

**Independent mid-term review**

**KINGDOM OF THAILAND**

**Industrial Energy Efficiency in Thailand**

UNIDO project No.: **GF/THA/11/001**  
UNIDO SAP ID: **103071 / 200000322**  
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## LIST OF ACRONYMS

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ADB`	Asian Development Bank
APEC	Asia Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
AWP	Annual Work Plan
Bcf	Billion cubic feet
CEO ER	CEO Endorsement Request form
CASO	Compressed air system optimization
CC	Climate change
CO <sub>2</sub>	Carbon dioxide
CDM	Clean Development Mechanism
DEDE	Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy
DIP	Department of Industrial Promotion (of Ministry of Industry)
DIW	Department of Industrial Works (of Ministry of Industry)
DSM	Demand-side management
EE	Energy efficiency
EEDP	Energy Efficiency Development Plan
EC	Energy conservation
EGAT	Electricity Generating Authority of Thailand
EMS	Environment Management Standard (ISO)
ENCON	Energy conservation
EnMS	Energy Management Standard (ISO)
EPPO	Energy Policy and Planning Office (of Ministry of Energy)
EU	European Union
ESCO	Energy service company
FSP	GEF full-sized project
FTI	Federation of Thai Industries
GW	Gigawatt, 1000 MW
GWh	Gigawatt-hours
GEF	Global Environment Facility
GEF CEO	GEF Chief Executive Officer
GHG	Greenhouse gas
IEE	Industrial Energy Efficiency
HQ	Headquarters
ISO	International Organization for Standardization
HL	Highly Likely
HS	Highly Satisfactory
HU	Highly Unsatisfactory
IMS	Integrated management standard
IEE	industrial energy efficiency
ktoe	kiloton of oil equivalent
kW	kilowatt
kWh	kilowatt-hour
M&E	Monitoring and evaluation
ML	Moderately Likely
MONRE	Ministry of Natural Resources and Environment
MS	Moderately Satisfactory
Mtoe	million tons of oil equivalent
MTR	Mid-Term Review
MU	Moderately Unlikely
MU	Moderately Unsatisfactory
MW	megawatt (million Watt)

NE	National expert
NGO	Non-governmental organization
NPC	National Project Coordinator
NPD	National Project Director
P2P	peer-to-peer
PIR	Project Implementation Review
PMU	Project Management Unit
PPG	GEF project preparation grant
PSC	Project Steering Committee
PSO	Pump system optimization
SO	System optimization
SSO	Steam system optimization
tCO <sub>2</sub>	tons of carbon dioxide (equivalent)
TEM	Total Energy Management program (of DIP)
THB	Thai Baht
TISI	Thai Industrial Standards Institute
TLC	Training of Lead Consultancy project (of TISI)
ToR	Terms of reference
UNIDO	United Nations Industrial Development Organization
USD	United States dollar

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# MAP



Map No. 3853 Rev. 2 UNITED NATIONS  
July 2009

Department of Field Support  
Cartographic Section

The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations



## EXECUTIVE SUMMARY

### Project summary sheet

<b>Project Title</b>	<b>Industrial Energy Efficiency</b>
<b>GEF ID Number</b>	3786
<b>UNIDO ID (SAP Number)</b>	GF/THA/11/001 (SAP: 103071 / 200000322)
<b>Region</b>	EAP
<b>Country</b>	<b>Thailand</b>
<b>GEF Focal Area and Operational Program:</b>	CC (CCM), GEF-4
<b>GEF Agencies (Implementing Agency)</b>	UNIDO
<b>Project Executing Partners</b>	Department of Industrial Promotion, Ministry of Industry
<b>Project Size (FSP, MSP, EA)</b>	FSP
<b>Project CEO Endorsement/Approval Date</b>	04-02-2011
<b>Project Implementation Start Date (PAD Issuance Date)</b>	11-04-2011
<b>Original Expected Implementation End Date (indicated in CEO Endorsement/Approval document)</b>	30-08-2016
<b>Revised Expected Implementation End Date (if any)</b>	31-08-2017
<b>GEF Grant (USD)</b>	USD 3,620,000
<b>GEF PPG (USD) (if any)</b>	USD 100,000
<b>Co-financing (USD) at CEO Endorsement</b>	USD 15,645,000
<b>Total Project Cost (USD) (GEF Grant + Co-financing at CEO Endorsement, excl. PPG)</b>	USD 19,265,000
<b>Agency Fee (USD)</b>	USD 362,000

### Introduction and brief description of the project

In South East Asia, Thailand has been a leader in the promotion of energy efficiency. The Government of Thailand has structured its energy policy, legal and regulatory frameworks, starting from early 1990s, for promotion of energy efficiency and renewable energy. For example, the Energy Conservation Promotion Act (ENCON Act), was passed in 1992 and amended in 2007. The Energy Efficiency Development Plan (EEDP) of 2011 sets short-term (2011-2015) and long-term (2011-2030) energy conservation targets both at the national level and for the specific energy consuming sectors, including industry, transportation, commercial and residential sectors.

Despite encouraging efforts in terms of regulatory policy framework, establishment of energy conservation funds, tax benefits and other incentives from the government, realization of energy efficiency initiatives by the industries to address the high energy consumption situation had been rather is low with limited penetration of energy-efficient measures, technologies, and practices in the industries. For example, many Thai industries are already ISO certified (ISO 9001:2008) for quality management and safety, but have not been familiar with the latest ISO standard 50001 on energy management systems (EnMS) nor are they

familiar with the concept of system optimization for improving energy efficiency. Thus, at the facility/company level there often are no built-in energy management policies and strategies that integrate energy issues in the existing management structure and energy-related issues are taken on an ad-hoc basis that does not allow a comprehensive and integrated approach that ensures sustainable energy cost reduction and improves the facility productivity simultaneously.

To address such barriers, multilateral technical assistance was sought from United Nations Industrial Development Organization (UNIDO) and the Global Environment Facility (GEF). The resulting “*Industrial Energy Efficiency Project*” is executed in cooperation with the Department of Industrial Promotion (DIP); Department of Industrial Works (DIW); Thai Industrial Standards Institute (TISI); and Department of Alternative Energy Development and Efficiency (DEDE). The project has received financial support from the Global Environment Facility (GEF) of USD 3,620,000 and co-financing from Thai government partners and private sector of USD 15,645,000. The **objective** of the project is “Promote energy efficiency in the industries through introduction of ISO Energy Management Standard incorporating industrial energy systems optimization”.

The project **outcomes and outputs** are:

1. ISO compliant energy management systems
  - Training material and tools on energy management developed
  - National awareness campaign launched on ISO 50001
  - National experts/factory personnel trained on ISO compliant energy management systems
  - Peer-to-peer network between industrial enterprises established and operated
2. Industrial energy systems optimization
  - Training material and tools on systems optimization developed
  - National experts/factory personnel trained on optimization of steam, compressed air, pumping and fans systems
  - Equipment vendors/suppliers trained on systems optimization
3. Enhancement of industrial energy efficiency (EE) financing capacity
  - Harmonized EE project evaluation criteria
  - Capacity of banks/FIs enhanced on EE projects financing
  - Training material developed and industry managers trained on the development of financial proposals
4. Implementation of energy management and systems optimization projects
  - Energy management projects implemented
  - Documented systems optimization demonstration projects
  - Recognition program developed

### **Project results and ratings**

The GEF/UNIDO project in Thailand is halfway through its project implementation and therefore needs to undergo a mid-term review (MTR) by independent reviewers as per UNIDO and GEF guidelines. This report presents the assessment and findings regarding project performance and progress against the following evaluation criteria: relevance, effectiveness, efficiency, sustainability and impact.

The table below provides a summary of conclusions and the ratings for a) progress towards results, b) project implementation and adaptive management and c) sustainability.

Criteria	Justification of ratings	Rating
<p>1. Design and relevance <i>UNIDO criterion:</i> implementation approach M&amp;E design</p>	<p>The overall project design is relevant to the national energy priorities, and has enjoyed strong participation of local stakeholders in project identification. The project is relevant to UNIDO and policies and fully relevant to the GEF focal area of climate change</p> <p>The Logical Framework, with its outcomes, outputs and target indicators, has been developed adequately and allows for the monitoring of project results. The M&amp;E process and specific reporting requirements are sufficiently identified in the Project Document (CEO ER). The budget provided for M&amp;E at the planning stage is sufficient. Regarding project strategy, it is worth mentioning that the project is an integral part of overall UNIDO efforts to promote energy management and systems optimization. In South-East Asia, IEE projects are being implemented in Malaysia, Myanmar, Thailand, Indonesia, Philippines and Vietnam, allowing exchange of ideas and experiences, while the training programs follow a similar proven setup that can be adapted to local circumstances and language, as needed.</p> <p>Certain aspects regarding sustainability are not in the project design, such as how the peer-to-peer network and training could be institutionalized to ensure functioning beyond the project's end. This issue has been given attention during implementation, but to consider this already in the design phase would have been better.</p>	<p>Relevance: HL (highly relevant) Design: HS (highly satisfactory)</p>
<p>2. Attainment of results; effectiveness</p>	<p>The project has been under implementation for almost 3 years and its current achievements compared to the targets show <i>highly satisfactory progress in two training Components 1 and 2</i>, in many cases exceeding the end-of-project targets. Progress in the EnMS and SO expert trainings has been 126% and 66% so far, in the EnMS and SO user trainings 51% and 155% respectively and management workshops' progress is 82%.</p> <p>Progress in <i>Component 4 has been significant and is rated satisfactory</i>. Of the target of 75 SO assessments, 26 have been completed, 8 are pending and 10 more are planned for 2015. Similarly, of the end-of-project target of 200 adopted EnMS plans, 24 have adopted plans, while 10 more are planned. Although the project is lagging behind in terms of achieving targets, it should be noted that implementation had to wait until the first trainings had been organised and further results will come in 2015-17 as the National Experts will perform more SO assessments and draft EnMS plans</p> <p>In <i>Component 3 (on energy efficiency financing)</i> activities are just starting with a survey and interviews to assess training needs and look at possible harmonization of evaluation criteria in EE loans. A number of trainings have already been organized for financial institutions and industrial companies with more planned for 2015/16. The progress is rated as <i>satisfactory</i>.</p>	<p>Satisfactory (S)</p>
<p>3. M&amp;E; Efficiency; <i>UNIDO criteria:</i> Quality at entry &amp; preparedness; UNIDO supervision and backstopping;</p>	<p>Project management has been successfully carried out by the UNIDO Project Manager and Project Management Unit (PMU) led by the Project Coordinator. These have drafted the progress reports that provide the necessary aspects of the periodical achievements of the project with narrative link back to the outcomes, outputs and targets elaborated in the logical framework. There has been good cooperation between the various project partners (DIP, TISI, DEDE and DIW) that closely work together with the PMU, meet annually in the Project Steering Committee (PSC) and have set up a Working Group. Although counterpart resources and adequate project management</p>	<p>HS (highly satisfactory)</p>

	arrangements were in place at project entry, the project initiation has met some delays, but currently project implementation is well on track. Realizing time planned may be too short, the project was extended until August 2017.	
4. Sustainability and risks; external factors	There are no major financial, socio-political or institutional and governance risks to sustainability identified. Technical risks associated with the optimization of compressed air and steam systems are very low. In fact, considerable energy savings have been achieved in many countries through system level efficiency opportunities. However, it has to be noted that the companies participating are mostly larger companies (that have already experience with similar management standards (ISO environment standard or quality). In future, the big challenge will be in passing the EE message to medium and small sized companies.	Likely (L)

Key **conclusion** is that the progress made on these outputs has been significant, with most planned outputs being achieved by the time of the mid-term review or expected to be on track by the end of 2015. The industries have showed strong interest in the project, especially the large industry companies. Through its awareness raising and capacity building activities, the project has supported many factories to implement EnMS and SO improvement projects that will result in significant energy savings and a reduction in GHG emissions. Based on the progress achieved thus far, it is expected that the project will be a position to achieve its global environment/development objectives.

### Recommendations

#### For the Project Team and national government partners

##### 1) *Institutionalization of training*

One aspect of sustainability is the institutionalization of training on EnMS and system optimization. The trainings contain a wealth of information and all training materials and documents could potentially be transferred to DEDE's Energy Training and Learning Center that could also serve as a focal point for e-learning on EnMS and SO issues. This issue would need to be deliberated by the Project Steering Committee before execution.

In a country the size of Thailand and a market of up to tens of thousands of small, medium and large enterprises, the number of trained national experts envisaged, about 80, and the number of companies targeted, about 200 in EnMS and 50 in SO, is small indeed. Even if the project could be up-scaled, it would only cover a small section of the sheer number of companies in the country. From the viewpoint of replication, we suggest diverting some project resources to the following a) Integration of the EnMS and SO in the curriculum of relevant undergraduate programs of prominent universities and/or b) Organization of short introduction and refresher courses or seminars at relevant engineering or business training institutes or by relevant industry and professional associations.

The first (curricula integration) would be medium-term in nature, while the other option (short courses or workshops) could probably be implemented on the short term. Piloting both these programs during the project's duration would be a desirable (new) output. It was suggested during the evaluation mission that giving some sort of UNIDO certificate to the trained national experts for their work done in companies would be useful for their professional work in the future.

##### 2) *Post-project action plan*

Towards the end of the project, the PMU should commission a sound analysis of the situation, remaining barriers and steps to be taken that ensure the policy-institutional, technical and financial-economic sustainability of the Project in the period after the project has come to an end.

The Project Document foresees the transfer of the maintenance of the peer-to-peer database and reporting tools to the relevant government agency. Thus, the institutionalization of the P2P network should be looked into, as well as the post-project role of existing industrial associations, chambers of commerce and industry and professional associations of engineers. The formation of a Working Group (with representatives of DIP, TISI, DEDE and DIW) is an important first step towards a post-project cooperation between these government entities. The post-project action plan should provide some details on objectives, plans and actions to be taken by the Working Group.

For example, the Working Group can play an important role in making information and knowledge on SO and EnMS available through materials and toolkits on CD and in printed form as well as web-based tools and info made available through e-learning portal. The destination of the equipment of energy audits and measurement equipment, procured under the project should be determined as well, although it was suggested to the Evaluators it might go to DIP for future assistance to smaller-sized industries (e.g. SME) or industries that do not have had exposure to similar management systems (such as EMS, environment).

These issues should be addressed towards the end of the Project by commissioning a sound 'post-project action plan'. Such an 'action plan' could have the following elements: a) overview chapter on status of EnMS, SO and EE, b) identification of lowered and remaining barriers, c) conclusion and recommendations to the Government and private sector institutions for post-project supportive actions.

### 3) *Finance*

It is not clear exactly what the need for external finance of industrial companies is to realize efficiency improvements (based on EnMS and SO analysis) or for any larger investments with an energy efficiency improvement component. In this respect, maybe smaller industries would be in more need of finance than the larger industries that have so far participated. Surveys amongst beneficiary (and potential) industries should include questions on financing needs and support required. This information should feed into the above-mentioned post-project action plan with a section on financing issues (if any) and options. In this respect, it would be useful to ask questions to company on fuel, power and corresponding monetary savings, but as well on estimated investment cost. This gives useful information on payback times as well as need for finance to cover investments.

### 4) *Gender*

To make the gender dimension in the various project activities more pronounced, gender-disaggregated indicators could be included in future company surveys to be able to measure gender mainstreaming of the project. While the collection of these surveys are expected to confirm that the employees of the focus sectors, namely heavy industries, such as cement and steel, are predominantly male, it would help the project gain a better understanding of the baseline gender disaggregation in Thai industry.

### For UNIDO and GEF Secretariat

### 5) *UNIDO*

Given the fact that UNIDO has organized similar projects on energy management and system optimization in over 20 countries, we would like to suggest that in UNIDO itself the training is internally institutionalized, i.e. by offering refresher courses in the participating countries. It should be looked into how this could be organized and funded with UNIDO's regular or extra-budgetary funding.

In general, the visibility of the UNIDO-supported projects on EnMS and SO could be much improved, for example, by setting up a dedicated website (as part of UNIDO's overall website) or as a separate set of webpages, covering EnMS and SO in general and the countries where UNIDO has implemented projects in particular. This would also be a good place to make available reports, manuals and selected course materials as well as maintaining an agenda of upcoming events, apart from making these materials available on the

national IEE websites. UNIDO should make clear to national websites hosts what materials or documents can be put on the website without infringing on copyright regulation

#### 6) *GEF*

It is being discussed to present a new initiative for funding under the new GEF-6 budget cycle. Given the large scope for replication in a country the size of Thailand and the cost-effectiveness of energy management planning and implementing energy optimization, it makes sense to scale up the activity and expand into other thematic or geographical areas:

- Support other industrial subsectors (if companies from these subsectors clearly indicate their needs);
- Cover new topics in system optimization (e.g., chillers, fans; again, this should be demand-driven);
- Increased focus on medium-sized companies.

On design, we notice a discrepancy between the sources of confirmed co-financing and the actual realization. Co-financing is usually calculated to meet GEF demands (e.g. to achieve ratios of 1 to 4 or 6 in GEF financing and co-financing), irrespective of the type of project, technology or investors, or how letters of co-financing can be organized during project design. This setup favors the confirmation of co-financing with a few large (supply-side) energy investments over demand-side projects with a multitude of beneficiaries that individually realize small investments. In general, private sector entities are more reluctant to sign co-financing letters than government entities and often are not sure what the legal implications of signing such a letter might be. To give an example, it is obviously easier to get a co-financing letter from two entities investing or making available USD 6 million each than getting 100 co-financing letters from companies investing USD 120,000 on average. In the case of the Thailand proposal, a large part of co-financing has been committed by the financial sector (as such positive, because it indicates their interest and commitment in energy efficiency), while in practice it seems likely to come from the companies directly by realizing small energy efficiency investments without having to resort to external finance. Conclusion is that the GEF should allow more flexibility and realism when co-financing is incorporated in the project design.

#### **Lessons learned**

The framework program on EnMS and SO in South East Asia can be used and should be presented by UNIDO as a best practice. The Thailand project can use this context to present the benefits of EnMS and SO in international fora and to a wider audience, stressing the importance of a well-conceived methodology regarding training and awareness raising and strong local ownership.

# 1. INTRODUCTION

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## 1.1 Background

### UNIDO industrial energy efficiency programme

Improving energy efficiency (EE) in industry is one of the most cost-effective measures to help supply-constrained developing and emerging countries meet their increasing energy demand and loosen the link between economic growth and environmental degradation, such as climate change. Despite this, energy efficiency improvements with very favorable payback periods often do not get implemented. When projects are implemented, it may often happen that results are not sustained due to lack of supportive operational and maintenance practices. Energy efficiency is still widely viewed as a luxury rather than a strategic investment in future profitability.

The final goal of the UNIDO Industrial Energy Efficiency (IEE) Programme is to effect sustained energy management and efficiency practices in industry of developing countries and emerging economies in order to reduce the environmental pressure of economic growth while increasing productivity, helping to generate economic growth, create jobs and alleviate poverty.

### Systems optimization and energy management systems

Three decades of national and international experiences with industrial energy efficiency programmes have shown that most energy efficiency in industry is achieved through changes in *how energy is managed* in an industrial facility, rather than through installation of new technologies. The goal of sustainable energy efficiency in industry requires that energy efficiency is integrated into daily management practices and systems for continual improvement. In order to achieve that, top management needs to be engaged in the management of energy on an ongoing basis

The Energy Management Standard (EnMS), ISO 50001, requires an organization to establish, implement, maintain, and improve an energy management system, enabling systematic achievement of continual improvement in energy performance, energy efficiency, and energy conservation. It imposes requirements on energy supply and consumption, in terms of measurement, documentation and reporting, design and procurement practices for energy-using equipment and systems as well as processes and personnel. However, it does not prescribe specific performance criteria with respect to energy. The energy management system will ensure the sustainability of the energy saving due to better planning and execution, more involvement of top management and all key persons and also a better monitoring and evaluations.

While equipment manufacturers have improved the performance of the individual system components (such as motors, steam boilers, pumps and compressors) to a high degree, the energy efficiency of systems that include these components is often quite low. Thus, efficiency of individual components may only be possible to improve with 2-5%, but by looking at the system as a whole and carefully matching equipment to demand needs, efficiency improvements of 20-50% are possible. Energy be saved, reliability and control of the system will be enhanced, while maintenance costs will decline. Payback periods for system optimization projects are typically short—from a few months to two-three years—and involve commercially available products and accepted engineering practices. Payback periods are low, because the focus is not only on changing out or supplementing equipment, but on eliminating or reconfiguring inefficient uses and practices.

## 1.2 Purpose and approach of the mid-term review

### Mid-term review

Independent evaluations of technical cooperation activities, such as projects, can take the form of mid-term reviews (MTRs), terminal (TE) or ex-post evaluations (UNIDO Evaluation Policy, 2006). Independent evaluations can be mandatory for programs and projects as established in funding agreements with donors. As outlined in the GEF Monitoring and Evaluation Policy<sup>1</sup>, **mid-term reviews** (MTRs) are mandatory for full-sized projects (GEF FSPs). The MTRs focus on a) assessment of progress towards results, b) monitoring of implementation and management, c) early identification of risks (to sustainability) and d) providing recommendations for corrective actions and future direction.

As per UNIDO and GEF guidelines, a mid-term review needs to be carried out for all GEF-financed full-sized projects by one or more independent consultants; ‘independent’ meaning not previously involved in the project’s design, management or implementation of activities. The GEF FSP project in Thailand is halfway its project implementation and therefore needs to undergo a MTR. It was decided by UNIDO to award the review contract to two independent consultants, Mr. Johannes (Jan) Van den Akker (Netherlands) and Ms. Tharee Kamuang (Thailand).

### Reducing industry’s carbon footprint in South East Asia through compliance with an energy management system (ISO 50001)

This programme framework was submitted by UNIDO to the Global Environment Facility (GEF) and approved by the GEF Council in November 2008. The objectives of the program are (a) controlling the growth of greenhouse gas emissions attributable to rapid industrialization in the countries of South East Asia; and (b) helping these industries reduce their costs of fuel and electricity. Besides the Thailand project, the programme is composed of national projects implemented in Indonesia, Malaysia, Myanmar, the Philippines and Vietnam; each designed to facilitate introduction of ISO 50001 through training and capacity building, including a technical focus on systems optimization.

The GEF FSP projects in Indonesia, the Philippines and Thailand are halfway through their project implementation and therefore need to undergo a mid-term review (MTR). It was decided by UNIDO to award the contract for the mid-term review in these three countries to one international (independent) consultant as lead evaluator, Mr. Johannes (Jan) Van den Akker (Netherlands). This ‘multi-country’ evaluation approach has the advantage that the results of the similar projects in various countries can be compared and country-specific situations (that may positively or negatively affect results) can be filtered out, which allows a more profound assessment. This report presents the findings of the MTR for Thailand, while a summary of issues and findings that are common to the three countries are given in Annex D.

### Objective and key question of the mid-term review

The Mid-term review (MTR) assesses project performance and progress against the evaluation criteria: relevance, effectiveness, efficiency, sustainability and impact.

The key question of the mid-term evaluation is to what extent the project is achieving the expected results at the time of the mid-term evaluation, i.e. to what extent the project has promoted industrial energy efficiency through system optimization approach and the introduction of ISO energy management standards. Through its assessments, the evaluation team should enable the Government, counterparts, the GEF, UNIDO and other stakeholders and donors to:

- Verify prospects for development impact and sustainability, providing an analysis of the attainment of global environmental objectives, project objectives, delivery and completion of project outputs/activities, and outcomes/impacts based on indicators. The assessment includes re-examination of the relevance of the objectives and other elements of project design.

<sup>1</sup> *The GEF Monitoring and Evaluation Policy* (GEF Secretariat, 2010)



- Enhance project relevance, effectiveness, efficiency and sustainability by proposing a set of recommendations with a view to ongoing and future activities until the end of project implementation.

### Methodology

Before undertaking the evaluation, an *Inception Report* was presented, including the proposed tasks, activities and deliverables, as well as a table of main evaluation questions that need to be answered to determine and assess project results, and to identify where the information is expected to come from (e.g. documents, interviews and field visits).

The review has been based on the following *sources of information*:

- Desk review of progress reports and project documents:
  - CEO Endorsement Request (CEO ER) and annexes; annual progress reports (project implementation reviews (PIRs)); other progress reporting;
  - Overview of budget expenditures and realized co-financing; annual work plans;
  - Project technical reports and description of outputs; project or counterparts' websites;
  - Policy documents on energy, industrial energy efficiency or climate change mitigation, as well as other relevant reports and documents from counterpart organizations or other stakeholders;
- One-week mission to Thailand (in May 2015) to hold interviews with stakeholders, beneficiaries and key informants and visits to selected project sites, in order to obtain in-depth information on impressions and experiences and to explore opinions about the initiative and their understanding and identify opportunities. The agenda of the mission is given in Annex B.

Regarding the data analysis and methods for analysis, the above-mentioned documents have been analyzed and data derived cross-checked with various sources of information. A full list of documents is provided in Annex C. The review of project and background documents has provided the basic facts and information for developing a first draft mid-term review report, while the mission has served to verify the basic facts, get missing data and to learn opinions of respondents to help interpret the facts. With respect to the latter, the individual interviews with key informants (one-to-one consultations) representing project partners and stakeholders are based on open discussion to allow respondents express what they feel as main issues, followed by more specific questions on the issues raised. The mission included on-site observations by visiting some of the companies that participated as 'demonstration' of energy management and systems optimization.

The mid-term review has been conducted in accordance with the UNIDO Evaluation Policy, the UNIDO Guidelines for the Technical Cooperation Programs and Projects, the GEF's 2008 Guidelines for Implementing and Executing Agencies to Conduct Terminal Evaluations, the GEF Monitoring and Evaluation Policy from 2010.

### Limitation and strengths of the review

A one-week mission has the limitation of potentially giving a snapshot impression only. Nonetheless, it is felt that this mix of data collection and analysis tools will yield viable answers to the evaluation/review questions within the limits of budget resources for the review and time availability. In addition, the international consultant was also recruited to undertake the mid-term review of similar projects in Indonesia and the Philippines. This has enabled a comparison of results between the three countries and for country-specific situations (that may positively or negatively affect results) to be filtered out, which allows to have a more profound assessment. The findings of the reviews will be presented in reports per country. This report presents the findings of the MTR for Thailand, while issues that are common to all three the countries are given in Annex D.

### 1.3 Content of the evaluation report

The review follows the latest UNIDO and GEF guidelines on mid-term reviews. As terminology and definitions can be confusing for the layperson, the following table in Box 1 tries to summarize the main contents of this report, indicating how the various evaluation issues and questions feed into the various chapters and sections. It slightly deviates from the outline given in the Terms of Reference (see Annex A) to allow a more logical presentation of the findings, but contains all the elements required in the ToR.

An *evaluation matrix* has been provided (see Box 21 in Annex D) that clarifies which evaluation criteria and questions have been addressed and how data were analyzed and collected. The purpose of the evaluation matrix is to clarify which issues will be looked at and in which sections of the MTR report these are presented.

#### Box 1 Overview of report content and evaluation scope

Contents	Reference to relevant parts in the model outline of the MTR report (as given in the ToR; see Annex A)
Title page Table of Contents	
Executive summary <ul style="list-style-type: none"> <li>Summary of project achievements and ratings (incl. project fact sheet)</li> <li>Summary of conclusions and recommendations</li> </ul>	
1. Evaluation objective and methodology <ul style="list-style-type: none"> <li>Background <ul style="list-style-type: none"> <li>Purpose and approach of the review</li> <li>Content of the review report</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Information on evaluation; scope and objectives of the evaluation</li> <li>Methodology and sources of information</li> <li>Outline of the report and evaluation questions/topics</li> </ul>
2. Country context and project description <ul style="list-style-type: none"> <li>Context and project background</li> <li>Project summary</li> </ul>	<ul style="list-style-type: none"> <li>Brief countries context and sector-specific issues of concern to the Project;</li> <li>Project description; objectives and expected outcomes and results; budget and co-financing; project implementation and counterparts</li> </ul>
2. Findings: Relevance and design <ul style="list-style-type: none"> <li>Relevance and conceptualization</li> <li>Stakeholder involvement</li> <li>Assessment of logframe and M&amp;E design</li> </ul>	Project assessment: <ul style="list-style-type: none"> <li>A. Design</li> <li>B. Report on the relevance of project towards countries and beneficiaries)</li> <li>H. Assessment of processes affecting achievement of project results: <ul style="list-style-type: none"> <li>Country ownership</li> <li>Implementation approach</li> </ul> </li> </ul>
3. Findings: Results and effectiveness <ul style="list-style-type: none"> <li>Assessment of outcomes and outputs (cf. with baseline indicators)</li> <li>Effectiveness</li> <li>Global environmental and other impacts</li> </ul>	<ul style="list-style-type: none"> <li>C. Effectiveness (The extent to which the project's deliverables were achieved, or are expected to be achieved, taking into account their relative importance)</li> <li>G. Impacts and long-term changes</li> <li>J. Gender mainstreaming</li> </ul>
4. Findings: implementation, processes and efficiency <ul style="list-style-type: none"> <li>Management and administration</li> <li>Monitoring and evaluation systems</li> <li>Stakeholder engagement; gender mainstreaming</li> <li>Budget, expenditures and co-financing; procurement</li> </ul>	<ul style="list-style-type: none"> <li>F. Assessment of monitoring and evaluation systems (assessment of M&amp;E plan implementation, project management)</li> <li>I. Project coordination and management (project management conditions and achievements, and partner countries commitment)</li> <li>D. Efficiency (Report on the overall cost-benefit of the project and partner Countries contribution to the achievement of project objectives)</li> <li>H. Assessment of processes affecting achievement of project results: <ul style="list-style-type: none"> <li>Preparation and readiness / quality at entry</li> <li>Delays and project outcomes</li> <li>UNIDO supervision and support</li> <li>Stakeholder involvement</li> </ul> </li> <li>K. Procurement issues</li> </ul>

Contents	Reference to relevant parts in the model outline of the MTR report (as given in the ToR; see Annex A)
5. Findings: sustainability <ul style="list-style-type: none"> <li>Risks and external factors</li> <li>Replication</li> </ul>	E. Sustainability of Project Outcomes (assessment of the risks and vulnerability of the project, considering the likely effects of sociopolitical and institutional changes in partner countries, and its impact on continuation of benefits after the GEF project ends, specifically the financial, sociopolitical, institutional framework and governance, and environmental risks) H. Assessment of processes affecting achievement of project results <ul style="list-style-type: none"> <li>Co-financing and sustainability</li> </ul>
6. Conclusions and recommendations <ul style="list-style-type: none"> <li>Conclusions on attainment of objectives and results</li> <li>Lessons learned</li> <li>Recommendations</li> </ul>	<ul style="list-style-type: none"> <li>Main evaluation conclusions related to the project's achievements and shortfalls; cross-referenced to relevant sections of the report</li> <li>Recommendations for UNIDO, government and/or counterpart organizations</li> <li>Lessons learned</li> </ul>
<b>Annexes</b> <ul style="list-style-type: none"> <li>Terms of Reference (ToR)</li> <li>Mission schedule and list of people interviewed</li> <li>List of documents</li> <li>Regional scope and common approach in project evaluations</li> </ul>	

The project will provide ratings, as suggested in the Terms of Reference (see Annex A). The evaluation covers a number of criteria:

- Relevance* – the extent to which the project is linked with national development priorities and policies, and in line with UNIDO priorities and GEF Operational Programs;
- Effectiveness* – the extent to which results have been delivered (or likely how this will be achieved);
- Results* – direct project results (outcomes and outputs) and longer-term impacts
- Efficiency* – extent to which results have been delivered without delay and with cost-effectiveness;
- Sustainability* – likely ability to continue deliver benefits for an extended period of time after completion.

## Box 2 GEF and UNIDO rating scales

Measure	Rating
Attainment of objectives and results (overall ratings)	<i>6-point scale:</i> <ul style="list-style-type: none"> <li>Highly satisfactory (HS): no shortcomings; exceeding all targets (excellent)</li> <li>Satisfactory(S): minor shortcomings; achieving most of the targets (well above average)</li> <li>Moderately satisfactory (MS): moderate shortcomings; achieving most of the targets (average)</li> <li>Moderately unsatisfactory (MU): significant shortcomings; achieving some targets (below average)</li> <li>Unsatisfactory (U): major shortcomings; expected not to achieve most of the targets (poor)</li> <li>Highly unsatisfactory (HU): severe shortcoming (very poor; appalling)</li> </ul> <i>Relevance (2-point scale):</i> <ul style="list-style-type: none"> <li>Relevant (R)</li> <li>Not relevant (NR)</li> </ul>
1. Design and <u>relevance</u> ; <i>UNIDO criteria:</i> quality at entry, preparedness	
2. Attainment of <u>results</u> ; <u>effectiveness</u>	
3. M&E; <u>Efficiency</u> ; <i>UNIDO criteria:</i> supervision and backstopping; implementation approach	
<u>Sustainability</u> and risks; external factors	<i>4-point scale:</i> <ul style="list-style-type: none"> <li>Likely (L): no or negligible risks to sustainability</li> <li>Moderately likely (ML): moderate risks</li> <li>Moderately unlikely (MU): significant risks</li> <li>Unlikely (U): severe risks</li> </ul>

## 2. COUNTRY INFORMATION AND PROJECT SUMMARY

### 2.1 Energy and energy efficiency in Thailand

#### Energy situation

While Thailand is an oil and natural gas producer, the country relies on imports to sustain its rising fuel demand. Domestic oil reserves and supply are limited in Thailand, and the country imports a significant share of its oil consumption. However, Thailand holds large proved reserves of natural gas, and natural gas production has increased substantially in the last few years. High demand growth over the past two decades led Thailand to become a net importer of natural gas. Natural gas production and consumption were on par until 1999 when consumption began to outpace production. In 2013, Thailand produced 1,476 billion cubic feet (Bcf) and consumed 1,843 Bcf of natural gas.

Natural gas accounted for the greatest share of the country's annual energy consumption in 2014 (more than 45%, followed by petroleum and other liquids (36%). Coal accounted for roughly 18% and hydroelectricity represented 2%.

#### Box 3 Production, consumption and imports of commercial energy

	2010	2011	2012	2013	2014
<b>PRODUCTION</b>	<b>988,589</b>	<b>1,017,647</b>	<b>1,082,135</b>	<b>1,077,848</b>	<b>1,072,523</b>
CRUDE	153,174	139,991	148,977	149,481	138,758
CONDENSATE	80,663	76,576	81,584	82,967	85,853
NATURAL GAS	629,965	642,689	718,065	726,714	731,874
LIGNITE	101,052	123,167	96,185	94,661	93,117
HYDRO	23,735	35,224	37,324	24,025	22,921
<b>IMPORT (NET)</b>	<b>1,001,150</b>	<b>1,020,143</b>	<b>1,082,449</b>	<b>1,121,830</b>	<b>1,171,144</b>
CRUDE	786,243	761,723	819,173	843,173	798,226
CONDENSATE	5	5	5	4	3
PETROLEUM PRODUCTS	-162,464	-131,250	-155,152	-141,828	-93,573
COAL	211,422	204,254	229,556	216,724	261,158
ELECTRICITY	12,425	18,457	17,973	21,515	20,983
NATURAL GAS	153,519	166,954	170,894	182,242	184,347
<b>STOCK CHANGE</b>	<b>-83,505</b>	<b>-127,079</b>	<b>-148,722</b>	<b>-140,549</b>	<b>-177,266</b>
<b>CONSUMPTION</b>	<b>1,782,908</b>	<b>1,854,465</b>	<b>1,981,846</b>	<b>2,001,532</b>	<b>2,052,595</b>
PETROLEUM PRODUCTS	653,317	674,600	709,943	729,742	734,080
NATURAL GAS	783,291	809,449	888,761	908,746	916,005
COAL	211,422	204,254	229,556	216,724	261,158
LIGNITE	98,718	112,481	98,289	100,780	97,448
HYDRO & IMPORTED ELE	36,160	53,681	55,297	45,540	43,904
<b>IMPORT/CONSUMPTION</b>	<b>56</b>	<b>55</b>	<b>55</b>	<b>56</b>	<b>57</b>
<b>NON - ENERGY USE</b>	<b>290,336</b>	<b>310,404</b>	<b>331,460</b>	<b>338,695</b>	<b>368,338</b>

Source: [www.eppo.go.th](http://www.eppo.go.th); energy statistics. Units in bbl/day (crude oil equivalent)

Thailand generated over 180.9 terawatt hours (TWh) in 2014 (see Box 2) by the state utility, EGAT (43%), small and independent power producers (51%) and imports. Fossil fuels, particularly natural gas, meet nearly all of Thailand's power requirements. Natural gas-fired generation consisted of 6,120.3 TWh (66% of the total electricity supply), followed by imported coal and lignite (21%). Oil-fired generation, mostly comprised of fuel oil, made up 0.9% of the power mix. Most of Thailand's renewable power generation is from hydroelectricity, comprising 2.9% of generation, or over 5.1 TWh in 2014. Despite environmental concerns or issues caused by coal-fired power, the Energy Policy and Planning Office (EPPO) is considering increasing coal-fired generation as a means to reduce dependency on natural gas imports for electricity generation<sup>2</sup>.

### Energy efficiency situation

In South East Asia, Thailand has been a leader in the promotion of energy efficiency. The Government of Thailand has structured its energy policy, legal and regulatory frameworks in place starting from the early 1990s for the promotion of energy efficiency and renewable energy. Thus, the Government has encouraged 'energy saving discipline' as a national culture and energy conservation in all sectors - household, industrial, services & commerce and transportation - through campaigns aiming to build up energy-saving conscience.

The Energy Conservation Promotion Act, or ENCON Act, was passed in 1992 and amended in 2007 (B.E. 2550). The Act is structured around the following pillars:

A) *Energy saving initiatives have been launched to stimulate decision-making of entrepreneurs to implement energy efficiency improvement*<sup>3</sup>

1) *Energy conservation promotion fund creation.*

The *Energy Conservation Promotion Fund (ENCON Fund)* receives revenue from taxation of all petroleum products sold in Thailand (THB 0.04-0.25 per liter) and its annual receipts are estimated at about THB 2-5 billion. The ENCON Fund allocates financial resources to activities that support energy efficiency and renewable energy. The projects that are eligible to benefit from the fund include Research and Development (R&D) in EE and RE, pilot projects, research and studies, energy audits, training and education. To promote private investments in RE/EE projects the following two funds have been established using funds sourced from the ENCON Fund:

- The *Energy Efficiency Revolving Fund* (with an initial capital of THB 2 billion) was launched in 2003 and provides loans through selected public and commercial Thai Banks of up to THB 50 million per project with fixed interest rate of less than 4% and repayment in a timeframe of 7 years;
- The *ESCO Fund* (with an initial capital of THB 500 million) was launched in 2008 targeting SMEs and can provide equity capital up to 50% of total equity for RE and EE projects.

2) *Tax incentives.*

Thailand has a number of tax incentives established in 2005 by the Government of Thailand to encourage investment in energy efficiency:

- *Cost-Based Tax Incentive* forms a measure, which allows 1.25 times of actual investment capital for tax calculation. The incentive applies to the first THB 50 million (USD 1.25 million) invested, and can be spread over 5 years;
- *A Performance-Based Incentives* has been made available for both building and factory owners. The measure allows a return of 30% of saving value to the project owners through income tax reduction, up to a cap of THB 2 million

<sup>2</sup> See energy statistics on [www.eppo.go.th](http://www.eppo.go.th)

<sup>3</sup> Information taken from *Peer Review on Energy Efficiency in Thailand* (APEC, 2010) and *Development and Status of Energy Efficiency in Thailand*, PowerPoint presentation by D. Egkamol (DEDE) at EGEE&C42 Meeting (Bangkok, 2013)

- *Import Duty Exemption*, administered by the Board of Investment (BOI), is an incentive which aims at offering an exemption on import duties for 8 years for new investments in energy conservation businesses, such as high efficiency machines or equipment and renewable energy equipment and manufacturing, ESCOs, etc.

### 3) *Demand-side management (DSM) by Bidding*

In 1993, Thailand initiated a demand-side management (DSM) program (with GEF support). EGAT, as the national partner for the implementation of the USD 189 million DSM Program, established a DSM Office (DSMO)<sup>4</sup>. The DSM by Bidding mechanism, as a new initiative started in 2008, provides financial support to encourage business operators to invest in higher energy efficiency machines/equipment. A subsidy is granted based on actual energy saving achieved in a year resulting from such investment<sup>5</sup>.

### B) *Royal decrees issued under the ENCON Act*

The enforcement of the ENCON Act required the publication of ministerial regulations for the implementation of the Act for designated buildings or factories<sup>6</sup>

- Under the *Royal Decree on Designated Buildings, B.E. 2538 (1995)* three Ministerial Regulations have been issued, prescribing: a) the standards, criteria, and procedures for energy conservation in designated buildings; b) the forms and schedule for submission of information on energy consumption and conservation; and c) the criteria, procedures and schedule for owners of designated buildings to establish and submit energy conservation targets and plans.
- Under the *Royal Decree on Designated Factories, B.E. 2540 (1997)* two Ministerial Regulations have been issued, prescribing: a) the forms and schedule for submission of information on energy production, consumption and conservation, including the criteria on and methods of recording information on energy consumption and installation or modification of machinery or equipment that affects the level of energy consumption and conservation; and b) the criteria, procedures and schedule for owners of designated factories to establish and submit energy conservation targets and plans.

### C) *Targets and plans for energy conservation*

Thailand's government developed the new national long-term Energy Efficiency Development Plan (EEDP) in 2011. The EEDP sets short-term (2011-2015) and long-term (2011-2030) energy conservation targets both at the national level and for the specific energy consuming sectors, including industry, transportation, commercial and residential sectors. The EEDP furthermore lays down strategies and guidelines for energy conservation, to establish the planning framework and the work plan and to allocate the tasks to related government agencies.

The Plan is formulated with a target to reduce energy intensity by 25% in 2030, compared with that in 2005, or equivalent to a reduction of final energy consumption by 20% in 2030, or about 30,000 thousand tons of crude oil equivalent (ktoe), of which 11,300 ktoe in industry. It is expected that implementation of EEDP will result in cumulative energy savings at an average of 14,500 ktoe/year, which is worth THB 272 billion/year, and cumulative CO<sub>2</sub> emission reductions at an average of 49 million tons/year.

EEDP will maintain the implementation of the existing programs and measures (such as the ENCON Act and ENCON Program), and it will further develop new measures with key stakeholders (from business, the

<sup>4</sup> By 2007, the DSM implementation has achieved overwhelming success as evidenced by reduced peak demand of 1,435.2 MW and reduced energy demand of 8,148.3 GWh, resulting in the CO<sub>2</sub> emission reduction of 5.63 million tons. See <http://www.egat.co.th/en/index.php/egat-dsm-programs>

<sup>5</sup> Subsidy = annual energy saving x subsidy rate with max subsidies rates set at THB 1/kWh for electricity, THB 75/MMBtu for liquid and gaseous fuels and THB 15/MMBtu for solid fuels

<sup>6</sup> Those with five or more transformers installed, with an electricity meter of  $\geq 1,000$  kW or  $\geq 1,175$  kVA, or those consuming  $\geq 20$  million mega joules of electrical energy equivalent.

general public, academic and government sectors), such as the establishment of minimum energy performance standards (MEPS) and energy labeling (for equipment, appliances, vehicles and buildings), as well as minimum standards for large businesses to implement energy conservation measures. There are 5 strategic approaches outlined in the EEDP:

- Mandatory requirements via rules, regulations and standards
- Energy conservation promotion and support
- Public awareness creation and behavioral change
- Promotion of technology development and innovation
- Human resources and institutional capability development

Regarding the industry sector energy efficiency measures, EEDP identified several prioritized activities in the first five years (2011-2015):

- Enforcement of the ENCON Act; Enforcement of the Energy Efficiency Resource Standards (EERS) for large energy producing business, including the EERS for the electricity supply industry;
- Allocation of subsidies for energy savings and/or peak load reduction that can be verified for retail consumers and small business/industries;
- Benchmarking energy intensity (energy consumption per unit production) in the industrial sector; Publishing and providing information on energy conservation and energy efficiency measures and technology;
- Strengthening energy service companies (ESCOs) and supporting the expansion of the ESCO business;
- Providing training courses for professionals in the field of energy efficiency, e.g. energy inspectors, auditors, energy efficiency consultants; developing expertise to serve consultancy agencies/companies and ESCOs.

### Climate change

The Office of National Resources and Environmental Policy and Planning (ONEP) of the Ministry of Natural Resources and Environment (MoNRE) (through the Office of Climate Change Coordination) is the national focal point for coordination with regard to the UNFCCC and Kyoto Protocol. It is responsible for coordination with regard to climate change co-operation at the state and international levels.

The climate change policy is formulated in a number of documents:



- National Strategy on Climate Change BE 2551-2555 (2008-2012), formulated by the National Committee of Climate Change Policy
- Thailand Climate Change Master Plan 2012 – 2050
- Draft National Strategy on Climate Change BE 2556-2560 (A.D. 2013-2017)

## 2.2 Project rationale and justification

### Remaining barriers to energy efficiency in industry at project formulation

Despite encouraging efforts in terms of regulatory policy framework, establishment of energy conservation promotion funds, tax benefits and other incentives from the government, realization of energy efficiency initiatives by the industries to address the high energy consumption situation had been rather low with limited penetration of energy-efficient measures, technologies, and practices in the industries.

This has been confirmed by various surveys:

- For example, the 2007 Industrial Census Whole Kingdom (National Statistical Office) reported that only 1,445 enterprises (5.5%) out of about 26,100 medium and large factories had participated in the government initiatives described in Section 2.1.
- A survey on current energy management practices, conducted during the preparation phase of this Project (PPG phase), observed that:
  - Thai industries, as in other countries in the region, tend to focus more on individual system components, such as motors, pumps, or boilers than on the whole system. Current practices show more emphasis on the replacement of components and individual measures, such as efficient lighting, leaks, etc. Failing or aging equipment is usually replaced with equipment of similar or larger capacity without first conducting a thorough assessment of actual system needs. Thus, these systems, once oversized or mismatched to load requirements, are likely to remain so for the life of equipment, which could be 10-20 years or more;
  - The Thai Energy Management System (by law) is actually based on the same concept as ISO 50001 and the current approach of energy management is adopted to comply with the regulatory requirements<sup>7</sup>. Being relatively new, in many companies energy management is often still an ad-hoc practice and not fully integrated with the overall management system as is the case with ISO 9000 and ISO 14000;
  - Institutionally, current efforts emphasize the end-users (industry) without creating a comprehensive energy efficiency market that not only encompasses the end-users, but also services providers, consultants/designers, equipment vendors/suppliers and financing institutions.

### Rationale for the Industrial Energy Efficiency Project in Thailand; project objective

The trend of rising energy prices and tougher competition increases the demand to improve energy efficiency in Thai industry. However, the existence of various barriers often hinders the realization of even some cost-effective energy efficiency measures despite the efforts deployed by the government to promote efficient use of energy. In order to understand and identify the main constraints that prevent the adoption of energy management and energy efficiency projects at the system level, in the PPG (project preparation phase), UNIDO invited the industry managers, energy efficiency practitioners and service/equipment providers to share their own perceptions of the main barriers faced by the Thai industry. The main barriers brought to light from the survey and listed in the Project Document are summarized in Box 4 (to which the Evaluators have added additional text on barriers).

To address barriers to the more widespread adoption of energy management and system optimization practices and to energy efficiency in industry in general, multilateral technical assistance was sought from United Nations Industrial Development Organization (UNIDO) and the Global Environment Facility (GEF) for the “**Industrial Energy Efficiency Project**”. The **objective** of the project is to “Promote energy efficiency in the industries through introduction of ISO Energy Management Standard incorporating industrial energy systems optimization”. The project outcomes and outputs are summarized in the next Section 2.3.

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<sup>7</sup> Designated factories and buildings with power demand of more than 1,000 kW and/or that consume 20,000 GJ per year



#### Box 4 Barriers and corresponding project-supported mitigation actions

Barriers	UNIDO/GEF Project intervention (outputs as mentioned in Project Document)
<p><b>Technical barriers</b></p> <ul style="list-style-type: none"> <li>○ Most engineers are well skilled for component based improvement, but less qualified for systems optimization which is not a common practice in the industry.</li> <li>○ High turnover of plant personnel assigned to the operation of industrial systems and changes in production lead to lack of persistence for systems optimization;</li> <li>○ The current practice does not institutionalize energy management and does not allow a comprehensive and integrated approach that ensures sustainable energy cost reduction and improves the facility productivity in an irreversible way.</li> </ul>	<ul style="list-style-type: none"> <li>1.1. Training material and tools on energy management developed</li> <li>1.3. National experts/factory personnel trained on ISO compliant energy management systems</li> <li>2.1. Training material and tools on systems optimization developed</li> <li>2.2. National experts/factory personnel trained on optimization of steam, compressed air, pumping and fans systems</li> <li>4.1. Energy management projects implemented</li> <li>4.2. Documented systems optimization demonstration projects</li> </ul>
<p><b>Information and awareness barriers</b></p> <ul style="list-style-type: none"> <li>○ Company management often implements energy management in the industries to comply with the regulations and do not view it as a mean to sustainably improve the industry productivity and competitiveness; management is often more concerned about reducing other production cost (labor, capital, raw materials, etc.) and energy is not seen as a core priority</li> <li>○ Industry operation and production investment budgets are accounted separately. Life cycle assessment is rarely considered on the purchase of industrial equipment by the industry. This often leads to purchasing less efficient equipment, which in turn, increases operation costs;</li> <li>○ Local manufacturers and vendors also lack technical information and trainings for supporting decisions to implement energy efficiency through systems improvements;</li> <li>○ Most consulting expertise on energy efficiency available in the country focuses on technology and components and not on processes and systems</li> </ul>	<ul style="list-style-type: none"> <li>1.2. National awareness campaign launched on ISO 50001</li> <li>1.4. Peer-to-peer network between industrial enterprises established and operated</li> <li>2.3. Equipment vendors/suppliers trained on systems optimization</li> <li>4.2. Documented systems optimization demonstration projects</li> <li>4.3. Recognition program developed</li> </ul>
<p><b>Financial barriers</b></p> <ul style="list-style-type: none"> <li>○ Most industries have a budgetary disconnection between capital projects and operation expenses (energy and maintenance);</li> <li>○ There is a gap between the industries need and the incentives and financial products offered by banks that often offer loans with criteria for large investments, while the relative small size of EE projects presents high transaction cost</li> </ul>	<ul style="list-style-type: none"> <li>3.1. Harmonized EE project evaluation criteria</li> <li>3.2. Capacity of banks/FIs enhanced on EE projects financing</li> <li>3.3. Training material developed and industry managers trained on the development of financial proposals</li> </ul>

### 2.3 Project description and strategy

UNIDO, the GEF implementing agency, has been implementing the project in close collaboration with the Department of Industrial Promotion (DIP). The UNIDO Project Manager (at UNIDO Hqs.) oversees project implementation and monitoring. However, the day-to-day project management is the responsibility of the Project Management Unit (PMU), headed by a National Project Coordinator. The DIP has designated one of their high-level officers to act as National Project Director (NPD) to guide the PMU in the implementation of the project. The PMU has been guided further by the Project Steering Committee (PSC) on the implementation of the project and consists of high-level representatives from various government agencies and organizations (see also Section 5.1).

**Box 5 Project overview: outcomes, outputs and budget**

Project Components/ Outcomes	Project outputs	GEF (USD)	Co-financing (USD)
<p><b>Component 1:</b> ISO compliant energy management systems</p> <p><b>Outcomes:</b></p> <ul style="list-style-type: none"> <li>Compliance to a policy instrument, compatible with ISO energy management standard, in place delivering sustainable improvements in energy efficiency in industry and improved productivity and competitiveness</li> </ul>	<p>1.1. Training material and tools on energy management developed</p> <p>1.2. National awareness campaign launched on ISO 50001</p> <p>1.3. National experts/factory personnel trained on ISO compliant energy management systems</p> <p>1.4. Peer-to-peer network between industrial enterprises established and operated</p>	965,000	985,000
<p><b>Component 2:</b> Industrial energy systems optimization</p> <p><b>Outcome 2:</b></p> <ul style="list-style-type: none"> <li>A cadre of energy efficiency professionals created both within industrial facilities as well as consultants and suppliers to initiate a process to transform local markets effectively for providing industrial systems optimization services</li> </ul>	<p>2.1. Training material and tools on systems optimization developed</p> <p>2.2. National experts/factory personnel trained on optimization of steam, compressed air, pumping and fans systems</p> <p>2.3. Equipment vendors/suppliers trained on systems optimization</p>	1,239,500	405,000
<p><b>Component 3:</b> Enhancement of industrial EE financing capacity</p> <p><b>Outcome 3:</b></p> <ul style="list-style-type: none"> <li>Increased availability of financial and institutional support for industrial energy efficiency initiatives</li> </ul>	<p>3.1. Harmonized EE project evaluation criteria</p> <p>3.2. Capacity of banks/FIs enhanced on EE projects financing</p> <p>3.3. Training material developed and industry managers trained on the development of financial proposals</p>	262,000	200,000
<p><b>Component 4:</b> Implementation of energy management and systems optimization projects</p> <p><b>Outcome 3:</b></p> <ul style="list-style-type: none"> <li>Increased adoption of energy management standards and system optimization energy efficiency projects by industry for continuous higher energy</li> </ul>	<p>4.1. Energy management projects implemented</p> <p>4.2. Documented systems optimization demonstration projects</p> <p>4.3. Recognition program developed</p>	668,500	13,350,000
<b>Project Management</b>		360,000	685,000
<b>Monitoring and Evaluation</b>		125,000	20,000
<b>Total</b>		3,620,000	15,645,000

## 2.4 Main project stakeholders

**Box 6 List of important stakeholders in energy and industry**

Stakeholder	Description
<b>Government</b>	
<b>Ministry of Industry</b> – <i>Department of Industrial Promotion (DIP)</i>	The responsibility of DIP is to encourage establishment of all types of essential industries in Thailand, to increase efficiency of industries, and to promote regional industrialization. The DIP mission includes to: i) Support industrial entrepreneur creation and entrepreneurship development; ii) Foster competitiveness of Thai industrial businesses; iii) Build and improve industrial promotion and development models; iv) Create and develop industrial business service-provider networks.
<b>Ministry of Industry</b> – <i>Thai Industrial Standards Institute (TISI)</i>	TISI is a focal point for standardization; it develops both mandatory and voluntary Thai Industrial Standards (TISs) to suit the need and the growth of industry, trade and economy of the country. Standards are developed according to the government policy of consumers' protection, industrial promotion to be competitive in the international market, environmental protection and natural resources preservation. To accomplish the above, TISI has the following mission: i) National standards development and product certification, ii) Standardization promotion; iii) Cooperation with international and regional standardization organizations and foreign standards bodies; iv) Standards information centre; and v) Community product standards development and certification. TISI participates in the development of international standards of the International Organization for Standardization.
<b>Ministry of Energy</b> – <i>Department of Alternative Energy Development and Efficiency (DEDE)</i>	DEDE is responsible for energy efficiency promotion, energy conservation regulation, alternative energy, energy technology dissemination in order to adequately meet the demand from every sector at optimum cost beneficial to the country development and to improve people's living standard. The duties and responsibilities of the DEDE are to: i) Promote, support and regulate energy conservation activities; ii) Research, study and develop alternative energy; iii) Establish regulations, standards and disseminate technology in relation to the generation, conversion, transmission, consumption and conservation of energy; iv) Monitor and assess the outcomes of alternative energy development and energy conservation activities; v) Administer the information in relation to alternative energy and energy conservation;
<b>Ministry of Industry -</b> <i>Department of Industrial works (DIW)</i>	DIW's major responsibilities are to: i) Supervise and coordinate industrial business operation activities by following the guidelines of environmental preservation, safety, hygiene and energy economization, ii) Promote and support the capability and efficiency development of industrial business operation for sustained development, iii) Serve as the national information center for industrial works, machines, chemical substances, hazardous substances and volatile substances, and iv) Look after the country's interests in international agreements regarding environment, safety and security.
<b>Ministry of Natural Resources and Environment (MONRE)</b>	MONRE's mission is to preserve, conserve, develop and rehabilitate natural resources and the environment to ensure their sustainable use, with active participation and support of the public and all stakeholders. Immediate objectives are to: i) Expedite the rehabilitation of seriously degraded natural resources and make them productive in a sustainable way; ii) Rehabilitate the environment and mitigate pollution problems in critical areas, and iii) Enhance capacity of society to contribute to successful natural resource conservation and management and environmental protection. MNRE is the GEF focal point.
<b>Ministry of Energy -</b> <i>Energy Policy and Planning Office (EPPO)</i>	As the energy policy maker, EPPO's tasks are to recommend on national energy conservation policies, management and development plans; to establish energy conservation measures and the framework of energy conservation promotion budget allocation; and to coordinate, follow up and evaluate the implementation outcome of the policies, management and development plans.
<b>Electricity Generating Authority of Thailand (EGAT)</b>	EGAT owns and operates various types of power generating plants located in various sites, together with transmission and main distribution systems nationwide. EGAT's DSM Office promotes energy conservation, especially in electrical appliances through standard and labelling scheme and EGAT also plays a role in encouraging energy efficiency in major industries, via ESCO programs.

*Note: DIP, together with TISI, DEDE and DIW, are the partner agencies of the project*

### 3. FINDINGS: DESIGN AND FORMULATION

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Chapters 3 to 5 present an overview of the evaluation findings, based on an assessment of the achievements of results (outcomes, outputs and impacts), implementation, design and sustainability. Due to the size of this project assessment, we have split it into four Chapters, namely a) design and relevance (Chapter 3), b) results and effectiveness, (Chapter 4), c) implementation, processes and efficiency (Chapter 5), while sustainability is discussed in Chapter 6. The evaluation topics (given in Box 1) and the evaluation matrix of criteria and questions (see Annex D) were used as guidelines to formulate the chapters.

#### 3.1 Relevance and conceptualization

##### National priorities and country drivenness

The project fits very well into government strategy on energy and sustainable energy development. There is a general concern at the government level about the inefficiency of energy usage in the industry. Moreover, the increasing greenhouse gas emissions arising from fossil fuel combustion in industry and power generation and high fuel prices at the international markets constitute a threat to the environment and economic sustainability of the country. The government is also conscious about the need to improve the competitiveness of industry by reducing production cost and promoting sustainable and low-carbon development. As discussed in Section 2.1 of this report in more detail, energy efficiency and conservation policy and planning, as well as climate change policy, is laid down in a number of plans, strategies and policies; such as, the Energy Conservation Promotion Act (1997, 2007), Energy Efficiency Development Plan (2011-2030), Thailand Climate Change Master Plan (2012 – 2050) and the National Strategy on Climate Change (2008-2012 and 2013-2017).

##### GEF priorities

The project falls under and supports GEF-4 Climate Change Strategic Program 2: “Promoting energy efficiency in the industrial sector”. This project complies with that objective. By addressing key existing barriers on information, technical capacity and market barriers for industrial energy efficiency in Thailand, the project will directly contribute to the promotion and increasing of the deployment and diffusion of energy-efficient technologies and practices in industrial production and manufacturing processes (Climate Change Strategic Long-term Objective 2). Its implementation includes improving policy and regulatory frameworks; institutional capacity building for industrial EE and demonstrating the application of industrial EnMS based on ISO 50001 and optimization of industrial energy systems in a number of firms.

##### UNIDO

The project is fully in line with UNIDO’s mandate, core competences and can benefit from UNIDO’s comparative advantage as a GEF implementing agency in the sustainable energy and climate change domain. The organization’s mandate is to support inclusive and sustainable industrial development, having strong core competences in the field of green industry, cleaner production and sustainable energy. UNIDO contributed significantly to the development of the ISO 50001 energy management system standard (EnMS) and promotion of systems optimization practices. Until now, UNIDO has developed and been implementing similar IEE projects in about 25 countries around the world. In particular, the project is part of the parent programme/umbrella project: “Reducing industry’s carbon footprint in South East Asia through compliance with an energy management system (ISO 50001)”. The programme is composed of national projects implemented in Indonesia, Malaysia, Myanmar, the Philippines, Thailand and Vietnam; each designed to facilitate introduction of ISO 50001 through training and capacity building, including a technical focus on systems optimization (see Annex D, which describes these projects that follow a similar methodology and setup).

### Stakeholder involvement in project design

During the preparatory phase, UNIDO engaged in direct and open discussions with the Department of Industrial Promotion (DIP) to select the target industrial sub-sectors. The final selection was based on the country needs and priorities in terms of enhancement of the industrial sector competitiveness, importance of the subsector in terms of economy and energy consumption, current practices and willingness to participate regarding energy management and systems optimization. The six industrial subsectors identified include 1) food products and beverages, 2) textiles, 3) chemicals, 4) rubber and plastic products, 5) non-metallic & mineral and 6) basic metal, to which the pulp & paper sub-sector has been added during project implementation. The targeted subsectors represent over half the number of establishments in the manufacturing sector (with about 12,600 medium and large enterprises in these sub-sectors).

During the project preparation phase (PPG) an awareness raising inception workshop was held as well as discussions with project counterparts and other stakeholders on technical design parameters and roles and responsibilities of the project partners.

## **3.2 Design of logical framework and progress indicators**

### Implementation approach and project strategy

The project has not been developed in isolation, but is part of the overall UNIDO efforts to promote energy management and systems optimization. The UNIDO IEE programme assists developing countries and emerging economies by providing policy advice, technical assistance, institutional capacity-building and market transformation support instrumental to the adoption and the implementation in industry of energy management and optimization systems. UNIDO contributed significantly to the development of the ISO 50001 energy management system standard (EnMS). Until now, UNIDO has developed and been implementing similar IEE projects in about 25 countries around the world, including five South-East Asian countries (see Annex D).

### Monitoring and evaluation (M&E); logical framework design

The Project Document (CEO Endorsement Request) contains a project M&E plan, outlining specific M&E activities, responsible parties, budgets, and timeframes. It includes the logical framework (a.k.a. results framework or logframe), the annual work plans as well as detailed progress and activity reports. The plan also includes and budgets for a mid-term evaluation and a final project evaluation. The activities outlined in the M&E plan meet the GEF minimum standards for M&E. The GEF budget of USD 125,000 is sufficient for the mandatory mid-term and final evaluations and holding the inception workshop at project start. This is in line with 'standard' practice; in fact, the allocation for M&E is higher than in similar GEF/UNIDO projects in which the GEF funds for M&E are usually budgeted at USD 50,000-100,000, depending on the size of the project.

The project logical framework approach has been used for the design of activities to implement the project. The logical framework (or logframe) developed for this project is well-formulated with outcomes, outputs and progress indicators. Each component has quantitative and clear indicators of output, such as number of executives briefed, number of industry personnel trained, number of competent local expert trained, number of vendors involved and number of pilot implementation both on EnMS and system optimization. We note that the list of indicators might have benefitted from a numbering system. In the next Chapter, the indicators of the logical framework (numbered for easy reference) will be described in detail, giving per indicator the evaluators' assessments of progress in achieving the target value of the indicator.

**In general, the reviewers have the opinion that project and M&E design is considered as 'highly satisfactory' and the project is rated as 'highly relevant'.**

## 4. FINDINGS: ASSESSMENT OF RESULTS AND EFFECTIVENESS

The results of the project include the project's outputs and outcomes and longer-term environmental and socio-economic impacts. Changes between the planned and actual results are described, based on the list of project indicators in the logical framework, and explained. External factors that may have affected the achievement of the intended results are identified.

### 4.3 Achievement of outcomes and outputs; effectiveness

#### 4.3.1 Description of planned outputs and achievements

Boxes 7 to 9 provide a summary of the assessment of project effectiveness in terms of achievement of outcomes and outputs. The presentation of these results follows the structure of outputs and indicators presented in the results framework (logframe) of the Project Document and the annual Progress Reports (PIRs).

#### Box 7 Assessment of project progress: Component 1

Outputs and activities	Indicators (numbered) Targets (bulleted)	Value or description of indicator (evaluation assessment; April 2015)
<b>Component 1: ISO compliant energy management systems</b>		
<i>Outcome:</i>		
<ul style="list-style-type: none"> <li>Compliance to a policy instrument that encourages industrial enterprises to adopt ISO compatible energy management standards to deliver sustainable improvements in industrial energy efficiency and competitiveness</li> </ul>		
1.1 Training material and tools on energy management developed	1) Training material on energy management systems provided to industrial enterprises <ul style="list-style-type: none"> <li>Availability of translated, comprehensive training material and tools specifically supporting the development and implementation of energy management compatible with ISO 50001.</li> </ul>	1. Training materials: Over 1,000 copies of translated energy management system (EnMS) training materials and manuals printed and distributed by UNIDO and the Thailand Industrial Standards Institute (TISI).
1.2 National awareness campaign launched on ISO 50001	2) National campaign provided information to industry to adopt ISO 50001. <ul style="list-style-type: none"> <li>Promotional literature distributed to industries to promote the adoption of ISO 50001.</li> </ul>	2. Campaign on EnMS: <ul style="list-style-type: none"> <li>Promotional brochures for the project, EnMS, and Systems Optimization (SO) produced and disseminated</li> <li>National awareness campaign on EnMS/ISO50001 conducted by showcasing project components at the trainings and other relevant events in cooperation with national industrial and business organizations</li> </ul>
1.3 National experts/factory personnel trained on energy management systems	3) Number of trained national experts <ul style="list-style-type: none"> <li>50 national experts</li> </ul> 4) Number of trained factory personnel <ul style="list-style-type: none"> <li>500 factory managers (out of which 300 will be trained)</li> </ul>	3. EnMS experts training: <ul style="list-style-type: none"> <li>73 national experts/candidate national experts have participated in the EnMS Expert Modules:               <ul style="list-style-type: none"> <li>29 National Experts on EnMS have been qualified under the EnMS Expert Training Program Batch 1 (2012-2013);</li> </ul> </li> </ul>

Outputs and activities	Indicators (numbered) Targets (bulleted)	Value or description of indicator (evaluation assessment; April 2015)
	in energy management system implementation)	<ul style="list-style-type: none"> <li>○ 46 candidate National Experts are participating in the EnMS Expert Training Program Batch 2 (2014 - 2015), of which 34 experts have been qualified</li> </ul> 4. Workshops and users training: <ul style="list-style-type: none"> <li>● 852 participants attended the awareness workshops, of which 408 management staff (from 311 factories), 171 factory staff and 273 other participants</li> <li>● 705 participants attended the EnMS User training, of which 353 participants from 153 factories in the target subsectors</li> </ul> <b>Planned:</b> <ul style="list-style-type: none"> <li>● The project plans to conduct at least 4 UNIDO Awareness Workshops per year, with approximately 60 participants per workshop;</li> <li>● TISI has committed to arrange 3-4 EnMS User Trainings per year in Bangkok with approximately 40 participants/training. In addition to this to cover additional regions, the project will arrange 4 additional User trainings in other provinces in 2015</li> </ul>
1.4 Peer-to-peer network developed between industrial companies created and operational	5) Network established and used to support program recognition and present savings result from energy management. <ul style="list-style-type: none"> <li>● All participating enterprises share their implementation plan on energy management on the network and learn from others' experience and results</li> </ul>	5. The project website is available (see <a href="http://www.ieeproject.com">www.ieeproject.com</a> ) and will be used as one of the channels to establish a peer-to-peer network.
<b>Rating: highly satisfactory (HS)</b>		



Second Batch EnMS expert training; participants included 21 consultants, 4 representatives from TISI, 2 representatives from DIP, 1 representative from DEDE, 18 representatives from 9 host facilities.

Source: 2015 Annual Report, IEE Project

### Box 8 Assessment of project progress: Component 2

Outputs and activities	Indicators (numbered) Targets (bulleted)	Value or description of indicator (evaluation assessment; April 2015)
<b>Component 2: Industrial energy systems optimization</b>		
<p><i>Outcome:</i></p> <ul style="list-style-type: none"> <li>A cadre of energy efficiency professionals created within industrial facilities as well as consultants and suppliers to initiate a process to transform local markets effectively and to provide industrial systems optimization services</li> </ul>		
2.1 Training material and tools on systems optimization developed	6) Training material on systems optimization provided to industrial enterprises. <ul style="list-style-type: none"> <li>Availability of translated, comprehensive training material and tools on systems optimization</li> </ul>	6. Training materials and tools <ul style="list-style-type: none"> <li>Development and production of comprehensive training materials and tools for System Optimization (SO) were made available. The presentation and manual in Thai language have been printed and distributed during the training sessions;</li> <li>Measuring equipment and instruments for optimization of steam, compressed air and pumping systems have been delivered to the PMU. The equipment database and lending record has been developed to support the implementation of system optimization.</li> </ul>
2.2 National experts/factory personnel trained on optimization of steam, compressed air, fan and pumping systems	7) Number of trained national experts <ul style="list-style-type: none"> <li>50 national experts</li> </ul> 8) Number of trained factory personnel <ul style="list-style-type: none"> <li>400 factory managers</li> </ul>	7. National experts SO: <ul style="list-style-type: none"> <li>A total of 24 National Experts have been qualified under SO Expert Training Programs (1st Batch;2013), of which 11 SSO, 5 PSO and 8 CASO;</li> <li>A further 28 experts have been trained in the 2nd Batch (2014), of which 15 SSO and 13 CASO</li> </ul> 8. End-user training: <ul style="list-style-type: none"> <li>948 participants received SO user training. Out of these, 621 participants from 239 factories in the target subsectors, of which SSO: 205, PSO: 178 and CASO: 229 participants</li> </ul> <p><b>Plan for 2015:</b></p> <ul style="list-style-type: none"> <li>03 SO user trainers will be organized by DIP in 2015 (in Bangkok area), while the Project will organize 3 more user training in the provinces</li> </ul>
2.3 Equipment vendors/suppliers trained on systems optimization	9) Number of trained equipment vendors and suppliers <ul style="list-style-type: none"> <li>Training of 50 equipment suppliers/vendors of EE products in systems optimization</li> </ul>	9. Two steam vendor meetings were organized (in August and November 2014; the latter together with the 1.5 day SSO training), attended by 22 companies
<b>Rating: highly satisfactory (HS)</b>		



### Box 9 Assessment of project progress: Component 3

Outputs and activities	Indicators (numbered) Targets (bulleted)	Value or description of indicator (evaluation assessment; April 2015)
<b>Component 3: Enhancement of industrial EE financing capacity development</b>		
<i>Outcome:</i> <ul style="list-style-type: none"> <li>• Increased availability of financial and institutional support for industrial energy efficiency initiatives</li> </ul>		
3.1 Harmonized EE project evaluation criteria	10) Evaluation criteria are harmonized within financial institutions to help them select best EE projects <ul style="list-style-type: none"> <li>• Criteria for evaluating EE projects are developed and harmonized by main financial institutions in Thailand</li> </ul>	10. EE project evaluation criteria and needs assessment: <ul style="list-style-type: none"> <li>• Interviews with 13 major banks in Thailand were held in 2014 from June - July 2014. Together with the results of a survey amongst banks and industry, this has served as input for the focus group meeting (with banks and industry) as well as for the training needs assessments (for activities 3.2 and 3.3) and evaluation criteria report</li> <li>• Report on criteria has been completed, and work is currently done on facilitation tools</li> </ul>
3.2 Trainings provided to banks/FIs on EE projects financing	11) Number of financial institutions and local banks personnel trained to understand main features of EE projects and better appraise EE projects proposals <ul style="list-style-type: none"> <li>• Strengthened capacity of financial institutions and local banks on EE projects evaluation</li> </ul>	11. Activities are ongoing. So far, two trainings have been organized (with 37 participants from 9 banks) on evaluation of EE projects for financing institutes
3.3 Training material developed and industry managers trained on the development of financial proposals	12) Training material relating to financing of energy efficiency project development are provided to industries <ul style="list-style-type: none"> <li>• Availability of translated, comprehensive material and guidelines specifically supporting the development of financial proposals for EE projects</li> </ul> 13) Number of trained facility managers/personnel in industrial energy efficiency project development <ul style="list-style-type: none"> <li>• Industrial facility managers/personnel have the capacity to analyze systems optimization and energy management projects and use energy and O&amp;M costs reduction projects</li> </ul>	12. Work in the final version of the training materials is ongoing 13. Three trainings have been organized (attended by 87 factory personnel from 40 factories) on evaluation of EE projects for industry  <b>Planned:</b> Four more trainings are planned for 2015
<b>Rating: Satisfactory (S)</b>		

## Box 10 Assessment of project progress: Component 4

Outputs and activities	Indicators (numbered) Targets (bulleted)	Value or description of indicator (evaluation assessment; April 2015)
<b>Component 4: Implementation of energy management and systems optimization projects</b>		
<i>Outcome:</i> <ul style="list-style-type: none"> <li>Demonstrable energy savings in participating factories through systems optimization and energy management standards and increased adoption of energy management standards by industry</li> </ul>		
4.1 Energy management projects implemented	14) Number of factories with energy management plans implemented <ul style="list-style-type: none"> <li>200 factories adopted energy management plans and completed operational improvement project</li> <li>50 factories adopted and implemented ISO 50001</li> </ul> 15) Number of case studies <ul style="list-style-type: none"> <li>25 case studies</li> </ul> 16) Number of factories registered for peer-to-peer network <ul style="list-style-type: none"> <li>Participating factories registered with the peer-to-peer network report energy savings</li> </ul>	14. Status energy management plans and operational improvements <ul style="list-style-type: none"> <li>24 factories that participated in the EnMS expert training (of which 9 that participated in the TLC project, funded by TISI's co-financing contribution)<sup>8</sup>, have adopted energy management plans (and completed operational improvement projects), of which</li> <li>07 have an ISO 50001 certified EnMS</li> </ul> 15. Case studies of factories with EnMS adopted are under development           16. P2P network: <ul style="list-style-type: none"> <li>See Indicator 5</li> <li>Basecamp is also used for ongoing communication between National Experts, International Consultants and the project team</li> </ul> <b>Planned:</b> <ul style="list-style-type: none"> <li>The project aims to begin follow-up activities with the participants of EnMS User training on their adoption of energy management plans in 2015</li> <li>Ten EnMS implementation will be supported by TISI (TLC project; co-financing) in 2015</li> </ul>
4.2 Documented systems optimization demonstration projects	17) Number of completed steam, pumping, fan and compressed air systems assessments <ul style="list-style-type: none"> <li>75 systems assessments conducted of which 50 led to completed systems optimization projects</li> </ul> 18) Number of completed systems optimization projects <ul style="list-style-type: none"> <li>25 case studies showing GHG emission reductions</li> </ul>	17. Completed assessments of 26 systems with the submission of the assessment report; SSO: 18, PSO: 2 and CASO: 6, while completion of 3 SSO and 5 CASO reports is pending.           18. The project aims to begin following up on and monitoring the implementation of SO projects in 2015 and tracking realized energy savings and GHG emission reduction. Examples of tracking activities include; monitoring of actual savings compared to the estimated savings identified in the assessment report, questionnaire surveys, and randomized telephone calls.  <b>Planned:</b> <ul style="list-style-type: none"> <li>10 SO assessments will be supported by DIP (under TEM<sup>9</sup>; co-financing), i.e. 6 SSO, 2 PSO and 2 CASO</li> </ul>

<sup>8</sup> Training of Lead Consultancy Project (TLC) of TISI provides training, seminars and consultancy to the manufacturers in establishing and developing their quality system according to ISO 9001, ISO 14001, TIS 18001

<sup>9</sup> The DIP is running the Total Energy Management (TEM) program for SMEs since 2004 separately as part of their initiatives for improvement of reliability and productivity of industrial operations. TEM programs focus on energy audits and training of plant personnel in general housekeeping.

Outputs and activities	Indicators (numbered) Targets (bulleted)	Value or description of indicator (evaluation assessment; April 2015)
4.3 Recognition program developed and implemented	19) Recognition program for participating companies established based on successful achievements	19. This issue will be discussed in the next PSC meeting scheduled for the 1 <sup>st</sup> quarter of 2015.
<b>Rating: Satisfactory (S)</b>		

### Components 1, 2 and 3: capacity building and training

The technical capacity building consists of two-step trainings. The first step targets trainers where international experts will deliver intensive training to national experts to a level such that they can train others. At the second step, international and national experts provide trainings and assistance to factory personnel. For a general overview on the approach and methodology of the various EnMS and SO trainings, the reader is referred to Annex D. The capacity building has been accompanied by the formulation and dissemination of promotional literature for the project and on ISO 50001 and systems optimization, press releases, and presentations to industry associations.

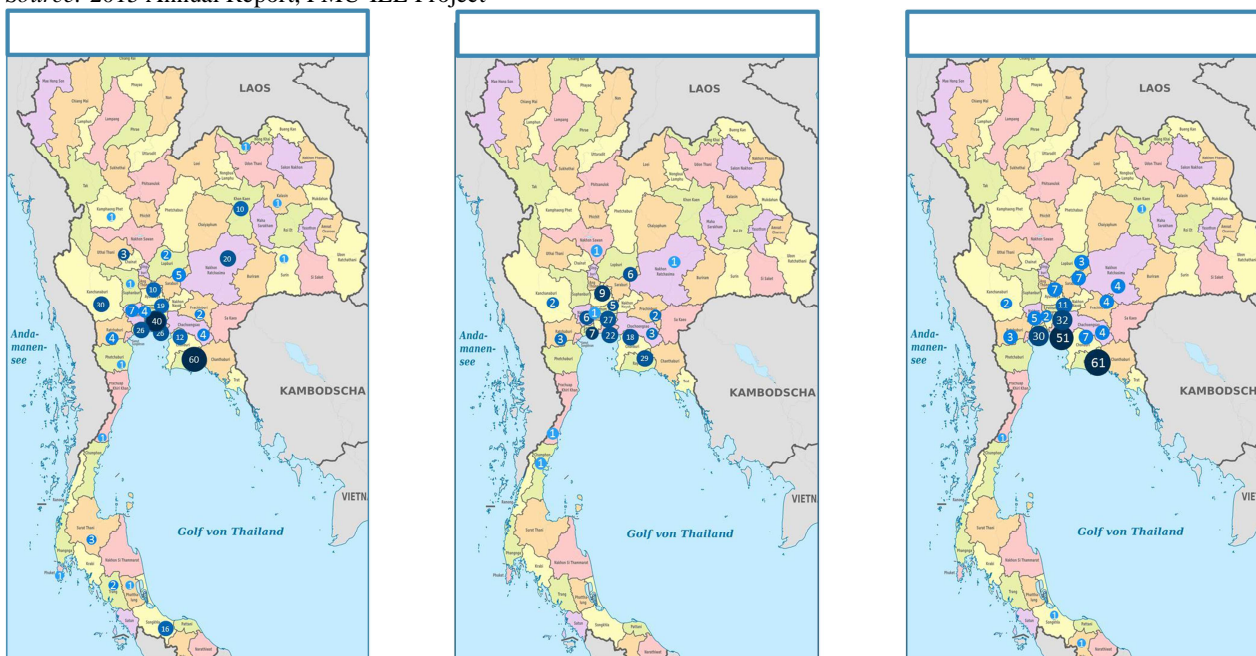
In the in-depth training on EnMS (expert training), 63 experts have participated (and have been qualified as EnMS expert) in two batches (2013, 2014), thus progress (in view of the target of 50) has been 126%. In the training of the three SO modules (SSO, 2 batches; PSO, 1 batch; CASO, 2 batches) 33 experts participated (implying progress of 66%).

A substantial number of representatives of industry, consultants, government staff and university lecturers have participated in the capacity building activities during 2013-2014:

- 852 participants attended the half-day management awareness workshops (with 408 people from industrial companies, or 82% of the target);
- 705 participants attended the two-day user trainings (with 353 representatives from companies, or 51% of the target);

### **Box 11 Location of management workshops and user trainings**

Source: 2015 Annual Report, PMU-IEE Project



- 948 people attended the two-day PSO, CASO or SSO user training;
- Two vendor meetings were organized (with 22 companies attending)

The activities for financial capacity building are ongoing. A survey (interviews, questionnaire) amongst banks and industry has led to a report on harmonization of evaluation criteria for financing EE projects and a financial training needs assessment. So far five trainings were organized (in 2015) with 124 participants from 9 banks and 40 factories. A peer-to-peer network will be created and managed by the project management unit to facilitate information exchange between the participating facilities. Participants in the two-day training sessions have been registered in the peer-to-peer network.

For the future (in 2015) the following activities are planned:

- To expand the coverage from the Bangkok area (on which focus has been so far, see Box 11) to the interior, more trainings are planned in other provinces in 2015 (4 EnMS and 3-4 SO user trainings as well as 4 management workshop), while TISI and DIP will continue to organize user trainings in the Bangkok area with their own funding. Four more financial trainings are planned for in 2015;
- A self-learning program for EnMS will be developed based on UNIDO's materials and feedback from the EnMS implementation. Based on the initial plan, the program will be divided into small modules and will be designed for both web-based and computer-based platforms. Similarly, self-learning program for financing capacity development, one for the financial institute and another for the factory. Based on the initial plan, the program will be divided into the small modules together with templates and worksheets, and will be designed for computer-based platform.

#### Component 4: implementation

As part of the training process (to get the programme certificate), the trained local experts need to implement their knowledge in pilot companies to assist them in setting up ISO 50001 and save energy through system optimization. Thus, the project has successfully supported 24 pilot companies to adopt an energy management system, of which 7 are ISO 50001 certified (see Box 12). Regarding SO, assessments have been completed for 26 companies (while the final SO reports for 8 companies are forthcoming). The project has started in 2015 the follow-up and monitoring of the implementation of SO projects in 2015.

The mechanism for the monitoring the actual savings (of EnMS and SO

#### **Box 12 Status of implementation in companies (Apr 2015)**

<b>EnMS implementation</b>	<b>SO assessment</b>
<p><i>Certified ISO 50001</i></p> <ol style="list-style-type: none"> <li>1. Royal Can Industries</li> <li>2. CPF Nongjok</li> <li>3. PTT Global Chemical</li> <li>4. Surabangyikan</li> <li>5. Aeroflex</li> <li>6. Eastern Polypack</li> <li>7. Tong Siang</li> </ol> <p><i>EnMS in place</i></p> <ol style="list-style-type: none"> <li>1. Sahaviriya Steel Industries</li> <li>2. Sahaviriya Plate Mill</li> <li>3. Beer Thip Brewery (1991)</li> <li>4. C.P. Rice</li> <li>5. Fueng Fu Anan</li> <li>6. Kulwong</li> <li>7. Red Bull Distillery</li> <li>8. TPI Polene</li> </ol> <p><i>Establishing EnMS (under TISI's TLC project):</i></p> <ol style="list-style-type: none"> <li>9. Wiik and Hoeglund</li> <li>10. British Dispensary (L.P.)</li> <li>11. Mahaphant Fiber Cement</li> <li>12. TCRSS</li> <li>13. Thai MFC</li> <li>14. Thai PET Resin</li> <li>15. Thai Pigeon</li> <li>16. Thai Silicate Chemical</li> <li>17. Theppadungporn Coconut</li> </ol>	<p><i>SSO:</i></p> <ol style="list-style-type: none"> <li>1. Ampol Food Processing</li> <li>2. Beer Thip Brewery (1991)</li> <li>3. CPF Nongjok</li> <li>4. Hwafong Rubber</li> <li>5. IRPC</li> <li>6. Krungthai Feedmill</li> <li>7. Kanyama Kasei</li> <li>8. Suksomboon Palm Oil</li> <li>9. CP Ram</li> <li>10. MMP International</li> <li>11. F&amp;N Diaries</li> <li>12. Chan Cha Rern Foam</li> <li>13. Surabangyikan</li> <li>14. Thai Asia Rice Products</li> <li>15. Thai Containers Group</li> <li>16. Thai Union Frozen Products</li> <li>17. Tong Siang</li> <li>18. UENO Fine Chemicals</li> </ol> <p><i>PSO:</i></p> <ol style="list-style-type: none"> <li>1. Bangkok Iron and Steel Works (Direct Cooling System)</li> <li>2. Bangkok Iron and Steel Works (Indirect Cooling System)</li> </ol> <p><i>CASO:</i></p> <ol style="list-style-type: none"> <li>1. Ampol Food Processing</li> <li>2. BS Metal</li> <li>3. CPF Nongjok</li> <li>4. Hwafong Rubber</li> <li>5. F&amp;N Diaries</li> <li>6. Red Bull Distillery</li> </ol>

Source: Progress Report (up to Apr 2015), Project Management Unit

projects) is under development and various measures will be implemented to reflect the savings in terms of monetary and energy units, as well as CO<sub>2</sub> reductions, such as examples of the measures include; monitoring of actual savings compared to the estimated savings identified in the assessment report, questionnaire surveys, and randomized telephone calls.

#### Rating of ‘results’

Based on the results showed in capacity building of experts and with companies, the first two components are rated as ‘highly satisfactory’. Nonetheless, the proof of the pudding will be in the eating, i.e. in achieving demonstrable results in the companies the experts have been working (part of Component 4). In other words, how much of the measures and options identified in energy management planning and systems optimization assessments have actually be considered by company management and resulted in implementation and completion. For this reason, a survey is planned for in 2015 on the progress in SO project implementation. This survey should help in monitoring project impacts on energy saving and CO<sub>2</sub> reduction. Overall, many planned activities in this project have been implemented within the periods they were planned although with some delays, which will be discussed in the next Chapter 5. Regarding component 3 on energy efficiency financing, the activities have been initiated in 2014 with a survey and interviews to assess training needs and look at possible harmonization of evaluation criteria in EE loans. The first trainings (for financial institutions and industrial companies) started in early 2015.

Thus, **the project implementation course to date has been with very noticeable achievements in the training and awareness components 1 and 2 (hence the ratings of ‘highly satisfactory’). We rate the results of Component 3 and 4 as ‘satisfactory’** with the observation that the final evaluators (at the end of the project) could consider rating ‘highly satisfactory’ if the end-of-project targets could be achieved.

## 4.4 Environmental and longer-term impacts

### Global environmental impacts

Project outputs and outcome contribute to the implementation of the GEF Focal Area on Climate Change, i.e. by reducing the energy-use related emissions of greenhouse gases (GHG) in the participating industry sectors. Box 12 gives estimates of expected energy and greenhouse gas emission reduction savings based on assumptions made at the time of writing the project proposal (CEO ER-Project Document).

### **Box 13 GHG emission reduction projections**

Savings	# of companies	% savings	Fuel/yr (GJ)	Power/yr (MWh)	Lifetime (yrs)
<i>Energy management</i>					
- Operational improvement	200	0.25%	259,120	11,480	5
- implementation EnMS	50	2%	518,250	22,960	15
<i>Systems optimization</i>					
- steam	16	12%	319,504		10
- compressed air	16	20%		7,968	10
- pumping	10	15%		3,390	10
- fans	8	15%		2,296	10
<i>Total annual savings (all companies)</i>			1,096,874	48,094	
<i>Lifetime energy savings</i>			12,264,390	538,340	
<i>Lifetime emission reduction</i>			989,427	272,238	tCO <sub>2</sub>
Total (direct) emission reduction				1,261,665	tCO <sub>2</sub>
Indirect emission reduction (bottom-up; RF=2)				2,523,329	tCO <sub>2</sub>

#### *Notes:*

- Figures on annual savings are based on data given in Annex F in the CEO Endorsement Request (CEO ER). However, the lifetime savings and emission reduction calculation method estimate differs from the CEO ER, which assumes direct emission reduction as realized during the first 5 years of the project and indirect as post-

project savings of these investment over the next 5 years and as a consequence of new investments (but only counted over the 5-year period, not over the lifetime of the new investments. This underestimates cumulative emission reduction. E.g. of an investment realized in yr 4 of the project, only the emission reduction in the first year would be counted, while in reality the reduction would still take place over the remaining lifetime of the investment. The results of the re-calculation presented in this Box are therefore more in line with the methodology of the 2008 *Manual for Calculating GHG Benefits of GEF Projects: EE and RE Projects* (GEF/C.33/Inf.18):

- Direct emission reduction (tCO<sub>2</sub>/year) is calculated as resulting from investment effected during the project-period and lifetime emission is calculated by multiplying the annual reduction with the assumed lifetime
- Indirect emission reduction (bottom-up) results from multiplying the (lifetime) direct emission reduction with a so-called replication factor (RF=2)
- Lifetime reduction is calculated by multiplying with assumed average lifetime
- Assumed emission factors (as in Annex F of the CEO ER): 0.5051 tCO<sub>2</sub>/MWh (Thailand grid) and emission factor for fuel = 80.7 tCO<sub>2</sub>/TJ, based on fuel oil-coal-natural gas mix at the time of writing the CEO ER.
- The original GHG reduction estimates (as given in the CEO ER/Project Document) calculate ‘direct savings’ as reductions from pilot projects (energy management and systems optimization) realized during the IEE project period only (5 years) and ‘indirect savings’ as savings from operational projects in a 5-year post-project period:
  - Direct fuel savings of 1,914,142 GJ and power savings of 154,423 MWh resulting in savings of 196,757 tCO<sub>2</sub>
  - Indirect fuel savings of 8,407,493 GJ and power savings of 381,878 MWh resulting in 871,390 tCO<sub>2</sub> reduction;
- The calculation method utilized in Annex F of the CEO ER/Project Document effectively underestimates the lifetime CO<sub>2</sub> emission reduction, basically because direct emission reduction are not calculated over the full lifetime of the investment (identified or realized in the project period) but with the end of the IEE project (after 5 years) as cut-off date; also for the indirect emission reduction a 5-year period is taken, while the Manual GEF/C.33/Inf.18) suggests a 10-year period after project’s end.

#### Box 14 Overview of expected direct emission reduction by mid-2015

Based on assessments by the national experts

	# of companies	Electricity savings		Fuel savings		Reduction tCO <sub>2</sub>
		MWh	USD	GJ	USD	
EnMS Batch 1	7	5,601	579,143	390,346	5,810,635	29,271
EnMS Batch 1	9	2,899	299,764	490	1,773	1,511
	16	8,500	878,907	390,836	5,812,408	30,781
SSO Batch 1	12	14,285	1,624,721	247,607	2,762,570	14,709
SSO Batch 2	11			241,085	613,885	7,296
SSO (co-fin)	1			11,527	209,424	930
PSO	2	2,983	308,419			1,507
CASO Batch 1	6	3,510	363,072			1,773
CASO Batch 2	5	413	42,688			322
	37	21,191	2,338,901	500,219	3,585,879	26,538
<b>Total</b>		<b>29,691</b>	<b>3,217,808</b>	<b>891,055</b>	<b>9,398,287</b>	<b>57,319</b>

Based on the current status of implementation (May 2015)

	# of companies	Electricity savings		Fuel savings		Reduction tCO <sub>2</sub>
		MWh	USD	GJ	USD	
EnMS Batch 1	7	1,399	14,476	146,372	2,581,979	12,036
EnMS Batch 1	9	2,786	288,035	490	1,773	1,453
	16	4,185	302,511	146,862	2,583,752	13,490
SSO Batch 1	12			32,620	1,343,279	2,458
SSO Batch 2	11					0
SSO (co-fin)	1					0
PSO	2	179	18,612			90
CASO Batch 1	6	3,177	328,508			1,605
CASO Batch 2	5					
	37	3,356	347,120	32,620	1,343,279	4,153
<b>Total</b>		<b>7,541</b>	<b>649,631</b>	<b>179,482</b>	<b>3,927,031</b>	<b>17,642</b>

Table based on data provided by the Project Management Unit

Above: table based on data provided in the assessment report of the National Experts

Below: table based on actual implementation, as confirmed by follow-up site visits or phone calls

It should be noted that the methodology of calculating cumulative GHG emission reduction is different from the one used in the Project Document (see the Notes of Box 13). This does *not* imply that the calculations in the Project Document are not correct, just that the methodology of calculating cumulative emission impact is different. In fact, this method is followed in many GEF project documents written prior to the 2008 Manual for Calculating GHG Benefits. We have re-calculated the estimates of the Project Document here for the sake of consistency in comparing the emission reduction results. In general, we can observe that, when reporting GHG emission reduction results, care has to be taken on how these calculated and the method made clear to the reader.

Box 14 above provides an overview of the expected energy savings, CO<sub>2</sub> emission reduction and monetary savings as result of the various energy management and systems optimization actions that have been identified in companies by the national experts so far (a total of 57,319 tCO<sub>2</sub>/yr). Assuming an average lifetime of 10 years of the measures, this implies direct emission reduction impact of 573.2 ktCO<sub>2</sub>. If we calculate the cumulative emissions of the projects of Box 13 over the project period (4 years, from year 2 up to year 5), the emission reduction is 229,276 tCO<sub>2</sub>, which looks okay in view of the originally formulated direct emission reduction target of 196,757 ktCO<sub>2</sub>. In our revised calculation (see Box 13), the identified lifetime GHG savings (573.2 ktCO<sub>2</sub>) expected to be achieved would amount to 45% of the re-formulated direct emission reduction target of 1,262 kilotons of CO<sub>2</sub>.

#### Socio-economic and gender aspects

Gender is not a particular area of focus in the project design. The majority of experts is male, not surprisingly given the traditional male domination in this field of technology. In the EnMS national experts Batch 1 and Batch 2 trainings, 14 out of 29 who participated were women. In the SO national experts training, 5 out of 28 who participated were women (April 2015 data, provided by PMU).

The improvement of energy efficiency in the Thai industry will result in a reduction in energy demand and intensity, as well as improved competitiveness and working environment in industry. In addition, the extensive awareness raising and capacity building activities will result in local experts with improved technical skill sets and might offer their abilities in the national and regional energy efficiency market. Majority of those who participated in the EnMS national experts training as well as many who have been certified or recognized as EnMS National Experts are from consultancies, academia, relevant government departments and non-profit organizations, or technical audit firms that would be naturally instrumental in disseminating the concept and practice of EnMS and ISO 50001 in particular.

#### Effectiveness

Based on findings presented in the Chapter, **project effectiveness at time of the mid-term evaluation is rated as highly satisfactory (HS).**

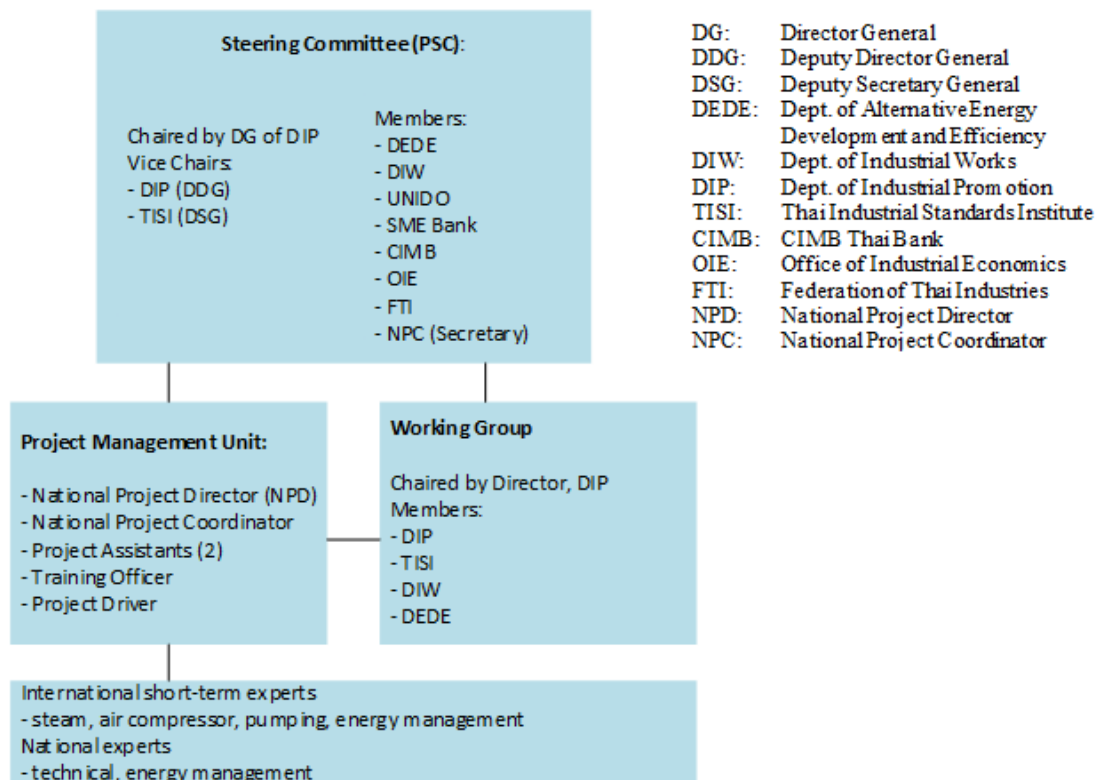
## 5. FINDINGS: IMPLEMENTATION AND EFFICIENCY

### 5.1 Management and administration

#### Coordination and management

The following figure (in Box 15) provides an overview of the project's management arrangements.

**Box 15** Project organizational setup



The *Project Management Unit (PMU)* is responsible for the overall operational management and implementation of the project activities. Its day-to-day operations are in the hands of a National Project Coordinator (NPC)<sup>10</sup>. The NPC has been responsible for the substantive quality of the project and for the proper use of project resources; mobilizing all national and international project inputs and organizing project activities in accordance with the project work plan. The PMU is guided by the National Project Director<sup>11</sup>, whose overall role has been to ensure the successful execution and implementation of the project toward achieving project results. The PMU also consists of supporting officers and staff<sup>12</sup> and is housed at the DIP Building as a part of the co-financing contribution from DIP. The PMU reports to the UNIDO Project Manager (based at UNIDO Headquarters, Vienna, Austria)<sup>13</sup>.

The Project Steering Committee (PSC) consists of high-level representatives from the project partners DIP, TISI, DEDE, DIW and UNIDO, as well as from representatives of financial institutions and industry

<sup>10</sup> Uma Wirutskulshai  
<sup>11</sup> Director General of DIP  
<sup>12</sup> Atchareeya Pongput  
<sup>13</sup> Sanjaya Shrestha



associations. The PSC's role has been to provide overall guidance to the PMU and coordination among participating agencies and other organizations. The PSC has met four times over the course of the project implementation period.

#### Preparation and readiness; delays in implementation

Counterpart resources and adequate project management arrangements are in place at project entry, and capacities of executing institution and counterparts were properly considered when the project was designed; partnership arrangements were properly identified and the roles and responsibilities negotiated prior to project approval.

Originally planned to start in April 2011, the IEE project had substantial delay due to the requirements of the Thai legislation on international cooperation programs and projects. After being granted the approval by the Thai Cabinet in March 2012, the Project Management Unit (PMU) advanced rapidly in 2012 with the first Project Steering Committee meeting on 27 March 2012, the Inception workshop in June, the procurement of equipment and the planning and implementation of the training activities in 2012-13 without further delays. International experts were recruited and local experts for EnMS and system optimization trainings were identified for further screening by international experts for final selection. A number of companies were identified to become pilot industry facilities.

#### Communications

The project implemented appropriate outreach and public awareness campaigns through publishing of technical evaluation reports, manuals, newspapers, articles. A project website has been set up (see [www.ieeproject.com](http://www.ieeproject.com)). Currently, the project brochure and some materials can be downloaded (e.g. EnMS and SO booklets and info). The PMU has produced two colorful annual reports that describe in great detail the project setup, objectives, training and implementation activities, including a list of all experts trained.

In view of these findings, the rating for Project Coordination and Management so far is **highly satisfactory**.

## **5.2 Supervision; monitoring and evaluation (M&E)**

#### Assessment of M&E implementation

In coordination with UNIDO and the Project Steering Committee, the Project Office has provided effective periodic oversight in implementation by means of overviews of inputs, work schedules and results according to the reportorial requirements of UNIDO and the GEF. Regarding reporting, three Project Implementation Reports have been formulated (Oct 2012; Oct 2013 and Dec 2014) as well as two Annual Reports (2013 and 2014) in booklet form. These are very detailed reports that provide exhaustive aspects of the periodical achievements of the project with narrative links back to the outcomes, outputs and targets elaborated in the logical framework. This process, now being supplemented with this Mid-Term Review, has strongly supported the monitoring of progress in implementation and results and has helped the Steering Committee in detecting issues that need to be addressed accordingly. The Project Steering Committee has met at least once every year. Issues discussed during these meetings included, among others, how to identify and track the energy savings and GHG emission avoidance achieved during project execution, and the inclusion of pulp and paper in the project's target subsectors.

#### UNIDO supervision and backstopping

UNIDO staff has provided quality support and advice to the project coming from UNIDO HQ and also hired international consultants bringing the best available knowledge and practice, providing the right staffing levels, continuity and frequency of field visits for the project, identifying problems in a timely manner and providing appropriate response. The Project Manager (UNIDO HQ in Vienna, Austria) and the PMU's

National Project Coordinator have continuously monitored the project and the Project Manager has visited the country and project sites (e.g. coinciding with PSC meetings). We suggest to rate M&E as **highly satisfactory**.

### 5.3 Stakeholder involvement and project partners

Generally, there is a very high level of stakeholder involvement in the project with sharing information and consultations carried out at several levels within the Project. National energy experts and other practitioners plan to organize themselves in an association with the aim of facilitating services by these experts to industries and other clients on energy efficiency.

On a managerial and planning level, main stakeholders are engaged within the Project Steering Committee (PSC), which is established to provide strategic guidance on the project implementation and facilitation of the coordination of various Government authorities, institutions and the industries. On the participation by government stakeholders, it can be mentioned that the government's commitment is clear by the realized co-financing (cash and in-kind) from TISI and DIP, as will be discussed in the next Section 5.4.

### 5.4 GEF budget and co-financing

#### Financial planning and realization

The Project has appropriate financial controls, including reporting and planning, that allows management to make informed decisions regarding the budget and allows for timely flow of funds. UNIDO manages the overall project budget and procures all services required, as well as preparing timely financial reports to the GEF, in accordance with the established UNIDO rules and regulations and applicable GEF requirements.

A summary of the performance of the project in terms of actual expenditures per main project component and budget category is given in the Box 16. It should be noted that detailed financial management or disbursement issues are not the subject of this MTR as such, as the project has a separate financial auditing process. This section analyses the progress of expenditures in relation with the progress of outputs and results.

The disbursement rate (of the GEF funds) has been 65% (USD 2.355 million of the GEF budget of USD 3.620 million); the reported realized co-financing is quite low (11%) as the lending schemes of the participating banks have not been used for the purpose of Project-linked energy efficiency investments. However, the low co-financing realization only reflects the amount of loans actually given for energy management and system optimization, which is zero. Instead, most cash co-financing so far has been in the form of direct investments in energy management and systems optimization by the participating companies (see Box 14). Thus, the co-financing table does not really reflect the planned or realized investment associated with the energy savings in EnMS and SO batches 1 and 2. However, realized co-financing in terms of realized investment is difficult to calculate ex-post, because the reporting on savings by company (as summarized in Box 14) does not include the investments needed by companies to achieve the annual savings.

The mid-term review reports (2015) of the other UNIDO IEE projects in the Philippines and Indonesia do give some investment figures of batch 1 and batch 2 investments. By comparing the results of these projects on energy and CO<sub>2</sub> emission reduction and investment reported, the Evaluators calculate that the investment in Thailand associated with the savings figures of Box 14 is between about USD 4.1 million (based on the assessments by NKEs) and 1.4 million (realized/implemented so far). In the reporting on co-financing, these 'real' investment figures should be added in lieu of the planned investment supported by the financial sector (loans); with this approach the figure of realized co-financing is much higher, about USD 3.1-5.8 million. Monitoring and surveys of EnMS and SO projects, and other performance surveys, are planned after this MTR (part of Outputs 3.1, 4.2 and 4.2). These surveys should include data on investment that will allow the

project to gain a better understanding of the actual contributions of the private sector and thus the level of co-financing.

The government institutions involved (DIP, TISI, DEDE) have contributed to cash and in-kind co-financing for supporting the various Project-organized trainings and the awareness campaigns as well as organizing trainings in addition (as part of their parallel project activities).

### Box 16 Overview of GEF budget and expenditures; committed and realized co-financing

GEF budget (USD)	Original budget	Expenditures (2012-May'15)		Original budget	Expenditures (2012-May'15)
International experts	753,000	1,025,067	Component 1	965,000	Data are not available due to changes in UNIDO's database (SAP) system during project execution
National staff and experts	590,000	409,822	Component 2	1,239,500	
Travel, project staff	150,000	35,806	Component 3	262,000	
Subcontracts	384,000	259,200	Component 4	668,500	
Training	968,000	185,051	M&E	125,000	
International meetings		708			
Premises		2,054			
Equipment	584,000	332,179	Project mngt.	360,000	
Sundries/misc	191,000	105,497			
<b>Total</b>	<b>3,620,000</b>	<b>2,355,384</b>		<b>3,620,000</b>	

Co-financing (USD)	Planned			Realized (Jun 2015)		
	Cash & staff	In-kind	Total	Cash & staff	In-kind	Total
DIP	915,250	369,750	1,285,000	31,760	162,528	194,288
TISI	831,250	328,750	1,160,000	242,804	85,457	328,261
DEDE		200,000	200,000		8,673	8,673
Industries				209,086	966,964	1,176,050
Financial sector	13,000,000		13,000,000			
<b>Total</b>	<b>14,746,500</b>	<b>898,500</b>	<b>15,645,000</b>	<b>483,650</b>	<b>1,223,622</b>	<b>1,707,272</b>

Source: based on data provided by the PMU, Annual Report (Apr 2015) and UNIDO Headquarters.

See comments in the main text on contribution by 'Industries' in co-financing

The PMU has raised the issue of mobilizing co-financing from the project partners during the PSC meeting; the Department of Industrial Promotion (DIP) has promised to mobilize their co-financing through the Total Energy Management project, while TISI has started using their TLC project as co-financing to support ISO 50001 implementation.

### Procurement

Procurement has not been a major issue with 'equipment' a minor component in the overall budget. Apart from office equipment, it mainly consists of the testing equipment and instrument for optimization of steam, compressed air and pumping systems. This equipment was procured in 2012 and delivered to the PMU. Pilot companies are selected in an interactive process in which companies express their interest or identified by the project and are checked on compliance (e.g. are within the industrial target subsectors; are willing to share information with the general public as a pilot company).

### Efficiency and ratings

The assessment of efficiency should answer whether the project is implemented in a cost-effective way and presents least-cost option. Efficiency also considers adequacy of contributions of government as well as the national executing agency for project implementation. Given the findings in this Chapter 5, we have the opinion that all efforts were undertaken to ensure cost-effectiveness of project results.

Only co-financing has not been forthcoming as planned. This can be explained by the time lag in realizing private sector investments and the over-optimistic expectation regarding lending of the financial sector for these types of EnMS and SO projects (see also Chapter 6 and 7 for observations on finance). **The overall rating for efficiency is satisfactory.**

## 6. SUSTAINABILITY

In GEF evaluations, the concept of *sustainability* is understood as the likelihood of continued benefits after the project ends. The assessment will look at the sustainability of outcomes and review technical, financial and institutional sustainability and how this sustainability will be affected by exogenous and endogenous risks.

### Box 17 Risk management and sustainability of project

Risks	Project mitigation	Assessment by MTR review team
<p><b>Institutional and policy: change in focus</b></p> <ul style="list-style-type: none"> <li>Change in government priorities leading to reduced support for the project, implementation delays, and reductions in the effectiveness of delivery of the training and demonstration programs.</li> </ul>	<p>The Government of Thailand has made substantial efforts in promoting energy conservation and renewable energy utilization, as evidenced by the Energy Conservation Law (1992, 2007) and energy efficiency strategies and plans.</p> <p>Also, the Thai Government is already promoting energy management standard. The TISI is part of the Project Committee 242 of ISO, which has already published ISO 50001.</p>	<p>So far, DIP, TISI and DEDE have been actively supporting the Project, e.g. by actively supporting the Project's training and EnMS/SO implementation at companies (and making available additional funding for expanding training activities). At the moment their support does not seem in doubt.</p> <p>The Project is offering these certification bodies the skills of the trained national experts and also the Project may provide additional training to these bodies (on how to audit an EnMS implemented in a company)</p> <p><b>Sustainability rating: likely</b></p>
<p><b>Techno-economic</b></p> <ul style="list-style-type: none"> <li>Following the systems optimization assessment, enterprises might not be willing to finance system optimization measures, even if cost effective high energy reduction potential exists;</li> <li>Technical risks associated with the optimization of steam, compressed air, fan and pumping systems are very low.</li> </ul>	<p>To deliver the required capacity building, UNIDO will employ the services of highly skilled experts with systems specific expertise (steam and compressed air) and proven training skills to convince senior and technical management at company level.</p>	<p>Technical risks associated with the optimization of compressed air and steam systems are very low. In fact, considerable energy savings have been achieved in many countries through system level efficiency opportunities. Most options are 'low hanging fruits' and the pilot implementation experiences have shown that the project provides adequate and practical EnMS and SO tools to pick these fruits.</p> <p><b>Sustainability rating: likely</b></p>
<p><b>Project-specific sustainability aspects</b></p> <ul style="list-style-type: none"> <li>Failure to achieve outcomes due to inability to scale up outputs</li> </ul>	<p>Through its linkage with ISO 50001, the project helps to assure that energy- efficient operations become part of each participating firm's operating culture.</p> <p>The combination of standards with tools and training will allow companies to "hardwire" industrial EE projects and investments into management structures, such as ISO, that provide documentation, independent verification, and continuous improvement.</p>	<p>The capacity and the awareness of major players is being enhanced including equipment vendors, equipment buyers (industry), services providers (consultants, designers), financiers and the government.</p> <p>National experts, as well as participants of the two-day training session, will be registered in the peer-to-peer network. Each participating factory will also have access to support from the EnMS and SO experts to assist them in implementing their energy management system, resulting in operational improvement, and in SO.</p> <p><b>Sustainability rating: likely</b></p>
<p><b>Environmental risks</b></p> <p>Factors, that can influence future benefits of the project</p>	<p>Not identified</p>	<p>No environmental risks connected to sustainability could be identified, which means the environmental <b>sustainability is likely</b> to be achieved.</p>

<p><b>Financial risks</b></p> <ul style="list-style-type: none"> <li>• Following the systems optimization audit and report, enterprises might not be willing to invest and finance the installation of new equipment, even if the energy reduction potential is important;</li> <li>• Financial government resources are not been made available</li> </ul>	<p>Through the project financing activities, UNIDO will provide training for enterprises' key personnel, to build their capacity to better understand the value of investing without delay on systems optimization and energy management, and the long-term financial benefits it brings.</p>	<p>Originally, the Project design foresees loans being made available by financial entities (such as SME Bank and CIMB Bank) to beneficiary companies. However, there is little or no demand. Maybe the size of investment (for energy management and SO) is such that these are usually financed on the company's balance sheet. Larger investment might involve changes in production process (e.g. changing a production line) in which the EE aspect would a part, but not as a separate item. The Project's pilots have been implemented in larger industries, but in reality small and medium-size industries (SMEs) might be more in need of external finance, but. However, if needed, banks would have loan schemes for energy-related investments available. In addition, partner banks could be and should be effective allies in promoting ISO 50001 to their client-base. Therefore, we give the financial <b>sustainability rating: likely</b></p>
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*Note:* Sustainability and risks description, possible mitigation measures and assessment are based on Project Document (CEO ER), PIR 2014 as well as information on risks collected and added by the MTR team

#### Potential for replication

The industrial sub-sectors selected for this study are categorized as medium and large size industries. So far about 42 companies have participated in the project implementation component, while the target is up to 250 companies<sup>14</sup>. While we judge that the participating companies have done so enthusiastically, these also form a small share of the total market of companies. The replication opportunity is much larger; manufacturing companies in the formal sector already number 12,500 companies<sup>15</sup>. One of the key requirements for replicability is to overcome the low penetration of energy management and systems optimization in the industry due to the lack of knowledge on its mechanism and its long-term benefits. This is addressed through increased institutional, technical capacity and awareness as well as demonstration projects in the country and the development of a network where industrial facility managers and experts can share their experience regarding the implementation of energy efficiency projects.

On the other hand, we note that the factories participating in the Project's pilot EnMS and SO activities are large, modern companies that already have experience with other ISO-compatible management system and/or do some energy management. The big question is what will happen post-project regarding EnMS and SO to be able to reach a substantial part of the market of large, medium and small companies of which most will not be as advanced in managerial or environmental awareness as the companies currently participating in the Project. But at least the Project has sown the seeds for replication, i.e. the EnMS National Experts are from consultancies, academe, relevant government departments and non-profit organizations, or technical audit firms that would be naturally instrumental in disseminating the concept and practice of EnMS.

<sup>14</sup> EnmS: 200 companies have EnMS plans; SO: 50 companies have conducted SO assessments. Of these, 25 have implemented EnMS and 17 system assessments

<sup>15</sup> As mentioned in the CEO ER form

## 7. CONCLUSIONS AND RECOMMENDATIONS

### 7.1 Summary of findings and ratings

The following table provides a summary of the ratings for a) progress towards results, b) project implementation and adaptive management and c) sustainability. Although not strictly required, a rating for ‘design’ has been added.

#### Box 18 Summary of main conclusions and ratings

Criteria	Concluding remarks	Rating
1. Design and relevance <i>UNIDO criterion:</i> implementation approach M&E design	<p>The overall project design is relevant to the national energy priorities, and has enjoyed strong participation of local stakeholders in project identification. The project is relevant to UNIDO and policies and fully relevant to the GEF focal area of climate change</p> <p>The Logical Framework, with its outcomes, outputs and target indicators, has been developed adequately and allows for the monitoring of project results. The M&amp;E process and specific reporting requirements are sufficiently identified in the Project Document (CEO ER). The budget provided for M&amp;E at the planning stage is sufficient. Regarding project strategy, it is worth mentioning that the project is integral part of overall UNIDO efforts to promote energy management and systems optimization. In South-East Asia, IEE projects are being implemented in Malaysia, Myanmar, Thailand, Indonesia Philippines and Vietnam, allowing the exchange of ideas and experiences, while the training programs follow a similar proven setup that can be adapted to local circumstances and language, as needed.</p> <p>Certain aspects regarding sustainability are not in the project design, such as how the peer-to-peer network and training could be institutionalized to ensure functioning beyond the project’s end. This issue has been given attention during implementation, but to consider this already during the design phase would have been better.</p>	<p>Relevance: HL (highly relevant) Design: HS (highly satisfactory)</p>
2. Attainment of results; effectiveness	<p>The project has been under implementation for almost 3 years and its current achievements compared to the targets show <i>highly satisfactory progress in two training Components 1 and 2</i>, in many cases exceeding the end-of-project targets. Progress in the EnMS and SO expert trainings has been 126% and 66% so far, in the EnMS and SO user trainings 51% and 155% respectively and management workshops’ progress is 82%.</p> <p>Progress in <i>Component 4 has been significant and is rated satisfactory</i>. Of the target of 75 SO assessments, 26 have been completed, 8 are pending and 10 more are planned for 2014. Similarly, of the end-of-project target of 200 adopted EnMS plans, 24 have adopted plans, while 10 more are planned. Although the project is lagging behind in terms of achieving targets, it should be note that implementation had to wait until the first training were organised and further results will come in 2015-17 as the National Experts will perform more SO assessments and draft EnMS plans</p> <p>In <i>Component 3 (on energy efficiency financing)</i> activities are just starting with a survey and interviews to assess training needs and look at possible harmonization of evaluation criteria in EE loans and organization of the first trainings (for financial institutions and industrial companies). The progress is rated as <i>satisfactory</i>.</p>	Satisfactory (S)
3. M&E;	Project management has been successfully carried out by the UNIDO Project	HS (highly)

Efficiency; <i>UNIDO criteria:</i> Quality at entry & preparedness; UNIDO supervision and backstopping;	Manager and Project Management Unit (PMU) led by the National Project Coordinator. These have drafted the progress reports that provide the necessary aspects of the periodical achievements of the project with narrative link back to the outcomes, outputs and targets elaborated in the logical framework. There has been good cooperation between the various project partners (DIP, TISI, DEDE, DIW) that closely work together with the PMU, meet annually in the Project Steering Committee (PSC) and have set up a Working Group. Although counterpart resources and adequate project management arrangements were in place at project entry, the project initiation has met some delays, but currently project implementation is well on track. Realizing time planned may be too short, the project was extended until August 2017.	satisfactory)
4. Sustainability and risks; external factors	There are no major financial, socio-political or institutional and governance risks to sustainability identified. Technical risks associated with the optimization of compressed air and steam systems are very low. In fact, considerable energy savings have been achieved in many countries through system level efficiency opportunities. However, it has to be noted that the companies participating are mostly larger companies (and/or those that have already experience with similar management standards (ISO environment standard or quality). In future, the big challenge will be in passing the EE message to other large and, particularly, medium and small sized companies.	Likely (L)

The IEE project has started the activities in all components covering the organizing of awareness workshops, expert and user trainings, the study of evaluation criteria of energy efficiency projects, the development of financial training materials, and the implementation of EnMS and SO Assessments. The industries have showed strong interest in the project, especially the large industry companies that are associated with the project by implementing pilot activities. Through its awareness raising and capacity building activities, the project has supported many factories to implement EnMS and SO improvement projects that will result in significant energy savings and a reduction in GHG emissions. Based on the progress achieved thus far, it is expected that the project is in a position to achieve its global environment/development objectives.

It is not quite clear to the Evaluators what the role of finance in general is in the context of energy management planning and systems optimization. In principle, the first recommendations coming out of energy planning and systems optimization assessment stress no-cost and low-cost options that can easily be financed in-house by the companies that participate in the project and tend to be larger companies that would finance energy efficiency as part of the company's balance sheet rather than having to go to external financiers. However, the principles of EnMS and SO do not exclude medium or high-cost energy efficiency investment that may be considered when the 'low-hanging fruits' have been picked.

## 7.2 Recommendations

### For the Project Team and national government partners

#### 1) *Institutionalization of training*

One aspect of sustainability is the institutionalization of training on EnMS and system optimization. The trainings contain a wealth of information and all training materials and documents should be transferred, for example, to DEDE's Energy Training and Learning Center that could also serve as a focal point for e-learning on EnMS and SO issues. This issue would need to be deliberated by the Project Steering Committee before execution.

In a country the size of Thailand and a market of up to ten-thousand small, medium and large enterprises, the number of trained national experts envisaged, about 80, and the number of companies targeted, about 200 in EnMS and 50 in SO, is small indeed. Even if the project could be up-scaled, it would only cover a small

section of the sheer number of companies in the country. From the viewpoint of replication, we suggest diverting some project resources to the following:

- Integration of the EnMS and SO in the curriculum of relevant undergraduate programs of prominent universities;
- Organization of short introduction and refresher courses or seminars at relevant engineering or business training institutes or by relevant industry and professional associations;

The first (curricula integration) would be medium-term in nature, while the other option (short courses) could probably be implemented in the short term. Piloting both these programs during the project's duration would be a desirable (new) output. Also, it was suggested during the evaluation mission that giving some sort of UNIDO certificate to the trained national experts for their work done in companies would be useful for their professional work in the future.

## 2) *Post-project action plan*

Towards the end of the project, the PMU should commission a sound analysis of the situation, remaining barriers and steps to be taken that ensure the policy-institutional, technical and financial-economic sustainability of the Project in the period after the project has come to an end.

The Project Document foresees the transfer of the maintenance of the peer-to-peer database and reporting tools to the relevant government agency. Thus, the institutionalization of the P2P network should be looked into, as well as the post-project role of existing industrial associations, chambers of commerce and industry and professional associations of engineers. The formation of a Working Group (with representatives of DIP, TISI, DEDE and DIW) is an important first step towards a post-project cooperation between these government entities. The post-project action plan should provide some details on objectives, plans and actions to be taken by the Working Group. For example, the Working Group (and DEDE's Energy Training and Learning center) can play an important role in making information and knowledge on SO and EnMS available through materials and toolkits on CD and in printed form as well as web-based tools and info made available through the e-learning portal. The destination of the equipment of energy audits and measurement equipment, procured under the project should be determined as well as, although it was suggested to the Evaluators it might go to DIP for future assistance to SMEs.

These issues should be addressed towards the end of the Project by commissioning a sound 'post-project action plan'. Such an 'action plan' could have the following elements: a) overview chapter on status of EnMS, SO and EE, b) identification of lowered and remaining barriers, c) conclusion and recommendations to the Government and private sector institutions for post-project supportive actions.

## 3) *Finance*

It is not clear exactly what the need for external finance of industrial companies is to realize efficiency improvements (based on EnMS and SO analysis) or regarding larger investments with a large energy efficiency improvement component. In this respect, maybe SMIs (small and medium-size industries) would be in more need of finance. Surveys amongst beneficiary (and potential) industries should include questions on financing needs and support required. This information should feed into the above-mentioned post-project action plan with a section on financing issues (if any) and options. In this respect, it would be useful to ask questions to company not only on fuel, power and corresponding monetary savings, but as well on estimated investment cost. This gives useful information on payback times as well as need for finance to cover investments.

## 4) *Gender*

To make the gender dimension in the various project activities more pronounced, gender-disaggregated indicators could be included in company surveys to be able to measure gender mainstreaming of the project.



While the collection of these surveys are expected to confirm that the employees of the focus sectors, namely heavy industries, such as cement and steel, are predominantly male, it would help the project gain a better understanding of the baseline gender disaggregation in Thai industry.

#### 5) For UNIDO

Given the fact that UNIDO has organized similar projects on energy management and systems optimization (SO) in over 20 countries, we would like to suggest that in UNIDO itself the training is internally institutionalized, i.e. by offering refresher courses in the participating countries. It should be looked into how this could be organized and funded with UNIDO's regular or extra-budgetary funding.

In general, the visibility of the UNIDO-supported projects on EnMS and SO could be much improved, for example, by setting up a dedicated website (as part of UNIDO's overall website) or as a separate set of webpages, covering EnMS and SO in general and the countries where UNIDO has implemented projects in particular. This would also be a good place to make available reports, manuals and selected course materials as well as maintaining an agenda of upcoming events, apart from making these materials available on the national IEE websites. UNIDO should make clear to national websites hosts what materials or documents can be put on the website without infringing on copyright regulations.

#### 6) For GEF

It is being discussed to present a new initiative for funding under the new GEF-6 budget cycle. Given the large scope for replication in a country the size of Thailand and the cost-effectiveness of energy management planning and implementing energy optimization, it makes sense to scale up the activity and expand into other thematic or geographical areas:

- Support other industrial subsectors (if companies from these subsectors clearly indicate their needs);
- Cover new topics in system optimization (e.g., chillers, fans; again, this should be demand-driven);
- Increased focus on medium-sized companies.

On design, we notice a discrepancy between the sources of confirmed co-financing and the actual realization. Co-financing is usually calculated to meet GEF demands (e.g. to achieve ratios of 1 to 4 or 6 in GEF financing and co-financing), irrespective of the type of project, technology or investors, or how letters of co-financing can be organized during project design. This setup favors the confirmation of co-financing with a few large (supply-side) energy investments over demand-side projects with a multitude of beneficiaries that individually realize small investments. In general, private sector entities are more reluctant to sign co-financing letters than government entities often not sure what the legal implications of signing such a letter might be. To give an example, it is obviously easier to get a co-financing letter from two entities investing or making available USD 6 million each than getting 100 co-financing letters from companies investing USD 120,000 on average. In case of the Thailand proposal, a large part of co-financing has been committed by the financial sector (as such positive, because it indicates their interest and commitment in energy efficiency), while in practice it seems likely to come from the companies directly by realising small energy efficiency investments without having to resort to external finance. Conclusion is that the GEF should allow more flexibility and realism when co-financing is incorporated in the project design.

### **Lessons learned**

The framework program on EnMS and SO in South East Asia, can be used and should be presented by UNIDO as a best practice. The Thailand project can use this context to present the benefits of EnMS and SO in international fora and to a wider audience, stressing the importance of a well-conceived methodology regarding training and awareness raising and strong local ownership.

## Annex A. TERMS OF REFERENCE

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### I. Scope and Purpose of the Evaluation

The mid-term evaluation will cover the duration of the project from its starting date in April 2011 to the mid-term evaluation date in early 2015. It will assess project performance and progress against the evaluation criteria: relevance, effectiveness, efficiency, sustainability and impact.

The evaluation team should provide an analysis of the attainment of the main objective and specific objectives under the four (4) core project components. Through its assessments, the evaluation team should enable the Government, counterparts, the GEF, UNIDO and other stakeholders and donors to:

- (a) Verify prospects for development impact and sustainability, providing an analysis of the attainment of global environmental objectives, project objectives, delivery and completion of project outputs/activities, and outcomes/impacts based on indicators. The assessment includes re-examination of the relevance of the objectives and other elements of project design according to the project evaluation parameters defined in chapter VI.
- (b) Enhance project relevance, effectiveness, efficiency and sustainability by proposing a set of recommendations with a view to ongoing and future activities until the end of project implementation.

**The key question of the mid-term evaluation is to what extent the project is achieving the expected results at the time of the mid-term evaluation, i.e. to what extent the project has promoted industrial energy efficiency through system optimization approach and the introduction of ISO energy management standards.**

### II. Evaluation Approach and Methodology

The mid-term evaluation will be conducted in accordance with the UNIDO Evaluation Policy, the UNIDO Guidelines for the Technical Cooperation Programmes and Projects, the GEF's 2008 Guidelines for Implementing and Executing Agencies to Conduct Terminal Evaluations, the GEF Monitoring and Evaluation Policy from 2010 and the Recommended Minimum Fiduciary Standards for GEF Implementing and Executing Agencies.

It will be carried out as an independent in-depth evaluation using a participatory approach whereby all key parties associated with the project are kept informed and regularly consulted throughout the evaluation. The evaluation team leader will liaise with the Project Manager on the conduct of the evaluation and methodological issues.

The evaluation team will be required to use different methods to ensure that data gathering and analysis deliver evidence-based qualitative and quantitative information, based on diverse sources: desk studies and literature review, statistical analysis, individual interviews, focus group meetings, surveys and direct observation. This approach will not only enable the evaluation to assess causality through quantitative means but also to provide reasons for why certain results were achieved or not and to triangulate information for higher reliability of findings. The concrete mixed methodological approach will be described in the inception report.

The evaluation team will develop interview guidelines. Field interviews can take place either in the form of focus-group discussions or one-to-one consultations.

The methodology will be based on the following:

1. A desk review of project documents including, but not limited to:

- (a) The original project document, monitoring reports (such as progress and financial reports to UNIDO and GEF annual Project Implementation Review (PIR) reports), output reports (case studies, action plans, sub-regional strategies, etc.) and relevant correspondence.
  - (b) Notes from the meetings of committees involved in the project (e.g. approval and steering committees).
  - (c) Other project-related material produced by the project.
2. The evaluation team will use available models of (or reconstruct if necessary) theory of change for the different types of intervention (enabling, capacity, investment, demonstration). The validity of the theory of change will be examined through specific questions in interviews and possibly through a survey of stakeholders.
  3. Counterfactual information: In those cases where baseline information for relevant indicators is not available the evaluation team will aim at establishing a proxy- baseline through recall and secondary information.
  4. Interviews with project management and technical support including staff and management at UNIDO HQ and in the field and – if necessary - staff associated with the project’s financial administration and procurement.
  5. Interviews with project partners including Government counterparts, GEF focal points and partners that have been selected for co-financing as shown in the corresponding sections of the project documents.
  6. On-site observation of results achieved in demonstration projects, including interviews of actual and potential beneficiaries of improved technologies.
  7. Interviews and telephone interviews with intended users for the project outputs and other stakeholders involved with this project. The evaluator shall determine whether to seek additional information and opinions from representatives of any donor agencies or other organizations.
  8. Interviews with the relevant UNIDO Field Office and the project’s management and Project Steering Committee (PSC) members and the various national and sub- regional authorities dealing with project activities as necessary. If deemed necessary, the evaluator shall also gain broader perspectives from discussions with relevant GEF Secretariat staff.
  9. Other interviews, surveys or document reviews as deemed necessary by the evaluator and/or UNIDO Office for Independent Evaluation.
  10. The inception report will provide details on the methodology used by the evaluation team and include an evaluation matrix.

### **III. Evaluation Team Composition**

The evaluation team will be composed of one international evaluation consultant acting as a team leader and one national evaluation consultant. The evaluation team should be able to provide information relevant for follow-up studies, including evaluation verification on request to the GEF partnership up to two years after completion of the evaluation.

Both consultants will be contracted by UNIDO. The tasks of each team member are specified in the job descriptions attached to these terms of reference. Members of the evaluation team must not have been directly involved in the design and/or implementation of the programme/projects.

The Project Manager at UNIDO, DIP, TISI, and DEDE will support the evaluation team. The UNIDO GEF Coordinator will be briefed on the evaluation and equally provide support to its conduct.

### **IV. Time Schedule and Deliverables**

The mid-term evaluation is scheduled to take place in the period from January 2015 to March 2015. The field mission is planned for February 2015. At the end of the field mission, there will be a presentation of the preliminary findings for all stakeholders involved in this project in Thailand.

After the field mission, the evaluation team leader will come to UNIDO HQ for a debriefing. The draft mid-term evaluation report will be submitted 4-6 weeks after the end of the mission.

## V. Project Evaluation Parameters

The evaluation team will rate the projects. The *ratings for the parameters described in the following sub-chapters A to J will be presented in the form of a table* with each of the categories rated separately and with **brief justifications for the rating** based on the findings of the main analysis. An overall rating for the project should also be given. The rating system to be applied is specified in Annexes 1 and 2.

### A. Project design

The evaluation will examine the extent to which:

- The project's design is adequate to address the problems at hand;
- A participatory project identification process was instrumental in selecting problem areas and national counterparts;
- The project has a clear thematically focused development objective, the attainment of which can be determined by a set of verifiable indicators;
- The project was formulated based on the logical framework (project results framework) approach;
- The project was formulated with the participation of national counterpart and/or target beneficiaries; and
- Relevant country representatives (from government, industries and civil society) have been appropriately involved and were participating in the identification of critical problem areas and the development of technical cooperation strategies.

### B. Project relevance

The evaluation will examine the extent to which the project is relevant to the:

- National development and environmental priorities and strategies of the Government and population of Thailand, and regional and international agreements. See possible evaluation questions under "Country ownership/driveness" below.
- Target groups: relevance of the project's objectives, outcomes and outputs to the different target groups of the interventions (e.g. companies, civil society, beneficiaries of capacity building and training, etc.).
- The GEF's focal areas/operational programme strategies: In retrospect, were the project's outcomes consistent with the focal areas in Climate Change/operational program strategies of the GEF CC - SP2 – Promoting Energy Efficiency in the Industrial Sector? Ascertain the likely nature and significance of the contribution of the project outcomes to the wider portfolio of GEF's Focal area and Operational Program. Furthermore, the compliance with the parent program/umbrella project: "Reducing industry's carbon footprint in South East Asia through compliance with an energy management system (ISO 50001)" should be assessed.
- UNIDO's thematic priorities: were they in line with UNIDO's mandate, objectives and outcomes defined in the Programme & Budget and core competencies?
- Does the project remain relevant taking into account the changing environment? Is there a need to reformulate the project design and the project results framework given changes in the country and operational context?

### C. Effectiveness: objectives and planned final results at the end of the project

- The evaluation will assess to what extent results at various levels, including outcomes, have been achieved. In detail, the following issues will be assessed: to what extent have the expected outputs, outcomes and long-term objectives been achieved or are likely to be achieved? Has the project generated any results that could lead to changes of the assisted institutions? Have there been any unplanned effects?
- Are the project outcomes commensurate with the original or modified project objectives? If the original or modified expected results are merely outputs/inputs, the evaluators should assess if there were any real outcomes of the project and, if there were, determine whether these are commensurate with realistic expectations from the project.
- How do the stakeholders perceive the quality of outputs? Were the targeted beneficiary groups actually

reached?

- What outputs and outcomes has the project achieved so far (both qualitative and quantitative results)? Has the project generated any results that could lead to changes of the assisted institutions? Have there been any unplanned effects?
- Identify actual and/or potential longer-term impacts or at least indicate the steps taken to assess these (see also below “monitoring of long term changes”). Wherever possible, evaluators should indicate how findings on impacts will be reported in future.
- Describe any catalytic or replication effects: the evaluation will describe any catalytic or replication effect both within and outside the project. If no effects are identified, the evaluation will describe the catalytic or replication actions that the project carried out. No ratings are requested for the project’s catalytic role.

#### D. Efficiency

The extent to which:

- The project cost was effective? Was the project using the least cost options?
- Has the project produced results (outputs and outcomes) within the expected time frame? Was project implementation delayed, and, if it was, did that affect cost effectiveness or results? Wherever possible, the evaluator should also compare the costs incurred and the time taken to achieve outcomes with that for similar projects. Are the project’s activities in line with the schedule of activities as defined by the project team and annual work plans? Are the disbursements and project expenditures in line with budgets?
- Have the inputs from the donor, UNIDO and Government/counterpart been provided as planned, and were they adequate to meet requirements? Was the quality of UNIDO inputs and services as planned and timely?
- Was there coordination with other UNIDO and other donors’ projects, and did possible synergy effects happen?

#### E. Assessment of sustainability of project outcomes

Sustainability is understood as the likelihood of continued benefits after the GEF project ends. Assessment of sustainability of outcomes will be given special attention but also technical, financial and organizational sustainability will be reviewed. This assessment should explain how the risks to project outcomes will affect continuation of benefits after the GEF project ends. It will include both exogenous and endogenous risks. The following four dimensions or aspects of risks to sustainability will be addressed:

- **Financial risks.** Are there any financial risks that may jeopardize sustainability of project outcomes? What is the likelihood of financial and economic resources not being available once GEF assistance ends? (Such resources can be from multiple sources, such as the public and private sectors or income-generating activities; these can also include trends that indicate the likelihood that, in future, there will be adequate financial resources for sustaining project outcomes.) Was the project successful in identifying and leveraging co-financing?
- **Sociopolitical risks.** Are there any social or political risks that may jeopardize sustainability of project outcomes? What is the risk that the level of stakeholder ownership (including ownership by governments and other key stakeholders) will be insufficient to allow for the project outcomes/benefits to be sustained? Do the various key stakeholders see that it is in their interest that project benefits continue to flow? Is there sufficient public/stakeholder awareness in support of the project’s long-term objectives?
- **Institutional framework and governance risks.** Do the legal frameworks, policies, and governance structures and processes within which the project operates pose risks that may jeopardize sustainability of project benefits? Are requisite systems for accountability and transparency, and required technical know-how, in place?
- **Environmental risks.** Are there any environmental risks that may jeopardize sustainability of project outcomes? Are there any environmental factors, positive or negative, that can influence the future flow of project benefits? Are there any project outputs or higher level results that are likely to affect the environment, which, in turn, might affect sustainability of project benefits? The

evaluation should assess whether certain activities will pose a threat to the sustainability of the project outcomes.

#### F. Assessment of monitoring and evaluation systems

- **M&E design.** Did the project have an M&E plan to monitor results and track progress towards achieving project objectives? The Evaluation will assess whether the project met the minimum requirements for the application of the Project M&E plan (see Annex 3).
- **M&E plan implementation.** The evaluation should verify that an M&E system was in place and facilitated timely tracking of progress toward project objectives by collecting information on chosen indicators continually throughout the project implementation period; annual project reports were complete and accurate, with well-justified ratings; the information provided by the M&E system was used during the project to improve performance and to adapt to changing needs; and the project had an M&E system in place with proper training for parties responsible for M&E activities to ensure that data will continue to be collected and used after project closure. Were monitoring and self-evaluation carried out effectively, based on indicators for outputs, outcomes and impacts? Are there any annual work plans? Was any steering or advisory mechanism put in place? Did reporting and performance reviews take place regularly?
- **Budgeting and Funding for M&E activities.** In addition to incorporating information on funding for M&E while assessing M&E design, the evaluators will determine whether M&E was sufficiently budgeted for at the project planning stage and whether M&E was adequately funded and in a timely manner during implementation.

#### G. Monitoring of long-term changes

The monitoring and evaluation of long-term changes is often incorporated in GEF-supported projects as a separate component and may include determination of environmental baselines; specification of indicators; and provisioning of equipment and capacity building for data gathering, analysis, and use. This section of the evaluation report will describe project actions and accomplishments toward establishing a long-term monitoring system. The review will address the following questions:

- a. Did this project contribute to the establishment of a long-term monitoring system? If it did not, should the project have included such a component?
- b. What were the accomplishments and shortcomings in establishment of this system?
- c. Is the system sustainable—that is, is it embedded in a proper institutional structure and does it have financing? How likely is it that this system continues operating upon project completion?
- d. Is the information generated by this system being used as originally intended?

#### H. Assessment of processes affecting achievement of project results

Among other factors, when relevant, the evaluation will consider a number of issues affecting project implementation and attainment of project results. The assessment of these issues can be integrated into the analyses of project design, relevance, effectiveness, efficiency, sustainability and management as the evaluators find them fit (it is not necessary, however it is possible to have a separate chapter on these aspects in the evaluation report). The evaluation will consider, but need not be limited to, the following issues that may have affected project implementation and achievement of project results:

- a. **Preparation and readiness / Quality at entry.** Were the project's objectives and components clear, practicable, and feasible within its time frame? Were counterpart resources (funding, staff, and facilities), and adequate project management arrangements in place at project entry? Were the capacities of the executing institution and counterparts properly considered when the project was designed? Were lessons from other relevant projects properly incorporated in the project design? Were the partnership arrangements properly identified and the roles and responsibilities negotiated prior to project approval?
- b. **Country ownership/drivenness.** Was the project concept in line with the sectoral and development priorities and plans of the country—or of participating countries, in the case of multi-country projects? Are project outcomes contributing to national development priorities and plans?

Were the relevant country representatives from government and civil society involved in the project? Did the recipient government maintain its financial commitment to the project? Has the government—or governments in the case of multi-country projects—approved policies or regulatory frameworks in line with the project’s objectives?

- c. **Stakeholder involvement.** Did the project involve the relevant stakeholders through information sharing and consultation? Did the project implement appropriate outreach and public awareness campaigns? Were the relevant vulnerable groups and powerful supporters and opponents of the processes properly involved? Which stakeholders were involved in the project (i.e. NGOs, private sector, other UN Agencies etc.) and what were their immediate tasks? Did the project consult with and make use of the skills, experience, and knowledge of the appropriate government entities, nongovernmental organizations, community groups, private sector entities, local governments, and academic institutions in the design, implementation, and evaluation of project activities? Were perspectives of those who would be affected by project decisions, those who could affect the outcomes, and those who could contribute information or other resources to the process taken into account while taking decisions? Were the relevant vulnerable groups and the powerful, the supporters and the opponents, of the processes properly involved?
- d. **Financial planning.** Did the project have appropriate financial controls, including reporting and planning, that allowed management to make informed decisions regarding the budget and allowed for timely flow of funds? Was there due diligence in the management of funds and financial audits? Did promised co-financing materialize? Specifically, the evaluation should also include a breakdown of final actual project costs by activities compared to budget (variances), financial management (including disbursement issues), and co-financing.
- e. **UNIDO’s supervision and backstopping.** Did UNIDO staff identify problems in a timely fashion and accurately estimate their seriousness? Did UNIDO staff provide quality support and advice to the project, approve modifications in time, and restructure the project when needed? Did UNIDO provide the right staffing levels, continuity, skill mix, and frequency of field visits for the project?
- f. **Cofinancing and project outcomes and sustainability.** If there was a difference in the level of expected co-financing and the cofinancing actually realized, what were the reasons for the variance? Did the extent of materialization of cofinancing affect project outcomes and/or sustainability, and, if so, in what ways and through what causal linkages?
- g. **Delays and project outcomes and sustainability.** If there were delays in project implementation and completion, what were the reasons? Did the delays affect project outcomes and/or sustainability, and, if so, in what ways and through what causal linkages?
- h. **Implementation approach.** Is the implementation approach chosen different from other implementation approaches applied by UNIDO and other agencies? Does the approach comply with the principles of the Paris Declaration? Does the approach promote local ownership and capacity building? Does the approach involve significant risks?

The evaluation team will rate the project performance as required by the GEF. The ratings will be given to four criteria: Project Results, Sustainability, Monitoring and Evaluation, and UNIDO related issues as specified in Annex 2. The ratings will be presented in a table with each of the categories rated separately and with brief justifications for the rating based on the findings of the main analysis. An overall rating for the project should also be given. The rating system to be applied is specified in the same annex. As per the GEF’s requirements, the report should also provide information on project identification, time frame, actual expenditures, and co-financing in the format in Annex 4, which is modeled after the GEF’s project identification form (PIF).

## I. Project coordination and management

The extent to which:

- The national management and overall coordination mechanisms have been efficient and effective? Did each partner have assigned roles and responsibilities from the beginning? Did each partner fulfil its role and responsibilities (e.g. providing strategic support, monitoring and reviewing performance, allocating funds, providing technical support, following up on agreed/corrective actions)?
- The UNIDO HQ and Field Office based management, coordination, monitoring, quality control and

technical inputs have been efficient, timely and effective (problems identified timely and accurately; quality support provided timely and effectively; right staffing levels, continuity, skill mix and frequency of field visits)?

- The national management and overall coordination mechanisms were efficient and effective? Did each partner have specific roles and responsibilities from the beginning till the end? Did each partner fulfill its role and responsibilities (e.g. providing strategic support, monitoring and reviewing performance, allocating funds, providing technical support, following up on agreed/corrective actions)? Were the UNIDO HQ based management, coordination, quality control and technical inputs efficient, timely and effective (problems identified timely and accurately; quality support provided timely and effectively; right staffing levels, continuity, skill mix and frequency of field visits)?

#### **J. Assessment of gender mainstreaming**

The evaluation will consider, but need not be limited to, the following issues that may have affected gender mainstreaming in the project:

- To what extent were socioeconomic benefits delivered by the project at the national and local levels, including consideration of gender dimensions?
- To what extent were gender focal points/relevant CSOs involved in the development and implementation of project activities?
- To what extent did the project actively incorporate gender mainstreaming into project development and implementation?

#### **K. Procurement issues**

The following evaluation questions that will feed in the Thematic Evaluation on Procurement have been developed and would be included as applicable in all projects (for reference, please see Annex 7 of the ToR: UNIDO Procurement Process):

To what extent does the process provide adequate treatment to different types of procurement (e.g. by value, by category, by exception...):

- Was the procurement timely? How long the procurement process takes (e.g. by value, by category, by exception, etc.)
- Did the good/item(s) arrive as planned or scheduled? If no, how long were the times gained or delays. If delay, what was the reason(s)?
- Were the procured good(s) acquired at a reasonable price?
- To what extent were the procured goods of the expected/needed quality and quantity?
- Were the transportation costs reasonable and within budget. If no, please elaborate.
- Was the freight forwarding timely and within budget? If no, please elaborate.
- Who was responsible for the customs clearance? UNIDO FO? UNDP? Government? Other?
- Was the customs clearance handled professionally and in a timely manner? How many days did it take?
- How long time did it take to get approval from the government on import duty exemption?
- Which were the main bottlenecks / issues in the procurement process?
- Which good practices have been identified?
- To what extent roles and responsibilities of the different stakeholders in the different procurement stages are established, adequate and clear?
- To what extent there is an adequate segregation of duties across the procurement process and between the different roles and stakeholders?

### **VI. Reporting**

#### **Inception report**

This Terms of Reference provides some information on the evaluation methodology but this should not be regarded as exhaustive. After reviewing the project documentation and initial interviews with the project manager, the International Evaluation Consultant will prepare, in collaboration with



the national consultant, a short inception report that will operationalize the ToR relating to the evaluation questions and provide information on what type of and how the evidence will be collected (methodology). The Inception Report will focus on the following elements: preliminary project theory model(s); elaboration of evaluation methodology including quantitative and qualitative approaches through an evaluation framework (“evaluation matrix”); division of work between the International Evaluation Consultant and National Consultant; mission plan, including places to be visited, people to be interviewed and possible surveys to be conducted and a debriefing and reporting timetable

### **Evaluation report format and review procedures**

The draft report will be delivered to UNIDO Office for Independent Evaluation (the suggested report outline is in Annex 1) and circulated to UNIDO staff and national stakeholders associated with the project for factual validation and comments. Any comments or responses, or feedback on any errors of fact to the draft report provided by the stakeholders will be sent to the Project Manager for collation and onward transmission to the project evaluation team who will be advised of any necessary revisions. On the basis of this feedback, and taking into consideration the comments received, the evaluation team will prepare the final version of the mid-term evaluation report.

The evaluation team will present its preliminary findings to the local stakeholders at the end of the field visit and take into account their feed-back in preparing the evaluation report. A presentation of preliminary findings will take place in Jakarta and at HQ after the field mission.

The mid-term evaluation report should be brief, to the point and easy to understand. It must explain the purpose of the evaluation, exactly what was evaluated, and the methods used. The report must highlight any methodological limitations, identify key concerns and present evidence-based findings, consequent conclusions, recommendations and lessons. The report should provide information on when the evaluation took place, the places visited, who was involved and be presented in a way that makes the information accessible and comprehensible. The report should include an executive summary that encapsulates the essence of the information contained in the report to facilitate dissemination and distillation of lessons.

Findings, conclusions and recommendations should be presented in a complete, logical and balanced manner. The evaluation report shall be written in English and follow the outline given in Annex 1.

### **Evaluation Work Plan**

The “Evaluation Work Plan” includes the following main products:

1. Desk review, briefing by project manager and development of methodology: Following the receipt of all relevant documents, and consultation with the Project Manager about the documentation, including reaching an agreement on the Methodology, the desk review could be completed.
2. Inception report: At the time for departure to the field mission, the complete package of received materials have been reviewed and consolidated into the Inception report.
3. Field mission: The principal responsibility for managing this evaluation lies with UNIDO. It will be responsible for liaising with the project team to set up the stakeholder interviews, arrange the field missions, coordinate with the Government. At the end of the field mission, there will be a presentation of preliminary findings to the key stakeholders in the country where the project was implemented.
4. Preliminary findings from the field mission: Following the field mission, the main findings, conclusions and recommendations would be prepared and presented in the field and at UNIDO Headquarters.
5. A draft Mid-term evaluation report will be forwarded electronically to the Project Manager, who will forward the same to the UNIDO Office for Independent Evaluation and circulated to main stakeholders.
6. A final Mid-term evaluation report will incorporate comments received.

## **VII. Quality Assurance**

The Project Manager (PM) will be responsible for managing the evaluation, preparing the terms of reference (TOR) and the job description (JD) of the evaluation consultant(s) on the basis of guidance of UNIDO Office for Independent Evaluation (ODG/EVA). The PM will forward drafts and final reports to ODG/EVA for review, distribute drafts and final reports to stakeholders (upon review by ODG/EVA), and organize presentations of preliminary evaluation findings which serve to generate feedback on and discussion of evaluation findings and recommendations at UNIDO HQ. Finally, the PM will be responsible for the submission of the final Mid-Term Evaluation Report.

### **ANNEX 1 - OUTLINE OF AN IN-DEPTH PROJECT EVALUATION REPORT**

#### **Executive summary**

- Must provide a synopsis of the storyline which includes the main evaluation findings and recommendations
- Must present strengths and weaknesses of the project
- Must be self-explanatory and should be 3-4 pages in length

#### **Evaluation objectives, methodology and process**

- Information on the evaluation: why, when, by whom, etc.
- Scope and objectives of the evaluation, main questions to be addressed
- Information sources and availability of information
- Methodological remarks, limitations encountered and validity of the findings

#### **Countries and project background**

- Brief countries context: an overview of the economy, the environment, institutional development, demographic and other data of relevance to the project
- Sector-specific issues of concern to the project and important developments during the project implementation period
- Project summary:
  - Fact sheet of the project: including project objectives and structure, donors and counterparts, project timing and duration, project costs and co-financing
  - Brief description including history and previous cooperation
  - Project implementation arrangements and implementation modalities, institutions involved, major changes to project implementation
  - Positioning of the UNIDO project (initiatives of government, other donors, private sector, etc.)
  - Counterpart organization(s)

#### **Project assessment**

This is the key chapter of the report and should address all evaluation criteria and questions outlined in the TOR (see section VI Project Evaluation Parameters). Assessment must be based on factual evidence collected and analyzed from different sources. The evaluators' assessment can be broken into the following sections:

- A. Design
- B. Relevance (Report on the relevance of project towards countries and beneficiaries)
- C. Effectiveness (The extent to which the development intervention's objectives and deliverables were achieved, or are expected to be achieved, taking into account their relative importance)
- D. Efficiency (Report on the overall cost-benefit of the project and partner Countries contribution to the achievement of project objectives)
- E. Sustainability of Project Outcomes (Report on the risks and vulnerability of the project, considering the likely effects of sociopolitical and institutional changes in partner countries, and

- its impact on continuation of benefits after the GEF project ends, specifically the financial, sociopolitical, institutional framework and governance, and environmental risks)
- F. Assessment of monitoring and evaluation systems (Report on M&E design, M&E plan implementation, and Budgeting and funding for M&E activities, Project Management)
  - G. Monitoring of long-term changes
  - H. Assessment of processes affecting achievement of project results (Report on preparation and readiness / quality at entry, country ownership, stakeholder involvement, financial planning, UNIDO support, cofinancing and project outcomes and sustainability, delays of project outcomes and sustainability, and implementation approach)
  - I. Project coordination and management (Report project management conditions and achievements, and partner countries commitment)
  - J. Gender mainstreaming
  - K. Procurement issues

At the end of this chapter, an overall project achievement rating should be developed as required in Annex 2. The overall rating table required by the GEF should be presented here.

### **Conclusions, Recommendations and Lessons Learned**

This chapter can be divided into three sections:

#### **Conclusions**

This section should include a storyline of the main evaluation conclusions related to the project's achievements and shortfalls. It is important to avoid providing a summary based on each and every evaluation criterion. The main conclusions should be cross-referenced to relevant sections of the evaluation report.

#### **Recommendations**

This section should be succinct and contain few key recommendations. They should:

- Be based on evaluation findings
- Realistic and feasible within a project context
- Indicate institution(s) responsible for implementation (addressed to a specific officer, group or entity who can act on it) and have a proposed timeline for implementation if possible
- Be commensurate with the available capacities of project team and partners
- Take resource requirements into account.

Recommendations should be structured by addressees:

- UNIDO
- Government and/or Counterpart Organizations
- Donor

#### **Lessons Learned**

- Lessons learned must be of wider applicability beyond the evaluated project but must be based on findings and conclusions of the evaluation
- For each lesson the context from which they are derived should be briefly stated

**Annexes** should include the evaluation TOR, list of interviewees, documents reviewed, a summary of project identification and financial data, and other detailed quantitative information. Dissident views or management responses to the evaluation findings may later be appended in an annex.

## ANNEX 2 - OVERALL RATINGS TABLE

Criterion	Evaluator's Summary Comments	Evaluator's Rating
<b>Attainment of project objectives and results (overall rating)</b>		
<b>Sub criteria (below)</b>		
Design		
Effectiveness		
Relevance		
Efficiency		
<b>Sustainability of Project outcomes (overall rating)</b>		
<b>Sub criteria (below)</b>		
Sociopolitical risks		
Institutional framework and governance risks		
Environmental risks		
<b>Monitoring and Evaluation (overall rating)</b>		
<b>Sub criteria (below)</b>		
M&E Design		
M&E Plan Implementation (use for adaptive management)		
Budgeting and Funding for M&E activities		
Project Management		
<b>UNIDO specific ratings</b>		
<b>Quality at entry / Preparation and readiness</b>		
<b>Implementation approach</b>		
<b>UNIDO Supervision and backstopping</b>		
<b>Overall Rating</b>		

### RATING OF PROJECT OBJECTIVES AND RESULTS

- Highly Satisfactory (HS): The project had no shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Satisfactory (S): The project had minor shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Moderately Satisfactory (MS): The project had moderate shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Moderately Unsatisfactory (MU): The project had significant shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Unsatisfactory (U) The project had major shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Highly Unsatisfactory (HU): The project had severe shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

**Please note:** Relevance and effectiveness will be considered as critical criteria. The overall rating of the project for achievement of objectives and results **may not be higher** than the lowest rating on either of these two criteria. Thus, to have an overall satisfactory rating for outcomes a project must have at least satisfactory ratings on both relevance and effectiveness.

## **RATINGS ON SUSTAINABILITY**

Sustainability will be understood as the probability of continued long-term outcomes and impacts after the GEF project funding ends. The evaluation will identify and assess the key conditions or factors that are likely to contribute or undermine the persistence of benefits beyond project completion. Some of these factors might be outcomes of the project, i.e. stronger institutional capacities, legal frameworks, socio-economic incentives /or public awareness. Other factors will include contextual circumstances or developments that are not outcomes of the project but that are relevant to the sustainability of outcomes.

### Rating system for sustainability sub-criteria

On each of the dimensions of sustainability of the project outcomes will be rated as follows.

- Likely (L): There are no risks affecting this dimension of sustainability.
- Moderately Likely (ML): There are moderate risks that affect this dimension of sustainability.
- Moderately Unlikely (MU): There are significant risks that affect this dimension of sustainability.
- Unlikely (U): There are severe risks that affect this dimension of sustainability.

All the risk dimensions of sustainability are critical. Therefore, overall rating for sustainability will not be higher than the rating of the dimension with lowest ratings. For example, if a project has an Unlikely rating in either of the dimensions then its overall rating cannot be higher than Unlikely, regardless of whether higher ratings in other dimensions of sustainability produce a higher average.

## **RATINGS OF PROJECT M&E**

Monitoring is a continuing function that uses systematic collection of data on specified indicators to provide management and the main stakeholders of an ongoing project with indications of the extent of progress and achievement of objectives and progress in the use of allocated funds. Evaluation is the systematic and objective assessment of an on-going or completed project, its design, implementation and results. Project evaluation may involve the definition of appropriate standards, the examination of performance against those standards, and an assessment of actual and expected results.

The Project monitoring and evaluation system will be rated on ‘M&E Design’, ‘M&E Plan Implementation’ and ‘Budgeting and Funding for M&E activities’ as follows:

- Highly Satisfactory (HS): There were no shortcomings in the project M&E system.
- Satisfactory (S): There were minor shortcomings in the project M&E system.
- Moderately Satisfactory (MS): There were moderate shortcomings in the project M&E system.
- Moderately Unsatisfactory (MU): There were significant shortcomings in the project M&E system.
- Unsatisfactory (U): There were major shortcomings in the project M&E system.
- Highly Unsatisfactory (HU): The Project had no M&E system.

“M&E plan implementation” will be considered a critical parameter for the overall assessment of the M&E system. The overall rating for the M&E systems will not be higher than the rating on “M&E plan implementation.”

## Annex B. ORGANIZATIONS VISITED

<b>Monday, 11 May 2015</b>	
0900-1200	IEE Project Office to interview <ul style="list-style-type: none"> <li>- Ms. Uma Wirutskulshai, National Project Coordinator</li> <li>- Ms. Atchareeya Pongput, Project Assistant</li> <li>- Mr. Ampol Somboompokaphan, Training Officer</li> </ul>
<b>Tuesday, 12 May 2015</b>	
0930-1230	Visit the factory at F&N Dairies (milk and beverage), Ayutthaya <ul style="list-style-type: none"> <li>- Interviewed engineer manager and Factory Utility Engineer</li> <li>- Factory visit</li> </ul>
1530-1630	DIP Office <ul style="list-style-type: none"> <li>- Ms. Nisakorn Jungjaroentham, Deputy Director General of DIP and DIP staff</li> </ul>
<b>Wednesday, 13 May 2015</b>	
0930-1230	Visit the factory at Tong Siang (Textile), Sumutsakorn <ul style="list-style-type: none"> <li>- Group interview meeting with Energy Management Team</li> </ul>
1330-1430	UNIDO Country Office <ul style="list-style-type: none"> <li>- Meeting with Mr. Edward Clarence-Smith, Director of Regional Office in Thailand</li> </ul>
1530-1630	TISI Office <ul style="list-style-type: none"> <li>- Meeting with Dr. Sutavadee Techajunta, Head, Inspection Body Accreditation Group and TISI staff</li> </ul>
<b>Thursday, 14 May 2015</b>	
1000-1100	IEE Project Office <ul style="list-style-type: none"> <li>- Interview Dr. Somchai Dechapanichkul, Managing Director of UEE Technology (Thailand) Co.Ltd.</li> </ul>
1430-1530	DEDE Office <ul style="list-style-type: none"> <li>- Interview Dr. Pongpan Vorasayan, Engineer</li> </ul>
<b>Friday, 16 May 2015</b>	
<b>Debriefing</b>	
1300-1500	DIP Office : Presentation of preliminary findings

## **Annex C. DOCUMENTS REVIEWED**

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### Project documentation

1. Project Document - Request for CEO Endorsement, UNIDO,
2. Terms of Reference, Independent Mid-Term Evaluation of the UNIDO Project: Industrial Energy Efficiency Project; UNIDO; 2015.
3. UNIDO Annual Project Implementation Report (PIR), Fiscal Year (FY) 2014 (1 July 2013 – 30 June 2014), UNIDO, Dec. 2014
4. UNIDO Annual Project Implementation Report (PIR), 2013, UNIDO, Oct. 2013
5. UNIDO Annual Project Implementation Report (PIR), 2012, UNIDO, Oct. 2012
6. 2014 Annual Report, Industrial Energy Efficiency Project
7. Progress Report (up to April 2015)

### Background

8. Thailand 20-Year Energy Efficiency Development Plan (2011-2030)
9. Development and Status of Energy Efficiency in Thailand; PowerPoint Presentation at EGEE&C42 Meeting, Bangkok, Nov. 2013, by Danai Egkamol, DEDE
10. Peer Review on Energy Efficiency in Thailand, Asia-Pacific Economic Cooperation (APEC), March 2010
11. Thailand's Climate Change Policies, PowerPoint presentation, 12<sup>th</sup> Workshop in GHG Inventories (WGIA12), August 2014, Climate Change Management and Coordination Office, MNRE
12. Thailand's Energy Efficiency Revolving Fund: A Case Study; Prepared for APEC Energy Working Group, APEC

## **Annex D. REGIONAL SCOPE AND CONTEXT**

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### **D.1 UNIDO projects on industrial energy efficiency in SE Asia**

#### Reducing industry's carbon footprint in South East Asia through compliance with an energy management system (ISO 50001)

This programme framework was submitted by UNIDO to the Global Environment Facility (GEF) and approved by the GEF Council in November 2008. The objectives of the program are (a) controlling the growth of greenhouse gas emissions attributable to rapid industrialization in the countries of South East Asia; and (b) helping these industries reduce their costs of fuel and electricity.

In South East Asia, energy management and systems optimization projects are implemented in Indonesia, Malaysia, Myanmar, the Philippines, Thailand and Vietnam; each designed to facilitate introduction of ISO 50,000 through training and capacity building, including a technical focus on systems optimization. The program will benefit from the involvement of regional organizations concerned with accelerating the introduction of standards and with harmonization of standards as trade facilitation mechanisms. For example, the program will be coordinated with the scheduled meetings of regional bodies concerned with energy and standards including the ASEAN Consultative Committee on Standards and Quality (ACCSQ) and the Pacific Area Standards Congress (PASC).

Sustainable energy efficiency improvement in the industry sector requires focused training at the level of individual systems, going beyond generic audits and simple equipment changes. Training has been accompanied by an incentive to make energy efficiency a permanent priority for industry managers. The strategic approach taken in each of the national projects involves provision of tools and capacity building for industrial energy systems optimization and the promulgation of an energy management standard (ISO 50000), supported by appropriate project financing and the implementation by industries of energy efficiency/systems optimization projects. Similarly, in each country, capacity building is being delivered to prepare governments (standards bodies) and industries for the introduction of an energy management standard, to be compatible with the international ISO 50000.

#### Projects in Indonesia, the Philippines, and Thailand: promoting industrial efficiency through system optimization and energy management standards

The projects in these countries started in April 2011 and are expected to finalize their operations by August-December 2016. All projects have a similar structure in terms of components and expected outputs, as is summarized in the Boxes 4 and 5

#### MTR: Indonesia, the Philippines, Thailand

The GEF FSP projects in Indonesia, the Philippines and Thailand are halfway through their project implementation and therefore need to undergo a MTR. It was decided by UNIDO to award one contract for the mid-term evaluation (as lead evaluator) to the international (independent) consultant, Mr. Johannes (Jan) VAN DEN AKKER (Netherlands).



### Box 19 Overview of components and outputs in the four projects

Component	Expected outputs		
	Indonesia	Philippines	Thailand
Energy management systems	<ul style="list-style-type: none"> <li>1.1 Reinforced capacity of government institutions</li> <li>1.2 Training materials and tools developed</li> <li>1.3 National awareness campaign launched on ISO 50001</li> <li>1.4 Trained national experts &amp; factory personnel on EM</li> <li>1.5 Peer-to-Peer network established</li> </ul>	<ul style="list-style-type: none"> <li>1.1 Policy support</li> <li>1.2 Training materials and tools developed</li> <li>1.3 National awareness campaign on ISO50001 launched</li> <li>1.4 Peer-to-peer network developed</li> <li>1.5 Trained national experts/factory personnel on EM</li> </ul>	<ul style="list-style-type: none"> <li>1.1 Training material and tools on energy management developed</li> <li>1.2 National awareness campaign launched on ISO 50001</li> <li>1.3 National experts/factory personnel trained on ISO compliant EM systems</li> <li>1.4 Peer-to-peer network between industrial enterprises established and operated</li> </ul>
Systems optimization	<ul style="list-style-type: none"> <li>2.1 Training materials and tools developed</li> <li>2.2 Trained national experts/factory personnel on SO</li> <li>2.3 Equipment vendors &amp; suppliers trained on SO</li> </ul>	<ul style="list-style-type: none"> <li>2.1 Training materials and tools developed</li> <li>2.2 Trained national experts/factory personnel on SO</li> <li>2.3 Vendors participation on SO training</li> </ul>	<ul style="list-style-type: none"> <li>2.1 Training material and tools on SO developed</li> <li>2.2 National experts/factory personnel trained on SO of steam, compressed air, pumping and fans systems</li> <li>2.3 Equipment vendors &amp; suppliers trained on SO</li> </ul>
Financial capacity	<ul style="list-style-type: none"> <li>3.1 Project evaluation criteria developed and harmonized</li> <li>3.2 Training material developed and capacity of industrial enterprises built on bankable energy efficiency projects development</li> <li>3.3 Capacity of financial institutions and local banks built to promote and invest in industrial energy efficiency projects</li> </ul>	<ul style="list-style-type: none"> <li>3.1 Harmonized EE project evaluation criteria</li> <li>3.2 Training materials developed</li> <li>3.3 Managers trained on financial aspects of EE projects</li> <li>3.4 Support for packaging of loans for industrial EE projects</li> </ul>	<ul style="list-style-type: none"> <li>3.1 Harmonized EE project evaluation criteria</li> <li>3.2 Capacity of banks/FIs enhanced on EE</li> <li>3.3 Training material developed and industry managers trained on the development of financial proposals</li> </ul>
Implementation and demonstration	<ul style="list-style-type: none"> <li>4.1 Energy management systems implemented</li> <li>4.2 Documented industry demonstration projects</li> <li>4.3 Recognition program developed and implemented</li> </ul>	<ul style="list-style-type: none"> <li>1.6 ISO compliant EM systems implemented</li> <li>2.4 Documented SO demonstration projects.</li> <li>1.7 Recognition program developed</li> </ul>	<ul style="list-style-type: none"> <li>4.1 Energy management projects implemented</li> <li>4.2 Documented SO demonstration projects</li> <li>4.3 Recognition program developed</li> </ul>

## Box 20 Project budget and implementing partners

	GEF financing (USD)	Co-financing (USD)	Implementing partners
Indonesia	2,180,380	14,175,000	Ministry of Energy and Mineral Resources (MEMR), Ministry of Industry (MOI) and <i>Badan Standardisasi Nasional</i> (BSN)
Philippines	3,166,065	24,000,000	Department of Energy (DOE), Department of Trade and Industry – Bureau of Product and Standards (DTI-BPS)
Thailand	3,620,000	15,645,000	Department of Industrial Promotion (DIP); Department of Industrial Works (DIW); Thai Industrial Standards Institute (TISI); and Department of Alternative Energy Development and Efficiency (DEDE)

## D.2 Training on EnMS and systems optimization

The trainings on EnMS and SO in the various countries roughly follow the same pattern and approach, which is shortly described in this Section.

### Energy management

The technical capacity building consists of two-step trainings. The first step targets ‘training of trainers’ where international experts will deliver intensive training to national experts to a level as such that they can train others. At the second step, international and national experts provide trainings and assistance to factory personnel. The preparatory activities will include the compilation of the training material by international experts, translation, identification of initial factories for the on-site training and identification of classroom facilities. The national experts and factory engineers will be selected based on criteria agreed in consultation with the government counterparts.

#### *Intensive training for national experts:*

The UNIDO international team provide training for the national energy management experts with most of this training taking place within the first two years of the project. These individuals subsequently assume the role of national energy management experts, become a source of national energy management expertise, and serve as multipliers for project impacts. The curricula is introduced to the national experts in three stages: observing the international experts teach, co-teaching with the international experts, and teaching with international experts observing and commenting on teaching techniques. The national energy management experts are trained through a mentoring and on-the-job (OTJ) process to an intermediate level of expertise. At the end, they are expected to be capable of:

- Conducting short (one-half day) workshops for factory managers on the benefits of implementing an energy management system in conformance with ISO 50001 and highlighting the technical assistance available to participating companies
- Conducting two-day training sessions for energy managers on implementation of an energy management system in conformance with ISO 50001, including information on internal auditing techniques
- Coaching facility personnel on energy management system implementation.

#### *Energy management trainings for factory managers and personnel*

At this second step, UNIDO’s international team along with trained national experts will conduct additional energy management training sessions. Together, they will develop specific criteria to select relevant participants for whom they will conduct energy management training sessions:

- Half-day workshops for factory personnel, including energy managers. The purpose is to encourage managers to register their key staff to participate in the subsequent full-day implementation training

sessions. The role of ISO 50001 in improving competitiveness, EE mandates, and enhancing prospects for international trade will be discussed at the workshop. A part of the workshop will be dedicated to presenting the range of technical assistance that would be available to their company and staff as a benefit of project participation. A guest speaker from the industry who is already engaged in energy management will also be sought for each workshop;

- Factory managers will receive two-day training on ISO 50001 energy management system implementation and internal auditing techniques to assist them in conforming to ISO 50001. The assumption is that, a significant portion of factory managers participating in the half-day workshops will choose to commit their employees to the energy management system implementation training.

The two-day training will guide participants through the Plan-Do-Check-Act cycle as it applies to the ISO 50001 energy management system. Instruction will be given on how to establish an effective energy plan, set improvement targets and objectives, establish energy performance indicators, and identify significant energy uses and opportunities for improvement. At least half a day will be dedicated to internal auditing and integrating the ISO 50001 energy management system into existing ISO management systems such as ISO 9001 and 14001.

### Systems optimization

This capacity building follows the same two-phase training approach as explained under ‘energy management’. Steam system optimization trainings are very technical trainings, which allow the trained local expert to learn and practice the system optimization assessment from UNIDO international experts. The trained local experts learn how to utilize the system optimization measurement devices, and use the analysis software to assess the industry steam, pump and compressed air system optimization opportunities.

The preparatory activities involve the compilation of training materials by international teams, translation, the identification of appropriate factories for the in-plant training with requisite compressor/steam systems, securing approval of site visits, purchase of measurement equipment to perform the in-plant training, acquisition of technical data from host plants pertaining to the systems and components to be evaluated by the teams, identification of classroom facilities, provision of accommodation for trainees, etc.

#### *Intensive training for national experts in systems optimization (SO)*

In the first phase, one-to-one and one-to-many training and implementation schemes will be achieved, in which UNIDO’s team of international experts is engaged in initial capacity building to create a core of highly skilled national experts. These individuals would subsequently assume roles as systems optimization experts, become a source of national systems optimization expertise, and serve as multipliers for project impacts. To ensure success of the project, trainees will be rigorously selected based on technical and training capabilities and consultation with the government counterpart ministry.

The SO training consists of:

- Training of national systems optimization experts by the UNIDO international team in classroom and plant settings. The national experts will be trained “on-the-job” on the use of measuring instrumentation, data collection and analysis, and the preparation of investment proposals for energy system improvements which are subsequently submitted to the management of the plants hosting the training.
- Training on use of UNIDO’s tools designed to assist national experts and their industrial customers in developing and documenting sustainable projects.
- Prepare national systems optimization experts to deliver training (specific to each system type) curricula.

Most of this training will take place within the first two years of the project. The national experts will receive both classroom training and on- site interactive training involving participating industrial facilities. Following completion of initial systems optimization training courses, the international team returns to work with their trainees on plant assessment and project development skills. In addition, the international experts

will prepare and observe trained national experts conducting training of local personnel in “factory training sessions”.

*Factory personnel capacity building on systems optimization*

At this second stage, UNIDO’s international team and trained national experts will jointly conduct additional systems optimization training sessions.

- One-day trainings for factory personnel across the country to introduce general concepts on pumping systems, steam systems, and compressed air systems optimization. This session will be a mix of theory and practical considerations.
- About half of factory employees that have already taken part in the 1-day training sessions will receive additional 2-day training sessions in the utilization of the UNIDO’s tools designed and developed under this component.

For a list of international experts involved in training on EnMS and SO in the Philippines, Thailand and Indonesia, the reader is referred to Box 24.

**Box 21 International trainers, UNIDO IEE projects in South-East Asia**

Trainer	System	Project Country
Stefan Walta	EnMS	Philippines, Indonesia
Richard Morrison	EnMS	Philippines, Thailand
Michael Doyle	EnMS	Thailand, Indonesia
Gunnar Hovstadius*	PSO	Philippines, Thailand, Indonesia
Eric Harding	CASO	Philippines, Thailand, Indonesia
Mark Pollard	CASO	Philippines, Thailand
Ian Moore	CASO	Indonesia
Ron Wroblewski*	FSO	Thailand
Riyaz Papar*	SSO	Thailand, Indonesia, Philippines
Veerasamy Venkatesan	SSO	Philippines

\* Also developed the training materials for their respective systems.

**D.3 Approach followed in reviews and evaluations; evaluation matrix**

Mid-term reviews and final evaluations

Independent evaluations of technical cooperation activities, such as projects, can take the form of mid-term, terminal or ex-post evaluations (UNIDO Evaluation Policy, 2006). Independent evaluations can be mandatory for programs and projects as established in funding agreements with donors. As outlined in the GEF Monitoring and Evaluation Policy<sup>16</sup>, all GEF-financed projects must receive a final (or **terminal evaluation**, (or TE) while mid-term evaluations (called **mid-term reviews**, or MTR) are mandatory for full-sized projects (GEF FSPs) only. All evaluations need to be undertaken by independent consultants, i.e. who has not been previously involved in project design, management or implementation of project activities. The reviews/evaluation will be carried out in accordance with the principles formulated by the UN Evaluation Group (UNEG)<sup>17</sup>.

The MTR and TE processes are quite similar, although the focus differs slightly. MTRs focus on a) assessment of progress towards results, b) monitoring of implementation and management, c) early identification of risks (to sustainability) and d) providing recommendations for corrective actions and future directions. Terminal evaluations also focus on a) assessments of results and implementation, b) identification

<sup>16</sup> The GEF Monitoring and Evaluation Policy (GEF Secretariat, 2010)

<sup>17</sup> UNEG Quality Checklist for Evaluation Reports, UNEG/G(2010)/2

of the project's successes and actions needed for consolidation of replicability and sustainability, c) emphasis on lessons learnt and recommendations for future project designs.

*This 'multi-country' evaluation approach has the advantage that the results of the similar projects in various countries can be compared and country-specific situations (that may positively or negatively affect results) can be filtered out, which allows to have a more profound assessment.* However, the findings of the reviews will be presented in separate reports per country as per GEF and UNIDO requirements, although the Evaluator will indicate common elements in an Annex on regional aspects.

#### Evaluation matrix

The following table relates the main evaluation parameters with the various sections of the proposed outline of the review/evaluation report.

**Box 22 Outline of the MTR report and link with criteria and questions in evaluation matrix**

Contents	Model evaluation criteria and/or questions	Indicator(s)	Means and sources of verification
<p>3. Findings: Relevance and design</p> <ul style="list-style-type: none"> <li>• Relevance and country drivenness</li> <li>• Stakeholder involvement</li> <li>• Assessment of logframe and M&amp;E design</li> </ul>	<p><b>Relevance:</b></p> <ul style="list-style-type: none"> <li>• National development and environmental priorities and strategies of the Government and population of Indonesia, and regional and international agreements. Was the project concept in line with the sectoral and development priorities and plans of the country—or of participating countries, in the case of multi-country projects? Are project outcomes contributing to national development priorities and plans?</li> <li>• Relevance of the project’s objectives, outcomes and outputs to the different target groups of the interventions. Is the Project addressing the needs of the target beneficiaries?</li> <li>• Consistency with the GEF focal areas in Climate Change/operational program strategies of the GEF CC - SP2 – Promoting Energy Efficiency in the Industrial Sector? UNIDO’s thematic priorities: were they in line with UNIDO’s mandate, objectives and outcomes defined in the Programme &amp; Budget and core competencies?</li> <li>• Links with the parent program/umbrella project: “Reducing industry’s carbon footprint in South East Asia through compliance with an energy management system (ISO 50001)”</li> </ul> <p><b>Design:</b></p> <ul style="list-style-type: none"> <li>• The project’s design is adequate to address the problems at hand;</li> <li>• A participatory project identification process was instrumental in selecting problem areas and national counterparts; The project was formulated with the participation of national counterpart and/or target beneficiaries;</li> <li>• Were lessons from other relevant projects properly incorporated in the project design? Were the partnership arrangements properly identified and the roles and responsibilities negotiated prior to project approval?</li> <li>• The project has a clear thematically focused development objective, the attainment of which can be determined by a set of verifiable indicators; The project was formulated based on the</li> </ul>	<p><b>Relevance:</b></p> <ul style="list-style-type: none"> <li>• Relationship between the Project objectives and the GEF climate change focal area;</li> <li>• Relationship between identified national energy priorities, policies and strategies</li> <li>• Perceptions of in-country stakeholders, including energy sector practitioners, CSOs, NGOs, communities, local government, as to whether Project responds to national priorities and existing capacities</li> </ul> <p><b>Design:</b></p> <ul style="list-style-type: none"> <li>• Degree of involvement of government partners and other stakeholders in the Project design process</li> <li>• Coherency and complementarity with other national and donor programmes</li> <li>• Number and type of performance measurement indicators for monitoring of implementation of strategy and intended results in planning documents (SMART indicators);</li> <li>• Number and type of</li> </ul>	<ul style="list-style-type: none"> <li>• Desk review of project design and technical documents; documents from GEF and other donors; national policies and strategies;</li> <li>• Interviews with project staff management, project partners (incl. former staff), stakeholders (industry, banks, associations) and UNIDO staff</li> </ul>

Contents	Model evaluation criteria and/or questions	Indicator(s)	Means and sources of verification
	logical framework (project results framework) approach; <ul style="list-style-type: none"> <li>• Have any amendments to the assumptions or targets been made or planned during the Project's implementation?</li> <li>• M&amp;E design. Did the project have an M&amp;E plan to monitor results and track progress towards achieving project objectives?</li> </ul>	amendments made to project design	
4. Findings: Results and effectiveness <ul style="list-style-type: none"> <li>• Assessment of outcomes and outputs (cf. with baseline indicators)</li> <li>• Effectiveness</li> <li>• Global environmental and other impacts</li> </ul>	<b>Results and effectiveness</b> <ul style="list-style-type: none"> <li>• Are the project outcomes commensurate with the original or modified project objectives? How do the stakeholders perceive the quality of outputs? Were the targeted beneficiary groups actually reached?</li> <li>• What outputs and outcomes has the project achieved so far (both qualitative and quantitative results)? Has the project generated any results that could lead to changes of the assisted institutions? Have there been any unplanned effects?</li> </ul> <b>Impacts</b> <ul style="list-style-type: none"> <li>• Describe project actions and accomplishments toward establishing a long-term monitoring system (environmental baselines; specification of indicators; and provisioning of equipment and capacity building for data gathering, analysis, and use)</li> <li>• To what extent were socioeconomic benefits delivered by the project at the national and local levels, including consideration of gender dimensions? To what extent did the project actively incorporate gender mainstreaming into project development and implementation?</li> </ul>	<b>Results and effectiveness:</b> <ul style="list-style-type: none"> <li>• Program level of achievement (intended and unintended outputs, outcomes and impacts)</li> <li>• Number of planned vs. implemented Projects/activities (see progress indicators in document)</li> </ul>	<ul style="list-style-type: none"> <li>• Desk review of project design and technical documents (incl. PIRs; results framework; monitoring data on company participation and energy savings); other relevant docs</li> <li>• Interviews with project partners, stakeholders (industry, banks, associations), and UNIDO staff; interviews with project experts (national and international);</li> <li>• Visit to beneficiary companies</li> </ul>
5. Findings: implementation, processes and efficiency <ul style="list-style-type: none"> <li>• Management and administration; role of UNIDO</li> <li>• Monitoring and evaluation systems</li> </ul>	<b>Implementation and management</b> <ul style="list-style-type: none"> <li>• Were counterpart resources (funding, staff, and facilities), and adequate project management arrangements in place at project entry? Was any steering or advisory mechanism put in place?</li> <li>• The national management and overall coordination mechanisms have been efficient and effective? Did each partner have assigned</li> </ul>	<b>Implementation and management</b> <ul style="list-style-type: none"> <li>• Examples of changes made in approach or strategy by management;</li> <li>• Timeline for implementation</li> </ul>	<ul style="list-style-type: none"> <li>• Desk review of project design and technical documents (incl. PIRs; data on budget; other</li> </ul>

Contents	Model evaluation criteria and/or questions	Indicator(s)	Means and sources of verification
<ul style="list-style-type: none"> <li>Stakeholder engagement and communications</li> <li>Budget, expenditures and co-financing; procurement</li> </ul>	<p>roles and responsibilities from the beginning? Did each partner fulfil its role and responsibilities? Adaptive management practices</p> <ul style="list-style-type: none"> <li>UNIDO’s supervision and backstopping. Did UNIDO staff identify problems in a timely fashion and accurately estimate their seriousness? Did UNIDO staff provide quality support and advice to the project, approve modifications in time, and restructure the project when needed? Did UNIDO provide the right staffing levels, continuity, skill mix, and frequency of field visits for the project?</li> </ul> <p><b>Assessment of M&amp;E system</b></p> <ul style="list-style-type: none"> <li><i>M&amp;E plan implementation.</i> The evaluation should verify that an M&amp;E system was in place and facilitated timely tracking of progress toward project objectives by collecting information on chosen indicators continually throughout the project implementation period; annual project reports were complete and accurate, with well-justified ratings. Was the information provided by the M&amp;E system was used to improve performance and to adapt to changing needs; Are there any annual work plans?</li> <li><i>Budgeting and Funding for M&amp;E activities.</i> Was M&amp;E was sufficiently budgeted for at the project planning stage and whether M&amp;E was adequately funded and in a timely manner during implementation.</li> </ul> <p><b>Stakeholder involvement</b></p> <ul style="list-style-type: none"> <li>Did the project involve the relevant stakeholders through information sharing and consultation? Did the project implement appropriate outreach and public awareness campaigns? Which stakeholders were involved in the project (i.e. NGOs, private sector, other UN Agencies etc.) and what were their immediate tasks? Did the project consult with and make use of the skills, experience, and knowledge of the appropriate government entities, NGOs, community groups, private sector entities, local governments, and academic institutions in the design, implementation, and evaluation of project activities? Were perspectives of those who would be affected by project decisions, those who could affect the outcomes, and those who could contribute information or other resources to the process taken into account while taking decisions?</li> </ul> <p><b>Financial planning and procurement</b></p>	<p>and completion of activities</p> <ul style="list-style-type: none"> <li>Evidence of clear roles and responsibilities for operational and management structure</li> </ul> <p><b>M&amp;E</b></p> <ul style="list-style-type: none"> <li>Existence of a Project M&amp;E system, including relevant processes and mechanisms for, monitoring, reporting, data collection &amp; management, and learning;</li> <li>Actual use of the M&amp;E system to change or improve decision- making/adaptive management</li> <li>Quality and quantity of progress reports</li> </ul> <p><b>Stakeholders and communications</b></p> <ul style="list-style-type: none"> <li>Extent to which the implementation of the Project has been inclusive of relevant stakeholders and collaboration between partners and/or local partnerships have been developed</li> <li>Client/Stakeholder satisfaction with Project staff</li> <li>Extent to which lessons learnt have been communicated to project stakeholders and other related programs and projects</li> </ul> <p><b>Financial planning</b></p> <ul style="list-style-type: none"> <li>Extent to which inputs have been of suitable quality and</li> </ul>	<p>relevant docs; media coverage, official notices and press releases</p> <ul style="list-style-type: none"> <li>Interviews with project partners, stakeholders (industry, banks, associations) and UNIDO staff; interviews with project experts (national and international)</li> </ul>



Contents	Model evaluation criteria and/or questions	Indicator(s)	Means and sources of verification
	<ul style="list-style-type: none"> <li>• Did the project have appropriate financial controls, including reporting and planning, that allowed management to make informed decisions regarding the budget and allowed for timely flow of funds? Did promised co-financing materialize? Specifically, the evaluation will also include a breakdown of final actual project costs by activities compared to budget (variances), financial management (including disbursement issues), and co-financing.</li> <li>• If there was a difference in the level of expected co-financing and the co-financing actually realized, what were the reasons for the variance? Did the extent of materialization of co-financing affect project outcomes and/or sustainability, and, if so, in what ways and through what causal linkages?</li> <li>• To what extent does the process provide adequate treatment to different types of procurement (e.g. by value, by category, by exception...)</li> </ul> <p><b>Efficiency and cost-effectiveness</b></p> <ul style="list-style-type: none"> <li>• Has the project produced results (outputs and outcomes) within the expected time frame? Was project implementation delayed, and, if it was, did that affect cost effectiveness or results? If there were delays in project implementation and completion, what were the reasons? Did the delays affect project outcomes and/or sustainability, and, if so, in what ways and through what causal linkages?</li> <li>• Wherever possible, the evaluator should also compare the costs incurred and the time taken to achieve outcomes with that for similar projects. Are the project's activities in line with the schedule of activities as defined by the project team and annual work plans? Are the disbursements and project expenditures in line with budgets?</li> <li>• The project cost was effective? Was the project using the least cost options?</li> <li>• Have the inputs from the donor, UNIDO and Government/counterpart been provided as planned, and were they adequate to meet requirements? Was the quality of UNIDO inputs and services as planned and timely?</li> </ul>	<p>available when required to allow the Project to achieve the expected results;</p> <ul style="list-style-type: none"> <li>• Planned vs. actual budget and co-finance realization</li> <li>• Percentage of budget for management and operations (vs. other activities); Percentage of budget spent on M&amp;E systems</li> </ul> <p><b>Effectiveness</b></p> <ul style="list-style-type: none"> <li>• Perceptions as to cost-effectiveness of program</li> </ul>	

Contents	Model evaluation criteria and/or questions	Indicator(s)	Means and sources of verification
<p>6. Findings: sustainability</p> <ul style="list-style-type: none"> <li>Risks and external factors</li> <li>Replication</li> </ul>	<p><b>Sustainability</b></p> <ul style="list-style-type: none"> <li><i>Financial risks.</i> Are there any financial risks that may jeopardize sustainability of project outcomes? What is the likelihood of financial and economic resources not being available once GEF assistance ends? (Such resources can be from multiple sources, such as the public and private sectors or income-generating activities; these can also include trends that indicate the likelihood that, in future, there will be adequate financial resources for sustaining project outcomes.) Was the project successful in identifying and leveraging co-financing?</li> <li><i>Sociopolitical risks.</i> Are there any social or political risks that may jeopardize sustainability of project outcomes? What is the risk that the level of stakeholder ownership (including ownership by governments and other key stakeholders) will be insufficient to allow for the project outcomes/benefits to be sustained? Do the various key stakeholders see that it is in their interest that project benefits continue to flow? Is there sufficient public/stakeholder awareness in support of the project's long-term objectives?</li> <li><i>Institutional framework and governance risks.</i> Do the legal frameworks, policies, and governance structures and processes within which the project operates pose risks that may jeopardize sustainability of project benefits? Are requisite systems for accountability and transparency, and required technical know-how, in place?</li> <li><i>Environmental risks.</i> Are there any environmental risks that may jeopardize sustainability of project outcomes? Are there any environmental factors, positive or negative, that can influence the future flow of project benefits? Are there any project outputs or higher level results that are likely to affect the environment, which, in turn, might affect sustainability of project benefits? The evaluation should assess whether certain activities will pose a threat to the sustainability of the project outcomes.</li> </ul> <p><b>Replication</b></p> <ul style="list-style-type: none"> <li>Describe any catalytic or replication effects: the evaluation will describe any catalytic or replication effect both within and outside the project. If no effects are identified, the evaluation will describe the catalytic or replication actions that the project carried out</li> </ul>	<p><b>Sustainability</b></p> <ul style="list-style-type: none"> <li>Extent to which risks and assumptions are adequate and are reflected in the project documentation</li> <li>Extent to which project is likely to be sustainable beyond the project;</li> </ul> <p><b>Replication</b></p> <ul style="list-style-type: none"> <li>Replication of activities with high levels of achievement toward objectives in other countries/interventions</li> </ul>	<ul style="list-style-type: none"> <li>Desk review of project design and technical documents (incl, PIRs; other relevant docs)</li> <li>Interviews with project staff, project partners, stakeholders (industry, banks, associations) and UNIDO staff; interviews with project experts (national and international)</li> </ul>

Contents	Model evaluation criteria and/or questions	Indicator(s)	Means and sources of verification
<p>7. Conclusions and recommendations</p> <ul style="list-style-type: none"> <li>• Conclusions on attainment of objectives and results</li> <li>• Lessons learned</li> <li>• Recommendations</li> </ul>	<ul style="list-style-type: none"> <li>• Evaluation conclusions related to the project’s achievements and shortfalls</li> <li>• What recommendations, if any, can be made based on the mid-term review to ensure the Project is on track to meet its targets?</li> <li>• Does the project remain relevant taking into account the changing environment? Is there a need to reformulate the project design and the project results framework given changes in the country and operational context?</li> </ul>	<ul style="list-style-type: none"> <li>• Perceptions of or actual levels of relative effectiveness and/or efficiency of the project cf. with other projects; Perceptions of clients, partners, and other stakeholders as to tangible development results stemming from Project activities/involvement</li> <li>• Lessons that have been learned regarding achievement of outcomes</li> <li>• Changes could have been made (if any) to the design to improve the achievement of the results</li> </ul>	<ul style="list-style-type: none"> <li>• Interviews with project staff and partners</li> <li>• Desk review of project docs and reports as well as external policy and other docs</li> </ul>

## Annex E. ABOUT THE EVALUATORS

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**Mr. Jan VAN DEN AKKER** is a technology management scientist with a Master's degree from Eindhoven University of Technology (Netherlands), specializing in international development cooperation. He is an expert on sustainable energy policy and technologies. Mr. Van den Akker specializes in studies and analytical work, project design and development, project coordination and implementation, project monitoring and evaluation, knowledge management, capacity strengthening and public-private partnerships in the field of sustainable energy strategies, energy efficiency, energy technologies and supply, climate change and the Clean Development Mechanism. He has lived and worked abroad for over 7 years in Zambia, Mexico and Thailand. In addition, has undertaken numerous short missions to about 45 countries in Africa, Latin America and Asia & the Pacific.

In 2003/2004 he founded ASCENDIS, as an independent office, and has been providing consultancy on sustainable energy and climate change, specializing in development issues. ASCENDIS is based in Westerhoven, Netherlands, but offers services in Africa, Asia and the Pacific, Europe and Latin America & the Caribbean, often by associating itself with local freelance experts, professionals and organizations. As a long-term expert with the United Nations system, Mr. Van den Akker has provided advice to governments and organizations on the design of investment and capacity building programs for UNEP, UNDP and UNIDO (mostly in GEF-funded activities), UNFCCC, European Commission and for NGOs/consultancy companies (e.g., Practical Action Consulting, Winrock) in the area of renewable energy, energy efficiency and sustainable transportation. He has reviewed and evaluated about 30 GEF-funded sustainable energy projects.

**Ms. Tharee KAMUANG** is an urban and environment researcher for over 17 years, has been working with the leading environmental NGO in Thailand and implemented more than 30 projects in collaboration with local communities, school teachers and children, as well as with local and national government institutes.

The focus of her work are urban environment management as well as climate change mitigation and adaptation, with an emphasis on sustainable development and good governance as a cross section. Specific achievements of her work are the development of framework and indicators for Sustainable City Award in Thailand since 2003, toolkit for school teachers on climate change and the promotion of urban agriculture and biodiversity for climate change adaptation in Thai cities, The Promotion of Low Carbon City across Thai Municipalities” under the Municipality League of Thailand (NMT) funded by the European Union (EU)

She also has experience to work with international organizations such as Konrad Adenauer Stiftung, under the DELGOSEA project as National Coordinator for Thailand from 1st March 2011 until 28th February 2012. In her function she was responsible to implement the project activities in Thailand. In 2014 she was a National Stakeholder Engagement Specialist and PPG Coordinator of Achieving Low Carbon Growth in the Cities through Sustainable Urban Systems Management in Thailand with UNDP.

## **Annex F. EVALUATION CONSULTANT CODE OF CONDUCT FORM**

### **Evaluators:**

1. Must present information that is complete and fair in its assessment of strengths and weaknesses so that decisions or actions taken are well founded
2. Must disclose the full set of evaluation findings along with information on their limitations and have this accessible to all affected by the evaluation with expressed legal rights to receive results.
3. Should protect the anonymity and confidentiality of individual informants. They should provide maximum notice, minimize demands on time, and respect people's right not to engage. Evaluators must respect people's right to provide information in confidence, and must ensure that sensitive information cannot be traced to its source. Evaluators are not expected to evaluate individuals, and must balance an evaluation of management functions with this general principle.
4. Sometimes uncover evidence of wrongdoing while conducting evaluations. Such cases must be reported discreetly to the appropriate investigative body. Evaluators should consult with other relevant oversight entities when there is any doubt about if and how issues should be reported.
5. Should be sensitive to beliefs, manners and customs and act with integrity and honesty in their relations with all stakeholders. In line with the UN Universal Declaration of Human Rights, evaluators must be sensitive to and address issues of discrimination and gender equality. They should avoid offending the dignity and self-respect of those persons with whom they come in contact in the course of the evaluation. Knowing that evaluation might negatively affect the interests of some stakeholders, evaluators should conduct the evaluation and communicate its purpose and results in a way that clearly respects the stakeholders' dignity and self-worth.
6. Are responsible for their performance and their product(s). They are responsible for the clear, accurate and fair written and/or oral presentation of study limitations, findings and recommendations.
7. Should reflect sound accounting procedures and be prudent in using the resources of the evaluation.

### **Evaluation Consultant Agreement Form**

Agreement to abide by the Code of Conduct for Evaluation in the UN System

Name of Consultant: J.H.A. VAN DEN AKKER (as Team Leader)

Name of Consultancy Organization (where relevant): \_\_\_\_\_

I confirm that I have received and understood and will abide by the United Nations Code of Conduct for Evaluation.

Signed at Westerhoven, Netherlands

Signature: \_\_\_\_\_

