



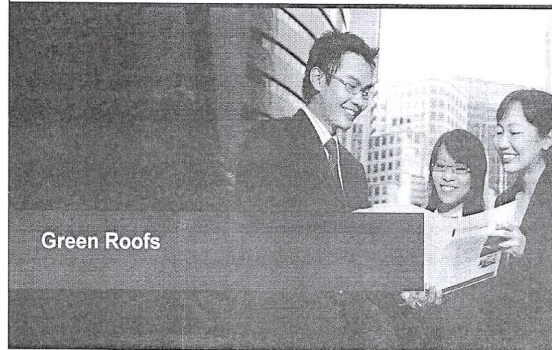
CASE STUDIES OF GREEN MEASURES AND LIKELY IMPACT ON PROPERTY VALUES

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CONTENTS

- o Areas of Case Studies
 - Green Roofs
 - Energy Savings
- o Green Roofs
 - Background
 - Prefabricated Extensive Green (PEG) Roof
 - Measurements-Before and After Implementation
 - Cost Make-up
 - Impact on Values
- o Energy savings
 - Energy Savings Measures
 - Typical Savings
 - Case Studies
 - Impact on Values

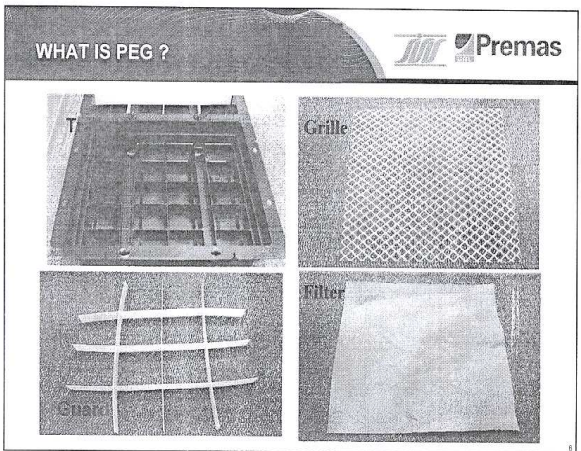
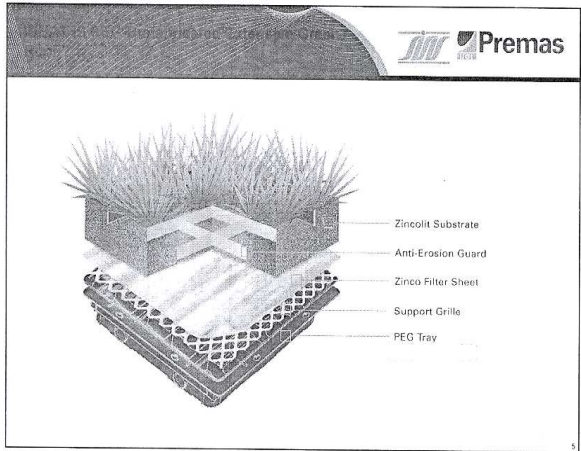


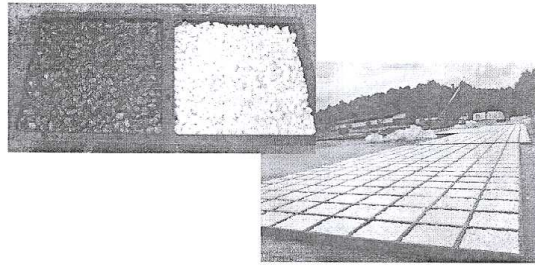
BACKGROUND

- PEG stands for **P**refabricated **E**xtensive **G**reen Roof Tray System
- It was jointly developed by Housing Development Board, National Parks Board and UGL Premas



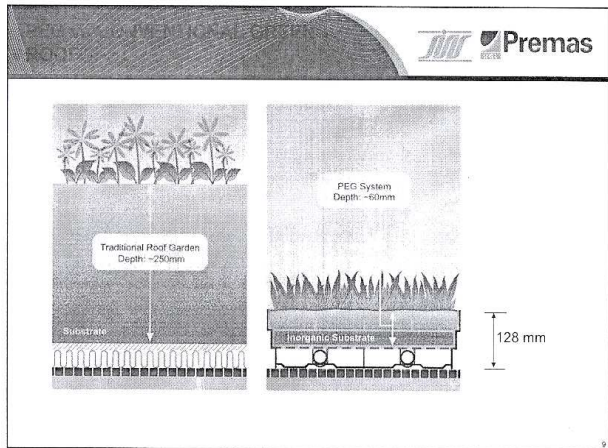
- Development work started in 2004







Plants replaced by coloured stones in PEG trays







- Pre-fabricated**
 - pre-assembled and planted with the desired vegetations before installation commences
 - instant gardening can be achieved



Before

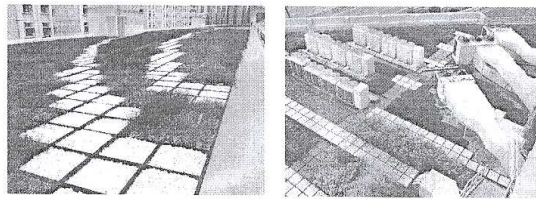
After 30 mins

FEATURES OF PEG



- **Flexible and portable**

- Assembly of PEG trays forms a grid, enabling the creation of patterns to achieve aesthetic effects



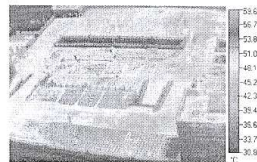
11

Measurement before and after installation

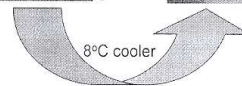


Thermal Graphs of Toa Payoh Blk 141A

Before installing PEG Tray System

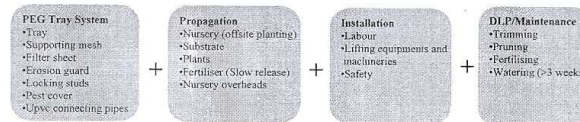


After installing PEG Tray System



12

Typical cost component for PEG System implementation



Cost - Singapore \$100 per square metre

Possible Savings

- Lower Maintenance Cost of Roof Tops as surface temperature is reduced
- Less heat transfer to the floor below the roof


Impact on Values

- Lower Maintenance Cost of Roof Tops as surface temperature is reduced
- Less heat transfer to the floor below the roof
- Quantitative measurement – under studies





COMMON ENERGY SAVING MEASURES

- Chiller optimisation
- Chiller retrofit
- Chiller plant consolidation
- System optimisation
- Pump sizing
- Variable speed pumps
- Fan sizing
- Variable speed fans
- High efficiency motors
- Cooling load reduction
- Ventilation control
- Space temperature reset
- Optimum Start / Stop
- Lighting controls
- High efficiency lighting
- Demand limiting

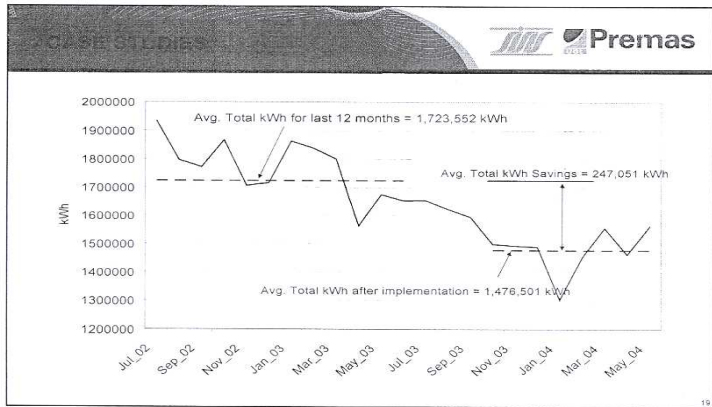
Case Studies 


	Immediate Measures	Long-term Measures
% of savings of Landlord's Electricity Consumption	5% - 20%	15% - 30%
Payback period	1 - 2 years	5 years
ROI	50%	20%


17

- Case Studies 
- 

- Office tower
 - **52 storey multi-tenanted office building**
 - **Annual electricity cost \$2,700,000**
 - Some built-in Energy Saving Features
 - **Configuration of chillers**
 - **Automatic condenser tube cleaning systems**
 - **Variable speed pumps**
 - **Variable speed AHU fans**
 - **Demand based lighting controls**
 - **CO based car park fan speed control**
 - **Demand based escalator controls**
 - **Intelligent building control systems**
- 18

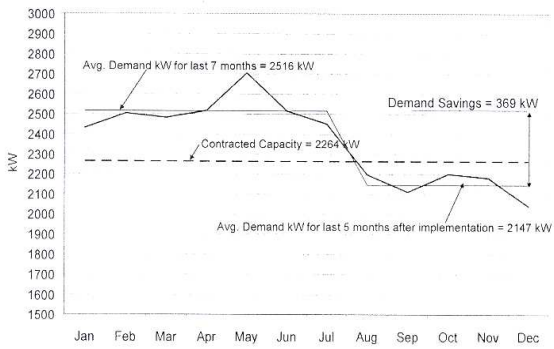


CASE STUDIES 



- Office tower
 - 42 storey multi-tenanted office building
 - Recently retrofitted
 - Annual electricity cost S\$1,750,000
- Savings measures
 - Optimisation of chiller operations
 - Optimisation of chilled water & condenser water pumping systems
 - Optimisation of cooling tower operations
 - Demand based control of car park ventilation fans
- Summary of savings
 - \$250,000 a year (14% reduction)
 - kWh reduction of 17%
 - Simple payback of 0.9 years

20



Current Quarter Electricity Charge = 19.81 Cents (Singapore) per KWH

52 Storey Office Building

Net Lettable Area (m2)	68,827
Savings	
Kwh (per month)	247,051
Amount (per month)	SGD 48,941
Rate	
(SGD per sqm per mth)	SGD 0.71
Pay Back (years)	5
Life Cycle of	
Equipment (Years)	15

52 Storey Office Building

NPV of Cost Savings (SGD) @ 6%	\$8,809,345
Capital Outlay (SGD)	\$2,936,448
Net Savings (SGD)	\$5,872,896

23

52 Storey Office Building

Market Value (SGD m) as at 31 Dec 2007	\$1,224
Purchase Price on Acquisition (SGD m)	\$794
Net Savings as a %tage of Value as at 31 Dec 2007	0.48%
Net Savings as a %tage of Purchase Price on Acquisition	0.74%

24

42 Storey Office Building	
Net Lettable Area (m2)	46,118
Savings	
Kwh (per month)	
Amount (per month)	SGD 20,833
Rate (per sqm per mth)	SGD 0.45
Pay Back (years)	0.9
Life Cycle of Equipment (Years)	10

42 Storey Office Building	
NPV of Cost Savings (SGD)	\$2,500,000
Capital Outlay (SGD)	\$225,000
Net Savings (SGD)	\$2,275,000

42 Storey Office Building

Market Value (SGD m) as at 31 Dec 2007	\$1,249
Purchase Price on Acquisition (SGD m)	\$675
Net Savings as a %age of Value as at 31 Dec 2007	0.18%
Net Savings as a %age of Purchase Price on Acquisition	0.34%