



BCA-IMDA GREEN MARK

BCA-IMDA Green Mark for Existing Data Centres Version EDC/1.1

To achieve GREEN MARK Award



Pre-requisite Requirement

All relevant pre-requisite requirements for the specific Green Mark Rating are to be complied with



**Energy Related Requirements
Minimum 35 points**

**Other Green Requirements
Minimum 10 points**

Part 1 - Energy Efficiency

- 1-1 Overall Energy Efficiency
- 1-2 Systems Energy Efficiency
 - Cooling System
 - Air Management System
 - Electrical System
 - IT Equipment
- 1-3 Energy/Environmental Policy and Management
- 1-4 Energy Monitoring and Assessment
- 1-5 Energy Efficient Features and Innovations

Part 2 - Water Efficiency

- 2-1 Water Use Efficiency
- 2-2 Alternative Water Sources
- 2-3 Cooling Tower Water Use

Part 3 – Sustainable Operation & Management

- 3-1 Refrigerants and Fire Suppressants
- 3-2 Sustainability Policy

Part 4 - Indoor Environmental Quality

- 4-1 Indoor Air Quality and Ventilation
- 4-2 Lighting Quality and Management
- 4-3 Thermal Comfort and Noise Level

Part 5 – Other Green Features

- 5-1 Other Green Features & Innovations

POINT ALLOCATION

ASSESSMENT CRITERIA		POINT ALLOCATIONS	
ENERGY EFFICIENCY			
Minimum 35 points to be scored	Part 1 – Energy Efficiency		
	1-1 Overall Energy Efficiency		
	- Minimum PUE ¹	10	
	- Optimized PUE (Full Load and Part Load)	17	
	1-2 Systems Energy Efficiency		
	- Cooling System	10	
	- Air Management System	10	
	- Electrical System	8	
	- IT Equipment	8	
1-3 Energy/Environmental Policy and Management	5		
1-4 Energy Monitoring and Assessment	10		
1-5 Energy Efficient Features and Innovations	10		
SubTotal (Part 1)		88	
OTHER GREEN REQUIREMENTS			
Minimum 10 points to be scored	Part 2 - Water Efficiency		
	2-1 Water Use Efficiency	3	
	2-2 Alternative Water Sources	3	
	2-3 Cooling Tower Water Use	6	
	SubTotal (Part 2)		12
	Part 3 – Sustainable Operation & Management		
	3-1 Refrigerants and Fire Suppressants	4	
	3-2 Sustainability Policy	3	
	SubTotal (Part 3)		7
	Part 4 – Indoor Environmental Quality		
	4-1 Indoor Air Quality and Ventilation	3	
	4-2 Lighting Quality and Management	3	
	4-3 Thermal Comfort and Noise Level	2	
	SubTotal (Part 4)		8
	Part 5 – Other Green Features		
	5-1 Other Green Features and Innovations	10	
	SubTotal (Part 5)		10
	SubTotal (Part 2 to Part 5)		37
	Total Green Mark Score		125

Note: Where a particular section is not applicable to the data centre assessed, the actual score awarded will be normalised with respect to the total maximum score less the score of the non-applicable section.

¹ Power Usage Effectiveness (PUE) is a globally accepted metric that illustrates the total energy used by a data centre divided by the energy used by IT equipment in that data centre.

Green Mark Award Rating and Prerequisite Requirements

Green Mark Score	Green Mark Rating
90 and above	Green Mark Platinum
85 to <90	Green Mark Gold ^{Plus}
75 to <85	Green Mark Gold
50 to <75	Green Mark Certified

Pre-requisite Requirements for Existing Data Centre Criteria

PART 1 – ENERGY EFFICIENCY

1. OVERALL ENERGY EFFICIENCY

Green Mark Rating	Minimum points achievement from Part 1 – Energy Efficiency
Green Mark Certified	35 points
Green Mark Gold	42 points
Green mark Gold ^{Plus}	50 points
Green Mark Platinum	60 points

2. MAXIMUM PUE

The data centre must have a current operating Power Usage Effectiveness (PUE) of no more than 2.2 for Green Mark certification.

3. MINIMUM COOLING SYSTEMS' EFFICIENCY

Minimum Design System Efficiency/Operating System Efficiency (DSE/OSE)

(i) For Data Centres using Water-Cooled Chilled-Water Plant

Green Mark Rating	Peak Data Centre Cooling Load (RT)	
	< 500	≥ 500
	Efficiency (kW/RT)	
Certified	0.95	0.85
Gold	0.90	0.80
Gold ^{Plus}	0.85	0.78
Platinum	0.80	0.75

(ii) For Data Centres using Air Cooled Chilled-water Plant or Unitary Air-Conditioner

Green Mark Rating	Peak Data Centre Cooling Load (RT)	
	< 500	≥ 500
	Efficiency (kW/RT)	
Certified	1.2	1.2
Gold	1.1	Not applicable
Gold ^{Plus}	0.95	
Platinum	0.88	

For data centres with peak cooling load of more than 500 RT, the use of air cooled central chilled-water plant or other unitary air-conditioners are not applicable for Gold and higher ratings.

4. ENERGY METERING AND REPORTING OF PUE

Please refer to 1-4-3 (c) for details on the permanent measurement and verification (M&V) requirements.

5. For beyond Green Mark Certified Rating, the efficiency of the cooling system shall be available and measurable to attain higher Green Mark Rating such as Gold, Gold^{Plus} and Platinum. If the efficiency of the cooling system is not available, the achievable Green Mark Rating shall be Green Mark Certified Rating.

Energy Related Requirements

Part 1 – Energy Efficiency (Total Points: 85)	Green Mark Points																		
<p>1-1 Overall Energy Efficiency</p> <p>Minimum Energy Performance: The data centre shall have a current operating PUE of no more than 2.2 in the Singapore climate.</p> <p>Operators must provide evidence of the design PUE value from specifications, design calculations or commissioning data.</p> <p>Optimized Energy Performance: To encourage increasing levels of energy efficiency for a data centre operating under Singapore climatic conditions.</p> <p>As data centres often operate at less than full load conditions, the energy efficiency at part load conditions contribute significantly to the overall energy consumption. The design of data centre equipment and cooling systems should aim to achieve part load efficiencies that approach full load conditions. The performance of data centres operating at part load conditions will be graded against a reference grade line</p> <p>Energy performance of each data centre space must be based on actual metered energy consumption.</p> <p>Determination of PUE shall be in accordance with the latest version of “Recommendations for Measuring and Reporting Overall Data Centre Efficiency” [Ref 1.] under PUE Category 1 (based on UPS output) for the IT load. If the UPS output data is not available, the closest direct measured power data will be used and a fixed PDU, UPS or transformer loss will be applied based on industry norms for such equipment. The total facility power will be taken at the point where the facility is metered.</p>	<p style="text-align: center;">Points for DC PUE (maximum 27 points)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Design PUE</th> <th>Points</th> </tr> </thead> <tbody> <tr><td>2.2</td><td>10</td></tr> <tr><td>2.1</td><td>12</td></tr> <tr><td>2.0</td><td>14</td></tr> <tr><td>1.9</td><td>16</td></tr> <tr><td>1.8</td><td>18</td></tr> <tr><td>1.7</td><td>21</td></tr> <tr><td>1.6</td><td>24</td></tr> <tr><td>1.5 and below</td><td>27</td></tr> </tbody> </table> <p>Points will be linearly interpolated for PUE values between those in the table.</p> <p>The actual operating PUE will be determined against a reference grade line, depending on the % of full load operation. An operating PUE above this line will be awarded 75% of full load PUE points.</p> <p>The reference grade line is formed by joining the three points at a) Full Load PUE, b) 1.1 times Full Load PUE at 66% of full load, and c) 1.25 times Full Load PUE at 33% of full load.</p> <p>Example of application of actual operating PUE:</p> <p><u>Data Centre A</u> Full-Load PUE = 1.5 → 27 pts 1.1 Full-Load PUE = 1.65 1.25 Full-Load PUE = 1.875 Actual Operating PUE = 1.9 @ 40% Full-Load PUE Points awarded = 0.75 × 27 = 20 pts</p> <p><u>Data Centre B</u> Full-Load PUE = 1.6 → 24 pts 1.1 Full-Load PUE = 1.76 1.25 Full-Load PUE = 2.0 Actual Operating PUE = 1.8 @ 50% Full-Load PUE Points awarded = 1.0 × 24 = 24 pts</p>	Design PUE	Points	2.2	10	2.1	12	2.0	14	1.9	16	1.8	18	1.7	21	1.6	24	1.5 and below	27
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<p>1-2 Systems Energy Efficiency</p> <p>Overall Data Centre Energy Efficiency must be corroborated by the component systems efficiency in order to identify areas of improvement in the data centre operations.</p>									
<p>1-2-1 Cooling System</p> <p>Encourage the use of high efficiency cooling system, both in terms of equipment efficiency and system configuration, to minimize the energy consumption. The performance of the overall air-conditioning system (in kW/RT) for the data centre shall be based on the actual operating efficiency of the system.</p> <p>The systems to be considered are as follows –</p> <p>(a) Water-Cooled Chilled-Water Plant, comprising:</p> <ol style="list-style-type: none"> i. Water-Cooled Chiller ii. Chilled water pump iii. Condenser water pump iv. Cooling tower or Heat Rejection Unit <table border="1" data-bbox="228 867 813 1152"> <thead> <tr> <th rowspan="2">Baseline <i>Prerequisite Requirements</i></th> <th colspan="2">Peak Cooling Load</th> </tr> <tr> <th>< 500 RT</th> <th>≥ 500 RT</th> </tr> </thead> <tbody> <tr> <td>Minimum water-cooled central chilled-water plant efficiency</td> <td>0.95 kW/RT</td> <td>0.85 kW/RT</td> </tr> </tbody> </table> <p>Note: Stricter minimum performance applies for Gold and higher ratings (see pre-requisite requirements)</p> <p>(b) Air Cooled Chilled-Water Plant / Unitary Air-Conditioners:</p> <p>Air cooled Chilled-Water Plant:</p> <ul style="list-style-type: none"> ▪ Air-Cooled Chiller ▪ Chilled Water Pump <p>Unitary Air-Conditioners:</p> <ul style="list-style-type: none"> ▪ Variable Refrigerant Flow (VRF) System ▪ Single-Split Unit ▪ Multi-Split Unit <p><i>Prerequisite Requirements:</i> Minimum system efficiency of air cooled chilled-water plant or unitary conditioners of 1.2 kW/RT</p> <p>Note: Stricter minimum performance applies for Gold and higher ratings (see pre-requisite requirements).</p>	Baseline <i>Prerequisite Requirements</i>	Peak Cooling Load		< 500 RT	≥ 500 RT	Minimum water-cooled central chilled-water plant efficiency	0.95 kW/RT	0.85 kW/RT	<p><u>If peak data centre cooling load ≥ 500RT</u></p> <p>4 points for achieving plant efficiency of 0.85 kW/RT</p> <p>0.25 point for every percentage improvement in the chiller plant efficiency better than 0.85 kW/RT</p> <p>Points = 4 + 0.25 x (% improvement)</p> <p><u>If peak data centre cooling load < 500RT</u></p> <p>4 points for achieving plant efficiency of 0.95 kW/RT</p> <p>0.35 point for every percentage improvement in the chiller plant efficiency better than 0.95 kW/RT</p> <p>Points = 4 + 0.35 x (% improvement)</p> <p>(Up to 10 points)</p> <p>4 points for achieving plant efficiency of 1.2 kW/RT</p> <p>0.2 point for every percentage improvement in the chiller plant efficiency better than 1.2 kW/RT</p> <p>Points = 4 + 0.2 x (% improvement)</p> <p>(Up to 10 points)</p> <p>Note: For data centres with peak cooling load of more than 500 RT, the use of air cooled central chilled-water plant or other unitary air-conditioners are not applicable for Gold and higher ratings.</p>
Baseline <i>Prerequisite Requirements</i>		Peak Cooling Load							
	< 500 RT	≥ 500 RT							
Minimum water-cooled central chilled-water plant efficiency	0.95 kW/RT	0.85 kW/RT							

<p>(c) Using chilled water from a central facility (e.g. district cooling system or central chilled water plant not operated solely to serve the data centre)</p> <p>For data centres using district cooling system, data from the central plant will be used for the computation of the cooling system performance.</p> <p>Note: Combination of system types Where there is a combination of system types, the computation of the points awarded will be pro-rated based on the actual cooling capacity supplied by each system type, or by the operating hours, if the different systems are not operating at the same time.</p>	<p>(c) Points in accordance with above based on central plant data. If no data is available, 4 points will be applied.</p>
<p>1-2-2 Air Management System:</p> <p>(a) Computer Room Air-Conditioning Unit (CRACs)</p> <p>Baseline: Fan power limitation in CRAC of 0.25 W/CMH (0.9 kW/m³/s)</p> <p>(b) To encourage good air management design with low bypass and recirculation, the data centre should have a Return Temperature Index (RTI), as defined in SS564, as close to 100% as possible.</p> <p>(c) To encourage the operation of the data centre at the high end of the recommended ambient temperature range, in accordance with ASHRAE 2011 Thermal Guidelines for Data Centres.</p> <p>The ambient temperature shall be based on the mean rack inlet temperature, which shall be measured at 2 or more points along the cold aisles so that it can appropriately represent the supply air temperature to the servers.</p> <p>(d) To encourage the operation of the data centre within the recommended ambient absolute humidity range, in accordance with ASHRAE 2011 Thermal Guidelines for Data Centres, without the need for humidity control.</p> <p>The dew point shall be measured at sufficient points that can appropriately represent the overall humidity distribution in the data centre.</p>	<p>(2 points for meeting baseline)</p> <p>0.1 Point for every percentage improvement in the air distribution system efficiency over the baseline</p> <p>(Up to 4 points)</p> <p>(2 points for RTI of 70% and above)</p> <p>(2 points for 24 °C and above)</p> <p>(2 points for dew point of 12 °C and above)</p>
<p>1-2-3 Electrical System</p> <p>To have the most efficient electrical power transformation and distribution system providing the required level of redundancy while maintaining high load factors.</p> <p>Building transformers shall have a transformation efficiency of at least 98%. Transformation loss values shall be based on measuring the loss across the</p>	<p>2 points</p>

<p>building transformers that is supporting the data centre operation. If this is not available, it will be calculated based upon the DOE/ NEMA TP-1 transformer efficiency standard or equivalent, and the actual percentage loading of each transformer.</p> <p>The IT power chain efficiency includes transmission lines, switchgear, UPSs and PDUs serving the IT equipment. Efficiencies higher than the baseline (minimum) efficiency, as shown in the table below, depending on the UPS load factor, will qualify for additional points. Values between the UPS Load Factors indicated in the table will be linearly interpolated.</p> <table border="1" data-bbox="228 562 813 898"> <thead> <tr> <th>UPS Load Factor</th> <th>Minimum IT Power Chain Efficiency</th> </tr> </thead> <tbody> <tr> <td>25%</td> <td>73 %</td> </tr> <tr> <td>33%</td> <td>78 %</td> </tr> <tr> <td>50%</td> <td>83 %</td> </tr> <tr> <td>66%</td> <td>85 %</td> </tr> <tr> <td>75%</td> <td>86 %</td> </tr> <tr> <td>100%</td> <td>88 %</td> </tr> </tbody> </table> <p>The UPS Load Factor and IT Power Chain Efficiency shall be determined, based on actual metered energy consumption, as follows:</p> <p>UPS Load Factor = Total UPS Output / Total Installed UPS Capacity(N)</p> <p>IT Power Chain Efficiency = Sum of PDU Output / Total UPS Input</p>	UPS Load Factor	Minimum IT Power Chain Efficiency	25%	73 %	33%	78 %	50%	83 %	66%	85 %	75%	86 %	100%	88 %	<p>4 points for achieving minimum efficiency.</p> <p>0.5 points for every 2% improvement in efficiency over the minimum.</p> <p>(Up to 6 points)</p>
UPS Load Factor	Minimum IT Power Chain Efficiency														
25%	73 %														
33%	78 %														
50%	83 %														
66%	85 %														
75%	86 %														
100%	88 %														
<p>1-2-4 IT Equipment</p> <p>To have the most efficient ICT equipment which meet the demand, while providing the required level of redundancy</p> <p>(i) Use of ICT equipment, including servers, storage devices and network systems, that are Energy STAR rated, where available. (minimum 25% of the equipment)</p> <p>(ii) Power control of ICT equipment. Low power modes, Power capping.(minimum 25% of the equipment enabled)</p> <p>(iii) Software control technologies, such as virtualization and optimizing algorithms or dynamic control of equipment for minimizing energy utilisation.</p> <p>(iv) Monitoring of ICT or Server Equipment Utilisation. (mean 15-20%)</p>	<p>2 point</p> <p>2 point</p> <p>2 point</p> <p>2 point</p> <p>Note: The section 1-2-4 is applicable only to data centres that have operational control over the ICT equipment.</p>														

<p>1-3 Energy/ Environmental Policy and Management</p> <p>Have policies that promote continuity of information to ensure that energy-efficient operating strategies are maintained; and provide a foundation for training and system analysis.</p> <p>Obtained SS 564 Certification, including intent, measures and implementation strategies of energy efficiency improvement plans to achieve energy target set over the next three years. Committed energy savings accrued from proposed measures should be quantified</p>	<p>5 points for SS564 certified data centres applying for Green Mark</p> <p>Required for Platinum and Gold^{Plus} Rating</p>
<p>1-4 Energy Monitoring and Assessment</p> <p>1-4-1 Energy Assessment and Energy Audit</p> <p>The data centre should have a systematic process in developing an understanding of the operation of the building's major energy-using system, options for optimizing energy performance, and a plan to achieve energy savings</p> <p>The assessment process shall include:</p> <ul style="list-style-type: none"> • Energy assessment of data centre space using DC assessment tools • Energy audit of non-data centre space • Performing a savings and cost analysis of all practical energy saving measures according to the company's constraints and economic criteria, along with a discussion of any effect on operations and maintenance procedures. • Documenting the energy analysis and potential cost-effective energy savings solutions <p>The audit shall verify that systems are</p> <ul style="list-style-type: none"> • installed, calibrated and perform according to the requirements, basis of design and construction documents. • performing at multiple load points according to design criteria during normal utility operations, maintenance operations and failure conditions. • giving the correct measured PUE according to design criteria at the current load and the calculated PUE at full load conditions. 	<p>2 point</p> <p>1 point</p>
<p>1-4-2 Building Management System</p> <p>The data centre should have a computer-based building management system (BMS) to provide information to support the ongoing accountability and optimization of data centre energy performance and identify opportunities for additional energy-saving investments.</p> <p>The BMS shall monitor and control major building</p>	<p>2 point</p>

<p>systems, including at a minimum, central cooling and heat rejection, ventilation, lighting and IT power transformation and distribution and IT equipment rack environmental conditions</p> <p>The BMS shall also support the:</p> <ul style="list-style-type: none"> • continuous monitoring and trend logging of significant energy systems • establishment of seasonal profiles to determine the potential for the use of free and partial free-cooling. • diagnostics within the control system to alert the staff when equipment is not being optimally operated. 	
<p>1-4-3 Energy Metering and Reporting of PUE</p> <p>(a) Data centre PUE metric from all energy sources should be measured and trended over time; so that the data centre owner and/or operator can verify that the energy related systems are performing according to the basis of design.</p> <p>The data centre shall be equipped with energy metering to provide total facility power and energy usage and total IT equipment power and energy usage on a historical basis, in order to determine instantaneous and average PUE data.</p> <p>(b) Besides PUE determination, the data centre shall be equipped with energy metering to provide power and energy usage for the facility's power transformation and distribution systems, cooling systems and any on-site generation and trending of these metrics on a historical basis. This will enable the data centre operator to verify that the building's energy related systems are performing according to the design energy efficiency performance at both partial load and full-load conditions.</p> <p>The number and type of meters that are required to be installed shall be determined by the data centre design, but shall be maximum 2% uncertainty, full-scale and provided to meter all forms of energy to the data centre, (electricity, natural gas, steam, chilled water, one-pass cooling, etc.) and at the output of the UPS or PDUs, if this is the source of power that serves the IT equipment.</p> <p>Meters must be calibrated to within the manufacturer's recommended range.</p>	<p>1 point</p> <p>2 point</p>

<p>(c) Prerequisite requirements: provision of permanent measuring instruments for monitoring of water-cooled chilled-water plant and air-cooled chilled-water plant efficiency. The installed instrumentation shall have the capability to calculate resultant plant efficiency (i.e. kW/RT) within 5% of its true value and in accordance with ASHRAE Guide 22 and AHRI 550/590.</p> <ul style="list-style-type: none"> • Location and installation of the measuring devices to meet the manufacturer’s recommendation • Data acquisition system shall be able to record and store values up to at least 3 decimal places • All data logging with capability to trend at 1 minute sampling time interval • Dedicated digital power meters shall be provided for the following groups of equipment: chiller(s), chilled water pump(s), condenser water pump(s) and cooling tower(s) • Flow meters to be provided for chilled-water and condenser water loop and shall be of ultrasonic / full bore magnetic type or equivalent • Temperature sensors are to be provided for chilled water and condenser water loop and shall have an end-to-end measurement uncertainty not exceeding $\pm 0.05^{\circ}\text{C}$ over entire measurement or calibration range. All thermo-wells shall be installed in a manner that ensures that the sensors can be in direct contact with fluid flow. Provisions shall be made for each temperature measurement location to have two spare thermo-wells located at both side of the temperature sensor for verification of measurement accuracy. <p>Prerequisite requirements: Verification of central water cooled chilled-water plant instrumentation: Heat Balance – substantiating test for water cooled chilled-water plant to be computed in accordance with AHRI 550/590. The operating system efficiency and heat balance to be submitted to BCA upon Commissioning.</p>	<p>2 point</p>
<p>1-5 Energy Efficient Features and Innovations</p> <p>Encourage the use of innovative energy efficient equipment, system or design features.</p> <p>To qualify, the features must achieve significant, measureable improvement of energy performance in one of the following areas:</p> <ul style="list-style-type: none"> (a) innovative cooling systems or features (including free air-cooling, direct liquid cooling and two-phase systems, etc) (b) innovative power supply, back-up power or UPS systems (c) IT operations, maintenance or system upgrade strategies not covered by Section 1-2-4 above (d) radical changes in data centre design, operations or systems not covered in any section above. <p>Encourage the application of renewable energy sources in data centres.</p>	<p>2 points for each innovation that demonstrate the following:</p> <ul style="list-style-type: none"> • The intent of the proposed innovation • The additional energy benefits delivered • The proposed requirements for compliance • The proposed performance metrics to demonstrate compliance and the approaches (strategies) used to meet the requirements <p>2 points for every 1% replacement of electricity usage with renewable energy</p> <p style="text-align: center;">(Up to 10 points)</p>

Other Green Requirements

Part 2 - Water Efficiency (Total Points:12)	Green Mark Points
<p>2-1 Water Metering and Water Leak Detection Use of Water Efficient Fittings Improvement Plans: Reduction targets, measures and implementation strategies</p> <p>(a) Provide private-metering and potable water leak detection system for better control and monitoring, such as:</p> <ul style="list-style-type: none"> (i) To monitor the water consumption on monthly basis (ii) Provision of private-meters for major water uses (e.g. cooling towers) (iii) Linking all private-meters to the Building Management System (BMS) for leak detection <p>(b) Encourage water use efficiency by either:</p> <ul style="list-style-type: none"> (i) PUB Water-Efficient Building Certificate for the facility, OR (ii) Through the use of water efficient fittings under Water Efficiency Labelling Scheme (WELS) <p>(c) Establish baseline water consumption performance and targets for improvements over the baseline. To show intent, measures and implementation strategies of water efficiency improvement plans over the next three years. Committed water savings accrued from proposed measures should be quantified. (PUB water efficiency management plan is acceptable as evidence)</p>	<p style="text-align: center;">1 point</p> <p style="text-align: center;">1 point</p> <p style="text-align: center;">1 point</p>
<p>2-2 Alternative Water Sources</p> <p>Use of suitable systems that utilize alternative water sources for non-potable uses: cooling tower make up water, irrigation, washing, water features, toilet flushing, etc to reduce use of potable water. Alternative sources can include rainwater, greywater (for toilet flushing only), NEWater, AHU condensate and recycled water from approved sources.</p>	<p style="text-align: center;">Points awarded based on % reduction in potable water usage of the applicable uses</p> <p style="text-align: center;"> > 50 % - 3 point < 10 % to 50 % - 2 point < 10 % - 1 point </p> <p style="text-align: center;">(Up to 3 points)</p>
<p>2-3 Cooling Towers Water Use</p> <p>Use of cooling tower water treatment system which can achieve 7 or better cycles of concentration at acceptable water quality.</p>	<p style="text-align: center;">Points awarded based on number of cooling tower cycles achieved</p> <p style="text-align: center;"> 10 cycles - 6 point 7 cycles - 4 point </p> <p>Note: The section 2-3 is applicable only to data centres using water-cooled systems.</p>

Part 3 - Sustainable Operation & Management (Total Points: 7)	Green Mark Points
<p>3-1 Refrigerants and Fire Suppressants</p> <p>To reduce global warming and damage to the ozone layer by minimising the release of greenhouse gases and ozone depleting substances.</p> <p>(a) Use Refrigerants with ozone depletion potential (ODP) of zero or with global warming potential (GWP) of less than 100.</p> <p>(b) Refrigerant leak detection monitoring system at critical areas of plant rooms containing chillers and other equipments with refrigerants.</p> <p>(c) In server rooms, use of Fire Suppressants with zero ODP and GWP of less than 100.</p> <p>(d) In UPS and Battery rooms, use of Fire Suppressants with zero ODP or GWP of less than 100</p>	<p>1 point</p> <p>1 point</p> <p>1 point</p> <p>1 point</p>
<p>3-2 Sustainability Policy</p> <p>3-2-1 Sustainable Purchasing and Operation</p> <p>Promote the procurement and use of environmentally friendly products that are certified by local certification bodies. Adoption of sustainable and environmental-friendly practices in the operation and maintenance of the facility.</p> <p>3-2-2 Waste Management</p> <p>(a) Promote and encourage waste minimization</p> <p>(b) Promote waste sorting, collecting, quantifying, monitoring and recycling of a large range of waste generated in-house Provide facilities or recycling bins for collection and storage of different recyclable waste such as:.</p> <p>(i) IT related waste such as, electronic equipment</p> <p>(ii) Plastic waste</p> <p>(iii) Metal waste</p> <p>(iv) Paper waste</p>	<p>1 point</p> <p>1 point</p> <p>1 point</p>

Part 4 – Indoor Environmental Quality (Total Points: 8)	Green Mark Points
<p>4-1 Indoor Air Quality and Ventilation</p> <p>To promote a healthy indoor environment.</p> <p>(a) In occupied areas, such as DC command centre, to monitor CO₂ and particulate filtration media in accordance with SS554:2009 Code of Practice for `Indoor air quality for air-conditioned buildings</p> <p>(b) In unoccupied space and server areas provide treated ventilation air on demand.</p> <p>Ventilation in chiller plant room</p> <p>(c) Provide ventilation without air-conditioning in the plant room</p>	<p>1 point</p> <p>1 point</p> <p>1 point</p>
<p>4-2 Lighting Quality and Management</p> <p>To encourage good workplace lighting quality to promote productivity and occupant comfort</p> <p>(a) In occupied space lighting level to comply with SS531. Lighting is user controllable and fluorescent lamps with electronic ballasts or LED lamps.</p> <p>(b) In machine spaces/server rooms lighting to be in accordance with recommendations of SS564. Use of occupancy sensors, bi-level lighting, task lighting is to be promoted.</p>	<p>1 point</p> <p>2 point</p>
<p>4-3 Thermal Comfort and Noise</p> <p>(a) In occupied areas comfort level to comply with SS 553 (Temperature and relative humidity)</p> <p>(b) In occupied areas, ensure internal noise level are maintained at an appropriate level and to comply with SS553 (low dbA rating)</p>	<p>1 point</p> <p>1 point</p>

Part 5 – Other Green Features (Total Points: 10)	Green Mark Points
<p>5-1 Green Features and Innovations</p> <p>To encourage the use of other green features which are innovative or/and have positive environmental impact.</p> <p>Features must achieve significant, measurable environmental performance in the data centre operations, maintenance or management not covered in Parts 2, 3 and 4 above</p>	<p>2 points for each feature or innovation that demonstrate the following:</p> <ul style="list-style-type: none"> • The intent of the proposed innovation • The additional environmental benefits delivered • The proposed requirements for compliance • The proposed performance metrics to demonstrate compliance and the approaches (strategies) used to meet the requirements <p>(Up to 10 Points)</p>