

Time schedule	Programs
1330 hour	Registration
1400 hour	Go Green Presentation
1500 hour	Question & Answer
1515 hour	Green Building Presentation by NLB
1530 hour	Building Tour
1600 hour	Refreshment
1700 hour	Lucky Draw

Green Building plan - Green Mark Scheme

For public building

All new public buildings

&

those under retrofitting
above 5000 sqm to be

Green Mark certified

For private building

Voluntary for
new & existing private building
to be

Green Mark certified

\$20 million cash incentive for
Green Mark Gold rating or higher

Eligible for new building,
retrofitting works with GFA>2000sqm
or

Public private partnership projects

wef 1st April 2007

Launch by BCA, Jan 2005 to rate building for environment impact & performance

Green Building plan - Green Mark Award rating

Green Mark Rating	New Building		Existing Building
	Residential	Non-residential	
Green Mark Platinum	90 and above		85 and above
Green Mark Gold plus	85 to < 90		80 to <85
Green Mark Gold	75 to < 85		70 to <80
Green Mark Certified	50 to < 75		55 to <70

Points allocation system

Green Building plan – Assessment criteria

Criteria	New Building		Existing Building
	Non-residential	Residential	
1. Mandatory Requirement	<ul style="list-style-type: none"> - Building Envelope – ETTV (envelope thermal transfer value) - Roof – RTTV (roof thermal transfer value) 	<ul style="list-style-type: none"> Building Envelope – RETV (Residential envelope thermal transmittance value) 	NIL
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Green Building plan requirement

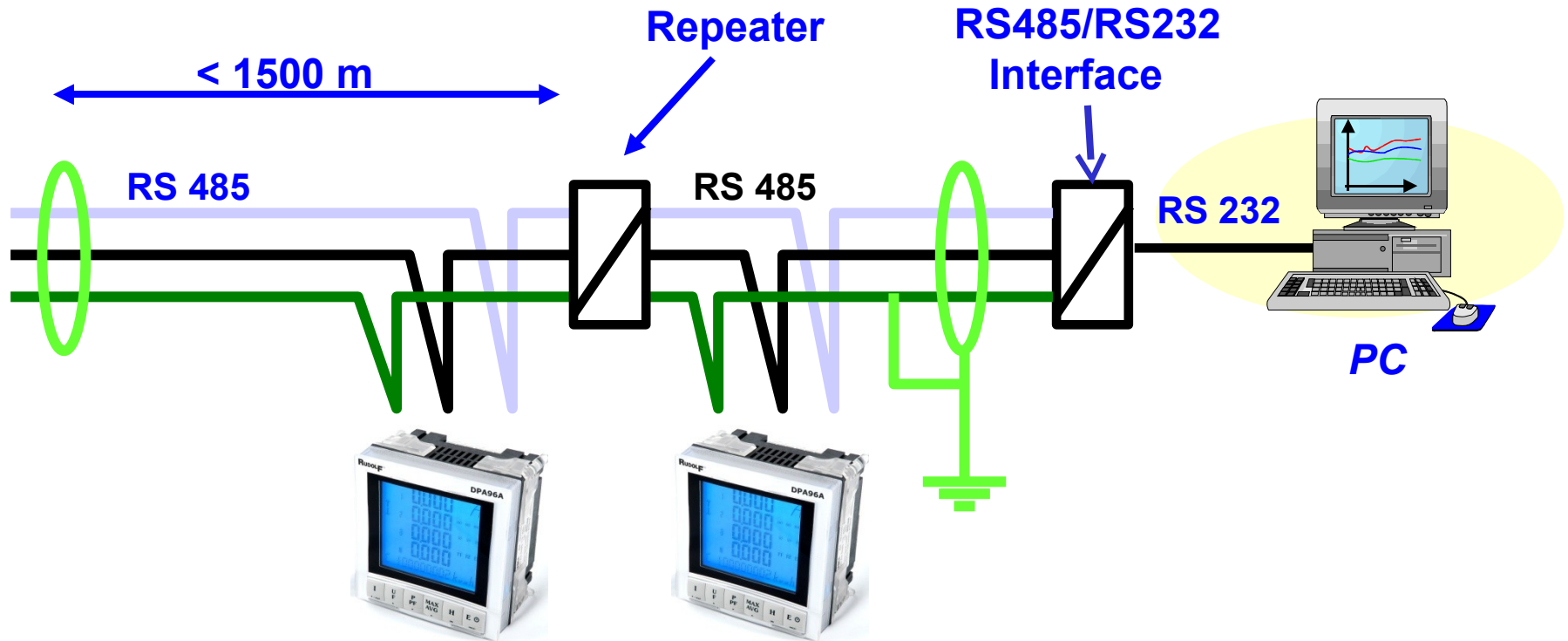
Area to apply	New Building			Existing Building
	Non-residential		Residential	
	Air-con	Non-Air-con		
Electrical sub-metering	Provision of sub-meters to monitor energy consumption of key building services & end-user/tenant energy usage			
Continual improvement for energy efficiency				Monthly monitoring of key building services
Water Efficiency	Sub-water meters+ link to BMS			
Energy saving - platinum - gold plus	30% saving 25% saving			

Green Building plan requirement

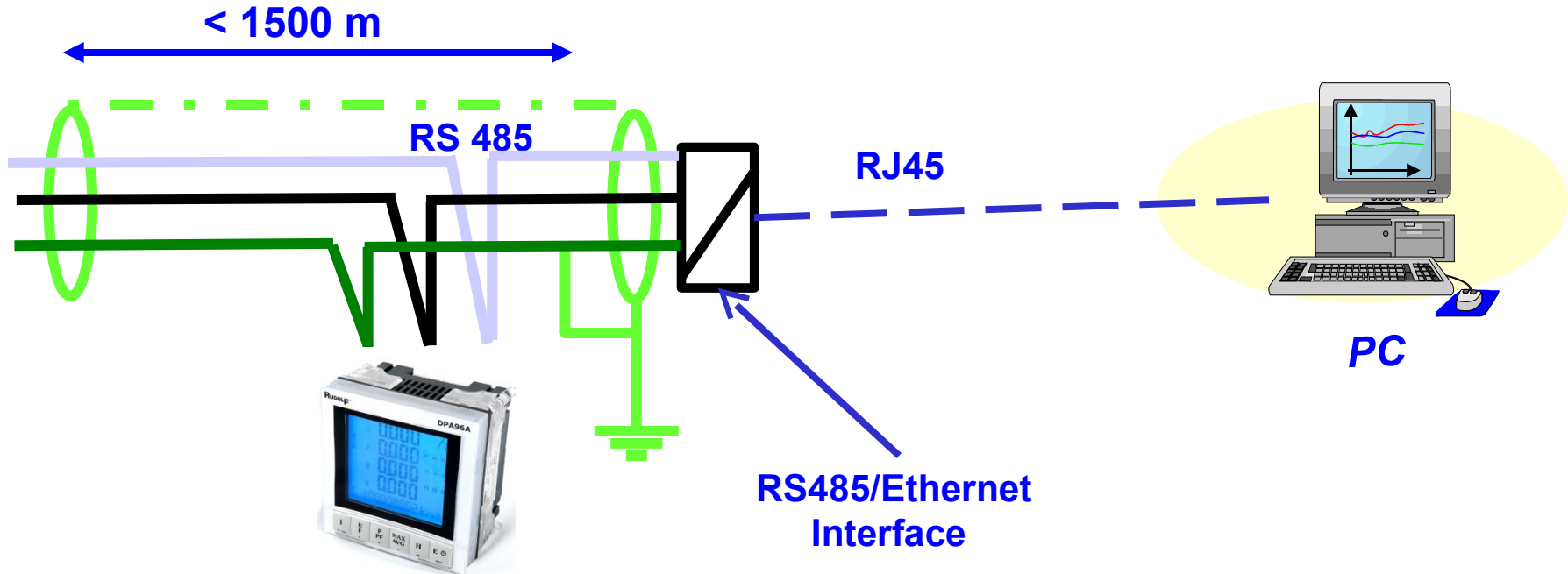
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Hardware architecture

Sub-metering requirement – Hardware infrastructure RS485 architecture

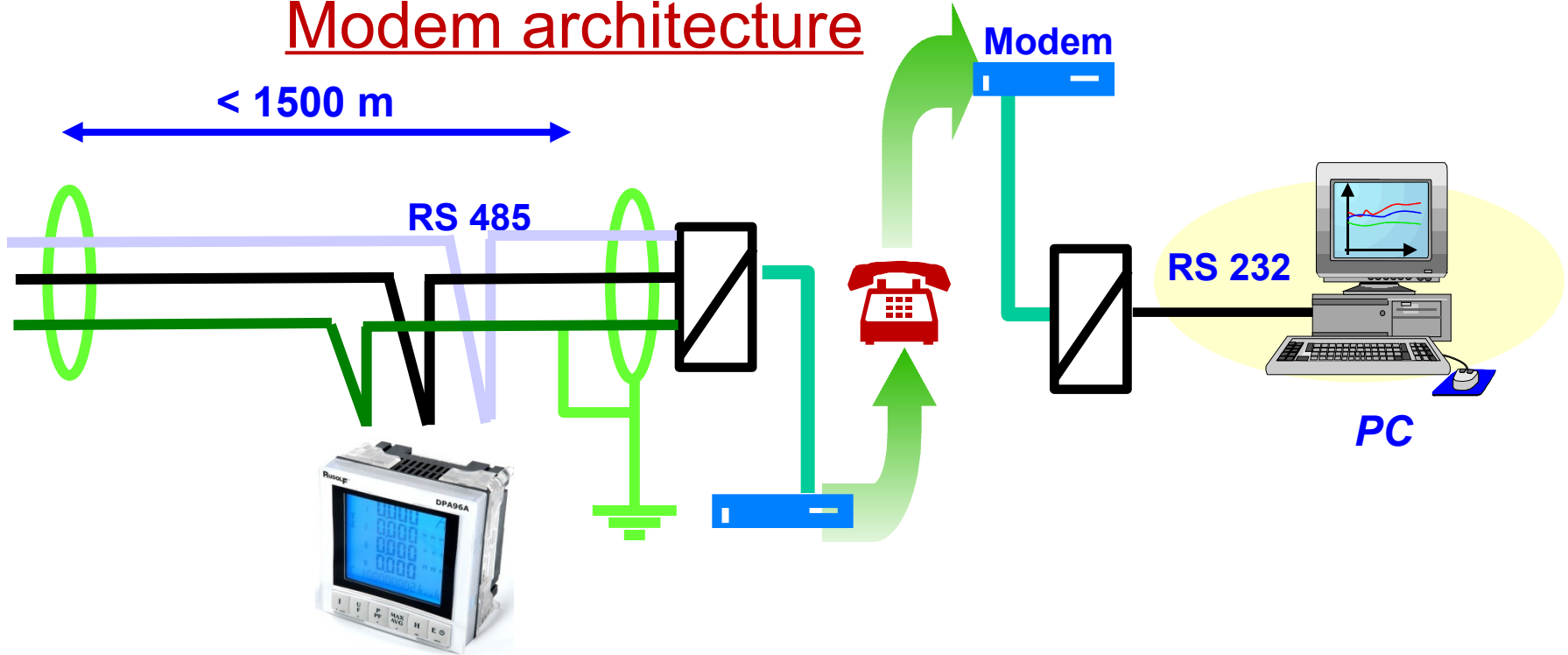


Sub-metering requirement – Hardware infrastructure Ethernet architecture



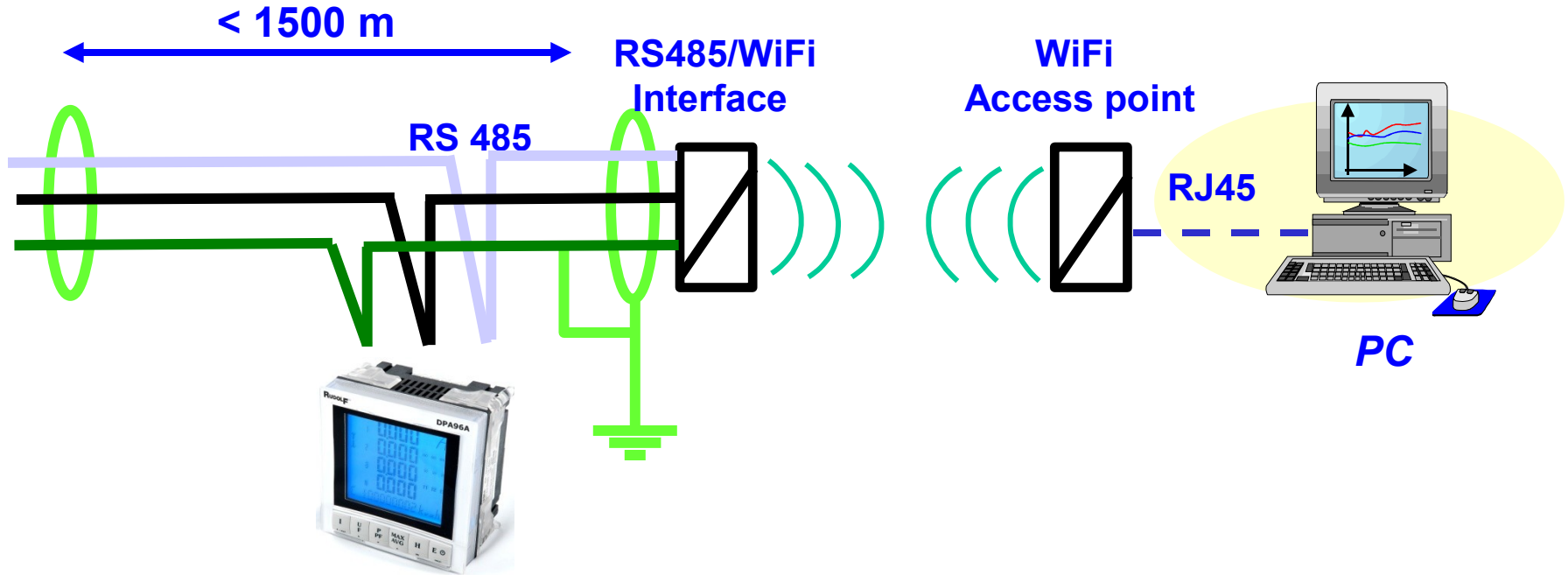
Sub-metering requirement – Hardware infrastructure

Modem architecture



Sub-metering requirement – Hardware infrastructure

Wireless architecture

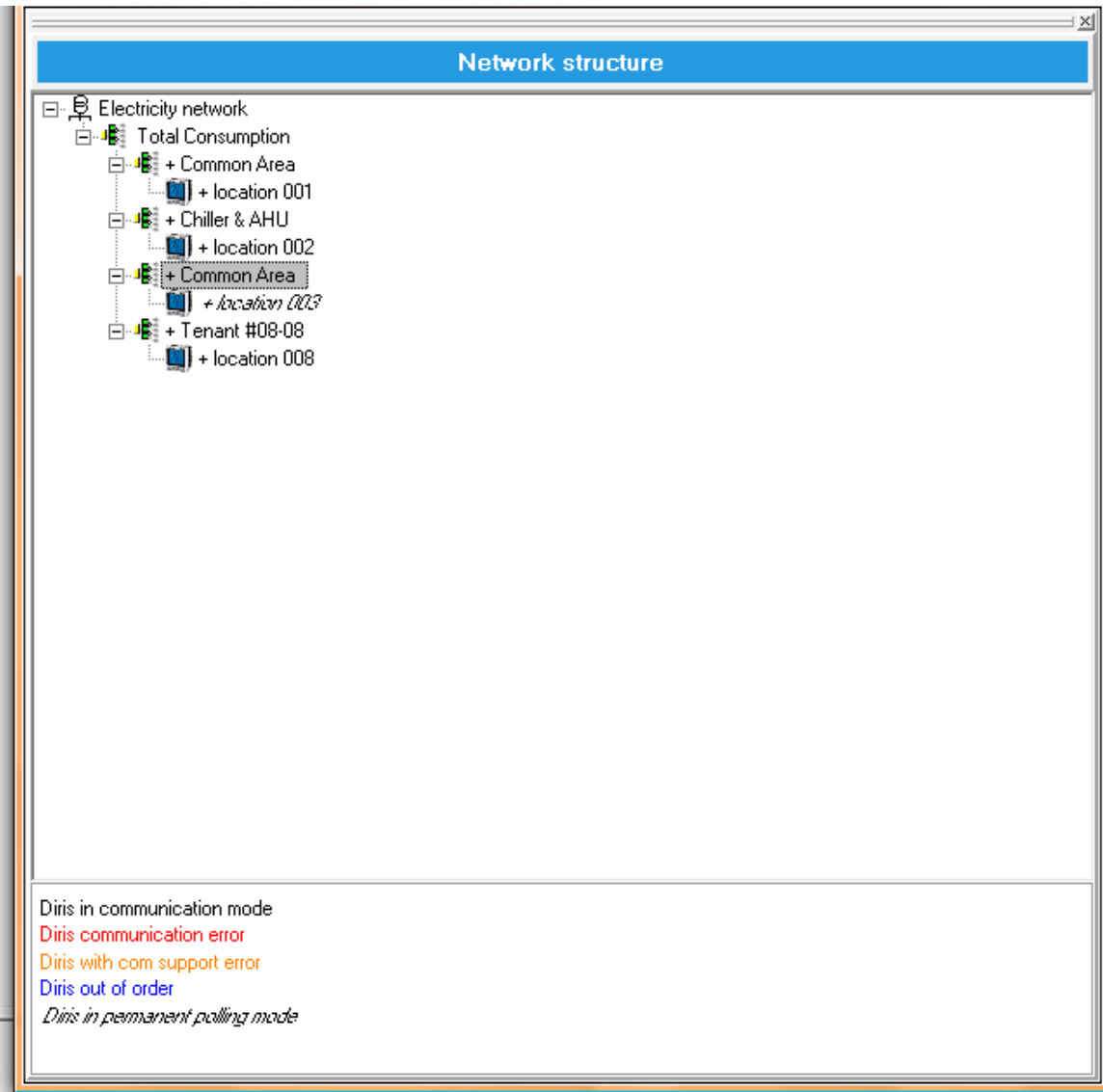


Green Building plan requirement

Area to apply	New Building			Existing Building
	Non-residential		Residential	
	Air-con	Non-Air-con		

Continual improvement for energy efficiency		Monthly monitoring of key building services
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Software demonstration



Network structure

General meters reading					
<input type="button" value="Refresh"/> <input type="button" value="Cancel"/>					
Name	Ea + (kWh)	Ea - (kWh)	Er + (kvarh)	Er (kvarh)	Es (kVAh)
Total Consumption	1,014	0	9,637	0	19,096
+ Common Area	0	0	0	0	0
+ location 001	0	0	0	0	0
+ Chiller & AHU	0	0	0	0	0
+ location 002	0	0	0	0	0
+ Common Area	148	0	5,412	0	10,721
+ location 003	148	0	5,412	0	10,721
+ Tenant #08-08	866	0	4,225	0	8,375
+ location 008	866	0	4,225	0	8,375

performed on 24/9/2008 between 4:03:41 PM and 4:03:43 PM

Type of report

Type of Report

General meters reading

performed on 9/23/2008 between 12:13:40 PM and 12:13:43 PM

Name	Ea + (kWh)		Ea - (kWh)		Er + (kvarh)		Er (kvarh)		Es (kVAh)	
Total Consumption	1146	kWh	0	kWh	9694	kvarh	0	kvarh	19243	kVAh
Chiller & AHU	0	kWh	0	kWh	0	kvarh	0	kvarh	0	kVAh
+ location 002	0	kWh	0	kWh	0	kvarh	0	kvarh	0	kVAh
Common Area	0	kWh	0	kWh	0	kvarh	0	kvarh	0	kVAh
+ location 002	0	kWh	0	kWh	0	kvarh	0	kvarh	0	kVAh
Data Centre	231	kWh	0	kWh	5448	kvarh	0	kvarh	10813	kVAh
+ location 003	231	kWh	0	kWh	5448	kvarh	0	kvarh	10813	kVAh
Tenant #08-08	915	kWh	0	kWh	4246	kvarh	0	kvarh	8430	kVAh
+ location 008	915	kWh	0	kWh	4246	kvarh	0	kvarh	8430	kVAh

Type of reports

General measurements and alarms reading performed on 9/23/2008 between 12:22:29 PM and 12:22:30 PM															
Name	I1 (A)	I2 (A)	I3 (A)	IN (A)	V1 (V)	V2 (V)	V3 (V)	U12 (V)	U23 (V)	U31 (V)	P (kW)	Q (kvar)	S (kVA)	PF	F (Hz) Alarm
location 003	64.6	64.6	64.6	194	234.01	234	234.04	0	0	0	27.78	12.07	30.29	0.917 L	50.06 I THD
location 008	38.82	38.82	38.82	116.58	234.6	234.5	234.51	0	0	0	16.77	7.26	18.27	0.917 L	50.06

View the event log of measurements Printed : Tuesday, September 23, 2008											
Device :	Selection	beginning on End :									
location 003		9/23/2008 11 9/23/2008 12:21:11 PM									
Date / Time	THD I1 (%)	THD I2 (%)	THD I3 (%)	THD IN (%)	THD U12 (%)	THD U23 (%)	THD U31 (%)	THD V1 (%)	THD V2 (%)	THD V3 (%)	
9/23/2008 12:20:28 PM	110.4	110.5	110.6	110.4	0	0	0	1	1	1	
9/23/2008 12:19:28 PM	112	111.7	111.8	111.8	0	0	0	1.1	1.1	1.1	

Allocated energies Printed : Tuesday, September 23, 2008				
beginning on :	End :			
9/22/2008	9/23/2008			
Device	Periode 1 : Ea+	Total Sa+	Periode 1 : Er+	Total Sr+
location 002	0	0	0	0
location 008	2	2	0	0
location 003	4	4	0	0

Green Building plan requirement

Area to apply	New Building			Existing Building
	Non-residential		Residential	
	Air-con	Non-Air-con		

Water Efficiency	Sub-water meters+link to BMS	
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Water meter link to BMS

Concentrating water meters to BMS



**Taking pulse output from water meter
Concentrate via R-DPA96A to BMS**

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Thank You

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Enhanced Green Mark Incentive

Green Mark rating	Green Mark Incentive (developers/building owners)		Green Mark Incentive (architects & M&E engineers)		Minimum energy Improvement
	Rate (per 1000m ²)	Cap	Rate (per 1000m ²)	Cap	
Gold	\$3,000 for new GFA & \$1,200 for existing GRA	\$300,000 or 0.2% of construction /retrofitting cost, which ever is lower	\$500 each	\$50,000 each	-
Gold ^{Plus}	\$5,000 for new GFA & \$2,000 for existing GRA	\$2,500,000 or 0.33% of construction /retrofitting cost, which ever is lower	\$800 each	\$80,000 each	25%
Platinum	\$6,000 for new GFA & \$2,400 for existing GRA	\$3,000,000 or 0.4% of construction /retrofitting cost, which ever is lower	\$1,000 each	\$100,000 each	30%

Energy Modelling

- For non-residential building air-conditioned buildings achieving Gold^{plus} and Platinum.
- To demonstrate energy saving of 25% and 30% respectively over its reference model using energy modelling framework set out by BCA
- Energy modelling methodology requires
 - a. Comparison of data between proposed & reference model on building design, material use, internal load & HVAC equipment;
 - b. Comparison of energy consumption between proposed & reference model 1 year period
 - c. Energy efficiency index for both proposed & reference model

Meter specification

- ✓ **Accuracy :** : 0.2 % I and U
0.5S active energy IEC62053-22
2 reactive energy IEC62053-23
- ✓ **Current inputs :** : insulated for 1 and 5A / secondary up to 10 kA
- ✓ **Voltage inputs :** : LV : Direct : up to 700 V AC 50 / 60 Hz
HV : Primary : 400 kV
Secondary : 60, 100, 110, 120,173 and 190 V
- ✓ **Auxiliary supply :** : 110 to 440 +/- 10% V AC 50/60 Hz
120 to 350 +/- 20% V DC

Digital Power Analyzer – R-DPA96A

- *Energy management*
- *Multi-measure*
- *Communication*
- *Monitoring*
- *Harmonics*
- *Control/Command*
- *Quality of voltage*

