BCA-IMDA Green Mark for New Data Centres

Version NDC/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
- Electrical System
- IT Equipment

1-3 Energy Efficiency and Performance Verification
1-4 Data Centre Design and Energy Management
1-5 Energy Efficient Features and Innovations

Part 2 - Water Efficiency

2-1 Water Efficient Design
2-2 Alternative Water Sources
2-3 Cooling Tower Water Use

Part 3 – Sustainable Construction & Management

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

Part 4 - Indoor Environmental Quality

4-1 Indoor Air Quality Performance
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 - Maximum Design PUE[1] - PUE Improvements over Reference Model (Full Load and Part Load)	 10 15
	1-2 Systems Energy Efficiency - Cooling System (including Air Management System) - Electrical System - IT Equipment	 12 8 8
	1-3 Energy Efficiency and Performance Verification - Commissioning of Energy Systems - Measurement and Verification Plan - Energy Metering and Reporting of PUE	 4 3 3
	1-4 Data Centre Design and Energy Management - Data Centre Planning and Design - Data Centre Operations and Energy Management	 5 5
	1-5 Energy Efficient Features and Innovations	10
	SubTotal (Part 1)	**83**
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 Construction & Management	
	3-1 Refrigerants and Fire Suppressants	4
	3-2 Sustainable Construction	5
	3-3 Sustainability Policy	3
	SubTotal (Part 3)	**12**
	Part 4 - Indoor Environmental Quality	
	4-1 Indoor Air Quality Performance	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 & Innovations	10
	SubTotal (Part 5)	**10**
	SubTotal (Part 2 to Part 5)	**42**
	Total Green Mark Score	**125**

[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 New Data Centre Criteria

PART 1 - ENERGY EFFICIENCY

1. OVERALL ENERGY EFFICIENCY

Green Mark Rating	Minimum points achievement from
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 design Power Usage Effectiveness (PUE) at full load condition of no more than 2.0 for Green Mark certification

3. MINIMUM SYSTEMS' EFFICIENCY

(1) Prescribed system efficiency of cooling system to be as follows:

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

Green Mark Rating	Peak Data Centre Cooling Load (RT)	
	< 500	≥ 500
	Efficiency$^{(1)}$ (kW/RT)	
Certified	0.90	0.80
Gold	0.90	0.80
Gold^{Plus}	0.80	0.75
Platinum	0.80	0.75

(ii) For Data Centres using Air Cooled Chilled-Water Plant or Unitary Air-Conditioners:

Green Mark Rating	Peak Data Centre Cooling Load (RT)	
	< 500	≥ 500
	Efficiency$^{(1)}$ (kW/RT)	
Certified	1.00	0.90
Gold	1.00	Not applicable$^{(2)}$
Gold^{plus}	0.95	
Platinum	0.88	

Note

(1) The performance of the overall cooling system for the data centre shall be based on the efficiency at full installed design capacity (N) plus any additional capacity that is required to maintain continuous availability of the service during operation (e.g. N+1). Performance data shall be backed by the manufacturer's test reports, commissioning information or obtained from the energy model. They will also

be subject to verification under section 1-3.

(2) 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. In general, the system efficiency of the air cooled central chilled-water plant and other unitary air-conditioners are to be comparable with the stipulated efficiency for water cooled central chilled-water plant. Data centres that are designed with air-cooled systems and for higher Green Mark rating will be assessed on a case by case basis.

(3) Prerequisite requirement for beyond Green Mark Certified Rating. The efficiency of the cooling system shall be available and measureable 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.

4. ENERGY MONITORING

(i) Provision of permanent measuring instruments for monitoring of water-cooled chilled-water system and air-cooled chilled water system operating system 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. Heat balance test for water-cooled chilled-water system is required for verification of the accuracy of the M&V instrumentation.

- 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 ±0.05°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.

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.

(ii) The data centre shall be equipped at a minimum 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. The number and type of meters that are required to be installed shall be determined by the data centre design, but at the minimum shall be *1½% percent accuracy*, 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.

(iii) To achieve efficiency at all IT load condition, the data centre shall be designed with scalable expansion by building up capacity in a modular approach to deployment in order to improve efficiency and ability to respond to business requirements.

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.

Energy Related Requirements

Part 1 - Energy Efficiency (Total Points: 83)	Green Mark Points

1-1 Overall Energy Efficiency of Data Centre

Use a **computer simulation model** to assess the energy performance of the **proposed data centre** facility and systems (Proposed DC Model) to achieve the most effective energy efficient design.

Quantify Proposed DC Model energy performance operating under Singapore climatic conditions, at Full Design Load, 66% of the Design Load, and 33% of the Design Load and express them in terms of improvement in **Power Utilization Effectiveness (PUE)** over a Reference DC Model.

The **Reference DC Model** is taken as a data centre with a **PUE of 2.0 at Full Design** Load, a **PUE of 2.2 at 66%** of the Design Load and a **PUE of 2.5 at 33%** of the Design Load.

Points will be given for increasing **improvement in PUE** of the Proposed DC **over the Reference DC Model at the Full Design capacity.**

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.

- At **66% of the Design Load**, the energy savings should be **not less than 75% of the percentage savings** at Full Design Load.
- At **33% of the Design Load**, the energy savings should be **not less than 50% of the percentage savings** at Full Design Load.

The **PUE value** is defined as the total energy used by a data centre divided by the energy used by IT equipment in that data centre. The total energy used by the data centre shall be taken at the point where the facility is metered. The IT equipment load shall be **based on UPS output** [PUE Cat. 1].

This PUE will also need to be verified in relation with section 1-3 on Energy Efficiency and Performance Verification. For verification purposes, if UPS output data is not available, the closest direct measured power data will be used and a fixed PDU loss will be applied based on industry norms for such equipment.

Points based on PUE results obtained from Proposed DC Energy Model

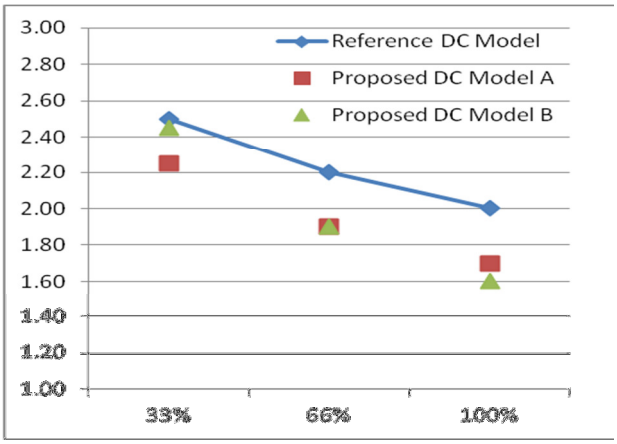
Design Full Load PUE	Equivalent Total Energy Savings over Ref DC Model %	Points
2.0	0%	10
1.9	5%	12
1.8	10%	14
1.7	15%	16
1.6	20%	19
1.5	25%	22
1.4 and below	30% and above	25

Points will be interpolated for PUE values between those in the table

If the required part-load conditions (at 66% and 33% of Design Load) are not satisfied, the Overall Energy Efficiency points achieved shall be **reduced by 25%**.

Example:

% Full Design Load	33%	66%	100%
		PUE	
Reference DC Model	2.50	2.20	2.00
Prop DC Model A	2.25	1.90	1.70
Prop DC Model B	2.45	1.90	1.60
		% Impr over Ref Model	
Prop DC Model A	10.00	13.64	15.00
Prop DC Model B	2.00	13.64	20.00



DC Model A: Full Load PUE = 1.7 → 16 pts
At 66% Load, % Impr = 13.64 >75% of 15;
At 33% Load, % Impr = 10.0 >50% of 15; **Pts** =1.0x16 **=16**
DC Model B: Full Load PUE = 1.6 → 19 pts
At 66% Load, % Impr = 13.64 <75% of 20;
At 33% Load, % Impr = 2.0 <50% of 20; **Pts** =0.75x19 **=14**

Proposed Data Centre Facility Energy Model

The computer simulation of the data centre facility and systems shall be carried out with an approved energy modelling software. A typical building energy modelling program may be used with the following enhancements:

a) The program must be able to accept a high proportion of internal loads from electrical equipment

b) A separate calculator shall be used to estimate the losses in the power supply chain (transformers, switchgear, UPSs and PDUs.) under various load conditions. These losses shall then be included as additional internal loads, dissipated as heat, at the appropriate spaces housing such equipment.

c) The system configurations must be able to accept redundant equipment and sequencing arrangements that enable the spare equipment capacity to be on "hot" standby, i.e. running together with base capacity.

Calculate the proposed data centre performance using the energy modelling software at full load, 66% and 33% load. Determine the PUE and compare with the reference model to obtain the improvements in energy performance at the various load points.

The energy performance improvements may come primarily from facility infrastructure design, selection of equipment, their capacities and part-load characteristics and how they are operated. Savings related to the energy use by the IT equipment will not be assessed in the model. The designer may use the opportunity to determine the optimum operating configuration of equipment and systems in terms of energy performance but must commit to the selection in the submission, which will be subject to verification in accordance with section 1-3.

1-2 Systems Energy Efficiency

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.

1-2-1 Cooling System

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 cooling system for the data centre shall be based on the efficiency at full installed design capacity (N) plus any additional capacity that is required to maintain continuous availability of the service during operation (e.g. N+1).

The systems to be considered are as follows –

(a) Water-Cooled Chilled-Water Plant, comprising:
- a) Water-Cooled Chiller
- b) Chilled water pump
- c) Condenser water pump
- d) Cooling tower or Heat Rejection Unit

Baseline *Prerequisite Requirements*	Peak Cooling Load	
	< 500 RT	≥ 500 RT
Minimum water-cooled central chilled-water plant efficiency	0.90 kW/RT	0.80 kW/RT

a) Water-Cooled Chilled-Water Plant

Peak data centre cooling load < 500 RT

4 points for meeting the prescribed chilled-water plant efficiency of 0.90 kW/RT

0.225 point for every percentage improvement in the chilled-water plant efficiency over the baseline

Points scored = 4 + 0.225 x (% improvement)

(Maximum of 8 points)

Note: Stricter minimum performance applies for Gold and higher ratings (see pre-requisite requirements)

(b) Air Cooled Chilled-Water Plant / Unitary Air-Conditioners (DX CRAC Units):

Air cooled Chilled-Water Plant:
- Air-Cooled Chiller
- Chilled Water Pump

Unitary Air-Conditioners:
- Variable Refrigerant Flow (VRF) System
- Single-Spilt Unit
- Multi-Spilt Unit

Baseline *Prerequisite Requirements*	Peak Cooling Load	
	< 500 RT	≥ 500 RT
Minimum system efficiency of air cooled chilled-water plant or unitary conditioners	1.00 kW/RT	0.90 kW/RT

Note: Stricter minimum performance applies for Gold and higher ratings (see pre-requisite requirements)

(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)

For data centres using district cooling system, data from the central plant will be used for the computation of the cooling system performance.

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.

Peak data centre cooling load ≥ 500 RT

5 points for meeting the prescribed chilled-water plant efficiency of 0.80 kW/RT

0.15 point for every percentage improvement in the chilled-water plant efficiency over the baseline

Points scored = 5 + 0.15 x (% improvement)

(Maximum of 8 points)

(b) Air Cooled Chilled-Water Plant/ Unitary Air-Conditioners

Peak data centre cooling load < 500 RT

4 points for meeting the prescribed air-conditioning system efficiency of 1.00 kW/RT

0.24 points for every percentage improvement in the air-conditioning system efficiency over the baseline

Points scored = 4 + 0.24 x (% improvement)

(Maximum of 8 points)

Peak data centre cooling load ≥500 RT

5 points for meeting the prescribed air-conditioning system efficiency of 0.90 kW/RT

0.49 points for every percentage improvement in the air-conditioning system efficiency over the baseline

Points scored = 5 + 0.49 x (% improvement)

(Maximum of 8 points)

(c) Using chilled water from a central facility

Points in accordance with above based on central plant data. If no data is available, 4 points will be applied.

(d) Air Management System: Computer Room Air-Conditioning Unit (CRACs) Baseline – Fan power limitation in CRAC of 0.25 W/CMH (0.9 kW/m^3/s) Base design: CHW >250RT , DX below 250 RT A variable volume design to vary the airflow rate as a function of actual load is encouraged and should have controls and/or devices (such as two-speed or variable speed control) that will result in fan motor demand of no more than 50 percent of design wattage at 66 percent of design fan speed.	(d) <u>Air Management System</u> 2 points for meeting baseline 0.1 Point for every percentage improvement in the air distribution system efficiency over the baseline (Up to 4 points)
1-2-2 Electrical System To have the most efficient electrical power supply system providing the required level of redundancy while maintaining high load factors. Building transformers shall have a transformation efficiency of at least 98%. Transformation loss values shall be based on measuring the loss across the 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. 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. The UPS Load Factor shall be determined as: UPS Load Factor = Total UPS Output / Total Installed UPS Capacity (N) The IT Power Chain Efficiency shall be determined from a separate calculator to be provided, based on switchgear, UPS and PDU selection and their system configuration.	2 points 4 points for achieving minimum efficiency. 0.5 points for every 2% improvement in efficiency over the minimum. (Up to 6 points)

UPS Load Factor	Minimum IT Power Chain Efficiency
25%	73%
33%	78%
50%	83%
66%	85%
75%	86%
100%	88%

1-2-3 IT Equipment To have policies that require the procurement and use of the most efficient ICT equipment which meet the demand, while providing the required level of redundancy.	
(i) ICT equipment, including servers, storage devices and network systems, that are Energy STAR rated, where available.	(2 points)
(ii) Power control of ICT equipment. Low power modes, Power capping.(minimum 25% of the equipment enabled)	(2 points)
(iii) Software control technologies, such as virtualization and optimizing algorithms or dynamic control of equipment for minimizing energy utilisation.	(2 points)
(iv) Monitoring of ICT or Server Equipment Utilisation.	(2 points)
	Note: The section 1-2-3 is applicable only to data centres that have operational control over the ICT equipment
1-3 Energy Efficiency and Performance Verification	
1-3-1 Commissioning of Energy Systems To verify that the data centre's energy related systems are installed, calibrated and perform according to the owner's project requirements, basis of design, construction documents and that they meet the minimum requirements of the Green Mark criteria. Commissioning shall be carried out at multiple load points (33%, 66% and 100%) and under normal utility operations, maintenance operations and failure conditions. The commissioning shall include verification of the Power Use Effectiveness (PUE) according to the design criteria at partial and full load conditions.	(4 points)
1-3-2 Measurement and Verification Plan The purpose of a measurement and verification plan is to have the ability to reconcile the actual data centre energy consumption over time with the design performance. Develop and implement a measurement and verification (M&V) plan. The M&V period must cover at least 1 year of post-construction occupancy. Using the partial (33%, 66%) and full load design projections and commissioning results, compare actual operating conditions to the plan, and provide a narrative to summarize performance, explaining where results vary from plan and including average hourly PUE.	(3 points)

Provide a process for *corrective action* if the results of the M&V plan indicate that energy savings are not being achieved. **1-3-3 Energy Metering and Reporting of PUE** 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. The data centre shall, at a minimum, 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. 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.	(3 points)
1-4 Data Centre Design and Energy Management **1-4-1 Data Centre Planning and Design** Demonstrate that the data centre planning and design: (i) Maintain balance between efficiency & resilience of data centre using design analysis of the operating model to balance cost & efficiency with resilience (ii) Promote scalable expansion by building up capacity in a modular approach to deployment in order to improve efficiency and ability to respond to business requirements **1-4-2 Data Centre Operations and Energy Management** 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. Management commitment towards obtaining SS 564 certification, including intent, measures and implementation strategies of energy efficiency improvement plans to achieve energy target set over the next three years.	(3 points) (2 points) (5 points)

1-5 Energy Efficient Features and Innovations Encourage the use of innovative energy efficient equipment, system or design features. To qualify, the features must achieve significant, measureable improvement of energy performance in one of the following areas: (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 1-2-3 above (d) radical changes in data centre design, operations or systems not covered in any section above. Encourage the application of renewable energy sources in data centres.	2 points for each innovation that demonstrate the following: • 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 2 points for every 1% replacement of electricity usage with renewable energy (Up to 10 points)

Other Green Requirements

Part 2 - Water Efficiency (Total Points:12)	Green Mark Points
2-1 Water Metering and Water Leak Detection Use of Water Efficient Fittings (a) Provide private-metering and potable water leak detection system for better control and monitoring, such as: (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 (b) Encourage water use efficiency by specifying in design the use of water efficient fittings under Water Efficiency Labelling Scheme (WELS)	2 point 1 point
2-2 Alternative Water Sources 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, condensate harvesting from the cooling system and recycled water from approved sources.	Points awarded based on calculated % reduction in potable water usage of the applicable uses > 50 % - 3 points < 10 % to 50 % - 2 points < 10 % - 1 point (Up to 3 points)
2-3 Cooling Towers Water Use Calculate percentage savings over baseline annual consumption. The baseline consumption is calculated based on the following: (a) Evaporation rate of 1% water flow rate for each 7 K of water temperature range, (b) Drift loss of 0.002% water flow rate for counter-flow towers and 0.005% water flow rate for cross-flow towers, and (c) Use of cooling tower water treatment system which can achieve 7 or better cycles of concentration of acceptable water quality.	Points awarded based % saving over baseline. > 50 % - 6 points > 30 % - 4 points (up to 6 points) **Note:** The section 2-3 is applicable only to data centres using water-cooled systems.

Part 3 - Sustainable Construction & Management (Total Points: 12)	Green Mark Points
3-1 Refrigerants and Fire Suppressants To reduce global warming and damage to the ozone layer by minimising the release of greenhouse gases and ozone depleting substances.	
(a) Use Refrigerants with ozone depletion potential (ODP) of zero or with global warming potential (GWP) of less than 100.	1 point
(b) Refrigerant leak detection monitoring system at critical areas of plant rooms containing chillers and other equipments with refrigerants.	1 point
(c) In server rooms, use of Fire Suppressants with zero ODP or GWP of less than 100.	1 point
(d) In UPS and Battery rooms, use of Fire Suppressants with zero ODP or GWP of less than 100	1 point
3-2 Sustainable Construction Encourage recycling and the adoption of building designs, construction practices and materials that are environmentally friendly and sustainable. (a) Use of Sustainable and Recycled Materials	
(i) Green Cements with approved industrial by-product (such as Ground Granulated Blastfurnace Slag (GGBS), silica fume, fly ash) to replace Ordinary Portland Cement (OPC) by at least 10% by mass for superstructural works.	(1 point)
(ii) Recycled Concrete Aggregates (RCA) and Washed Copper Slag (WCS) from approved sources to replace coarse and fine aggregates for concrete production of main building elements. Note: For structural building elements, the use of RCA and WCS shall be limited to maximum 10% replacement by mass of coarse/fine aggregates respectively or as approved by the relevant authorities.	Extent of Coverage : The total quantity used (in tonnage) for replacement of the coarse or fine aggregates must not be less than the minimum usage requirement that is [0.03 x Gross Floor Area (GFA in m^2)] 1 points for the use of RCA to replace coarse aggregates 1 points for the use of WCS to replace fine aggregates (Up to 3 points for NDC 3-2(a)(i) and (a)(ii))
(b) Concrete Usage Index (CUI) Encourage designs with efficient use of concrete for building components.	**Project CUI (m^3/m^2)** / **Points Allocation** ≤ 0.70 / 1 point ≤0.50 / 2 points **Note:** The section 3-2 is applicable only to standalone data centres

3-3 Sustainability Policy **3-3-1 Sustainable Purchasing** Establish a policy to promote the procurement and use of environmentally friendly products that are certified by local certification bodies. **3-3-2 Waste Management** (a) Establish a policy to promote and encourage waste minimization (b) Establish a policy to 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: 1. IT related waste such as, electronic equipment 2. Plastic waste 3. Metal waste 4. Paper waste	1 point 1 point 1 point

Part 4 – Indoor Environmental Quality (Total Points: 8)	**Green Mark Points**
4-1 Indoor Air Quality Performance To promote a healthy indoor environment. (a) In occupied areas to provide means to monitor CO_2 and particulate filtration media in accordance with SS554:2009 Code of Practice for `Indoor air quality for air-conditioned buildings' (b) In unoccupied space and server areas to provide means to supply treated ventilation air on demand.	2 point 1 point
4-2 Lighting Quality and Management To encourage good workplace lighting quality to promote productivity and occupant comfort (a) Specify in design that in occupied space lighting level to comply with SS531. Lighting is user controllable and fluorescent lamps with electronic ballasts or LED lamps. (b) Specify in design that 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.	1 point 2 point

4-3 Thermal Comfort and Noise	
(a) In occupied areas specify comfort level to comply with SS 553 (Temperature and relative humidity)	1 point
(b) In occupied areas, specify in design that internal noise level are maintained at an appropriate level and to comply with SS553 (low dbA rating)	1 point

Part 5 – Other Green Features (Total Points: 10)	**Green Mark Points**
5-1 Green Features and Innovations To encourage the use of other green features which are innovative or/and have positive environmental impact. Features must achieve significant, measurable environmental performance in the data centre operations, maintenance or management not covered in Parts 2, 3 and 4 above	2 points for each feature or innovation that demonstrate the following: • 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 (Up to 10 Points)