

Responses to Feedback and Suggestions on Energy Efficiency and Renewable Energy Opportunities for Businesses (June 2015)

This document was prepared by the Building and Construction Authority (BCA), Economic Development Board (EDB), the National Environment Agency (NEA), the National Climate Change Secretariat (NCCS), SPRING Singapore, and relevant agencies.

Buildings Sector

S/N	Suggestion	Response
Better Management of Energy Use		
1	Reduce excessive cooling of buildings, e.g. through compulsory air-conditioning temperature controls that prevent excessively low temperatures (e.g. no lower than 23-25C). A committee could be formed to look into such solutions.	<p>Guidelines on indoor temperatures were incorporated into Singapore Standard SS553: 2009, Code of Practice for air-conditioning and mechanical ventilation in buildings. Specifically, section 7.1.3 of the SS553:2009 states that the normal design dry bulb temperature for comfort air-conditioning can vary from 23°C to 25°C, with lower temperature applicable to zones with solar load and higher value in all other zones.</p> <p>Credits are awarded under the Green Mark Scheme to encourage higher indoor temperature set points.</p> <p>For public buildings, all air-conditioned premises are required to operate at an indoor temperature set point of 24°C and above.</p> <p>While some feedback seeks to mandate temperatures, BCA and NEA are open to suggestions on ways to better encourage building owners and tenants to keep air-conditioning settings within the suggested range.</p>
2	Encourage systems that allow local adjustment of central air-conditioning, and optimise air distribution accordingly	<p>Criteria within user-centric Green Mark schemes such as Green Mark for Office Interior and Green Mark for Retail encourage air-con designs that offer greater flexibility. Examples include zoning of air-conditioning to serve areas with different usage/occupancy needs, and installing controls capable of sensing space use and responding to space demand in rooms with specialty occupancies (e.g. meeting rooms, pantry).</p> <p>BCA will also set up an integrated Research, Development and Demonstration (RD&D) hub - the Green Building Innovation Cluster (GBIC). This will seek to enhance, inter alia, the efficiency and performance of air conditioning and distribution systems in Singapore's hot and humid environment. Further information on GBIC is provided in responses below.</p>
3	Introduce energy monitoring systems in all large buildings, and collect data centrally to analyse where energy could be saved	<p>Building owners are encouraged to install systems such as building management systems (BMS) and sub-meters, to better track buildings' energy consumption to identify areas for improvement. Additional points are awarded during assessment for Green Mark buildings.</p> <p>To increase awareness of energy use in order to drive energy efficiency improvements by building owners, BCA has introduced regulation for existing buildings that requires building owners to submit building information and energy</p>

		<p>consumption data through BCA's online submission portal, the Building Energy Submission System (BESS), on an annual basis from 1 July 2013, starting with commercial buildings. The data collected will help to formulate national building energy benchmarks. Data will be made available to all through the annual publication of BCA's Building Energy Benchmarking Report (BCA BEBR).</p> <p>The BCA BEBR enables building owners to assess their building performance, and spurs them into improving their building's performance. It includes a list of the top 10 best performing buildings of each category based on their Energy Utilisation Index (EUI), a metric which reflects the total electricity consumption per unit gross floor area (GFA) of the building for the year.</p> <p>From the first year of submitted data collated through the BESS, BCA's analysis found that there was an almost equal share of electricity consumption between building owners and tenants. To encourage energy efficiency amongst tenants, BCA has channelled more efforts to reach out to tenants through initiatives like the Green Lease Toolkit and the Green Mark Pearl Award</p> <p>The Green Building Innovation Cluster (GBIC) will be a one-stop hub to experiment, exhibit, and exchange knowledge on promising energy efficient solutions and innovations in green buildings. It will also have a data repository for energy use data from supported demonstration projects. This repository can then be tapped on to analyse the performance of energy efficient technologies.</p>
4	Central air-conditioning systems are more efficient and should be encouraged	Depending on the type of use and operating conditions, building owners and their consultants typically consider the merits of different types of building cooling systems. Minimum environmental standards and the Green Mark Scheme encourage the design of energy efficient air-conditioning systems during building construction or retrofitting.
Better Passive Design		
5	Introduce better passive design, such as double doors or rotating doors to keep cool air in, and tinted windows to reduce cooling load	Better passive design is strongly encouraged under BCA's Green Mark scheme, and stringent building code requirements are already in place for building envelope thermal performance. For the purpose of energy conservation, the maximum permissible Envelope and Roof Thermal Transfer Values (ETTV and RTTV) have been set at 50 W/m ² . To encourage better design, credit is awarded under the Green Mark for thermal performances of building envelopes that are better than the building code requirement. In addition, to achieve the higher rating of Green Mark Gold ^{plus} and Platinum, new non-residential developments have to meet prerequisite requirements for ETTV of below 42 W/m ² and 40 W/m ² respectively. The upcoming Green Mark version will have an enhanced focus on climatic-responsive passive design (e.g. double doors or tinted windows) to further encourage strategies that reduce energy demand.
6	Encourage eco-architecture (e.g. Star Vista), where common areas	Developers and architects currently determine buildings' designs for the development, based on site specific and various considerations. To encourage lower energy usage, natural ventilation designs are encouraged in Green

	and corridors are not cooled by air-conditioning	Mark with separate criterion provided for non air-conditioned areas.
7	Encourage natural daylight to save energy used for lighting, which also improves productivity and creates friendly work environments	Designs that optimise usage of effective daylighting to reduce energy use of artificial lighting are encouraged within Green Mark Criterion for New and Existing Buildings. Green Mark points will be allocated for designs that fulfil the criteria and extent of daylighting coverage.
Incentives		
8	Provide incentives for developers to install efficient appliances in new buildings and during retrofitting	There are various Green Mark Incentives Schemes (GMIS) available to encourage developers, building owners as well as tenants to address energy efficiency within buildings. These include:
9	Address split incentive issue by incentivising landlords to address energy efficiency	<p>For New Developments: GMIS – Design Prototype provides funding support for engaging Environmentally Sustainable Design (ESD) consultants to conduct collaborative design workshops and assist in simulation studies early in the project, to go beyond GM Platinum.</p> <p>For New and Existing Developments: Green Mark Gross Floor Area (GM GFA) Incentive Scheme jointly launched by BCA and URA provides bonus GFA for private developments attaining Green Mark Gold^{Plus} or Platinum ratings.</p> <p>For Existing Developments: GMIS for Existing Buildings and Premises (GMIS-EBP) provides co-funding of up to 50% of the Energy Improvement Works involving the installation of energy efficient equipment to achieve energy improvements.</p> <p>More information on incentive schemes can be found in: http://www.bca.gov.sg/Professionals/Technology/technology.html</p> <p>Green Lease Toolkit Besides incentive schemes, the Green Lease also acknowledges the possible synergies in cooperation between building owners and tenants (and any relevant service providers and contractors). It addresses split incentives. For instance, by installing energy efficient lighting that generates less heat, a landlord can benefit from reduced overall air-conditioning energy consumption while a tenant can benefit from the reduced energy bill for lighting usage. To encourage green leases, BCA has created a green lease toolkit to aid landlords and tenants in working together to improve their building's environmental performance.</p> <p>Green Mark Pearl Award BCA launched the Green Mark Pearl Award in 2014 to recognise developers and building owners who demonstrate thought leadership and efforts in actively engaging their tenants to shape behaviour and operational practices that result in improved total building performance. Through this award, BCA expects the green tenanted GFA to increase to at least 50%-70% for each building that is given the award.</p>

Other		
10	<p>Increase awareness of potential savings for tenants from improving energy efficiency (e.g. efficient lighting, cooling systems)</p>	<p>BCA has developed a Green Buildings Virtual Tour, accessible though http://www.greenmark.sg/virtual-tour.php, that shows estimated savings from improving energy efficiency (e.g. using daylighting, office equipment with energy labels) in offices and homes.</p> <p>Apart from user-centric Green Mark schemes to promote and recognise environmentally-friendly and sustainable practices, BCA has developed a toolkit for building owners to engage tenants on going green through a 'green lease' – a mutual lease agreement to minimise environmental impact. Under a green lease, tenants agree to limit annual average electricity consumption, and are encouraged to monitor and report office electricity consumption and develop targets for continuous improvement. There are also green partnerships between BCA and developers/building owners to engage tenants to improve sustainability standards in fit outs and daily operations.</p> <p>The Green Mark portfolio programme allows building tenants to simplify the Green Mark certification for multiple spaces of a similar type to achieve certification faster and at a lower cost.</p> <p>BCA is open to suggestions on how to further increase tenants' awareness of potential savings.</p>
11	<p>Building managers should be educated and trained (should be a full time responsibility, if possible) on energy management.</p> <p>Many companies already have qualified energy managers/ have systems for energy management</p>	<p>We agree that building Facilities Managers (FM) have an important role. BCA Academy offers comprehensive training programmes to equip FMs with knowledge and skills to implement sustainable improvement measures in existing buildings.</p> <p>At present, certification courses on the Green Mark Scheme are offered to FMs at both entry and advanced level – Green Mark Facilities Manager (GMFM) and Green Mark Facilities Professional (GMFP). We welcome feedback on these, or additional areas of need.</p>
12	<p>Introduce renewable energy generation, such as solar panels on roofs or vertical walls of buildings. Other forms of renewable energy include micro wind turbines on buildings.</p>	<p>The Green Mark Scheme encourages adoption of solar PV and alternate energy generation in buildings. Recognition is accorded based on the proportion of overall consumption displaced.</p> <p>Singapore's wind speeds are relatively low, at an average of about 2-3 metres per second (m/sec). Projects using small wind turbines require annual average wind speeds of at least 4 m/sec to be economically viable. Micro wind turbines are also generally less efficient than larger wind turbines. Moreover, the latter require a lot of space, whether on land or at sea, which is a challenge in land-scarce Singapore.</p>
13	<p>High-rise buildings in the CBD and other buildings should switch off exterior lights from 3am till sunrise.</p>	<p>URA's night lighting master plan for designated areas within the city centre, buildings in the CBD, Marina Centre, and Marina Bay, aims to guide buildings to be lit in a coordinated manner to create an attractive night time skyline for Singapore's city centre. Under the night lighting guidelines, all buildings are guided to be fitted with lighting fixtures that are energy efficient and to comply with Singapore Standards SS530: 2006 which states that the lighting</p>

		power budget for lighting of the building's façade shall not be greater than 5% of the total interior lighting load of the building. The guidelines require building owners to turn on the external lighting from Friday to Sunday, between 7 to 11pm. Outside of these times, the lights can be dimmed or turn off to conserve energy.
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Industrial Sector

S/N	Suggestion	Response
Regulation		
1	Specify energy efficiency (EE) improvement targets for major energy consumers	We agree that improving energy efficiency (EE) is key to reduce greenhouse gas (GHG) emissions. With effect from 2013, energy-intensive users in the industrial sector are required to implement basic energy management practices under the Energy Conservation Act (ECA). Energy-intensive companies consuming 54 TJ of energy or more each year are required to appoint at least one energy manager, report energy use and GHG emissions annually and submit EE improvement plans annually. The legislation, which is relatively new, currently does not specify EE improvement plan targets for these companies to meet but they are strongly encouraged to develop robust cost-effective plans for implementation. The Government will track the level of implementation of such plans over the medium to long term and monitor the adoption rate of energy efficiency measures.
2	Introduce minimum energy standards; these would provide more information to build confidence, incentivise action, and enhance selection of energy efficient equipment	Over the next few months, NEA will conduct consultations and gather feedback on the feasibility of setting minimum energy performance standards for industrial equipment and systems.
3	Introduction of emissions caps will ensure efficiency gains and minimise rebound effects (which are more effective than intensity targets)	Emissions caps are typically established to allow for emissions trading, for example in the EU's Emissions Trading Scheme. The Government currently undertakes emissions reduction efforts across all sectors and has not reached a decision on carbon pricing. The benefits and implications of carbon pricing will have to be carefully studied before a decision is taken.
Incentives & Financing		
4	Introduce financial support (e.g. grants) to ensure reasonable Return on Investment (ROI) of energy efficiency projects	Apart from the Energy Efficiency Improvement Assistance Scheme (EASe) and Grant for Energy Efficient Technologies (GREET) incentives, EDB has partnered Sustainable Development Capital LLP (SDCL) to pilot an Energy Efficiency financing scheme whereby a third party financier pays the full upfront cost of energy efficiency projects, and shares the energy cost savings with the company.
5	Solar energy may not be so practical for larger consumers of electricity. However, where it is practical, low interest rates loans could be offered to companies for installation	Commercial arrangements are available for consumers to tap on to finance solar PV systems. Under solar leasing arrangements, the solar leasing firm designs, finances, installs, operates, and maintains the PV systems. Consumers only need to pay an agreed rate for the solar power generated and consumed, without having to pay upfront costs.

6	If possible, establish a baseline and methodology for savings quantifications to enable financial institutions to understand energy savings methodology	If the EE financing pilot is successful, SDCL will share data to facilitate better understanding of energy efficiency financing.
Better Knowledge Sharing		
7	Increase avenues for consumers to learn, adapt, and apply EE solutions, such as through open dialogues and workshops. For example, viewing of actual energy efficiency projects in similar industries	The Energy Efficient Singapore website (www.e2singapore.gov.sg) contains information on EE incentive schemes, success stories, and how industrial companies can improve their EE. Companies can sign up as Energy Efficiency National Partnership (EENP) partners to learn about EE technologies, best practices, standards and case studies. The National Energy Efficiency Conference, Share and Learn sessions and other learning events are organised under the EENP programme to develop the capabilities of industrial companies.
8	Provide industry averages and other statistics so comparison with best practices can be made	To help companies identify EE improvement possibilities, the Government has conducted benchmarking studies for energy-intensive facilities such as pharmaceutical facilities and data centres. The findings can be found at http://www.e2singapore.gov.sg/Resources/Industry_Resources.aspx . A benchmarking study for the food manufacturing sub-sector is currently being conducted. Best practices implemented by companies that have benefited from government grants such as EASe and GREET are also shared on the Energy Efficient Singapore website (www.e2singapore.gov.sg).
9	Encourage businesses to have high-level officers that identify opportunities for energy efficiency. This could change organisational mind-sets to have a holistic view of both business and social impacts	Under the ECA, energy-intensive companies must appoint at least one energy manager, report energy use and GHG emissions annually, and submit EE improvement plans annually. To establish an internal reporting mechanism that closes the loop between line management and top management in the tracking of performance, the reports and plans have to be endorsed by the chief executive of the companies.
SMEs		
10	SMEs typically have less manpower to adopt latest energy management processes, and require more financial and technical assistance for project execution. For SMEs, ESCOs should be engaged to assess and execute projects, rather than just perform	The SME Energy Efficiency Initiative, developed by SPRING Singapore and led by Sustainable Energy Association of Singapore (SEAS), is a \$17M initiative to bring together existing government grants to help SMEs reduce energy costs, increase productivity and promote energy efficiency. The initiative aims to help SMEs become more resource efficient by providing support for companies to undertake energy audits to identify their energy profile as well as implement solutions to monitor energy consumption and improve energy efficiency through the adoption of new technologies. SEAS also runs management-level and technical training courses to support SMEs with the knowledge and tools to

	audits.	<p>improve energy efficiency. SEAS recently teamed up with the Carbon Trust (UK) to roll out a Pilot Programme targeting SMEs in the food manufacturing sector with the main aim of helping the targeted SMEs to achieve at least 10% savings in energy costs.</p> <p>While ESCOs may be able to help SMEs in executing the projects, it is also important for the SMEs to establish their own energy objectives and targets, to ensure that EE improvements are sustainable. SMEs may also tap on the existing DfE, GREET and EASe grants offered by NEA and EDB to offset EE project costs.</p> <p>SMEs can also tap on BCA's Green Mark Incentive Scheme for Existing Buildings and Premises (GMIS-EBP) which aims to encourage SME building owners and tenants to undertake Energy Improvement Works involving the installation of energy efficient equipment approved by BCA to achieve substantial improvements in energy efficiency.</p>
Other		
11	Improve methodology for determining baseline consumption of the industrial sector to identify energy efficiency opportunities, e.g. through using more sensors, automated controls, etc	<p>The Government has introduced programmes such as EASe, which co-funds the cost of conducting detailed energy studies, to measure the energy consumption of companies' major energy-consuming systems accurately. The detailed energy studies will help determine baseline energy consumption, identify areas where energy savings can be made, and estimate the amount of savings achievable. SPRING has recently adopted a group of standards that complement the ISO 50001 Energy Management Systems standard, which includes principles and guidance for measuring energy performance using energy baselines and performance indicators.</p> <p>SMEs can also tap on iSPRINT for funding to install systems that allow long-term continuous self-monitoring of energy consumption.</p>
12	Introduce aggressive tiered pricing to stimulate a longer-term view on energy efficiency. Clear, long-term policy goals will allow organisations to plan accordingly and with certainty	<p>In Singapore, energy and electricity costs are not subsidised. Small and large consumers pay market prices. One consideration is that a levy on top of the market price would add to business costs, and it would be challenging to identify thresholds for tiering (e.g. a big company may have multiple subsidiary units that qualify for lower rates). The Government's continuing focus is on energy conservation and efficiency. This is achieved by building up capability, access to information, and co-funding to help reduce payback periods for EE projects. We will continue to review various policy tools and incentive schemes to support continued improvements in EE.</p>
13	Basic carbon footprint reporting and benchmarking for companies to benchmark companies against industry peers	<p>We have embarked on mandatory energy management requirements under the ECA, which requires energy-intensive companies to submit energy use and non-energy related GHG emission reports annually. This will allow companies and their management to be more aware of and to better understand their energy consumption and GHG emissions, as a first step. Benchmarking studies and efforts have commenced across several sub-sectors.</p>