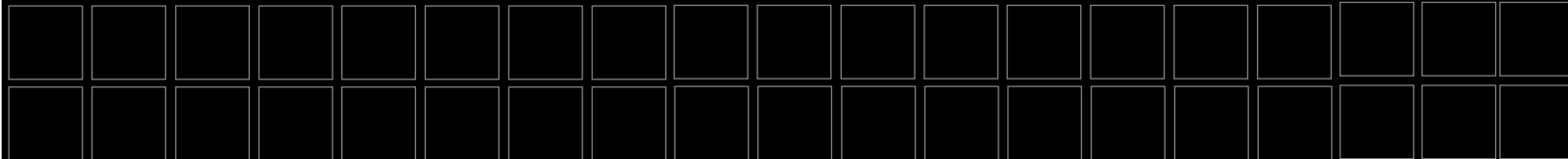
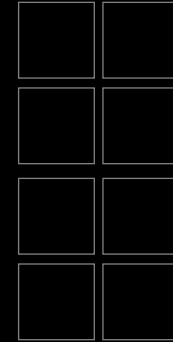


EC-ASEAN Energy Facility (EAEEF)



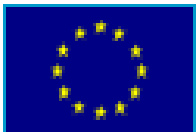
Projects 64 and 68 2nd Project Meeting



Development of a Business Model for Building Energy Performance Services in the ASEAN Region (Project 64) - Project Updates

A/Prof Lee Siew Eang
Energy Sustainability Unit
National University of Singapore





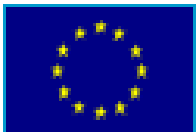
Outline of Presentation

First 8 Months Schedule & Responsibilities (Updates)

Tasks/Sub Tasks Updates

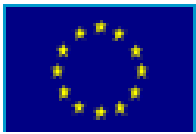
Information Centre Updates

Schedule and Targets for Next 6 Months



First 8 Months Schedule & Responsibilities (Updates)

First Year (2005)	CTBP-NUS	PTM	IEN	INVIE (Advisory)
Feb	1.1			
Mar	1.1		1.2	1.2
April			1.2	1.2
May	1.3_2.1	1.3_2.1_3.1	1.2	1.2_1.3_2.1_3.1
Jun	1.3_2.1	1.3_2.1_3.1		1.3_2.1_2.2_3.1
July	1.3_1.4_2.1_2.2_3.2	1.3_1.5_3.1	1.5	1.3_1.4_1.5_2.1_2.2_2.3_3.1_3.2
Aug	1.3_2.2_3.2	1.3_1.5_2.2_3.1	1.5	1.3_1.5_1.7_2.1_2.2_2.3_3.1_3.2
Sept	2.2_2.3_3.2	2.2	2.3	2.2_2.3_3.2



Tasks/Sub-Tasks

Task 1: Investigation to identify and develop a suitable base model for energy performance of commercial building (Main Action)

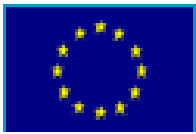
Sub-Task

1.1 Project inception meeting (CTBP)

1.2 Review energy simulation methods commonly used in the region (IEN)

1.3 Field data collection (6 in Singapore and 6 in Malaysia) (CTBP,PTM)

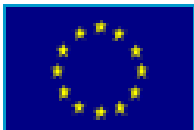
1.4 Workshops among members (CTBP)



Tasks/Sub-Tasks

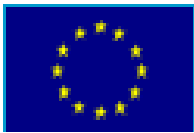
Task 1: Sub-Task

- 1.5 Verify performance of simulation methods using actual measured data (PTM, IEN)
- 1.6 Development of a base model for building energy simulation (CTBP)
- 1.7 Group meeting and study tour to key centers in Europe (INIVE-EEIG)
- 1.8 Develop measurement and verification protocol (M&VP) (CTBP, IEN)
- 1.9 Preparation of report (CTBP, IEN)



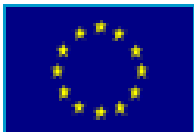
Task 1 (Updates)

Sub-Task No	Update	Remarks
1.1 CTBP	Completed	Inception Meeting held on 30-31 Mar 2005 in Athens, Greece
1.2 IEN	Completed	Review Report will be presented at 2 nd meeting
1.3 CTBP/IEN	On-going Target: 4/2006	1. CTBP in process of collecting 4 buildings data 2. PTM has not provide info on any building data
1.4 CTBP	In preparation	22-23 September 2005, Belgium
1.5 PTM/IEN	On-going Target: 4/2006	Progress report will be presented at 2 nd meeting
1.7 INIVE-EEIG	On-Going Target :11/2005	To provide more information at 2 nd meeting



List of Simulation Methods Investigated

Methods	Description	Output	Remarks
Statistical Regression Models	Linear , Multiple Regression	<ol style="list-style-type: none"> 1.Easy to establish 2.Most commonly used 3.Carried out modelling on 6 buildings 	Fair accuracy
Computational Simulation	Neural Network, Support Vector Machines (SVM) Design Builder (EnergyPlus) eQuest (DOE-2.0) Visual DOE 4.0	<ol style="list-style-type: none"> 1.High accuracy 2.Complex to use <ol style="list-style-type: none"> 1.High accuracy 2.Easy to use 3.Detailed description 	For practical reason, SVM too complicated without user interface <ol style="list-style-type: none"> 1.Time consuming. Large building information (2 Weeks) 2.Need large pool of data.



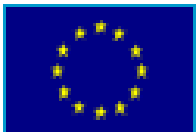
EC-ASEAN Energy Facility (EAEF) Commencement Meeting



Results of Simple Linear Regression (SR)

Building	Annual Energy Use (kWh/m ² /month)		MAE (%)	CV	VAR(Model) (kWh/m ² /month)	90%PI (%)
	Measured	Modeled				
A	20.26	20.59	1.64	3.80	1.35	10.06
B	32.87	32.09	2.42	2.78	2.60	2.9
C	28.59	24.22	15.33	3.49	29.79	48.15
D	25.55	25.76	0.8	3.76	2.05	2.59
E	18.81	18.34	2.5	3.32	2.83	3.04

For example: the final predicted result of building A are expressed as $20.59 \pm \sqrt{1.35}$, within 20.59 ± 10.06 prediction interval



EC-ASEAN Energy Facility (EAEF) Commencement Meeting



Results of Multiple Linear Regression (MLR)

	Baseline Year	Prediction Year		MAE(%)		CV(%)		VAR		PI	
		SR	MLR	SR	MLR	SR	MLR	SR	MLR	SR	MLR
G	23.52	24.11	24.14	2.51	2.63	7.11	5.18	3.96	2.05	4.15	3.30
H	30.31	28.63	30.35	5.53	0.14	8.26	3.97	8.9	2.05	5.72	3.72
I	22.86	23.66	23.66	7.44	3.49	12.63	11.37	13.44	9.71	6.73	5.90

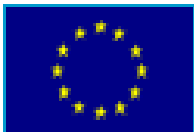
Improvements

97%

52%

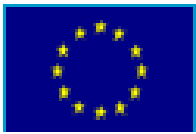
77%

35%



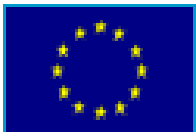
Results of Neural Network Modelling (NN)

Building Ref. No.	Actual Value (kWh/month/ m²)	Predicted value	CV (%)	MAE (%)
K	10.55	10.39	9.67	-1.5
L	11.05	11.12	15.5	0.64
M	9.54	10.23	15.12	7.33
N	12.59	11.82	14.17	-6.2



Results of Support Vector Machines (SVM)

Building Ref. No.	Actual Value (kWh/month/m ²)	Predicted value	CV (%)	MAE (%)
K	10.55	10.26	2.69	-2.72
L	11.05	11.43	2.39	3.44
M	9.54	9.61	1.28	0.68
N	12.59	12.35	0.99	-1.89
			<3%	<4%



Tasks/Sub-Tasks

Task 2: Develop energy services project documentation

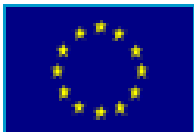
2.1 Review existing standard forms of contract (CTBP)

2.2 Develop standard forms of contract for energy retrofit projects (CTBP)

2.3 Development of tender document and specification (CTBP)

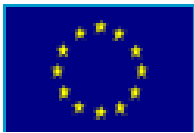
2.4 Document project procurement and procedures and evaluation (CTBP)

2.5 Seminar workshop to disseminate findings and seek feedback from industry (CTBP)



Task 2 (Updates)

Sub-Task No	Updates	Remarks
2.1 CTBP	Brought-backward Actual Target : 7/2005 Revised Target : 11/2005	Funding arrangement to be finalised
2.2 CTBP	On-going Target : 10/2005	Funding arrangement to be finalised
2.3 CTBP	On-going Target : 4/2005	Funding arrangement to be finalised



Tasks/Sub-Tasks

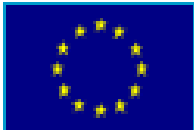
Task 3: Review local financing practices and options and develop document templates for project financing and the computation of returns and benefits

Sub-Task

3.1 Review European and ASEAN experiences in performance contracting (PTM)

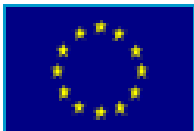
3.2 Investigate local and regional financing options for energy performance (CTBP)

3.3 Prepare documentary requirements of each financing option (CTBP)



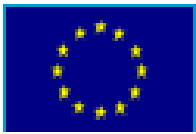
Task 3 (Updates)

Sub-Task No	Updates	Remarks
3.1	Completed (1 st Part)	1. 1 st review report will be presented at 2 nd meeting 2. 2 nd Part to start: 2/2005 and finish 4/2005
3.2	On-going Target: 10/2005	



Review of Singapore's Experience in Performance Contracting

	Description	Remarks
Ministry of Finance (MOF) National Environment Agency (NEA)	<ul style="list-style-type: none">•Pilot Energy Saving Project for Public Sector Facilities•Involve 8 Public Sector Agencies 2 Types of Model: <ol style="list-style-type: none">1.Shared Savings model2.Guaranteed Savings model	First government initiative to encourage the use of performance contracting for energy retrofitting projects Lunched on 7 April 2005
ESCOs	Review through application submitted for ESCO Accreditation Scheme (Auditing Services)	On-going and gathering feedback from ESCOs through survey.



Information Centre

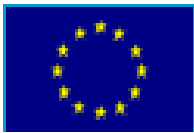
1. Seminar and Workshops

Seminar on Energy Management Best Practices & Technologies

Organized jointly by Singapore Association for Environmental Occupational Health and Safety Companies (SAFEco) and ESU/NUS University of Singapore ,
7 April 2005, Hotel Le Meridien, Singapore.

2. Website

Launched on 7 April 2005 . We address : www.esu.com.sg



EC-ASEAN Energy Facility (EAEF) Commencement Meeting



Information Centre – Seminar Info (Pg 1)

REGISTRATION FORM

Seminar on Energy Management Best Practices & Technologies

Date: Thursday 7th April 2005
Time: 9:00am - 6:00 pm
Venue: Hotel Le Meridien
 100 Orchard Road Singapore
Fees: \$100 (SMEs & Members)
 \$200 (Non-SMEs & Non-Members)
(includes lunch, seminar materials, GST & parking)

For more information, please contact Mr. Pearyn Tan at Tel: 6291 8111 or Fax: 6291 7183 or Email: Info@esucap.org.sg

Name: _____
Designation: _____
Company: _____
Address: _____
Tel: _____ **Fax:** _____
E-mail: _____

Please tick where applicable
 [SMEs/Member] [Non-Member]

Cash charges to be made payable to Singapore Association For Environmental Companies and related to 10, River Valley Road #05-02A River Valley Point, Singapore 149510 no later than 26th March 2005. The organizer reserves the right to change registration fee in the best interests of the programme. No cancellations or transfers. Seating is on a first-come, first-served basis. No refund will be given to you nearer to the event. Please inform us if you don't receive it.

The Straits Times
Wednesday March 9, 2005
\$10m kitty to help firms
check energy spending

Environment and Water Minister Yaacob Ibrahim announced the setting up of a \$10million fund that the companies could use to do energy appraisals.


In this seminar you can understand from the experts how energy efficiency can improve your bottom line & how to make use of various funding opportunities available. Also hear from companies, hotels, and commercial buildings what prompted them to embark on the path of energy efficiency and how they have benefited from the experience.


This will be a one-stop seminar for all your energy efficiency related questions on technology, services, funding, real life experiences and more.

Seminar
on
Energy Management
Best Practices
&
Technologies


7th April 2005
Hotel Le Meridien


Organised by:

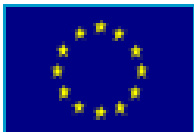
 Singapore Association For Environmental Companies and Related Energy Companies

 National University of Singapore

Supported by:

 Singapore Environment Agency

 Singapore Green Building Council



EC-ASEAN Energy Facility (EAEF) Commencement Meeting



Information Centre – Seminar Info (Pg 2)

The only way that Singaporeans could do more to reduce air efforts at consumption, make sure we get maximum mileage out of the energy we consume, don't waste it!"
(DPM Lee on 21 May '04)

Seminar on Energy Management Best Practices & Technologies

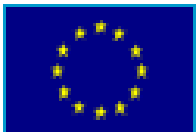
Continued instability in the Middle East and soaring global demand for oil has resulted in record highs in oil prices. All this may lead to "costlier power". (DPM Lee on 21 May '04). Business challenges like maintaining cost competitiveness and managing the environmental impact of energy consumption can provide new opportunities. De-regulation and liberalisation in the electricity industry has seen some innovative and market driven energy products like performance contracting as well as a whole range of innovative strategies and new technologies. Are these technologies practical, tried & tested. Can these new opportunities translate into lower energy bills?

In order to assist industry with the impact of these challenges as well as to promote energy efficiency, SAFECO, NEA, NUS and EMA has jointly organised this seminar. A number of technologies with case studies will be presented for discussion.

ENERGY MANAGEMENT BEST PRACTICES AND TECHNOLOGIES

7th April 2005, Hotel Le Meridien, Singapore

0830	Registration	
0800	Welcome Address by SAFECO Chairman, Mr. Edwin Khoo	
0810	Address by Guest of Honour, Senior Parliamentary Secretary Ministry of Environment & Water Resources, Assoc Prof Eon Tsal Kee	
0825	Changing the Energy mindset to improve your bottom line by Mr Vincent Lee, Chairman, Industry Committee for Energy Efficiency (ICEE)	
0800	Presentation on funding of Energy Efficiency & Renewable Energy projects by Dr Mike Allen, REEEP Founder	
0930	TEA BREAK	
1000	Presentation on Energy Efficiency Improvement Accelerate Scheme (EIAS) by Mr Ananda Rana Ghoshal, Chief Engineer, Resource Conservation Department, National Environment Agency	
1000	A Proposed ISO9000 Accreditation Programme by Mr Prof Lee Siew Eng, Head, Energy Sustainability Unit (EDU's LEAP Partner), National University of Singapore	
1000	Reliability Ombud: Performance Contracting Case Study - Mr David Siew, General Plant Engineer, Reliability Ombud Asia Pacific Pte Ltd	
1030	Panel Discussion	
1000	LUNCH	
1430	Track 1 - Manufacturing Overview of Energy Efficiency for the Manufacturing Sector - Challenges & Opportunities by Dr Josephine Kim, Chairman, Industry sub-committee, National Energy Efficiency Committee	Track 2 - The Building Energy Performance Benchmarking for Commercial Buildings in Singapore by Mr Muzil Haji Sagor, Manager, Energy Sustainability Unit (EDU's LEAP Partner), National University of Singapore
1600	Case Study of Energy Management in the pharmaceutical sector by Mr Goh Peng Lim, Chairman, MEIC Pharmaceutical Workshop	Examining Energy Efficiency - Case Study by Mr Edward Huan, Director of Engineering, Royal Plaza On Street, ASLEAP Energy Award Winner
1530	Energy Management Opportunities and Strategies in the Chemical and Petrochemical Sector by Mr Mark Doran, Project Manager-Energy, Asia Pacific, Shell Global Solutions	Achieving Optimum Energy Efficiency by Benchmarking in commercial building: A performance contracting case study by Johnson Control
1600	TEA BREAK	TEA BREAK
1630	Market Rules for Co-generation by Mr Soh Sai Goo, Deputy Director, Regulation Division, Energy Market Authority	Building Office Building Energy Consumption by Mr Dong Sang, Energy Sustainability Unit (EDU's LEAP Partner), National University of Singapore
1700	Optimization of Chilled Water System by Mr Yoon Chin Hoek, Section Manager, Site Facilities, STMicroelectronics	Facility optimization in buildings by Mr Martin Lim, Director, Business Development, Southeast Asia, Honeywell Building Solutions
1730	Panel Discussion	Panel Discussion

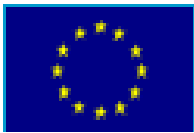


EC-ASEAN Energy Facility (EAEF) Commencement Meeting



Information Centre – Website



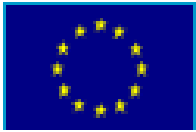


EC-ASEAN Energy Facility (EAEF) Commencement Meeting



Next 6 Months Schedule & Responsibilities

First Year (2005)	CTBP-NUS	PTM	IEN	INVIE (Advisory)
Oct	1.3_2.2_2.3_3.2_3.3	1.3_1.5_2.2_3.1	1.5_2.3_3.3	1.3_1.5_2.2_2.3_3.1_3.2_3.3
Nov	1.3_1.6_2.3_3.3	1.3_1.5	1.5_2.3-3.3	1.3_1.5_2.3_3.3
Dec	1.3_1.6_1.8_2.3_2.4_3.3	1.3	1.7_2.3_2.4-3.3	1.3_1.8_2.3_3.3
Second Year (2006)				
Jan	1.3_1.4_1.6_1.8_1.9_2.3_2.4_2.5_3.3	1.3_1.5_2.5	1.5_1.8_1.9_2.3_2.4_3.3	1.5_1.8_1.9_2.3_3.3
Feb	1.3_1.8_1.9_2.3_2.4_3.3_4.1	1.3_1.5_3.1	1.5_1.8_1.9_2.3_2.4_3.3	1.3_1.5_1.8_1.9_2.3_3.1_3.3
Mar	1.3_1.8_1.9_2.3_2.4_3.3_4.1	1.3_1.5_3.1	1.5_1.8_1.9_2.3_2.4_3.3	1.3_1.5_1.8_1.9_2.3_3.3



Thank You

