Global Sustainable Buildings Guide - Singapore

Energy Performance Certificates and Minimum Energy Standards

| Contents |
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| To generate table of contents, right-click here and select **Update Field.** |

# Is there a mandatory form of energy performance certification? When does it apply and are there any prescribed minimum standards?

**Introduction**

The building sector, which is responsible for more than one-third of Singapore's total electricity consumption, is included in the government's commitment to reducing its emissions intensity by 36% from 2005 levels by 2030.

The BCA is driving the energy efficiency of buildings, working closely with industry and stakeholders, in accordance with its [SLE Buildings Technology Roadmap](https://www1.bca.gov.sg/docs/default-source/docs-corp-buildsg/sustainability/sle_tech_roadmap.pdf?sfvrsn=8b09f272_0), which the BCA introduced in 2018.1 The SLE Buildings Technology Roadmap reviewed existing technology roadmaps developed in 2014 and set normalized energy efficiency index targets to achieve improvements in the energy efficiency index by 40% (moderate adoption) to 60% (aggressive adoption) in over 2,013 best-in-class buildings (Green Mark Platinum as a proxy) by 2030.

The BCA has progressively raised buildings' energy performance through regulation, incentives and building R&D. This has resulted in the current best-in-class buildings using at least 50% less energy compared to 2005 levels and the building stock's energy use intensity improving by 9% overall since 2008.2

The BCA's stated aspiration is to achieve Positive Energy, Zero Energy and SLE buildings that are 60%-80% more energy efficient than 2005 levels.

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| **Categories of SLE building** | **SLE building's energy savings and energy sources** |
| Positive Energy | * 115% of all energy consumption, including plug load, supplied from on-site renewable energy sources
 |
| Zero Energy | * All energy consumption, including plug load, supplied from on-site and off-site renewable energy sources
* On-site renewable source to be first maximized before exploring off-site renewable sources
* Renewable energy certificates must comply with SS 673: 2021 Code of Practice for Renewable Energy Certificates:3

Renewable energy generated within SingaporeMinimum of three years with commitment to recertification |
| SLE | * Best-in-class Green Mark building achieving at least 60% energy savings above 2005 building codes, which is being used as the anchor reference for Green Mark energy savings
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**Green Mark: 2021 energy efficiency certification**

The second edition of the [Green Mark: 2021 certification standard](https://www1.bca.gov.sg/docs/default-source/docs-corp-buildsg/sustainability/20211028_certification-standard_r1-1.pdf) came into effect on 1 June 2024 (superseding the first edition which was applied from 1 November 2021 to 31 December 2023) 4.

The Green Mark: 2021 assessment framework comprises the following:

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| **Assessment framework**  | **Application** |
| Green Mark: 2021 | Recognizes performance that is above mandatory, regulated standards, which includes robust levels of energy efficiency and applies to both of the following:Developments at the design and completion (as built) stageExisting buildings that are either:Undergoing retrofitting (including a major change to the cooling system) or major energy-use change as defined under Part IIIB of the Building Control Act 1989 and the 2013 Regulations)In operation but with no previous Green Mark certification |
| Green Mark: 2021 In Operation | Simplified version of Green Mark: 2021 for projects that have previously been assessed and fully certified under Green Mark that have demonstrated their holistic environmental performanceTracks the key performance indicators (KPIs) based on actual operational data to ensure that the building is performing to the same Green Mark: 2021 standardApplies to the following:Existing buildings in operation that have previously held Green Mark certification, and with no major energy use changeProjects seeking Green Mark recertification |

Most of the building types are eligible for assessment, including office towers, retail buildings and hotels. However, Green Mark: 2021 does not apply to office interiors, retail interiors or other interior fit-out projects.

Building projects must meet either the 2008 Regulations or the 2013 Regulations before Green Mark certification is conferred. The 2008 Regulations were amended in 2022 to adopt the Green Mark certification of Green Mark Platinum SLE as the minimum requirement.5

The following projects are required to adopt one of three energy efficiency (operational carbon) pathways leading to greater energy efficiency, with each pathway describing the requirements to achieve an energy efficiency of 50%, 55% and 60% (SLE standard) to demonstrate their energy efficiency levels:

New nonresidential development

New residential development

Existing nonresidential development

Green Mark: 2021 adopts the World Green Building Council's term of "operational carbon," which describes the amount of carbon emissions associated with energy used to operate the building or in the operation of infrastructure.

The energy efficiency (operational carbon) pathways are as follows:

Aligned to real project performance with validated data with flexibility for projects to demonstrate their performance

Outcome-based with full recognition of passive design strategies and renewable energy systems' contribution to energy savings

Supportive of innovation, encouraging the use of new technologies, approaches and solutions to energy performance

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| **Pathway** | **Metric** |
| Pathway 1 — energy use intensity (EUI) | EUI measures the total annual energy consumption of a building over the GFA (in kilowatt-hour/m2/year), based on the following:* Energy modeling (design)
* Energy calculation and measured data (retrofit)
* Measurement — in operation
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| Pathway 2 — fixed metrics | A prescriptive pathway where projects must demonstrate high levels of performance in each of the key building energy systems.* Key performance metrics (ingredients) that make an energy-efficient project — all aspects must be met individually.
* Any shortfall in performance can be made up with the use of on-site renewables, subject to the building typology multiplication factor.
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| Pathway 3 — energy savings | Energy savings demonstrated by energy modeling in accordance with the [Green Mark: 2021 Energy Modelling Guideline](https://www1.bca.gov.sg/docs/default-source/docs-corp-buildsg/sustainability/20210909_energy-modelling-guideline_r1.pdf), which measures energy savings by comparing the annual energy consumption of the proposed model (designed building) against the reference model (baseline building) |

**Singapore Green Building Council (SGBC) certification schemes**

The SGBC is a nonprofit organization, launched in 2009 as a private-public sector partnership with the key role of advocating green building design, practices and technologies and driving environmental sustainability in the building and construction industry.6 In March 2015, the SGBC introduced the following schemes:

The [Singapore Green Building Product](https://www.sgbc.sg/sgbc-certifications/sgbp-certification) (SGBP) certification scheme

Recognized by the BCA's Green Mark, SGBP-certified products accrue points that count toward a project's Green Mark rating

Complies with many of the requirements in ISO 14024 environmental labels and declarations and Type I environmental labeling, and is accepted by regional green building rating tools such as the following:

GreenRE, a rating tool set up by the Real Estate and Housing Developers' Association of Malaysia

LOTUS, the Vietnam Green Building Council's rating tool

The [Singapore Green Building Services](https://www.sgbc.sg/sgbc-certifications/sgbs-certification) (SGBS) certification

This is a platform to recognize and profile professional services firms that deliver best-in-class green buildings aligned with the latest industry benchmarks and best practices.

SGBS-certified firms are recognized under the Green Mark certification scheme.

**Energy modeling**

The BCA considers7 energy modeling an integrated approach that does the following:

Provides a good gauge of the building's energy consumption

Identifies energy efficiency opportunities

Indicates how a building is going to operate

To attain higher-tier Green Mark certifications (i.e., GoldPLUS or Platinum), the BCA requires demonstratable energy savings through energy modeling. As part of their application and assessment process for GoldPLUS or Platinum Green Mark certification, developers and building owners must measure the building's energy performance by comparing the annual power consumption of the proposed model (designed building) against the reference model8 (baseline building). The reference model complies with the 2008 Regulations or the 2013 Regulations and the Singapore standards on energy efficiency, lighting and ventilation, which include the following:

[SS530:2014+A1:2018 — Code of Practice for energy efficiency standard for building services and equipment](https://www.singaporestandardseshop.sg/Product/GetPdf?fileName=190212134105SS%20530-2014%28plus%29A1-2018%20-%20Preview.pdf&amp;pdtid=f7a3d234-223b-42a5-b509-45496aae20dd). This code, first issued in 2006, was revised in 2014 and amended in 2018. This code does the following:

Raises the energy efficiency requirements in accordance with international standards for air-conditioning equipment, water heaters, electric motors and lighting power density

Adopts new methods to determine efficiency for water chilling packages and lighting power density

Includes new efficiency standards for buildings with high-capacity service water-heating, systems, distribution transformers, and lifts and escalators

[SS CP13:1999 — Code of Practice for mechanical ventilation and air conditioning in buildings (Incorporating Amendment No. 1, February 2000 and Erratum No. 1, June 2001)](https://www.singaporestandardseshop.sg/Product/GetPdf?fileName=060421171050Preview%20-%20CP%2013-1999%28plus%29Amd1%26Err1.pdf&amp;pdtid=8690d588-7d33-42e5-a541-d0f684f966fe), which establishes a broad standard for engineers, architects, contractors, and owners to comply with in matters relating to mechanical ventilation and air-conditioning

[SS CP 38:1999 — Code of Practice for artificial lighting of buildings](https://www.singaporestandardseshop.sg/Product/SSPdtDetail/c6ff56f7-4f52-4118-a801-cc7261bfc0f1#:~:text=Code%20of%20practice%20for%20artificial%20lighting%20in%20buildings&amp;text=Also%20establishes%20the%20criteria%20for,activities%20thus%20enhancing%20visual%20comfort.), which recommends a range of illuminance levels for various types of buildings and recommended design illuminances, and establishes the criteria for the design, installation, and maintenance of artificial lighting in buildings so as to provide sufficient lighting for indoor activities, thus enhancing visual comfort

[Code on Envelope Thermal Performance for Buildings](https://www1.bca.gov.sg/docs/default-source/docs-corp-news-and-publications/publications/codes-acts-and-regulations/retv.pdf) to assist architects and professional engineers to comply with the envelope thermal performance standards prescribed in the building regulations

The proposed model must perform better than the reference model in total annual savings in energy consumption through the following:

Better building design

Higher improved equipment efficiency

Lower thermal transmittance of building envelope

Simulation results from the proposed model must show at least the following:

25% savings in annual energy consumption compared to the reference model for Green Mark GoldPLUS

30% energy savings for Green Mark Platinum

**Mandatory submission of periodic energy audits of cooling systems**

The system performance of any building cooling system, including the energy-efficient ones, is expected to deteriorate over time if not properly operated and maintained. As such, the BCA requires a periodic energy audit9 by a registered energy auditor10 to ensure that the building cooling system continues to operate as efficiently as per its initial design throughout its life cycle and comply with the minimum standards stipulated in the [Code on Periodic Energy Audit of Building Cooling System](https://www1.bca.gov.sg/docs/default-source/docs-corp-buildsg/sustainability/periodic-energy-audits-code_edition-4-0s.pdf) ("**Energy Audit Code**").

Based on such building information and energy consumption data, the BCA establishes the national building energy benchmarks, with EUI as the benchmarking metric used to measure building energy efficiency. These building energy benchmarks are published by the BCA annually11 to monitor Singapore's building energy performance.

The following buildings will have to carry out the energy audit:12

Existing buildings that have undergone the installation, substantial alteration or replacement of a building's/development's water-cooled/air-cooled chiller(s) (major energy-use change) unless excepted13

Existing buildings undergoing major retrofitting works

Existing buildings under the MEI regime that are classified as energy-intensive

New buildings that have applied for planning permission on or after 1 December 2010

Building owners must ensure that the building cooling system's level of operating system efficiency meets the minimum system efficiencies stipulated in the Green Mark certification standard referred to in the 2008 Regulations and the 2013 Regulations and in the Energy Audit Code, which does the following:

Sets out the energy efficiency standard applicable to a cooling system of the building

Stipulates the manner that an energy audit is to be carried out in determining the building cooling system's level of energy performance during operation

Spells out the required qualification and experience for an energy auditor's registration or renewal of registration

The CBC, appointed under the Building Control Act 1989, will issue notices requiring periodic audit of energy efficiency to building owners and allow a reasonable timeframe for them to complete the energy audit.

Existing buildings: The CBC may serve the first notice no less than 36 months from the date of the notice of approval of the as-built score.

New buildings: The CBC may serve the first notice at any time after the temporary occupation permit or certificate of statutory completion is issued.

For subsequent energy audit submissions, the CBC may serve each subsequent notice no less than 36 months after the date that the last notice was served.14

For owners of prescribed existing buildings classified as energy-intensive and subject to the MEI regime, the CBC will issue an MEI audit notice15 and such building owners will be required to:

Appoint a qualified person (a Professional Mechanical Engineer or energy auditor registered with BCA) within 90 days from the issuance of the MEI audit notice to:

Conduct an energy audit of the building which will involve a review of the major energy-consuming systems in a building to identify possible measures to optimize energy use

Develop an Energy Efficiency Improvement Plan (EEIP) which reduces the building’s EUI by at least 10% from pre-audit levels. The measures in the EEIP can range from simple, low-cost measures (e.g. simple maintenance works like replacing faulty parts / sensors, insulating hot water systems, installing monitoring instruments) to more extensive retrofitting works.

Submit the audit report of the energy audit carried out and an EEIP

Implement EEIP measures within three years from the submission of the audit report

Maintain the 10% reduction in EUI for a period of one year after implementation of the EEIP measures16

The CBC may choose not to issue an MEI audit notice on any prescribed ground, or if there are good reasons to withhold or cancel the MEI audit notice, for example if a building is:

scheduled for redevelopment in the near future

currently undergoing major retrofitting works or energy use change17

Failure to comply with requirements under the MEI regime will attract fines ranging from SGD 10,000 to SGD 150,000, depending on the severity of the offence and may also be compounded in the case of a continuing offence. Building owners will be penalized for the following breaches in respect of:

submission of EEIP18

duty to carry out EEIP19

submission of maintenance report20

non-compliance with the Commissioner of Building Control's written direction issued to the building owner for the purpose of ensuring that the specified reduction or approved reduction in energy use intensity is achieved and maintained21.

Building owners who depart or deviate from EEIP22 will also be penalized.

**Minimum Energy Performance Requirements and the MEI regime**

The following minimum energy performance standards currently apply to new and existing buildings undertaking major energy use change or undergoing major retrofitting works, with the MEI regime applying to existing buildings classified as "energy-intensive" from the third quarter of 2025:

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| **Building type** | **Percentage minimum energy performance requirements** | **Effective date of latest requirements** |
| New buildings | 50% (energy efficiency improvement over 2005 levels) | December 2021 |
| Existing buildings undergoing major retrofitting works | 40% (energy efficiency improvement over 2005 levels) | December 2021 |
| Existing buildings undergoing major energy use change | 40% (energy efficiency improvement over 2005 levels) | June 2022 |
| Existing buildings under the MEI regime that are classified as energy-intensive | 10% reduction in the building’s EUI from pre-audit levels | (expected implementation date in the third quarter of 2025) |

[1] See the BCA media release: [BCA Drives The Next Generation Of Green Buildings – The Super Low Energy Buildings](https://www1.bca.gov.sg/docs/default-source/docs-corp-news-and-publications/media-releases/pr_sgbw2018.pdf?sfvrsn=6749b909_4).

[2] See the BCA: [Super Low Energy Building Technology Roadmap](https://www1.bca.gov.sg/docs/default-source/docs-corp-buildsg/sustainability/sle-tech-roadmap-report--published-ver1-1.pdf?sfvrsn=f2df22ed_0).

[3] See the Singapore Standards Council media release: [New Singapore Standard launch to support management and use of Renewable Energy Certificates](https://scic.sg/images/New-singapore-standard-launch-to-support-management-and-use-of-renewable-energy-certificates.pdf).

[4] See the BCA [Green Mark 2021](https://www1.bca.gov.sg/buildsg/sustainability/green-mark-certification-scheme/green-mark-2021#:~:text=Starting%20from%201%20June%202024,submitted%20before%201%20June%202024.&amp;text=The%20BCA%20Green%20Mark%202021,tailored%20for%20the%20tropical%20climate.)

[5] Regulation 4(1)(f) in relation to building on land sold on or after 30 June 2022 under the GLS.

[6] See [About the SGBC](https://www.sgbc.sg/about-us/about-sgbc).

[7] See the BCA: [Green Mark Certification Scheme: Energy Modelling](https://www1.bca.gov.sg/buildsg/sustainability/green-mark-certification-scheme/energy-modelling) and [Green Mark: 2021 Energy Modelling Guideline](https://www1.bca.gov.sg/docs/default-source/docs-corp-buildsg/sustainability/20210909_energy-modelling-guideline_r1.pdf).

[8] See the [Framework for Energy Modeling for Green Mark Incentive Scheme (GMIS)](https://www1.bca.gov.sg/docs/default-source/docs-corp-buildsg/sustainability/em_frame.pdf).

[9] Currently, section 22FF of the Building Control Act 1989 allows the CBC to serve a notice to owners of new buildings or buildings undergoing a major energy-use change to submit building energy consumption data for a periodic audit of the building cooling system's energy efficiency, and Regulation 9 of the 2013 Regulations requires the energy audit to be conducted in accordance with the Energy Audit Code. Once the amendments to the Building Control Act 1989 come into effect, the new section 22FF will make such submission mandatory for all owners of prescribed buildings.

[10] Regulation 10 of the 2013 Regulations.

[11] See for example the BCA: [Building Energy Benchmarking Report (Statistics and Figures) 2023](https://www1.bca.gov.sg/docs/default-source/docs-corp-buildsg/sustainability/bca-building-energy-benchmarking-report-2023.pdf). This report is updated annually to reflect newly added buildings and major renovations.

[12] See [FAQ on Environmental Sustainability Requirements](https://www1.bca.gov.sg/docs/default-source/docs-corp-buildsg/sustainability/faq-on-environmental-sustainability-requirements.pdf).

[13] Regulation 3 of the 2013 Regulations exempts the application to Type A use of the building ((a) as a data center; (b) as a religious building; (c) as a residential building (other than serviced apartments); or (d) as a utility building) and Type B use of the building ((a) as an industrial building, an industrial retail building, a light industrial building or a special industrial building; (b) as railway premises; (c) to provide airport services and facilities; or (d) to provide port services and facilities).

[14] See the [BCA Circular to Building Owners And Professional Institutes/Associations 9 December 2013](https://www1.bca.gov.sg/docs/default-source/docs-corp-buildsg/sustainability/2nd-circular.pdf?sfvrsn=5d4dd761_4) and the Energy Audit Code, para. 5.1.1.

[15] New section 22FJ of the Building Control Act 1989.

[16] new sections 22FB, 22FC, 22FD, 22FE and 22FL and new Division 2 of the Building Control Act 1989.

[17] new sections 22FJ and 22FK of the Building Control Act 1989.

[18] new section 22FO(6) of the Building Control Act 1989

[19] new section 22FQ(4) of the Building Control Act 1989

[20] new section 22FT(4) of the Building Control Act 1989

[21] new section 22FU(4) of the Building Control Act 1989

[22] new section 22FS(2) of the Building Control Act 1989

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