STRATEGIES FOR SUCCESSFUL ENERGY MANAGEMENT PROGRAM

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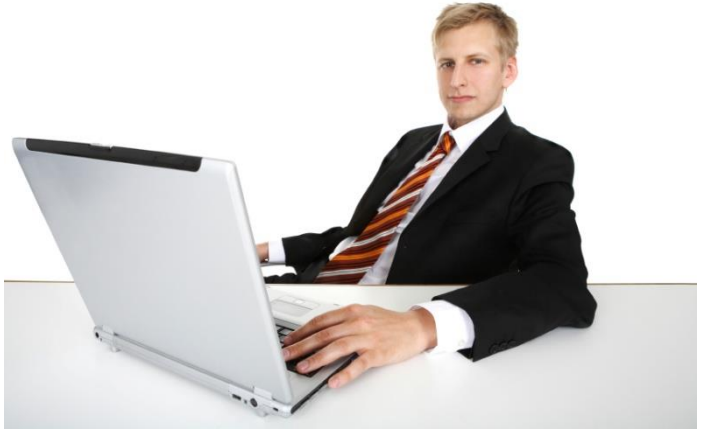
20 December 2013

CONTENT

- Energy Management Roadmap
- Fundamental For Successful Energy Management Program
  - Metering your performance automatically
- Who has done it successfully?
  - UTM experience
  - MMB experience
  - TNB experience
- Conclusion

CERTIFIED ENERGY MANAGER / REGISTERED ELECTRICAL ENERGY MANAGER



Energy Management Gold Standard

SUSTAINABLE ENERGY MANAGEMENT ROADMAP

Evaluation

- Energy Management Matrix

Organization Preparation

- Energy Policy
- Energy Committee
- Set up EM Component
- Awareness Training

Energy Management Gold Standard (AEMAS)

Report to ST

Implementation of Energy Conservation Measures

- Detailed Energy Audit
- Select Energy Target & Plan
- Set up SIT
- Technical Training

Energy Management Gold Standard (AEMAS)

System Integration

- Accreditation Scheme
- Integrate to ISO/ TPM
- Procedural Training

Energy Management Gold Standard (AEMAS)

APPROACH

- Appoint Energy Manager
- Develop a well written energy policy
- Form an effective energy management committee
- Set-up energy accounting centres
- Determine energy efficiency index
- Develop working manual and tools for EM
- Develop energy management working procedures
- Outline investment appraisal for energy efficiency
- Develop human resource in EMS
- Prepare comprehensive documentation in EMS

Metering your performance automatically

FUNDAMENTAL FOR SUCCESSFUL ENERGY MANAGEMENT PROGRAM

INVESTMENT TYPES

- No cost
  - Immediate action
- Low Cost
  - Immediate Return (ROI)
- High Cost
  - Substantial Return (IRR)

What Is An Energy Management System?

- Energy Management System enable installations to **ENSURE EFFICIENT** energy consumption and utilization...

Money Isn't All You're Saving

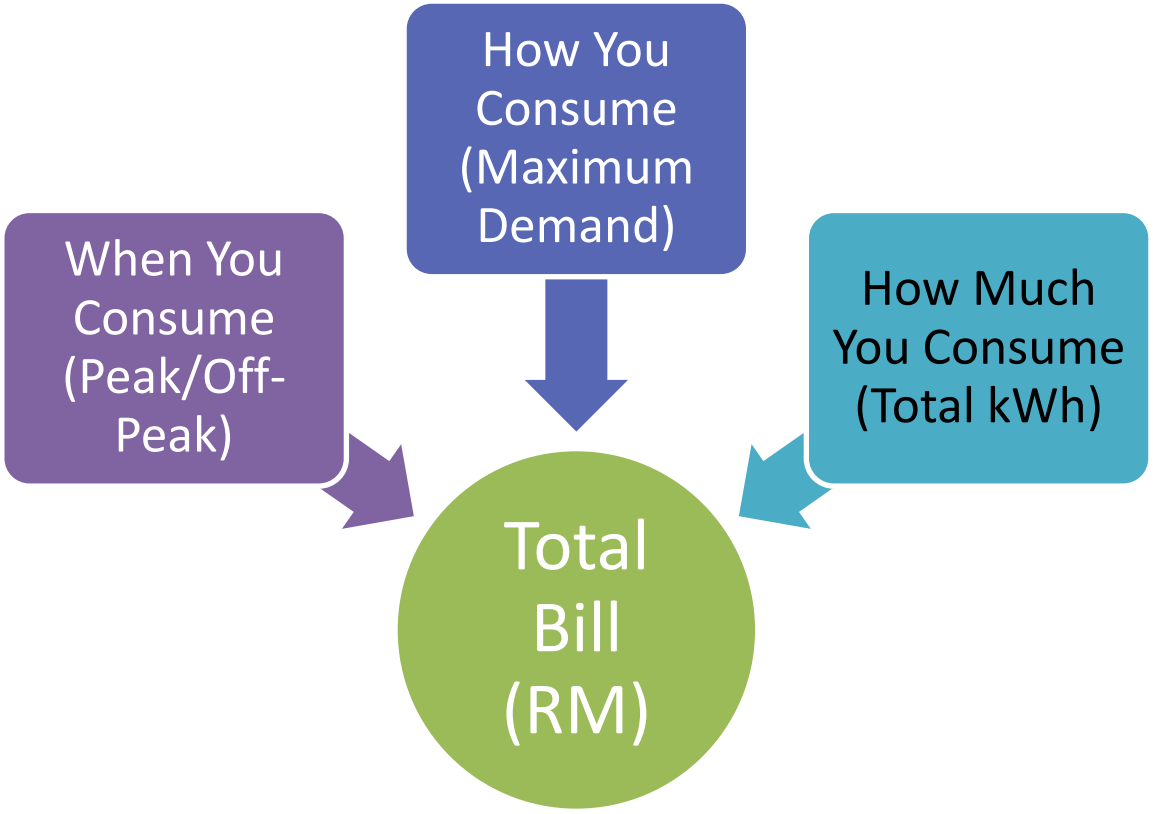
OVERVIEW

- EMa$$ Energy Management Solution System is a software product to collect & monitor the energy consumption data from Circutor's Powerstudio software or EMaSS software (with generic modbus driver)
- Data can then be grouped and processed to create various reports & dashboard display on external large displays like TV.

WHAT DOES EMASS DO?

- Verify accuracy of utility meter readings (TNB meter)
- Efficiency of their consumption (kWh/m2, kWh/unit, kWh/manhour, kWh/tonne)
- Apportion individual consumption from total (RM, kWh, Maximum Demand, Carbon Footprint)
- Real Time & Historical Information on consumption trends (demand trend, maximum demand, idling time, peak/off-peak hours, working day, off day)

UTILITY BILL'S COMPONENTS!



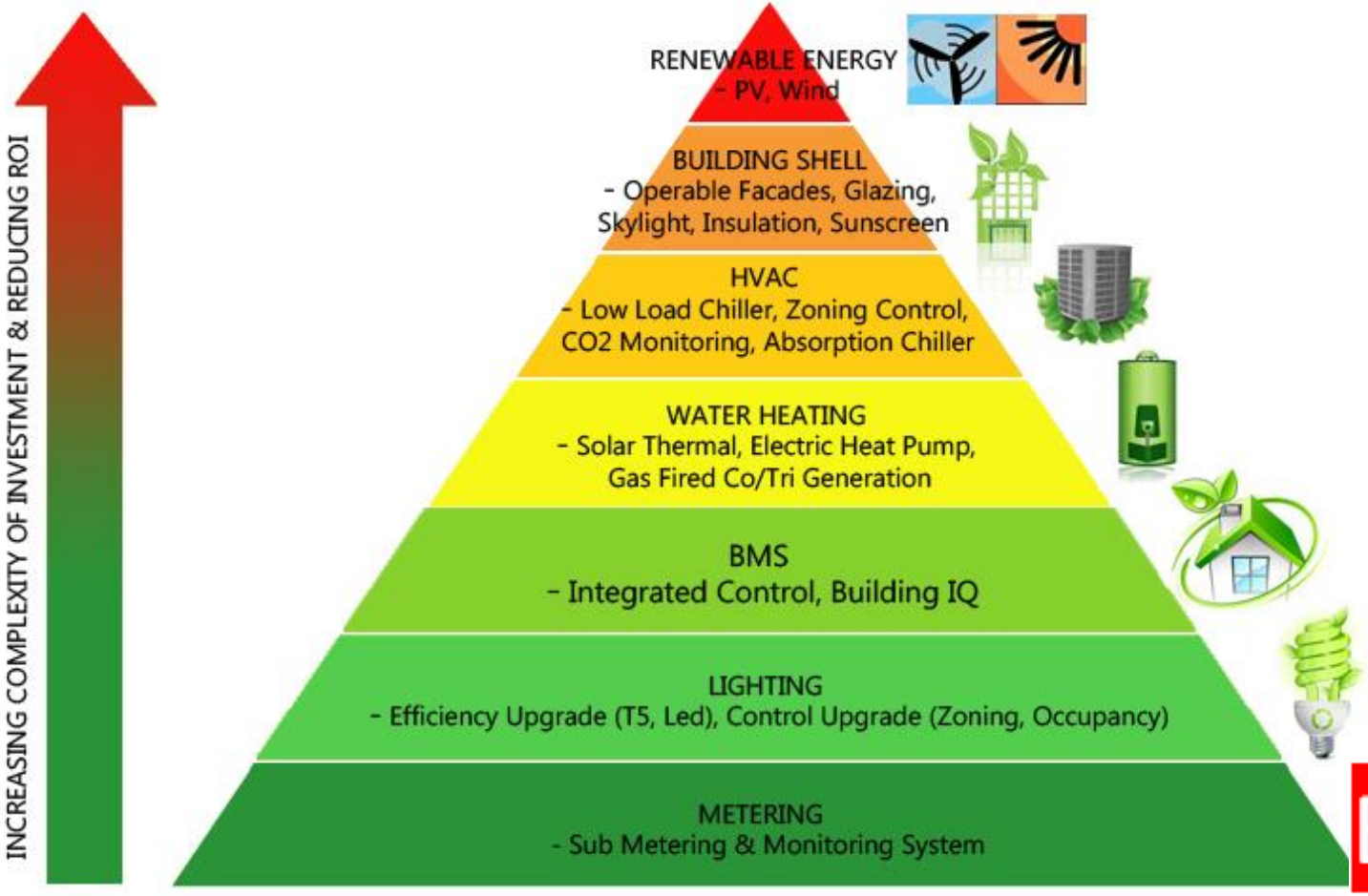
Example

Tariff E3 - High Voltage Peak/Off-Peak Industrial Tariff		
For each kW of Maximum Demand per month during the peak period	RM/kW	30.4
For all kWh during the Peak period	sen/kWh	28.8
For all kWh during the Off-Peak period	sen/kWh	17.3

PROCESS IN UPHOLD EFFICIENCY USING EMASS

Quality	• Output Yield Index <Output/Input >
Production	• Productivity Index <Actual Qty/Plan Qty>
Energy	• EnPI <Output/kWh)

WHY IMPLEMENT EMASS?



EMa$$

Energy Management Solution System

WHY IMPLEMENT EMaSS?

- EMASS is easiest, cheapest & most effective method to reduce energy consumption
- MS ISO 50001 implementation
- Efficient Management Of Electrical Energy Regulations 2008, under Electricity Supply Act 1990
- EMASS increases operational efficiency
- Carbon footprint reporting
- Corporate Social Responsibility

SIRIM

Suruhanjaya Tenaga

ISO 50001
Energy Managment System

KEY TO ENERGY CONSUMPTION REDUCTION?

- Maintenance
  - Improved Maintenance
- Culture
  - Energy Efficient Culture
- Technology
  - Energy Efficient Technology

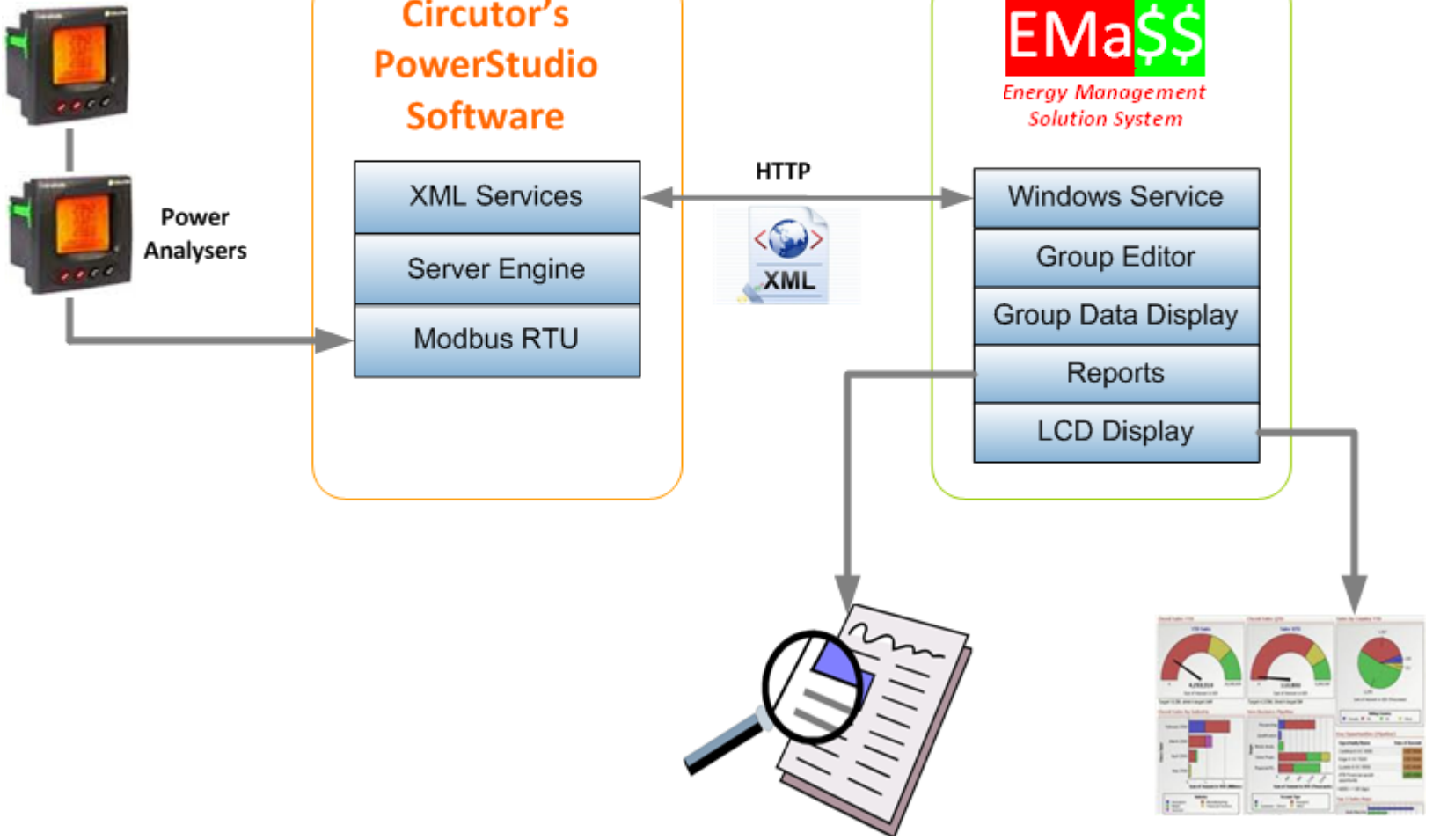
EMASS Ensures Results!!!

EMaSS Lowers Energy Consumption!

Step 1	• Tariff Report from EMAS identifies energy consumption hotspot (cost allocation and focus attention)
Step 2	• Tariff Report from EMASS enables monitoring of energy consumption
Step 3	• Demand Chart from EMASS identifies energy consumption pattern (Maximum Demand and Demand Trend)
Step 4	• Index Report from EMASS enables energy consumption benchmarking and monitoring
Step 5	• Index Report from EMASS enables and ensures proper “Maintenance”, “Energy Culture” and “Energy Efficient Technology” implementation
Step 6	• Index Report ensures improvement of Productivity based on energy consumption KPI (EnPI)
Step 7	• LCD Display enables Real Time Consumption Data broadcast to target audience

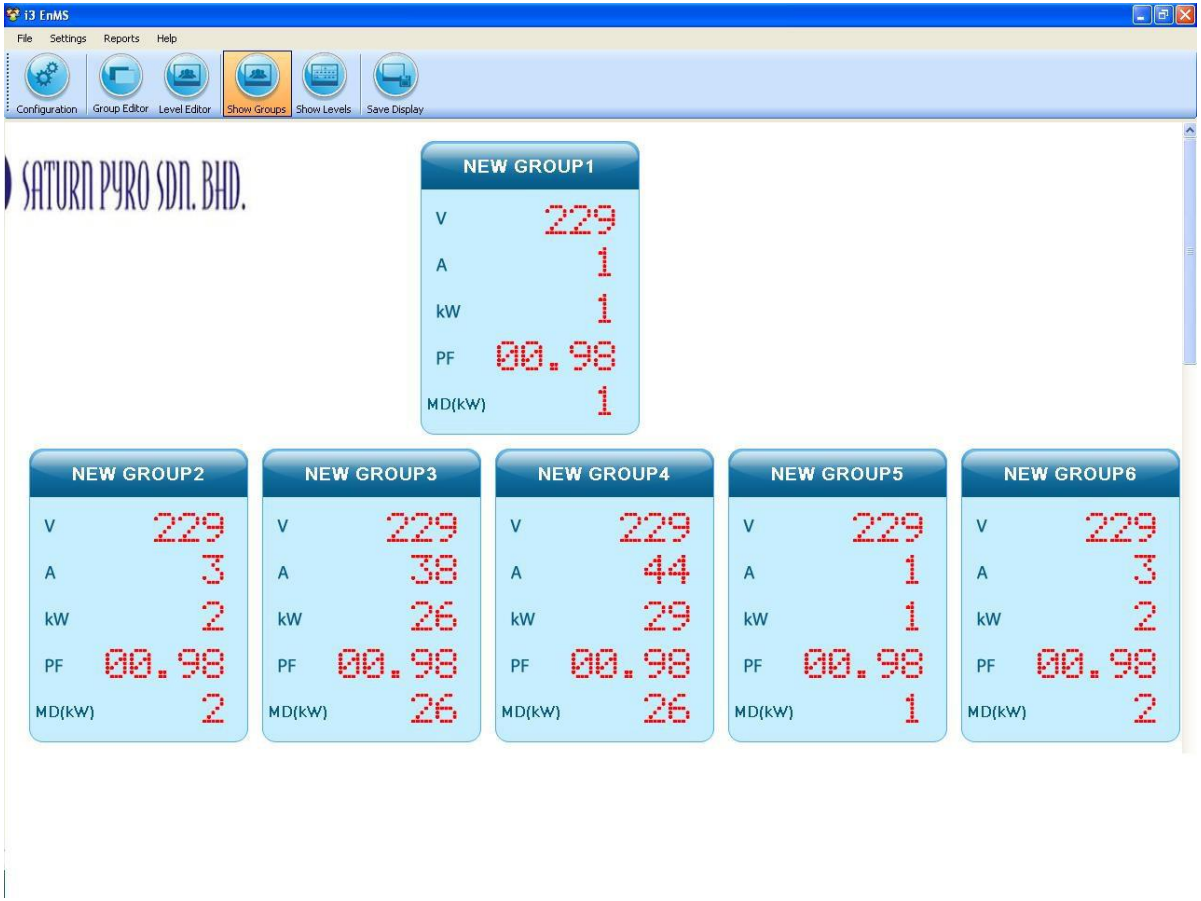
ARCHITECTURE

Energy Management Solution System



GROUP DATA DISPLAY

- Group's key data like Voltage , Ampere, Kilo Watt, PF and Maximum demand are displayed graphically
- Display will be refreshed automatically as per the settings done.



TARIFF REPORT

Reports on consumption, cost & carbon footprint (daily, weekly, monthly & yearly) by individual sections, processes and areas of operation

EMaSS
Energy Management Solution System

EMaSS
Daily Tariff Report

Tariff Period : 01/10/2011 to 09/10/2011

Report Generated Date : 28/10/2011

Group Name : CHILLER

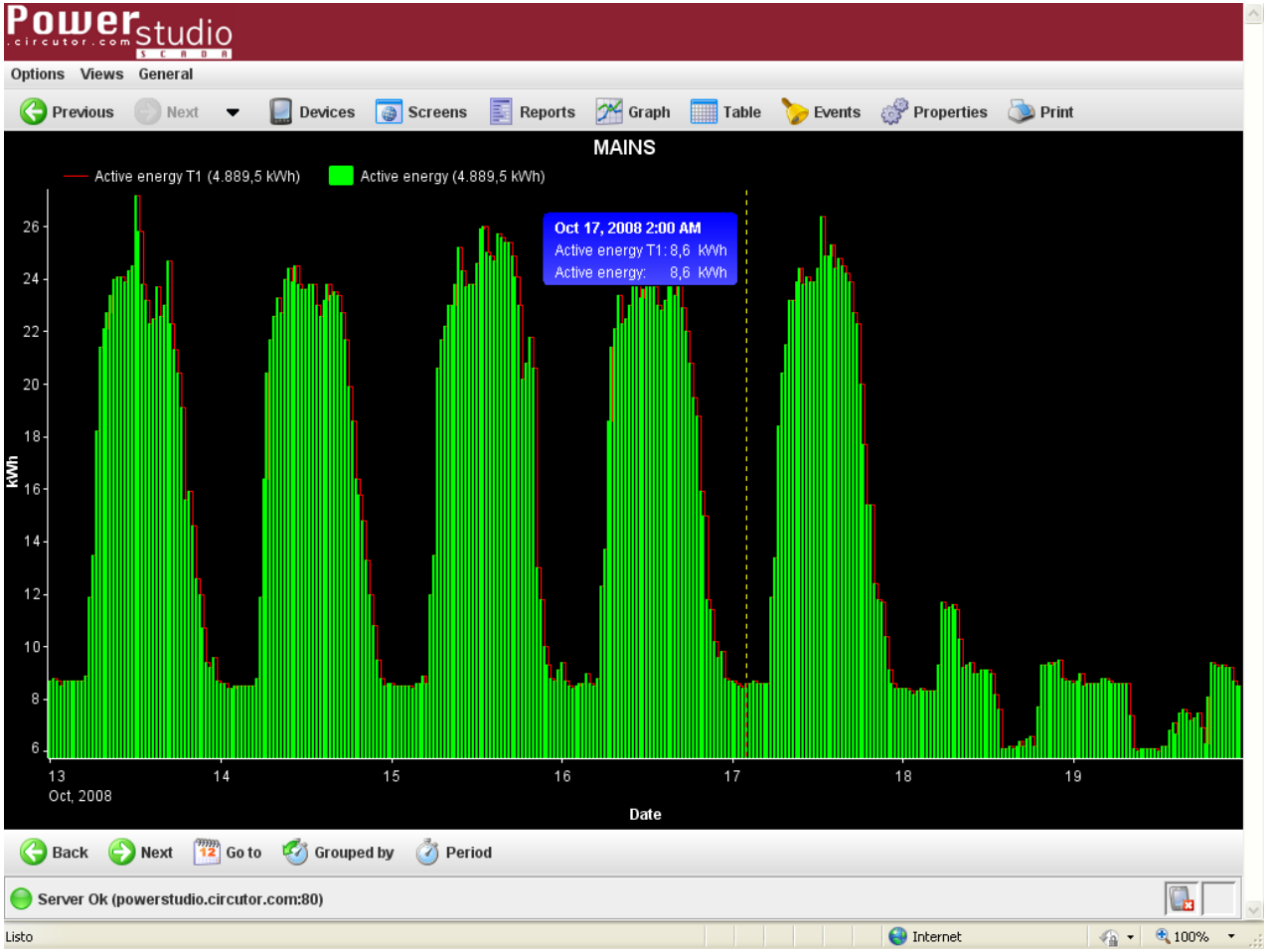
Date	Off Peak		Peak		Max Demand (kW)	MD Amount (MYR)	Total kWh	Total Amount (MYR)	Carbon Foot Print(kg)
	kWh	Amount (MYR)	kWh	Amount (MYR)					
01/10/2011	0.00	0.00	14.78	4.15	43.20	1,265.76	14.78	1,269.91	8.87
02/10/2011	0.00	0.00	25.09	7.05	45.00	1,318.50	25.09	1,325.55	15.05

Group Name : PRODUCTION 1

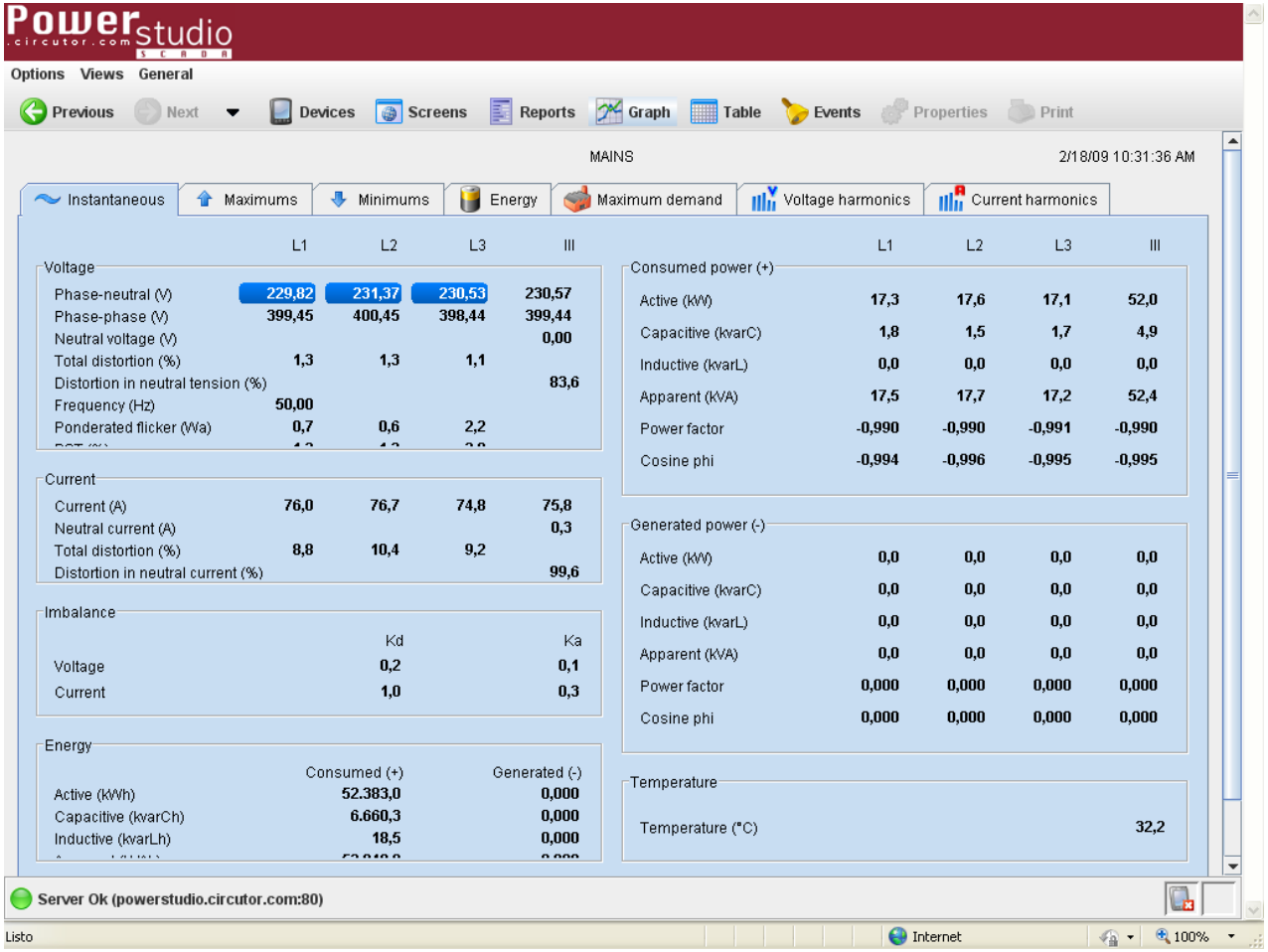
Date	Off Peak		Peak		Max Demand (kW)	MD Amount (MYR)	Total kWh	Total Amount (MYR)	Carbon Foot Print(kg)
	kWh	Amount (MYR)	kWh	Amount (MYR)					
01/10/2011	0.00	0.00	12.98	3.65	43.20	1,265.76	12.98	1,269.41	7.79
02/10/2011	0.00	0.00	12.11	3.40	45.00	1,318.50	12.11	1,321.90	7.27
03/10/2011	0.00	0.00	11.36	3.19	45.00	1,318.50	11.36	1,321.69	6.82

DEMAND CHART

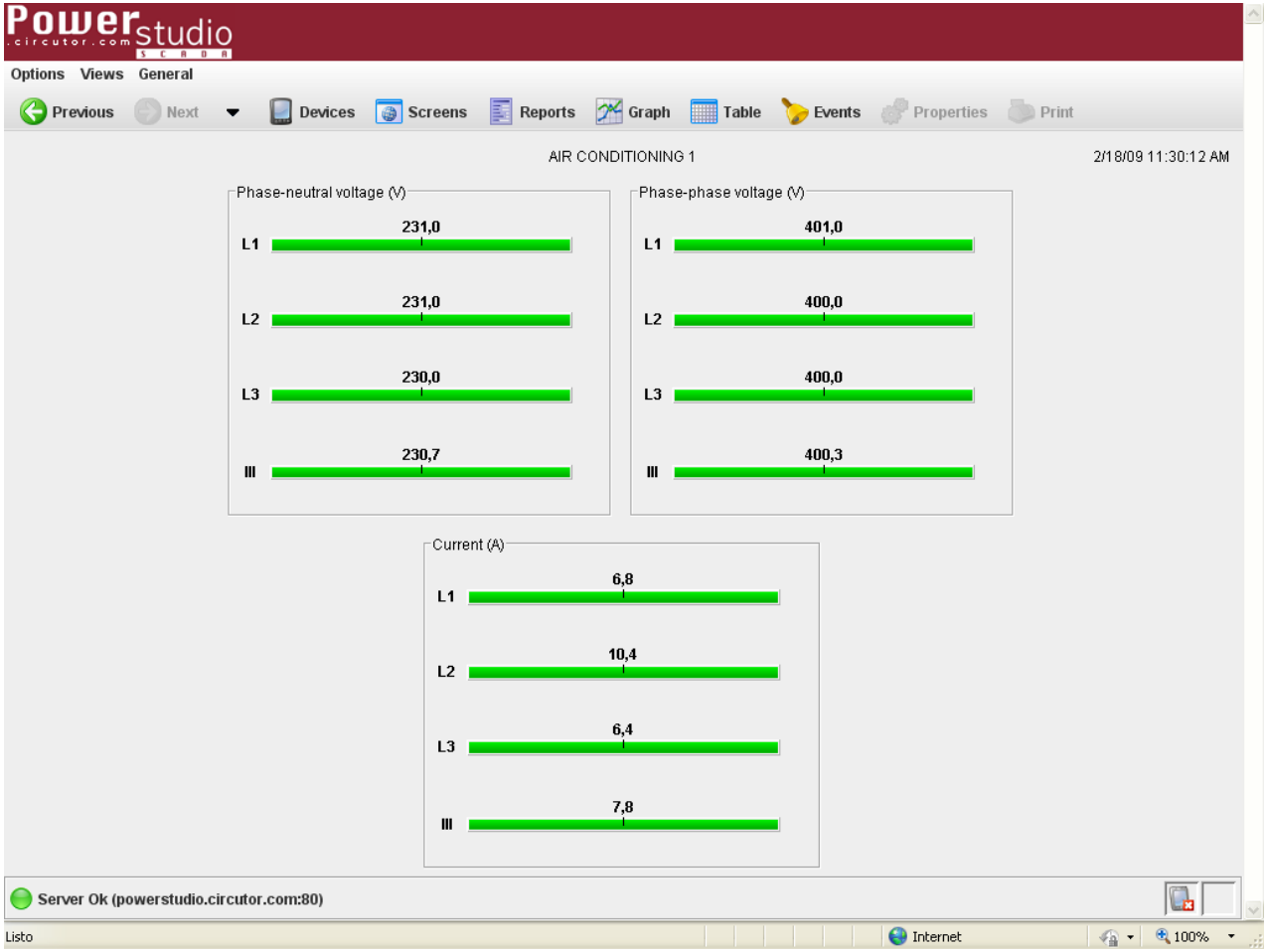
Shows energy consumption pattern (Maximum Demand and Demand Trend)



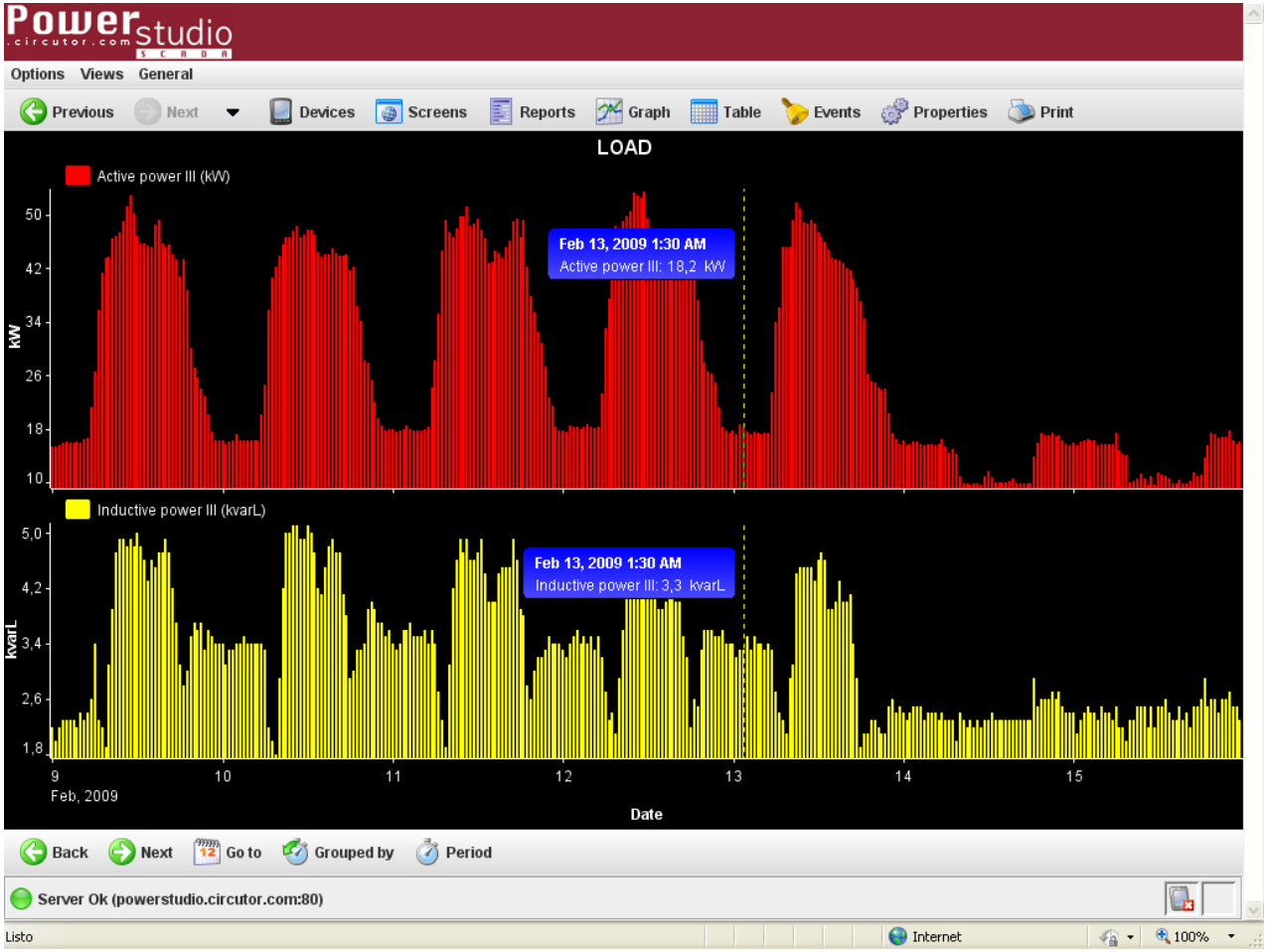
REAL TIME VALUES!



Real Time Values' Graphical Display!



Parameters' Graphs!



INDEX REPORT

Reports on consumption efficiency (daily, weekly, monthly & yearly) by individual sections, processes and areas of operation

Daily Index Report

Tariff Period : **01/10/2011 to 09/10/2011**

Report Generated Date : **31/10/2011**

Group Name : **CHILLER**

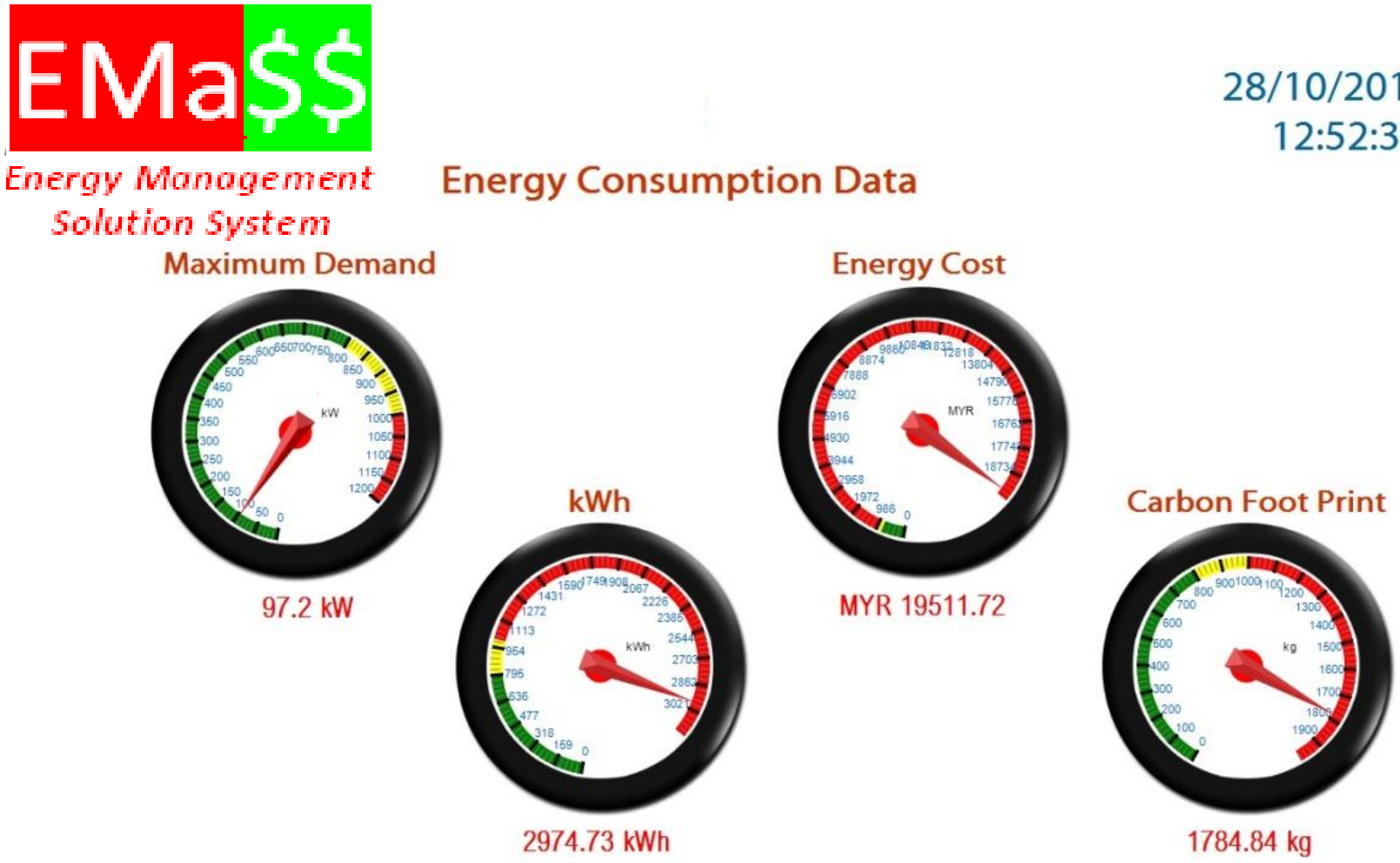
Date	Parameter			Total Consumption (kWh)	kWh Index (kWh / h)
01/10/2011	Time	5.00	h	14.78	2.95
02/10/2011	Time	6.00	h	17.78	2.96
03/10/2011	Time	3.00	h	21.18	7.06
04/10/2011	Time	5.00	h	30.08	64.01
05/10/2011	Time	4.00	h	16.74	4.185

Group Name : **PRODUCTION 2**

Date	Parameter			Total Consumption (kWh)	kWh Index (kWh / kg)
01/10/2011	Weight	3.00	kg	12.98	4.33
02/10/2011	Weight	5.00	kg	12.11	2.42
03/10/2011	Weight	4.00	kg	11.36	2.84
05/10/2011	Weight	7.00	kg	24.65	3.52
06/10/2011	Weight	4.50	kg	11.62	2.58
08/10/2011	Weight	7.00	kg	19.10	2.73
09/10/2011	Weight	9.00	kg	15.17	1.69

LCD DISPLAY

LCD TV displays installation or localized area energy consumption data, trend and allocation



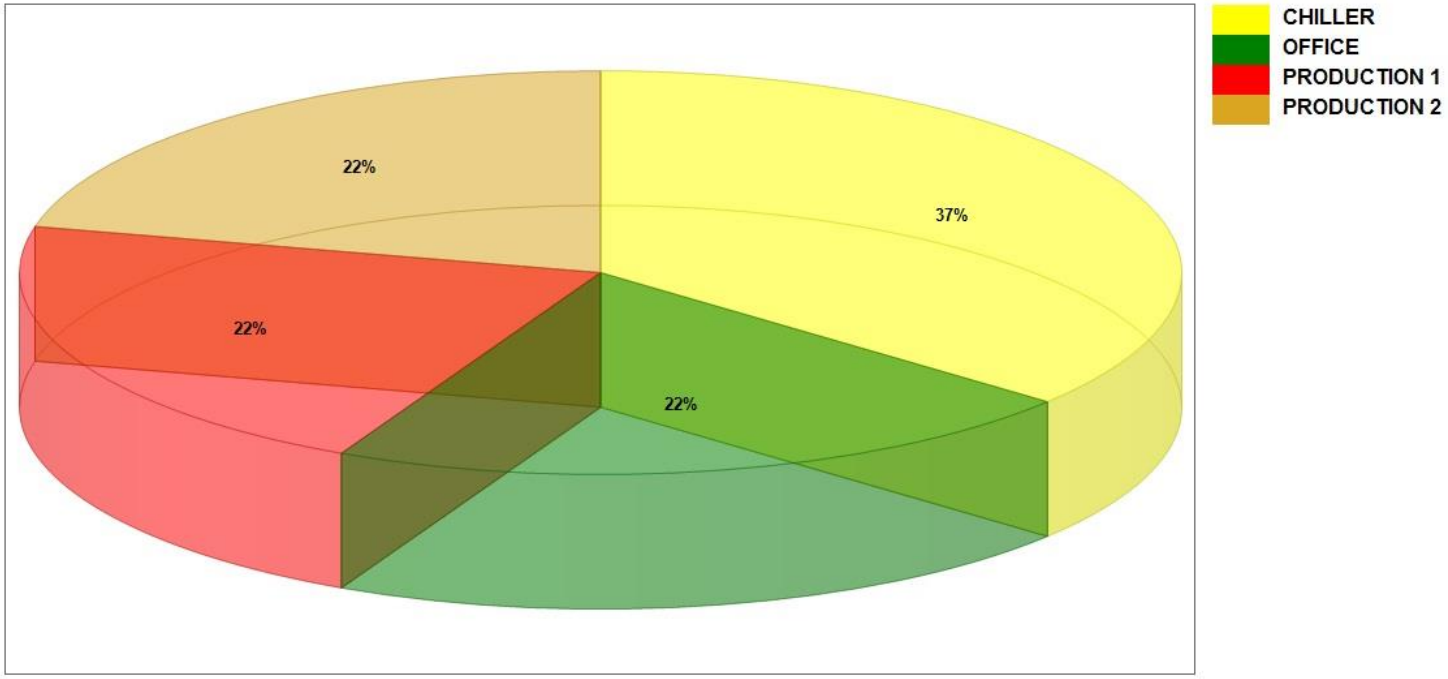
LCD DISPLAY

LCD TV displays installation or localized area energy consumption data, trend and allocation

EMa$$
Energy Management Solution System

28/10/2011
12:54:02

Consumption Breakdown

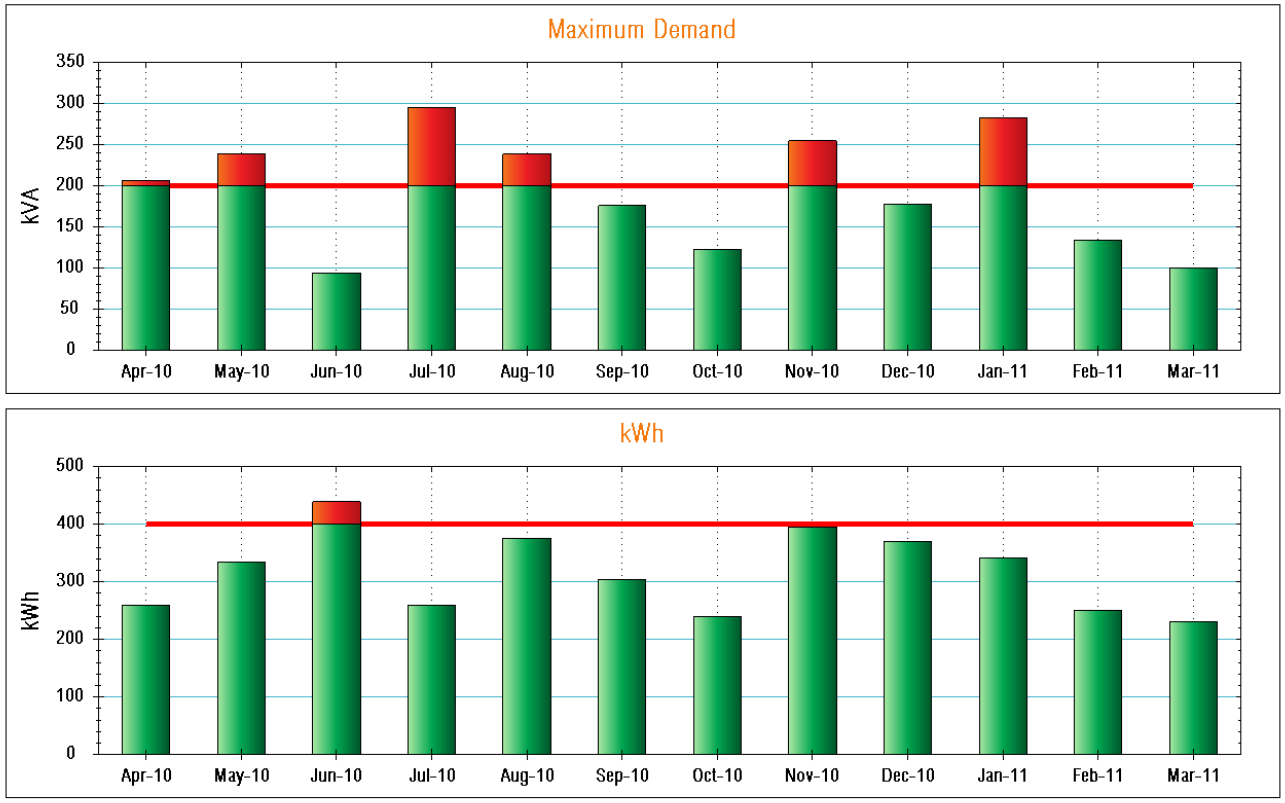


LCD DISPLAY

LCD TV displays installation or localized area energy consumption data, trend and allocation

22/03/2011 8:17:38 PM

Energy Consumption Trend



WHY EMaSS?

3x More Cost Effective

Control of MD

EMa$$

Energy Management Solution System

80% Less Manpower

5x Faster & Easier Setup

100% Features, Reports & Screens

SUCCESS STORY: UTM JOURNEY

2012 ASEAN ENERGY AWARD : Large Building Category

Green Purchasing Asia, Feb 2012

COVER | OPPORTUNITIES | RETROFITS

Practising what it preaches

UTM's electricity bill hit new low in July 2011

Varsity to be first university to take part in ASEAN Energy Award this year

By Stephen Ng

July 2011 was a milestone for Universiti Teknologi Malaysia (UTM) — for the first time since 2008, the university's electricity bill dipped below the RM1 million (US$318,000) markenergy efficient drive . Considering that the university's monthly power consumption over the past three years was as high as RM1.7 million, the July figure of RM962,345 was a sterling achievement.

To Prof Dr Zainuddin Abdul Manan, a key member of a group who implemented the energy efficiency drive at UTM, such an achievement is the result of all-round cooperation from the campus community.

consumption of the ten new buildings is an average of 770,000 kWh or RM260,000 a month in the months of June and July."

(Single Star) (see explanation). The other was a subsidiary of Malaysia's telecommunications company, **TM Research and Development (TMRD)**.

The university will go for the Energy Management GOLD (Two Star) Standard, when it is able to sustain the improvement in its electricity consumption. "We will also be the first Malaysian university to participate in the upcoming ASEAN Energy Award in 2012. At the moment, not even one university in ASEAN has taken up the challenge," he says.

Working within budget

Energy-saving initiatives began in UTM as far back as 2003, when the facilities maintenance team improved power usage at the library with the help of an energy services company (ESCO) which provided the investments, and subsequently shared the savings. Early last year, an in-house energy management committee with representation from all faculties was set up to provide, among other things, training on

UTM SAVE RM800,000 in 2010

Dapat kurangkan kos bayaran elektrik RM800,000 tahun lalu

UTM berjaya jimat tenaga

Utusan Malaysia, 23 Mac 2011

Oleh NURUL HUDA HASSAN
huda.hassan@utusan.com.my

JOHOR BAHRU 22 Mac - Usaha Universiti Teknologi Malaysia (UTM) menggunakan lampu jimat tenaga ternyata membuahkan hasil apabila berjaya menjimatkan kos bayaran elektrik sebanyak RM800,000 pada tahun lalu.

Naib Canselor UTM, Prof. Dr. Zaini Ujang berkata, bagi menjayakan usaha tersebut, sebanyak 15,000 lampu jimat tenaga telah ditukar sejak awal tahun lalu bagi menggantikan 60,000 lampu kalimantang.

"Kos bil elektrik meningkat 12 hingga 15 peratus antara tahun 2004 hingga 2009 melibatkan bayaran sebanyak RM22 juta setahun untuk tujuan itu dan langkah ini membantu menjimatkan perbelanjaan kita," katanya.

Beliau berkata demikian pada Majlis Pelancaran Kampus Lestari UTM yang disempurnakan oleh Menteri Sumber Asli dan Alam Sekitar, Datuk Seri Douglas Uggah Embas di sini baru-baru ini.

Tambahnya, antara bangunan yang terlibat proses penukaran lampu ialah Bangunan Canselori Sultan Ibrahim dan Perpustakaan Sultanah Zanariah selain memasang sistem pendingin udara boleh kawal di setiap bilik.

Beliau berkata, UTM juga mempergiatkan usaha mengurangkan pelepasan gas rumah hijau sebanyak lima peratus pada tahun ini berbanding tahun lalu menerusi rangka kerja kelestarian kampus yang menyeluruh.

> Kos bil elektrik meningkat 12 hingga 15 peratus antara tahun 2004 hingga 2009 melibatkan bayaran sebanyak RM22 juta setahun untuk tujuan itu dan langkah ini membantu menjimatkan perbelanjaan kita
>
> DR. ZAINI UJANG
> Naib Canselor UTM

"Berdasarkan kepada kajian yang dijalankan pada 2009, pembebasan karbon dioksida setiap tahun di dalam kawasan kampus UTM adalah sebanyak 3.2 tan dan sehingga hari ini UTM menjadi universiti pertama menjalankan kajian menjejak jumlah karbon.

"Gas rumah hijau yang dibebaskan adalah hasil daripada aktiviti yang dijalankan di UTM seperti penggunaan tenaga elektrik, perjalanan staf serta pelajar dan pelupusan sampah," ujarnya sambil menyeru semua penghuni UTM untuk sentiasa menjaga alam sekitar.

DOUGLAS Uggah Embas (kiri) menerima laporan *carbon foot print* daripada Zaini Ujang pada Majlis Pelancaran Kampus Lestari UTM di Skudai, Johor Bahru, baru baru ini. - UTUSAN/NASIRUDDIN YAZID

UTM Achievement 2010-June 2013 highlights

RM4.88 million electric bill reduction

16.5 Mega Wh reduction

(benchmark year 2009)

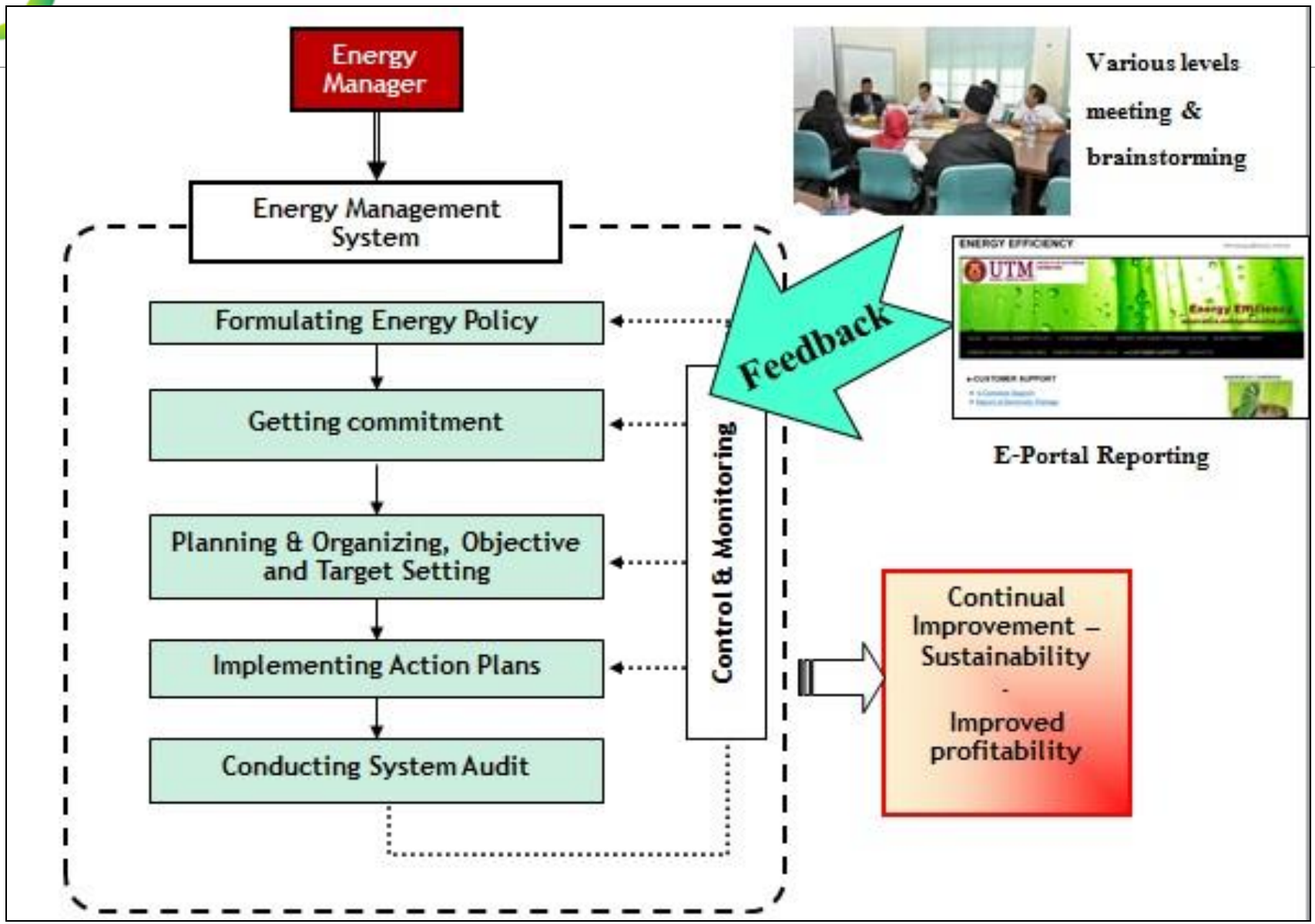
Highlights :

- UTM grand project entitled 'A One Stop Centre for Sustainable Energy Management' was announced Winner of 'ASEAN Energy Award 2012 in Sep 2012 – Large Building Category' by ASEAN Centre for Energy (ACE)
- UTM is the only university in ASEAN that holds the 2 star Asean Energy Management Accreditation Scheme (AEMAS) Energy Management Gold Standard – award on 29 Jan, 2013.
- UTM was the first organisation who has trained 30 of its staff as Certified Energy Managers
- UTM has saved RM800K in 2010, RM1.7 million in 2011 & RM1.9 million in 2012
- UTM's proprietary in-house Electrical Billing Management System (EBMS)

UTM SUSTAINABLE ENERGY MANAGEMENT PROGRAM

A One Stop Centre for Sustainable Energy Management"

UTM ENERGY MANAGEMENT PROCESS

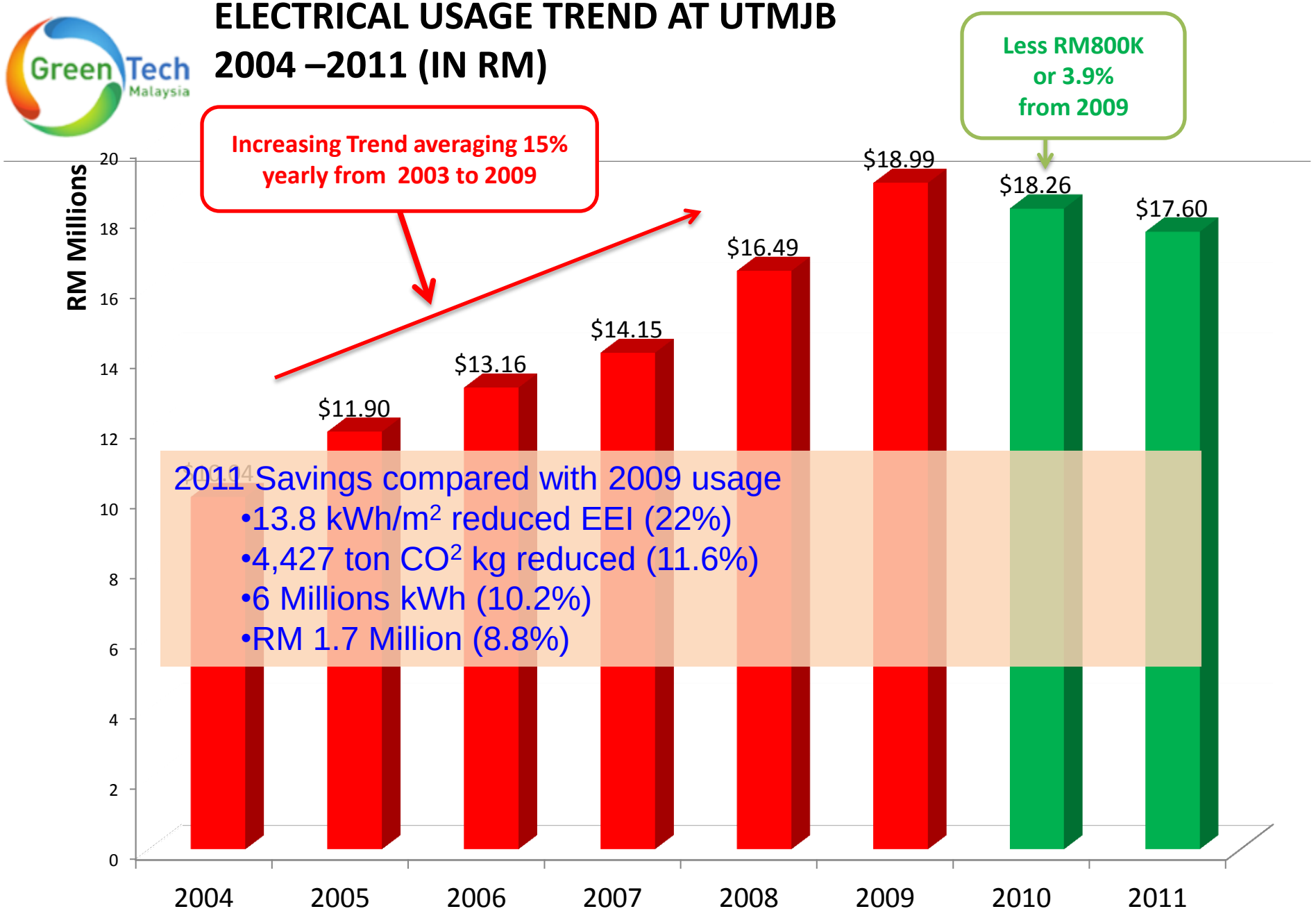


ENERGY MANAGEMENT MATRIX

BEFORE SEMP IMPLEMENTATION
CURRENT STATUS AS OF APRIL 2012

	Energy Policy	Organization	Motivation	Information System	Marketing	Investment
4	Energy policy, action plan and regular review, have commitment of top management as part of an environmental strategy	Energy management has been fully integrated into management structure. Clear delegation of responsibility for energy consumption	Formal and informal channels of communication regularly exploited by energy manager and energy staff at all levels	Comprehensive system sets targets, monitors consumption, identified faults, quantifies savings and provides budget tracking	Marketing the value of energy efficiency and the performance of energy management both within and outside the organization	Positive discrimination in favor of 'green' schemes with detailed investment appraisal of all new build and refurbishment opportunities
3	Formal energy policy, but no active commitment from top management	Energy manager accountable to energy committee representing all users, chaired by a member of the managing board	Energy committee used as main channel together with direct contact with major users	M & T reports for individual premises based on sub-metering, but savings not reported effectively to users	Programme of staff awareness and regular publicity campaigns	Some payback criteria employed as for all other investment
2	Unadopted energy policy set by energy manager or senior department manager	Energy manager in post reporting to ad-hoc committee, but line management and authority are unclear	Contact with major users through ad-hoc committee chaired by senior department manager	Monitoring and targeting reports based on supply meter data. Energy unit has ad-hoc involvement in budget setting	Some ad-hoc staff awareness training	Investment using short term payback criteria only
1	An unwritten set of guidelines	Energy management is the part-time responsibility of someone with only limited authority or influence	Informal contacts between engineer and a few users	Cost reporting based on invoice data. Engineer complies reports for internal use within technical department	Informal contacts used to promote energy efficiency	Only low cost measures taken
0	No explicit policy	No energy management or any formal delegation of responsibility for energy consumption	No contact with users	No information system. No accounting for energy consumption	No promotion of energy efficiency	No investment in increasing energy efficiency in premises

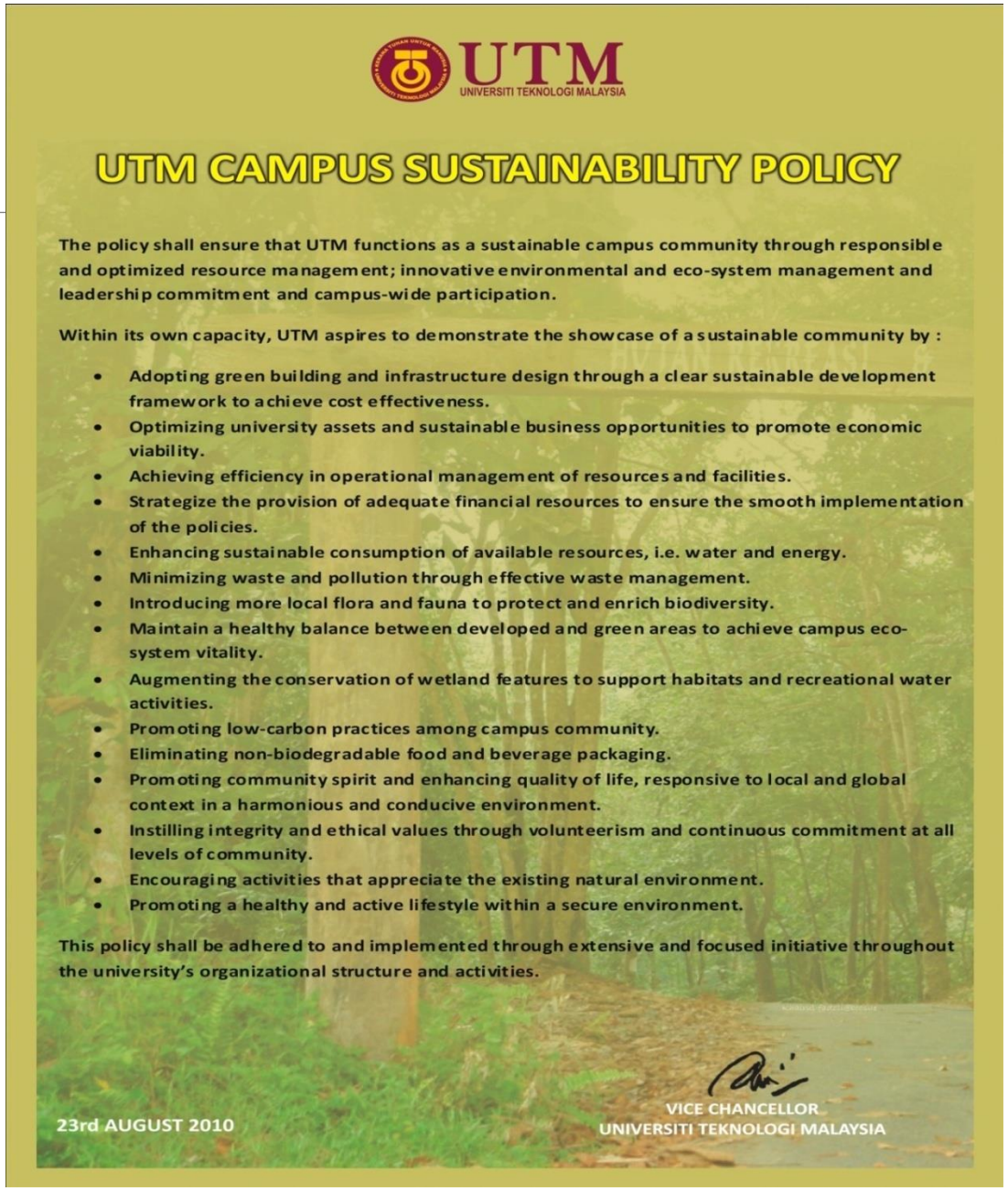
ELECTRICAL USAGE TREND AT UTMJB 2004 –2011 (IN RM)



2011 Savings compared with 2009 usage

- 13.8 kWh/m^2 reduced EEI (22%)
- 4,427 ton CO^2 kg reduced (11.6%)
- 6 Millions kWh (10.2%)
- RM 1.7 Million (8.8%)

UTM SUSTAINABILITY POLICY



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

UTM CAMPUS SUSTAINABILITY POLICY

The policy shall ensure that UTM functions as a sustainable campus community through responsible and optimized resource management; innovative environmental and eco-system management and leadership commitment and campus-wide participation.

Within its own capacity, UTM aspires to demonstrate the showcase of a sustainable community by :

- Adopting green building and infrastructure design through a clear sustainable development framework to achieve cost effectiveness.
- Optimizing university assets and sustainable business opportunities to promote economic viability.
- Achieving efficiency in operational management of resources and facilities.
- Strategize the provision of adequate financial resources to ensure the smooth implementation of the policies.
- Enhancing sustainable consumption of available resources, i.e. water and energy.
- Minimizing waste and pollution through effective waste management.
- Introducing more local flora and fauna to protect and enrich biodiversity.
- Maintain a healthy balance between developed and green areas to achieve campus eco-system vitality.
- Augmenting the conservation of wetland features to support habitats and recreational water activities.
- Promoting low-carbon practices among campus community.
- Eliminating non-biodegradable food and beverage packaging.
- Promoting community spirit and enhancing quality of life, responsive to local and global context in a harmonious and conducive environment.
- Instilling integrity and ethical values through volunteerism and continuous commitment at all levels of community.
- Encouraging activities that appreciate the existing natural environment.
- Promoting a healthy and active lifestyle within a secure environment.

This policy shall be adhered to and implemented through extensive and focused initiative throughout the university's organizational structure and activities.

23rd AUGUST 2010

VICE CHANCELLOR
UNIVERSITI TEKNOLOGI MALAYSIA

UTM ENERGY POLICY

ENERGY POLICY

Declaration of Commitment

Universiti Teknologi Malaysia is committed to practice energy efficiency and conservation throughout its campus in order to create a conducive and sustainable campus environment for teaching, learning, research and intellectual development.

Statement of Policy

Universiti Teknologi Malaysia (UTM) Energy Policy is to establish a sustainable energy management system to enable continuous, effective and widespread implementation of energy efficiency and conservation practices at all premises within UTM. The process and procedure adopted shall enable the establishment of measurable energy reduction targets and energy index without compromising reliability, comfort and safety. The energy management system will be driven and motivated by creative and innovative initiatives from within the UTM community. UTM Energy Policy will be managed by UTM Energy Manager who will also manage compliance issues.

Energy Policy Guidelines

- To consume energy in the most efficient, economical and environmentally responsible ways.
- To apply the latest technology as well as energy efficiency practices in all aspects or organization operation.
- To constantly seek achievable reductions in energy consumption.
- To manage energy efficiency taking into consideration the requirements of law and reliable operation of the systems in use at the installation.
- To provide training and information for relevant staff in energy efficiency management.
- To contribute to the efforts of the government in reducing the emission of harmful gasses, including carbon dioxide.

Inspiring Creative & Innovative Minds

POLISI PENGURUSAN TENAGA UTM

Perisytiharan komitmen

Universiti Teknologi Malaysia (UTM) komited untuk melaksanakan aktiviti-aktiviti kecekapan tenaga dan pemeliharaannya di seluruh kampus dalam rangka mencipta persekitaran kampus yang kondusif dan lestari untuk pengajaran, penyelidikan pembelajaran, dan pembangunan intelektual.

Kenyataan Dasar

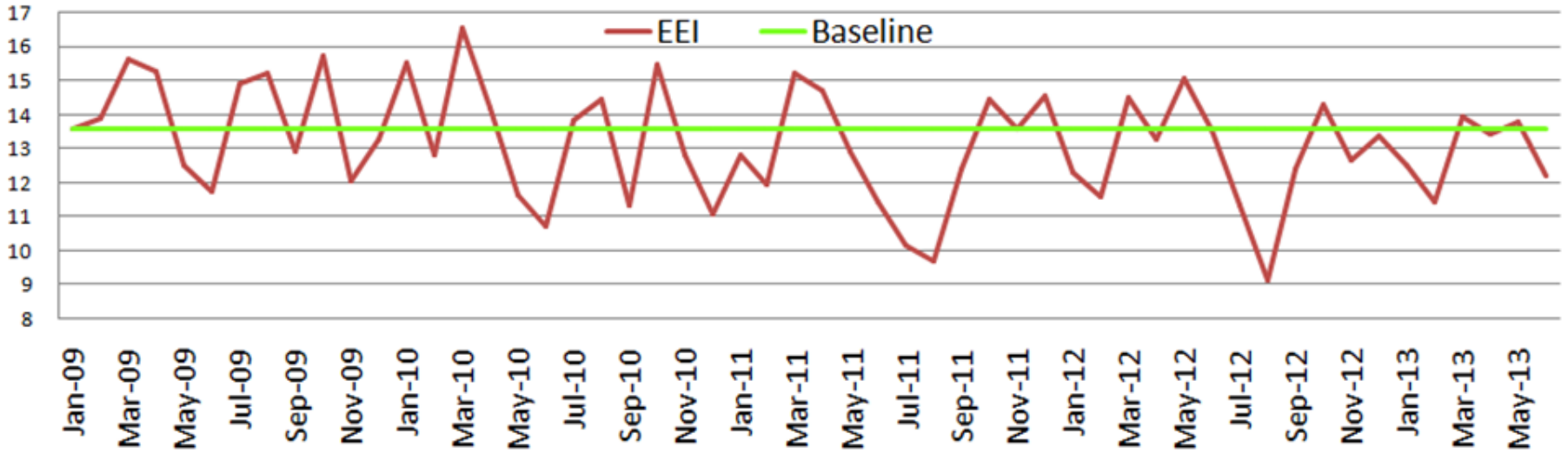
Polisi Pengurusan Tenaga UTM ini adalah untuk menetapkan sistem pengurusan tenaga yang berterusan dan juga mengaktifkan pelaksanaan berterusan, berkesan dan menyeluruh dari kecekapan tenaga dan amalan pemuliharaan di semua premis dalam UTM. Proses dan prosedur yang diterima pakai akan membolehkan pembentukan sasaran pengurangan tenaga terukur dan Indeks Tenaga tanpa mengorbankan kebolehpercayaan, keselesaan dan keselamatan fasiliti. Sistem pengurusan tenaga akan dipacu oleh inisiatif kreatif dan inovatif dari dalam masyarakat UTM sendiri. Dasar Tenaga UTM akan diuruskan oleh Pengurus Tenaga UTM yang juga akan menguruskan pematuhan terhadap Akta Bekalan Tenaga Elektrik 1990.

Tatacara Pengurusan Tenaga

- Penggunaan tenaga dengan cara yang paling cekap, ekonomi dan bertanggung jawab terhadap alam sekitar.
- Menerapkan teknologi terkini serta amalan kecekapan tenaga di segala aspek operasi organisasi.
- Untuk terus menerus mencari segala peluang pengurangan penggunaan tenaga.
- Untuk menguruskan kecekapan tenaga dengan mempertimbangkan keperluan undang-undang serta kebolehpercayaan operasi sistem.
- Mengadakan latihan dan maklumat untuk kakitangan yang relevan dalam pengurusan kecekapan tenaga.
- Untuk menyumbang pada usaha kerajaan dalam mengurangkan pembebasan gas berbahaya, termasuk karbon dioksida.

Menjana Minda Kreatif & Inovatif

UTM ENERGY EFFICIENCY INDEX

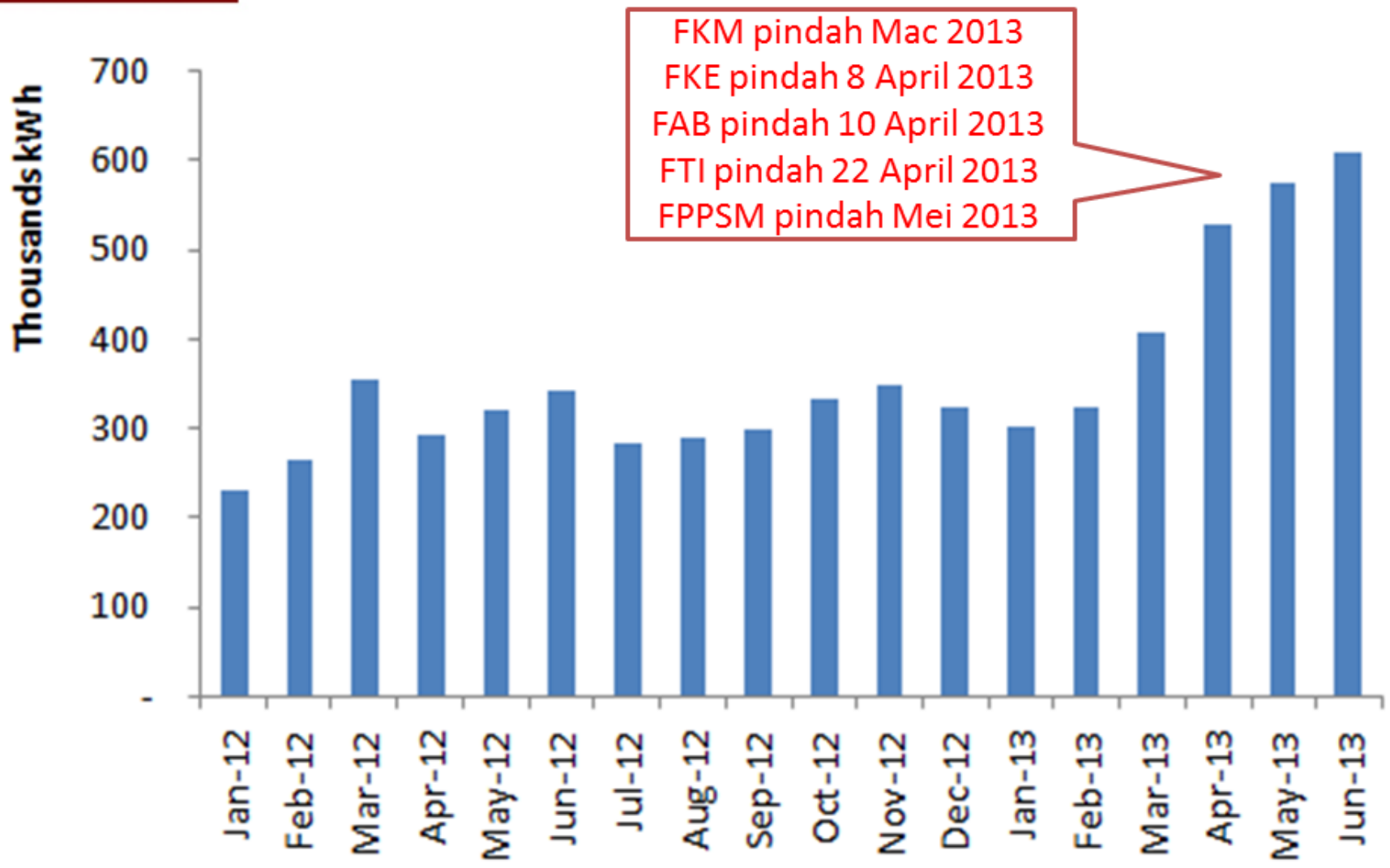


Tahun	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Jan-Jun	% reduced compared 2009
2013	11.54	10.56	13.96	13.45	13.77	12.20							75.5	-8.7%
2012	12.32	11.58	14.50	12.79	14.48	13.00	10.88	8.78	11.95	13.76	12.18	12.88	78.7	-4.8%
2011	12.83	11.93	15.20	14.70	12.94	11.41	10.14	9.69	12.39	14.48	13.58	14.57	79.0	-4.4%
2010	15.51	12.81	16.54	14.23	11.66	10.74	13.82	14.44	11.34	15.48	12.83	11.09	81.5	-1.4%
2009	13.58	13.91	15.62	15.29	12.49	11.76	14.89	15.21	12.92	15.75	12.03	13.30	82.6	0.0%

AIR-CONDITIONED FLOOR AREA	352,710 m^2
AIR-CONDITIONED FLOOR AREA(+rmk9 10%)	367,414 m^2
AIR-CONDITIONED FLOOR AREA(+rmk 20%)	382,117 m^2
AIR-CONDITIONED FLOOR AREA(+rmk9 30%)	396,821 m^2

Alhamdulillah we able to sustain the energy saving

Electrical usage trend for RMK9 new building (in kWh)



TNB SEMP AUTOMATION SYSTEM

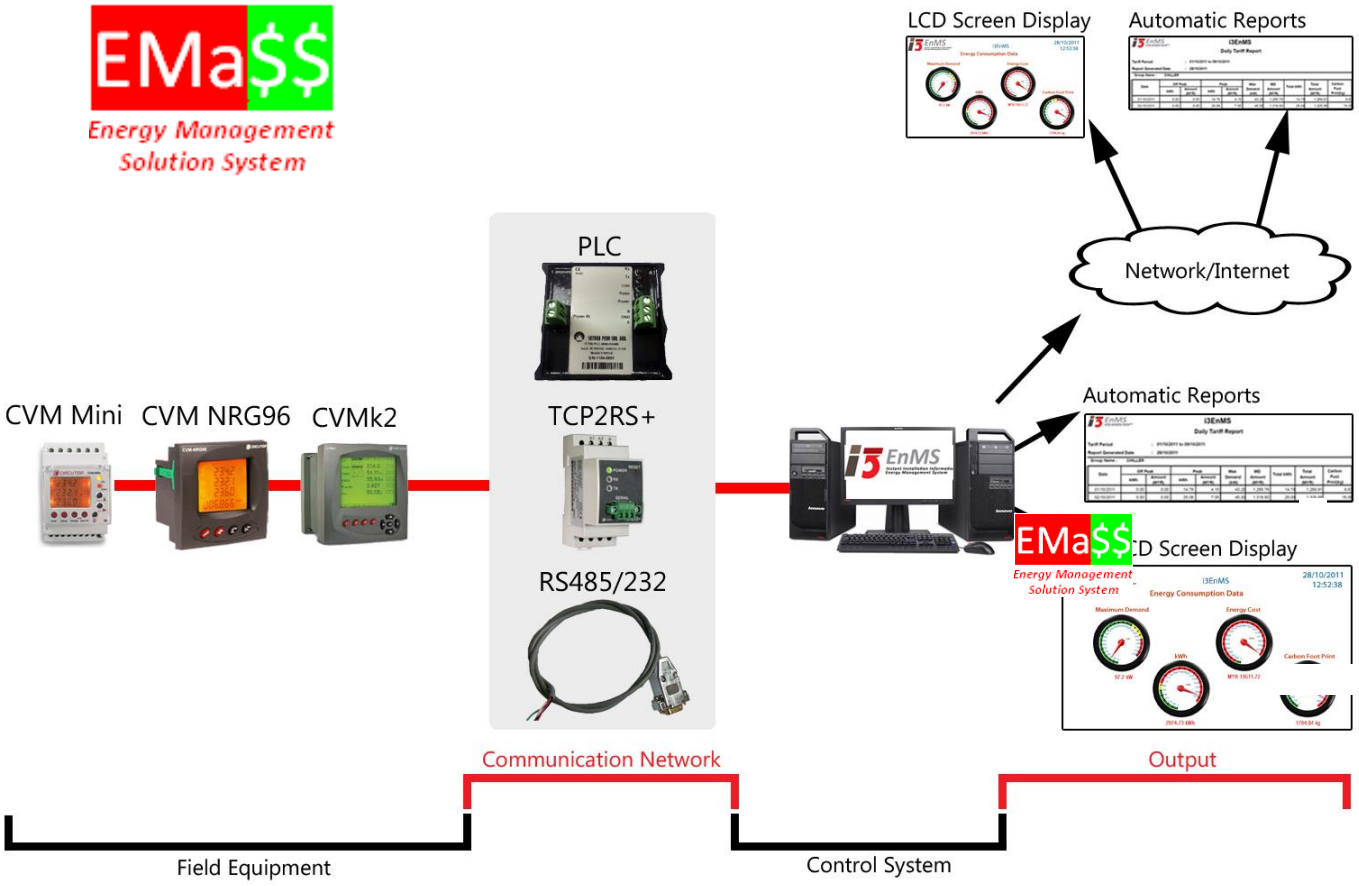
Objectives of Power Quality Analyzers at TNB Incomer

1. Determine the quality of Incoming supply from TNB and ensure accuracy of TNB meter (counter-check).
2. High-End Power Quality Analyzer which is able to detect voltage sag, swell, flicker, asymmetry, imbalance, distortion… events are recorded with time stamp.
3. Displays wave form (V & A), phasorial diagram & harmonic decomposition (to 50th order).
4. 4 quadrant energy measurement, with over 500 measured parameters, including multi tariff setting.
5. Memory with removable SD Card (up to 2GB) ensures retention of data for up to 6 years based on each minute data logging… data analyzed with PowerVison.
6. Determine total overall demand trend with MD details (when and how much).

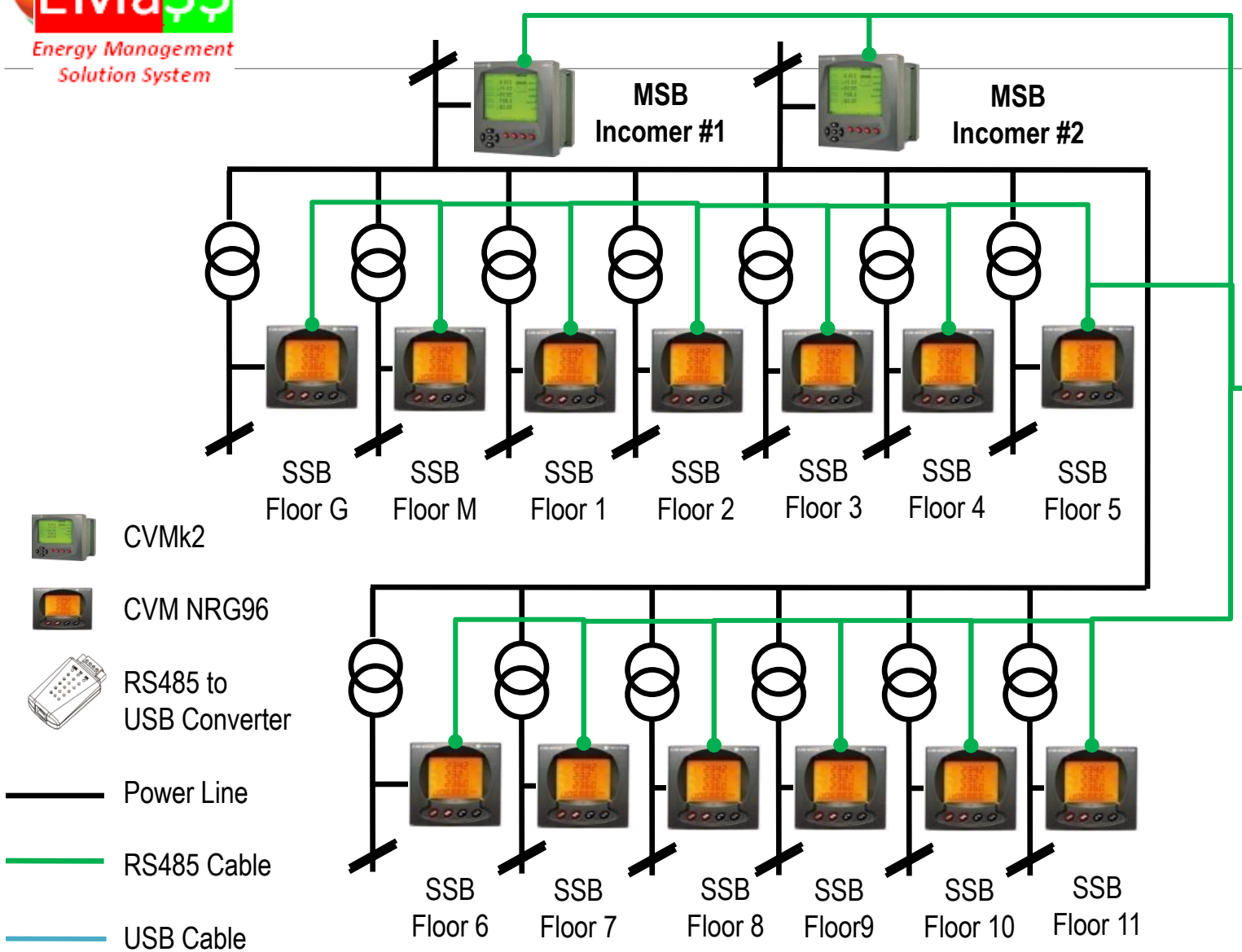
Objectives of Power Analyzers at MSB, SSB & Process DB

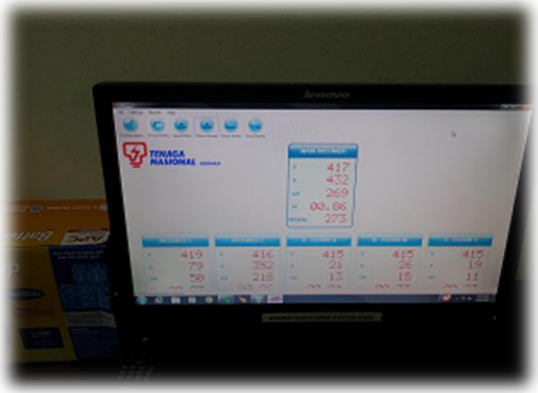
1. Sub-metering to determine the energy consumption, area PF, kW & MD.
2. THD (total harmonics distortion) for both Voltage and Current are displayed.
3. Harmonic decomposition (to 15th order) possible with HAR version.
4. 4 quadrant energy measurement, with 48 or 63 measured parameters (depending on version).
5. RS485 connectivity for data connection with PowerStudio software to record, display, monitor, recall & print all measure parameters in tables or graphs.
6. Determine area demand trend with MD details (when and how much).

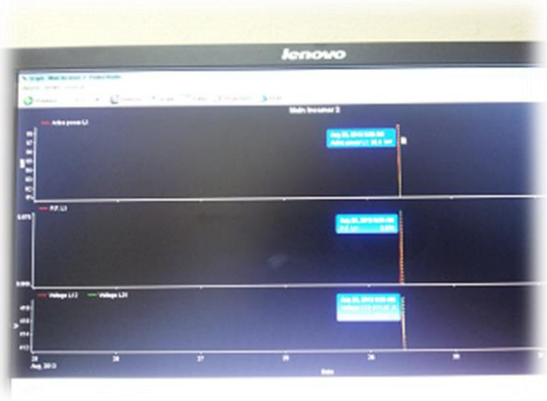
STORIES: TNB SET-UP

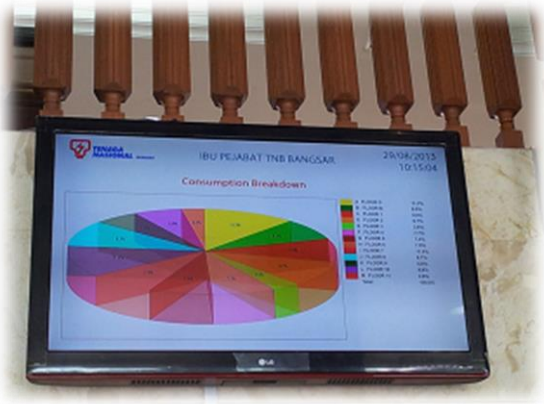


TNB HQ LAYOUT









EMa$$
Energy Management
Solution System

CONCLUSION

- The savings are real
- The achievement is possible
- The methods are proven
- LEARN AND IMPROVE

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Thank You

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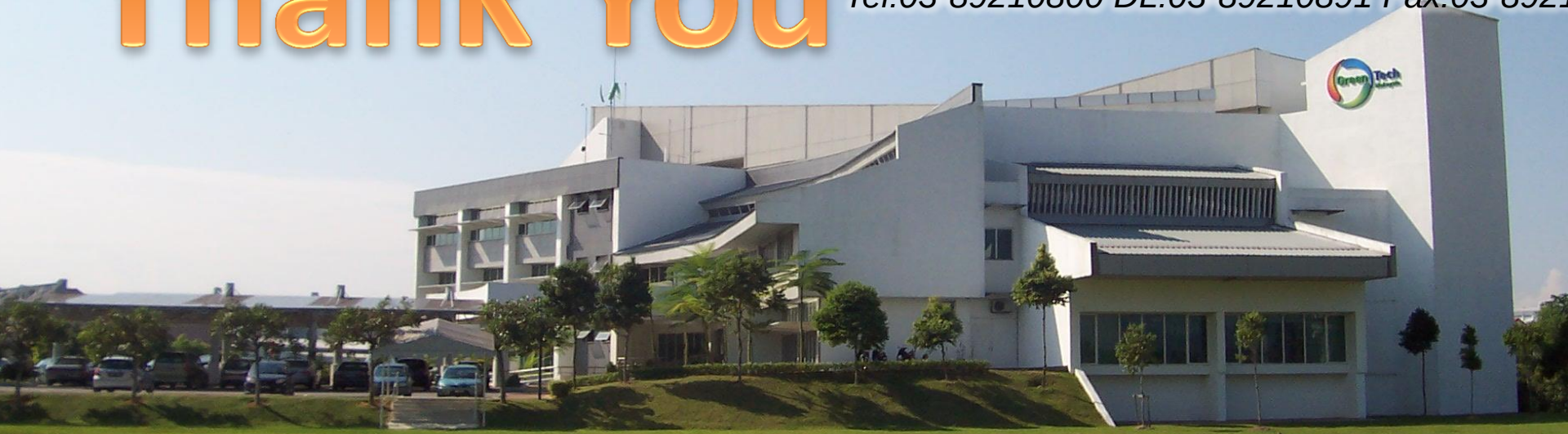

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