

Introduction

What is the Real Estate Environmental Benchmark?

The Real Estate Environmental Benchmark (REEB) is a publicly available benchmark of operational environmental performance for commercial properties in the UK. It is based on the annual utility consumption data of the commercial property portfolios within the BBP membership.

This report provides energy and water performance benchmarks for offices, shopping centres, shopping villages, retail parks, leisure parks, industrial parks and car parks, which can be used to understand the performance of any building similar to these types.

With the permission of BBP members, the data is made available on an anonymous basis to support the industry as a whole, and a wide range of research projects and initiatives.

What's new for this years' update?

This report represents the first update to these benchmarks since the covid-19 pandemic, with the previous benchmarks being based on data for the year April 2019-March 2020. We have continued to gather annual consumption data from our membership through the years directly affected by the pandemic, and the subsequent period as commercial buildings continue to adapt to new societal behaviours and working patterns, and some of the findings from this were published in our [REEB 2022 Insights Report](#). The BBP Benchmarking Working Group took the decision not to update the benchmarks in this period, and to wait until sufficient 'post-pandemic' data was available. With another set of annual data now collected from the membership representing the period to March 2023, we are able to publish a reliable update.

The 2022/23 benchmarks are based on a different sampling approach to previous reports.

The updated benchmarks show a reduction in energy intensity when compared to the previous benchmarks based on 2019/20 pre-pandemic data. The scale of this reduction varies by building type. As an example, the AC offices benchmark (the most common building type in the REEB dataset) has reduced by around 15%. Further long-term trend analysis will be covered in the next version of the REEB Insights report.

How do these benchmarks relate to others in the industry?

The Real Estate Environmental Benchmark (REEB) was first produced in 2010, when very few other benchmarks were available to commercial property owners and managers to understand the relative performance of their buildings. In 2024, the context is different, with various energy & carbon benchmarks available in the UK and internationally for different building types. The challenge is no longer just about the availability of benchmarks, but making sense of them in an evolving commercial and regulatory environment where appraising the environmental performance of buildings has never been more important.

In response to this, we have introduced some new content to this update:

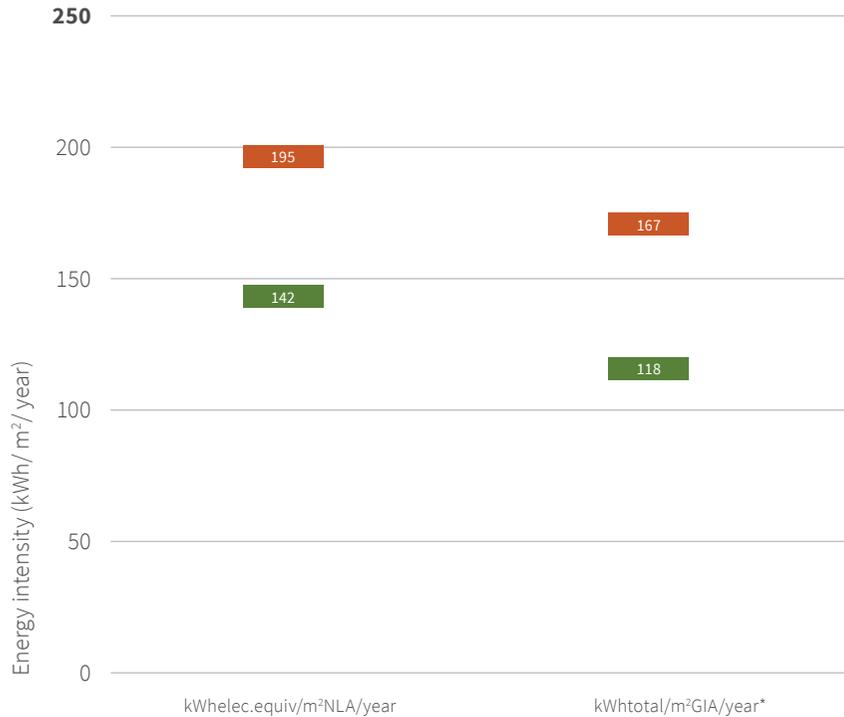
- The benchmarks are now expressed in 'total energy per m² (gross)', as well as 'electricity equivalence per m² (net)' so that users can more easily read across from these benchmarks to others (see p.7 for more details)
- We have included a new 'REEB in context' section as the latter half of this report, which presents the benchmarks in the context of other industry initiatives, and the wider benchmarking landscape

We hope that you find this report useful and welcome any feedback to info@betterbuildingspartnership.co.uk

Energy Benchmarks – Offices

Offices (A property with single or multiple tenants used to conduct commercial business activities)

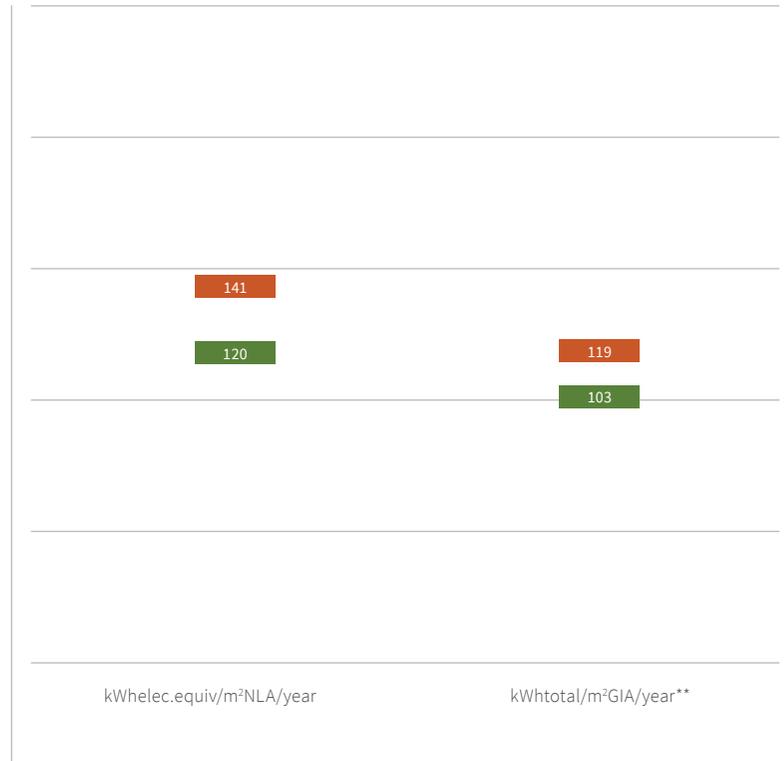
Benchmarks are ‘whole building’ (i.e. common parts and tenant-occupied areas), but exclude mixed use elements such as retail spaces, gyms and data servers. Where offices include dealing floors these are removed from the total consumption. **Only offices that are >75% let for the reporting year are included.** The floor area metrics used are ‘Net Lettable Area’ for presentation as ‘Electricity Equivalent per m² per year’, and ‘Gross Internal Area’ for presentation as ‘Total Energy kWh per m² per year’. These floor areas exclude non-office aspects of the building.



Air Conditioned Offices

Definition: Mechanically Ventilated and/or Air-Conditioned properties are fully sealed and controlled via a combination of components required to provide full control of temperature, humidity and air quality. This includes fixed self-contained systems such as split units and centralised systems. Mechanical ventilation systems that provide no mechanical cooling but serve spaces that are cooled by other means are included within this HVAC category. Air conditioning is often provided by Air Handling Units (AHU) connected to ductwork that supplies air to and extracts air direct from within a space. AHU that consist of only a fan and a heating or cooling element located within the space they serve, known as Fan Coil Units (FCU) are also included here. Cooling itself could be generated either within the unit itself or can be provided by connection to central chillers.

Sample size for benchmarks above: 472
Total 2022/23 Buildings Submitted: 1,078



Naturally Ventilated / Mixed Mode Offices

Definition: Naturally ventilated offices employ openable windows, skylights and such other openable systems (either manually or automatically controlled), to supply and remove air from the building without any mechanically assisted ventilation. Mixed mode buildings employ a hybrid approach to space conditioning that uses a combination of natural ventilation from openable windows (either manually or automatically controlled) and mechanical systems that include air distribution equipment which may also include refrigeration equipment for cooling. A mixed-mode building uses air-conditioning only when and where it is necessary, optimising the use of natural ventilation whenever it is feasible.

Sample size for benchmarks above: 50
Total 2022/23 Buildings Submitted: 195

The average mix of fuels / electricity for buildings in this sample using both is:

- * 38% Fuels / 62% electricity
- ** 40% Fuels / 60% electricity

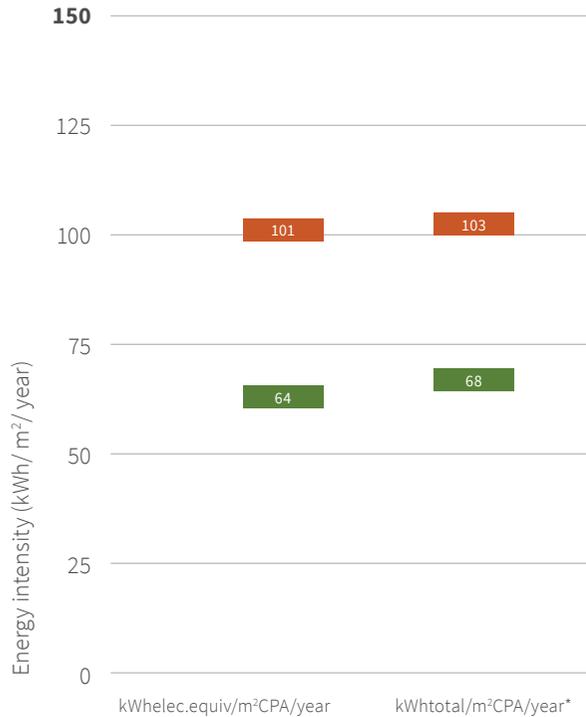
- 25th Percentile (Good practice)
- 50th Percentile (Typical practice)

NLA Net Lettable Area
 CPA Common Parts Area

Energy Benchmarks – Shopping Centres

Shopping Centres (Retail properties with a central common mall and adjoining retail units)

Benchmarks represent the ‘common parts’ of the property, excluding all retail unit and car park energy consumptions. The floor area metric used is ‘Common Parts Area’, which includes the landlord-controlled mall and circulation spaces (e.g. staircases, elevators, lifts, and service / storage areas). For unenclosed shopping centres the ‘Common Parts Area’ may also include external walkways and open/semi-covered courts. ‘Common Parts Area’ is used as the denominator whether the energy consumption is expressed in electricity equivalent or total energy.



Enclosed Shopping Centres (Air Conditioned)

Definition: An enclosed retail property that includes a central common mall area and adjoining retail units. The retail units typically do not have any independent access and are accessed through the common mall area. Such properties are typically not accessible to the public after closing hours. These enclosed shopping centres are mechanically ventilated and/or Air-Conditioned as per the detail above for offices.

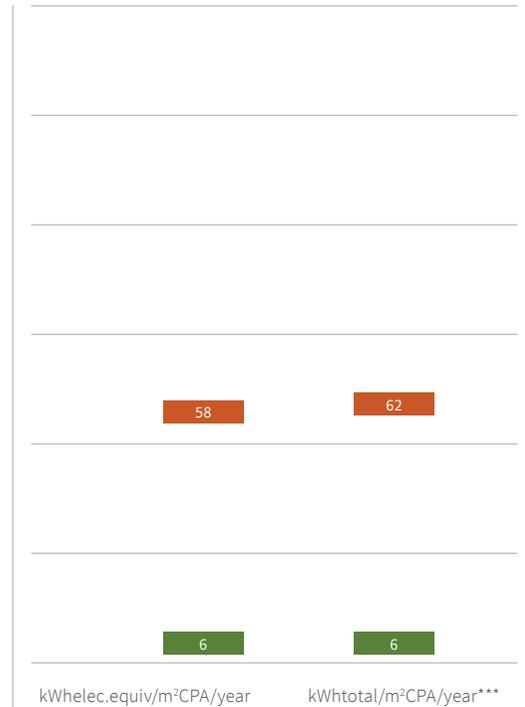
Sample size for benchmarks above: 16
Total 2022/23 Buildings Submitted: 26



Enclosed Shopping Centres (Naturally Ventilated / Mixed Mode)

Definition: An enclosed retail property that includes a central common mall area and adjoining retail units. The retail units typically do not have any independent access and are accessed through the common mall area. Such properties are typically not accessible to the public after closing hours. These enclosed shopping centres are naturally ventilated / mixed mode as per the detail above for offices.

Sample size for benchmarks above: 17
Total 2022/23 Buildings Submitted: 27



Unenclosed Shopping Centres

Definition: A partially open retail property that includes a central common mall area. The common mall area is not fully sealed e.g. there is a roof but open entrances, and therefore accessible to the public after store closing hours.

These unenclosed shopping centres typically have no centralised heating or ventilation.

Sample size for benchmarks above: 10
Total 2022/23 Buildings Submitted: 19

* 25% Fuels / 75% electricity
** 26% Fuels / 74% electricity
*** 27% Fuels / 73% electricity

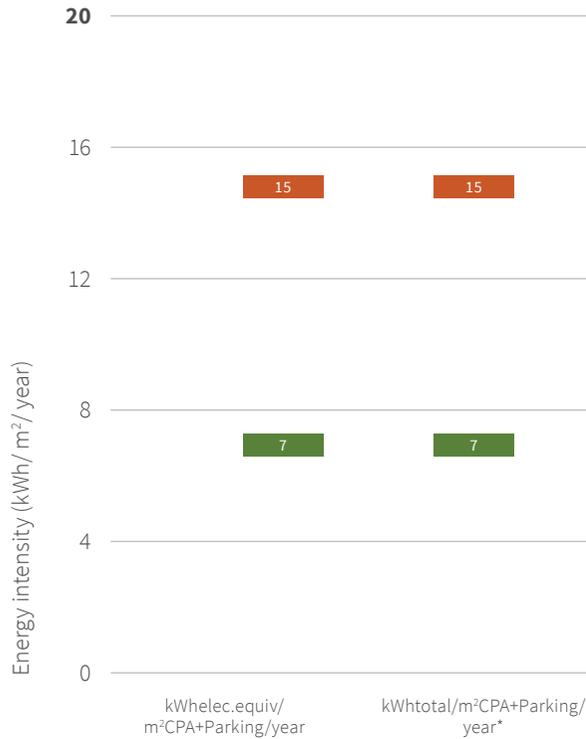
■ 25th Percentile (Good practice)
■ 50th Percentile (Typical practice)

NLA Net Lettable Area
CPA Common Parts Area

Energy Benchmarks – Shopping Villages, Retail Parks & Leisure Parks

Shopping Villages, Retail Parks & Leisure Parks (Out-of-town destinations or open-air facilities including retail and leisure activities)

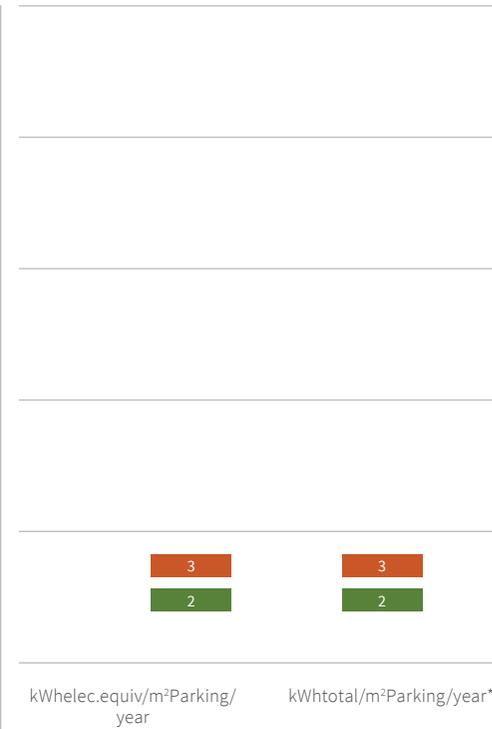
Benchmarks include the energy consumption associated with the lighting of external areas, service yards, open-air car parks, and external landscaped area and walkways. **They exclude the energy consumption associated with retail units, or any covered/multi-storey car parks.** The floor area is based on the area of open air parking (calculated using the car park numbers multiplied by 25m²). In the case of Shopping Villages the floor area also includes the Common Parts Area (pedestrianised streets, service yards, external landscaped areas). The floor area denominators are the same whether the energy consumption is expressed in electricity equivalent or total energy.



Shopping Villages

Definition: A shopping destination characterised by rows of shops/retail units that are accessed via open pedestrianised streets and are located within well landscaped areas. The car park where present is generally located on an adjoining site, but a small amount of car parking may exist around the shops as well.

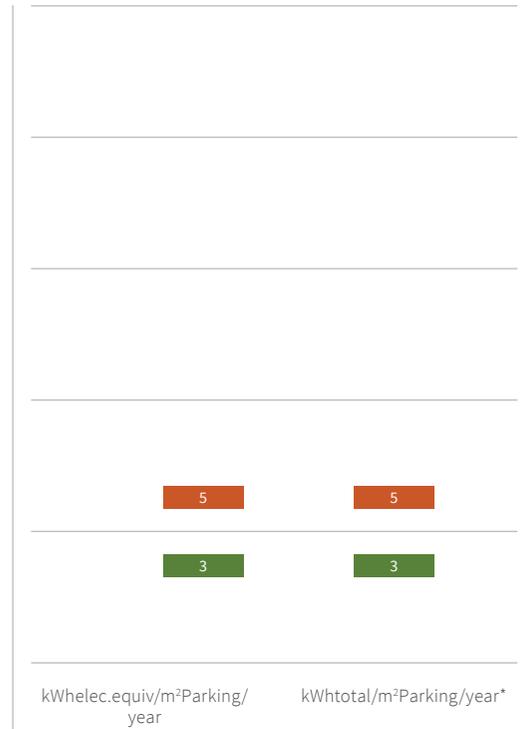
Sample size for benchmarks above: 13
Total 2022/23 Buildings Submitted: 19



Retail Parks

Definition: An out-of-town, open-air retail facility that comprises mainly medium and large-scale specialist retailers. It is characterised by mostly free-standing properties, with ample on-site parking located in front of the stores and/ or around the site at ground level.

Sample size for benchmarks above: 138
Total 2022/23 Buildings Submitted: 183



Leisure Parks

Definition: An out-of-town, open-air leisure facility, that may also include some retail units. Similar in nature to a Retail Park, but includes facilities such as bowling, cinemas etc. It is characterised by mostly freestanding, with ample on-site parking located in front of the stores and/or around the site at ground level.

Sample size for benchmarks above: 27
Total 2022/23 Buildings Submitted: 51

■ 25th Percentile (Good practice)
■ 50th Percentile (Typical practice)

NLA Net Lettable Area
CPA Common Parts Area

Energy Benchmarks – Industrial Parks

Industrial Parks

Benchmarks include the energy consumption associated with the open-air car park, service yard and any external landscaped areas. **They exclude any energy consumption associated with any of the buildings on site**, and any multi-storey car parks. The floor area is based on the external area, given as 'Gross Plot Area' minus Building Footprint. The floor area denominator is the same whether the energy consumption is expressed in electricity equivalent or total energy.



Industrial Parks

Definition: A site that contains multiple, free standing office or logistics buildings grouped together. On-site parking is typically located in front of each building and/or around the site. Landscaped areas may also exist within the site.

Sample size for benchmarks above: 91
Total 2022/23 Buildings Submitted: 144

The average mix of fuels / electricity for buildings in this sample using both is:

* Whole sample 'all-electric'

- 25th Percentile (Good practice)
- 50th Percentile (Typical practice)

NLA Net Lettable Area
 CPA Common Parts Area

Producing the REEB Benchmarks

Calculation Methodology

- Property submissions from 2022/23 only have been selected. This change from the previous REEB method (using 3 years' worth of submissions) reduces the sample sizes used to produce the benchmarks but avoids data being used from reporting years that were directly affected by the covid-19 pandemic.
- Properties that fail any data quality controls are excluded. This includes:
 - Properties with missing data that are vital to the analysis.
 - Properties that show abnormal changes between years or data anomalies that cannot be explained or confirmed by the data provider.
 - Properties that exceed Energy Intensity High/Low Thresholds without suitable explanation from the data provider. Table 1 shows the thresholds that are applied.
- These 2022/23 energy intensities for the eligible properties form the final dataset on which the quartile analysis is performed to produce the benchmarks as follow:
 - 50th Percentile (median) = REEB Typical Practice
 - 25th Percentile (upper Quartile) = REEB Good Practice

Adjustments

- Electricity equivalent (kWh_{elec-eq}) = kWh of electricity equivalent. Electricity 'equivalence' is calculated using the ratio of primary energy of each fuel compared to electricity. It combines into kWh of electricity equivalent, measuring the amount of electricity used and adding an equivalent amount to account for any other fuels used. Table 2 provides the co-efficient factors used to convert the fuel types. These factors were based on preparatory work conducted by BRE whilst developing the SAP 10.2 methodology.
- REEB office area data is quoted as Net Lettable Area (NLA) or Gross Internal Area (GIA) in various sections of this report, where the latter also includes the common parts associated with the office space. If participants provide only NLA or GIA, the other area field is calculated for use in the analysis using a conversion factor assuming that NLA is approximately 0.8 of GIA.
- Fuels and thermal energy consumption for heating is not adjusted for weather or operating hours.

Future Development Priorities

- Clarification of REEB methodological differences with other initiatives where BBP members are providing data
- Ongoing improvement of data coverage in the context of whole building/partial building distinctions and energy data types used
- Ongoing improvement of area data used and further alignment with IPMS

Table 1: High/low thresholds for energy intensity applied as part of data

Property Type	Lower Threshold (kWh _{elec-eq} /m ² /year)	Higher Threshold (kWh _{elec-eq} /m ² /year)
Office (Non-Air Conditioned)	30	600
Office (Air Conditioned)	50	1000
Enclosed Shopping Centre (Non-Air Conditioned)	30	600
Enclosed Shopping Centre (Air Conditioned)	30	600
Unenclosed Shopping Centre	0.4	400
Shopping Village	-	150
Retail, Leisure and Industrial Park	-	50

Table 2: Factors for converting to Electricity Equivalent

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gas / LPG	0.45	0.47	0.46	0.47	0.49	0.53	0.56	0.59	0.66	0.70	0.72	0.75	0.75
Fuel oil	0.47	0.49	0.48	0.49	0.52	0.56	0.59	0.61	0.69	0.73	0.75	0.79	0.79
Wood pellets	0.54	0.56	0.55	0.57	0.59	0.64	0.67	0.70	0.79	0.84	0.86	0.90	0.90
District heating	0.55	0.56	0.55	0.57	0.59	0.64	0.67	0.71	0.79	0.84	0.86	0.91	0.90
District cooling	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40

REEB in Context

The Real Estate Environmental Benchmark (REEB) was first produced in 2010, when very few other benchmarks were available to commercial property owners and managers to understand the relative performance of their buildings. In 2024, the context is different, with various energy & carbon benchmarks available in the UK and internationally for different building types. The challenge is no longer just about the availability of benchmarks, but making sense of them in an evolving commercial and regulatory environment where appraising the environmental performance of buildings has never been more important.

In response to this, we have introduced this 'REEB In Context' section to this year's benchmarks publication. The following pages show the REEB benchmarks for each building type relative to other industry benchmarks. This analysis is not intended to be exhaustive, as there are many relevant initiatives happening in the UK and internationally, and within specific sectors. We expect this analysis to change over time and welcome any feedback from those producing or actively using industry benchmarks (info@betterbuildingspartnership.co.uk).

Please note

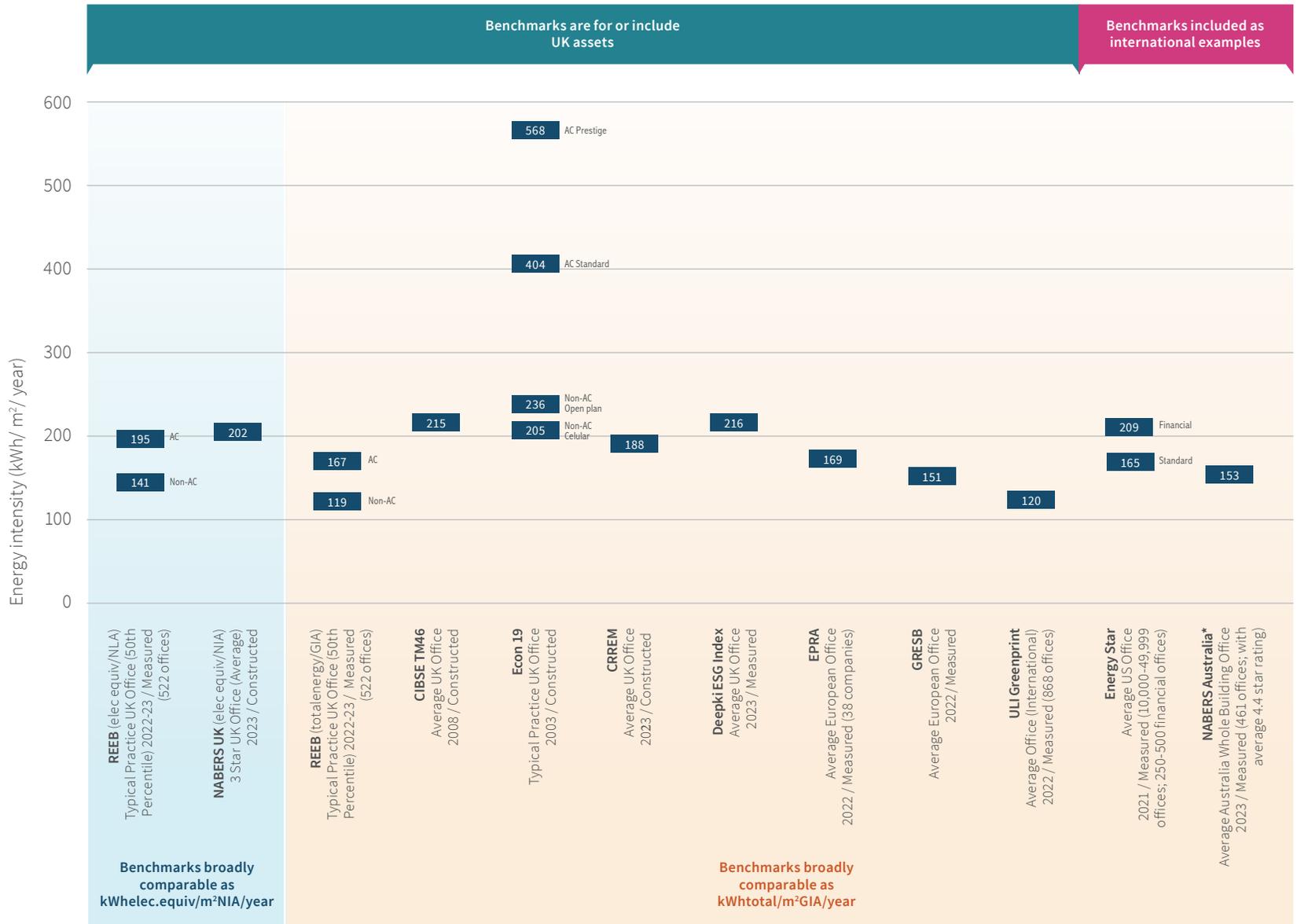
The methodologies used to produce industry benchmarks can vary significantly. Property benchmarks are typically quoted in kWh/m²/year, but even in these cases there can be significant differences in: Property Type Definition; Energy Data (Numerator); and Floor Area (Denominator). Benchmarks also vary in the averages used for any sample of assets (e.g. mean vs median) and the percentiles used to articulate various performance levels. Furthermore, some benchmarks are based on 'measured' data from a sample of assets, whilst others are 'constructed' from various sources which can include measured data, modelling, and other published information. The charts on the following pages have tried to make the distinctions between different benchmarks clear, whilst allowing for broad comparisons to be made.

The analysis presented in this section is indicative-only. It can be used to understand the types of benchmarks available to the industry and a general range of performance levels. It should not be used as an alternative to engaging with the specific benchmarks directly to understand the performance level of an asset, and all benchmarks used are referenced on p.12 for further investigation

Office Benchmarks in Context

This chart shows the REEB Office benchmarks in the context of a range of other office benchmarks available in the UK and internationally.

Please note that there is less variation in typology for office benchmarks than for retail and industrial benchmarks on the following pages.

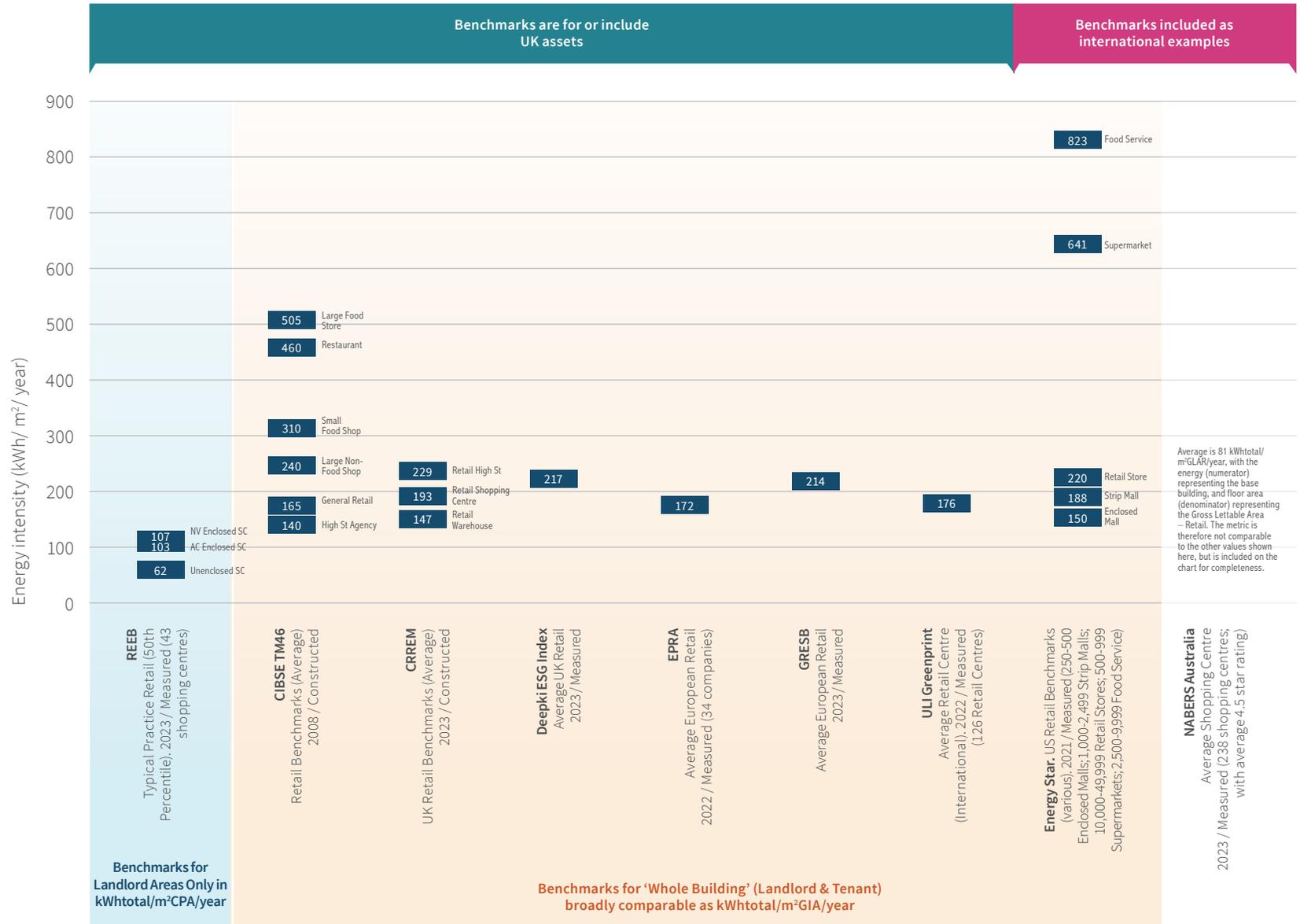


* Please note that NABERS Australia had 2,119 rated office spaces in 2023 when considering Whole Building, Base Building and Tenancies combined, with an average energy intensity of 97 kWh/m²NLA/year. Whole Building ratings alone have been used for this chart, with an indicative conversion to GIA applied (see p.12 for references and notes)

Retail Benchmarks in Context

This chart shows the REEB 'Retail' benchmarks in the context of a range of other retail benchmarks available in the UK and internationally.

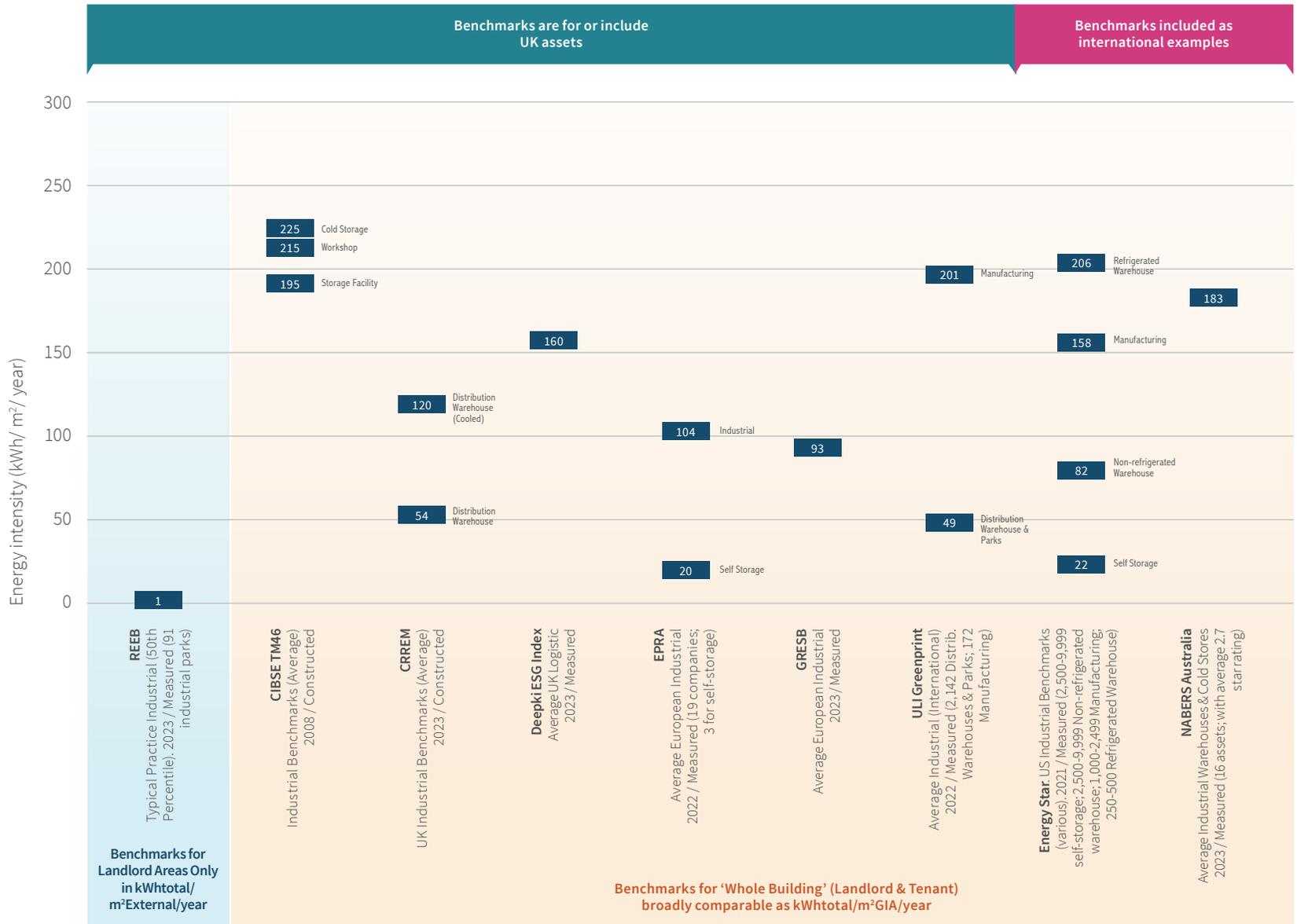
Please note the lack of a standardised 'typology' for retail assets. Where organisations produce a variety of retail benchmarks there can be a significant variance between different retail 'types'.



Industrial Benchmarks in Context

This chart shows the REEB 'Industrial' benchmarks in the context of a range of other industrial benchmarks available in the UK and internationally.

Please note the lack of a standardised 'typology' for industrial assets.



References & detail of sources used for ‘REEB in context’ charts

All links provided correct at time of publication.

NABERS UK

Reference data taken from ‘NABERS UK Reverse and Simple Calculator Tool’ (NABERS_UK_Reverse_and_Simple_Calculators_v2.0.xls)
This tool will soon be freely available again at the new CIBSE website for NABERS UK <https://cibsecertification.co.uk/nabers-uk/>

Please note that the ‘Whole Building Reverse Calculator’ tab was used to determine the ‘3 Star’ EUI threshold used in this report. The following parameters were used: 2021 (Data Year); Central London (Postcode); 40 hours per week (Operating hours at >20% occupancy); 1 occupied workstation per 20m² (Occupant Density); 75%-25% ratio of electricity-gas (Fuel Mix)

CIBSE TM46

Reference data taken from TM46 document directly.
Document reference: CIBSE. *TM46: Energy Benchmarks*. CIBSE, 2008.
Report available at: <https://www.cibse.org/knowledge-research/knowledge-portal/tm46-energy-benchmarks>

ECON 19

Reference data taken from Econ 19 directly.
Document reference: UK Government Energy Efficiency Best Practice Programme. *Energy Consumption Guide 19: Energy Use in Offices*. Carbon Trust, 2003.

CRREM

Reference data taken from CRREM Tool v2.04 (2023_09_20_CRREM-Risk-Assessment-Tool-EU-pre-filled_V2.04.xls)
Website reference for tool download: <https://www.crrem.eu/tool/>

Deepki ESG Index

Reference data taken from Deepki ESG Index website directly.
Website reference: <https://index-esg.com/> (accessed March 2024)

Please note that the following filters were used to generate the data used in this report: UK (Region); 2023 (Publication Year); Final Energy Consumption (Indicator)

EPRA

Reference data taken from KPMG & EPRA study on the non-financial performance of LRE companies in Europe.
Document reference: European Public Real Estate Association. *Deep Dive on Non-Financial Performance: Listed Real Estate Companies Across Europe*. 2023.

Report available at: <https://www.epra.com/press-corner/articles/kpmg-epra-study-non-financial-performance-listed-real-estate-companies-europe-focusing-energy-intensity-water-intensity-and-gree>

GRESB

Reference data taken from GRESB website directly, using the summary results for the 2023 Real Estate Assessment
Website reference: <https://www.gresb.com/nl-en/2023-real-estate-assessment-results/#> (accessed March 2024)

Please note that the data in this report was taken from the ‘Real Estate Asset Average Intensity Chart’. Filters applied as follows: Energy/Office/Europe; Energy/Retail/Europe; Energy/Industrial/Europe.

ULI Greenprint

Reference data taken from ULI annual ‘State of Green’ Report.
Document reference: Urban Land Institute. *State of Green: ULI Greenprint Performance Report*, Vol. 14. Washington, D.C.: Urban Land Institute, 2023.
Report available at: <https://knowledge.uli.org/en/reports/research-reports/2023/state-of-green-greenprint-performance-report-volume-14>

NABERS Australia

Reference data taken from the online NABERS Annual Report
Website reference: <https://nabers.info/annual-report/2022-2023/> (accessed April 2024)

Please note that the following filters were used to generate the data used in this report: All (State); Whole Building (Rating Scope); Exclude (Green Power)

Please note that the NABERS Annual Report data was converted from MJ/m² to kWh/m² using a factor of x0.28

Please note that the Energy Intensity values for Whole Building Offices on p.9 have also converted the NABERS Annual Report data from MJ/m²(NLA) to MJ/m²(GIA) using an indicative factor of x1.25

Energy Star

Reference data taken from Energy Star website directly, using the ‘Data Explorer’ Tool Website reference: <https://www.energystar.gov/buildings/resources-topic/portfolio-manager-data-explorer> (accessed March 2024)

Please note that the following ‘Data Explorer’ Tool filters were used to generate the data used in this report: 2021 (Data Year); All (Property Types); All (Gross Floor Area); All (States); All (Energy Star Certified); All (Years Built); All (Weekly Operating Hours)

Please note that the ‘Data Explorer’ Tool data was converted from kBtu/sq.ft to kWh/m² using a conversion factor of x3.15

Acknowledgements

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REEB 2023 Participants



Partners working with REEB Participants and the BBP Benchmarking Working Group

