

Towards better energy use benchmarks for Singapore's commercial buildings

The refined parameters will help asset owners and the government compare performance across this property segment. BY DAVID DICKINSON, CHEN HUAYING AND JOSEPH OOI

The Building and Construction Authority (BCA) launched the Green Mark (GM) certification scheme 20 years ago, a green-building rating system designed to evaluate a building's environmental impact and performance. Subsequently, in 2008, new buildings were required to meet a minimum environmental sustainability standard. Over this time, the government has also introduced the minimum standards for existing buildings to reduce energy use.

In September 2024, the Mandatory Energy Improvement (MEI) regime was announced, with the intent to speed up energy efficiency improvements. This programme shifts the emphasis from "encouraging" improvements in energy efficiency to "requiring" them if energy use intensity is higher than a stipulated threshold.

Properties consistently ranked among the worst 25 per cent of buildings in terms of energy use intensity will be required to undergo energy audits and implement energy efficiency improvement measures.

Owners of commercial and institutional buildings report their buildings' information and energy use under the Annual Mandatory Submission of Building Information and Energy Consumption Data (AMS), and this information forms the basis of the building energy benchmarks.

The energy use intensity of a building is measured by the Energy Use Intensity (EUI) metric, which is based on total annual electricity consumption per square metre of building gross floor area (GFA).

Refining existing benchmarks

Up until recently, the BCA's EUI benchmarks grouped commercial buildings into office, retail and hotel if they occupied 60 per cent or more of GFA. With the support of BCA, the Institute of Real Estate and Urban Studies (Ireus) proposed a higher cut-off of GFA usage to 90 per cent or more. This aims to provide purer benchmarks, which can be combined into weighted benchmarks for buildings with a mix of these uses.

In 2023, the median EUI for pure offices was 164, followed by hotels at 255 and retail properties at 447, clearly showing the substantial differences in energy use intensity be-



The energy use intensity of a building is measured by the Energy Use Intensity metric.
PHOTO: BT FILE

tween each type of property.

In Singapore, it is common for buildings to contain a mix of uses. The pure benchmarks can be factored into any combination of floor area allocated to office, retail and hotel uses, to derive a weighted benchmark specific to a building. As energy use in offices is typically less than that in hotels and retail, the previously used 60 per cent cut-off for benchmarks can be more onerous for office buildings that contain other commercial uses and less onerous for retail properties.

For example, Guoco Tower is a large downtown development of mostly offices, but it also contains hotel and retail components. Its reported 2023 EUI of 231 would place it well above the median for pure office of 164 and even above the 75th percentile of 205.

However, against a weighted median benchmark of 214 based on the GFA allocated to each use, its performance would be much better.

In its recent online release of 2023 EUI data, the BCA adopted the Ireus approach by using a similar 90 per cent cut-off for its energy use benchmarks. In addition, owners can also estimate weighted benchmarks based on the mix of uses in a building.

Offices

Among offices, energy use intensities were not substantially different between the subcategories except for laboratories with energy use that was almost double that for offices overall (median EUIs of 309 and 164, respectively). Offices in business parks had the lowest median EUI at 145, possibly due to more buildings within business parks that use district cooling (the energy consumption of which is at-

tributed to the district cooling operator).

Retail

In Singapore, most retail properties under the BCA's AMS are multi-tenanted shopping centres. The non-strata shopping centres generally represent the best-performing retail properties in Singapore in terms of revenue and patronage.

They commonly have long opening hours, high levels of pedestrian traffic and often contain uses with higher energy consumption and/or intensity, such as supermarkets, restaurants and cinemas. As a result, their EUIs are relatively higher, with a median of 483 overall. Those linked to MRT stations had even higher median energy consumption at 511, while those not linked to MRT stations were lower at 472.

Strata shopping centres had much lower energy use, with a median EUI of 284. This was probably a result of these centres being less heavily patronised than the non-strata shopping centres. They might also accommodate more service businesses such as tuition or dance studios, which have lower energy footprints or shorter trading hours. As a result, shopping centre energy use is likely to be closely related to financial performance. This presents a conundrum for owners of top-performing malls if their energy use is benchmarked against lesser-performing centres.

Hotels

Median energy use was slightly higher among five-star hotels at 256 compared with 238 for four-star properties. Hotels were also examined by size, with smaller hotels of under 15,000 square metres having higher energy use than larg-

er hotels. These smaller hotels also had a wider variation in energy use, with the worst 25 per cent having EUIs of at least 344.

More effective monitoring

The refinement of Singapore's commercial building energy use benchmarks is a vital step for both building owners and the government. They enable more effective monitoring of energy usage and provide valuable reference points, allowing owners to measure their energy use against more efficient peer properties. With this information, targeted energy efficiency improvement strategies can be developed.

To further assist building owners, Ireus is currently analysing the costs and benefits of around 100 green retrofitting projects undertaken in commercial buildings across Singapore in recent years.

Further refinement of Singapore's commercial building energy use benchmarks is possible. While building typology significantly affects EUI, other factors such as operating hours and tenant composition could also be analysed more closely as potential differentiators for EUI benchmarking categories.

As we gather more operational data and deepen our understanding, these benchmarks can be further enhanced, ensuring they remain relevant and insightful for all stakeholders.

The Ireus Refining Energy Use Benchmarks report was released in January 2025 and is available through the Ireus website. The BCA's latest Building Energy

Energy use intensity across different types of commercial buildings

Overall comparison across sectors

| CATEGORY | ENERGY USE INTENSITY PERCENTILES (KILOWATT/HOUR PER SQUARE METRE PER YEAR) | | | | | NUMBER OF PROPERTIES |
|----------|--|------|--------|------|------|----------------------|
| | 10TH | 25TH | MEDIAN | 75TH | 90TH | |
| Office | 109 | 135 | 164 | 205 | 294 | 177 |
| Retail | 223 | 322 | 447 | 525 | 634 | 73 |
| Hotel | 188 | 215 | 255 | 311 | 360 | 69 |

Offices

| CATEGORY | ENERGY USE INTENSITY PERCENTILES (KILOWATT/HOUR PER SQUARE METRE PER YEAR) | | | NUMBER OF PROPERTIES |
|------------------------------|--|------------|--------------------------------|----------------------|
| | BEST QUARTILE 25TH PERCENTILE | MEDIAN | WORST QUARTILE 75TH PERCENTILE | |
| Office overall | 135 | 164 | 205 | 177 |
| Offices without laboratories | 133 | 160 | 196 | 162 |
| Offices with laboratories* | 235 | 309 | 470 | 15 |
| Central area offices | 136 | 160 | 181 | 103 |
| Outer area offices | 132 | 167 | 204 | 29 |
| Business parks | 114 | 145 | 205 | 30 |
| Strata office buildings | 146 | 160 | 164 | 12 |

Shopping centres

| CATEGORY | ENERGY USE INTENSITY PERCENTILES (KILOWATT/HOUR PER SQUARE METRE PER YEAR) | | | NUMBER OF PROPERTIES |
|-----------------------------|--|------------|--------------------------------|----------------------|
| | BEST QUARTILE 25TH PERCENTILE | MEDIAN | WORST QUARTILE 75TH PERCENTILE | |
| Retail overall | 322 | 447 | 525 | 73 |
| Non-strata shopping centres | 445 | 483 | 562 | 50 |
| - Linked or next to MRTs | 457 | 511 | 565 | 29 |
| - Not near MRTs | 423 | 472 | 541 | 21 |
| Strata shopping centres | 226 | 284 | 309 | 15 |

Hotels

| CATEGORY | ENERGY USE INTENSITY PERCENTILES (KILOWATT/HOUR PER SQUARE METRE PER YEAR) | | | NUMBER OF PROPERTIES |
|------------------------------|--|------------|--------------------------------|----------------------|
| | BEST QUARTILE 25TH PERCENTILE | MEDIAN | WORST QUARTILE 75TH PERCENTILE | |
| Hotels overall | 215 | 255 | 311 | 69 |
| 5-star | 231 | 256 | 292 | 24 |
| 4-star | 207 | 238 | 323 | 39 |
| Hotels 15,000 sq m or larger | 209 | 233 | 259 | 36 |
| Hotels under 15,000 sq m | 238 | 283 | 344 | 33 |

Note: EUI measured by IREUS in collaboration with BCA, reflecting a more stringent threshold for categorising as office, retail or hotel, which is 90% of GFA, up from BCA's previous benchmark of 60%.

SOURCE: IREUS GRAPHIC GARETH CHUNG, BT

Benchmark Report is available online in Excel format on its website.

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