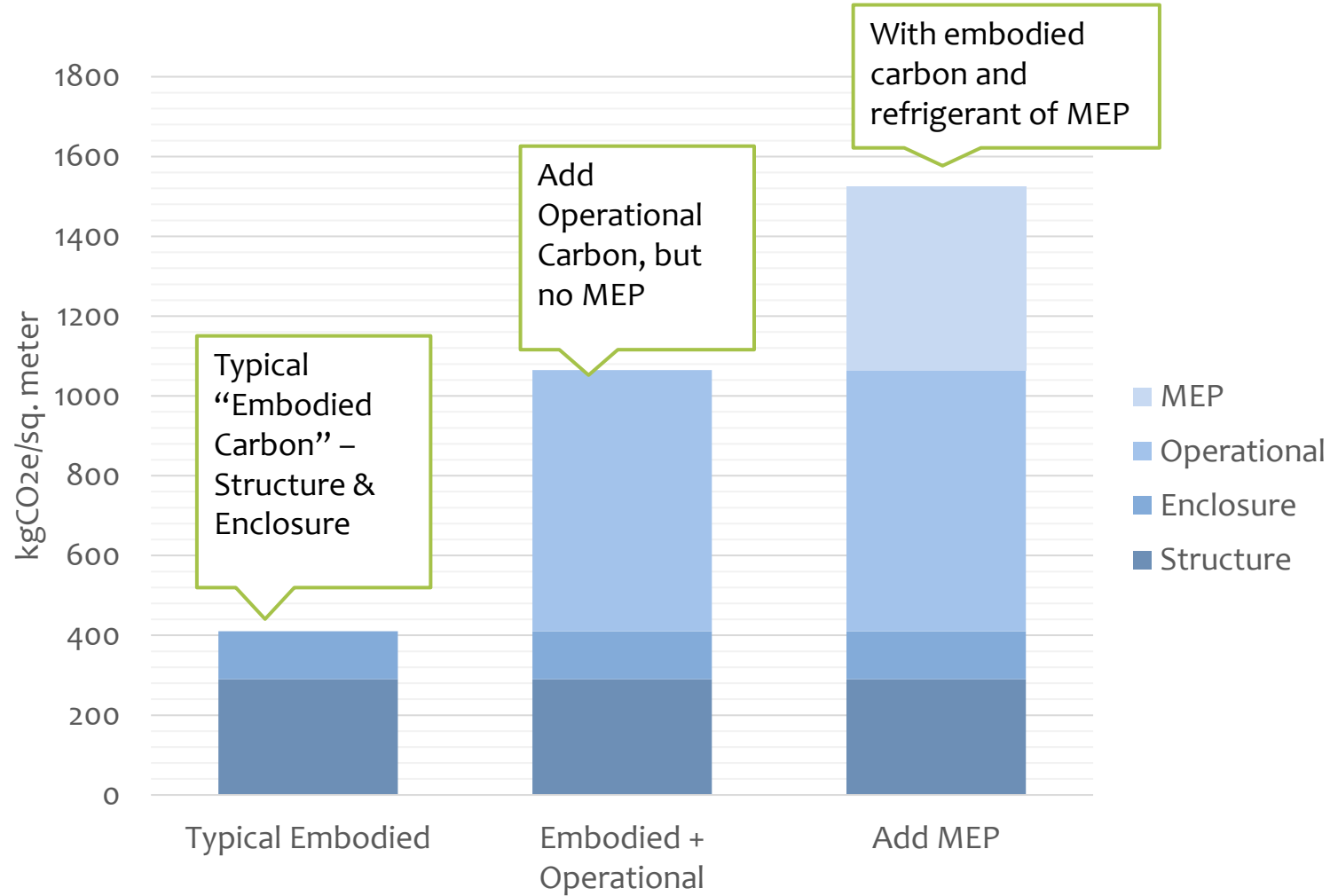
Limiting warming to 1.5C is increasingly difficult without large-scale negative emissions



Courtesy Carbon Brief



... And a new look at MEP's Role



Quantifying Carbon: Environmental Product Declarations (EPDs)

ENVIRONMENTAL PRODUCT DECLARATION

THERMAFIBER® MINERAL WOOL

OWENS CORNING



Owens Corning® Thermafiber® Mineral Wool insulation enhances comfort, energy savings and sustainability in new and existing structures.

Owens Corning, and its family of companies, is a leading global producer of residential and commercial building materials, glass fiber reinforcements, and engineered materials for composite systems. It uses a decision framework for managing company as a sustainable enterprise. It is the focus of the company's strategic market-leading business scope – human in scale the company's purpose and products make the better place.

Owens Corning is committed to balancing economic growth, social progress and sustainability goals to its building and composite customers the world.

This Environmental Product Declaration is a component stated goal to provide life cycle information on all core products.

sustainability.owenscorning.com

ENVIRONMENTAL PRODUCT DECLARATION



According to ISO 14025, EN 15804 and ISO 21930:2017

Thermafiber® Mineral Wool

EPD PROGRAM AND PROGRAM OPERATOR	UL Environment
NAME, ADDRESS, LOGO, AND WEBSITE	333 Pingston Road Northbrook, IL 60061
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	General Program Instructions v2.5 March 2020
MANUFACTURER NAME AND ADDRESS	Owens Corning, One Owens Corning Parkway, Toledo, OH, USA
DECLARATION NUMBER	4790011847.101.1
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	1 m ² insulation at R _{si} =1
REFERENCE PCR AND VERSION NUMBER	Part B: Building Envelope Thermal Insulation EPD Requirements, UL 10010-1
DESCRIPTION OF PRODUCT APPLICATION/USE	Thermafiber® Mineral Wool is a type of slag wool insulation product used in a variety of building applications, both residential and commercial, requiring the use of thermal insulation.
PRODUCT RSL DESCRIPTION (IF APPL.)	75 years
MARKETS OF APPLICATION	Building Material
DATE OF ISSUE	10/1/2021
PERIOD OF VALIDITY	5 Years
EPD TYPE	Product-specific
RANGE OF DATASET VARIABILITY	NA
YEAR(S) OF REPORTED PRIMARY DATA	2020
LCA SOFTWARE & VERSION NUMBER	Simapro 9.1
LCI DATABASE(S) & VERSION NUMBER	ecoinvent 3.6
LCIA METHODOLOGY & VERSION NUMBER	TRACI 2.1 v1.05

The PCR review was conducted by:

PCR Review Panel	epd@ulenvironment.com
Thomas P. Gloria, Industrial Ecology Consultants	
Aspire Sustainability	

This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:

Thomas P. Gloria, Industrial Ecology Consultants	
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Limitations: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not recognize. EPDs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can only not replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health and safety, environmental impact assessments, etc.

Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and impact.

- Standardized reporting on environmental impacts – including carbon
- Industry-level or product-specific analysis
- Can be in-house or third-party certified

ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool

According to ISO 14025, EN 15804 and ISO 21930:2017



4.1. Life Cycle Impact Assessment Results

Table 10 LCIA Results for North America (TRACI) for Thermafiber® Mineral Wool Insulation, SAFB™ (2.5 pcf | 40 kg/m³), WABASH, (1 m², R_{si}=1)

TRACI v2.1	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	A1-C4
GWP 100 [kg CO2 eq]	1.33E+00	2.51E-01	3.76E-04	MND	MND	2.50E-02	MND	2.75E-03	1.60E+00
ODP [kg CFC-11 eq]	1.06E-07	1.07E-08	1.90E-11	MND	MND	6.04E-09	MND	6.17E-10	1.67E-07
EP [kg N eq]	2.06E-04	1.56E-04	1.54E-07	MND	MND	1.62E-05	MND	2.29E-06	7.74E-04
POCP [kg O3 eq]	5.93E-04	1.63E-04	1.66E-05	MND	MND	4.51E-03	MND	8.01E-04	1.25E-01
ADP _{non} [MJ, LHV]	7.44E-02	4.53E-02	1.68E-04	MND	MND	5.34E-02	MND	5.49E-03	1.83E+00

Table 11 LCIA Results for North America (TRACI) for Thermafiber® Mineral Wool Insulation, SAFB™ (2.5 pcf | 40 kg/m³), JOPLIN (1 m², R_{si}=1)

TRACI v2.1	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	A1-C4
GWP 100 [kg CO2 eq]	1.33E+00	2.51E-01	3.76E-04	MND	MND	2.52E-02	MND	2.77E-03	1.17E+00
ODP [kg CFC-11 eq]	1.06E-07	1.07E-08	1.90E-11	MND	MND	6.09E-09	MND	6.23E-10	1.91E-07
EP [kg N eq]	2.06E-04	1.56E-04	1.54E-07	MND	MND	1.57E-04	MND	2.67E-05	5.29E-03
POCP [kg O3 eq]	5.93E-04	1.63E-04	1.66E-05	MND	MND	1.64E-05	MND	2.31E-06	1.05E-03
ADP _{non} [MJ, LHV]	7.44E-02	4.53E-02	1.68E-04	MND	MND	4.55E-03	MND	8.08E-04	1.14E-01

Table 12 LCIA Results for North America (TRACI) for Facing (1 m²), Cradle-to-Grave (A1-C4)

Facing (1 m²)	GWP 100 [kg CO2 eq]	ODP [kg CFC-11 eq]	EP [kg N eq]	POCP [kg O3 eq]	ADP _{non} [MJ, LHV]
5225T-White	4.67E-01	2.81E-08	2.21E-04	3.45E-02	4.07E-01
5225T Printed	4.52E-01	2.70E-08	2.59E-03	3.38E-02	3.79E-01
5263 Printed 5x5	4.84E-01	2.90E-08	2.71E-03	3.58E-02	4.89E-01
30J	6.28E-01	4.54E-08	3.55E-03	3.71E-03	6.62E-01
WMP-VR	1.79E-01	1.88E-08	1.02E-03	1.51E-04	3.22E-01
3114B	1.78E-01	1.72E-08	1.11E-03	8.94E-05	2.86E-01
7903	1.85E-01	1.78E-08	1.11E-03	1.29E-04	2.92E-01
G47499	1.18E-01	1.31E-08	4.90E-04	1.96E-02	2.86E-01
3035PRE 2.0	6.44E-01	3.41E-08	2.77E-03	7.95E-03	3.00E-01
5225T	5.99E-01	5.30E-08	2.77E-03	1.27E-03	4.67E-01
5229	9.98E-01	5.16E-08	3.24E-03	2.84E-04	6.06E-01
5229 Printed	9.98E-01	5.16E-08	3.24E-03	2.84E-04	6.06E-01
VL6307	1.61E-01	1.59E-08	1.01E-03	4.18E-04	6.06E-01
GWP 100 - Global Warming Potential; ODP - Ozone Depletion Potential; EP - Acidification Potential; POCP - Smog Formation Potential; ADP _{non} - Abiotic Resource Depletion Potential of Non-renewable (fossil) energy resources					

Results by life cycle module, the aggregate of which are shown in Table 12, can be found in Appendix B.

GWP in kgCO₂e is proxy for carbon emissions – here reported by life cycle stage



Product-specific EPD



MEP Factors for Tracking Emissions

Material Scope of “MEP”

Included in Current Standards

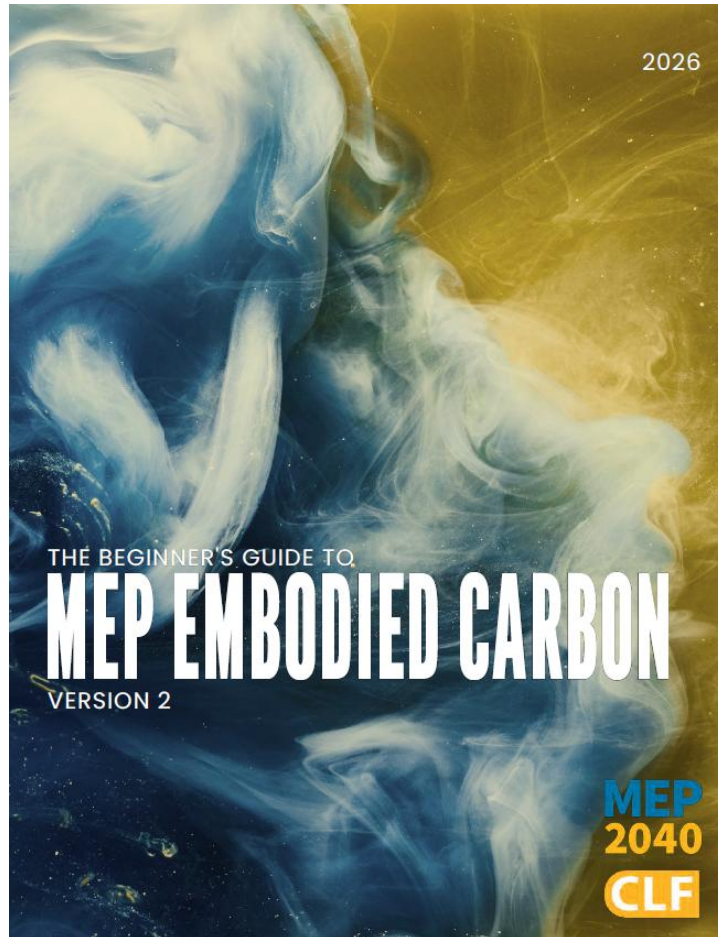
- Mechanical (HVAC) Equipment
- Mechanical Piping and Ductwork
- Plumbing Pipe and Fixtures
- Electrical Equipment
- Lighting Fixtures
- Wiring and Conduit
- Photovoltaic Systems
- MEP Insulation

Other “MEP” Systems

- Vertical Transportation
- Fire Protection
- Low-voltage, data, communications
- Security, alarms
- A/V
- Misc. support – hangers, valves, fittings



MEP Whole Life Carbon Pilot



- 27 Participating Firms
- 20 pilot projects identified
- Results reported and tabulated
- Use of Revit and One Click LCA
- Required 60 – 80 EPDs per project, with many gaps in data



Quantifying MEP

- Determine Units - Quantity, weight, length etc.
- Building Information Modeling (BIM) for take offs and tracking
- Define Exclusions



Case Study: Wymer Hall



Poll: Where is MEP Embodied Carbon impact highest?

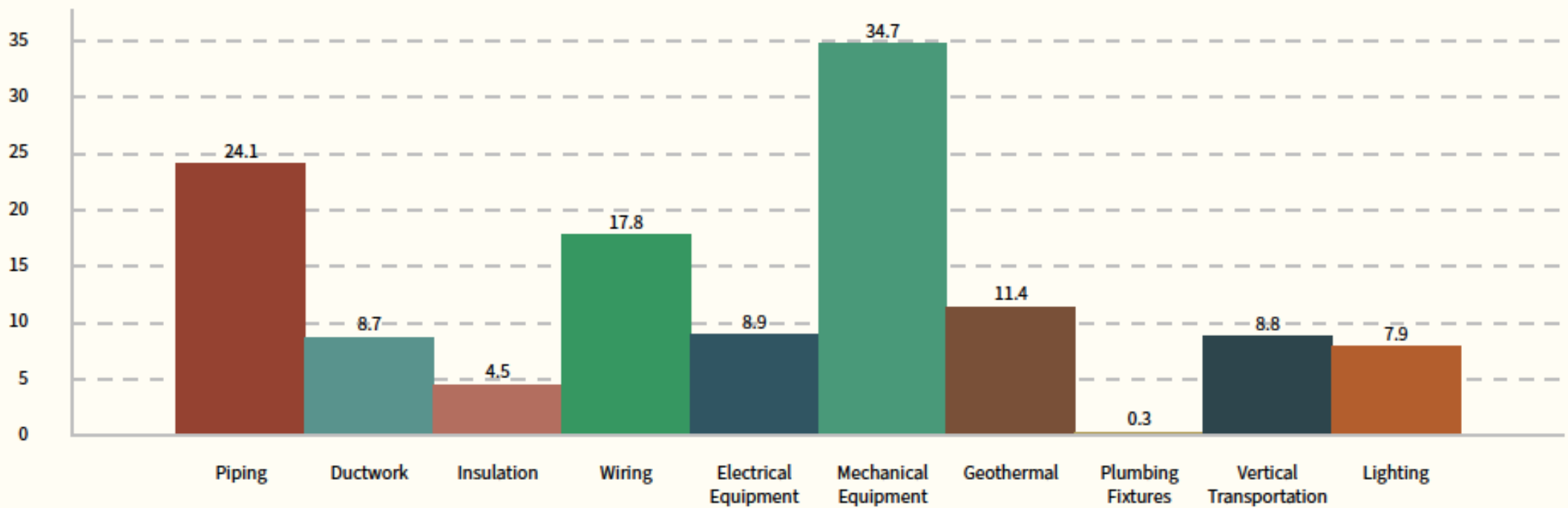
- Wiring
- Plumbing
- HVAC equipment
- Refrigerant
- Other?



Case Study, Cradle to Gate

FIGURE C. MEP CATEGORY RESULTS (A1-A3)

kgCO₂e/m²



MEP WHOLE LIFE CARBON PILOT - EMBODIED CARBON (A1-A3) BY CATEGORY

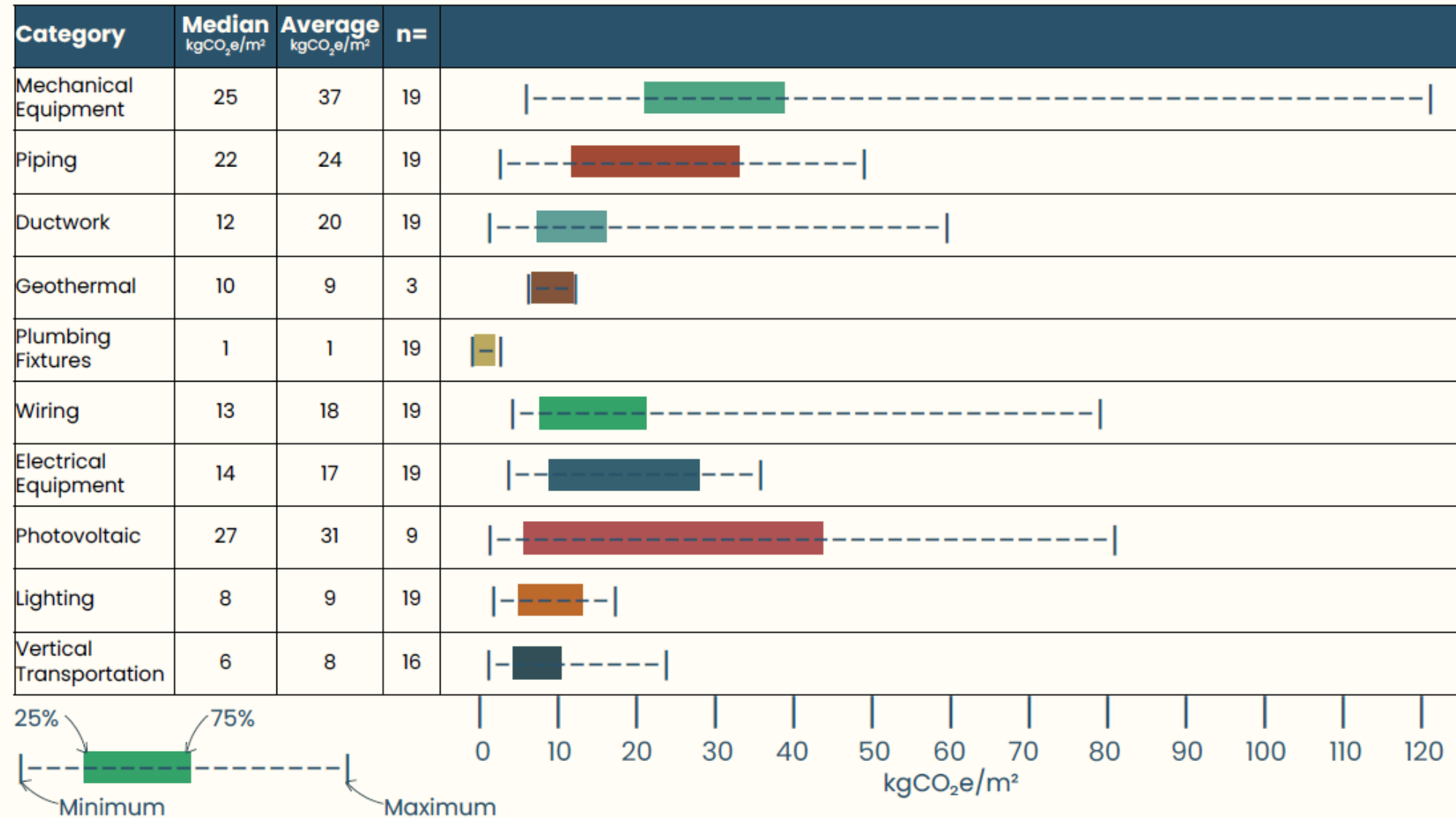
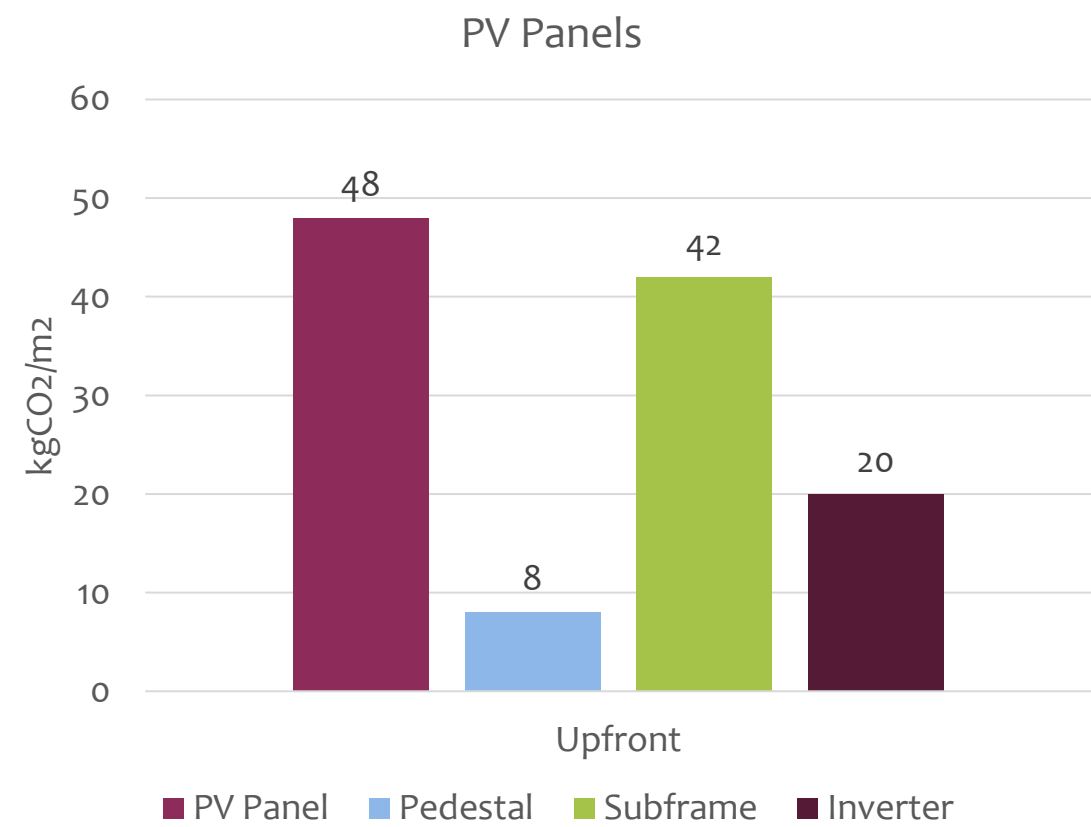
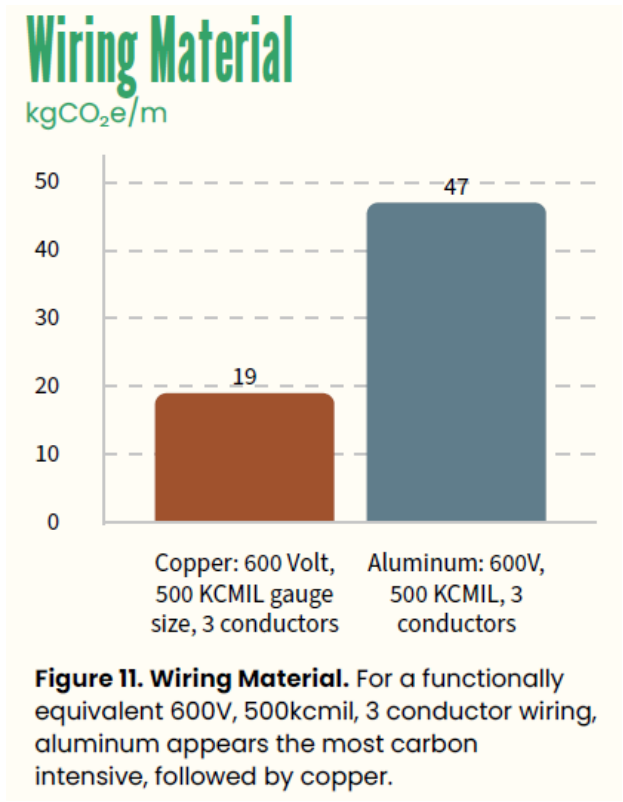


Figure 3. MEP 2040 Whole Life Carbon Pilot Embodied Carbon (A1-A3) by Category. Box and whisker plot showing cradle-to-gate LCA results for each category from the MEP Whole Life Carbon Pilot.

Sample Emissions – PVs



Sample Emissions: Wiring and Piping



Embodied Carbon of Piping (A1-A3)

Piping Material by Size

kgCO₂e/m

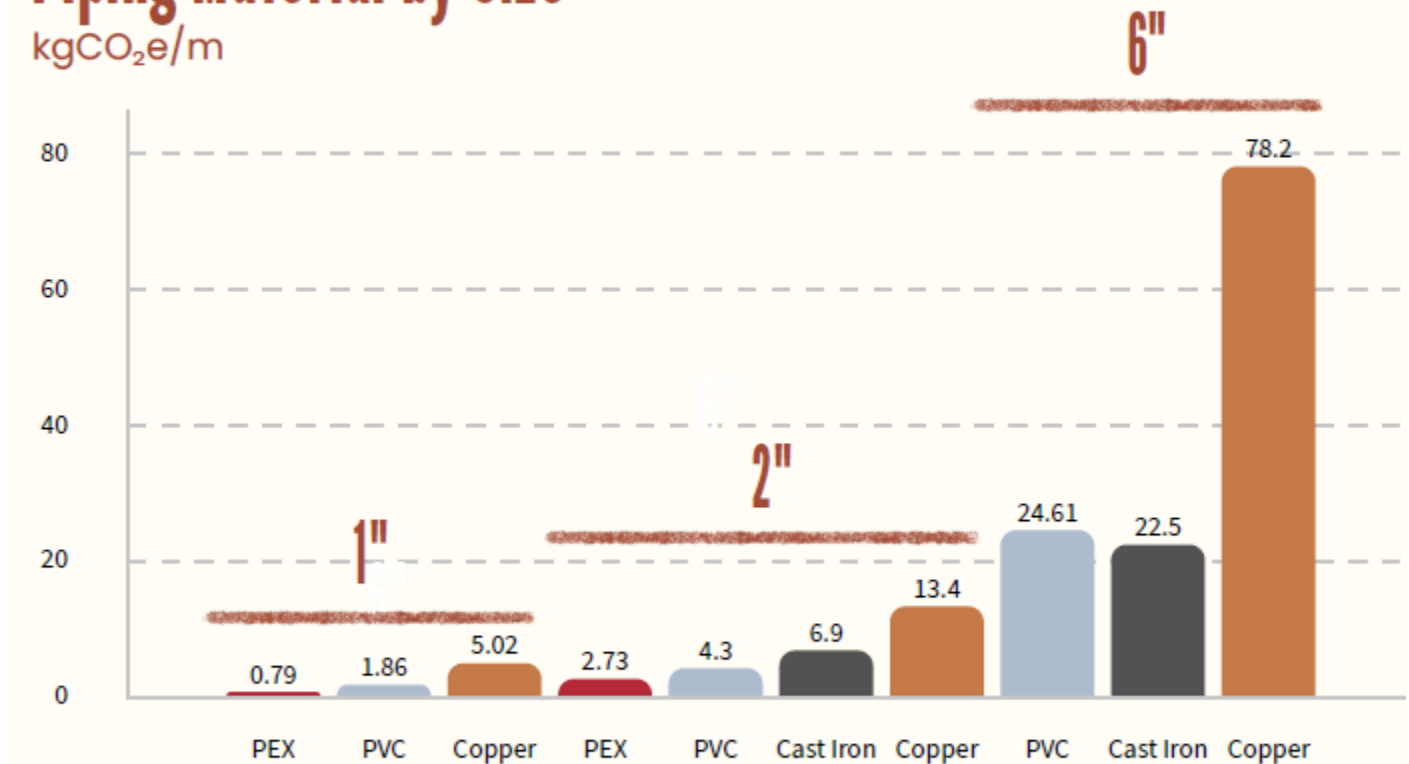
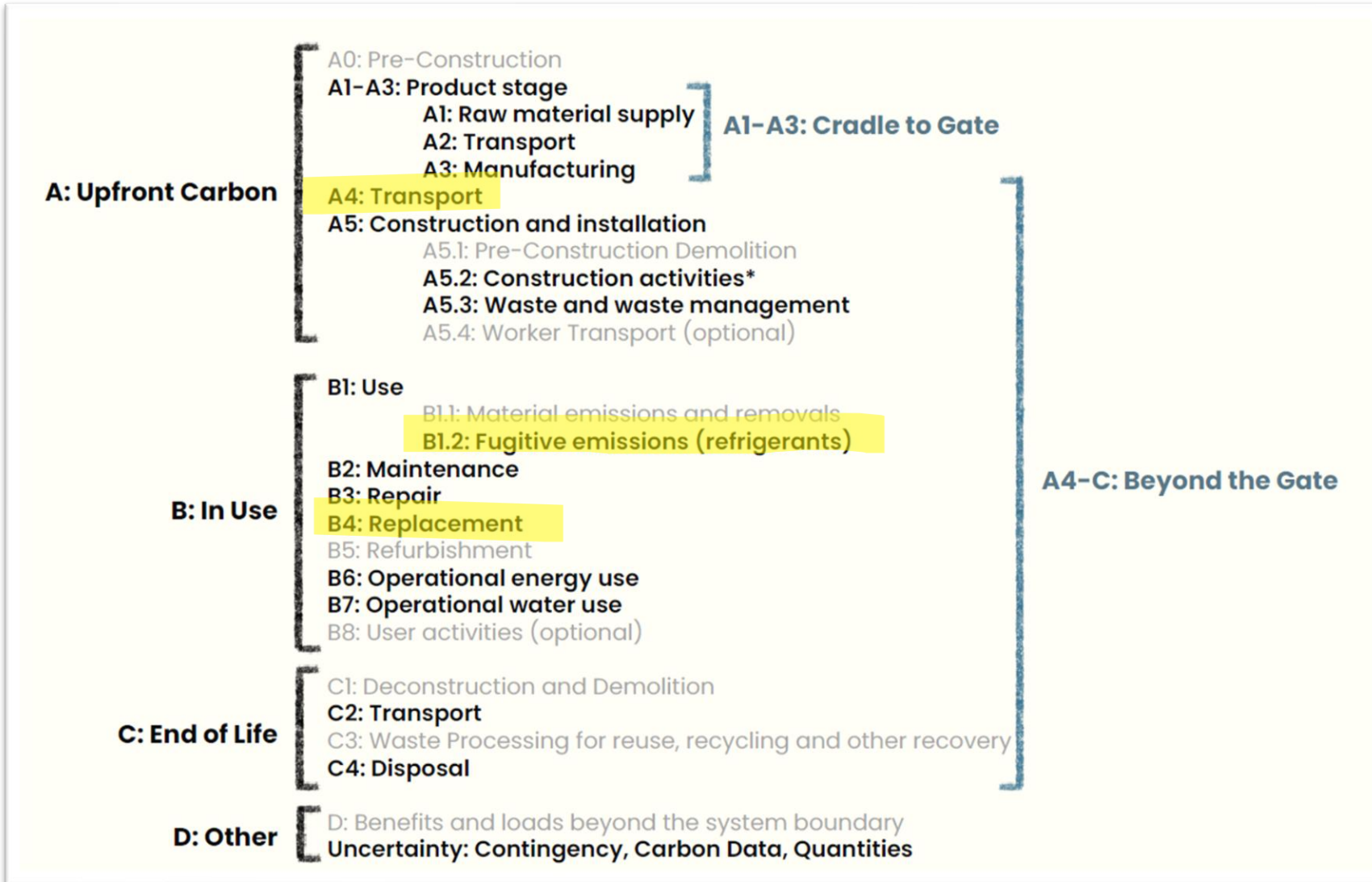


Figure 6. Piping Material by Size. For a functionally equivalent cross-sectional piping dimensions of 1", 2" and 6" sizes, copper appears the most carbon intensive. followed by PVC and then cast iron. Depending on the application size, PVC and cast iron trade places in their ranking.

Beyond the Gate (A4-C) + Contingency



Beyond the Gate (A4-D)

A4 - Transportation

- Transportation emissions are based on mass, distance and mode
- Compared to other building systems, MEP systems are high-mass and often travel significant distances

B4 Replacement

- Industry standards for Equipment Service Life
- Override with actual warrantied service life

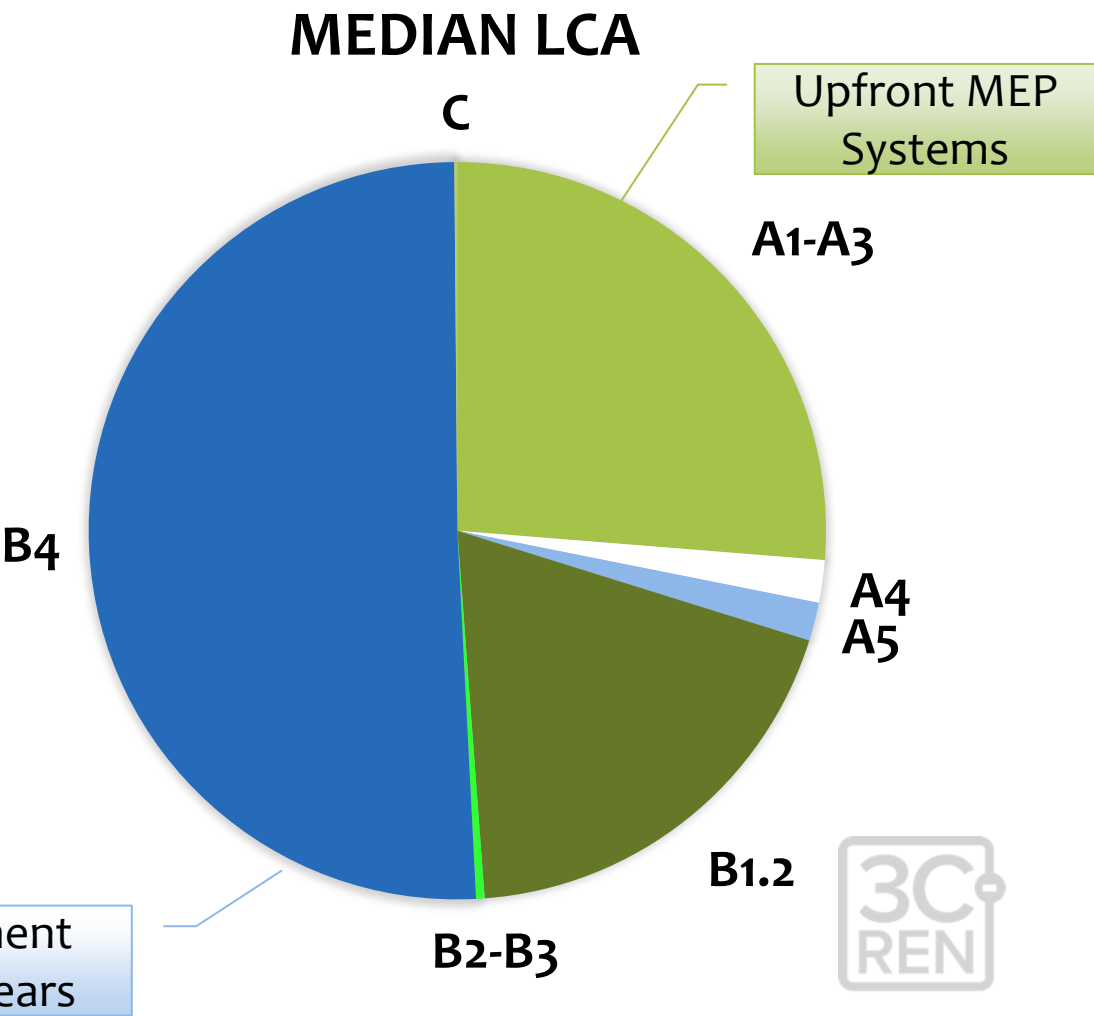


Poll: Where is MEP Carbon impact highest (by life cycle stage)?

- A1-A3 Product Manufacture
- A4 Transport
- B1.2 Refrigerants
- B4 Replacement
- B6 Operational

MEP Embodied Carbon - by Life Cycle Stage, kgCO2e/m²

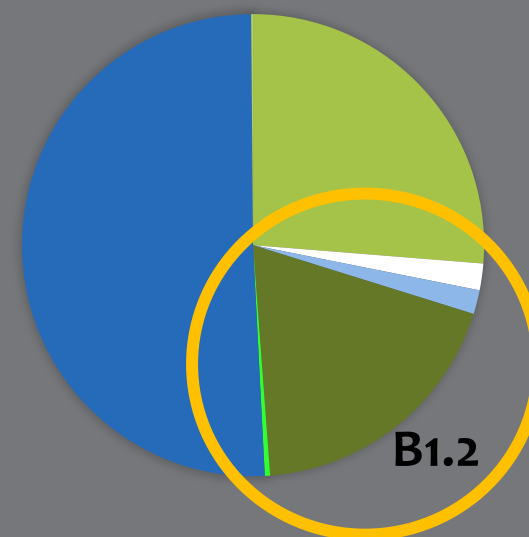
LCA Stage	Median	% of Total	Stage
A1-A3	141.0	26.3%	Product
A4	10.0	1.9%	Transport
A5	9.0	1.7%	Construction
B1.2	102.0	19.0%	Refrigerant
B2-B3	2.0	0.4%	Repair
B4	272.0	50.7%	Replacement
C	0.7	0.1%	End of Life
A-C Total	1,087.1		





Refrigerants (B1.2)

MEDIAN LCA



It's the Global Warming Potential (GWP)

Refrigerant	GWP	Common System Application	Notes
R410A	2088	Conventional VRF systems and Heat Pumps / Chillers	Commonly used refrigerant with high GWP, also regularly used in distributed refrigerant systems with high system volumes increasing risk of leakage and potential climate damage
R134a	1430	Heat Pumps/ Chillers	
R32	633	Hybrid VRF systems and Heat Pumps / Chillers	R32 is mildly flammable* and is a HFC with a reasonably high GWP, however this is <1/3 of the GWP of other common HFCs such as R410A
R290 (propane) & R600 (butane)	3 & 4 respectively	Heat Pumps/ Chillers	R290 and R600 are Hydrocarbons which are highly flammable and heavier than air*
R1234ze	<1	Heat Pumps/ Chillers	An HFO refrigerant, typically available for large plant, R1234ze is mildly flammable*
R744 (CO2)	1	Heat Pumps	CO2 can be used in high temperature heat pumps, such as those dedicated to the production of domestic hot water. Systems are high pressure and require a low water temperature onto the heat pump to maximise coefficients of performance (COP) in heating
R717 (NH4, ammonia)	0	Heat Pumps	Typically available for large plant. Ammonia is mildly flammable and has medium toxicity concerns*

Table 1 - Table of refrigerants, their GWP and their common applications

Recall GWP measured in kgCO₂e

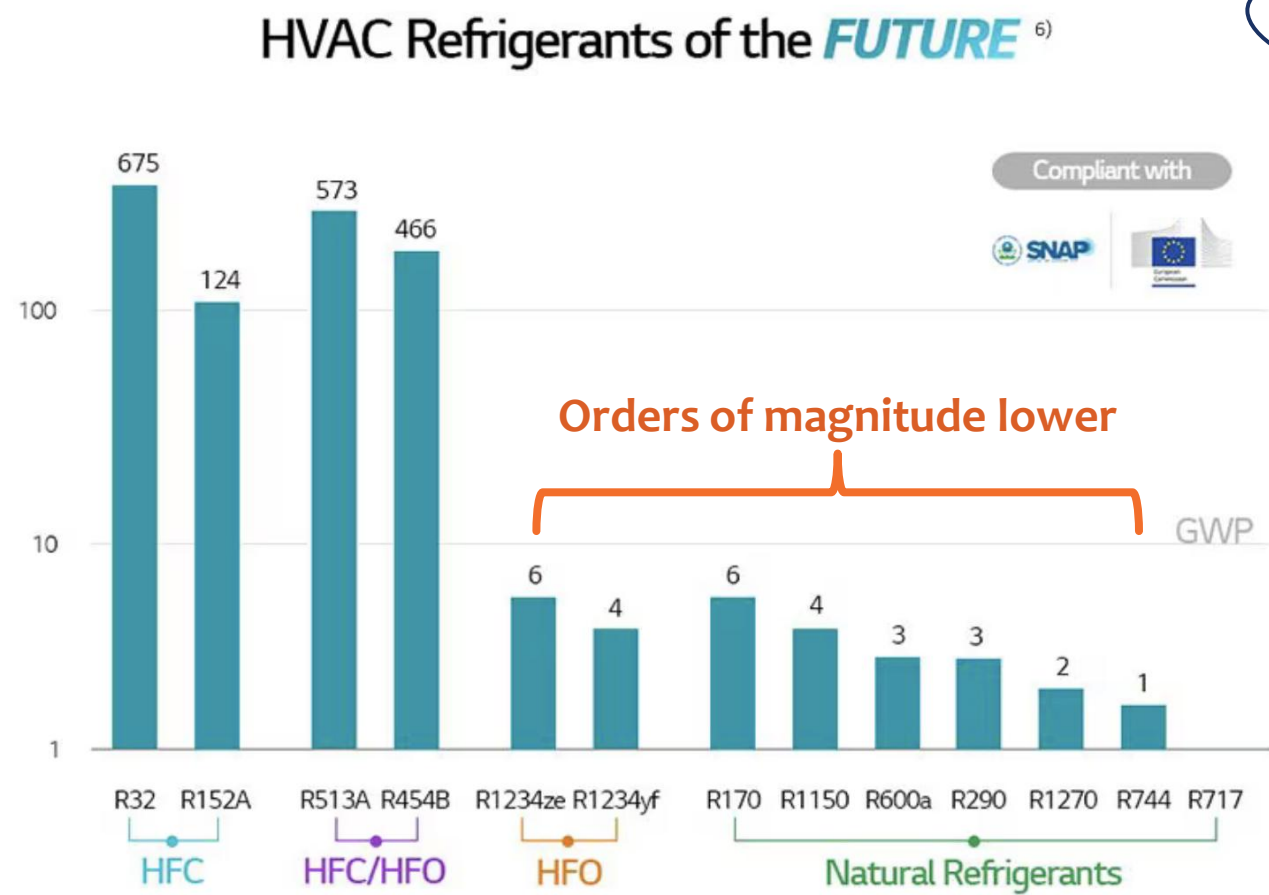
GWP of R410a = 2088, or the equivalent of 2088 times CO₂

California building and mechanical codes limit (as of January 2025) the GWP of refrigerants to 750.

This has prompted a shift toward lower GWP refrigerants – including CO₂ (1) and R717 (0).



Refrigerants of the Future



CFCs and HCFCs phased out globally with The Montreal Protocol (1987)



Calculating Fugitive Emissions and Leakage

“Different types of systems pose different leakage scenarios, given variation in the refrigerant charge, extent of piping, equipment type, installation, maintenance, refill and disposal practices.” – MEP 2040

B1.2 Fugitive Emissions Refrigerants Calculations²

$$[\text{B1.2 Installation}] = \text{REF}_{\text{ch,site}} \times x_i \times \text{GEF}_{\text{ref}} \times \# \text{Inst}$$

$$[\text{B1.2 Annual}] = \text{REF}_{\text{ch,tot}} \times x_o \times \text{GEF}_{\text{ref}} \times \text{RSP}$$

$$[\text{B1.2 EOL}] = \text{REF}_{\text{ch,tot}} (1 - Z_d) \times \text{GEF}_{\text{ref}} \times \# \text{Disp}$$

- REF_{ch} = Refrigerant charge weight
- x_i and x_o are leakage rates
- GEF_{ref} = 100-yr emissions factor of refrigerant used



Example: Wymer Hall

- $REF_{ch} = 240\text{lb}$ or 108.8kg
- X_i and $X_o = 0.01$ and 0.03
- $GEF_{ref} = 2285$ (R410a)

B1.2 Fugitive Emissions Refrigerants Calculations¹

$$[B1.2 \text{ Installation}] = REF_{ch,site} \times X_i \times GEF_{ref} \times \#Inst$$

$$[B1.2 \text{ Annual}] = REF_{ch,tot} \times X_o \times GEF_{ref} \times RSP$$

$$[B1.2 \text{ EOL}] = REF_{ch,tot} (1-Z_d) \times GEF_{ref} \times \#Disp$$

$$[B1.2 \text{ Installation}] = 108.8\text{kg} \times 0.01 \times 2255\text{kgCO}_2\text{e/kg} \times 4 \text{ installations} = 9813 \text{ kgCO}_2\text{e}$$

$$[B1.2 \text{ Annual}] = 108.8\text{kg} \times 0.03 \times 2255\text{kgCO}_2\text{e/kg} \times 60 \text{ years} = 441,619\text{kgCO}_2\text{e}$$

$$[B1.2 \text{ EOL}] = 108.8\text{kg} \times (1-0.8) \times 2255\text{kgCO}_2\text{e/kg} \times 4 \text{ disposals} = 196,275\text{kgCO}_2\text{e}$$

Total 647,707 kgCO₂e

Table 16. Default Leakage Rates for Refrigeration/Air Conditioning Equipment¹

Equipment Type as Listed in ASHRAE 240P Draft	Equipment Type Listed in MEP 2040 Reporting Template	Installation Leakage Rate ^a	Annual Operating Leakage Rate	Recovery Efficiency
Residential AC/HP (ducted)	Split Systems - Ducted	1%	5%	80%
Small self contained AC/HP (PTAC/HP)	Heat Pumps - self-contained (PTAC, PTHP, WSHP)	NA	1%	80%
Residential mini-split and multi-split ductless AC/HP	Split Systems - Ductless	1%	2.5%	80%
Commercial ductless VRF Systems	VRF Systems	1%	3%	80%
Light Commercial Rooftop AC/HP units (5-25 tons)	Air Handling Units < 25 tons	1%	8%	80%
Large Commercial Rooftop AC/HP units (>25 tons)	Air Handling Units > 25 tons	1%	6%	80%
Water-cooled Centrifugal & Screw Chillers (all sizes)	Chillers/heat pumps - water cooled	1%	3%	80%
Air-cooled Chillers (all sizes)	Chillers/heat pumps - air cooled	1%	6%	80%

a. For equipment charged at a factory and not connected to field refrigerant piping, use an installation rate of 0.0%.

Strategies for Possible Reductions

Equipment switch could double annual leakage, but not a lot of commercial options for savings.

Limited

Less Refrigerant (e.g. reduce line length by half)

325,000 kgCO₂

Lower GWP refrigerant (e.g. R32)

430,000 kgCO₂

REN

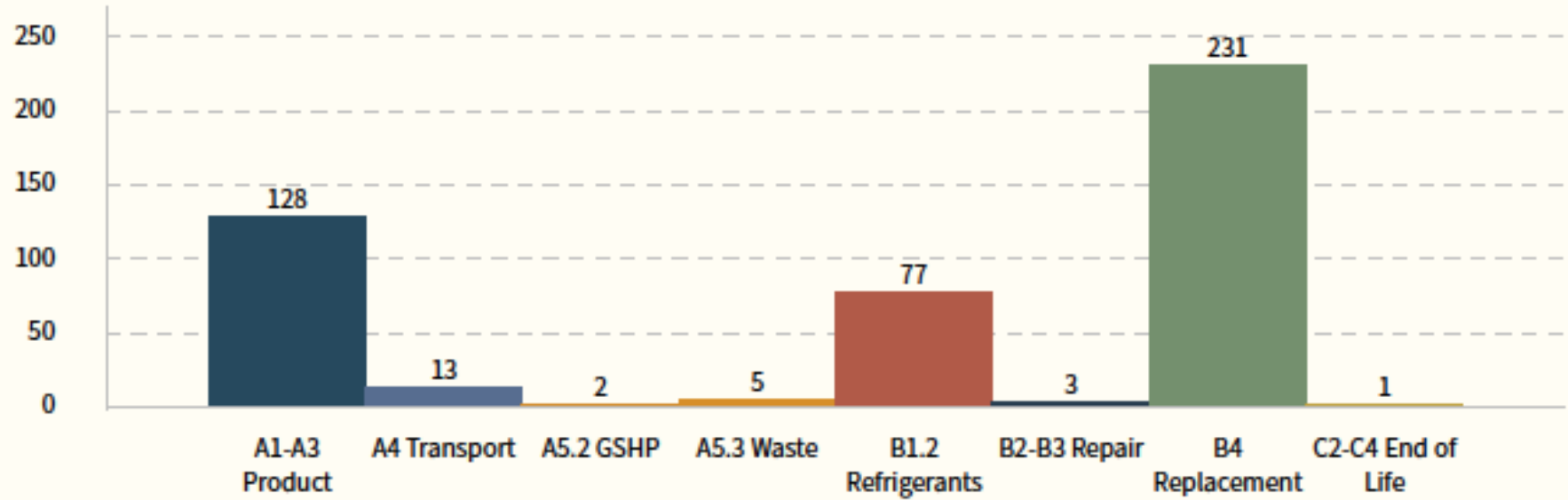


Whole Life Carbon for MEP

Embodied Carbon for MEP – Whole Life (60 years)

FIGURE S. MEP EMBODIED RESULTS (NO B6/B7)
kgCO₂e/m²

460 kgCO₂e/m²

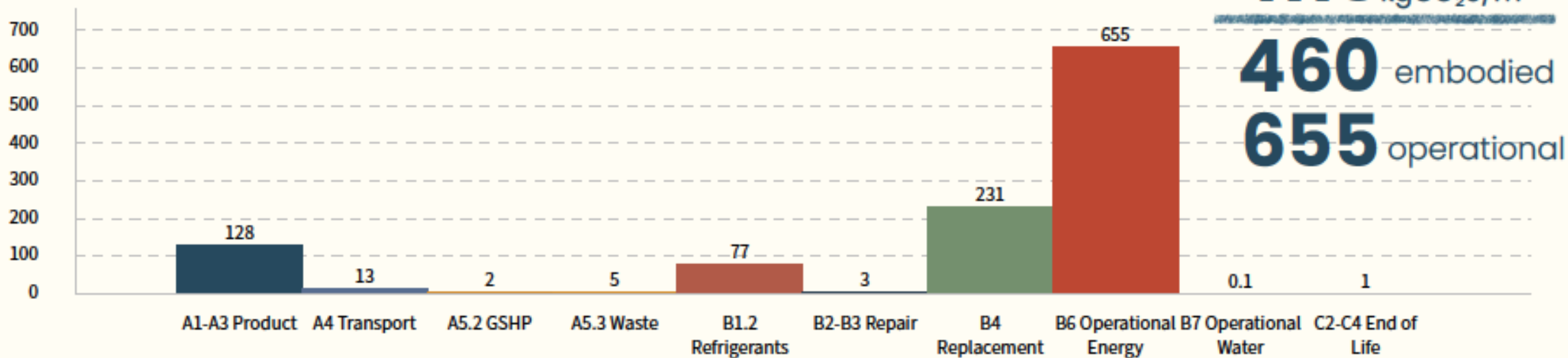


Case Study: Wymer Hall



With operational energy

FIGURE V. MEP EMBODIED RESULTS
kgCO₂e/m²



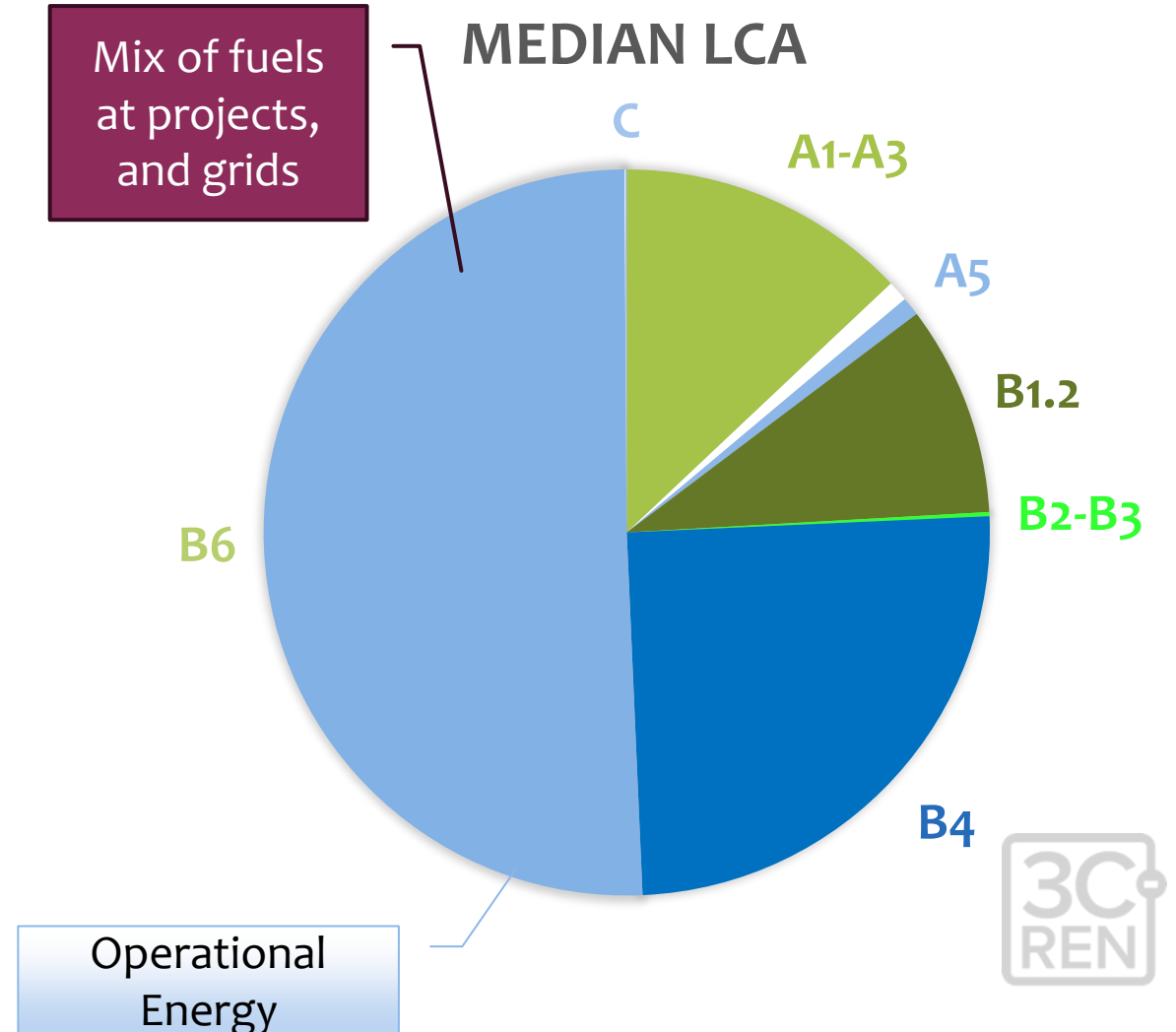
Case Study: Wymer Hall



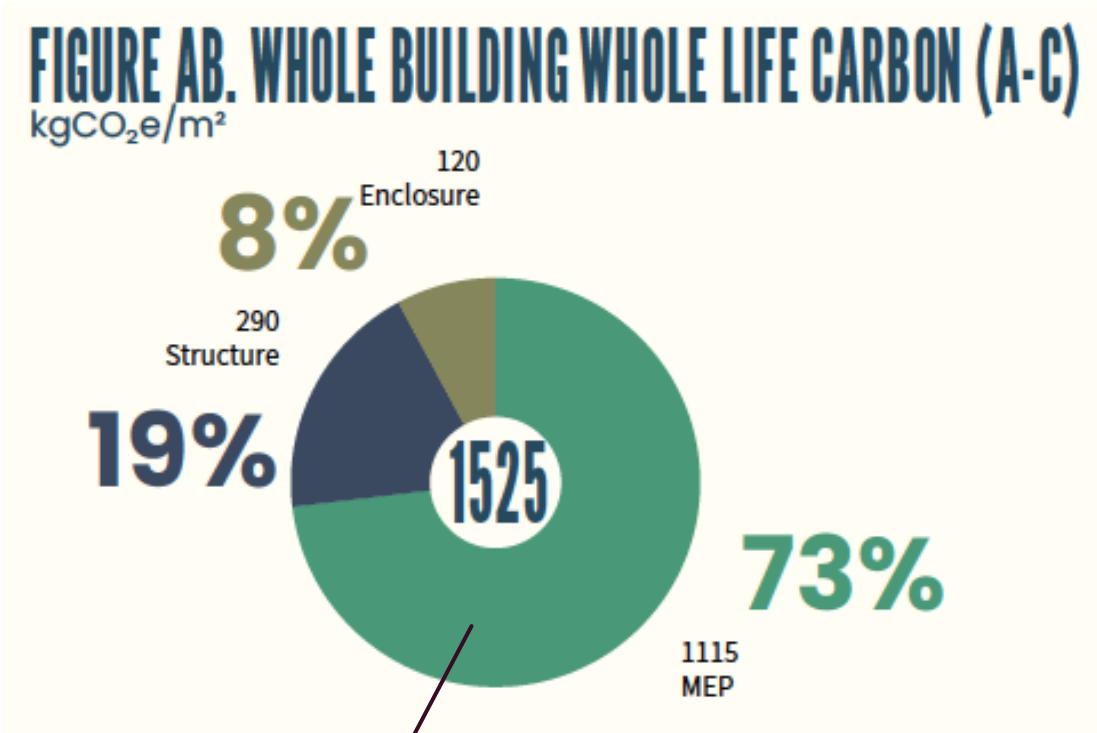
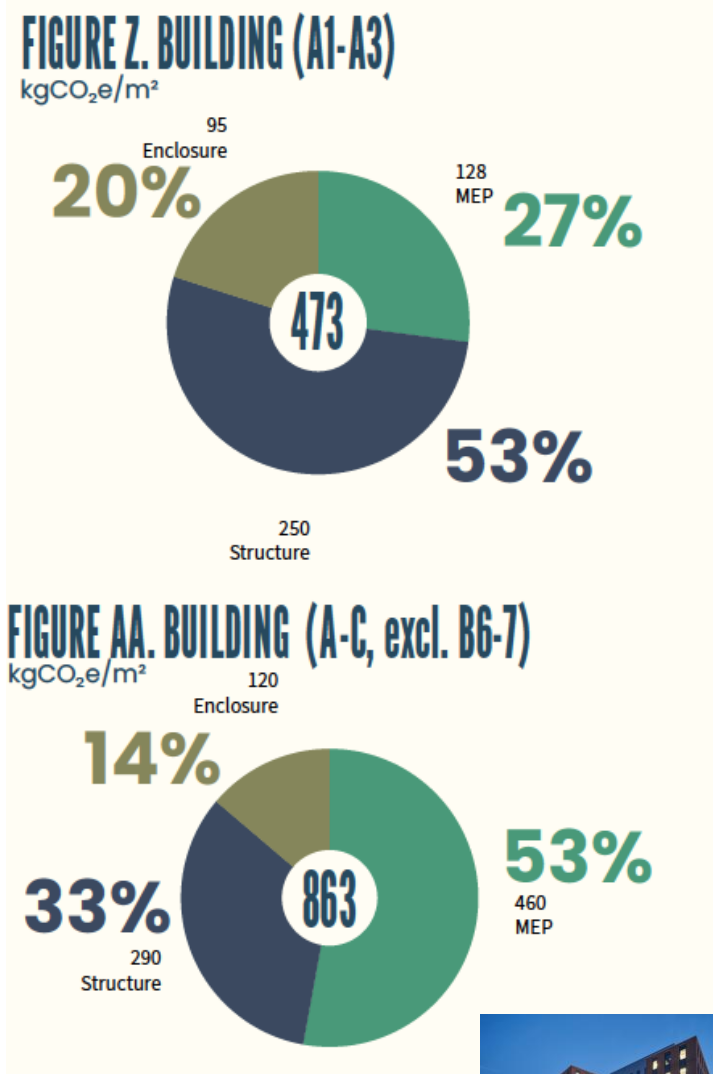
LCA with Operational Carbon, kgCO₂e/m²

LCA Stage	Median	% of Total	Stage
A1-A3	141.0	13.0%	Product
A4	10.0	0.9%	Transport
A5	9.0	0.8%	Construction
B1.2	102.0	9.4%	Refrigerant
B2-B3	2.0	0.2%	Repair
B4	272.0	25.0%	Replacement
B6	550.0	50.6%	Operational Energy
B7	0.4	0.0%	Operation Water
C	0.7	0.1%	End of Life
A-C Total	1,087.1		

MEP 2040 Pilot



Full Circle: All together now



Lumps
Operational
Energy into MEP.
Reasonable?



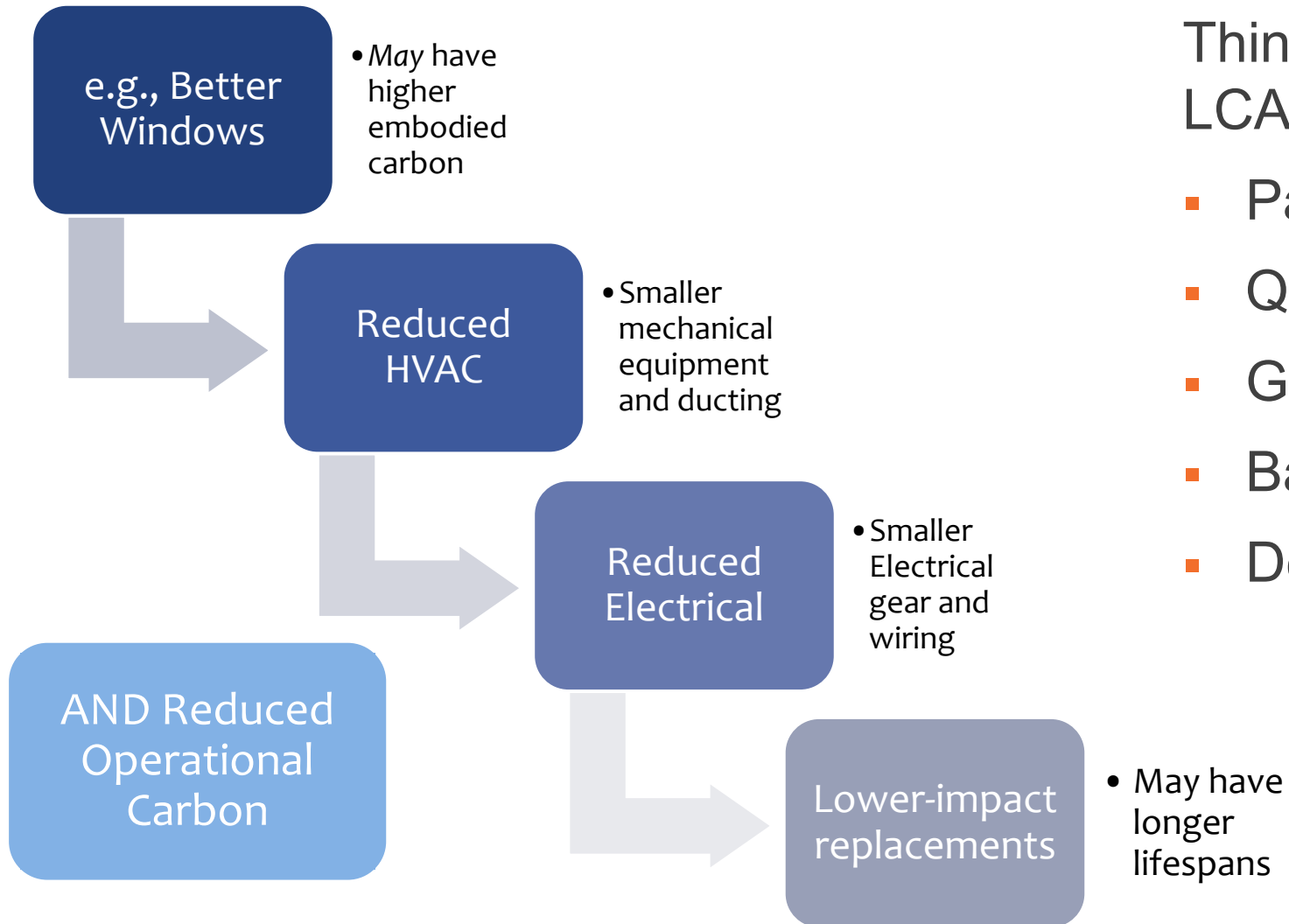
Case Study: Wymer Hall





Strategies for Reducing Emissions

Design for Energy Efficiency, of course



Think about the “Domino Effect” of LCA Choices:

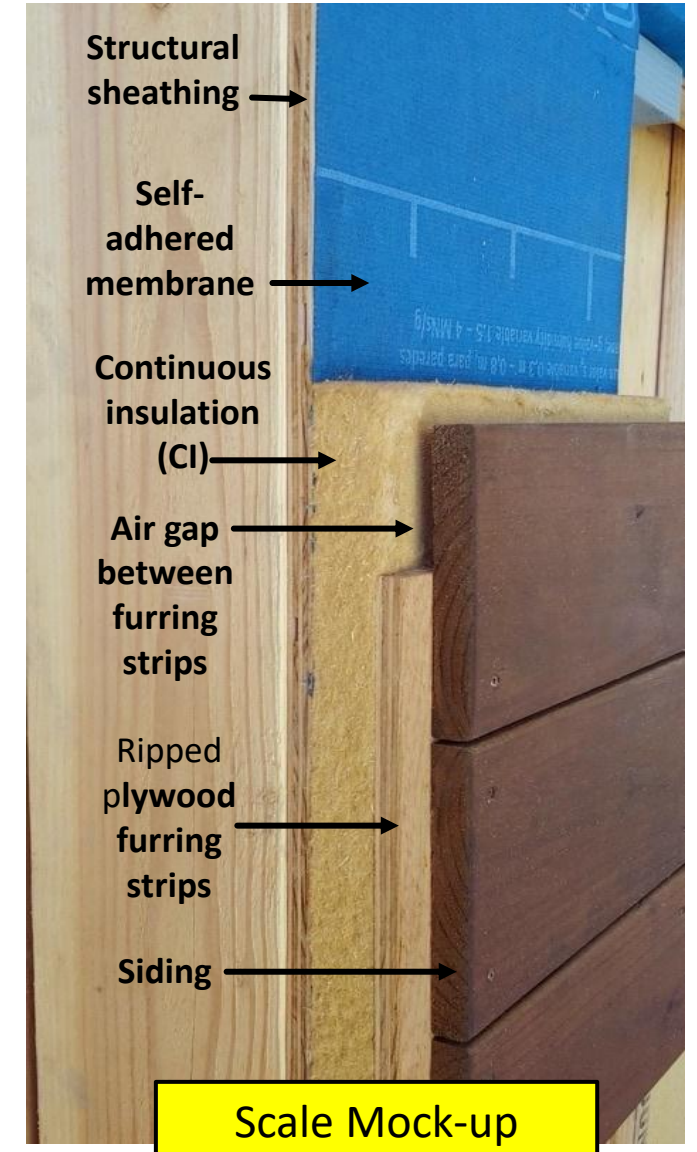
- Passive Design Strategies
- Quality insulation and windows
- Great air sealing
- Balanced daylighting
- Design for ‘off’



Energy Efficiency and ZNE



- Passive House level of insulation and air sealing
- Quality windows, strategic sizing and placement
- One ductless mini-split with Ducted HRV
- No natural gas
- 12 solar panels – fully ZNE
- Very small MEP Carbon footprint...



Consider LCA at Conceptual MEP Design



- Consider fewer heating and cooling systems and more balanced air distribution for thermal comfort
- Consider thermal energy storage (TES) to reduce peak cooling loads and the subsequent peak equipment and refrigerant charge
- Use targeted metrics when appropriate, e.g., emissions per “cooling ton” vs. per floor area
- Select products for a long lifespan

Additional MEP Strategies

- Review EPDs and compare data for equivalent products
- Select metals with higher recycled content
- Design distribution systems for efficiency, *and coordinate in the field*
- Understand 'hidden' embodied carbon, e.g., PV subframe.



Single family home bath fan ducts
Photo: Energy Vanguard

Specify low-emitting insulation

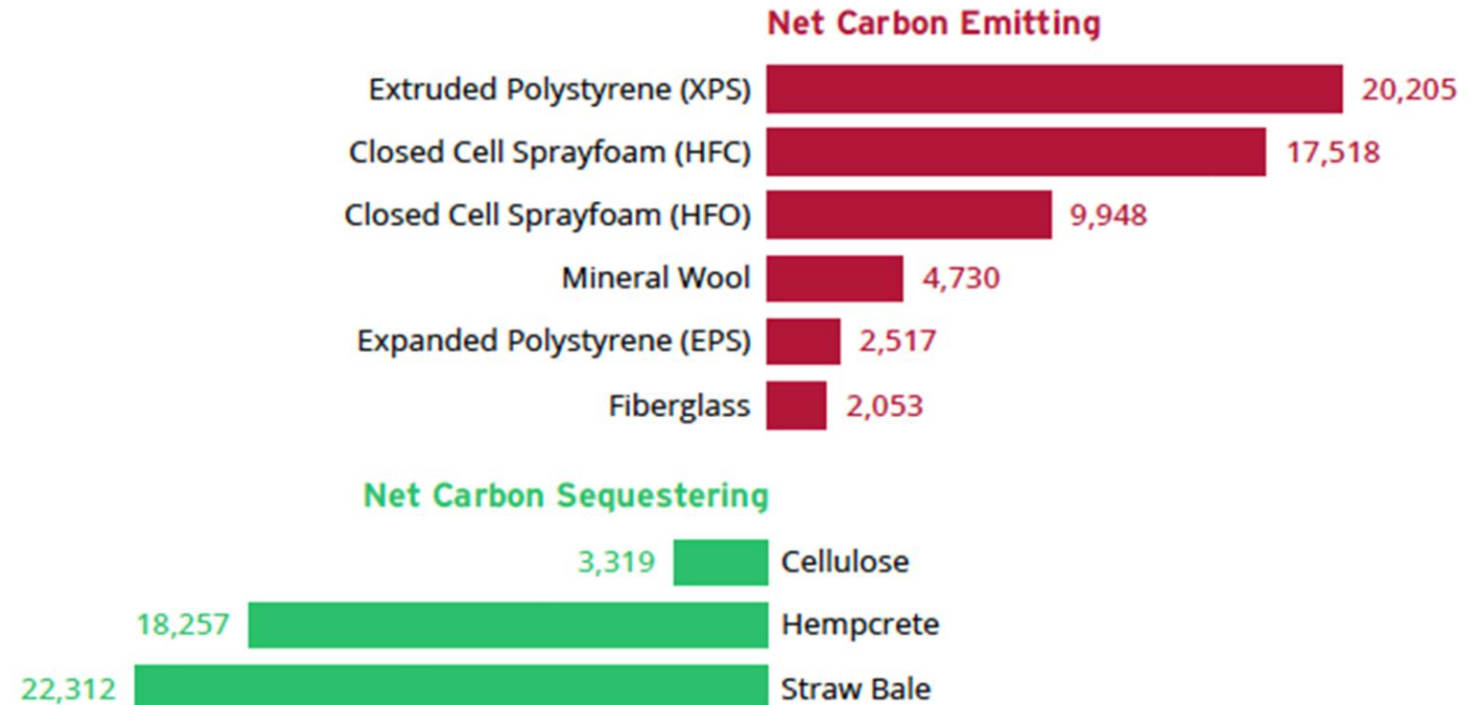
- Look for low-GWP insulation for ducts and pipe
- Run ducts in conditioned space



Rockwool Pipe Insulation

Exhibit 3

Embodied carbon of insulation materials (kg CO₂e)



Note: The amount of CO₂e is based on R-20 at 234 m².

Source: Chris Magwood, *Opportunities for CO₂ Capture and Storage in Building Materials*, 10.13140/RG.2.2.32171.39208, 2019.

Reduce Refrigerants



- Select low-GWP refrigerants
- Consider distribution options, e.g., hydronic vs. refrigerant, to reduce leakage potential
- Right-size equipment; tight factors of safety
- Consider shifting peak demand

Looking Ahead

- ASK suppliers and manufacturers for EPDs and explain why they're helpful
 - Even when you're not doing a full LCA
 - Become familiar with what's available and where the variables are
- Advocate for policies and programs that recognize MEP embodied carbon and refrigeration impacts



GENERAL INFORMATION

MANUFACTURER INFORMATION

Manufacturer	Daikin Applied Europe SpA
Address	Via Piani di Santa Maria, 72 00072 Ariccia (Rome) Italy
Contact details	epddae@daikinapplied.eu
Website	https://www.daikinapplied.eu/EWYT-CZ (daikinapplied.eu)

PRODUCT IDENTIFICATION

Product family	EWYT-CZ
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PRODUCT INFORMATION

Product	EWYT-CZ		
Function	Reversible heat pump for comfort heating and cooling for residential or light commercial applications.		
Model	EWYT64CZP-A2		
P _{heating} (P _h)	43,42 kW	P _{cooling} (P _c)	64,28 kW
t _{heating}	2066	t _{cooling}	600
SCOP	2,87	SEER	5,34
Capacity, P rev	$P_{rev}(kW) = \frac{(t_{heating} * P_h + t_{cooling} * P_c)}{(t_{heating} + t_{cooling})}$		
	48,11 kW		

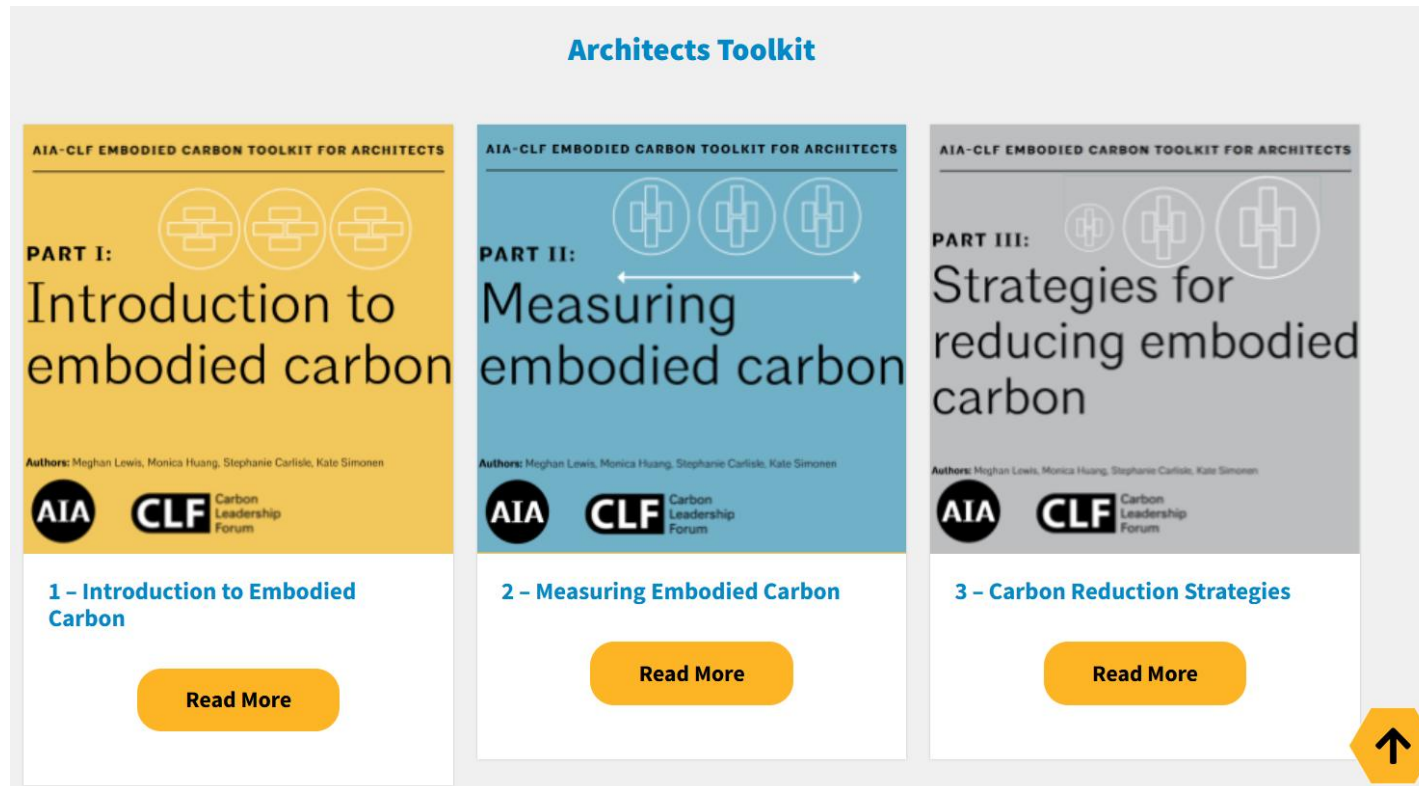




Industry Efforts and Resources



Carbon Leadership Forum



- Research
- Resources
- Benchmarking
- Case studies
- Toolkits
- Etc.

<https://carbonleadershipforum.org/>



The MEP 2040 Challenge

MEP 2040
Committing to Zero

“All systems engineers shall advocate for and achieve net zero carbon in their projects: operational carbon by 2030 and embodied carbon by 2040.”



The MEP 2040 Commitment

1. Establish a company plan
2. Request low-GWP refrigerants
3. Request EPDs
4. Participate in Forums

Sign the Commitment
– MEP Firms

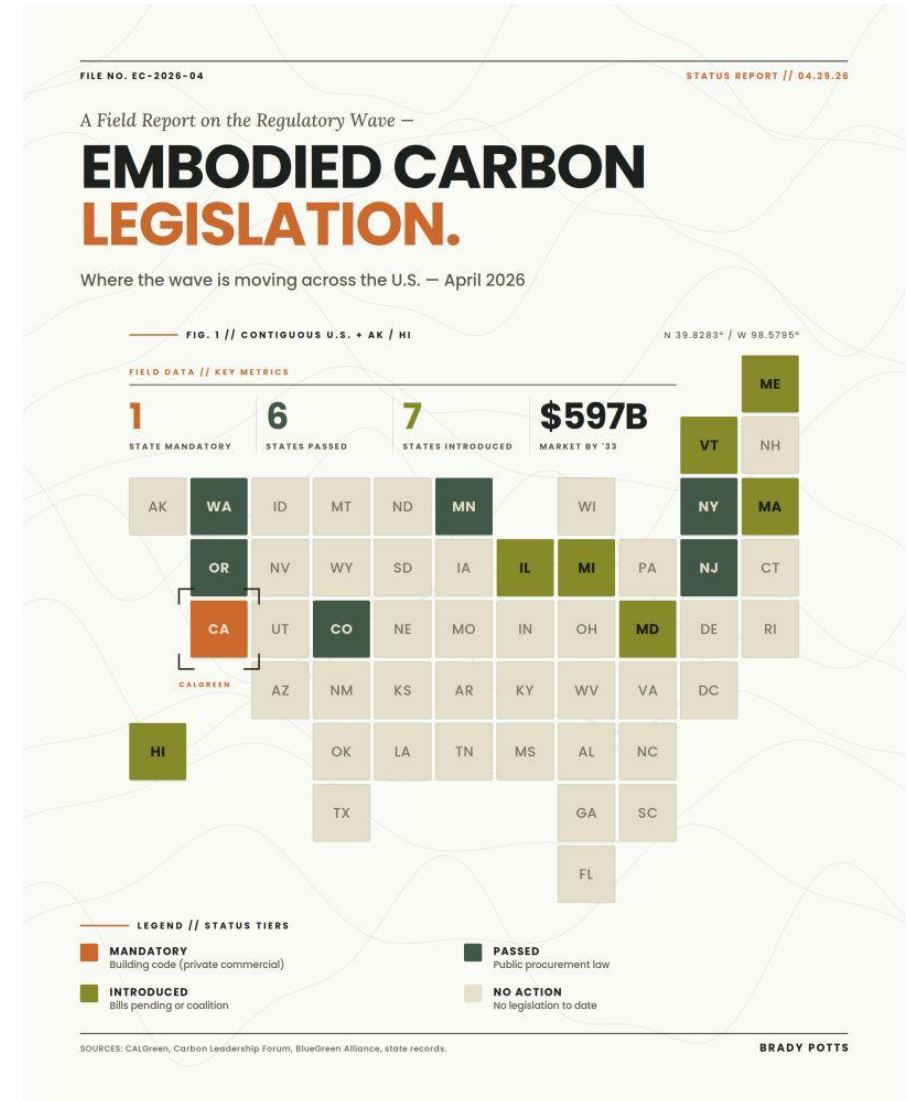
Sign the Commitment
– Non-MEP
Organizations

MEP Signatories – a snapshot



Closing Thoughts

- Evolving Knowledge
- Evolving Policy and Legislation
- CALGreen journey on Embodied Carbon
 - Current: 50,000 SF Non-Res
 - 3 pathways, all with limited scope, no MEP
- Addressing challenges along the way
 - Quantities, complexity, EPD availability
- Increasing industry interest and/or acceptance



Questions about Title 24?

3C-REN offers a *free* Code Coach Service



Online:
3c-ren.org/code

Call:
805.781.1201

Energy Code Coaches are local experts who can help answer your Title 24 Part 6 or Part 11 questions.

They can provide code citations and offer advice for your res or non-res projects.

REN

Thanks for coming!

Continuing Education Units Available

- Contact chloe.swick@venturacounty.gov with any questions

Today's Slides and Recording are Coming to Your Inbox Soon!

Upcoming Courses:

- **Green Building Construction Tour– Morro Bay (6/16)**
- What a Load Calculation Is and Why One Is So Important (7/7)
- Next Generation Passive Solar and Passive House (7/22)
- Ask the Experts: Energy Compliance and Modeling (8/19)
- Introduction to Residential HVAC Design (8/20)

