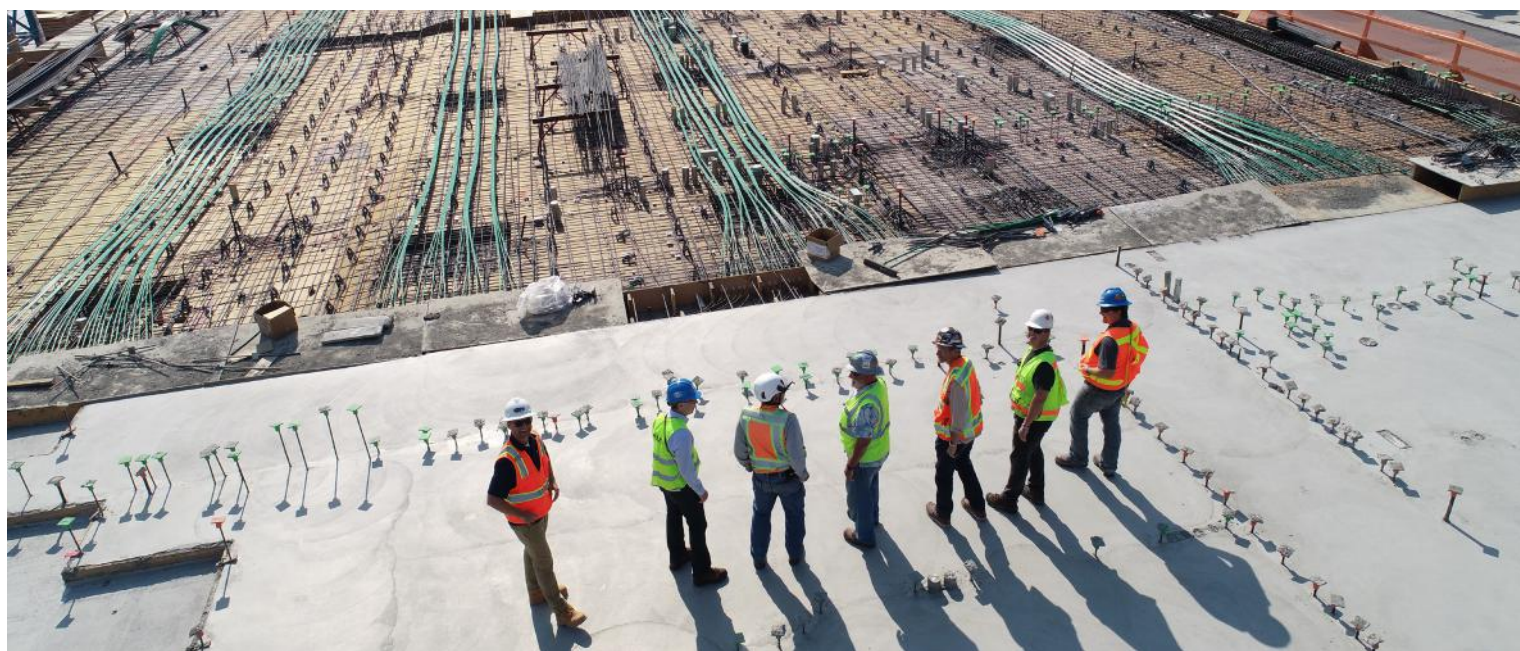


ENABLING SUSTAINABILITY IN THE BUILT ENVIRONMENT

Sustainable development remains a worldwide focus, and green construction is well-positioned to aid in this shift. Yet, determining whether the fundamental components of our built environment is still a priority.



Enabling Sustainability in the Built Environment



In order to achieve the vision of a low-carbon and energy-efficient future, the environmental performance of each and every building product cannot be left to chance since buildings are permanent structures in place for decades at a time. As such, the materials used in its construction play important roles in ensuring that the building's footprint and impact on its surrounding environment is as small as possible. Green building materials certified for their environmental performance, coupled with sound green building design and technology along with an emphasis on sustainability, will definitely go towards creating buildings which are greener and healthier for both occupants and the environment.

The Singapore Green Building Product (SGBP) scheme, managed by the Singapore Green Building Council (SGBC), is a certification for green building products and materials. It is based on scientific and engineering principles and built upon the collective knowledge and expertise of the building and construction industry. The SGBP certification scheme advances the built environment to one that is greener and more carbon-efficient while facilitating sustainable procurement. The certification ensures that sustainability is integrated throughout the design and manufacturing process of green building products.

METHODOLOGY & ASSESSMENT CRITERIA

The SGBP covers a wide range of products and assesses them based on their sustainability performance. Environmental and health impacts can occur across a product's lifecycle, from raw material extraction or cultivation, through manufacturing, use and end-of-use management. The scheme looks at the whole lifecycle of products to account for the full impact and assesses products and materials on their sustainability performance.

The SGBP's assessment criteria is categorised into common criteria which apply to most products and specific criteria which apply only to relevant products. The SGBC Certification team will identify for each applicant which assessment criteria are most suitable for their products. For some products, the assessment against criteria covers the whole product lifecycle, while for other products, the assessment criteria focus on a select few lifecycle stages across raw material extraction or cultivation, manufacturing, distribution, use, and end-of-use. This grounded methodology enables building products to be impartially evaluated for their relevant, noteworthy qualities, benchmarked against similar products in its category.

Enabling Sustainability in the Built Environment

SGBC will assess the degree to which the certifying product meets the assessment criteria. For some products, the applicant will need to show proof of laboratory test results or other documentation to verify the product's alignment with some criteria. SGBC works with a selection of lab partners to assist applicants on any third-party tests required for certification. After the assessment, the certified product will be awarded a rating between 1 and 4 ticks, based on its performance. 1 tick indicates good attributes, while 4 ticks indicate leading industry performance.

For both the common and specific assessment criteria, some are mandatory, and others are optional. The assessment criteria have been drawn up by SGBC in close collaboration with industry professionals and experts. SGBC continually reviews the criteria to ensure they reflect the current science, engineering and best practice.

As the enabler of built environment sustainability, SGBC has been working on decarbonisation initiatives, programmes and pathways for the better part of the past decade. To achieve the highest-possible Leader (4-ticks) rating, SGBP certification requires a product's carbon footprint data (amongst other criteria) across the whole product lifecycle: from raw material extraction all the way to its end of life.

In the drive towards low-carbon construction, the SGBP certification scheme will now assess concrete and steel products based on their carbon footprint and Global Warming Potential (GWP) instead of clinker/ recycled content, which necessitates the provision of environmental product declarations (EPDs) for each product undergoing certification. An EPD is a standardised quantification of environmental information on the life cycle of a product, similar to nutrition labels found on the packaging of food products. EPDs provide comprehensive and standardised information about the environmental impact of a product throughout its lifecycle, offering data on energy consumption, greenhouse gas emissions, water usage, and waste generation.

To ensure that Singapore manufacturers have the ability to develop internal capabilities to report on the carbon emissions of their products in accordance to international standards, SGBC is collaborating with One Click LCA, a global building lifecycle assessment platform, to pilot a Concrete EPD Generator in the Singapore market. This digital

WHAT THE SCHEME IS AND HOW IT WORKS



tool will provide another avenue for local concrete manufacturers to obtain consistent carbon data, identify decarbonisation opportunities and generate accurate, verifiable EPDs.

ENVIRONMENTAL SUSTAINABILITY

With the advancement of built environment sustainability over the years, many Singapore green building services firms have developed deep and specialised capabilities, and have a strong track record in delivering excellent Green Mark projects. To better reflect the deepening and maturing of firms' capabilities, SGBC has revised the certification criteria and categorisation of both the Environmental Sustainability (ES) and Energy Performance Contracting (EPC) categories for the Singapore Green Building Services (SGBS) certification scheme.

Environmental Sustainability (ES) services complement traditional built environment professional services disciplines, such as architecture and engineering, by integrating multi-disciplinary considerations to achieve environmental sustainability outcomes and goals.

ES firms typically possess expertise in specialised areas such as energy modelling, Computational Fluid Dynamics (CFD) for natural ventilation studies, energy audits, chiller plant optimization and decarbonisation strategies. The result is a high-performance, energy and resource-efficient building that is both healthy and comfortable for occupants. They can also help projects achieve SLE,

Enabling Sustainability in the Built Environment

Zero Energy and Zero Carbon targets. ES firms have deep capabilities in optimising overall building performance, for both new and existing buildings, to achieve higher ratings in Green Mark and other Green Building rating schemes. This includes certification to Super Low Energy and Zero Energy certification standards.

The SGBS certification scheme for ES services was developed to support the needs of project owners seeking professional services to meet the sustainability goals for their buildings and building projects. The tiering of ES firms corresponds generally to the following project needs:

Environmental Sustainability Services

- L1** Building projects with international stakeholders that seek to attain ambitious Green Mark ratings and certifications to other international or sectoral programmes
- L2** Building projects that seek to attain ambitious Green Mark ratings and other sustainability objectives
- L3** Building projects that seek to meet statutory requirements or modest Green Mark ratings
- L4** Simple building works or interior fit-out projects with aspirational targets, where project owners may be corporations from beyond the built environment industry

SGBS-certified ES firms have highly trained staff with Green Mark Accredited Professional (GMAP) and Green Mark Advanced Accredited Professional (GMAAP) qualifications. GMAPs serve as leads for Green Mark projects as Responsible Persons, whilst GMAAPs are required for the endorsement of Energy Modelling and CFD reports.

ENERGY PERFORMANCE CONTRACTING

Energy performance contracting (EPC) is an effective approach for the retrofitting of existing buildings to meet present-day standards and to raise energy efficiency performance. It is a contractual model supported by the Building and Construction Authority (BCA) under the Green Mark certification scheme.

Under the EPC model, the building owner enters into an energy performance contract with an EPC firm to achieve and maintain a certain level of Building or Chiller Plant energy efficiency performance level, or to deliver a guaranteed quantum of energy savings. The terms of an EPC contract are to be determined by both parties to meet appropriate goals and objectives. EPC firms

are also able to take on the full upfront cost of energy retrofits by offering a Zero Capital Partnership (ZCP).

Similar to ES firms, SGBC accredits EPC firms under the SGBS certification scheme. The appointment and involvement of SGBS-certified EPC firms in Green Mark projects is accorded specific credits under the Green Mark 2021 certification scheme. Up to 1.0 point can be scored in Resilience Section RE 2.1b Procurement for the appointment of SGBS-certified Energy Performance Contracting (EPC) firms to implement and deliver energy efficiency projects that guarantee operational system efficiency for a minimum of three years.

INDUSTRY RECOGNITION

The SGBP and SGBS are the key standards and benchmarks for green building products and services in the built environment sector. Products and services certified by SGBC are highly recognised under the Green Mark Scheme, Singapore's national green building rating tool administered by the Building and Construction Authority (BCA), which allows for the accrual of bonus points that count towards a project's Green Mark rating. The more highly rated a product is under the SGBP scheme (i.e., the more ticks it has achieved), the more points are awarded towards the Green Mark rating.

The SGBP is also widely accepted by regional green building rating tools for its coverage of a building product's sustainability performance. Key examples include GreenRE, a rating tool set up by the Real Estate & Housing Developments' Association (REHDA) of Malaysia, and the LOTUS programme administered by the Vietnam Green Building Council. The SGBP complies with many of the requirements in ISO 14024 Environmental labels and declarations — Type I environmental labelling. ✔

Read on to find out more about industry-ready green building solutions put forward by SGBC Member organisations, on display at the SGBC Pavilion @ BEX Asia 2023.



Airmaze Corporation Pte Ltd

Airmaze Corporation Pte Ltd was incorporated in 2015 as a world-class air quality management innovator, specialising in air filtration, air treatment and green technologies, meeting air-related needs and challenges. With vast experience and technical knowledge, Airmaze's dedicated team supports clients regionally with effective solutions, efficient production, top-class products made in compliance with international testing methods, coupled with friendly and quality customer service.

Airmaze provides one-stop air filtration solutions, ranging from case studies on air-related issues, manufacturing and supplying full range of air filters (pre to high range products), to installation works and after-sales services.:



Azendian Solutions

Azendian Solutions is an AI, Data Science and Operations Technology company that empowers businesses to make informed decisions applying the cutting-edge technology of Data Analytics, Artificial Intelligence (AI), and Machine Learning to achieve sustainability, ESG and productivity goals.

Azendian's smart building and energy optimisation solutions for a lower carbon, more sustainable built environment is game changing in its approach, methodology and integration of Machine Learning data driven techniques with Operations Technology engineering systems. It works and collaborates with customers and partners from offices in Singapore, Japan, Australia and Malaysia.

Enabling Sustainability in the Built Environment

bbp

Heating, ventilation, and air conditioning (HVAC) systems contribute up to 60 percent of energy consumption in commercial buildings, data centers, industrial facilities and infrastructure like airports and hospitals.

Founded in 2012, bbp offers patented energy optimisation technologies that reduce HVAC energy consumption. Using proprietary software algorithms, Internet of Things and industrial controllers, bbp has enabled multiple blue chip and Fortune 500 companies across 9 market to achieve energy and cost savings of up to 40 percent. With bbp's unique business model, asset owners or operators pay from actual savings delivered, allowing uninterrupted focus on their core operations.



bbp is an award-winning & accredited energy efficiency company that enables businesses to achieve carbon neutrality

- \$0 investment
- pay with actual savings
- savings verified by 3rd party auditor
- save up to 40%

Access your chiller plant data anytime, anywhere
Using bbp's chiller plant management system

bbp



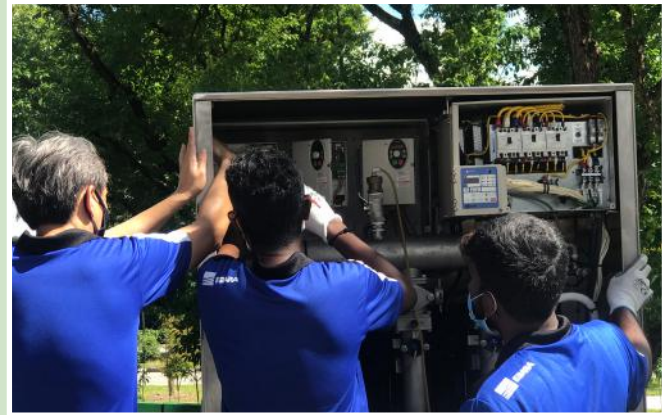
Belimo

Belimo is the global market leader in the development, production, and sales of field devices for the energy-efficient control of heating, ventilation and air-conditioning systems (HVAC). Founded in 1975, the company employs over 2,200 people and has been listed on the Swiss Exchange (SIX) since 1995.

Consistent focus on market and customer needs makes Belimo a partner which offers customers unsurpassed added value. The customer-oriented CESIM method developed by Belimo for optimising building technology with sensors, control valves and damper actuators ensures that its products have a major influence on comfort, energy consumption, safety, installation and maintenance in buildings.

Ebara Engineering Singapore Pte Ltd

Ebara Corporation started operations in Singapore with a branch office in the early 1980. Ebara Engineering Singapore Pte Ltd was registered officially in 1983 and started to provide pump overhaul business, system engineering design and custom design pumps.



The Precision Machinery division was started in early 1992 with the aim to service the growing semiconductor industry. It has since grown from a small section to a full division with overhaul facilities for dry vacuum pumps. This business now covers the whole of South East Asia and Oceania.



ENGIE

ENGIE strives to accelerate the transition towards a carbon-neutral world, through reduced energy consumption and more environmentally-friendly solutions, reconciling economic performance with a positive impact on people and the planet.

Leveraging globally leading technologies, ENGIE creates innovative energy and smart solutions that enhance the performance of homes, businesses, and communities. From strategy, financing syndication and design, to engineering, energy-efficient asset construction, operations management and outcome assurance, ENGIE acts throughout the value chain to help clients decarbonise today, for a better tomorrow.

With a geographical focus in Singapore, Malaysia, and the Philippines, ENGIE brings efficient energy solutions spanning from integrated energy performance services and low-carbon infrastructure (district cooling, EV charging, onsite solar, etc.) to large-scale renewables across the real estate, and data centre sectors.

G-Energy Global Pte Ltd

G-Energy stands at the forefront as an ESCO, boasting an expert team of energy specialists and certified Green Mark consultants. With more than 17 years of industry experience, G-Energy actively partners with diverse sectors to spearhead sustainability through innovative practices.

Its comprehensive one-stop solution covers design, construction, and certification attainment, enabling clients to meet stringent Total System Efficiency criteria. Through the optimisation of HVAC systems, G-Energy empowers clients to achieve substantial energy savings while bolstering environmental sustainability efforts, assisting clients to design, build and achieve Total System Efficiency (TSE) for the Air-Conditioning and Mechanical Ventilation (ACMV) system in their buildings as part of the green building certification process.



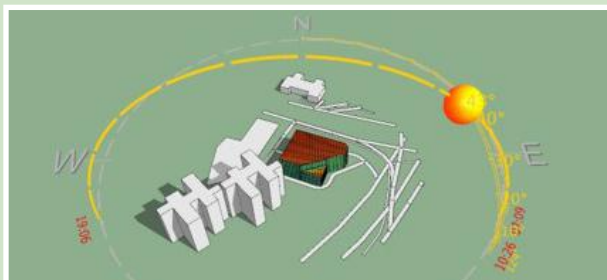
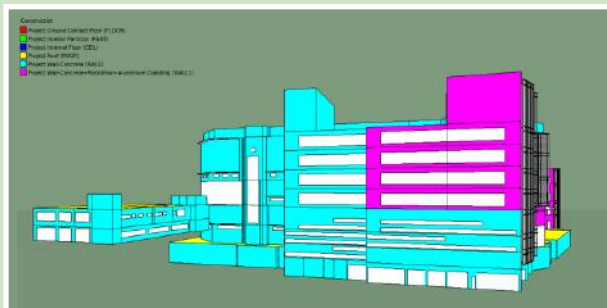
BCA has **significantly tightened the Energy Efficiency Requirements** for its Green Mark certification scheme on November 1, 2021.



For a building to be classified as **Net Zero or Positive Energy**, it must meet **Super Low Energy (SLE)** rating.



Assist building owners in **accelerating their sustainability efforts** by providing a **Zero Capex Energy Efficiency-as-a-Service business model** to help them accomplish their green building objectives.



HY M&E Consultancy

HY M&E Consultancy Services is a Professional Engineering Company that provides Mechanical and Electrical Consultancy Service to Building and Infrastructure Developers. Its services include Mechanical & Electrical service planning, authority submissions, project management, technology applications, drafting and design. HY M&E has two subsidiaries: Commodore and BeeCon.

Commodore specialises in the testing & commissioning of electrical assets (such as transformers, switchgear, cables, batteries, LPS, EV, PV, across different voltage levels to monitor equipment health condition, ensure protection integrity and proper functionality. It also performs power quality assessment for electrical load profiling, anomaly checks and troubleshooting and energy consumption measurements.

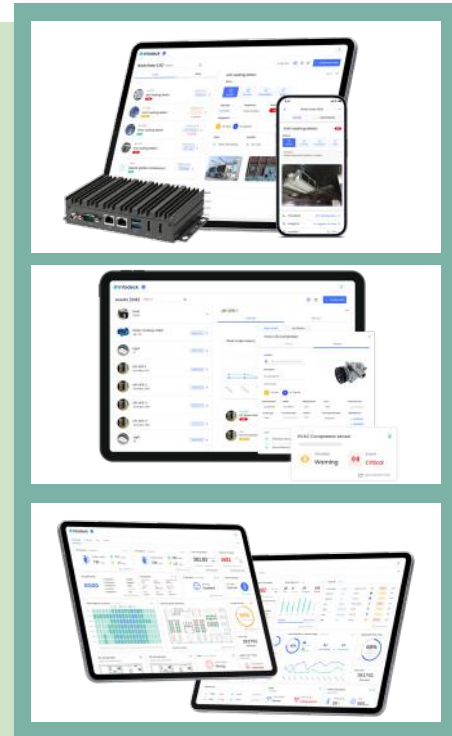
BeeCon provides sustainability services including but not limited to Green Building certifications, energy management studies with optimisation, solar studies energy storage systems and microgrids.

Infodeck Technology

Infodeck Technology is dedicated to bridging the divide between isolated systems and the data from emerging IoT devices. It provides a robust solution to optimise efficiency, minimise manual effort, and boost productivity through data-driven decision-making. Infodeck's cutting-edge solution empowers smart and sustainable buildings to achieve their ESG goals.

Infodeck offers an advanced facility operations management and smart workflow solution that harnesses the power of IoT techniques. It empowers maintenance and operations teams to streamline the day-to-day maintenance life cycle efficiently, enhance asset utilisation, and gain valuable insights from real-time data.

Moreover, Infodeck's edge computing enables resilient real-time data processing, it supports integrations such as LoRaWAN, Modbus, BACnet, MQTT and RESTful APIs, enabling the effortless connection of isolated systems and new IoT devices' data. With Infodeck, organisations unlock the seamless potential of optimised facility management, making operations smoother and more efficient than ever.



Intellihub Pte Ltd

Established in 2011, Intellihub Pte Ltd specialises in smart control solutions with a core emphasis on IoT sensors. Offering consultancy, integration, development, installation and project management services under its portfolio, Intellihub strives to be a complete solution house.

In the era of intelligent buildings, sensors play a pivotal role in data collection, sending it to IoT software for data analytics. Information is necessary for true building intelligence and helps businesses have more well-informed and better decision-making.

Intellihub remains committed to advancing building intelligence and efficiency with reliable yet innovative sensor technology. Its sensor solutions support seamless integration with BACnet, MQTT, and RESTful APIs.

Enabling Sustainability in the Built Environment



Nanyang Polytechnic

Established as an institution of higher learning in 1992, Nanyang Polytechnic's (NYP) academic schools offer quality education and training through 40 full-time diploma courses and common entry programmes. NYP's School of Design & Media (SDM) nurtures innovative and enterprising learners through a powerful combination of art, design, technology and expertise. NYP's hallmark is an educational model co-built with some of the industry's biggest names, leading to

additional mentorship programmes, certifications and valuable opportunities for its learners.

NYP's close industry partnerships enables its schools and enterprises to learn and update each other with industry best practices, explore and experiment new ideas and solutions, as well as induct students to the real world. NYP SDM's industry partners include CPG Consultants, DBS Bank, National Healthcare Group, ONG&ONG Group, Singapore Green Building Council, Urban Redevelopment Authority, and many more.

Signify

Signify is the world leader in lighting for professionals and consumers and lighting for the Internet of Things. Its Philips products, Interact connected lighting systems and data-enabled services, deliver business value and transform life in homes, buildings and public spaces.



In 2022, Signify had sales of EUR 7.5 billion, approximately 35,000 employees and a presence in over 70 countries. Signify achieved carbon neutrality in its operations in 2020 and have been in the Dow Jones Sustainability World Index since its IPO for six consecutive years and were named Industry Leader in 2017, 2018 and 2019.

Signify has been leading the lighting industry with innovations that serve professional and consumer markets for more than 125 years. Its energy efficient lighting products, systems and services enable customers to enjoy a superior quality of light, make people's lives safer and more comfortable and businesses more productive.

Enabling Sustainability in the Built Environment



Tectus Group

Tectus Group, a family-owned multinational operating in diverse industries globally, has a particular focus on embodied carbon within its construction, real estate and specialised engineering and inspection businesses.

Tectus' mission is to protect, maintain and responsibly grow the built world using technology. By adopting a holistic view on the emissions impact of asset lifecycles, Tectus contributes to minimising embodied carbon through employing carbon-

efficient construction methods, promoting use of maintenance, repair and retrofit technologies and enabling stakeholders to proactively inspect, monitor and maintain structures to maximise longevity, asset health and Net Present Value (NPV).

Tectus provides post-tensioning technology, modular construction with prefabricated and prefinished volumetric steel hybrid units, Asset Management digitisation, Maintenance Repair and Retrofit technology as well as building materials and Greentech.



YiTac(S) Pte Ltd

Navigating Towards Sustainability

YiTac(S) Pte Ltd

YiTac is dedicated to providing sustainability solutions with attributes in being environmental friendly, energy efficient and as well as productivity. Through its pioneering solutions, YiTac leads the market in propelling eco-friendly technologies while maximising energy conservation in the built environment.

YiTac's wide range of sustainable products and solutions includes:

- "Twenty80" Passive Displacement Ventilation (PDV) System
- "Kingspan" Pre-insulated Duct System
- "Grundfos" Distributed Pumping System
- "York" Air-cooled Chillers
- "Troidtekt" Green Acoustic Panels
- Measurement and Verification System for Variable Refrigerant Flow (VRF) System

