

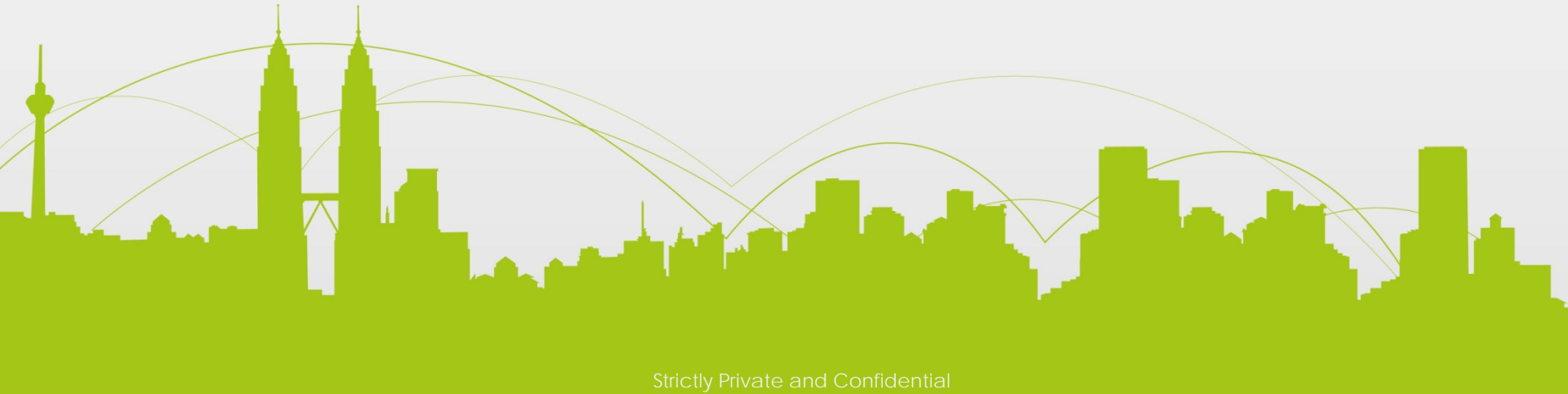


# KFM

## Solutions for built environment

### Perdana Putra, The Making of a High Performance Green Building

Ir. Mohd Fadzil Shah  
19 April 2016



# About KFM

## Integrated Asset Management Services & Technology

- Operating in Kuala Lumpur, Penang, Dubai and Abu Dhabi
- More than 10 million SF of Assets Under Management
- Solutions for Built Environment with integrated Design, Build and Manage capabilities

### GREEN

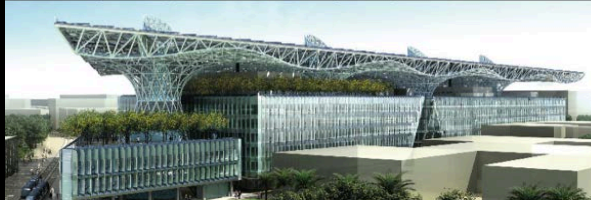
#### Mitigate & Adapt to Climate Change



Cities present a real opportunity to minimise environmental impacts by improving energy efficiency, minimising urban sprawl, promoting the use of energy-efficient public transport and improving adaptation to climate change.

### SMART

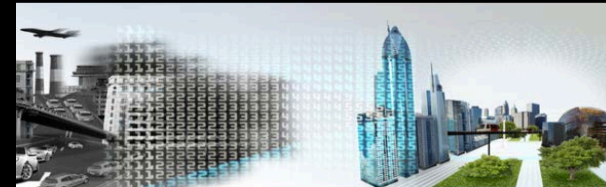
#### Running a city on an intelligent platform



"Smart-city" projects have been multiplying around the world. They aim to integrate the recent efforts to introduce smart features in a variety of sectors and use this "system of systems", to manage the urban environment better. Smart systems may well be humankind's best hope for dealing with its pressing environmental problems, notably global warming.

### CONNECTED

#### The Internet of Things meets The Internet of People



Connected sustainable cities employ ubiquitous, networked intelligence to enable collaboration between people in government, businesses and consumers – thereby improving efficiency, increasing trade and commerce and provide better healthcare, safety and security to all citizens.



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# Qualified and Accredited

## 5\* Ranking by SME Corp and Class A Contractor

- 5\* ranking by SME Corp
- TeraS status company
- PKK Class A
- CIDB G7
- ISO 9001
- Malaysian Green Building Confederation



Celebrating Malaysia's  
Enterprising Spirit



Solutions for  
built environment

# Award Winning SME

## Excellence Recognized by Government, Customers & Business Partners

We have been rated 5 Stars in the SCORE rating by SME Corp and ascertained by Deloitte. KFM has won awards from WASL/ Dubai Real Estate Company. Furthermore KFM has received multiple awards by Schneider Electric.



Highest Rated Services Company by SME Corp & Deloitte



Outstanding Service Award by Dubai Real Estate Company / WASL



Shooting Star Award by Schneider Electric Asia Pacific



GreenTech Award Malaysia's Top 30 Green Catalysts



Solutions for built environment



# Track Record

Prestigious Government Buildings and Corporate Headquarters in Malaysia and United Arab Emirates.

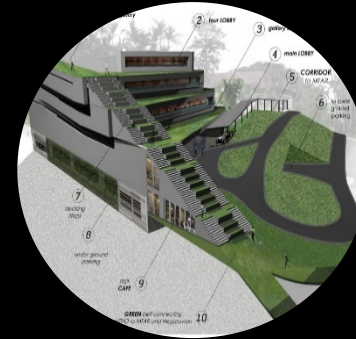


# Track Record

Prestigious Government Buildings and Corporate Headquarters in Malaysia and United Arab Emirates.



- **KLCC BMS Upgrade, Installation and Maintenance to achieve GBI Gold Rating**
- **Awarded in 2015**



- **Design and build of Memorial Tun Hussein Onn which will be green certified**
- **Awarded in 2015**



- **FM services for MAB office buildings, hangar, workshop space and hotel**
- **Awarded in February 2016**



- **Green Chiller installation at Silterra's plant in Kulim under EPC model**
- **Awarded end of February 2016**

# Government's Vision

## Putrajaya as the "Flagship" Green Township

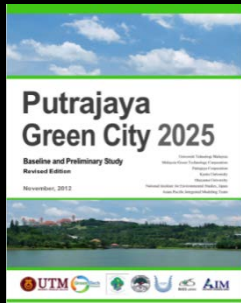


**“Putrajaya and Cyberjaya will serve as flagship green townships. The Government will take the lead in adopting green building standards. New Government buildings will be designed to meet green standards. Energy efficiency of existing buildings will be enhanced and as a showcase example, the Prime Minister’s Office complex will be upgraded to meet the Gold Standard Green rating.”**

Source: PM’s speech in Parliament to table Malaysia’s 10<sup>th</sup> Economic Plan

# INTRODUCTION

**Several initiatives have been introduced and policies developed to making Putrajaya, the administrative city of Malaysia, as a model township for Sustainability and Green Technology**

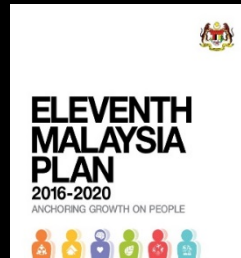


**Putrajaya Structure Plan 2005**

Provides guidance in planning and development of Putrajaya including vision, direction and policies to transform Putrajaya from a Garden City into Green City

**Putrajaya Corporation's Strategic Plan 2011 - 2015**

Establishes strategic plans and steps to lead Putrajaya along the green city, low-carbon sustainable development path



**Putrajaya Green City 2025 (PGC 2025)**

Specifies preliminary baseline report to provide direction for the preparation of the roadmap for Putrajaya Green City development

**11<sup>th</sup> Malaysia Plan**

Government to lead by example on sustainability practices for the industry by retrofitting Government buildings to be energy efficient



# Perdana Putra

## The Nation's Top Administrative Building



- **The structural design for Perdana Putra is influenced by Malay, Islamic and European cultures such as Palladian and Neoclassicism.**
- **It was designed by a Qidea Architect with inspiration from the former prime minister, Tun Dr. Mahathir bin Mohamad.**

### BUILDING AT A GLANCE

**Gross Floor Area: About 1 million square feet.**

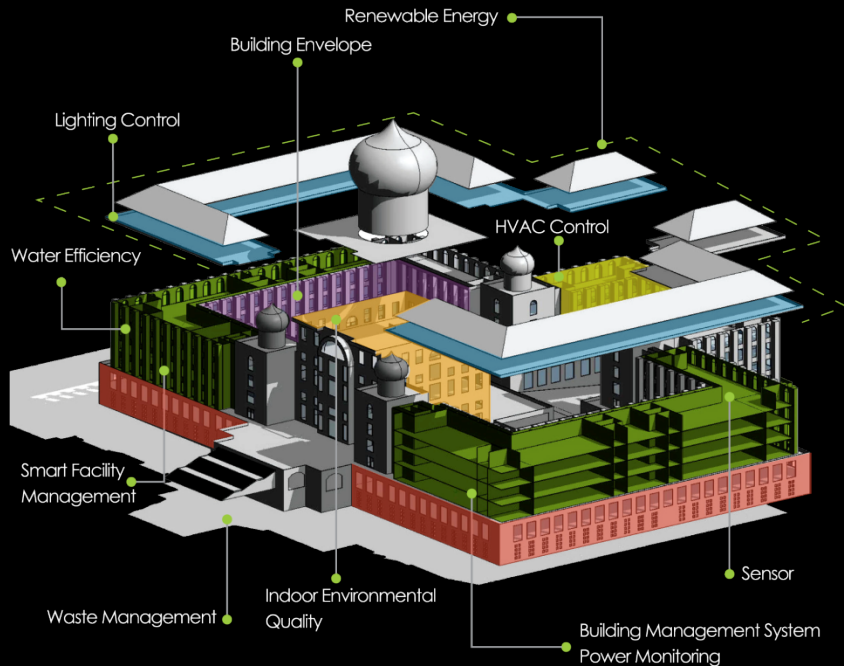
**Location : Parcel A, Presint 1, Putrajaya, Malaysia**

**Occupancy: 2,200, Houses the Prime Minister and Deputy Prime Minister Office, Chief Secretary Office, Implementation Coordination Unit, PEMANDU, National Security Council, etc.**

**Construction: 1997, Completed: 1999**

# Perdana Putra High Performance Green Building

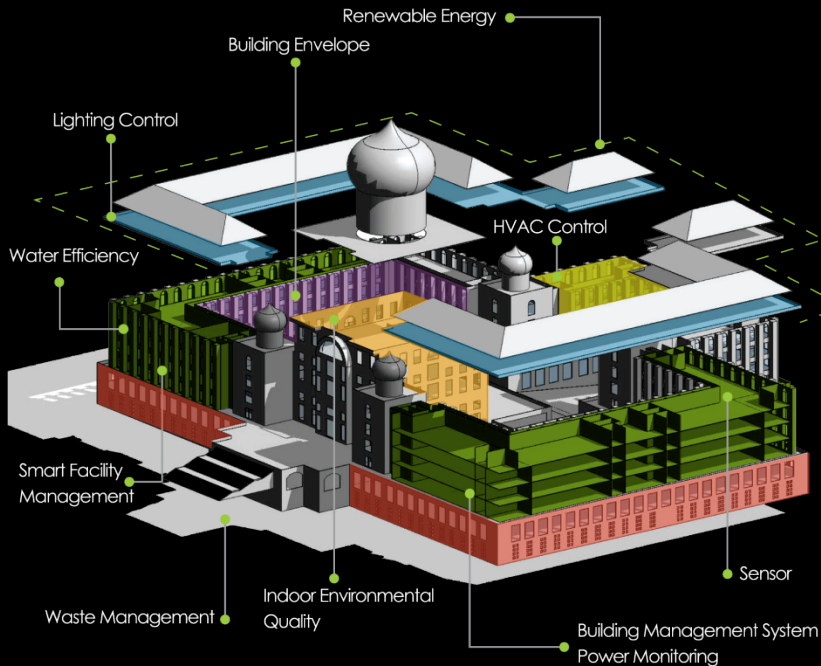
## Major Challenges



- High Aspiration set by PM for Perdana Putra to achieve the highest Green Certification
- PFI Project Financing
- Building Lifecycle Issues
- Our design approach
- Is a building upgrade project where most of the works have to be executed after working hours.

# Perdana Putra High Performance Green Building

## Green Building Index (GBI) Platinum



- 20 year PFI project
- Reduce energy consumption by 33%
- Reduce carbon emission by 40%
- Savings in utilities of approximately RM2m per annum

# Building Performance in Putrajaya

## Performance Data

Rank	Building	Building Energy Intensity kWh/m <sup>2</sup> /year
1.	Diamond Building – Energy Comm.	65
2.	Perdana Putra - PMO	85
3.	Low Energy Office - KeTTHA	110
4.	2G1 – Customs Department	185
5.	Ministry of Finance (MoF)	200
6.	Wisma Putra	222

Source: Data Year 2014, KFM's Building Energy Study



# Achievement in Efficiency

## Perdana Putra - High Performance Green Building

	<b>Before</b> (2010 Baseline)	<b>After</b> (2014, GBI Certification)	<b>Savings</b>
<b>Energy Intensity</b>	<b>138 kWh/m<sup>2</sup>/year</b>	<b>85 kWh/m<sup>2</sup>/year</b>	<b>38%</b>
<b>Annual Water Usage</b>	<b>133,614 m<sup>3</sup></b>	<b>80,535 m<sup>3</sup></b>	<b>40%</b>
<b>CO<sub>2</sub></b>	<b>7,268,738 kg</b>	<b>4,884,908 kg</b>	<b>33%</b>
<b>Chilled Water</b>	<b>4,071,552 kWh</b>	<b>1,255,334 kWh</b>	<b>69%</b>
<b>Total Energy</b>	<b>13,435,744 kWh</b>	<b>9,031,253 kWh</b>	<b>33%</b>

## NON-RESIDENTIAL EXISTING BUILDING (NREB)

### ASSESSMENT CRITERIA OVERALL POINTS SCORE

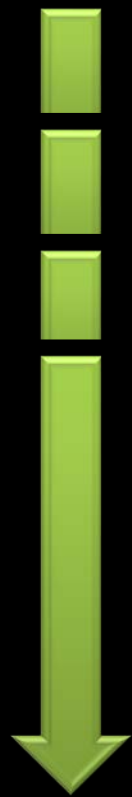
PART	ITEM	MAXIMUM POINTS
1	Energy Efficiency (EE)	38
2	Indoor Environmental Quality (EQ)	21
3	Sustainable Site Planning & Management (SM)	10
4	Material & Resources (MR)	9
5	Water Efficiency (WE)	12
6	Innovation (IN)	10
TOTAL SCORE		100



# ENERGY CONSERVATION MEASURE

PERDANA PUTRA ENERGY INTENSITY 2010 : 138.86

kWh/m<sup>2</sup>/year



<b>Base case from Data Logging</b>		<b>138.86</b>
<b>Repair of BMS, etc</b>	<b>5.67</b>	<b>133.19</b>
<b>Simulation Base Building</b>	<b>0.12</b>	<b>133.07</b>
<b>Temperature Setting to 24 degrees C / 65% RH</b>	<b>4.75</b>	<b>128.32</b>
<b>Changing of Lighting to LED Lights</b>	<b>17.90</b>	<b>110.43</b>
<b>Occupancy Sensors and Photo Sensors</b>	<b>0.22</b>	<b>110.21</b>
<b>Change of All AHUs motors to EFF1 motors</b>	<b>0.21</b>	<b>110.00</b>
<b>Change of All CHWP motors to EFF1 motors</b>	<b>0.02</b>	<b>109.98</b>
<b>Day lighting Design with Photo Sensor at Office</b>	<b>0.80</b>	<b>109.17</b>
<b>Reduction of Plug Load (Smart Infrastructure)</b>	<b>6.04</b>	<b>103.13</b>
<b>Installation of 650kWp BIPV</b>	<b>13.93</b>	<b>89.20</b>
<b>Changing of Façade Lighting to LED Lights</b>	<b>1.92</b>	<b>87.28</b>



# ENERGY EFFICIENCY

## 35 out of 38 GBI Points

ACMV Repair & Upgrade  
EFF1 Motors  
Smart Infra System  
Energy Management System  
Lighting Management System



Building Management System



LED Lights – Indoor and Outdoor



650kWp Solar Power System – Sustainable Power Source



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# ENVIRONMENT QUALITY

## 14 out of 21 GBI Points

Pre AHU  
Low VOC & Zero Urea Formaldehyde  
No Smoking  
CO2 Sensors  
Thermal Comfort Control



# SUSTAINABLE & SITE PLANNING

## 10 out of 10 GBI Points

Pest Management  
Erosion Control  
Management



Prioritized Green and Carpool Parking



Greenery Application



Roof Garden



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# MATERIAL & RESOURCES

## 8 out of 9 GBI Points

Clean Agent  
Sustainable Timber  
Sustainable Purchasing Policy



**REUSE  
REDUCE  
RECYCLE** Kitarkan Semula Bateria

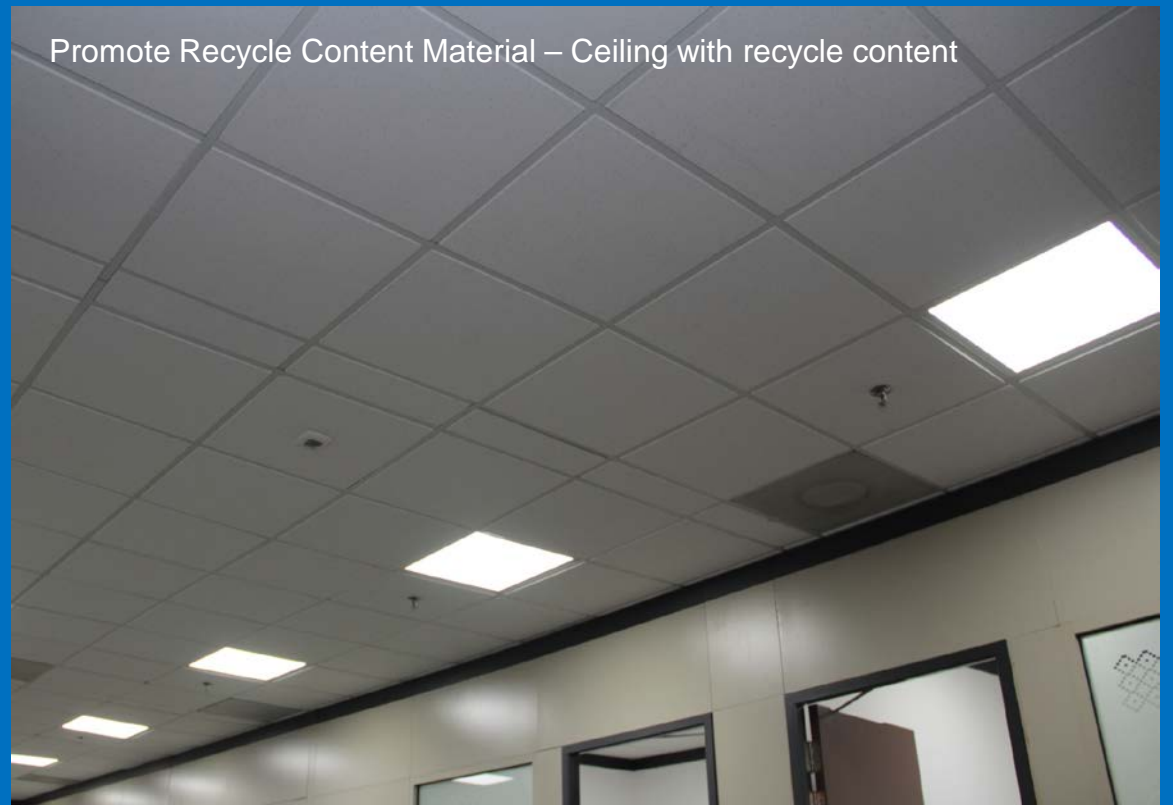
**97%**  
peratus bateri tidak dikitar semula menyebabkan pembuangan sebanyak **8000 ton** bateri setahun

Promotion of Recycling

 **KFM** Solutions for built environment

The infographic features a green globe with a white map of the world, surrounded by stylized green and white daisies and battery icons. The text is in a clean, sans-serif font. At the bottom, there is a small circular seal and the KFM logo with the tagline 'Solutions for built environment'.

Promote Recycle Content Material – Ceiling with recycle content





# WATER EFFICIENCY

## 11 out of 12 GBI Points

Rain Water Harvesting  
Irrigation System  
Water Leakage Detection System



Recycling of Ablution Water

### Water Efficient Plumbing and Sanitary Fitting



# INNOVATION

## 10 out of 10 GBI Points

Condensate Water Recovery  
Heat Pipes  
Central Vacuum System



Composite Machine - Production of Compost from organic waste



Perdana Putra : The Making of A High Performance Green Building

# PERDANA PUTRA



THE MAKING OF A HIGH PERFORMANCE GREEN BUILDING

[Click Here for Video Presentation](#)



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# PROGRAM PENGURANGAN TENAGA DAN KECEKAPAN TENAGA

STRATEGI PERLAKSANAAN BERTERUSAN

Oleh KFM HOLDINGS SDN. BHD.



# Green and Energy Efficiency Implementation

## CONSULTING

Energy Management

Sustainability

Asset Condition Audit

## ENGINEERING

Building Envelope

Energy Efficiency

Water Efficiency

Indoor Environmental Quality

Sustainable Features

Renewable Energy

Building Management System

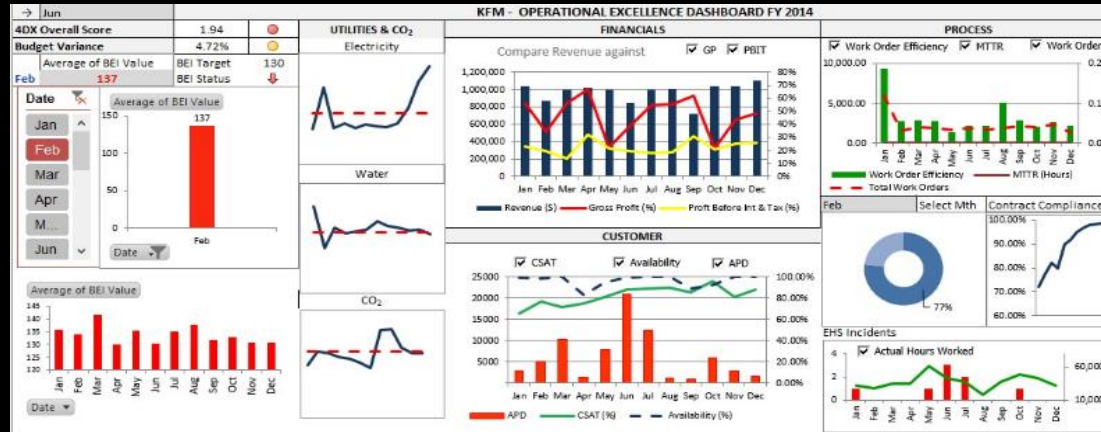
## OPERATIONS

Integrated Facilities Management

Integrated Operations Centre

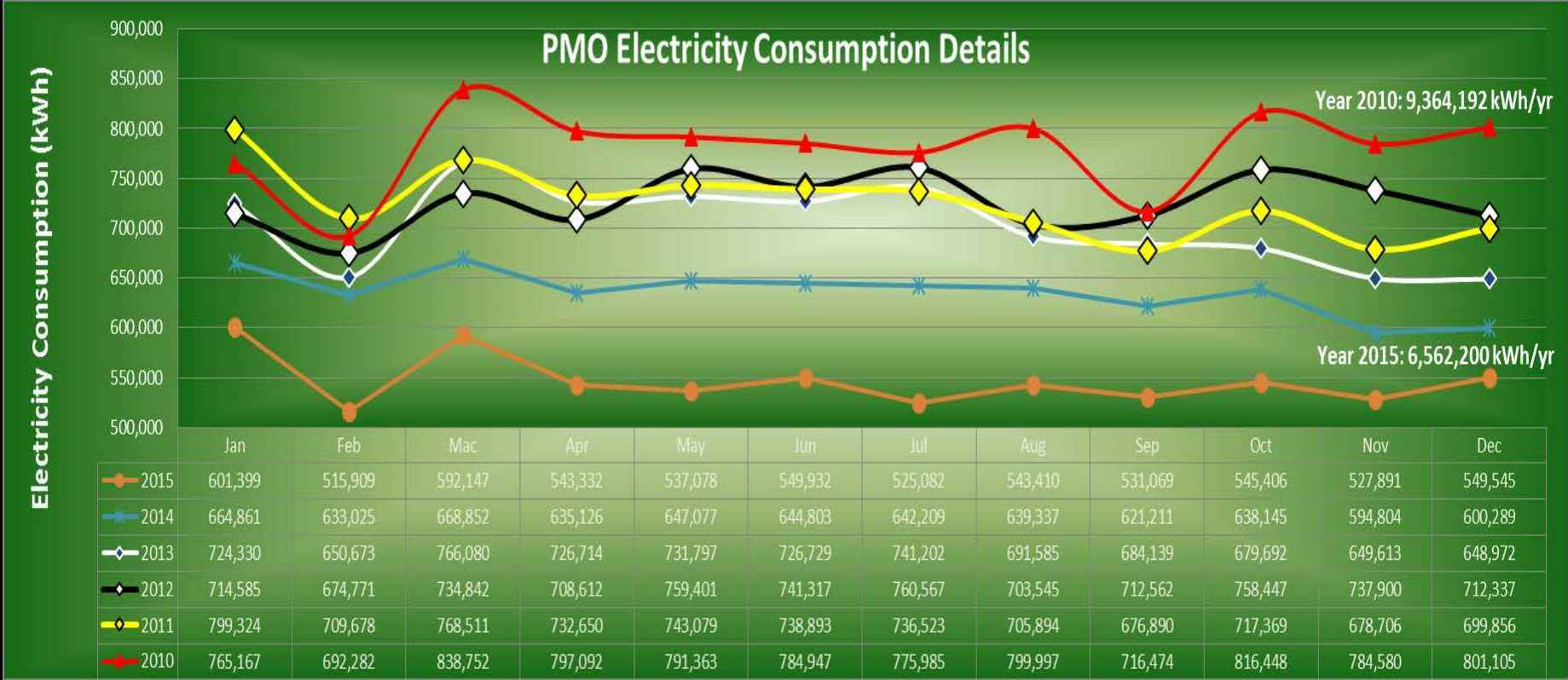
Asset Lifecycle Management

# Integrated Operation Centre (IOC)



- Continuous Commissioning
- Data monitoring
- Energy Management
- CVA Monitoring
- Call Center

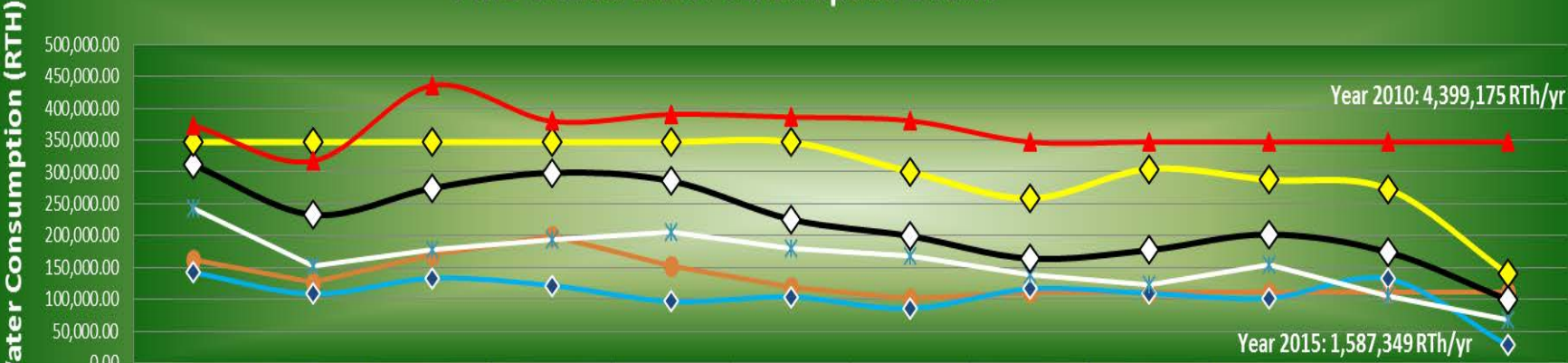
# Utility Monitoring



30% Saving

# Utility Monitoring

## PMO Chilled Water Consumption Details



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	161,900	126,400	169,924	198,925	151,716	119,506	100,858	111,624	111,624	111,624	111,624	111,624
2014	142,100	108,500	133,100	121,700	96,600	103,700	85,500	116,300	109,500	101,900	131,900	28,000
2013	243,100	152,800	177,900	193,800	204,700	179,900	168,500	138,900	122,800	153,500	106,100	68,500
2012	311,523	232,921	274,603	298,766	285,700	225,600	199,300	164,000	177,300	201,900	173,900	99,300
2011	347,181	347,181	347,181	347,181	347,181	347,181	300,421	258,501	304,848	287,751	273,073	140,053
2010	373,300	317,200	435,800	379,700	390,580	386,190	380,500	347,181	347,181	347,181	347,181	347,181

64% Saving



# Utility Monitoring

PMO Water Consumption Details



	Jan	Feb	Mac	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	6,217	6,111	7,168	7,375	7,657	5,982	6,791	7,340	6,349	8,028	9,081	7,100
2014	5771	6428	7437	6,364	6,011	7,564	7,404	7,849	9,382	6,643	6,089	6767
2013	7,656	8,207	8,017	9,311	7,473	7,137	6,304	7,068	7,421	9,644	7,107	6,063
2012	7,369	7,174	7,084	7,400	7,046	7,548	7,307	8,612	7,972	7,543	7,142	7,428
2011	9,786	13,340	10,525	9,879	10,594	8,415	5,985	7,945	7,945	3,779	7,623	8,386
2010	11,830	12,529	10,891	12,352	8,850	10,778	11,057	10,011	8,864	12,064	11,423	12,965

36% saving



# Utility Monitoring

Using The Formula  
Given by GDC:

$$\text{kWh} = \text{RTh} \times 3.517/3.8$$



Combining GDC Usage and  
Electricity Usage in kWh results  
into:

**40%  
saving**



Energy Type	2010 PMO Consumption			2011 PMO Consumption			2012 PMO Consumption			2013 PMO Consumption			2014 PMO Consumption			Current Consumption (2015)	
	Months	kWh/mth	RM	kWh/mth	RM	kWh/mth	RM	kWh/mth	RM	kWh/mth	RM	kWh/mth	RM	kWh/mth	RM/mth		
Total Energy (TNB Electricity & GDC in kWh)	January	1,110,665.97	405,393.08	1,120,649.15	409,036.94	1,002,907.73	366,061.32	949,325.45	346,503.79	796,378.29	290,678.08	751,241.71	274,203.22				
	February	985,858.95	359,838.52	1,031,003.15	376,316.15	890,345.52	324,976.11	792,093.42	289,114.10	733,444.61	267,707.28	632,895.53	231,006.87				
	March	1,242,096.37	453,365.17	1,089,836.15	397,790.20	988,994.30	360,982.92	930,731.13	339,716.86	792,039.55	289,094.44	749,416.13	273,536.89				
	April	1,148,514.34	419,207.73	1,053,975.15	384,700.93	985,127.80	359,571.65	906,081.00	330,719.57	747,762.55	272,933.33	727,442.32	265,516.45				
	May	1,152,855.07	420,792.10	1,064,404.15	388,507.52	1,023,823.87	373,695.71	921,252.24	336,257.07	736,482.84	268,816.24	677,495.15	247,285.73				
	June	1,142,376.01	416,967.24	1,060,218.15	386,979.63	950,115.74	346,792.24	893,231.18	326,029.38	740,780.08	270,384.73	660,537.95	241,096.35				
	July	1,128,147.76	411,773.93	1,014,570.54	370,318.25	945,024.39	344,933.90	897,153.18	327,460.91	721,341.50	263,289.65	618,428.73	225,726.49				
	August	1,121,322.15	409,282.59	945,143.48	344,977.37	855,331.32	312,195.93	820,140.61	299,351.32	746,975.71	272,646.13	646,720.95	236,053.15				
	September	1,037,799.15	378,796.69	959,034.85	350,047.72	876,657.82	319,980.10	797,793.63	291,194.68	722,556.13	263,732.99	634,379.95	231,548.68				
	October	1,137,773.15	415,287.20	983,690.12	359,046.89	945,310.76	345,038.43	821,760.29	299,942.51	732,456.13	267,346.49	648,716.95	236,781.69				
	November	1,105,905.15	403,655.38	931,442.25	339,976.42	898,849.03	328,079.89	747,811.34	272,951.14	716,880.92	261,661.54	631,201.95	230,388.71				
	December	1,122,430.15	409,687.01	829,478.74	302,759.74	804,241.76	293,548.24	712,370.55	260,015.25	626,203.74	228,564.36	652,855.95	238,292.42				
<b>AVERAGE</b>		<b>1,119,645.35</b>	<b>408,670.55</b>	<b>1,006,953.82</b>	<b>367,538.15</b>	<b>930,560.84</b>	<b>339,654.71</b>	<b>849,145.34</b>	<b>309,938.05</b>	<b>734,441.84</b>	<b>268,071.27</b>	<b>669,277.77</b>	<b>244,286.39</b>				



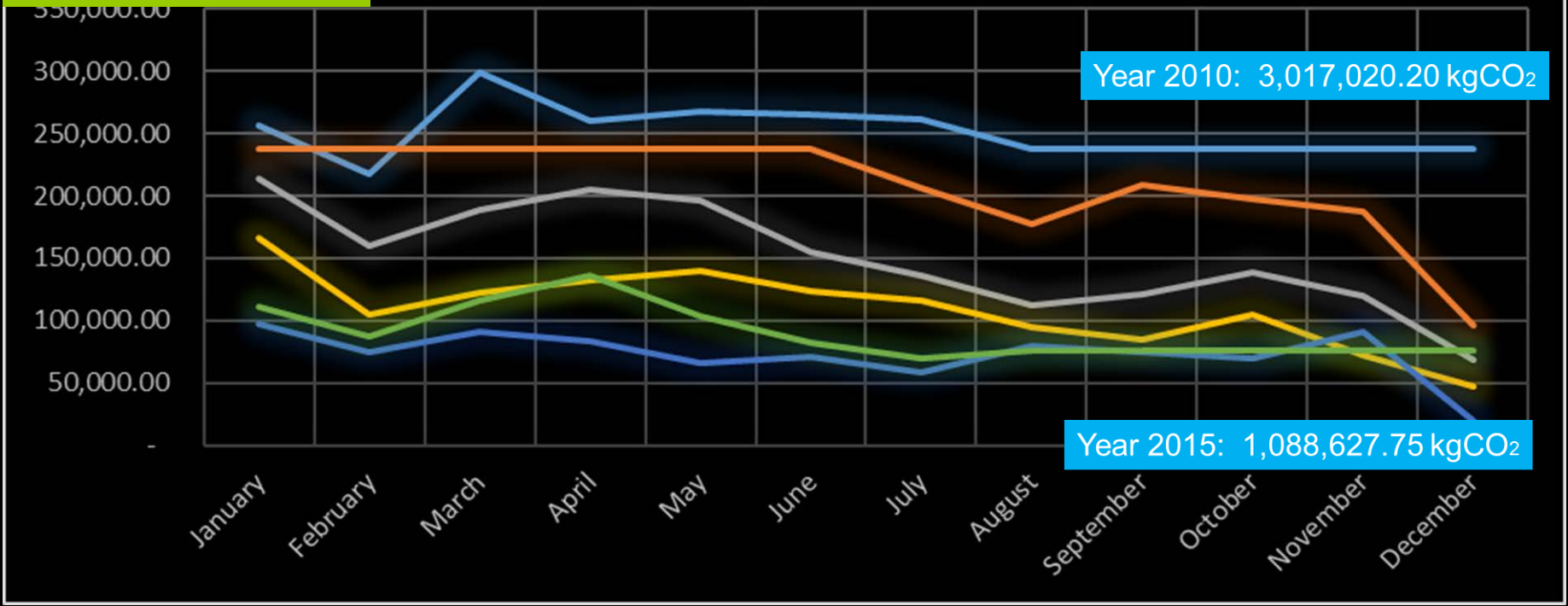
# Carbon Footprint Monitoring

CO<sub>2</sub> Usage  
(1 kWh =  
0.741kgCO<sub>2</sub>)

64% Saving!!!

### CO<sub>2</sub> PMO Consumption in kg

2010 2011 2012 2013 2014 2015



Year 2010: 3,017,020.20 kgCO<sub>2</sub>

Year 2015: 1,088,627.75 kgCO<sub>2</sub>

# Monthly Dashboard

## ENGINEERING

### ENERGY SAVING

■ 2014-2015 against 2013-2014  
■ 2014-2015 against 2010 (Baseline)



**9.7%**  
38.9%

Savings of Overall Energy Consumption



**7.6%**  
61.4%

Savings of Gas District Cooling (GDC) Consumption



**9%**  
0%

Solar Energy Contribution from the total energy used



**15.7%**  
26.7%

Reduction of Electrical Consumption



**86 kWh**  
138 kWh

m<sup>2</sup>/YEAR (BEI)

## ECONOMIC



**6.6%** 4.2%

Reduction of Electricity Bill



**1.8%** 37.5%

Reduction of Water Consumption

## ENVIRONMENT



**1,080 Kg**

Of Organic Waste diverted from landfills



**2,410 Nos**

New Plants was planted



**8,496,530.9 M<sup>3</sup>**

Recycled Natural water resources from nearby lake for Irrigation

# Experience Sharing

## The Making of A High Performance Green Building in Live Occupied Government Building

- **Commitment from stakeholders are key to success**
  - Integrated Design Process through active collaboration and participation from the users and clients
- **Active Project Planning and Execution Capabilities**
  - To accommodate and mitigate for uncertainties in the project.
- **Continuous Improvements**
  - To engage the knowledge and experience horizontally and vertically and continuously seeking further improvement jointly with internal and external parties of interest.
- **Green and Sustainability pay off over the long run**
  - The benefits of green building go beyond cost. Once the systems are in place, it is satisfying to see the end results and maintain such a facility

# THE FUTURE IS GREEN, SMART & CONNECTED

## Solutions for the Built Environment – A Better Future for All



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