

FINAL EVALUATION

*Malaysian Industrial Energy Efficiency Improvement Project
(MIEEIP)*

**Government of Malaysia
United Nations Development Programme
Global Environment Facility**

FINAL VERSION

January 2008

**Jan van den Akker
International consultant, ASCENDIS**

LIST OF ABBREVIATIONS

AAIBE	<i>Akaun Amanah Industri Bekalan Elektrik (= MESITA)</i>
ACEM	Association of Consulting Engineers Malaysia
ASEAN	Association of South-East Asian Nations
APR-PIRs	annual project implementation reviews
CETDEM	Centre for Environment, Technology and Development, Malaysia
CETREE	Centre for Education and Training in Renewable Energy and Energy Efficiency
CO ₂	carbon dioxide
CPC	Chief Project Coordinator
CTA	Chief Technical Advisor
DANIDA	Danish International Development Assistance
DOS	Department of Statistics
EC	Energy Commission (= <i>ST</i>)
ECCJ	Energy Conservation Centre of Japan
EE	energy efficiency
EEPLS	Energy Efficiency Projects Lending Scheme
EPC	energy performance contracting
EPU	Economic Planning Unit (of Prime Minister's Office)
ESCO	energy services company
EUI	energy use index
FMM	Federation of Malaysian Manufacturers
FRIM	Forest Research Institute Malaysia
GEF	Global Environmental Facility
GHG	greenhouse gas
GJ	gigajoules (= billion joules)
HEM	high-efficiency motor
IEM	Institution of Engineers of Malaysia
JETRO	Japan External Trade Organization
JKR	<i>Jabatan Kerja Raya</i> (Public Works Department)
k	kilo
KTAK	<i>Kementerian Tenaga, Air dan Komunikasi</i> (= MEWC)
MAESCO	Malaysian Association of Energy Services Companies
MASHRAE	Malaysian Chapter of American Society of Heating, Refrigerating and Air-Conditioning Engineers
MEPA	Malaysian Energy Professionals Association
MEPS	minimum energy performance standards
MESA	master energy service agreement
MESITA	Malaysia Electricity Supply Industries Trust Account (= <i>AAIBE</i>)
MEWC	Ministry of Energy, Water and Communications (= <i>KTAK</i>)
MIDA	Malaysian Industrial Development Agency
MIDF	Malaysian Industrial Development Finance
MIEEIP	Malaysia Industrial Energy Efficiency Improvement Project
MJ	megajoules (= million joules)
MNRE	Ministry of Natural Resources and Environment
NPC	National Productivity Corporation
NPD	National Project Director
NSC	National Steering Committee
PORIM	Palm Oil Research Institute of Malaysia
PTM	<i>Pusat Tenaga Malaysia</i> (Malaysia Energy Centre)
RM	Malaysian Ringgit
SESB	Sabah Electricity Sdn Bhd
SESCO	Sarawak Electricity Supply Company
SIRIM	Standards and Industrial Research Institute of Malaysia
ST	<i>Suruhanjaya Tenaga</i> (= EC)
tCO ₂	tonnes of CO ₂
TNB	<i>Tenaga Nasional Berhad</i>
UNDP	United Nations Development Programme
UNITEN	<i>Universiti Tenaga Nasional</i>
US\$ / USD	United States dollar

EXECUTIVE SUMMARY

Industrialization and modernisation has spread rapidly among certain Asian countries, including Malaysia. Consequently, the energy-intensive lifestyles of those living in the so-called developed countries is now being adopted more rapidly too. This implies increased energy use and increased emissions from automobiles, factories and power plants, leading to local air and river pollution as well as global warming and climate change.

Energy efficiency drive at the national level was first stated in the Seventh Malaysia Plan (1996-2000), which actually gave birth to the Malaysia Energy Centre (PTM). Energy efficiency is again explicitly addressed in the Ninth Malaysia Plan (2006-2010). The industrial sector is expected to implement measures for improvements in equipment and processes as well as end uses. In practice many barriers hamper the implementation of energy efficiency (EE). Main **barriers** include:

- Limited awareness of EE techniques and their economic benefits;
- Limited access to information on energy-efficient (EE) technologies and performance benchmarks for EE technologies;
- Unwillingness of industrial establishments to incur what are perceived to be the ‘high-cost / high-risk’ transactions;
- Preference of industries to focus on investments in production improvements rather than on efficiency;
- Insufficiently energy regulations (such as EE standards and labelling);
- Few EE technology demonstration projects either by industry or the Government;
- Inadequate and low-quality local energy support services;
- Lack of trained industry and financial sector personnel on energy management;
- Lack of financiers that are prepared and interested in financing EE investments as well as appropriate financing mechanisms;
- Lack of an approved national energy efficiency policy and action plan
- Insufficient financial resources for the adequate staffing of the implementing agencies involved (such as PTM) as well as for the implementation of EE measures

To address such barriers to energy efficiency and energy conservation in the country’s industrial sector, the Government of Malaysia initiated the **Malaysian Industrial Energy Efficiency Improvement Project (MIEEIP)** in 1999 to improve the rational use of energy in the industrial sector. Support and funding has been provided by the Global Environment Facility (GEF), the United Nations Development Programme (UNDP) as well as the Government of Malaysia and the private sector. UNDP is the project’s implementing agency on behalf of the GEF. The Ministry of Energy, Water and Communications (MEWC, formerly known as Ministry of Energy, Communications and Multimedia, during the initial implementation of the project) was appointed the project’s executing agency, whereas Pusat Tenaga Malaysia (PTM) is the designated implementing agency.

The project incorporates measures for capacity strengthening and a demonstration incentive scheme. MIEEIP initially focussed on eight energy-intensive industries (wood, rubber, food, ceramics, glass, pulp & paper, iron & steel and cement). During project implementation, three other sub-sectors were later added (plastics, textile and oleo-chemical). It is expected that at the end of the project Malaysia will have a foundation for continued efforts to capture the energy efficiency potential within the industry sector. At the end of the project, the project document mentions that the following **outcomes** will have been achieved:

1. Establishment and publication of (subsectoral) energy benchmarks;
2. Promotion of energy auditing as an effective tool for energy management;
3. Energy rating programmes for energy-efficient equipment;

4. Documented and widely disseminated information on energy-efficient processes, technologies and practices;
5. Trained and supported local energy service companies (ESCOs);
6. Implementation of significant energy efficient technology and processes demonstrations in collaboration with relevant agencies, private sector and financial institutions

In accordance with regulations of UNDP and GEF, a Final Evaluation has to be carried out under the responsibility of the GEF-implementing agency (i.e. UNDP), of which the results are presented in this report. An international consultant was fielded from 22 November - 5 December 2007 to undertake the final evaluation. During the mission, extensive discussions were held with the project team and representatives from UNDP Malaysia, EPU, MEWC, FMM, ESCOs and beneficiary companies. Relevant project documents were also analysed

The **achievements** of the project so far can be summarised as follows:

- The E-Benchmarking activities have successfully compiled a database of more than 1,500 industries built up from data sourced from the Department of Statistics (DOS), although the use of the tools has some limitations. MIEEIP has developed an Energy Efficiency and Conservation Guidelines for Electrical Equipment (EE&C Guidelines);
- A total of 54 industries have been audited under the project, in the following sub-sectors: cement (3), ceramic (6), iron & steel (4), food (10), glass (3), pulp & paper (6), rubber (9), wood (7), oleo-chemical (2), plastics (2) and textile (2). MIEEIP has produced a useful 56-page document called “Industrial Energy Audit Guidelines – A Handbook for Energy Auditors”;
- An energy efficient motor rating and labelling programme has been proposed to the Energy Commission, but is only implemented on a voluntary basis so far. A “Boiler Best Practice” guidebook has been developed;
- Various promotional materials that have been successfully developed and disseminated to stakeholders and beneficiaries, by means of the quarterly newsletter (MIEEIP News), articles in professional publications, newspaper articles and advertorials and by means of numerous workshops and seminars. MIEEIP has also helped to establish the MEPA, and association of energy experts, which is open to energy practitioners of various academic backgrounds. A special booklet “Achieving Industrial Energy Efficiency in Malaysia” was published by UNDP to highlight efforts of the MIEEIP and energy conservation efforts in Malaysia in general;
- A Master Energy Services Agreement (MESA) was drawn up by the MIEEIP Team at PTM as a sample document to assist ESCOs and industries in the implementation of energy efficiency activities. Despite this MIEEIP efforts in ESCO development as well as training and seminars, the ESCO industry in Malaysia has not developed well;
- Ten EE technology demonstration projects in energy-intensive industries (pulp and paper, glass, food, steel, palm oil) have been supported as well as three local equipment manufacturers (motor rewinding, fans) by means of technical assistance (feasibility analysis) and investment support (through the Energy Efficiency Projects Lending Scheme, EEPLS);
- One demonstration project (Heveaboard Bhd in Gemas) based on ESCO concept has been successfully implemented based on the MESA.

Major **conclusions** resulting from the evaluation analysis are as follows:

The project, in the view of the Evaluator, has made important and real contributions to removing some barriers, in particular EE awareness creation and capacity building in important areas such as benchmarking, best practices, audits and demonstration of EE

processes and technology. MIEEIP has taken a first step in creating basic skills to understand the factors affecting decision-making concerning energy efficiency by industrial energy users as well as consultancy companies. It has generated powerful insights into the technical and economic potential for energy efficiency initiatives and the means available to government to realise that potential.

While these achievements are real, their longer-term sustainability is in doubt without continuous government support and legislative and financial interventions (which are currently lacking). Most of the MIEEIP activities will need to be continued as part of PTM regular programme. However, continuation will depend strongly on the financial support of the Government to sustain these efforts. In fact, it seems that the lack of a conducive policy and planning framework in Malaysia for the promotion and implementation of energy efficiency is a one big barrier. Therefore, a separate component on energy efficiency planning and regulations would have benefited the project, but was not included in the project design in 1998, although the project has provided some inputs towards regulatory framework formulation.

In addition, another main barrier to improved energy use in Malaysia remains the highly subsidised energy prices. There is little that the MIEEIP project can do directly to remove that barrier except for providing relevant policy recommendations.

The Evaluator has the following **recommendations**:

- More serious implementation of sustainable energy policies by the Government is a prerequisite to kick-start the industry towards producing more energy-efficient products both for local and overseas market. Leaving such strategy to PTM to lead the industry is an effort beyond the mandate and capability of PTM and will only bring insignificant results;
- Regarding efficiency in industrial processes as well as the local manufacturing of energy efficient equipment, such an EE Action Plan could be formulated by the Government, which could entail the following elements:
 - The currently proposed 'energy management regulations' for companies that consume a certain amount of energy;
 - Energy standards and labelling as a means of promoting and implementing EE, not only in manufacturing, but for consumer equipment as well;
 - Provision of better tax incentives to manufacturing sector to implement EE measures;
 - Lowering energy subsidies that presently encourage inefficient rather than rational energy use.
- Main recommendation for PTM, the implementing agency, is to keep the momentum regarding the interest and practice of EE in industry set by MIEEIP project:
 - For PTM to continue and expand the MIEEIP activities, the Government has to allocate sufficient funds to enable these roles to be carried out and to have minimum staff strength. Furthermore, capable and experienced staffing is critical in ensuring PTM's success in providing advisory services to the government and the industries.
 - The application of E-Benchmarking tools could be expanded to other (sub)sectors or another new activity could be to introduce international benchmarks for similar subsectors;
 - PTM should not compete with ESCOs, and should act as an intermediary between the industries and ESCOs. While audits would have to be undertaken largely by the ESCOs, on commercial terms; PTM should work with the ESCO association (MAESCO) to enhance their professional image and should continue to assist in their capacity building and PTM should also initiate and monitor the ESCO registration;
 - PTM should continue with campaigns and promotional activities to increase demand for energy efficiency equipment in the country;

- Talks should be held between PTM, MIDF and MEWC on the continuation of the MIEEIP project's lending scheme into a full-fledged national-level EE promotion fund, while at the same time commercial banks should be encouraged with government support to introduce 'green lending schemes.

MIEEIP has proved to be a good and successful collaboration between Government agencies, professional bodies, and industry associations.

One **lesson learned** is that care must be taken not to exaggerate the potential of certain energy efficiency promotion instruments, such as ESCOs or certain financial incentives, while other barriers remain in place, such as the practice in Malaysia of substantially subsidizing energy cost. ESCO or financial incentives alone will not be able to overcome the barriers discussed and no single measure can provide immediate solution. As such, policy planners must look into bigger perspective when implementing EE.

Despite the low cost of energy, the MIEEIP project has managed to demonstrate the feasibility and achievability of energy saving measures and has managed to entice managers in industrial companies as well as some financial institutions to get involved in energy efficiency and conservation.

While such voluntary participation is laudable in an initial phase, energy efficiency promotion and implementation needs to be an integral part in the Government's long-term public policy. The sustainability of MIEEIP and the eventual impact depend much on whether the Government decides to put an energy efficiency policy in place with effective policy instruments backed up by substantial resources. The analysis of this Evaluation Report suggests that if similar energy efficiency projects are implemented in future they should be predicated on the expectation that appropriate regulations and substantial government funding will subsequently be available.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS	2
EXECUTIVE SUMMARY	3
TABLE OF CONTENTS	7
1. INTRODUCTION	8
1.1 BACKGROUND.....	8
1.2 PROJECT OBJECTIVES AND STRATEGY	9
1.3 EVALUATION METHODOLOGY AND STRUCTURE OF THE REPORT	11
1.4 PROJECT SET-UP AND STAKEHOLDERS.....	13
2. FINDINGS	15
2.1 IMPLEMENTATION: ASSESSMENT OF ACHIEVEMENT OF OUTCOMES AND OUTPUTS	15
2.1.1 <i>Outcome 1 Energy-use benchmarking component</i>	15
2.1.2 <i>Outcome 2 Energy audit component</i>	17
2.1.3 <i>Outcome 3 Energy rating component</i>	20
2.1.4 <i>Outcome 4 Energy efficiency promotion programme</i>	21
2.1.5 <i>Outcome 5 ESCO support component</i>	23
2.1.6 <i>Outcome 6 Energy technology demonstration programme</i>	26
2.1.7 <i>Outcome 7 Local EE equipment manufacturing support programme</i>	27
2.1.8 <i>Outcome 8 Financial institutions component</i>	30
2.1.9 <i>Overall comments and observations</i>	32
2.2 IMPLEMENTATION: ASSESSMENT OF THE PROJECT’S IMPACTS	33
2.3 PROJECT RELEVANCE, DESIGN AND COUNTRY DRIVENNESS	38
2.3.1 <i>Relevance</i>	38
2.3.2 <i>Project conceptualisation</i>	38
2.4 ASSESSMENT OF THE IMPLEMENTATION APPROACH IN ACHIEVING OUTCOMES AND OUTPUTS ..	39
2.4.1 <i>Progress towards results; adaptive management</i>	39
2.4.2 <i>Financial planning and delivery of counterpart inputs</i>	42
2.4.3 <i>Stakeholder involvement and partnership strategy</i>	45
2.4.4 <i>Logical framework and monitoring</i>	45
3. CONCLUSIONS AND RECOMMENDATIONS	47
3.1 CONCLUSIONS.....	47
3.1.1 <i>Project design and project implementation</i>	47
3.1.2 <i>Impacts, sustainability and replicability</i>	48
3.2 RECOMMENDATIONS.....	48
3.2.1 <i>Recommendations for promotion and implementation of EE in Malaysia</i>	48
3.2.2 <i>Recommendations for PTM</i>	51
3.3 LESSONS LEARNT	54
ANNEX A. TERMS OF REFERENCE OF THE EVALUATION	56
ANNEX B. ITINERARY OF THE EVALUATION TEAM AND LIST OF DOCUMENTS 63	
B.1 MISSION SCHEDULE AND LIST OF PEOPLE MET	63
B.2 LIST OF REVIEWED DOCUMENTS.....	64
ANNEX C. LIST OF WORKSHOPS AND SEMINARS	65
ANNEX D. LIST OF PROJECT DOCUMENTS	67
ANNEX E. LIST OF AUDITED COMPANIES	69
ANNEX F. LIST OF AGREEMENTS	71

1. INTRODUCTION

1.1 Background

Energy efficiency drive at the national level was first stated in the Seventh Malaysia Plan (1996-2000), and later stressed again in the Eight Malaysia Plan (2000 – 2005). The main initiative in the Seventh Malaysia Plan was the birth and establishment of the Malaysia Energy Centre (PTM), whose major task as a government-owned company is to promote and implement energy efficiency programmes at the national level.

Energy efficiency is again explicitly addressed in the Ninth Malaysia Plan. Energy efficiency programmes will focus on energy saving features in the industrial and commercial sectors as well as the domestic sectors. The industrial sector is expected to implement measures for improvements in equipment and processes as well as end uses. Efficient Management of Electrical Energy Regulations¹ are to be introduced, Uniform Building By-Laws to be amended to incorporate energy efficiency features, and specifications promulgated for accurate and informative electrical appliance labelling to be further enhanced.

Main barriers include:

- Limited awareness of EE techniques and technologies in industry and their economic benefits (on a lifecycle basis);
- Limited access to information on energy-efficient (EE) technologies and to performance benchmarks for EE technologies;
- Unwillingness of industrial establishments to incur what are perceived to be the ‘high-cost / high-risk’ transactions;
- Preference of industries to focus on investments in production-related improvements rather than on energy efficiency;
- Insufficiently energy regulations (such as EE standards & labelling) and implementation;
- Few EE technology demonstration projects implemented either by industry or the Government;
- Inadequate and low-quality local energy support services;
- Lack of trained industry and financial sector personnel on energy management;
- Lack of financiers that are prepared and interested in financing EE investments as well as appropriate financing mechanisms;
- Insufficient financial resources for the adequate staffing of the implementing agencies involved (such as PTM) as well as for the implementation of EE measures;
- Lack of an approved national energy efficiency policy and action plan.

These barriers all lead up to a core problem in the promotion and implementation of EE measures in industries, which is the inefficient and wasteful use of energy in industrial facilities, implying high energy consumption and demand and increased greenhouse gas (GHG) emissions from the Malaysian industrial sector.

¹ This would compel, among others, the appointment of ‘energy managers’ for companies above a threshold defined by volume of energy use (6000 MWh per year)

1.2 Project objectives and strategy

To address these barriers a full-size project, called “Malaysia - Industrial Energy Efficiency Project (MIEEIP)” was formulated during 1998. The Project Document was signed in July 1999 by UNDP and Government of Malaysia. The Ministry of Energy, Communications and Multimedia (MECM; now known as the Ministry of Energy, Water and Communications, MEWC) was the designated national executing agency. The Pusat Tenaga Malaysia (PTM, Energy Centre) was designated by the MECM to implement the project on its behalf².

The UNDP Project Document of MIEEIP mentions as its project **objective** “is to improve energy efficiency in Malaysia’s industrial sector, through removing barriers to efficient industrial energy use, and through creating a sustainable institutional capacity to provide energy efficiency sources, and a conducive policy, planning and research framework”. The

Box 1 Institutions involved in the implementation of energy policy in Malaysia

The key Malaysian Government ministries and agencies involved in promoting renewable energy and energy efficiency are the Energy Unit of Economic Planning Unit (EPU) of the Prime Minister’s Office, the Ministry of Energy, Water and Communications (MEWC), the Energy Commission (EC) and Pusat Tenaga Malaysia (PTM).

The role of *MEWC (Kementerian Tenaga, Air dan Komunikasi, KTAK)* is to facilitate and regulate the electricity sectors in the country and to ensure affordable energy is available to consumers throughout the country. As the country is maturing, its responsibility has shifted from being a service provider to policy formulation, in coordination with the *Economic Planning Unit* (of the Prime Minister’s Office) to provide the general direction, strategies and determine the level of implementation. In general, these strategies are largely outlined in Five-Year Plans (see main text).

The Energy Commission (Suruhanjaya Tenaga, ST) has been the regulatory agency for the electricity and piped gas supply industries in Malaysia since 2002 replacing the Department of Electricity and Gas Supply (DEGS). The Commission’s main tasks are to provide technical and performance regulation for the electricity and piped gas supply industries, as the safety regulator for electricity and piped gas and to advise the Minister on all matters relating to electricity and piped gas supply including energy efficiency and renewable energy issues. The Commission is attempting to emulate the experiences of efficiency standards and labelling programmes worldwide, but mandatory measures have not been implemented so far. For high performance motors and energy efficient refrigerators, a programme is implemented on a voluntary basis.

The *Malaysia Energy Centre (Pusat Tenaga Malaysia, PTM)*, the, was established by the Malaysian Government in 1997 as an independent not-for-profit company for the development and coordination of energy research. PTM’s aim is to be the focal point on energy implementation and catalyst for linkages with universities, research institutions, industry, and national and international energy organizations. The PTM has four major functions.

- Energy policy research;
- Guardian and repository of the national energy database;
- Promoter of national energy efficiency and renewable energy programmes
- Coordinator and lead manager in energy research and development and demonstration projects

PTM offers membership to individuals and companies across the entire spectrum of the Malaysian energy industry including the electricity power industry, the oil and gas industry, research institutions, institutions of higher learning, service providers, suppliers and energy consumers. Membership provides access to informational databases; consultancy services on building and industry energy audits; energy efficiency and renewable energy; training programmes; and opportunities for industry networking.

² Other significant programmes have been Capacity-Building in Demand-Side Management (2003-2005) implemented by the Energy Commission and co-funded by Danish International Development Assistance (DANIDA) as well as the establishment of the Centre for Education and Training in Renewable Energy and Energy Efficiency (CETREE) at Universiti Sains Malaysia.

logical framework in the GEF Project Brief mentions as **objectives** “to reduce the risk of climate change by reducing net GHG emissions” and “removing barriers to large-scale application, implementation and dissemination of least-cost energy-efficient technologies and by promoting more efficient use of energy”.

The Project Document further details that these objectives are to be achieved through eight Project Components with immediate objectives as listed below.

Component 1: Energy Use Benchmarking Program

- To establish and develop energy-use benchmarks for various industrial sub-sectors (based on industrial processes, operations and energy systems) that can be used by industries as guides in their EE&EC efforts.

Component 2: Energy Auditing Program

- To promote energy auditing as an effective tool for industrial energy management;
- To establish Sectoral Energy Audit Teams; and,
- To conduct a continuing Energy Audit Program for industries

Component 3: Energy Rating Program

- To provide information on energy-efficient equipment and energy rating programs to increase awareness and encourage the use of energy efficient equipment in industry and set up an industrial equipment testing facility to label equipment.

Component 4: Energy Efficiency Promotion Program

- To disseminate information on energy efficient practices in industries, EE&EC technology applications and establish an association of accredited energy specialists, consultants and technology developers and providers.

Component 5: ESCO Support Program

- To develop a suitable institutional and legal framework for ESCO activities in the country;
- To develop institutional arrangements that will promote ESCOs to the industrial sector;
- To assist the local ESCOs in making bankable project proposals, business plans, and in securing financing arrangements for their clients;
- To advice ESCOs in defining the feasible products and services that they can offer and evaluating the risks associated with performance contracting.

Component 6: Energy Technology Demonstration Program

- To demonstrate the applicability and the feasibility (technical and economic) of proven energy efficiency technologies;
- To document and disseminate information on the application and benefits of energy efficiency technologies in local industrial settings;
- To provide technical and financial assistance to industrial energy users.

Component 7: Local Energy Efficient Equipment Manufacturing Support Program

- To initiate design and manufacturing improvement projects of local industrial equipment manufacturers as a means of promoting and accelerating the production and utilization of energy efficient equipment in industries.

Component 8: Financial Institutions Participation Program

- To promote and accelerate the production and utilization of energy efficient industrial equipment through dissemination of information and techniques on energy efficient equipment designs and production;
- To set up financing arrangements for the provision of loans to eligible companies / equipment manufacturers that can host energy efficient technology demonstration programs and design applications and produce energy-efficient industrial equipment amongst local and markets for the technology demonstration activity.

The document of the full-size project was formally signed in 1999 with a total budget of US\$ 20.79 million with GEF financing of US\$ 7.30 million, government co-financing in cash of US\$ 6.30 million³ and in-kind of US\$ 1.63 million and private sector cash contributions of US\$ 5.26 million. Implementation of the project started in 1999 and was supposed to be completed by 2003. The project completion date was extended in 2004 to December 2006 and is now scheduled at end December 2007.

As per original design, MIEEIP focussed initially on the following 8 energy-intensive industrial sub-sectors: iron & steel, cement, wood, food, glass, pulp & paper, ceramics and rubber. Later three other sectors were added, namely oleo-chemical, plastics and textiles. Box 2 provides some examples of energy efficiency improvements that can be implemented in these sectors.

1.3 Evaluation methodology and structure of the report

In accordance with regulations of the UN Development Programme (UNDP) and the Global Environment Facility (GEF), a Final Evaluation of MIEEIP has to be carried out under the responsibility of the GEF-implementing agency (i.e. UNDP). The results of the evaluation are presented in this report. The **purpose of the evaluation** is to analyse and assess the achievements and progress made, identify factors that have facilitated or impeded the achievement of outcomes and the effectiveness, efficiency, relevance, impact and sustainability of the project. The evaluation is expected to generate the main lessons learned and recommendations.

An international consultant, Mr. Jan van den Akker (Netherlands), hereinafter referred to as the “Evaluator”, was engaged by UNDP-Malaysia to conduct the evaluation. He conducted a mission in Malaysia from 24 November to 5 December. During the mission, extensive discussions were held with the project management team and with representatives from UNDP Malaysia, Ministry of Energy, Water and Telecommunications (MEWC), the project management team and important private sector stakeholders, such as beneficiary manufacturing companies (and the manufacturers’ association FMM) and ESCOs. The itinerary and list of people met is provided in Annex B.

During the mission, the Evaluator drew up an agenda that covers the issues to be addressed as mentioned in its Terms of Reference (see Annex A) and follows the structure of this report:

- Introduction (project description and evaluation method);
- Findings on project progress
 - Project’s performance in terms of results (achieving objectives and outputs in terms of realised activities and inputs used) and impacts, quantitatively and qualitatively

³ Via PTM yearly budget (US\$ 3.1 million) and the share of wood and biomass energy efficiency and conversion of FRIM and SIRIM (US\$ 2.2 million) as part of the co-financing for the demonstration schemes of component and from JBEG.

- measured by indicators (as set in the project document and the annual project review documents),
- Description of awareness raising and other project impacts,
- The Evaluator's assessment of the project design and execution;
- Conclusions and recommendations
 - Conclusions taking into account sustainability and replicability issues,
 - Lessons learned and recommendations.

The Evaluator adopted the following **methodology of evaluation**:

- i) Review of project reports, in particular the Project Documents, APR-PIRs (annual project implementation reviews), mid-term evaluation report, impact study report, minutes of meeting of the National Steering Committee (NSC) as well as other background information;
- ii) Meetings with the main project partners and stakeholders in Malaysia.

The report is divided into four sections. This first section provides general background of the project, purpose of evaluation, project implementation setup, partners/stakeholders and evaluation methodology. The next section dwells on findings derived from analysis of selected reports and from interactions with the stakeholders interviewed.

Box 2 Examples of energy efficiency improvements in industry

A summary of energy efficient technologies and practices is given below. To the typology can be added proper cleaning, operation and maintenance of systems as well as optimization of system operation.

Space conditioning:

- Thermal storage
- Sealing and balancing of ducts and pipes
- Improved efficiency of equipment
- Improved building design

Water heating:

- Insulation blankets
- Heat pumps
- Flow restrictors
- High-efficiency water heaters

Building envelope:

- Insulating glass
- Low-emissivity glass
- Insulation
- Solar shading
- Highly reflective roofs

Controls:

- Automated energy management systems

Motors:

- Variable speed drives
- Improved motor rewinding
- High-efficiency motors (HEMs)

Refrigeration

- Defrost controls
- Multi-stage compressors
- Insulation
- High-efficiency refrigeration cases

Lighting

- High-efficiency ballasts and reflector systems
- Lighting controls and occupancy sensors
- Daylight dimmers and switches
- Compact fluorescent lamps (CFLs)
- Efficient fluorescent lamps
- High-intensity discharge lamps

Process improvements

- Drying / curing efficiency
- Economizers in recovery in steam systems
- Waste heat recovery
- Good boiler and furnace maintenance
- Air compressor efficiency
- Repairing leaks and insulating tanks and pipes

Ventilation

- Improved efficiency
- Variable air volume
- Multi-speed or variable speed motor

Source: Completion Report (Zet, 2007)

The evaluation findings are described following the logical framework design of the project of outputs and indicators, as given in the APR-PIRs. In the third section, conclusions from the observations and findings are discussed in the context of the project objectives. These also pertain to sustainability and replicability of project. Section 3 ends with lessons learnt and some general recommendations.

1.4 Project set-up and stakeholders

The project is executed by the Pusat Tenaga Malaysia (PTM) on behalf of the Ministry of Water, Energy and Communications (MEWC), which represents the Government of the Republic of Malaysia, and in co-operation with private sector partners interested in implementing energy efficiency improvement measures.

For general coordination, monitoring and strategy support for the project implementation, a National Steering Committee has been established (NSC) consisting of representatives of the following organizations:

- Economic Planning Unit (EPU) of the Prime Minister's Office (chairperson of the NSC)
- Ministry of Energy, Water and Communications (MEWC or *Kementerian Tenaga, Air & Komunikasi, KTAK*)⁴
- UNDP (United Nations Development Programme)
- MIDA (Malaysian Industrial Development Authority)
- FMM (Federation of Malaysian Manufacturers)
- JBEG (Jabatan Bekalan Elektrik dan Gas)
- Energy Commission (EC, or *Suruhanjaya Tenaga, ST*)
- MNRE (Ministry of Natural Resources and Environment, *Keentarian Sumber Asli & Alam Sekitar*)
- CETDEM (Centre for Environment, Technology and Development Malaysia)
- SIRIM Bhd. (formerly Standards and Industrial Research Institute Malaysia)
- FRIM (Forest Research Institute of Malaysia)
- PTM (*Pusat Tenaga Malaysia, Malaysia Energy Centre*)

A Project Implementation Unit (PIU) was set up, initially led by a full time Chief Technical Advisor (CTA), Mr. Ponudurai Rajamanikam until 2004 and led by Dr. K.S. Kannan as Chief Project Coordinator (CPC) thereafter. They have been responsible for the day-to-day management of the project, ensuring that the expected outputs are completed in a timely manner and that they comply with the specific UNDP/GEF criteria and requirements. The project managers (CTA and CPC) also have regularly reported on the progress of the project to the executing agency and UNDP.

The Head of PTM has been functioning as National Project Director⁵, representing the Government as the person responsible for the project from the Government side. Additional short-term international consultants were recruited to provide specific services and to support the implementation of the project through the critical stages.

Two consortiums which consist of both local and international consultants were appointed:

⁴ Previously, the Ministry of Energy, Communications and Multimedia (MECM). Before the Government reshuffling, the Ministry of Science, Technology and Environment, MOSTE, *Kementerian Sains, Teknologi & Alam Sekitar* participated as well as the KPU (*Kementerian Perusahaan Utama*).

⁵ Dr. Mohd. Zamzam Jaafar, Dr. Hassan Ibrahim and currently Dr. Anuar Abdul Rahman

- Zet Consortium (consisting of Zet, Fichtner, CESI and Ecoloner) provided consultancy services for Component 1,2,4,5,6,7 and 8 and also as an integrated part of the overall MIEEIP project team (see section 2.5.1).
- Techno Economist Consortium consisting of Techno Economist and Dansk Energi Management) provided consultancy services for Component 3.

Each component was led by a Component Project Manager (whom reports to the CPC) and a part-time local Technical Advisor was appointed to provide advisory services on an as-needed basis. Initially the project team consisted of about 18-20 staff, but is currently at about 6-8 staff, employed by PTM.

2. FINDINGS

2.1 Implementation: assessment of achievement of outcomes and outputs

For each of the three outcomes, as mentioned in paragraph 1.2, this section assesses the progress in the implementation of the project's outcomes and outputs, following the format as given in the annual implementation review reports (APR-PIRs).

2.1.1 Outcome 1 Energy-use benchmarking component

Indicator: Established and developed energy-use benchmarks for various industry sub-sectors based on industrial processes, operations and energy systems) that are used by industries as guides in their EE & EC efforts.

Table 1 Outputs, indicators and status of outcome 1

Outputs	Indicator (June 2007)	Status (June 2007)
1.1 System for energy benchmarking in place	Data collection is available online and hosted by National Productivity Corporation (NPC). See http://bond-npc.org/my/bench	Completed
1.2 Energy consumption benchmarks for Malaysian industries	Over 150 industries have used the online system of benchmarking data	Completed
1.3 Industrial energy-use database	Based on data from Dept. of Statistics (DOS), information on almost 1,500 industries is available at PTM	Completed
1.4 Dissemination of industry energy use benchmarks	Disseminated in 6 seminars & workshops since 2006; Publication on EE Guidelines for EE equipment	Completed

Baseline

Before MIEEIP the information on energy-use benchmarks was not available and only basic information on industry energy use was gathered for statistical purposes.

Activities and achievements

- | | |
|-------------|--|
| 2002 – 2003 | <ul style="list-style-type: none">• Built capacity on energy use in NPC• Voluntary participation at selected industrial sectors in collaboration with the respective industrial associations hence resulting in a detailed benchmarking |
| 2004 | <ul style="list-style-type: none">• Dissemination of Industry Energy-use benchmarks (Newsletter No. 15)• Completed Mobile Benchmarking Kit Equipment Installation, Testing and Commissioning at SCA Packaging (M) Sdn Bhd |
| 2005 | <ul style="list-style-type: none">• Collaboration with FMM, MIDA and the Department of Statistics (DOS) to |

- disseminate the benefits of the e-benchmark database
- Meetings with FMM and MIDA on collaboration with these organizations for the energy use data collection.
- Seminar on "Improve Productivity and Profits through Energy Efficiency Initiatives" in 2005 to disseminate information on benchmarking programme; organized together with C6
- Study tour to Department of Alternative Energy Development and Efficiency, Thailand
- 2006
- Workshop on "Energy Conservation Guidelines for Malaysian Industries"
- 65 companies engaged to participate in the e- benchmarking system.
- The EE Management Committee consisting of MASHRAE, IEM, METD, EETD, SIRIM and ST were established for the drafting of the EE Guidelines
- Workshop from 1–17 October 2006 on the EE Guidelines and was attended by JETRO/ECCJ, Working Group members and PTM.
- Data on 1,500 industries from the Department of Statistics is being reviewed and compiled by to add on to the benchmarking database.

General observations and comments

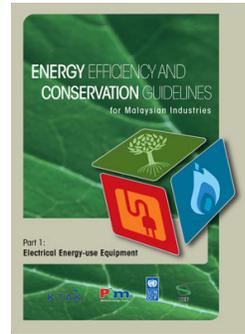
The E-Benchmarking initiative is designed to display the energy consumption and production data. The key features of the E-Benchmark for national purposes are as follows:

- The indicator used is Energy Use Index (EUI), which is defined as the total energy consumed for a certain product. So, the EUI is a mean of indicating the efficiency of the industry's energy consumption with respect to its production. The unit used is 'Gigajoule per tonne' (GJ/t).
- The electronic database provides an way of collecting energy use and industry's production data in an ongoing way as compared to normal time-consuming surveys;
- From the database, an industrial company can compare its energy consumption profile with all the rest of similar companies, without having to know the name of these companies. If the company's EUI is higher than the rest of the group, this indicates that the company should be pursuing energy efficiency measures to be at par with or better than the other competitor industries.

The E-Benchmarking has successfully compiled a database of more than 1,500 industries built up from data sourced from the Department of Statistics (DOS). Available from DOS originally were 12,227 numbers of production data and 5,308 numbers of energy data reported by 5,308 companies in year 2003. Some limitations of the tool reportedly are (source: PTM, 2007):

- The wide disparity of range of EUI makes it difficult for the E-Benchmarking to demonstrate the credibility of the figures mentioned. For example, the cement sector shows EUI ranging from 0.1-1.2. Apparently, the large range suggests that within cement, the various sub-sectors (e.g. cement production, processing cement products are substantially different, hence we are comparing apples and pears;
- Care must be exercised on the reliability and validity of data submitted. Some kind of arrangement, such as preliminary energy audit, could be made on random basis to check the validity of the data provided;
- Some companies are not interested to provide data, because they do not view the tools as being useful to them or simply because of confidentiality issues.

MIEEIP has developed an Energy Efficiency and Conservation Guidelines for Electrical Equipment (EEC Guidelines). The format of the guidelines was established as a result of the advice given by the Japan External Trade Organisation (JETRO) and the Energy Conservation Centre of Japan (ECCJ) in a workshop conducted in June 2006. Eight types of electrical equipment are included in these guidelines, namely: transformers, motors, chillers, cooling towers, fans and blowers, pumps and air compressors, and lightings. The guidelines are a useful reference for industries to adopt energy efficiency practices, and manage and improve their energy utilization and environmental management.



The key features and benefits of these guidelines are:

- They provide Malaysian industries with guidance in design, selection and information on equipment energy-efficiency ratings, best-practice guidance in operation, monitoring, inspection and maintenance;
- They provide industries with ways how to conduct energy-saving measures to achieve cost savings and improved productivity, using appropriate equipment in their factory and building premises.

2.1.2 Outcome 2 Energy audit component

Indicator: Energy auditing is widely practiced and used in Malaysian industries

Table 2 Outputs, indicators and status of outcome 2

Outputs	Indicator (June 2007)	Status (June 2007)
2.1 Energy audit skills upgrading	8 PTM staff (engineers and technical assts) have been trained in energy auditing; FMM Energy Committee trained to undertake preliminary energy audits in all sectors;	Done
2.2 Standardised energy audit procedures and energy tools developed	Review of current practices; Publication on industrial energy audit revised and available. Complete set of energy audit equipment available.	Completed
2.4 Conduct of energy audits	Procurement of energy audit instruments; A total of 76 audits have been conducted so far; Evaluation of the programme	Completed
2.5 Energy audit follow-up programme	Auditing of 3 additional plans; Auditing is mentioned in the 9 th Malaysia Development Plan Paper for MEWC on policy and strategy measures	Completed
2.6 EE assessment of new industrial facilities	Two sites have been reviewed as to their energy efficiency features. A draft booklet on the checklist of features and case studies is being finalized.	Draft report

Baseline

Before MIEEIP, no auditing of industry was performed in a systematic way. In early 1990s, Japan International Cooperation Assistance (JICA) and Asian Development Bank (ADB)/ADEME conducted studies on energy consumption baseline and a series of on-the job energy management trainings but full implementation of recommendations was never been materialized due to lack of awareness and readiness in the industrial sectors.

Activities and achievements

- | | |
|------|--|
| 2000 | <ul style="list-style-type: none">• Trainings on Energy Management by Eco Energy and Fichtner |
| 2001 | <ul style="list-style-type: none">• ESCO Business Development Workshop; ESCO Comprehensive Development Workshop Organized; Mini Workshop on EPC to MAESCO• Participated in a study mission to Germany. |
| 2002 | <ul style="list-style-type: none">• National ESCO Workshop;• Electrical Energy Audit Training; Capital Budgeting Training;• Conducted two (2) energy management training sessions from both private and government sector for relevant stakeholders and beneficiaries;• Survey of Malaysian industries on Energy Management practices |
| 2003 | <ul style="list-style-type: none">• Organization of Workshop for Model of ESCO Business Plan and Strategy• “Energy Engineering and Business Tools Workshop; “Business and Financial Planning” Workshop;• 48 preliminary energy audits in 8 sectors;• Study Mission to Italy.• The first national Energy Audit Guidelines for the industrial sector was published and launched by the Minister of Energy Communication and Multimedia in NCEP 2 at PWTC on 22 September 2003. |
| 2004 | <ul style="list-style-type: none">• Two papers presented on the energy audit findings in a forum entitled "Workshop on EE and Conservation for Major Industries in Southeast Asia" organized by the ASEAN EE & C SSN and ECCJ at Putrajaya Marriot on 25 December 2004. |
| 2005 | <ul style="list-style-type: none">• Successfully carried out energy audit together with Energy Conservation Centre of Japan (ECCJ) in the oleo-chemical sector;• Selection of the 8 ESCOs to carry out the energy audit;• Successful organisation of the `Japan Malaysia Seminar on EE in Process Industries" on 1st December 2005 held at UTM Skudai, Johore. |
| 2006 | <ul style="list-style-type: none">• Energy Audit Guidelines has been completed and revised in certain sections by the Technical Adviser.• A Presentation of the Energy Audit Software by Dr. Zainuddin to FMM and PTM engineers. The chairman of the Pulp and Paper association has consented that his company will participate in the pilot study for this software.• Energy Audit activities for three (3) additional sectors have been completed• Initiated a collaboration programme with SMIDEC to conduct one (1) audit each per sector for textile, sago and wood industries.• PTM joint audit with ASEAN Centre of Energy (ACE) and Energy Conservation Centre of Japan (ECCJ) was conducted in Lao PDR from 9 –12 October 2006. 3 staff from PTM participated in the audit as part of C2 representatives.• For the energy audit for the petrochemical and cement sectors held in Myanmar in November 2006 - a staff from PTM participated in it.• Checklist for the Energy Efficiency features of new installations has been drafted and two companies have been identified as hosts for the programme. |



General observations and comments

Energy audits are a systematic studies or surveys to determine how energy is being used in a building or a plant. It is also a useful procedure to find out the best options for energy conservation. Energy audits provide an analysis of the amount of energy (e.g., electricity, gas or fuel oil) consumed during a given period in the form of electricity, gas, fuel, oil or steam. Using that information, it is also possible to determine how the energy was used according to the various processes in a plant or at the various outlets in a building. The next step in an energy audit then is to identify the potential for energy savings accurately.

Out of 76 factories visited and consulted, a total of 54 factories have been audited under the project, in the following sub-sectors: cement (3), ceramic (6), iron & steel (4), food (10), glass (3), pulp & paper (6), rubber (9), wood (7), oleo-chemical (2), plastics (2) and textile (2).

At the beginning of the MIEEIP, industries were reluctant to participate in the project to have their sites audited. During the course of project implementation, through continuous promotions such as seminars, workshops, training courses, demonstration project, newsletters, websites, and direct consultations, more and more industries were willing to participate. The three additional industry sectors (oleo-chemical, plastics and textiles) were included for energy audit after extending the project in 2004. The Evaluator did not have the time to go in detail through all the reports, but the mid-term evaluation (Lucas, 2003) as well as stakeholders interviewed, have the opinion that the general standard of quality of the energy audit performance was high.



MIEEIP has produced a useful 56-page document called “Industrial Energy Audit Guidelines – A Handbook for Energy Auditors” especially targeted to the top management and maintenance personnel of industries to energy services companies (ESCOs), as well as to the academia and Government agencies. The guidelines have the following benefits:

- Offer a guide to efficient energy practices that can be implemented in the Malaysian industries;
- Provide insights into the structure and systematic energy audit practices; and
- Allow capacity-building of energy auditors and maintenance personnel.

The first edition of the guidelines was published in 2003 and was distributed free of charge to the industries and other target groups. The second and more voluminous version is at the final stage of printing and will be ready soon. The second version, when published, will be sold as part of an income generating activity for PTM. If not done already, the Evaluator feels that it would be good to have copies of the second version sent to professionals for peer review and comments.

2.1.3 Outcome 3 Energy rating component

Indicator: Information materials on energy-efficient equipment are not widely available and no energy rating programs for equipment are implemented.

Table 3 Outputs, indicators and status of outcome 3

Outputs	Indicator (June 2007)	Status (June 2007)
3.1 Info on EE equipment and energy rating available to energy	Policy paper on EE motors submitted to Energy Comm. ⁶ ; Publication on the boiler best practice notes is ready and completed.	Done
3.2 Design and construction of testing facility	Specifications on equipment testing facility developed; However, installation of motor resting facility was shelved by NSC ⁷	Shelved
3.3 Boiler training and demo unit	The plan to purchase a boiler demo unit has been shelved due anticipated infrequent use and potential maintenance problems. As an alternative it was decided to use a similar existing facility at a nearby university	Shelved

Activities and achievements

- 2002
 - Policy study on “Energy Rating Programme”; Report was submitted to Energy Commission in August 2002;
 - Completed the Market Survey for 7 equipment i.e. electric motors, boilers, pumps, fans and blowers, furnaces, air compressors and heat exchangers;
 - Completed the Electric Motor Market Survey for the pilot project of the motor rating programme
- 2003
 - Conduct impact assessment on the Malaysian motor rating programme.
 - Boiler Best Practice Seminar/Workshop was held in 15 & 16 October 2003
- 2004
 - Completed the design of the electric motor testing facility
- 2005
 - Signed agreements between eight Manufacturers, Dealers and Suppliers of electric motor for the "High Efficient Electric Motor Agreement".
 - Draft technical specification for the boiler training/demo facility and has been prepared and forwarded to the host site for their comments
- 2006
 - Tender Evaluation Report prepared for Boiler Best Practice and Demo Equipment Tender Exercise for PTM's Board approval.
 - Draft copy of the HEM Brochure
- 2007
 - Successfully organized the "Seminar on the Use of High Efficiency Motors (HEM) in Industries on 25 January 2007 at Renaissance Kuala Lumpur Hotel.
 - Prepared the Motor Best Practice Syllabus

⁶ Completed and being further promoted in collaboration with Copper Development Centre (CDC). Presentation in 6 seminars and one major seminar in collaboration with CDC

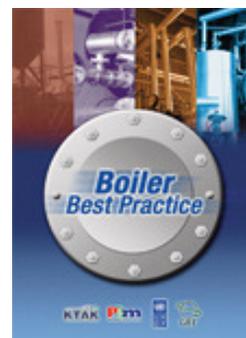
⁷ Since this is a baseline activity to be funded from MESITA, it can be carried out when the regulations regarding the mandatory testing of electric motors are already in place

Baseline

Before MIEEP, information materials on energy-efficient equipment were not widely available and no energy rating programs had been designed or implemented.

General observations and comments

The energy efficient motor rating and labelling programme has been proposed to the Energy Commission. Currently only about 2 percent of the motors used in the Malaysian industries are high efficiency motors (HEMs). According to a survey made in 2005 about 70 percent of the electricity consumed by the industries is consumed by motors alone. It was envisioned that when the programme is implemented and HEMs become more widely used in industries, that there might be 3 to 5 percent energy savings in industries from motors alone. On thermal systems, a Boiler Best Practice guidebook was developed from course notes of best boiler practice workshops organised in 2003 and 2004/5. The guidebook highlights the technical details in operating boilers and thermal systems at maximum efficiency. The guidebook will become a useful reference for boiler operators to follow to ensure higher efficiency of the thermal systems in the industry. Unfortunately, due to the infancy of the regulatory policy on such equipment, the testing facility for HEM and boiler was requested to be on-hold. The component with the assistance of the DANIDA, government agencies such as Energy Commission and PTM, managed to get in-depth knowledge on the rating scheme and its know-how on the programme implementation. For example, Energy Commission has embarked on the voluntary programme not only for HEM, but for the refrigerator for the residential sector as well.



2.1.4 Outcome 4 Energy efficiency promotion programme

Indicator: Dissemination of information on energy efficient practices in industries, EE&EC technology applications and establishment of an association of accredited energy specialists, consultants and technology developers and providers.

Table 4 Outputs, indicators and status of outcome 4

Outputs	Indicator (June 2007)	Status (June 2007)
4.1 Enhanced information activities (newsletters, brochures, bulletins)	MIEEIP Newsletters 19 Issues Published and Circulated to 4,000 Manufacturers; MEPA News letters 6 issues were published for members; Documented EE case studies from the following MIEEIP audited factories (see Table 9)	Completed
4.2 Energy technology information services	Information available at PTM resource centre and is frequently used by industry and PTM members	Completed
4.3 Established professional organization of accredited specialists	Established MEPA (with 150 energy professionals) and organized annual conventions	Completed

Baseline

Publications on energy efficiency and conservation were only appearing on a limited scale.

Activities and achievements

- | | |
|------|--|
| 2000 | <ul style="list-style-type: none">• Resource Centre set up at PTM• Malaysian Energy Professionals Association was established in April 2002, having a current membership of 150 |
| 2003 | <ul style="list-style-type: none">• One-day Energy Management Seminar for University Students (UNITEN) 20th September, 2003• National Convention for Energy Professionals 2 on 22nd September, 2003 (Organized jointly with MEPA) |
| 2004 | <ul style="list-style-type: none">• Website developed (see www.ptm.my/mieeip)• Outline on industrial Energy Management for University Co-Curriculum Workshop 19-01-2004• Seminar on "Improve Productivity and Profits through Energy Efficiency Initiatives" 04-08-2005.• Forum on Renewable Energy and Energy Efficiency "The Way Forward" 12-08-2004 (Organised jointly with MEPA) |
| 2005 | <ul style="list-style-type: none">• National Convention for Energy Professionals 2005 on 15-09-2005 (organised jointly with MEPA);• Agreement signing ceremony between PTM and Industries Malayawata Bhd, Pascorp Paper Industries Bhd and Apollo Rubber Sdn Bhd) by Y.B. Dato' Seri Dr. Lim Keng Yaik, MEWC on 15-09-2005• Series of seminars mainly on Energy Efficiency case studies from the demonstration projects and also MIEEIP audited factories were carried out for members of the Federation of Malaysian Manufacturers and the Malaysian Timber Industries Board at the following locations: |
| 2006 | <ul style="list-style-type: none">• Launching of the Heveaboard Mensilin Demonstration Project on 7-04-2006, 2006 by Y.B.Dato' Shaziman Abu Mansor Deputy Minister of Energy Water and Communications• Published two advertorials in the News Straits Times as follows:<ul style="list-style-type: none">○ PTM's first successful EE technology demonstration project dated 08-04-06○ MIEEIP Targets Efficient Energy Use dated 14-07-2006• Proposal For The Implementation Of An ESCO Accreditation Scheme 11/05/06• Seminar with MEPA entitled Energy Efficiency & Conservation "Lessons Learnt, Challenges Faced & What's Next" on 14-11-2006 (organised jointly with MEPA) |
| 2007 | <ul style="list-style-type: none">• Successfully organized the "Seminar on the Use of High Efficiency Motors (HEM) in Industries" on 25-01-2007 at Renaissance Kuala Lumpur Hotel.• Prepared the Motor Best Practice Syllabus |

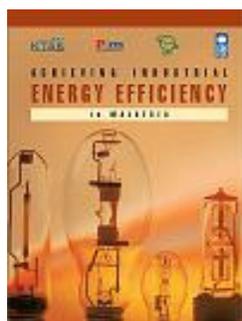
General observations and comments

MIEEIP has developed various promotional materials that have been disseminated to stakeholders and beneficiaries. These are in the form of newsletters (MIEEIP News), articles in professional publications and newspaper articles/advertorials. A total of 20 issues of the MIEEIP News have been published. The MIEEIP team has developed a comprehensive mailing list for the MIEEIP Newsletter covering different target groups and currently has over 2,500 subscribers that come from (PTM, 2007):

- MIEEIP audited industrial companies (54; see Annex E for a full list of audited companies);

- Other industrial companies from the cement and ceramic (39), food and glass (75), oleo-chemical (251), plastic (168), rubber (153), plastics (168), textile (75) and wood subsectors (388) and other FMM members, companies and individuals (over 1,000);
- Institutions and organizations (84);
- ESCOs and associations (69);
- UNDP, embassies and government organizations (214);
- Overseas subscribers (68).

MIEEIP has also helped to establish the MEPA (Malaysian Energy Professionals Association). MEPA was established in 2002 to increase the number of energy experts or trained energy professionals. Current membership is around 120. The membership is open to all professionals of varied backgrounds (such as engineers, accountants, business personnel), who usually serves as managers in the industry or manufacturing companies. MEPA will help to create impact to human resource development for the energy industry. PTM is the secretariat of MEPA. In fact most activities of MEPA are driven by a number of PTM executives, being committee members of MEPA. So far MEPA has organised two conferences; first one in August 2003, and the second one in August 2005.



A special booklet “Achieving Industrial Energy Efficiency in Malaysia” was published by UNDP to highlight efforts done by MIEEIP, highlighting on objectives of each of the eight Components of the project, the activities initiated, together with lessons learnt. The book also features an article on “Energy in Malaysia” which highlights Malaysia's energy policy, current energy demand and supply scenario, indigenous resources as well as the energy industry development. It describes the roles and functions of the main energy organisations of the country. MIEEIP technology demonstration projects are elaborated in this book as industrial case studies (also available on the PTM website).

2.1.5 Outcome 5 ESCO support component

Indicator: Establishment of an optimal structure for an ESCO industry in Malaysia and development of options for performance contracting in industries

Table 5 Outputs, indicators and status of outcome 5

Outputs	Indicator (June 2007)	Status (June 2007)
5.1 Survey and evaluation of the capacity of known ESCOs	Published directory of ESCO and available service; A workshop and a Fast Track ESCO project launched;	Completed
5.2 Developed design tools, marketing strategy and legal framework for ESCOs	Workshops conducted; Marketing strategy ongoing	Completed
5.3 Training of local engineering firms and consultants in integrating EE in their designs	Workshop conducted	Completed
5.4 Developed accreditation scheme for ESCOs	A draft ESCO registration scheme has been developed and sent to MEW	Completed

Baseline

Before MIEEIP project initiation, some consultancy or equipment suppliers provided some energy efficiency advisory services, but not in a way corresponding to the ESCO and energy performance contracting concept. In other words, there was no established ESCO industry.

Activities and achievements

- | | |
|------|--|
| 2000 | <ul style="list-style-type: none">• First survey of Malaysian ESCOs in March 2000 |
| 2001 | <ul style="list-style-type: none">• ‘ESCO Business Development’ workshop in February 2001• “ESCO Comprehensive Development” workshop in June 2001• Fact finding mission to USA in June 2001• Workshop on “Energy Performance Contract (EPC)” in September 2001• ESCO Directory slotted in the 5th MIEEIP Newsletter in September 2001 |
| 2002 | <ul style="list-style-type: none">• National ESCO Workshop in collaboration with Component 8 in February 2002 (promotion of ESCO concept to the financial institutions through Financial Institutions Forum)• ESCO concept promoted to insurance industries in an effort to mitigate ESCO project risks• ESCO Directory slotted in the 9th MIEEIP Newsletter in September 2002• Review of ESCOs and EE activities in USA and Canada 2002• Workshop for Model of ESCO Business Plan and Strategy on 25-11-2002• Individual consultancy for 7 ESCOs in their respective business plans in December 2002 |
| 2003 | <ul style="list-style-type: none">• Review of ESCOs and EE activities in the Republic of Korea and Denmark in May 2003• Second survey of Malaysian ESCOs in 2003• Launched the 1st Malaysian ESCO directory for dissemination to 1000 recipients• Disseminated and provided information on the availability of EE incentives “Industrial Energy Performance Contract (EPC)” workshop in collaboration with Component 4 in March 2003• “Energy Engineering and Business Tools” workshop in March 2003• Sponsorship of MAESCO booth at the SMIDEC Exhibition in May 2003• “Energy Engineering Tools” and “Business and Financial Planning” workshops conducted in June 2003 |
| 2004 | <ul style="list-style-type: none">• Compiling feedback from selected ESCOs, monitor and value the activities of selected ESCOs in the Demonstration Component• Wrap up session for ESCOs in April ‘04 |
| 2005 | <ul style="list-style-type: none">• Sponsored ESCOs to attend the 1st Asia ESCO Conference in Bangkok, October 20 - 21, 2005 |
| 2006 | <ul style="list-style-type: none">• 8 ESCO companies were contracted by MIEEIP to audit companies (Penfabric Sdn Bhd; Viscount Plastics (M) Sdn Bhd, Prym Newey (M) Sdn Bhd and Formosa Prosonic Holdings Sdn Bhd)• Launched the Heveaboard Mensilin ESCO Concept Demonstration Project on 7 April 2006 |
| 2007 | <ul style="list-style-type: none">• Review of the Master Energy Service Agreement |

General observations and comments

Most industries, while being convinced of the benefits of energy efficiency measures, have been hesitant to provide capital investment for such efforts. In an energy performance contracting (EPS) scheme, it is the task of the ‘energy service company’ (ESCO) to perform an energy audit and to propose energy-saving options and measures; the ESCO will then

make the investment (on a loan arrangement with a financial institution. During project implementation, the ESCO will be adequately paid for its services from the energy saved and the ESCO will make monthly repayments to the bank.

MIEEIP has developed the tools for ESCO development and capacity building. The Master Energy Services Agreement (MESA) was drawn up by the MIEEIP Team at PTM as a sample document to assist energy service companies and industries in the implementation of energy efficiency activities by setting out the relevant procedures and obligations of both parties. In Malaysia, while most ESCOs are capable of conducting energy audits, currently only a few of them are ready to move further from energy audits to energy performance contracting. The MESA can become a useful reference for ESCOs to equip themselves with the capability and skill to be engage in energy performance contracting.



It is difficult to judge the final quality; so far MESA has only been used and tested once, signed between Heaveboard Bhd as the host site and Mensilin as the ESCO. The MESA has since been reviewed after identifying some weaknesses in its original version of the MESA. Apparently, one issue that MESA does not adequately address, for example, are details in project implementation.

In spite of the ESCO Component in MIEEIP, the ESCO industry in Malaysia has not developed well. The following are current attributes of the ESCO industry in Malaysia:

- Many ESCOs have a "poor image", aggravated by the fact that also equipment suppliers identify themselves as ESCOs (as a means to market the equipment they sell);
- The fact that only 1 out of 4 projects earmarked for ESCO execution had been carried out has failed to impress the industrial community of the ESCOs' professional capability;
- While ESCOs are capable of undertaking energy audits (consultancy), they seem less interested in taking up the challenge of performance contracting, supposedly because of the absence of Government regulations on energy efficiency (Energy Management Regulations have been proposed, but approval is still pending) and finance mechanisms (e.g., soft loans)
- Many companies are still hesitant to pursue energy savings, because the current fuel cost does not reflect the real energy production cost.
- Most companies are financially capable to carry out EE projects. If interested, they would prefer to do the EE project on their own rather than do it with an ESCO and share the energy savings with the ESCO.

A directory of Malaysian ESCOs was published in 2003, which also included various materials on energy efficiency promotion and services that ESCOs can provide. The directory was distributed to some 1,000 recipients. The directory lists out only 28 ESCOs. These are the more established ones in the country. Their services and specialisation cover energy audits, energy management, energy efficiency training, energy efficiency retro-fittings, energy performance contracting, and renewable energy solutions. To date the list has been updated, with most of them voluntarily registered with PTM. If accepted by MEWC and implemented, the scheme will help to bolster up the professional image and credibility of the ESCOs.

2.1.6 Outcome 6 Energy technology demonstration programme

Indicator: Successful demonstration of the applicability and feasibility of proven energy efficiency technologies

Baseline

No real demonstration activities on EE technology has been developed and carried out.

Table 6 Outputs, indicators and status of outcome 6

Outputs	Indicator (June 2007)	Status (June 2007)
6.1 Demonstration projects designed, developed	7 projects designed, out of which 6 funded and hardware procured, 5 being commissioned and 4 under implementation	Ongoing
6.2 Dissemination of information on application and benefits on EE technology	Completed and being further promoted by PTM (incorporated in seminars conducted under Outcome 4, in collaboration with FMM)	Completed
6.3 Demo programme evaluation	Report	Completed

Activities and achievements

- | | |
|------|---|
| 2002 | <ul style="list-style-type: none"> • One (1) pre-feasibility study for one (1) fast track approach demonstration project i.e. "Replacement of oil fired heating system to wood fired heating system" project where the ESCO is Mensilin and the host site is Heveaboard. Industrial sector is wood. • Investment grade audit for fast track approach demonstration project between Mensilin (ESCO) and Heveaboard (Host) |
| 2004 | <ul style="list-style-type: none"> • Three pre-feasibility studies for 3 demonstration projects under the normal approach i.e. (1) J.G. Containers, sector: glass, (2) Johnson-Suisse, sector: Ceramics, (3) FELDA Vegetable Oil, sector: food • Investment grade audit for JG Containers under normal approach demonstration project; completed investment grade audit for glass, ceramics and food |
| 2005 | <ul style="list-style-type: none"> • Signing agreements for Pulp and Paper, Rubber and Iron and Steel Sector; • Pre-feasibility study and Investment Grade Audit for Pulp and Paper, Rubber, Iron and Steel Sectors. • Installation of Fast Track project (Mensilin and Heveaboard) • Installation and commissioning for food and ceramic project |
| 2006 | <ul style="list-style-type: none"> • Installation and commissioning for glass sector. Completed the installation and commissioning for pulp and paper sector. • Pre-feasibility study for cement sector. Host site reluctant to proceed. • Pre-feasibility study for wood sector (Visdamax); host site reluctant. • Pre-feasibility study for Dog Hwa (Wood); host site reluctant to proceed (agreement clause) • Pre-feasibility study for textile sector (Hytex); MoA signed. • Other potential host site approached but did not proceed - Seng Choon Plywood |

(Wood) - Mico Chip Board (Wood)

- Completed the monitoring and verification report for ceramics and food;
- ETDP information disseminated through workshops – C4 FMM road shows (C4 – FMM Road shows)

General observations and comments

The component focused on implementing measures which can be easily replicated and will act as the showcase for the industries concerned. By demonstrating actual applications, it is possible to show that substantial benefits can accrue and need not be costly. The major activities in this component involving feasibility studies, the engineering design, installation, operation, monitoring and evaluation. As at Dec 2007, it has successfully completed (installing and commissioning) 7 projects in various sub sector of the industry. Two types of demonstration were formulated

- Fast Track Approach (or ESCO approach) and
- Normal Approach (or direct implementation by PTM and the host companies) .

The Fast Track Approach requires an ESCO, by means of a MESA, to implement the EE project based on performance contracting. As stated in the findings in the Component 5, even after various capacity building activities developed by MIEEIP, ESCO in Malaysia has not developed well and finding a true workable ESCO is not an easy task which resulting only one ESCO approach demonstration project was being implemented. With industries craving for more demonstration projects, this led PTM to pursue the normal Approach aggressively and search for companies whom able to host such technology demonstration in their premises. The successful rate for type ii (Normal Approach) demonstration projects has been higher than in the ESCO approach. Successful host companies and ESCO were entitled for financing packages developed by Component 8 and the reader is referred to the part ‘observations and comments’ of section 2.1.8 of this report.

2.1.7 Outcome 7 Local EE equipment manufacturing support programme

Indicator: Improvement in the design and manufacturing of energy efficient industrial equipment by local manufacturers

Table 7 Outputs, indicators and status of outcome 7

Outputs	Indicator (June 2007)	Status (June 2007)
7.1 Improvement the design and manufacturing	Assessment done of local equipment manufacturing capabilities; Evaluations of performance of locally produced equipment and analysis of potential improvements	Completed
7.2 Training local industrial equipment manufacturers on high efficiency design and production technologies	Local manufacturers trained in workshop; Three local manufacturers have been offered assistance. Of these two have completed the installation and disseminated the results of their respective project through seminars.	Completed
7.3 Evaluation of the programme	Ongoing	Ongoing

Baseline

No substantial improvement in the design and manufacturing of energy efficient industrial equipment by local manufacturers

Activities and achievements

- | | |
|-----------|--|
| 2002 | <ul style="list-style-type: none">• Conducted a market survey to verify the situation of the market for energy efficient equipment in Malaysia |
| 2003 | <ul style="list-style-type: none">• Successfully set up and establish the standard of analysis to assess the capability of the manufacturing processes of local equipment manufacturers.• Prepared the preliminary evaluation report of typical performance of selected locally produced equipment.• Prepared detailed evaluation report of typical performance of selected locally produced equipment.• ‘Business and Financial Planning’ workshop with the assistance of C5.• Successfully obtained the approval from the Tender Evaluation Committee (TEC) on possible "Energy Efficiency and Manufacturing Improvement Demonstration Projects" |
| 2004-2005 | <ul style="list-style-type: none">• Market survey to verify the market situation for EE equipment in Malaysia• Setup and establishment of the standard of analysis to assess the capability of the manufacturing processes of local equipment manufacturers;• Identification and selection of four energy efficiency & manufacturing improvement demonstration projects for different locally produced equipment;• Agreement for the pump manufacturer Chun Khong Engineering Sdn Bhd• Agreement for the fan & blower manufacturer Massive Fan Sdn. Bhd• Preliminary “Evaluation Report of Typical Performance of Selected Locally Produced Equipment”• Detailed Evaluation Report of Typical Performance of Selected Locally Produced Equipment (Phase 1 & Phase 2).• Business and Financial Planning Workshop• Boiler Best Practice Workshop• Approval from Technical Evaluation Committee (TEC) on possible energy efficiency & manufacturing improvement demonstration projects• Review, comment and verification procedure by international consultant for the and tender specifications preparation; for:<ul style="list-style-type: none">○ Pump manufacturer Chun Khong Engineering Sdn Bhd○ Fan and blower manufacturer Massive Fan Sdn Bhd• Completed the Factory Test Acceptance (FTA) for:<ul style="list-style-type: none">○ Fan & Blower Manufacturer - Massive Fan Industries Sdn. Bhd.○ Pump Manufacturer – Chun Khong Engineering Trade Sdn. Bhd.○ Motor Rewinder - Rotary Technical Services Sdn. Bhd.• Business plan preparation, legal documentation and loan approval by MIDF (Fund Manager of MIEEIP Project) for:<ul style="list-style-type: none">○ Pump Manufacturer – Chun Khong Engineering Sdn. Bhd○ Fan & Blower Manufacturer Massive Fan Sdn. Bhd. |
| 2006 | <ul style="list-style-type: none">• MoA for the Motor Rewinder – Rotary Technical Services Sdn Bhd• MoA for the Kiln Dryer Manufacturer – Visdamax (M) Sdn. Bhd.• Tender specifications preparation and tender evaluation for:<ul style="list-style-type: none">○ Motor Rewinder Rotary Technical Services Sdn. Bhd.○ Visdamax (M) Sdn. Bhd.• Delivery, installation, commissioning and training of the demonstration project |

for:

- Pump manufacturer Chun Khong Engineering Trade Sdn Bhd
- Fan & Blower manufacturer Massive Fan Industries Sdn. Bhd.
- Completed “Pump Best Practice” workshop
- Completed the Business plan preparation, legal documentations and loan approval by MIDF for
 - Motor Rewinder – Rotary Technical Services Sdn. Bhd.
 - Kiln Dryer Manufacturer – Visdamax (M) Sdn. Bhd

General observations and comments

This component has mainly focused on industrial equipment, such as boilers, pumps, fans & blowers and motor re-winding. Two strategic documents “How to Encourage Local Manufacturers to Produce High Energy-Efficient Equipment”, one for pumps and one for fans and blowers, aim at laying out a pathway for Malaysian manufacturers of this equipment to produce high-efficiency products with competitive prices so that they are able to find a place in the highly competitive globalised market.

The main pump market in Malaysia is for water supply and the local water pump market is dominated by low-price, lower-quality pumps imported from China. As a result overall quality of the imported and purchased pumps is compromised in terms of their energy consumption per work capacity characteristics. The Malaysian pump market is estimated at RM 450 million annually. Imported pumps dominate about 85% of this market, valued approximately at RM 380 million. The local manufacturers enjoy only a 15 percent share of the market, valued at a total of RM 70 million. Currently, the survey indicated that there are no more than 5 local pump manufacturers. There are two approaches of improving pump efficiency, and these are:

- Manufacturing pumps of higher efficiency at competitive prices;
- Ensuring pumps are operated at optimum conditions.

Similarly, the most of the fans and blowers used in industries are of ‘average’ standard and quality. There is therefore high potential for local manufacturers to produce high quality and energy-efficient fans and blowers in this country, both for local and international markets. The potential for designing and manufacturing of these products lie in blade designing (which includes choice of materials, housing design, motor efficiency and variable speed drives).

Fans and blowers use motors to drive them. In one survey made by the Energy Commission in 2005, 70 percent of the electricity used in industries is by electric motors alone, of which only two percent of them are High-Efficiency Motors (HEMs). In Malaysia (and other developing countries, for that matter) motor-rewinding is an industry of itself, and many people earn their living by doing motor-rewinding as a business⁸. There is therefore high potential for energy savings at the national level if the country moves towards encouraging more widespread use of HEMs, and the Government taking particular strategies to block or reduce to a minimum the import of cheap and low-quality electricity motors (that mostly come from China).

⁸ In reality, motor-rewinding cannot make the repaired motor more energy-efficient that it originally was, as a matter of fact, it is the opposite. No rewinding activity can be as efficient as the original winding, hence making the rewired motor slightly less efficient that it originally was. However, improved motor rewinding techniques have shown that rewinding of burnt-out motors can also restore closer to the original efficiency level or achieve longer operating hours as compared to standard motor rewinding methods. Given the importance of the sector, it makes sense to support any activity in motor re-winding to reduce the loss of energy efficiency, for example, from 1 percent loss to 0.5 percent loss.

At the beginning of MIEEIP, it was reportedly not easy to find local equipment manufacturers willing to participate. There are few of such manufacturers. MIEEIP managed to secure only three equipment manufacturers (Chun Khong Engineering Sdn Bhd, Massive Fan Industries Sdn Bhd and SSC (M) Sdn Bhd, for pumps, fans & blowers, motor rewinding, respectively) had benefited in improving their equipment efficiency and productivity.

2.1.8 Outcome 8 Financial institutions Support component

Indicator: Established financing arrangements for provision of loans to eligible companies and equipment manufacturers who can host energy efficient technology demo projects and produce energy-efficient industrial equipment.

Baseline

Until the MIEEIP project lending facility, no such lending schemes for energy efficiency were available in governmental or commercial financial institutions.

General observations and comments

This part describes the Technology Demonstration and Local equipment Support programmes (Component 6 and 7), financially supported under Component 8 (EEPLS)) with the overall objective of showcasing the applicability as well as the technical and economic feasibility of advanced energy efficient technologies in the Malaysian industries and the capability of the local manufacturers in producing such equipment.

Table 8 Outputs, indicators and status of outcome 8

Outputs	Indicator (June 2007)	Status (June 2007)
8.1 Set up financing arrangements	Instituted project lending schemes with MIDF; Selection of companies for demonstration project components and local manufacturers support program; Loan scheme being implemented and monitored. Three companies have started paying back the amortization of their loans	Ongoing
8.2 Monitoring of loan scheme	Loan scheme being implemented and monitored. Three companies have started paying back the amortization of their loans	Ongoing
7.3 Sustainable energy support programme	Proposal paper on EE revolving fund sent to MEWC	Ongoing

Table 9 Overview of case studies presented and companies supported by MIEEIP in implementing or manufacturing EE

Case study (Component 4)	Company	Lending scheme and payment (P) and interest subsidy (I) (Component 8)	Disbursements Interest subsidy O: outstanding	Annual (A) and accumulated (C) repayments at 31-10-07
		Scheme 1 (Comp. 6) (Fast-track; ESCOs)		
HeveaBoard – Mensilin (particleboard; Gemasp, Negeri Sembilan)	Mensilin Holdings (ESCO)	P: 2 million	D: 2 million	A: 36,833 (60 months) C: 552,441
		Scheme 2 (Comp. 6) (Normal approach)		
JG Containers (glass containers; Kiang, Selangor)	JG Containers	P: 2 million I: 300,000	D: 2 million I: 78,0565 and O: 221,944	A: 33,333 (60 months) C: 300,000
	Johnson Suisse	P: 2 million I: 300,000	D: 2 million I: 135,522 and O: 164,478	A: 33,333 (60 months) C: 566,667
	Felda Vegetable	Did not apply for loan		
	Apollo Rubber	P: 1,400,000 I: 210,000	D: 241,191 and O: 1,158,809 I: 3,852 and O: 206,148	
	Pascorp Paper	P: 1,300,000 I: 195,000	O: 1,300,000 I: 195,000	
Malayawata Steel	Malayawata Steel	Loan is under negotiation		
		Scheme 3 (Comp. 7) (Local equip. manuf.)		
	Chun Kong	P: 500,000 I: 62,500	D: 500,000 I: 24,219 and O: 38,281	A: 10,417 (48 months) C: 125,000
	Massive Fan	P: 500,000 I: 62,500	D: 500,000 I: 18,855	A: 10,417 (48 months) C: 72,917
	Rotary Tech, SSC	P: 420,000 I: 52,500	D: 420,000 O/I: 52,500	
		Other		
Cargill Palm Oil Products (Kuantan, Pahang)				
Pan-Century Edible Oils (palm oil, Pasir Gudang, Johore)				
Jayakuik (particleboard; Kiang, Selangor)				

Note: all amounts are in Malaysian Ringgit (MR)

The project's Energy Efficiency Lending Schemes (EEPLS) are as follows (see also Table 9):

- Under the "Fast Track Approach", an ESCO is selected to work closely with a selected host demonstration company, under an energy performance contract. Maximum loan eligible for an ESCO is 90 percent of the energy efficiency project cost or not more than RM 2 million, whichever is lower;
- Under the "Normal Approach", PTM works closely with the selected host demonstration companies. A fund of RM 8 million is established in MIDF, where each factory can borrow up to 50 percent of the energy efficiency investment, or a maximum of RM 2 million. Four of the originally eight demonstration projects were designed to be under the normal approach;
- A third scheme was established to support the local equipment manufacturers (Component 7 only).

To implement the above-mentioned demonstration projects⁹, project lending schemes have been established at the MIDF. Loans can be provided up to 50% of the project value and at 0% interest rate. Total funds received to implement and finance the demonstration projects of components 6 and 7 have been RM 13.75 million, of which:

- UNDP: RM 9.75 million (RM 7.5 million for Component 6 and RM 2.25 million for Component 7)
- MEWC (through AAIBE, also referred to as MESITA): RM 4 million

Out of the RM 13.75 million, RM 11.3 million has been allocated, of which RM 7.9 million has actually been disbursed (up to 31-10-2007; see Table 9 for more details).

Under the 'Fast-Track Approach' originally 4 projects were originally planned¹⁰. Only the HeveaBoard has become successful, while the other three backed out eventually. This again indicates that the fact that both industries and ESCOs are not quite ready for energy performance contracting (EPC). In general, medium-sized companies have taken advantage of the funding schemes. Large companies (many energy-intensive industries are subsidiary of multinational companies) have their own financial resources, while for small companies the loan amount may have been too high.

2.1.9 Overall comments and observations

The eight components themselves are closely interlinked, although to the novice reader this will not immediately become clear when browsing through the numerous quarterly progress and technical reports produced. There are particularly strong links between the Components on benchmarking (1) and ratings (3) on one side and between, demonstration (6), ESCO support (5), local equipment manufacturing (7) and financial institutions (8) on the other side, as well as between the two main groups in the promotion component (4) and the energy audit component (2).

To give more specific examples:

⁹ It should be noted that the MIEEIP team has supported various feasibility studies in companies other than those that finally applied and agreed to participate in the demonstration projects: wood subsector, 3 companies; plastics, 2; textiles 1; pulp and paper, 3; rubber, 3; food, 1, while the demonstration projects in glass, ceramics and HeveaBoard were based on the energy audits;

¹⁰ Besides HeveaBoard, these were:

- Kuantan Cement (ESCO 4 Cofreth); project: variable speed drive (VSD), application for large ID & FD fans;
- Amsteel Sdn Bhd (ESCO 4 Eco Energy); project: Oxygen lance manipulator for electric arc furnace
- Sunway Keramo (ESCO 4 J. S. Mahir); project: Airless drying system for ceramic industry.

- Component 2 provides the information for which the basis of Component 1 (Benchmarking Programme) was based upon. Component 2 is also actively involved in the development of Component 5 (ESCOs Programme) activities by selecting ESCOs representatives to be involved in the audit exercise. Component 2 energy auditors are also engaged in conducting feasibility studies as part of Component 6 (Energy Technology Demonstration Programme) activities;
- Some of the case studies of component 4 describe the 6 demonstration projects of component 6 that have all undergone an energy audit (component 2). Of the demo projects only one has been developed with ESCO support (Heveaboard), but six demo projects have received support by the project's financial mechanism (component 8), while the latter has also extended support to 3 local equipment manufacturers. Table 9 gives an overview of these interlinkages between components in terms of assistance given to the companies participating as demonstration hosts in the MIEEIP.

2.2 Implementation: assessment of the project's impacts

Table 10 provides an overview of the envisaged or potential impacts of the project, which are briefly described below.

Energy savings and CO₂ reduction

Eleven highly intensive industrial sectors were selected. The total number of industries that were audited amounted to 48 (of which the *direct emission reductions* are calculated in Box 1) to which 6 audits were added later. These industries are the immediate beneficiaries.

The spin-off impact to other industries, however, is potentially many times more. Through seminars, workshops, road shows, newsletters, media publications and the website, industries in the country as a whole have been alerted and have been shown (through the demo projects) the importance and need for energy savings and efficiency measures. The implementation of such measures is a vital strategy for industries to be more efficient in their energy consumption pattern and to cut down any possible wastes in their energy use. A feedback received by the MIEEIP team from factories covered in the MIEEIP database indicated that over 250 companies have started implementing energy efficiency activities at their sites.

Assuming an average energy savings of 12,814 GJ per year per company (based on the estimate of 615.1 GJ per year of energy savings in the 48 audits companies, given in Box 1), this would imply *indirect* CO₂ savings of 3,778 tCO₂ per company.

Thus, total energy savings of 250 companies implementing energy saving measures would be around 3.2 million GJ, giving a CO₂ reduction of 944.7 kilotonnes of CO₂ annually (i.e., 9.45 million tCO₂ over a 10-year period)¹¹.

Development of sectoral policies, laws and regulations

Some MIEEIP activities have had some impact on recent policy formulation that is reflected in the 'energy chapter' of the Ninth Malaysia Plan 2006 – 2010 (NMP 2006-2010) as well as on recommendations made to the energy regulator, i.e. the Energy Commission:

¹¹ According to an industry survey in 2004 undertaken by FMM, there were 1,088 industries (out of a total number of 1,954 FMM members) categorised under the original eight industry sectors of the MIEEM, with a total energy consumption of 39,112,746 GJ per year. A mere 3% of energy savings initiatives (if pursued by these energy-intensive industries) would result in savings of 1.17 million GJ per year. (This is equal to the amount of fuel required to run a 45 MW power plant at operating at 0.85 power capacity; source: PTM, 2007).

Table 10 Indicators of project impacts

Impact of the Project	Indicators (based on the 2007 APR-PIR, unless indicated otherwise)	Corresponding outcome indicators (for the eight component as mentioned after the section title in section 2.1)
1. Energy savings 2. Annual and cumulative CO ₂ reduction	Estimates made by the Evaluator (see main text below) ¹² <ul style="list-style-type: none"> • Energy savings: 3.2 million GJ per year • <i>Direct</i> CO₂ emission reduction (in 48 audited industries, including the demonstration projects, see Box 1) <ul style="list-style-type: none"> ○ Annual: 181,000 tCO₂ ○ Cumulative: 1.81 million tCO₂ (10-yr period) • <i>Indirect</i> CO₂ emission reduction (250 industries, see main text) <ul style="list-style-type: none"> ○ Annual: 944.7 ktCO₂ ○ Cumulative: 9.45 million tCO₂ • <i>Potential</i>: if all no cost, low-cost and high-cost energy savings measures would be implemented in 250 industries, CO₂ reduction could be 4 times higher 	
3. Development of sectoral policies, laws and regulations	<ul style="list-style-type: none"> • <i>APR-PIR</i>: indicator mentioned as “drafting, adoption and enforcement of policies and legislative measures”, but not quantified, because MIEEIP does not have ‘policy and regulation’ component 	<ul style="list-style-type: none"> • Established and developed energy-use benchmarks for various industry sub-sectors <ul style="list-style-type: none"> ○ E-benchmark database has been established by PMT and NPC
4. Improvement of awareness and understanding of EE technologies in industry	<ul style="list-style-type: none"> • <i>APR-PIR</i> mentions ‘market that the project has financed, developed or transformed’: <ul style="list-style-type: none"> ○ 80 companies utilising EE equipment (motors mainly) ○ 120 companies monitoring energy consumption ○ 600 companies using cleaner fuels (natural gas and biomass) 	<ul style="list-style-type: none"> • Energy auditing is practised and used <ul style="list-style-type: none"> ○ 800 companies practising energy management ○ 54 audited (under MIEEIP) • Information materials are widely available and energy rating programmes are implemented <ul style="list-style-type: none"> ○ Policy paper submitted, but no rating programme approved yet • Successful demonstration of the applicability and feasibility of <ul style="list-style-type: none"> ○ 9 demonstration projects have been implemented with MIEEIP support ○ Improvement in the design of EE equipment (3 companies supported) • Dissemination of info on EE practices and technologies <ul style="list-style-type: none"> ○ See main text, Annex C
5. Expansion of business and supporting services for EE investments	<ul style="list-style-type: none"> • <i>Not mentioned in APR-PIR</i> 	<ul style="list-style-type: none"> • Establishment of MEPA (association of energy professionals) • Establishment of an optimal structure for ESCOs and of options for performance contracting <ul style="list-style-type: none"> ○ Despite MIEEIP, ESCO concept is not taking off (due to reasons external to the project)
6. Increase of financing availability and financing mechanisms	<p><i>The 2007 APR-PIR reports:</i></p> <ul style="list-style-type: none"> • Volume of investments: <ul style="list-style-type: none"> ○ US\$ 4.4 million (MIEEIP) ○ US\$ 10 million (private) • Two banks (Bank Pembangunan and RHB Bank) have established funds for sustainable energy (RM 2 billion) • Investments in EE in 2006/7 were reportedly were RM 40 million 	<ul style="list-style-type: none"> • Established financing arrangements <ul style="list-style-type: none"> ○ Project lending scheme established at MIDF, but has not been transformed and/or up-scaled in a full-fledged EE revolving fund (but proposal has been sent to MEWC)

¹² Note that the 2007 APR-PIR provides the following: energy savings: 102 ktoe (2006) and 409 ktoe over the period 200-2006 as well as emission reduction of 2.04 MtCO₂ in 2006 and 7.57 MtCO₂ over 2000-2006, but without indicating how these figures were calculated

Box 3 Emission reduction impact of MIEEIP energy audits

The impact study PTM (2007) analyses the impacts of the energy audits in the first 48 industrial companies (six later audits were not included). The study distinguishes between (1) no-cost measures, (2) low-cost measures and (3) high-cost measures. Under the no-cost category, 156 recommendations were made, out of which only 104 (67 percent) were carried out. A figure of 90% or above is highly desirable here, because the main barrier (pointed out by most industries) is the cost factor. Nonetheless, even measures that bear no cost were not being able to be implemented; this is indicative for the lack of will (or concern) both at the top and middle levels management.

Low-cost recommendations involve carrying out measures that do incur some investments that can be recovered within a period of 2 years. Such measures include, for example; use of as much day-lighting as possible for the factories, and ensuring that the steam systems are well insulated, and recovery of the heat waste from the flue gas stack and the boiler condensates. Out of a total of 212 recommendations made only 76 were carried out (36 percent), again a disappointing figure, according to PTM (2007).

High-cost recommendations involve carrying out measures that incur substantial investments; this normally includes putting up or replacing old equipment or technologies with new and more efficient ones, and improving existing processes with more state-of-the art processes. While benefits can be substantial though, one would expect many companies to come up with the investment fund. Out of a total of 105 recommendations, only 15 were implemented (14 percent).

The 48 industries audited during the beginning of the MIEEIP had indicated a potential savings of 2.58 million GJ per year and financial savings of RM 85 million a year if all of the no-cost, low-cost and high-cost recommendations would have been implemented. This would result in a CO₂ emission reduction of 761,000 tonnes of CO₂. Over a 10-year period, the amount of CO₂ mitigated would be 7.61 million tCO₂. However, if we assume that only part of the potential savings potential will actually be realized in the 48 companies (the percentages of no-cost, low-cost and high-cost measures implemented, as indicated above), the average energy saving is only 23.8%, implying savings of 615,000 GJ per year, annual CO₂ reduction of 181,000 tonnes per year and a cumulative CO₂ reduction of 1.81 million tCO₂.

Sectors	Food	Wood	Ceramic	Cement	Glass	Rubber	Pulp & Paper	Iron & Steel	Total	Correction factor
Energy consumption ('000 GJ/yr)	1,835	1,032	774	21,557	4,000	611	5,080	4,223	39,113	
Energy costs (10 ⁶ RM/yr)	42.2	13.5	24.1	204.2	97.8	16.9	84.2	160.1	643.0	
- No cost	24	8	39	1	31	57	52	64	277	67%
- Low cost	111	132	75	7	14	21	69	57	486	36%
- High cost	238	221	42	337	59	84	691	149	1,821	14%
Total savings ('000 GJ/yr)	374	361	155	345	104	162	812	270	2,583	615
Total cost savings (10 ⁶ RM/yr)	8.5	5.2	6.0	33.8	2.5	4.3	19.8	5.3	85.3	
CO ₂ emission reductions (kt/yr)	28.0	30.4	14.5	444.7	8.1	18.9	194.4	22.8	761.7	181.4
# of audited factories	10	7	6	3	3	9	6	4	48	
Factories registered	471	75	54	54	18	134	134	148	1,088	

Source: UNDP (2006) and PTM (2007)

- The Energy Efficiency and Conservation Guidelines report (see section 2.1.1) would become the main reference document when the Efficient Management of Electrical Energy Regulation may finally be enacted in due course, as envisaged in the NMP;
- The E-benchmarking database allows the energy intensity for a particular industry activity (micro energy intensity) be determined and analyzed, from which the energy intensity at the national level (macro energy intensity) can be determined and compared with international benchmarks for that particular industry subsector. Such information is useful in re-strategizing the industry and national energy policy of the country in the future.
- Electric motors consume about 70% of electricity in industry. A DANIDA-supported study has shown that only 2-4% of the electric motors used in the industry sector are highly energy-efficient motors (HEMs). All others are standard and low-quality motors that penetrate widely into the Malaysian market because they are cheap.
- The Government should put a stop the practice of using standard and substandard electric motors, by allowing only HEMs to be imported into the country and/or improving the existing tax incentives mechanism to encourage their use. A MIEEIP-supported a working group on motors concluded that introduction of standards for electric motors¹³ would lead to savings of 72,000 GWh for the period 2003-2004 (PTM, 2007). A proposal was made to the Energy Commission, but its approval remains pending.

Besides the above-mentioned inputs, MIEEIP has not had a separate component on ‘policy making, regulation and legislation’ on energy efficiency for industry. The Evaluator feels this has been an omission in the project’s design (as will be discussed further in section 2.3.1). There appears to be a view in some circles in the Government that decisions on energy efficiency are a purely commercial decision by the companies involved. This is unlikely to be true for two reasons:

- First, in an environment of subsidized energy prices, the savings determined at market prices underestimate the true opportunity cost of energy savings;
- Second, international experiences also show that a national programme consisting of sustained awareness campaigning with financial incentives (the ‘carrot’) as well as mandatory regulations, standards and labelling (the ‘stick’) are necessary to have a real energy savings impact.

Capacity strengthening and awareness

Until MIEEIP energy efficiency promotion efforts in Malaysia focused on individual energy audits, while MIEEIP has provided a more holistic framework to create awareness and promote energy efficiency in industries. The Evaluator concludes that MIEEIP has largely been successful in lowering one main barrier in implementing energy efficiency in industries, i.e. the lack of awareness or ignorance among the higher management circles of the industry.

At the beginning of the MIEEIP, industries were reluctant to participate in the audit component. During the course of MIEEIP implementation, through continuous promotions (such as seminars, workshops, training courses, the demonstration projects, newsletters and the website) and direct consultations, more and more industries were willing to participate.

MIEEIP has created and developed a team of trained energy auditors in PTM. While initially being young engineers, the impact study PTM (2007) concludes that “after conducting 54 audits the MIEEIP auditors are the most capable group of energy auditors in the country”. They will play an important role in further promoting energy savings measures in industry

¹³ Based on the European Committee of Manufactures of EU Electrical Machinery and Power Electronics (European CEMEP) scheme. Source of data: PTM (2007)

through the conduct of energy audits in the future. For those who had resigned from the team, while they are a loss to PTM, they are not a loss to the country, since some of them reportedly have established their own energy service companies (ESCOs) to continue doing energy audit services as part of a private sector.

In general, the project has provided institutional strength to PTM. In fact, PTM is now capable of implementing two other big UNDP/Government of Malaysia projects, which are the Biomass Based Power Generation and Co-generation (BioGEN), and Malaysia Building Integrated Photovoltaic Project (MVIPV). Consequently, PTM has become a recognized energy organization, not only domestically, but also in the ASEAN region.

The MIEEIP News has also contributed to EE awareness. It is difficult to measure the impact in terms of higher awareness or EE measures implemented, but one survey carried out in 2006 showed that 87% out of 155 respondents gave an 'excellent/good' rating. Of the 155, 50 industries replied having implemented various energy saving measures, while out of these 50, 20 had also established an energy management team.

Through the accumulation of participation in seminars, workshops, training sessions, and other capacity-building exercises, it has been estimated that over the six-year period, the MIEEIP had reached out approximately 5,000 industries, in particular within the 11 industrial subsectors: (cement, ceramics, food, glass, iron and steel, pulp and paper, rubber, wood, textiles, plastics and oleo-chemicals. This figure (5,000) also includes those reached out through PTM and MIEEIP publications, in particular the MIEEIP News. In addition, there are also conferences or seminars organised by the entity given birth to by the MIEEIP, i.e. the Malaysian Energy Professional Association (MEPA). MEPA organizes its MEPA conference once in every two years or so.

ESCO supporting services for EE investments

The ESCO industry in Malaysia remains in its infancy, as it keeps on struggling to find a place in the business community. The energy performance contracting scheme is still not well received in the manufacturing industry with so far only one MESA (Master Energy Service Agreement) signed¹⁴. The MIEEIP programme had been responsible in creating its existence, and as such it still needs some boost and support from the programme that created it. A voluntary ESCO registration scheme has also been developed by PTM. If accepted by MEWC and implemented, the scheme will help to bolster up the professional image and credibility of the ESCOs.

Financing and demonstration projects

MIEEIP Energy Efficiency Project Lending Schemes (EEPLS) is actually a mini-version of an 'energy efficiency revolving fund (EERF). One can say that in the absence of such an up-scaled fund and/or other 'green funding' schemes, more ambitious energy efficiency improvements in energy-efficient processes and technologies cannot easily be pursued. On a positive note, two banks reportedly have expressed interest in 'green funding', namely RHB Bank and Bank Pembangunan.

¹⁴ In other areas, EPC may be more popular. The new building development projects are most likely done through EPC. The IPPs may have carried out their power generation projects through EPC.

2.3 Project relevance, design and country drivenness

2.3.1 Relevance

Generally, Malaysia has to face the challenges of future development in a global environment where the spur to growth fuelled by hydrocarbons will be proportionally weaker than in the past. Spiralling oil prices, environmental degradation and climate change have made the need for sustainable use of energy more evident. Growth will need to come from the manufacture and sale of products that are increasingly competitive on international markets in terms of quality and price. Efficient use of energy makes an important contribution to lower costs and therefore to competitiveness.

Thus, the project is relevant to the development objectives of Malaysia. The 9th Malaysia Development Plan 2006-2010 indicates in its Chapter 19 the importance of energy efficiency. The Plan mentions energy efficiency programmes in the industrial and buildings sectors. Its predecessor, the 8th Plan (2001-2005) already emphasized the efficient utilisation of energy, in particular in the industrial and commercial sectors. The Ninth Malaysia Plan's target focuses basically on industries and office buildings. The plan targets at reducing the national electricity elasticity from 1.58 to 1.05 (implied). This translates to power reduction of 1,071 MW and energy savings of 35,370 GWh and demands an annual 8.7 percent average reduction target every year¹⁵. It is not impossible to achieve such a target, but it would require highly concerted efforts by the agencies involved in the implementation of energy policy and efficiency (see Box 1).

In fact, while such lofty targets sound nice, in practice many barriers hamper the implementation of energy efficiency (EE), as listed in section 1.1. If these barriers remain (a "business-as-usual scenario") the energy efficiency target of the Ninth Malaysia Plan will not be achieved. MIEEIP has made a timely attempt to lower (some of) these barriers.

2.3.2 Project conceptualisation

As such, the project document provides a clear, logical structure in eight Components. The outputs of each Component are clearly specified and would if achieved meet the objectives of each Component. The original list of activities has not always been practical, and has changed over time, but this may be expected of a project that was initiated 8 years ago. The eight Components themselves are closely interlinked. There are particularly strong links between the Components of Benchmarking (Component 1), Audits (2) and Ratings (3), group 1, and between the Components Demonstration (6), ESCO support (5), Support to manufacturers (7) and financial instruments (8), group 2. The Component on Audits (2) and Promotion (4) link the two groups.

While, the project addresses the barriers mentioned in section 1.1, one main barrier has not been addressed. The evaluator has the opinion that energy efficiency promotion requires a policy of the 'carrot and the stick'. The project is designed to make a first step to work on the 'carrot', i.e. to create awareness in industry and institutions and to strengthen capacity in important areas such as benchmarking, best practice, audits, demonstration of EE technology and processes and even helping to design financial instruments. Apparently, in 1998 when the project was designed, it considered that some basic awareness and capacity should be created first of all. Although the Evaluator has the advantage of hindsight, it seems that the

¹⁵ Source: Impact Study (PTM, 2007), page 108.

lack of a conducive policy and planning framework in Malaysia for the promotion and implementation of energy efficiency is another main barrier (together with the existence of subsidised energy prices). Therefore, a separate component on energy efficiency planning and regulations would have benefited the project.

2.4 Assessment of the implementation approach in achieving outcomes and outputs

2.4.1 Progress towards results; adaptive management

Project management

The project management structure is explained in Section 1.2. Overall direction of the MIEEIP rests with a National Steering Committee (NSC) chaired by the Deputy Director of the Energy Section Economic Planning Unit (Prime Minister's Department). The NSC has met 12 times since project inception with a last meeting planned for December 2007¹⁶. Attendance appears to be good and the minutes of meeting are satisfactorily. Day-to-day project management is the responsibility of a full-time project manager (Chief Technical Adviser, CTA; later named Chief Project Coordinator). A Component Manager or Leader manages each Component, in the beginning with an assistant, although over the years the number of staff has decreased over the years, as will be explained below.

PTM is an ISO 9000 organisation and its quality control procedures have been adopted by MIEEIP and applied fairly consistently. Overall, despite the various hurdles, the Evaluator observes that the project has been well managed. Also, the working arrangement with the stakeholders and UNDP has worked satisfactorily.

Delays in project implementation

The project was initially meant to be run from 1999 to 2004. In 2004, the NSC decided to extend until 2006 and again was extended until December 2007. Although the MIEEIP is finally considered a success (as described in the previous sections), one has to appreciate *the delay and multitude of other problems* that had to be encountered.

The *benchmarking component* started with delays, as industry was initially uncooperative (Lucas, 2003). Confidentiality was an issue and in general it was not clear for companies why they should spend time and money on providing data which is not compulsory. The international consultants apparently recommended a model for benchmarking based on the Thai system of reporting, but this system is not appropriate for Malaysia where data are poorer and reporting is not obligatory. Fortunately, the project management changed course and sought cooperation with NPC and DoS (as described in section 2.1.1). NPC agreed on extending its benchmarking system (based on measuring productivity in labour and capital) to energy.

Under the *energy rating component* regulations for electric motors have been proposed, in cooperation with the Energy Commission (ST) and SIRIM (a government-owned company working on standards and scientific research), as well as a testing protocol based on EU procedures. Unfortunately, the rating programme remains voluntary. Other activities have been postponed including:

¹⁶ December 1999, March 2000, March 2001, October 2001, February 2002, September 2002, May 2003, January 2004, July 2004, August 2005, May 2006 and December 2006.

- Tendering, installation and commissioning of a test facility for electric motors;
- Installation of energy-efficient boiler training/demonstration unit.

Another main source of delay has been in getting the *demonstration projects* ready, i.e. acquiring the company management's approval, have ESCOs involved and get the necessary finance arranged (Components 6, 7 and 8). Reportedly, the whole process from initiation to final commissioning of a demonstration site typically took from 2 to 3 years or longer (PTA, 2007). Reasons for the delays have been:

- Difficulty in launching proposals with ESCOs undertaking energy performance contracting. Of the envisaged four projects with ESCOs ('fast-track' projects, see section 2.1.8), only one has materialized, partly due to a combination of insufficient commitment and poor financial strength of the ESCOs;
- Difficulty in convincing the industry management¹⁷, company management taking a long time for the final decision and, in some cases, management reversing their decision or changing equipment and processes (even after a Memorandum of Understanding had been signed);
- Purchase of equipment from outside the country affected by foreign exchange rate changes;
- The procedure and process taken by the financial institution (MIDF) is reportedly to be lengthy. On one hand, a finance provider must perform due diligence; on the other hand, being a new mechanism, the project lending schemes apparently did not have a fully streamlined and efficient set of procedures. Banks, in general, were not interested in financial instruments for energy efficiency

In addition, PTM (MIEEIP) has had problems regarding manpower requirement. The current staff strength had dropped to half (from 16 in the beginning to 8 currently). This is caused by two phenomena in PTM, as described below:

- Resignation of PTM staff due to low remuneration and benefits as well as PTM's financial uncertainty of the future, had to some extent affected the performance and smooth implementation of the MIEEIP project;
- Over the years PTM has been assigned with more national tasks and projects. Though these projects have engaged personnel and consultants on a contractual basis from outside, PTM is also assigning its own personnel to these later projects. Some previous personnel of the MIEEIP team have since been reassigned to these later projects;
- The MIEEIP manager changed in 2004, which reportedly caused some delay in project implementation.

As it has been generally discussed, it is observed that weak policy implementation is identified as one of the causes of the delay. The Evaluator noted that various recommendations have been forwarded to relevant authorities but not many have been well adopted. For example, policy recommendation on equipment rating and its techno economic studies was completed in 2001 but was unable to make any concrete inroads to ensure it is sustainable and well embedded in any form of mandatory regulation. The needs of having a good energy management practice have been frequently propagated but as at date, a clear and sustainable demand-side energy policy is found to be lack

Adaptive management

Adaptive management has been practiced. Changes to the project team and activities are implemented from time to time. For example, in Component 2, there is a need to form a specialist group for energy auditing for each industrial sector and stationed in the industry

¹⁷ The mid-term evaluation report (Lucas, 2003) reports that in the beginning of the project, the team was 'young' and therefore often regarded as 'inexperienced' by industry.

association (FMM) but after further consultations, due to highly diversified industry portfolios, the requirement is actually not necessary and the project adjusted itself by establishing a common industry consultation group which covers various “general” utility issues.

Long-term consultancy

Two consortiums, providing both local and international consultants, were appointed for the implementation of major MIEEIP activities:

- Zet Consortium (consisting of Zet Corporation Sdn Bhd (Malaysia), Fichtner GmbH (Germany), CESI (Italy) and Ecoloner SA (Belgium), providing consultancy services for Components 1,2,4,5,6,7 and 8 (see also section 2.5.1).
- Techno Economist Consortium (consisting of Techno Economist and the Dansk Energi Management), providing consultancy services for Component 3.

The Consortiums have provided expertise in most of the components, such as:

- Data analysis and database design for benchmarking; training of PTM staff in database operation;
- Organization of workshops/seminars on energy management and auditing techniques;
- Training of local energy auditing teams in process design and control, heat transfer, energy efficient practices and the use of auditing instruments;
- Assist in the energy auditing and identification of possible energy efficiency improvements in the cement, ceramics, food, wood, pulp & paper, iron & steel, glass and rubber sub-sectors;
- Assisting in the purchase of energy auditing equipment;
- Recommendation on a feasible national rating programme
- Preparation of the tender documents and specification for testing facilities.
- Documentation of successful EE projects and information dissemination (article writing, design and publication of newsletters;
- Development of accreditation scheme for energy professionals;
- Support and training on energy performance contracting and ESCO development;
- Assist PTM in the identification of EE technologies and processes as well as the design, hardware procurement, installation, commissioning and monitoring and evaluation of the demonstration projects;
- Train PTM and host company staff in the operation and maintenance of installed hardware and monitoring of performance (energy and cost savings);
- Identification of improvements that can be incorporated in the design and production of local equipment;
- Preparation of application and contract forms for the project lending schemes.

Overall, the experience with international consultants seem to have been good, especially in training and capacity building, although the mid-term evaluation reports that in the beginning it looked like there was too much of a parallel structure within the overall setup (Lucas, 2003)¹⁸. The mid-term evaluation study also mentions that little use was made by local consultants (except in Component 8), reportedly because it was difficult to hire local consultants with the necessary skills.

¹⁸ The Consortium had a Project Director (Mr. Zulkifil Zahari), Coordinator (Mr. Panos Konstantin) and an Assistant Project Manager (Mr. Iskandar Majidi and a Secretary (Ms. Meena Nair)

2.4.2 Financial planning and delivery of counterpart inputs

The resources under the project come from cash contributions from UNDP, GEF and the Government as well as in-kind contributions. Table 12 provides an overview of budget expenditures from 1999 to 2007. We can see that UNDP and GEF resources have been mostly spent (98% of US\$ 7.3 million and 77% of US\$ 0.3 million, respectively). The Government contribution through PTM's annual budget (100% of US\$ 3.1 million) is also completely spent. Unfortunately, other co-financing contributions have not been forthcoming, such as the contribution through the Energy Supply Trust Fund (MESITA¹⁹ or AAIBE, 22% of US\$ 5.3 million) and the wood and biomass energy conversion projects of FRIM and SIRIM (US\$ 2.2 million). The contribution of US\$ 2 million for the test facility (motors) is still not disbursed, pending the decision by an appropriate institution to host and maintain such a facility.

The Evaluator feels that the amount of non-disbursed co-financing, as originally planned, is worrisome, especially from the GEF point-of-view as a fund that provides co-financing²⁰.

Another question is whether this affected the realization of the objectives of MIEEIP. The answer is that, while support from FRIM/SIRIM has not materialised as planned, private sector has indeed invested or is planning to invest in the demonstration and EE equipment components 6 and 7 of the project, as indicated in the Table 9. Although *de jure* this private sector financing cannot be counted as GEF co-financing (since these were not considered in the financial plans as laid down in the GEF Project Brief and UNDP Project Document), it is the Evaluator's opinion that it should be taken into account as *de facto* co-financing, compensating for the lack of FRIM/SIRIM and other not forthcoming co-financing.

Table 11 Expenditures by Zet Consortium

	Expenditures (US\$)	
	Planned	Spent
Component 1	148,100	118,472
Component 2	1,206,200	1,006,754
Component 3	-	-
Component 4	179,450	79,846
Component 5	136,850	167,789
Component 6	331,000	324,264
Component 7	401,000	113,446
Component 8	110,250	49,842
<i>Subtotal</i>	<i>2,512,850</i>	<i>1,860,413</i>
Miscellaneous		195,124
Total	2,512,850	2,055,537

Source: Completion Report (Zet, 2007)

Table 13 gives an indication of project progress until 2004. In terms of budget resources, most of the activities of the Components 1 (benchmarking), 2 (audits)²¹ and 5 (ESCO support) had been finalized by mid-2004 and large part of the funds of Component 4

¹⁹ Regularly contributed by the power supply companies in Peninsular Malaysia based on their electricity sales.

²⁰ For GEF, co-financing is an important condition, as it is supposed to finance 'incremental' cost only. If large amount of co-financing is not forthcoming in the end in a big project such as MIEEIP, this might endanger future applications by Malaysia for GEF support

²¹ Auditing equipment has been purchased to the amount of about US\$ 300,000 with UNDP funds, mainly for use in the auditing component two. The availability of the equipment was critical to the success of the component. It is recommended that the equipment is continued to be maintained properly and rented out the private companies or ESCOs at modest rates.

Table 12 Summary of MIEEIP expenditures from 1999 until October 2007

No.	Contribution Agency	Fund Allocation	Actual Expenditures until 31 October 2007		Undisbursed Expenditure	
		USD	USD	%	USD	%
1	Government of Malaysia- Pusat Tenaga Malaysia (PTM) / Ministry of Energy, Water & Communications (MEWC)	3,072,000	3,072,000	100%	-	0%
	Government of Malaysia- Energy Commission (EC)	1,064,000	-	0%	1,064,000	100%
	Government of Malaysia- FRIM & SIRIM	2,166,000	-	0%	2,166,000	100%
2	Global Environment Facility (GEF)	7,300,600	7,172,119	98%	128,481	2%
3	United Nations Development Programme (UNDP)	300,000	231,031	77%	68,969	23%
4	Private Sector (Energy Supply Industry Trust Fund)	5,260,000	1,180,045	22%	4,079,955	78%
5	Government of Malaysia (In-kind)	1,627,600	1,627,600	100%	-	0%
Total (USD)		20,790,200	13,282,795	64%	7,507,405	36%

Table 12 Details of MIEEIP expenditures from 1999 until July 2004

No.	Description	Allocation Budget	Actual Expenditure			Balance	
			1999 - 2003	Jan-Jun 2004	TOTAL		
			USD	USD	USD		(%)
A	GEF Fund	7,300,600	3,931,541	191,142	4,122,683	56%	3,177,917
B	UNDP Fund	300,000	231,030	8,345	239,375	80%	60,625
C	AAIBE Fund	5,260,000	1,061,011	-	1,061,011	20%	4,198,989
D	GoM/PTM Fund	6,302,000	4,196,116	389,752	4,585,868	73%	1,716,132
E	GoM (In-kind)	1,627,600	1,088,207	156,932	1,245,139	77%	382,461
Grand Total (USD)		20,790,200	10,507,905	746,171	11,254,076	54%	9,536,124

(promotion). However, roughly half of the funds for the demonstration project and corresponding financing schemes (components 6 and 8) as well as the efficient equipment components 3 and 7 were still unspent by mid-2004. Finalising the activities in these components, was the main reason for extending the project for another two years in 2004 and again in 2006. Given the fact that most crucial outputs have been achieved by the end of 2007, these project extensions seem justified.

Table 13 Details of MIEEIP expenditures from 1999 until July 2004 (cont'd)

Comp.	Description	Allocation Budget	Actual Expenditure			Balance	
			1999 - 2003	Jan-Jun 2004	TOTAL		
			USD	USD	USD		USD
A. GEF FUND							
1	Energy-use Benchmarking	143,048	112,207	8,462	120,669	84%	22,379
2	Energy Audit	1,511,837	1,475,292	7,474	1,482,766	98%	29,071
3	Energy Rating	285,054	101,669	17,830	119,499	42%	165,555
4	Energy Promotion	215,667	152,247	23,383	175,630	81%	40,037
5	ESCOs Support	197,519	189,233	7,253	196,486	99%	1,033
6	Technology Demonstration	2,585,554	1,149,166	6,592	1,155,758	45%	1,429,796
7	Equipment Manufacturing	921,330	71,342	33,430	104,772	11%	816,558
8	Financial Participation	110,250	52,286	1,936	54,222	49%	56,028
	Admin & Other Costs						
	i. Administrative (PTM)	576,676	378,696	79,945	458,641	80%	118,035
	ii. Monitoring (UNDP-KL)	753,665	249,403	4,837	254,240	34%	499,425
Total (USD)- GEF Fund		7,300,600	3,931,541	191,142	4,122,683	56%	3,177,917
B. UNDP FUND							
2	Energy Audit	200,000	192,323		192,323	96%	7,677
4	Energy Promotion	95,000	38,067	8,345	46,412	49%	48,588
	Admin & Other Costs						
	i. Administrative (PTM)	5,000	640		640	13%	4,360
<i>Total (USD)- UNDP Fund</i>		<i>300,000</i>	<i>231,030</i>	<i>8,345</i>	<i>239,375</i>	<i>80%</i>	<i>60,625</i>
C. AAIBE FUND							
3	Energy Rating	3,000,000			-	0%	3,000,000
6	Technology Demonstration	2,260,000	1,061,011		1,061,011	47%	1,198,989
<i>Total (USD)- AAIBE Fund</i>		<i>5,260,000</i>	<i>1,061,011</i>	<i>-</i>	<i>1,061,011</i>	<i>20%</i>	<i>4,198,989</i>
D. GoM/PTM FUND							
	Admin & Other Costs	6,302,000	4,196,116	389,752	4,585,868	73%	1,716,132
<i>Total (USD)- GoM/PTM Fund</i>		<i>6,302,000</i>	<i>4,196,116</i>	<i>389,752</i>	<i>4,585,868</i>	<i>73%</i>	<i>1,716,132</i>
E. GoM (In-kind)							
	Admin & Other Costs	1,627,600	1,088,207	156,932	1,245,139	77%	382,461
<i>Total (USD)- GoM (In-kind)</i>		<i>1,627,600</i>	<i>1,088,207</i>	<i>156,932</i>	<i>1,245,139</i>	<i>77%</i>	<i>382,461</i>
GRAND TOTAL (USD)		20,790,200	10,507,905	746,171	11,254,076	54%	9,536,124

Source tables 12 and 13: Mr. Malik Atan (PTM)

2.4.3 Stakeholder involvement and partnership strategy

In general, one can say that the project forms a good example of government agencies, institutes and private sector organisations working hand-in-hand. The Annex F on memorandums of agreements (MoAs) and understanding (MoUs) is indicative for cooperation with the private sector.

For example, MIEEIP has won the support and cooperation of the Federation of Malaysian Manufacturers (FMM) in promoting energy efficiency to FMM members. In addition, MIEEIP has also created good collaboration and linkages with the following industrial associations:

- Malaysian Timber Industry Board
- The Cement and Concrete Association of Malaysia
- Malaysian Iron and Steel Industry Federation
- Malaysian Pulp and Paper Manufacturers Association
- Malaysia Rubber Products Manufacturers Association

MIEEIP has successfully established the E-Benchmarking programme in a smart partnership with National Productivity Corporation (NPC) and later involving the Department of Statistics (DOS). To be able to formulate the 'Energy Efficiency and Conservation Guidelines', the project established nine Working Groups, one "Section A Working Group" (with Government representatives (MEWC, ST, MIDA, PTM) and a working group each for the 8 modules with participation of institutes, associations of engineers, associations of manufacturers, individual companies as well as universities. Other important stakeholders include the state power company Tenaga Nasional Berhad (TNB)²², Institute of Malaysian Engineers (IEM), Association of Consulting Engineers (ACEM), Persatuan Akitek Malaysia (PAM), PORIM, Electrical and Electronics Association of Malaysia (TEEAM) and the CETREE (Centre for Education and Training in Renewable Energy and Energy Efficiency).

2.4.4 Logical framework and monitoring

A logical framework (of outcomes, outputs, indicators and verifiers) is provided in the GEF Project Brief. A set of indicators for the project's achievements is given in the first 'annual implementation review' reports (APR-PIRs) of 2001. The formats in which these APR-PIRs reports had to be submitted to UNDP/GEF have changed during the course of project implementation, so have the formats in which indicators are reported as well as the list of activities (and corresponding indicators itself). The indicators were reviewed in 2003 and retrofitted back in 2004 defining the annual targets for each. The indicators used in this Evaluation Report (listed in sections 2.1, project progress, and 2.2, impacts) are taken from the last APR-PIR (2007).

While these changes in list of activities, list of indicators and reporting formats may be understandable, it makes a quick check of project progress a bit more difficult. Such a task is not made easier by the sheer volume of progress and technical reports, publications, case studies and papers the project has produced (see Annex D for a complete overview of MIEEIP reports). Even the Quarterly Progress reports are given per component (and there are eight of them) and this large amount of reports has the danger that anyone, who wants an

²² As well as the electricity utilities SESB and SESCO in Serawak and Sabah

overview of project implementation over time and issues encountered, may not see the wood for the trees, i.e. would get lost in the details. The 2004 hand-over reports give a good bird's eye view of project implementation, but again per component rather than at least having a summary for the project as a whole. The Evaluator suggests that a similar 'end-of-project' report is prepared, similar to the hand-over project, which encompasses all components rather than presenting results per component.

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 Conclusions

The following summarises the findings of the evaluation. Each of the points discussed below has been dealt with in more detail in the previous chapter 2.

3.1.1 Project design and project implementation

Project conceptualisation

The project document describes a coherent set of objectives and outputs. Indeed, at the time of writing of the project document (1998), awareness and capacity in industry and consultancy business regarding energy efficiency in Malaysia was low, and the project rightly addresses this important barrier.

The Evaluator believes that energy efficiency is a matter of ‘carrot and the stick’. The project is designed around making the ‘carrot’ look appetising, i.e. ‘pulling’ industrial companies by providing capacity building, free audits and loans for efficiency improvements at zero interest rate. However, there is a tendency in the document to exaggerate the importance of certain instruments, for example a project financial fund can only reach a limited amount of companies²³; the ESCO concept may work in other countries but not necessarily in Malaysia²⁴. More importantly, the ‘stick’ has not been included in the project design in terms of a government ‘pushing’ companies in the framework of an energy efficiency policy by means of a coherent set of policy instruments and regulations²⁵.

Effectiveness of implementation

Effectiveness means the extent to which outputs of the project have achieved the project’s objective. Until the project extension of 2004, effectiveness was highest in the Components 1 (benchmarking) and 2 (audits). Effectiveness of the Components 3 (rating of equipment) and 5 (ESCOs) has remained limited up to now (partly due to external factors limiting the impact of activities undertaken under these components). After the project extensions in 2004 and 2006, most of the targeted outputs in the components 6, 7 and 8 have been achieved. In general, the Evaluator has the opinion that the achievement of the components has been **satisfactory**, in accordance with the ratings given in the latest Annual Implementation Review reports (APR-PIRs).

²³ The intention is to demonstrate the effectiveness of such intervention, which after successful implementation will be replicated by the stakeholders, mainly the banking/financial sector as well as the Government.

²⁴ Apparently, the interest in the ESCO was high back in 1997-1998. The interventions that were proposed are mainly to address what the so-called ESCOs at that time as their needs and barriers to hurdle.

²⁵ The GEF-supported project interventions are meant mainly to demonstrate EE procedures, techniques and practices, as well as EE technologies. The follow-up (project replications) would be facilitated by supporting policies and regulations that the Government will come up with based on the results of the project interventions. In retrospect, these should have been explicitly carried out as part of the MIEEIP activities instead of just assuming that the GOM will follow through with the policies and legislative frameworks. It should be noted that, as a lesson learned, as early as 2000, the succeeding GEF projects (BioGen and BIPV) have included specific activities on policy making and regulatory frameworks.

3.1.2 Impacts, sustainability and replicability

The project, in the view of the Evaluator, has made important and real contributions to removing some barriers, in particular awareness creation and capacity building in important areas such as benchmarking, best practices, audits and demonstration of EE processes and technology. MIEEIP has taken a first step in creating basic skills to understand the factors affecting decision-making concerning energy efficiency by industrial energy users as well as consultancy companies. Potentially it has generated powerful insights into the technical and economic potential for energy efficiency and the means available to government to realise that potential.

While these achievements are real, their longer-term sustainability is in doubt without continuous government support and legislative and financial interventions (which are currently lacking). Most of the MIEEIP activities will need to be continued as part of PTM regular programme. However, continuation will depend strongly on the financial support of the Government to sustain these efforts. In fact, it seems that the lack of a conducive policy and planning framework in Malaysia for the promotion and implementation of energy efficiency is a one big barrier. Therefore, a separate component on energy efficiency planning and regulations would have benefited the project, but was not included in the project design in 1998, although the project has provided some inputs towards regulatory framework formulation.

In addition, another main barrier to improved energy use in Malaysia remains the highly subsidised energy prices. There is little that the MIEEIP project can do directly to remove that barrier except for providing relevant policy recommendations.

3.2 Recommendations

3.2.1 Recommendations for promotion and implementation of EE in Malaysia

Energy policy and planning

More serious implementation of sustainable energy policies is a pre-requisite to kick-start the industry towards implementing EE practices and projects as well as using and producing more energy-efficient products both for local and overseas market. Leaving such strategy to PTM to lead the industry is an effort beyond the mandate and capability of PTM, and if at all initiated by PTM, will only bring insignificant results. Apart from having the obvious energy conservation potential, an effective energy efficiency (EE) policy (and EE action plan) is necessary to spearhead the policy of pushing both energy-efficient and Malaysian-made products to the frontier of technology to capture a good share of local as well as international market.

Regarding efficiency in industrial processes as well as the local manufacturing of energy efficient equipment, such an EE Action Plan could be formulated by the Government, which could entail the following elements:

- The currently proposed 'energy management regulations' for companies that consume a certain amount of energy;
- Energy standards and labelling as a means of promoting and implementing EE, not only in manufacturing, but for consumer equipment as well;

- Provision of better tax incentives to manufacturing sector to implement EE measures;
- Lowering energy subsidies that presently encourage inefficient rather than rational energy use.

Without these measures being implemented, the Government will not give a signal to the private sector that it takes energy efficiency seriously. Such actions are urgently needed to break the culture of ‘wait-and-see’ attitude regarding energy efficiency and conservation that exist in many companies in Malaysia.

Box 4 Recommendations for UNDP and GEF

Project design and implementation

The Evaluator has evaluated eight UNDP-GEF climate change projects up to date (including MIEEIP) and, while projects differ in scope and size, some interesting similarities regarding project design and implementation have shown up. The following text in this section 3.1.1 does not refer to MIEEIP in particular, but to these evaluations in general.

Projects lasting 1.5 or 2 times longer than originally planned seem to be the norm rather than the exception, due to several reasons:

- The project inception period (the period after GEF endorsement/approval by GEF CEO, getting the required signatures of UNDP and the counterpart organisations as well as hiring the project coordinator and rest of the team up to organising the first inception workshop) usually takes longer than expected, sometimes up to 6 months or longer;
- While capacity building, training, background studies can usually be well planned by the project team, two other group of activities usually take much longer than was optimistically planned in the project document. First, convincing private sector actors to invest in technologies and processes regarded as new or risky, usually has long lead times. It takes time to convince the (non-technical) senior management to take the investment decision and tendering or loan application procedures in public-private partnership often can be cumbersome. Second, the project can propose policy frameworks, regulations and financial incentive schemes. Again, convincing mid-level government officials often is not a problem, but getting final approval of top decision makers may be harder. Even if supported, subsequent enactment implies going through a political process that often goes far beyond the period of 3-5 years of a typical UNDP-GEF project.

Delays often start already in the project formulation phase. Again, going from formulation of a first concept, discussing with UNDP, presenting it to GEF, finally getting GEF approval is a process that can take years with the danger that by the time the project is finally approved the set of barriers it seeks to address and the policy environment may have changed. In the new GEF-4 cycle, the documentation of projects and proposals now requires defining ‘milestones’, i.e. expected dates of project proposal submission, GEF approval, project initiation and finalization. The Evaluator suggest, based on his evaluation experiences, that such milestones are not defined over-optimistically, but also that, during project implementation, administrative hurdles in both UNDP and GEF that cause unnecessary delay are reviewed and removed.

Logical framework and evaluation

Nowadays, UNDP-GEF project proposals contain a logical framework of outputs and progress indicators with baseline and final targets and means of verification listed (the so-called ‘logframe’). While preparing this framework is often time consuming, it is sad to see that in most of the eight projects evaluated so far, such a framework is not really referred to when undertaking monitoring and evaluation, neither in the APR-PIR nor in baseline or end-of-the project impacts studies (if the latter studies are done at all). Consequently, it is sometimes difficult to quantify project outputs, let alone its impacts. The following is suggested by the Evaluator:

- Elaboration of the logframe should not be done after writing the list of outcomes and outputs just because the GEF format demands it, but as tool to design such a list;
- For the APR-PIR a simplified logframe can be used with key indicators only for the outcomes and outputs;
- The complete logframe should be used in the baseline and end-of project impact studies as type of table of contents.

Labelling and MEPS; energy regulations

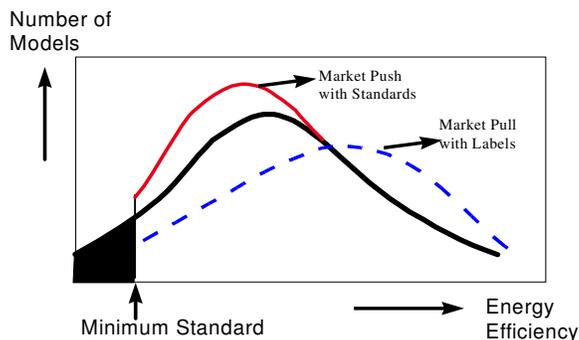
Energy rating and labelling is an important energy efficiency programme that must be carried out nationally to ensure that various energy consuming equipment or technologies generally used in the country are energy efficient and meet certain minimum standards.

Energy labelling is necessary to, among others, indicate the minimum efficiency requirement of energy-consuming equipment. The institutional mechanism and procedure should be planned as different entities will have to be indicated or appointed to take care of the testing, deciding the accepted performance band or range, the labelling, and enforcing (see Box 5). Following the introduction of labelling, or as an alternative in some cases, Minimum Energy Performance Standards (MEPS) for various consuming equipment should be introduced. Such guidelines or standards could be introduced initially for electricity consuming equipment, such as motors, fans and blowers, chillers, air-compressors and pumps; and later

Box 5 Standards and labelling

Informative labels affixed to manufactured products describe the product's energy performance (energy consumption, energy efficiency, energy cost, or combinations thereof). Energy labels empower users of equipment to make informed choices about the products they buy and to manage their energy bills. Labels "pull" the distribution of energy-efficient models upward (see figure below) by providing information that assists the users in making rational decisions and stimulating manufacturers to design products that achieve higher rating levels.

Minimum performance efficiency standards (MEPS), as a complementary tool to appliance labelling, have been successfully applied overseas and have brought about predictable, significant and lasting improvements in efficiencies. Once an energy labelling is in place and there is been some shift in the efficiency levels in the market, MEPS can be enacted to remove the most inefficient product from the market. This effect is a "market push" (see figure below).



extended to thermal equipments such as boilers, furnaces and heat-exchangers.

More research and development and testing facilities of international standards at industry and private sector level should be encouraged by the Government to encourage the private sector to continuously conduct research and tests to improve their products performance and efficiency, so that they can maintain their niche in both local and global market. This can be done through provision of grants, subsidy, tax deductions or other forms of incentives and schemes. Of course, in the end the private sector itself would have to provide the major share of funding to improve their own production capability and facility to match new designs and technologies on the changing national and international markets.

Tax incentives and other government support

Without energy management regulations, MEPS (Minimum Energy Performance Standards) and a more practical tax-incentive scheme, it is difficult to promote EE equipment, such as efficient motors, pumps, fans & blowers, in the country.

The Government and the private sector need to work hand-in-hand to push through this policy by encouraging public-private partnerships (PPP):

- A special support programme could be created by the Government (and for example implemented by PTM) with the aim of improving efficiency of operating equipment (system optimization), energy-efficient manufacturing of equipment, and of increased manufacturing of EE equipment through cooperation between local manufacturers and academia (for research, testing and laboratory facilities);
- MIEEIP's lending scheme should be expanded into a Government-supported revolving energy-efficiency or 'clean energy' fund. The Fund could be sourced from a small percentage of the electricity tariff and fuel prices. At the same commercial banks should be encouraged to established similar lending schemes with some government financial support as guarantee to be able to provide 'soft' loans. It is encouraging to hear in this respect that, two banks, RHB Bank and Bank Pembangunan have expressed interest to be involved in EE lending;
- The existing tax incentive mechanism introduced by the Government since the Eight Malaysia Plan to encourage more widespread application of energy efficiency and renewable energy seriously needs revamping. In the case of electric motors, in the current scheme, for example, no one could buy a high-efficiency motor (HEM) off-the-shelf locally, whereas motors need immediate replacement when they are faulty (source: PTM, 2007).

Energy pricing

Malaysia spends an astounding amount of RM 40 billion a year for subsidizing energy supply (of which RM 15 billion on natural gas for power generation), equivalent to about US\$ 500 per capita per year. For the economy as a whole, it not only discourages rational behaviour regarding energy consumptions in fact, this is a *de facto* subsidy from the poor to the rich, who usually own more energy-guzzling equipment, vehicles, etc. than the poorer fellow countrymen. For industry in particular, this discourages energy savings as it implies that the total energy costs in the factory are so significant compared to other operational costs, maybe around 6-7% of total production cost.

Judging from the discussions and available literature, this has been made known and the government is already in the path of levelling its energy price structure, as stated in the 9th Malaysia Development Plan mentions that "initiatives will be undertaken to review the energy pricing structure to reflect market prices of various alternative energy sources and encourage greater efficiency in utilization of energy while discouraging wasteful consumption. A review will be undertaken to gradually reduce subsidies on energy prices".

3.2.2 Recommendations for PTM

Main recommendation here is to keep the momentum regarding the current interest in energy efficiency in industry. In fact, PTM is planning to extend energy efficiency promotion to other areas such as buildings, in particular buildings of government institutions.

Capacity strengthening of PTM

For PTM to continue and expand the MIEEIP activities, the Government has **to allocate sufficient funds** to enable these roles to be carried out and to have minimum staff strength. Furthermore, **capable and experienced staffing** is critical in ensuring PTM's success in providing advisory services to the government and the industries. As such, it is highly recommended that the above issue is given priority and the resources needed allocated. The impact study PTM (2007) recommends minimum staff strength of 17-24 experienced staff to be able to continue the activities initiated by MIEEIP and to expand these or undertake new activities. Such core staff would be supported by consultants / technical advisors contracted on an as-needed basis to carry specific activities under energy efficiency.

E-Benchmarking

If time and funds are available to support, the E-Benchmarking tools could be expanded to other subsectors or another new activity could be implemented to include international benchmarks for similar sub-sectors. The following recommendations are taken from PTM (2007):

- E-Benchmarking need to be further developed and refined and the data verified to make it more useful. Even within certain industry sector, such as iron and steel, the type of industries can be quite varied. Thus, the more diverse and disaggregated the E-Benchmarking database, the more credible will the EUIs be for comparing between companies within the same industry sector and subsectors. Here, the continuing cooperation of PTM with Department of Statistics (DOS) to obtain the necessary data, to verify them, and maintain the E-Benchmarking database is recommended;
- PTM 's energy auditors will be instrumental in the verification exercise by doing random checks of data at the plant level;
- The e-database needs to be more attractive and user-friendly to capture more interests from the industrial community. The portal should be accessible through both NPC and PTM (Energy Information Bureau) and may be linked with the websites of the various manufacturers' associations. One or two IT people could be continuously involved.
- International benchmarks would have to be included to make e-benchmarking more useful.

Energy audits and ESCOs

In future, PTM will not be expected to do the energy audits as they had done in the MIEEIP period, as PTM has another important role to play as governmental implementing agency on energy. Thus, PTM should not compete with ESCOs, but instead act as an intermediary between the industries and ESCOs. Energy audits would have to be undertaken largely by the ESCOs, on commercial terms. In any case, there are just too many industries that need the energy audit, and it is hoped that the ESCO business, over time, will become more credible. PTM could work with MAESCO (or any other similar association) to increase their professional image and should continue to assist in their capacity building and PTM should also initiate and monitor the ESCO registration process.

The impact study (PTM, 2007) mentions the following competencies of PTM in the area of energy auditing:

- Setting baselines to evaluate energy efficiency projects in industries. There must be a close collaboration between the e-benchmarking and the auditing efforts
- Acting as an independent body to monitor and verify performance of projects on energy efficiency in industries;

- Conducting preliminary or walk-through energy audits for Government purposes or for gathering data for database building;
- When necessary, acting as a referee/reference for investment grade audits carried out by ESCOs under third-party financing scheme; and acting as a neutral arbitrator in any future disputes between ESCOs and industries;
- In a facilitating capacity, PTM could refine the MESA could concept to suit particular sub-sector industry and particular type of arrangements involved.

Industries are still sceptical on the credibility of Malaysian ESCOs. Malaysian ESCOs need to build their own reputation and credibility to gain wide acceptance by the industrial community. To protect their profession and professionalism, the more credible ESCOs, or their association (such as MAESCO) should be able to come up with a proper accreditation scheme. Meanwhile, PTM has proposed an accreditation system in which only professionally skilled and qualified companies will participate.

Knowledge management and information dissemination

PTM should continue with campaigns and promotional activities to increase demand for energy efficiency equipment in the country. PTM's Energy Information Bureau (EIB) should be enhanced as a one-stop-shop website to encourage industries, buildings owners and operators, and the general Malaysian public to be energy efficient. More specifically, the following recommendations can be made:

- For a more efficient management of the knowledge system of the MIEEIP, efforts must be made such that all soft copies of the MIEEIP reports are centrally saved in the MIEEIP server and hard copies in a filing cabinet. This must be done on an urgent basis before some of the soft copy documents in individual computers be lost, displaced or accidentally deleted;
- Some more 'easy-to-read' publications could be published, such as the EEC Guidelines or the booklet 'Achieving Industrial Energy Efficiency', e.g., summarizing per subsector and/or per type of technology, the main issues and options, national and international benchmark data, case studies, etc. To target the busy top management of industries, government entities and parliamentarians alike, 2-page flyers with concise info could be made.
- The MIEEIP News was established for the purpose of disseminating MIEEIP news. Containing useful info it should be merged with the existing PTM bulletin *Energy Smart* or, alternatively, be expanded to become a national/official newsletter on energy efficiency (and maybe covering both industry and building sectors);
- Similarly, the MIEEIP website should be merged with the web pages of PTM's Energy Information Bureau;
- As the word 'demonstration' project implies, the PTM team would have to devise some means of not only presenting these as case studies on the PTM website and at seminars, but continue to organize physical visits to the actual site²⁶ (also outside the Klang Valley);
- The prime outreach target group could be expanded from engineers and industries to financial institutions and top decision-makers in government and at the political level. Without financing support and without real political backup, no national energy initiative will materialize. This means also that the 'language' used in the newsletter and at seminars should be such that 'non-technical' or 'non-energy' people find these things attractive and easy to digest.
- To convey the above messages, staff with social science and communications qualifications should be employed by PTM.

²⁶ Although hailed as 'flagship' demonstration project, the General Manager of HeveaBoard reported that no site visit had been organized.

Lending schemes

MIDF has been given the task to manage the project lending scheme. A meeting should be held between PTM, MIDF and MEWC on the continuation of the scheme (with the remaining funds from AAIBE/EEPLS as input). In a second round of loan offers, instead of zero interest loans, perhaps a low interest may be levied, to sustain the money value of the Fund, because the current loan terms of up to 6 years at zero-interest rate will make the Fund shrink over time. In short, the project financing schemes should be expanded into a national-level energy efficiency revolving fund, boosted by Government funding at an appropriate level.

Standards and labelling: energy management regulations

Electric motors form one type of common equipment in industries that has the highest energy efficiency impact if the national energy efficiency programme is implemented more effectively. With Government support (and regulation in future introduced possibly by the Energy Commission), PTM could assist SIRIM (and the Energy Commission) in the formulation of minimum energy performance standards (MEPS). Later, labels and standards could be developed and proposed for other energy-consuming equipment.

In the absence of energy efficiency regulations (and the current lack of government commitment to implement such regulations), a 'voluntary' code of practice (COP) could be proposed for energy efficiency equipment. The COP will provide the range of equipment specifications which would be accepted for application. The current Energy Efficiency and Conservation Guidelines for Electrical Equipment has already established the features and procedure to follow to ensure efficient operation of eight different types of electrical equipment (transformers, motors, chillers, cooling tower, fan & blower, pumps, air-compressors, lightings). The COP can be further developed from these guidelines.

3.3 Lessons learnt

E-Benchmarking

E-Benchmarking is difficult to implement and use effectively, for the following reasons:

- The Energy Use Index (EUI) is difficult to define and be compared with even between industries within the same sector. This is because of varied equipment, technologies, and processes used. The production outputs are also varied.
- It is also difficult to compare with international benchmarks as the manufacturing and operating conditions are vastly different. Background issues such as different manufacturing standards and rules, different weather conditions, strict local and global environmental regulations which are prevalent in developed countries must be clearly understood if Malaysian EUIs were to be compared with international ones.
- Despite the numerous production and energy use data available from the Department of Statistics for the E-Benchmarking database, these data are not verified and are not in a ready format. It will be a huge task to verify most of the data.

Impact of efficiency promotion projects and sustainability

MIEEIP has proved to be a good and successful collaboration between Government agencies, professional bodies, and industry associations. However, care must be taken not to exaggerate the potential of certain energy efficiency promotion instruments, such as ESCOs or certain financial incentives, while other barriers remain in place, such as the practice in Malaysia of substantially subsidizing energy cost. ESCO or financial incentives alone will not be able to overcome the barriers discussed and no single measure can provide an immediate solution. As such, policy planners must look into a bigger perspective when implementing EE.

Despite the low cost of energy, the MIEEIP project has managed to demonstrate the feasibility and achievability of energy saving measures and has managed to entice managers in industrial companies as well as some financial institutions to get involved in energy efficiency and conservation.

While such voluntary participation is laudable in an initial phase, energy efficiency promotion and implementation needs to be an integral part in the Government's long-term public policy. The sustainability of MIEEIP and the eventual impact depend much on whether the Government decides to put an energy efficiency policy in place with effective policy instruments backed up by substantial resources. The analysis of this Evaluation Report suggests that if similar energy efficiency projects are implemented in the future they should be predicated on the expectation that appropriate regulations and substantial government funding will subsequently be available.

ANNEX A. TERMS OF REFERENCE OF THE EVALUATION

Introduction

The Malaysian Industrial Energy Efficiency Improvement Project (MIEEIP), funded by GEF, UNDP, Government of Malaysia, and the Malaysian private sector, was launched in the 3rd quarter of year 2000 and it is expected to end at the December 2007. This project is executed nationally by Ministry of Energy, Water and Communication (MEWC) and the implementing agency is the Malaysia Energy Center (PTM – Pusat Tenaga Malaysia).

The project was designed under GEF Operational Programme #5: Removing Barriers to Energy Conservation and Energy Efficiency. The development objective of the project is to improve energy efficiency in Malaysia's industrial sector, by removing barriers to efficient industrial energy use, and through creating a sustainable institutional capacity, increase awareness raising in energy efficiency and development of a conducive policy, planning and research framework.

The improvement target is to reduce the energy consumption in the industrial sector by 10% in the end of the project (December 2007, original end 2004) as compared to the business as usual scenario. In addition, based on 1995 levels, the project should directly and indirectly help reduce GHG emissions from the industrial sector by 10% by the year 2004. Other outcomes of the project are the following:

Industries become aware of the actual and rational energy utilization performance, as well as Energy Efficiency and Energy Conservation (EE&EC) measures that can be applied to improve energy utilization efficiency through the establishment of energy use norms for industrial sub-sectors and processes.

- Industries comply with regulations / guidelines designed to encourage the use of energy efficient equipment and practices;
- Awareness about, and attitude towards, energy efficiency and environmental improvement by industries widespread;
- Industries are using and benefiting the local energy support services (ESCOs) in the implementation of their EE&EC projects;
- Industries are implementing proven and cost-effective EE&EC technology projects;
- Industries utilize locally manufactured equipment with comparable efficiencies to imported quality industrial equipment;
- PTM is able to increase its capacity and capability in providing energy advisory services to the public and the private sectors.

However, there are several barriers which could hamper the smooth implementation of MIEEIP. These are as follows:

- Limited knowledge/awareness about EE&EC techniques/technologies in industries and the lifecycle economic benefits.
- Limited access to information on EE&EC techniques as well as energy benchmark.
- Industries are unwilling to incur what are perceived as “high cost, high risk” transactions.
- Industries generally focus on investments on production-related improvements.
- Lack of financiers ready to finance EE&EC investments.
- Limited/not stringent regulations on energy efficient standards and implementation.
- Few/limited EE&EC technology demonstration projects implemented.
- Weak local energy support service.

In order to achieve the development objective, the project's immediate objectives are embodied in the eight project components as follows:

Component 1: Energy-use Benchmarking

Component 2: Energy Audit
Component 3: Energy Rating
Component 4: Energy Efficiency Promotion
Component 5: Energy Service Company (ESCO) Support
Component 6: Energy Technology Demonstration
Component 7: Local Energy Efficient Equipment Manufacturing Support
Component 8: Financial Institutional Participation

Major outputs of each component are the:

1. Development of energy-use benchmarks for various industries and their sub-sectors by setting up data collection systems, establishing benchmark index, installing database, and establishing the system to disseminate information.
2. Promotion of energy auditing for an industrial energy management; establishment of standardized energy auditing procedures, energy audit tools and energy management system; conduct of energy audits for selected industrial sectors; evaluation of the results and impacts of the auditing program; and development of sustainable follow-up programs for each industry association.
3. Implementation of a comparative energy rating program; proposed policy intervention needed, dissemination of information on energy-efficient equipment and energy rating programs to increase and encourage the use of energy efficient equipment; conduct of policy support studies; and proposal for an equipment performance testing facility.
4. Dissemination of information on energy efficient practices in industries and technology applications; establishment of a credible and sustainable website; establishment of an association of accredited energy specialists, consultants, and technology developers and providers; and development of an accreditation scheme for energy specialists and ESCOs.
5. Development of a suitable institutional and legal framework for ESCO; development of institutional arrangements that will promote ESCOs to the industrial sector; and assistance in making bankable project proposals, business plans, securing financing arrangements, defining the feasible products and services, and evaluating risks.
6. Identification of potential energy saving technologies that can be applied in Malaysian industries; establishment of baseline data for each demonstration site; development of installation and implementation designs/plan for the demonstration site; arrangement of the financial assistance for each demonstration scheme; monitoring and evaluation of the energy performance of each demonstration scheme.
7. Evaluation of the typical energy performance of selected local equipment; identification of potential improvements and new designs for local equipment; training of local equipment manufactures on high efficiency designs and production technologies; provision of technical assistance; and provision of funds to eligible equipment design and manufacturing improvement projects.
8. Training on local banking and financial institutions on financing EE&EC project; development of the criteria to select demonstration and equipment manufacturing companies for financial assistance; and selection of demonstration and equipment manufacturing companies.

Objectives of the evaluation

The purpose of the terminal evaluation (or Final Evaluation) of the Malaysia Industrial Energy Efficiency Improvement Project (MIEEIP) is *to review and rate the performance* of the project from the start of the project implementation up to the present. The review will include:

- Evaluating both the *progress in project implementation, measured against planned outputs* set forth in the Project Document with latest revision in accordance with rational budget allocation, and an
- Assessment of the *overall impact* of the project to the country;
- The evaluation will also *identify lessons learned and best practices* from the MIEEIP, which could be applied to future and other on-going projects.

Scope of Evaluation

This evaluation will involve analysis at two levels: on a component-by component level and on the overall project level. The analyses will include:

Assessment of progress in project implementation

In this context, implementation means the provision of inputs and achievement of outputs as well as processes of implementation. The project is now at the end of its project life and as such progress should be measured against outputs stated in the project document, the inception report as well as the amendment to the inception report approved by the National Steering Committee. The evaluation will focus on such aspects as appropriateness and relevance of work plan, compliance with the work plan along side with budget allocation; timeliness of disbursements; procurement, quantity and quality of goods and services created; coordination among different project stakeholders. Any issue that has impeded or advanced the implementation of the project or any of its components, including actions taken and resolutions made should be highlighted. Activities to be continued by the executing agency shall also be recommended. The template below shall assist the consultant in reviewing the progress.

Activities		Budget		
Planned	Actual	As per ProDoc	Actual Expenditures	% of Project Budget

Overall, the following assessments shall be carried out:

- Capacity of risk management in overall project implementation and per component level i.e., whether the assumptions and risks are well recognized and mitigating measures are considered throughout implementation.
- Project design, i.e., whether the project design allowed for flexibility in responding to internal and external changes in the project environment.
- Implementation difficulties, i.e., whether difficulties and barriers, which were not expected at the start of the project, are identified and the approaches for the solutions are considered and implemented effectively.
- Project resources, i.e., whether the project components and activities were logically designed as to content and time frame commensurate with the human and financial resources that were made available.

Assessment of project outputs

For both the component and overall project levels, assess:

- Whether the project is implemented in the right direction to achieve the outcomes (i.e., based on the agreed work plan).
- The significance of the outcomes so far achieved for the country/region.
- Whether the project outputs are produced effectively, efficiently, and in a timely manner according to the time schedule.
- The quality and credibility of the outputs, as stipulated in the Project Document.
- The project's contributions to the targeted beneficiaries and their effectiveness.

- How effective and efficient the project funds are utilized, and how the expenditures are monitored.
- The credibility of the data used in the project and reliance of the numerical outputs.
- The monitoring and evaluation of the project consultants' work.
- The quality of the internal monitoring system results.

Assessment of project impact

Since the project at the end of its implementation, the evaluation should assess the below:

- *Capacity Development* - The effects of the project activities on strengthening the capacities of the Pusat Tenaga Malaysia (PTM), MEWC and other related stakeholders and the industries.
- *Sustainability* - Efforts undertaken to ensure that the results of successful projects are sustained beyond the period of GEF financing will be evaluated, as well as the project's existing mechanisms. It is imperative to confirm whether the policy recommended by the projects are well embedded in the current national policies or future policies.
- *Leverage* - The project's effectiveness in leveraging local or other international funds that would influence larger projects or broader policies to support its goal will be assessed.
- *Awareness Raising* - The Project's contribution to raise awareness about energy conservation and energy efficiency in industries, should be examined, as well as the project's contribution to promote policy or advocacy activities and collaboration among the industries.
- *Lessons Learned and Best Practices* - Both good and bad experiences and lessons learned from the implementation of the project thus far will be identified and evaluated. There shall be a document the integration and application of experience from the various components of the project (holistic approach).
- *Operational recommendations* - Recommendations will be developed to help the executing agency and project partners improve its operational and support activities for renewable energy development in the province in line with GEF priorities. The recommendations would aim to:
 - Help PTM and partners improve the project implementation and to address operational lapses and gaps;
 - Strengthen the work of the PMO and Project Steering/Advisory Committee/s and how the activities shall sustain under the government's initiatives;
 - Enable UNDP Country Office and UNDP GEF to provide effective support in future (if any);
 - Improve ways to draw, share and document lessons learned and best practices experience to the various stakeholders; and
 - Provide effective operational guidance for effective implementation of the remaining part of the project and onwards for future project prospect/s.

Evaluation Methodology

The evaluation team will review relevant project documents and reports related to the planned evaluation and of the GEFs and conduct focused group discussions with the National Project Director (NPD) on topics and issues that relate to the implementation and impact of the project. The Evaluators are expected to become well versed as to the objectives, historical developments, institutional and management mechanisms, project activities and already documented "lessons learned" of the project. Information will be gathered through document review, group and individual interviews and site visits. More specifically, the evaluation will be based on the following sources of information:

Review of documents related to the project such as project document, quarterly and annual progress reports, other activity/component specific reports and evaluation, if there are any, etc.

- Structured interview with knowledgeable parties, i.e., NPD, Project Staff members, Sub-Contractors, International/National Consultants, UNDP Country Office Counterparts, members of the National Steering/Advisory Committee/s, Project Beneficiaries or grantees, etc.
- Site visits to specific projects, if feasible. The site visits should be discussed with the CPC and the UNDP Country Office.

Prior to visiting the PTM, the evaluation team shall receive all the relevant documents including at least:

- Project document
- Inception report
- Amendments to the inception report
- Latest Project Implementation Report (2006)
- Internal monitoring results
- Terms of Reference for past consultants' assignments and summary of the results
- Past audit reports, quarterly reports
- Mid-Term review report
- Pictures of equipment, installations and sites if any
- Newspaper/publication articles

The evaluation team shall meet and interview the following:

- National Project Director
- Chief Project Coordinator
- Finance Officer
- Component Managers (all)
- Relevant officers from the executing agency, MEWC
- UNDP and UNDP GEF officers
- Economic Planning Unit (EPU) officers
- Representative from Energy Commission
- Representative from industrial association (FMM)
- Representative from the financing institution (MIDF)
- Consultants

If necessary, the evaluation team may also interview or visit the following:

- Participating Industries
- Audited facilities
- Equipment suppliers
- Representative from the Energy Service Company (ESCO)
- Demonstration facilities
- Other project partners

Evaluation Team

The evaluation shall be carried out by an international and a local independent consultant (2 persons). Both shall have the necessary expertise in but not limited to

- Project evaluations especially in UN/UNDP sustainable energy projects
- Familiar with project management framework
- Have involved in managing industries or any industrial energy efficiency projects
- Have sound knowledge in policy and project financing

The local consultant shall assist the international consultant (also the lead consultant) in providing information on country specific issues such as local laws, institutional arrangements and communications.

Requirements

- Have tertiary education in engineering, science, business, economics or any development qualification. Post-graduate or with relevant professional qualification is preferred.
- More than 8 years of working experience in the areas addressed with a good knowledge of the state-of-the-art approaches and international best practices;
- Prior evaluation experience of similar projects in UNDP programme countries and familiarity with the specific UNDP GEF monitoring and evaluation requirements;
- Fluency in English

Schedule and Deliverables

- Period: The evaluation is proposed to begin from mid-November 2007 and will last for a period of three weeks maximum. However, the final schedule will be prepared upon discussion between UNDP and the implementing agency.
- Presentation of the findings, 1st draft (in point form) : The evaluation team is expected to present the observation, findings and draft recommendation 2 days before the end for the period for the purpose of fact-finding and data reconciliation.
- 1st draft of the report: 2 weeks after the end of the evaluation period
- Final Draft: A month after the end of the evaluation period.

The evaluation report will be produced highlighting important observations, analysis of information and key conclusions including its recommendation/s. The format of the report shall consist as below:

- | |
|--|
| <ol style="list-style-type: none">1. Title Page2. List of acronyms and abbreviations3. Table of contents, including list of annexes4. Executive Summary (max 3 pages)5. Introduction, Scope, and Purpose of the evaluation6. Methodology including description of the work conducted and Key questions7. Annexes8. Findings and Observation (at component level, at project level, project targets, capacity building)9. Budget Utilization (% against actual, component level and project level)10. Proposed remaining activities if any11. Recommendations, including, lessons, generalizations, alternatives for sustainability of the activities12. Conclusion (max 3 pages)13. Annexes providing a brief summary of the documents reviewed and persons interviewed with the description of the key content / conclusions drawn. |
|--|

Budget, Fee & Remuneration

All the costs incurred for the conduct of the evaluation shall be charged against project funds allocated for the conduct of such activity according to the standard UNDP rates. The consultancy is subject to a lump sum payment as per UNDP guidelines, including the consultancy fee, Daily Subsistence Allowance (DSA) at duty station, and one round trip airfare to and from the duty station in Kuala Lumpur (international consultant). 50% of the consultancy fee shall be paid upon signature of the contract while the balance shall be paid upon satisfactory submission of the report.

Commissioning Process and Communication

The commissioning tasks shall be conducted by the UNDP Kuala Lumpur with the advice of the executing agency (MEWC) and the implementing agency (PTM) as per following guidelines:

- Draft the [terms of reference](#) (TOR) in consultation with key partners and stakeholders.
- [Select the evaluator\(s\)](#) on a competitive basis and through a transparent process in line with UNDP's [procurement procedure](#);
- Brief the evaluator(s) on the expectations for the evaluation and on the [code of conduct](#) ;
- Review the first draft of the [evaluation report](#) and give relevant stakeholders a chance to provide feed back on factual errors or omissions;
- Disseminate the main evaluation findings, conclusions and recommendations to audiences internal and external to UNDP

More info at

<http://www.gefweb.org/MonitoringandEvaluation/MEAbout/meabout.html>

http://www.undp.org/gef/undp-gef_monitoring_evaluation/undp-gef_monitoring_evaluation.html

UNDP Kuala Lumpur will be responsible in engaging the evaluation team and any communication to said activities shall be forwarded to:

Asfaazam Kasbani Programme Manager (Energy and Environment) UNDP Malaysia Or email to: asfaazam.kasbani@undp.org Direct Line: +603 2091 5133 fax +603 2095 2870

ANNEX B. ITINERARY OF THE EVALUATION TEAM AND LIST OF DOCUMENTS

B.1 Mission schedule and list of people met

22/11	<ul style="list-style-type: none"> • Arrival of international consultant, Mr. J. van den Akker • Meeting with stakeholders at EE in Buildings workshop, Cyberjaya
23/11	<ul style="list-style-type: none"> • Meeting with project team²⁷ and CEO of PTM, Mr. Anuar Abdul Rahman
24-25/11	<ul style="list-style-type: none"> • Report writing
26/11	<ul style="list-style-type: none"> • Meetings at EPU (Mr. Nik Adnan Abdullah, Deputy Director; Mr. Kamarul A.B. Mustafa, Assistant Director) and Moh. Azizan B.M. Fauzi (Assistant Director) • Meeting at MEWC (Ms. Badriyah Abd Malek, Undersecretary; Moh. Shaharin Umar, Assistant Secretary) • Meeting at FMM (Mr. Lew Chin Hoi, Chairman of Energy Management Committee; Ms. Wan Haslina W. Hussin (Executive, Energy Utilities & Infrastructure Unit)
27/11	<ul style="list-style-type: none"> • Meeting with ZET Corporation (Mr. Zulkifli B. Zahari, Managing Director) • Report writing
28/11	<ul style="list-style-type: none"> • Meeting with MIDF (Mr. Nik Izani bin N. M, Vice-President and Head of Sales; Mr. Zulkamar Baharom, Development Finance Division) • Meeting with Energy Commission
29-30/11	<ul style="list-style-type: none"> • Attendance at launch of Human Development Report 2007/2008 • Report writing • Teleconf with Mr. Noel Soriano (UNDP/GEF RTA, Bangkok) • Discussion with project team members
01/12	<ul style="list-style-type: none"> • Visit to C7 site, Rotary Technical Services (Mr. Ricky Lim, General Manager; Mr. Harban Singh, Senior Service Manager)
02/12	<ul style="list-style-type: none"> • Report writing
03/12	<ul style="list-style-type: none"> • Visit to PASCORP Paper (Mr. Shamsudin B. Abd Rashid, Assistant General Manager)
04/12	<ul style="list-style-type: none"> • Visit to HeveaBoard (Mr. S. Ganesan, General Manager)
05/12	<ul style="list-style-type: none"> • Presentation of preliminary findings and discussion • Departure of international consultant

²⁷ Mr. K.S. Kennan (Chief Project Coordinator), Mr. Phubalan Karunakaran (Components 1 and 2), Ms. Meena Kumar Nair (Components 4 and 5), Mr. Ghazali Talib (Component 6), Mr. Zul Azri Hamidan (Component 6), Mr. Moh. Ibrahim Bachik (Components 3 and 7), Mr. Abd Malik Atan (Component 8)

B.2 List of reviewed documents

MIEEI-related reports and publications:

EPU (2006)

Ninth Malaysia Development Plan, Chapter 19, by Economic Planning Unit, Prime Minister's Office

Lucas (2003)

MIEEIP, Mid-Term Evaluation Report, by Nigel Lucas (Royal Academy of Engineering)

PTM (2003)

Malaysian ESCO Directory; by Pusat Tenaga Malaysia

PTM (2004)

MIEEIP, Interim Report

PTM (2007)

Malaysian Industrial Energy Efficiency Improvement Programme, Impact Study; by Pusat Tenaga Malaysia

PTM (2007b)

Energy Efficiency and Conservation Guidelines for Malaysian Industries, Part I: Electrical End-Use Equipment, by Pusat Tenaga Malaysia

UNDP (2006)

Achieving Industrial Energy Efficiency in Malaysia; by United Nations Development Programme

ZET (2007)

MIEEIP, Completion Report, by Z. Zahari (Project Director for MIEEIP of ZET-Fichtner-Econoler-CESI Consortium)

Other materials reviewed

- Project Document of MIEEIP (United Nations Development Programme)
- Quarterly Progress Reports 2001-2007, by MIEEIP as well as other project management materials, such as Steering Committee minutes of meeting and MIEEIP Hand-Over reports (2004)
- APR-PIR (2001, 2002, 2004, 2005, 2006, 2007), annual project implementation review reports (by United Nations Development Programme)
- Materials related to the specific project outputs under the eight Components, including case study materials (only partly reviewed; a full list of project publications is given in Annex D)
- Websites, www.ptm.org.my and www.ptm.org.my/mieeip

ANNEX C. LIST OF KEY WORKSHOPS AND SEMINARS

Component 1 (Energy-Use Benchmarking)

Workshops & Training Courses:

- Energy Conservation Guidelines for Malaysian Industries", (2006)
- "EE Guidelines" attended by JETRO/ECCJ, WG members and PTM (2006);
- Energy Benchmarking Training in the United States;

Seminars & Conferences:

- Industrial Energy Efficiency Technology Demonstration "Improve Productivity and Profits through Energy Efficiency Initiatives" (2005);

Component 2 (Energy Audit)

Workshops & Training Courses:

- Energy Efficiency Features Training Workshop (2003);
- Energy Management Training Sessions for the Private Sector (2002);
- Energy Management Training Session for the Government Sector (2002);
- Electrical Energy Audit (2002);
- Energy Audit Training Course, by Eco Energy (2000);
- Energy Management Training Course, by Fichtner, Germany (2000);

Seminars & Conferences:

- Energy Efficiency in Process Industries (2005);

Component 3 (Energy Rating)

Seminars & Conferences:

- The Use of High Efficiency Motors (HEM) in Industries (2007);
- Boiler Best Practice, (2003);
- Seminars for Working Groups on High Efficiency Motors (HEM) and Boiler Best Practices during 2000-2004 with ST

Component 4 (Energy Efficiency Promotion)

Workshops & Training Courses:

- Study Mission to Canada, India, United States & Denmark;
- An Outline on Industrial Energy Management for University Co-Curriculum (2004);

Seminars & Conferences:

- The Use of High Efficiency Motors (HEM) in Industries " HEM Ensures Improved Efficiency; Lower Operating Costs and Increased Profits" (2007);
- Energy Efficiency & Conservation "Lessons Learnt, Challenges Faced & What's Next", 2006;
- Energy Efficiency Case Studies (Series of seminars in Kuala Lumpur, Penang, Sarawak, Perak);
- National Convention for Energy Professionals (2005);
- Renewable Energy and Energy Efficiency "The Way Forward" (2005);
- Industrial Energy Efficiency Technology Demonstration "Improve Productivity and Profits through Energy Efficiency Initiatives" (Aug 2005);

- National Convention for Energy Professionals (2003);
- Energy Management (2003);

Component 5 (Energy Service Company (ESCO) Support)

Workshops & Training Courses:

- Study Mission to Canada, India, United States & Denmark
- Business and Financial Planning (2003);
- Energy Engineering Tools Workshop Follow-Up for ESCOs (2003);
- Energy Engineering and Business Tools (2003);
- Industrial Energy Performance Contract (EPC) (2003);
- Business and Financial Planning (2003);
- Energy Engineering and Business Tools (2003);
- Model of ESCO Business Plan and Strategy (2002);
- National ESCO (2002);
- Energy Performance Contract (EPC) (2001);
- ESCO Comprehensive Development (2001);
- ESCO Business Development (2001);
- EPC to MAESCO (2000);
- ESCO Comprehensive Development (2000);
- ESCO Business Development (2000);

Seminars & Conferences:

- 1st Asia ESCO Conference in Bangkok (2005) (sponsored ESCO to attend the conference);
- Promoting the ESCO Concept to Financial Institutions at Financial Institutions Forum (2002):

Component 6 (Energy Technology Demonstration)

Workshops & Training Courses:

- ETDP Information Dissemination Through Workshops (together with Component 4 FMM Road Shows (2006);

Component 7 (Local Energy Efficient Equipment Manufacturing Support)

Workshops & Training Courses:

- Pump Best Practice (2006);
- Boiler Best Practice (2004/05);
- Business and Financial Planning (2004/05);
- Business and Financial Planning (with assistance of Component 5) (2003);
- Capital Budgeting (2002);

Seminars & Conferences:

- Boiler Best Practice (2003);

Component 8 (Financial Institution Participation)

Workshops & Training Courses:

- Business and Financial Planning (in collaboration with Comp 5&7) (2003)
- International Round Table Discussion of Energy Efficiency and ESCO Financing (2002)

Seminars & Conferences:

- Financial Institutions (2002).

ANNEX D. LIST OF PUBLICATIONS AND REPORTS PRODUCED

Publications

1. Energy Audit Guideline Part – 1st Edition
2. ESCO Directory
3. Energy Efficiency and Conservation Guidelines – Electrical Equipment
4. Boiler Best Practice
5. Achieving Industrial Energy Efficiency in Malaysia by UNDP, GoM & PTM
6. EE assessment in new facilities
7. MIEEIP Newsletter, Issues 1-20
8. MEPA Newsletter, Issues 1-6
9. Energy Audit Guidelines – 2nd Edition

Reports

1. Inception Report September 2000 and June, 2001
2. “Strengthening ESCOs in Malaysia” Survey of Existing Companies, Identification of Barriers and Recommendations April, 2000
3. Survey on Dissemination Policy of Energy Efficiency Technology in Malaysia December 2000
4. 54 Audit Reports prepared for 11 industrial sectors between the period 2001-2006 (see Annex E for a List of Audited Companies)
5. Report; Evaluation of Existing ESCOs April, 2001
6. Amendment to Inception Report February, 2002
7. Market Survey Report (Assessment of Needs of Local Manufacturers In Terms of Support for Design Capability for Energy Efficient Improvement) July, 2002
8. Policy Studies on Energy Rating Programme. Report August 2002.
9. International ESCO Survey Report- Canada October 2002
10. International ESCO Survey Report- USA October 2002
11. Support to the Development of Credible and Proactive ESCOs in Malaysia – Survey of ESCOs in Malaysia “ Identification Impacts of the MIEEIP activities to the ESCO business” December, 2002
12. Input Study on Energy Audit to the Economic Planning Unit January, 2003
13. Investment Grade Audit Report – Heveaboard Berhad April, 2003
14. International ESCO Survey Report- Republic of Korea May 2003
15. Proposal for the Development of the Energy Business Fund , September, 2003
16. Preliminary Report on the Evaluation of Typical Energy Performance of Selected Locally Produced Industrial Equipment February, 2004
17. Evaluation of Typical Energy Performance of Selected Locally Produced Equipment (Pump, Boiler, Fan & Heat Exchanger) April, 2004
18. Final Report on the ESCO Wrap Up Session April, 2004
19. Investment Grade Audit Report – Felda Vegetable Oil Products August, 2004
20. Investment Grade Audit Report – Tunnel Kiln Upgrade June- August, 2004
21. Investment Grade Audit Report- JG Containers Sdn Bhd September, 2004
22. Operational Procedures & Guides of Energy Efficiency Project Lending Scheme (January, 2005)
23. A Sub-Sectoral Assessment on Industrial Sector Energy Consumption (A MIEEIP Audit Finding in Eight Energy Intensive Sub-Sectors) February, 2005
24. Investment Grade Audit Report – Pascorp Paper Industries Berhad October, 2005

25. Report on the Evaluation of Typical Energy Performance of Selected Locally Produced Industrial Equipment (Boiler , Electric Motor Rewinder & Dryer) October, 2005
26. Investment Grade Audit Report – Apollo Rubber Sdn Bhd November, 2005
27. Final Report of the Energy Use Benchmarking Programme 2006
28. Investment Grade Audit Report – Malayawata Steel Berhad March, 2006
29. Review of ESCO Fast Track Demonstration Projects Implementation April, 2006
30. Proposal For The Implementation Of An ESCO Accreditation Scheme May , 2006
31. Report on the Development of and Energy Efficiency Revolving /Guarantee Fund 2007
32. Proposal to set up EE Revolving Fund (to MEWC)
33. Report on the Review of the Master Energy Services Agreement May 2007
34. Proposal /Strategic Paper on” How to Educate Local Manufacturers to Produce High Energy Efficient Equipment” Malaysia’s Pump Industry and Energy Efficient Pump Development and the Challenge – From the Perspective of Pump Manufacturers in Malaysia January, 2007
35. Proposal Paper on “How to Educate Local Manufacturers to Produce High energy Efficient” From the Perspective of Fan & Blowers Manufacturers March 2007
36. Malaysian Industrial Energy Efficiency Improvement Programme Impact Study (A Study Conducted To Gauge The General Impact Of The MIEEIP), 2007

Other documents

Minutes of meetings: Monthly progress meetings (various period)
 Project Review Committee (various period)
 National Steering Committee (various period)
 Tender Evaluation Committee (various period)

Tender specifications: Motor test-bed
 Boiler demo/training unit

UNDP reports: Quarterly reports
 AIR/PIR
 Financial reports

Completion reports: Techno Economists
 Zet consortium

Discussion notes (various period)

ANNEX E. LIST OF AUDITED COMPANIES

ENERGY AUDIT CLIENTS		
Name	Town	State
Sabah Forest Industries Sdn Bhd	Sipitang	Sabah
Anshin Steel Ind. Sdn Bhd	Shah Alam	Selangor
Sinmah Food Industries Sdn Bhd	Masjid Tanah	Melaka
Kong Guan Sauce & Food Manufacturing Co.Sdn Bhd	Prai	P.Pinang
Koko Malaysia Sdn Bhd	Hutan Melintang	Perak
Samsung Corning (M) Sdn Bhd	Kawasan Perindustrian Tuanku Jaafar, Sungai Gadut	Negeri Sembilan
JG Containers (M) Sdn Bhd	Klang	Selangor
Malaysian Sheet Glass Berhad	Sungai Buloh	Selangor
Malaysian Newsprint Industries Sdn Bhd	Termeloh	Pahang
Tritex Containers Sdn Bhd	Beranang	Selangor
Sime Inax Sdn Bhd	Batang Berjuntai	Selangor
Sanitec Johnson Suisse Sdn Bhd	Petaling Jaya	Selangor
Best Tile Works Sdn Bhd	Klang	Selangor
Sunway Keramo Sdn Bhd	Klang	Selangor
Perpa Parquat Sdn Bhd	Kuantan	Pahang
Heveaboard Sdn Bhd	Gemas	Negeri Sembilan
Pesaka Terengganu Bhd	Dungun	Terengganu
Amsteel Mills Sdn Bhd	Klang	Selangor
Jayakuik Sdn Bhd	Sandakan	Sabah
Malayawata Steel Bhd	Prai	P.Pinang
Rinda Perusahaan Makanan (M) Sdn Bhd /Cipta Foodstuffs (M) Sdn Bhd	Seberang Prai Tengah	P.Pinang
Pan Century Edible Oils Sdn Bhd	Pasir Gudang	Johor
G.B.Industries Sdn Bhd	Rembau	Negeri Sembilan
Sun Rubber Industries Sdn Bhd	Seremban	Negeri Sembilan
Kumpulan Jebco (M) Sdn Bhd	Sungai Buloh	Selangor
Glovco Rubber Sdn Bhd	Klang	Selangor
Anshin Castings Industries Sdn Bhd	Shah Alam	Selangor
Orna Paper (M) Sdn Bhd	Batu Berendam	Melaka
Genting Sanyen Industrial Paper Sdn Bhd	Banting	Selangor
APMC Sdn Bhd (Kanthan Works)	Chemor	Perak
Tasek Corp.Sdn Bhd	Ipoh	Perak
APMC Sdn Bhd (Rawang Works)	Rawang	Selangor
Rubber Thread Ind (M) Sdn Bhd	Ipoh	Perak
Plaat Rubber (M) Sdn Bhd	Bayan Lepas	P.Pinang
Samsung Corning (M) Sdn Bhd	Seremban	Negeri Sembilan
Golden Clay Industries Sdn Bhd	Yong Peng	Johor

ENERGY AUDIT CLIENTS		
Name	Town	State
Sykt.Kia Lim	Parit Solong	Johor
Cenpak Paper Products (M) Sdn Bhd	Senai	Johor
CHG Plywood Sdn Bhd	Cheras	Selangor
Kilang Papan Low Fat Sdn Bhd	Hulu Trengganu	Terengganu
Fung Keong Rubber Manufactory (M) Sdn Bhd	Klang	Selangor
Phoenix Rubber Products Sdn Bhd	Kuala Ketil	Kedah
KYM Industries (M) Sdn Bhd	Beranang	Selangor
Cargill Palm Products Sdn Bhd	Kuantan	Pahang
S & P	Selekoh	Perak
Globalmas Sdn Bhd	Kuching	Sarawak
Felda Vegetable Oil		Kuala Lumpur
Wear Save Malaysia	Port Klang	West Malaysia
Penfabric Sdn Bhd –Mill 3	Bayan Lepas	Penang
Viscount Plastics (Malaysia) Sdn Bhd	Bandar Baru Bangi	Selangor
Formosa Prosonic Holdings Sdn Bhd	Pelabuhan Kelang	Selangor
Prym Newey Malaysia Sdn Bhd	Tanjung Kling	Melaka
Pan Century Oleochemical Sdn Bhd	Pasir Gudang	Johor
Akso Nobel Oleochemical Sdn Bhd	Pasir Gudang	Johor
Chung Khong Engineering Trade Sdn. Bhd.	Ipoh	Perak
Massive Fan Industries Sdn. Bhd.	Balakong	Selangor
Rotary Technical Services Sdn. Bhd.	Kajang	Selangor

ANNEX F. LIST OF AGREEMENTS

List of Memorandums of Understanding (MoUs) and Agreements (MoAs)

MEMORANDUM OF UNDERSTANDING and AGREEMENTS		
No.	Title	Date
1	Consultancy Services Agreement for Malaysian Industrial Energy Efficiency Improvement Project (MIEIP) between Pusat Tenaga Malaysia and Zet Corporation Sdn Bhd in association with Fichtner-CESI-Econoler	20 th July, 2000
2	Consultancy Services Agreement for Malaysian Industrial Energy Efficiency Improvement Project (MIEIP) between Pusat Tenaga Malaysia and Techno Economist Sdn Bhd in association with Dansk Energi Management , Danish Technological Institute and Dansk Energi Analyse	20 th July, 2000
3	Energy Audit Memorandum of Understanding Pusat Tenaga Malaysia and the Cement & Concrete Association of Malaysia	27 th February, 2001
4	Energy Audit Memorandum of Understanding Pusat Tenaga Malaysia and the Malaysian Rubber Products Manufacturers' Association	27 th February, 2001
5	Energy Audit Memorandum of Understanding Pusat Tenaga Malaysia and the Malaysian Timber Industry Board	27 th February, 2001
6	Energy Audit Memorandum of Understanding Pusat Tenaga Malaysia and the Malaysian Iron and Steel Industry Federation	27 th February, 2001
7	Energy Audit Memorandum of Understanding Pusat Tenaga Malaysia and Sinmah Food Industries Sdn Bhd	27 th February, 2001
8	Energy Audit Memorandum of Understanding Pusat Tenaga Malaysia and Malaysian Newsprint Industries Sdn Bhd	27 th February, 2001
9	Energy Audit Memorandum of Understanding Pusat Tenaga Malaysia and Malaysian Newsprint Industries Sdn Bhd	27 th February, 2001
10	Energy Audit Memorandum of Understanding Pusat Tenaga Malaysia and Sime Inax Sdn Bhd	27 th February, 2001
11	Energy Audit Memorandum of Understanding Pusat Tenaga Malaysia and JG Containers (Malaysia) Sdn Bhd	27 th February, 2001
12	Energy Audit Memorandum of Understanding Pusat Tenaga Malaysia and Malaysian Sheet Glass Berhad	27 th February, 2001
13	Energy Audit Memorandum of Understanding Pusat Tenaga Malaysia and Koko Malaysia Sdn Bhd	27 th February, 2001
14	Energy Audit Memorandum of Understanding Pusat Tenaga Malaysia and Samsung Corning (Malaysia) Sdn Bhd	27 th February, 2001
15	Energy Audit Memorandum of Understanding Pusat Tenaga Malaysia and Tritex Containers Sdn Bhd	27 th February, 2001
16	Energy Audit Memorandum of Understanding Pusat Tenaga Malaysia and Kong Guan Sauce & Food Mfg. Co.Sdn Bhd	27 th February, 2001
17	Energy Audit Memorandum of Understanding Pusat Tenaga Malaysia and Sanitec Johnson Suisse Sdn Bhd	27 th February 2001

18	Energy Audit Memorandum of Understanding Pusat Tenaga Malaysia and Genting Sanyen Industrial Paper Sdn Bhd	27 th February, 2001
19	Agreement Between Pusat Tenaga Malaysia and Malaysian Industrial Development Finance Berhad (Energy Efficiency Projects Lending Scheme for Energy Service Companies (ESCO) and Industries for the Energy Technology Demonstration Project)	9 th May, 2002
20	MOUs between PTM and all demo project host sites (8)	
21	Master Energy Service Agreement between Mensilin Holdings Sdn Bhd and Heveaboard Sdn Bhd (For the Implementation of the Replacement of Oil Fired Thermal Oil Heater to Waste Wood Fired Thermal Oil Heater Project in the Wood Sector)	7 th April, 2003
22	Memorandum of Understanding Between National Productivity Corporation and Pusat Tenaga Malaysia for the Energy Use Benchmarking Programme	6 th May, 2003
23	Agreement Between Pusat Tenaga Malaysia and Malaysian Industrial Development Finance Berhad (Appoinment of MIDF as the Implementing Agency to ensure the success of the Energy Efficiency Project Lending Scheme for Local Equipment Manufacturers)	13 th May, 2004
24	Agreement Between Pusat Tenaga Malaysia and Chun Khong Engineering Trade Sdn Bhd (Host Site for the Implementation of the Energy Efficient Equipment Manufacturing Demonstration Project –Pump)	22 nd October, 2004
25	Agreement Between Pusat Tenaga Malaysia and Massive Fan Industries Sdn Bhd (Host Site for the Implementation of the Energy Effcient Equipment Manufacturing Demonstration Project –Fan& Blowers)	15 th October, 2004