

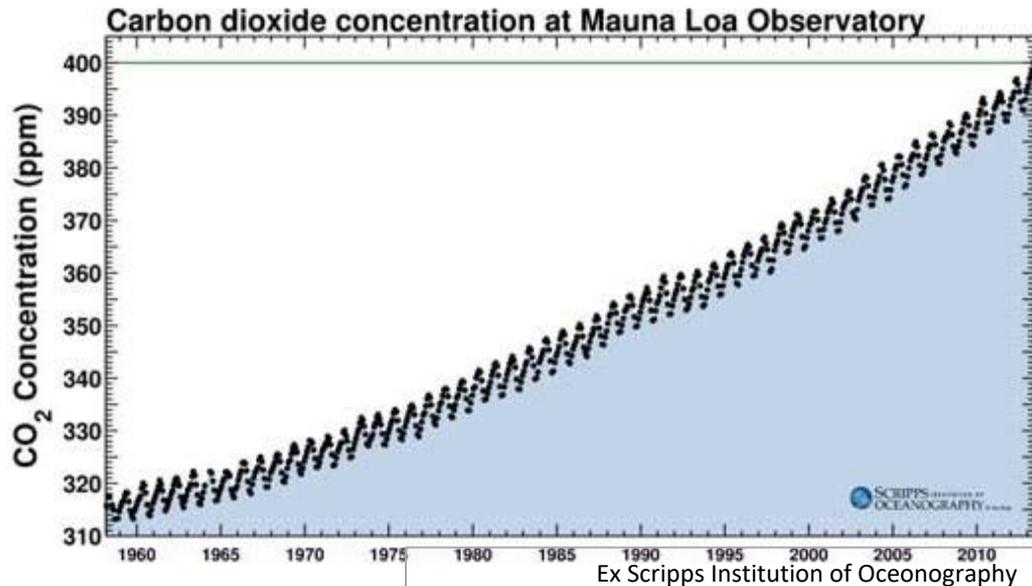
Delivering Net Zero and Future Homes Policy and Delivery

Lynne Sullivan OBE, RIBA
Chair, Good Homes Alliance



2019 and the Net Zero objective

- Catastrophic climate change
- Significant need to reverse greenhouse effect
- UN Sustainable Development Goals
- Renewable energy and re-forestation
- Value scarce resources



BUSINESS INSIDER UK MORE

Earth has crossed a scary threshold for the first time in more than 800,000 years, and it could lead to tens of thousands of deaths

Kevin Loria
May 9, 2018, 3:07 PM 1,313

FACEBOOK LINKEDIN TWITTER EMAIL PRINT

- Monthly average atmospheric carbon dioxide levels have topped 410 ppm for the first time in more than 800,000 years, according to recent research.
- There's good reason to think this will have disastrous effects on human health.



Kevin Frayer/Getty Images



2019 and the Net Zero objective

- No time to lose
- UK Cross-party support for Net Zero by 2050



2019 and the Net Zero objective – UK Context

- Warming climate in UK; increasing rainfall events
- Lack of clarity on decarbonization pathway
- Diverse and inefficient existing buildings stock
- 40% of products in the UK are imported
- CCC Assumptions on **newbuild**: Implementation of the proposed Future Homes standard will enable all new homes from 2025 or earlier to be fully decarbonised.

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Climate change Wildlife Energy Pollution

We have **11** years to limit climate change catastrophe, warns UN

Urgent changes needed to cut risk of extreme heat, drought, floods and poverty, says IPCC

- **Overwhelmed by climate change? Here's what you can do**



Emerging UK Policy Context for Homes + Buildings

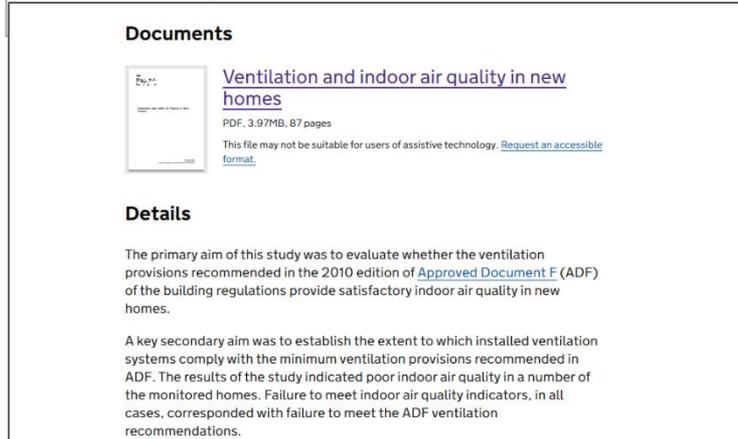
- Improving Health & Wellbeing outcomes: indoor and outdoor air quality; ventilation
- Source control of pollutants: better information and limits on offgassing
- Increasing understanding of correlation between poor indoor environment and negative health impact



The Guardian website header includes navigation links for Search jobs, Dating, Sign in, Search, and UK edition. The main navigation bar features Opinion, Sport, Culture, Lifestyle, and More. The article headline reads: "UK is endangering people's health by denying their right to clean air, says UN". The sub-headline states: "World body urges Conservative government to 'step up and show leadership' on the air pollution crisis". The main image shows a person on a bicycle in traffic next to a red double-decker bus.



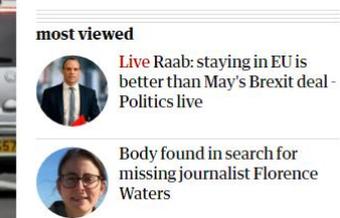
The GOV.UK website header includes a search bar and navigation links for Departments, Worldwide, How government works, and Get involved. The breadcrumb trail reads: Home > Housing, local and community > Planning and building > Building regulation. The page title is "Ventilation and indoor air quality in new homes". The text below the title states: "This research investigated the indoor air quality and ventilation provided in new homes."



The HEMAC NETWORK website header includes logos for Mackintosh Environmental Architecture Research Unit, The Glasgow School of Art, Arts & Humanities Research Council, and University of Aberdeen. The main heading is "HEMAC NETWORK" with the subtitle "HEALTH EFFECTS OF MODERN AIRTIGHT CONSTRUCTION". The navigation bar includes links for ABOUT, COMMITTEE, SYMPOSIUM, WORKSHOP, SANDPIT, AMR PROJECT, NEWS, MEMBERS, and RESOURCES. The main image shows a woman looking out a window. The text below the image states: "The primary aim of this study was to evaluate whether the ventilation provisions recommended in the 2010 edition of Approved Document F (ADF) of the building regulations provide satisfactory indoor air quality in new homes. A key secondary aim was to establish the extent to which installed ventilation systems comply with the minimum ventilation provisions recommended in ADF. The results of the study indicated poor indoor air quality in a number of the monitored homes. Failure to meet indoor air quality indicators, in all cases, corresponded with failure to meet the ADF ventilation recommendations."



The Good Homes Alliance logo features a stylized blue circular graphic and the text "Good Homes Alliance".



The "most viewed" section includes two items: "Live Raab: staying in EU is better than May's Brexit deal - Politics live" and "Body found in search for missing journalist Florence Waters".

Emerging Policy Context for Homes + Buildings

- UK Net Zero by 2050, PMs Jodrell Bank commitment to halve all buildings energy use by 2030
- Core Cities, Smart Cities and Local Authorities' ambitions on decarbonisation and electric vehicles
- Requirement for Biodiversity Net Gain on developments
- APPG on Healthy Homes + Buildings; air quality statistics on effects such as cognitive impairment
- NHS England Healthy New Towns - the importance of public open space: greening/leisure
- Impact of Grenfell Inquiry and the Each Home Counts review on quality
- Impact of the hottest summer(s) to date: mitigating overheating
- Design Quality references in NPPF; Building Better, Building Beautiful
- Social housing – need for diversity and affordability of stock



BLOG: Future looks green for Greater Manchester

John Alker, Director of Policy and Places, reflects on Andy Burnham's Greater Manchester Green City Summit on March 21.

Welcome
Andy Burnham
Mayor of Greater Manchester

PUBLISHED ON TAGS SHARE



Theresa May unveils plan to halve building energy use by 2030

By Matt Mace | edie.net May 22, 2018 Advertisement

Theresa May unveiled the UK government's modern Industrial Strategy on 21 May. (Number 10 / Flickr)

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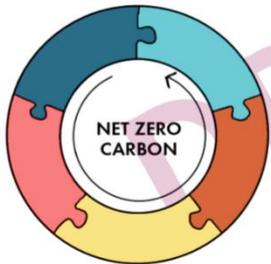
Net Zero for the Built Environment – Whole Life thinking

FIVE KEY COMPONENTS OF

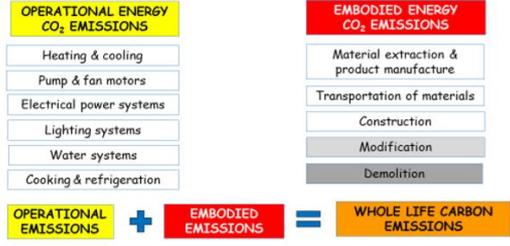
Net-Zero Carbon Buildings

The proposed key requirements for a new building to qualify as 'Net-Zero Carbon' in operation are summarised below. Each requirement should be independently verified post-construction.

We recognise that new buildings in operation represent only one pathway to net-zero, in addition to whole-life carbon (including emissions from construction) and existing building retrofits. These alternative pathways will be considered separately.



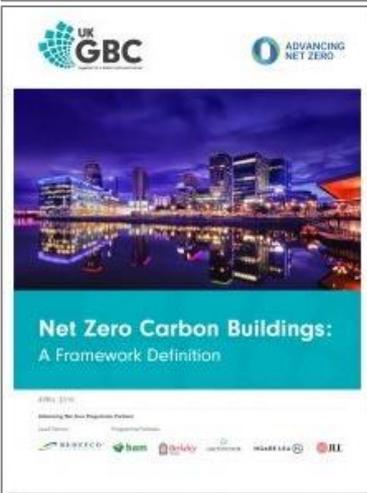
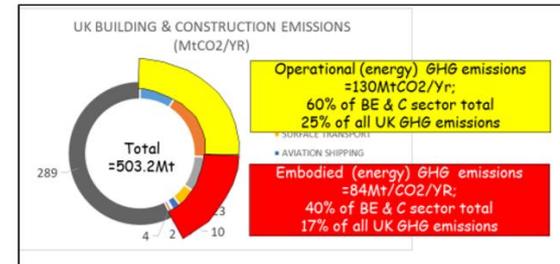
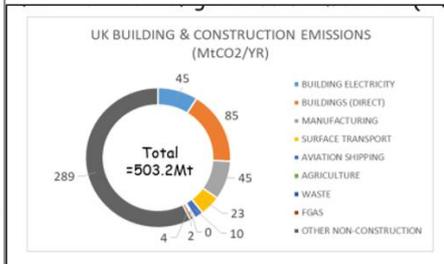
- LOW ENERGY USE**
 - Annual Energy Use Intensity (EUI) should be less than 36 kWh/m²/yr for residential, 56 kWh/m²/yr for school and 72 kWh/m²/yr for commercial office buildings.
 - Space heating demand should be less than 16 kWh/m²/yr for all building types.
- EMBODIED CARBON DISCLOSURE**
 - Whole life carbon assessment should be carried out to inform understanding of building impact.
- LOW CARBON ENERGY SUPPLY**
 - Combustion on site is prohibited.
 - Report carbon content of heating used on site (gCO₂/kWh).
 - On-site renewable energy is incorporated to satisfy the zero carbon balance.
 - Report building annual peak energy demand.
 - Incorporate metering and controls to facilitate smart grid development.
- MEASUREMENT AND VERIFICATION**
 - Annual energy use and renewable energy generation must be independently verified in use.
- ZERO CARBON BALANCE**
 - Demonstrate a net zero carbon balance on an annual basis.
 - Any energy consumption not met by onsite renewable energy should be met by investment into additional renewable energy capacity off-site OR a minimum 15 year renewable energy power purchase agreement.



[Ref: BS EN 15978 & BS EN 15804]

Ex Paddy Conaghan The Edge briefing Oct 2019

UK split:



- Built Environment approx. 40% of UK emissions, of which >15% on heating
- Operational Energy
- Embodied energy, and the Whole Life perspective
- Pay attention to 'offshoring' – NB UK Consumption emissions exceed territorial emissions by ~300Mt pa



Net Zero for the Built Environment: Demand and Supply

GreenBiz

Analysis

Events

Videos

Circular Economy

Energy

More +



The biggest resource we don't use: Q&A with Amory Lovins, energy innovator

Amory Lovins (April 2019):

It's quite astonishing to me that most of the conversations, especially in this country, about decarbonization are 99 percent on the supply side, and almost all that electricity, whereas something like two-thirds or more of the action is on the demand side.

Golden: How can we conquer that barrier?

Lovins: It's simple and unsatisfactory to say, just pay attention. There are some opinion leaders who could help with this by giving more attention to what's happening in efficiency and realizing that it's not static, it's highly dynamic, and the innovations are not only in technology but at least equally in design, business models and finance.

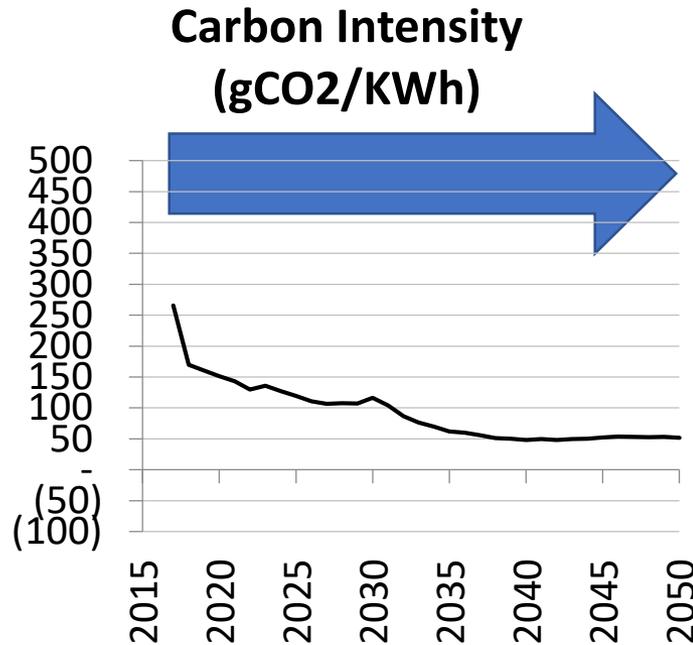
I don't see a coherent message emerging about the relative importance of efficiency and renewables. Obviously, we need both of them and they reinforce each other, but I think a casual observer might come away thinking that practically all the action is on the supply side, and it's not.



Net Zero: Supply-side issues



National Grid Network



Renewable Energy Generators



Thermal Power Plants

Thermal Storage/
Battery Storage

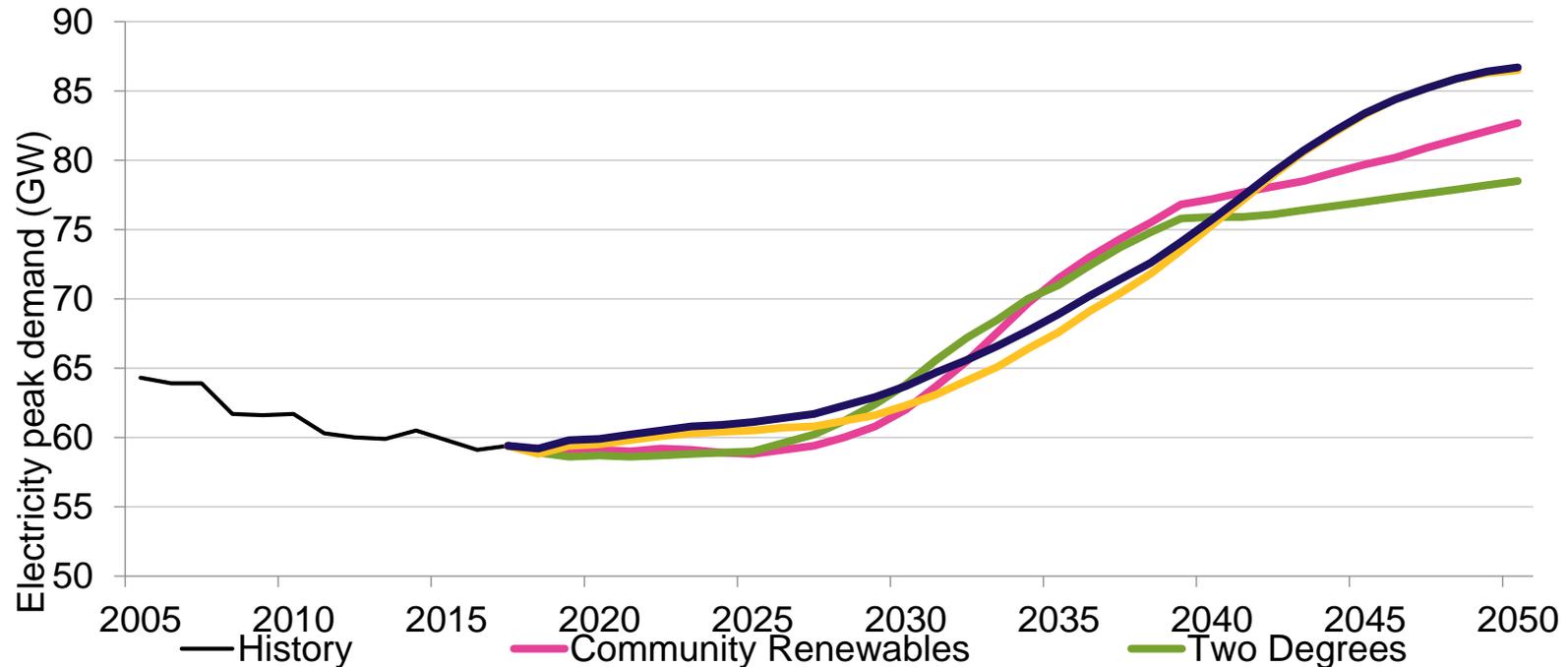


Local/National Network

- So just decarbonise the grid ...?
- 26M Homes in the UK – most heated by gas or oil
- Need to move many of these to use electricity for both to be able to capitalize on grid decarbonization ...
- The rest ... low carbon heat?
- That's a huge additional load on the grid ...



Net Zero: Supply-side issues



Source: National Grid Future Energy Scenarios, July 2018, Chart 4.2

- **But it's not that easy ... just relying on grid decarbonization would require a massive increase in grid peak load capacity**
- **And needs to consider seasonal variations in renewables supply**

Net Zero: Supply-side issues

10

National

The Guardian Friday 25 October 2019

Offshore wind turbines 'could meet all global energy needs'

Jillian Ambrose
Energy correspondent

Erecting wind turbines on the world's best offshore sites could provide more than enough clean energy to meet global electricity demand, according to a report.

A detailed study of the world's coastlines has found that offshore wind farms alone could provide more electricity than the world needs - even if they were only built in windy regions in shallow waters near the shore.

Analysis by the International Energy Agency (IEA) revealed that if wind farms were built across all usable sites that are no further than 37 miles (60km) off the coast, and where coastal waters are no deeper than 200ft (60 meters), they could generate 36,000 terawatt hours (TWh) of renewable electricity a year.

This clean energy boom would easily meet the current global demand for electricity of 23,000 TWh.

"Offshore wind currently provides just 0.3% of global power generation,

but its potential is vast," said the IEA's executive director, Dr Fatih Birol.

The IEA study also predicts that offshore wind will grow 15-fold to emerge as a \$1tn (£780bn) industry in the next 20 years, and will prove to be the next great energy revolution. The IEA said earlier this week that global supplies of renewable electricity were growing faster than expected and could expand by 50% in the next five years, powered by a resurgence in solar energy.

But in the coming decades offshore wind power will drive the world's growth in clean power due to plummeting costs and new technological breakthroughs, which include floating installations that can harness wind speeds further from the coast.

This next generation of floating turbines could generate enough energy to meet the world's total electricity demand 11 times over in 2040.

The report predicts that the EU's offshore wind capacity will grow from almost 20 gigawatts today to nearly 130 gigawatts by 2040, but with stronger climate commitments this could reach 180 gigawatts.

In China the growth of offshore wind is likely to be even more rapid, said the IEA. Their offshore wind capacity is forecast to grow from four

Growth industry

0.3%

Percentage of power generation globally provided by offshore wind - but IEA said 'its potential is vast'

£780bn

Potential value of the offshore wind industry if it grows as expected over the next 20 years, the report says

20

Capacity, in gigawatts, of the EU's offshore wind capacity today; it is predicted to grow to 130GW by 2040

gigawatts today to 110 gigawatts by 2040, or 170 gigawatts if it adopts tougher climate targets.

Birol said offshore wind would not only contribute to generating clean electricity, but could also be involved in the production of hydrogen, which can be used in place of fossil fuel gas for heating and in heavy industry.

The process of making hydrogen from water uses huge amounts of electricity but abundant, cheap offshore wind power could help produce a low-cost, zero-carbon alternative to gas.

In the North Sea, energy companies are already planning to use the electricity generated by giant offshore windfarms to turn seawater into hydrogen on a floating "green hydrogen" project, backed by the UK government. The clean-burning gas could be pumped back to shore to heat millions of homes by the 2030s. The UK has committed to reaching net zero carbon emissions by 2050.

The overlap between the declining oil and gas industry and burgeoning offshore wind could offer big economic benefits for the UK, Birol said.

"Offshore wind provides a huge new business portfolio for major engineering firms and established oil and gas companies which have a strong offshore production experience. Our analysis shows that 40% of the work in offshore wind construction and maintenance has synergies with oil and gas practices," he said.

- IEA report predicts EU's offshore wind capacity will grow 6x at least by 2040 and could power hydrogen production

Net Zero for newbuild homes – what is achievable now

6.1 Offices

National Energy Foundation
Milton Keynes
Built in 2004
430 m² GIFA
81 kWh/m²
Total energy consumption
Improvement on typical
64%



Canolfan Hyddgen
Macchynlleth, Wales
Built in 2009
400 m² GIFA
95 kWh/m²
Total energy consumption
Improvement on typical
57%



Enterprise Centre
Norwich
Built in 2015
3,400 m² GIFA
70 kWh/m²
Total energy consumption
Improvement on typical
68%



Keysham Civic Centre
Bristol
Built in 2015
6,365 m² GIFA
107 kWh/m²
Total energy consumption
Improvement on typical
52%



BSD Office
Kettering
Built in 2017
420 m² GIFA
104 kWh/m²
Total energy consumption
Improvement on typical
54%



6.2 Primary schools

Rogiet Primary School
Monmouthshire
Built in 2009
1,660 m² GIFA
93 kWh/m²
Total energy consumption
Improvement on typical
53%



St Lukes CoE Primary School
Wolverhampton
Built in 2009
2,600 m² GIFA
99 kWh/m²
Total energy consumption
Improvement on typical
49%



Bushbury Hill Primary School
Wolverhampton
Built in 2011
1,808 m² GIFA
73 kWh/m²
Total energy consumption
Improvement on typical
63%



Montgomery Primary School
Exeter
Built in 2012
2,786 m² GIFA
60 kWh/m²
Total energy consumption
Improvement on typical
69%



Wilkinson Primary School
Wolverhampton
Built in 2014
2,610 m² GIFA
60 kWh/m²
Total energy consumption
Improvement on typical
69%



6.3 Domestic

Rowner Renewal Phase 2
Hampshire
Built in 2011
2 Blocks; 5 units (out of total 24)
60 kWh/m²
Total energy consumption
Improvement on typical
59%



Wimbish
Essex
Built in 2011
14 units
75 kWh/m²
Total energy consumption
Improvement on typical
48%*



Lancaster cohousing
Lancaster
Built in 2012
41 units
61 kWh/m²
Total energy consumption
Improvement on typical
59%



Racecourse estate
Durham
Built in 2012
25 units
70 kWh/m²
Total energy consumption
Improvement on typical
53%



Lark Rise
Buckinghamshire
Built in 2015
1 detached house
32 kWh/m²
Total energy consumption
Improvement on typical
78%



* This is close to a 50% and was therefore still included as a case study with interesting findings

Buildings Mission 2030

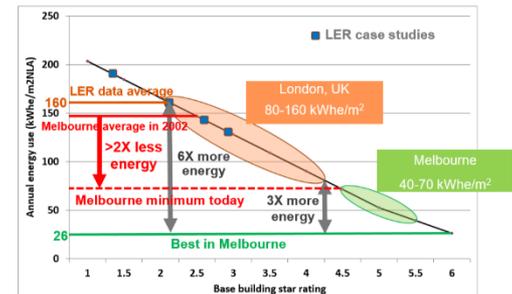
Background report to Recommendations from the Green Construction Board in response to the 2030 Buildings Mission
April 2019



NB Report illustrates how halving newbuild emissions over today's performance is possible through energy and systems efficiencies ie to reduce demand

- Identify current benchmark for building typology: aim to halve energy demand
- Use efficient low-carbon building systems: eg MVHR, ASHP
- Then factor in integrated renewables, grid decarbonization, storage, local demand management

Can we do it? Yes we can! Australia is beautiful, really smart!

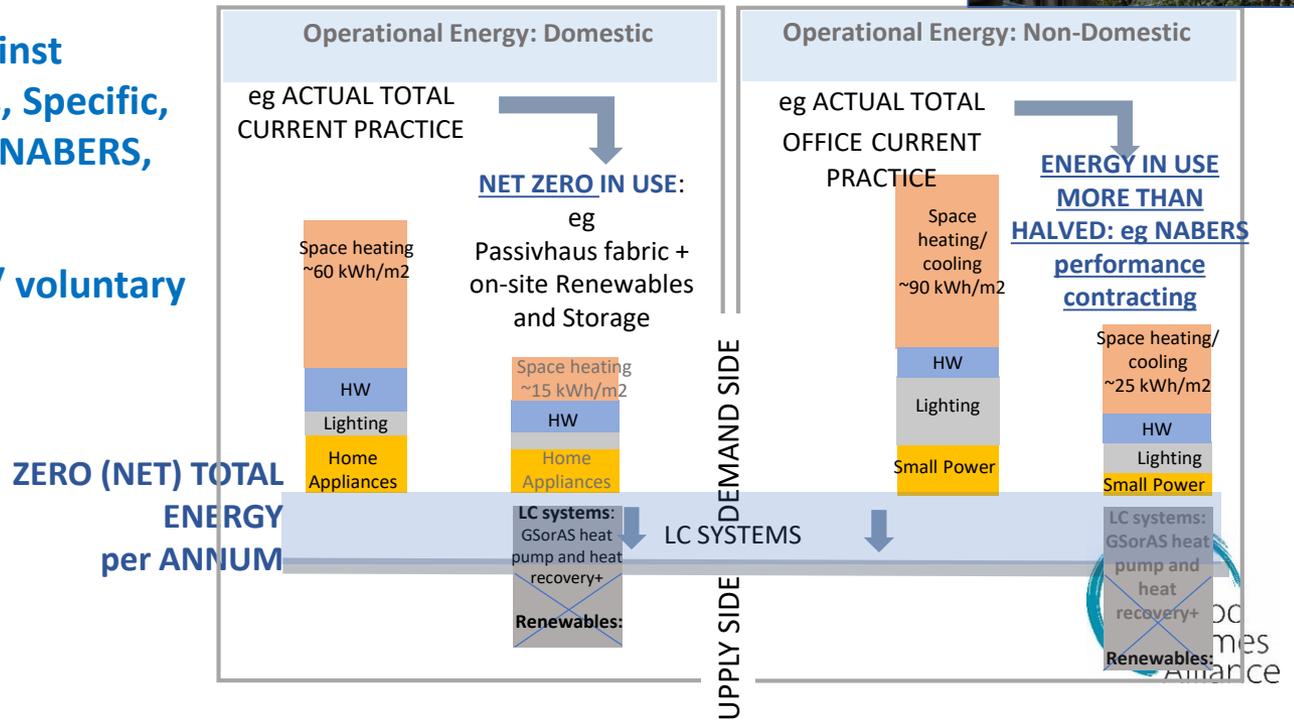


Key principles for Net Zero : reducing operational demand

Halving building (operational) energy use by at least 2030.. AND THEN to Net Zero..

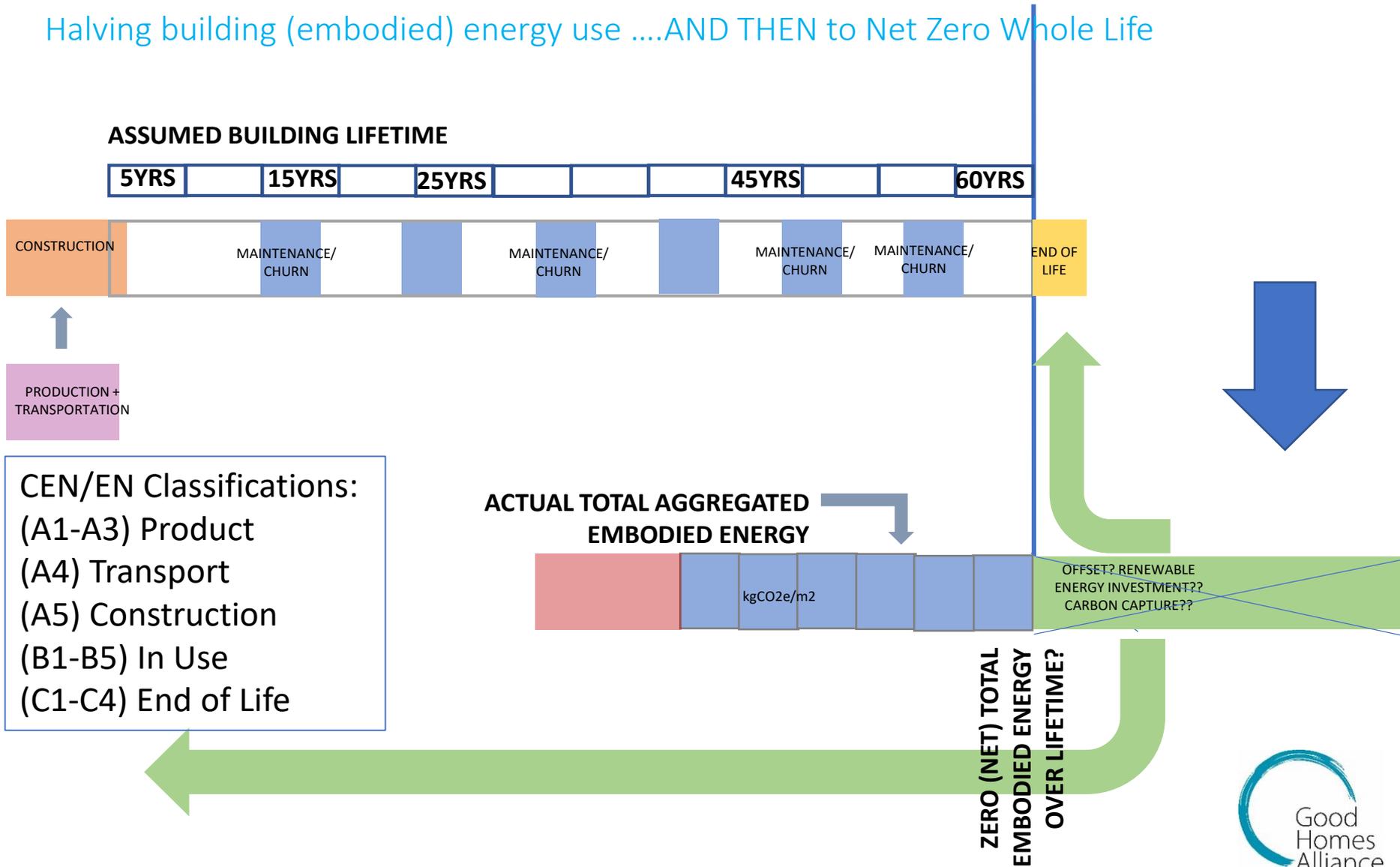


- All energy in use (not modelled)
- Strategies and choices: demand-side and supply-side
- Domestic and Non-Domestic
- Examine Techniques against Outcomes eg Passivhaus, Specific, Zero Positive, Zero Bills, NABERS, Energiesprong
- Define regulatory/fiscal/ voluntary drivers



Key principles for Net Zero : reducing embodied energy

Halving building (embodied) energy use ...AND THEN to Net Zero Whole Life



Net Zero: resilience, resource-efficiency, long-term value

- Digital innovation is key to transparency of outcomes
- Long-term thinking is essential for long-term value
- Post-Grenfell calls for verification of outcomes
- MMC is valuable if speed and replicability are important drivers: but the fundamental advantage is factory-standard control of quality

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Architecture **I've seen the future and it's Norwich: the energy-saving, social housing revolution**

Oliver Wainwright
 @ollywainwright
 Tue 16 Jul 2019 17:30 BST

3970 588



▲ Quietly miraculous ... the Goldsmith Street project. Photograph: Tim Crocker

The 100 homes on Goldsmith Street aren't just smart and modern. They may be the most energy-efficient houses ever built in the UK. Could this be the start of proper social housing?

The New York Times

Grenfell Fire Inquiry Demands Radical Overhaul of U.K. Building Rules



Britain's prefab housing revolution: One in five Barratt homes to be built in factories

By MATT OLIVER FOR THE DAILY MAIL
 PUBLISHED: 22:01, 9 May 2019 | UPDATED: 11:14, 14 May 2019

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One in five homes made by Britain's biggest builder are to be partly assembled in factories.

The homes can be built quicker, create less waste and are cheaper to produce, Barratt Developments claimed yesterday.

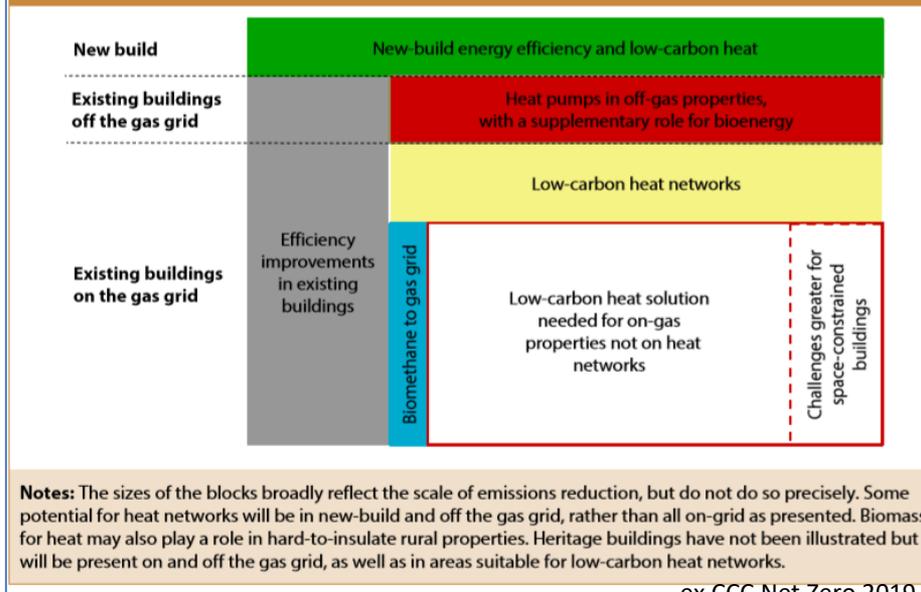
It is the latest developer to ramp up its use of prefabricated homes, which experts say could herald a revolution in house building.



Net Zero: resilience, resource-efficiency, long-term value

- A rigorous approach to best value in the context of Net Zero
- whole-life thinking is key
- Convergence on energy efficiency at the 'top' of the hierarchy, but followed by LC systems efficiencies, and must be set within the overall context of Net Zero
- Decarbonising supply-side is more difficult at small scale; BEIS due to produce Heat and Energy strategy in 2020

Figure 3.3. Low-regrets measures and the remaining challenge for existing buildings on the gas grid



ex CCC Net Zero 2019





Thank you

Lynne Sullivan OBE, RIBA
Chair, Good Homes Alliance

