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Independent terminal evaluation

Royal Government of Cambodia

Reducing Greenhouse Gas Emissions through Improved Energy Efficiency in the Industrial Sector

UNIDO project number: GF/CMB/11/001

SAP 104034, GEF ID: 3976



**UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION**

UNIDO OFFICE FOR INDEPENDENT EVALUATION

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This document has not been formally edited.

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Abbreviations and acronyms

ASEAN	Association of South East Asian Nations
AWP	Annual work plan
BEE	Bureau of Energy Efficiency (Government of India)
CCC	Cambodian Chamber of Commerce
CCD	Climate Change Department (under MoE)
CCM	Climate change mitigation
COMFAR	UNIDO's Computer Model for Feasibility Analysis and Reporting
CTA	Chief technical advisor
EED	Energy Efficiency Department (under MoME)
EMS	Environmental management system
EOP	End of project
ESCO	Energy service company
EVA	UNIDO Evaluation Group
FSP	Full Scale Proposal
GDP	Gross domestic product
GEF	Global Environment Facility
GHG	Greenhouse gas
GJ	Gigajoules
GMAC	Garment Manufacturers Association of Cambodia
HQ	Headquarters
HUO	Head of UNIDO Office in Cambodia
IEE	Industrial energy efficiency
ISO	International Standard Organization
ITC	Institute of Technology of Cambodia
kWh	Kilowatt hour
LDC	Least developed country
LEAP	Long-range energy alternative planning system
M&E	Monitoring and evaluation
MAFF	Ministry of Agriculture, Fisheries and Forests
MIME	The former Ministry of Industry, Mines and Energy
MJ	Megajoules
MoE	Ministry of Environment
MoIH	Ministry of Industry and Handicrafts
MoME	Ministry of Mines and Energy
MW	Megawatt
MRV	Measurement, reporting and verification
NCPO-C	National Cleaner Production Office of Cambodia
PAC	Project Advisory Committee
PC	Project coordinator

PIF	Project identification form
PIR	Project implementation report
PMU	Project management unit
PPG	Project Preparation Grant
PSC	Project Steering Committee
PSMIA	Phnom Penh Small and Medium Industry Association
RGoC	Royal Government of Cambodia
RUPP	Royal University of Phnom Penh
SEC	Specific energy consumption
SMART	Specific, measurable, attainable, relevant and time bound
SME	Small to medium enterprises
SNC	Second National Communication
SPIN	Sustainable Product Innovation Project (EU-funded)
TT	Technology transfer
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework on Climate Change Convention
UNIDO	United Nations Industrial Development Organization
VSBK	Vertical shaft brick kiln
WB	World Bank

Glossary of evaluation related terms

Term	Definition
Baseline	The situation, prior to an intervention, against which progress can be assessed.
Effect	Intended or unintended change due directly or indirectly to an intervention.
Effectiveness	The extent to which the development intervention's objectives were achieved, or are expected to be achieved.
Efficiency	A measure of how economically resources/inputs (funds, expertise, time, etc.) are converted to results.
Impact	Positive and negative, intended and non-intended, directly and indirectly, long term effects produced by a development intervention.
Indicator	Quantitative or qualitative factors that provide a means to measure the changes caused by an intervention.
Lessons learned	Generalizations based on evaluation experiences that abstract from the specific circumstances to broader situations.
Logframe (logical framework approach)	Management tool used to facilitate the planning, implementation and evaluation of an intervention. It involves identifying strategic elements (activities, outputs, outcome, and impact) and their causal relationships, indicators, and assumptions that may affect success or failure. Based on RBM (results based management) principles.
Outcome	The likely or achieved (short-term and/or medium-term) effects of an intervention's outputs.
Outputs	The products, capital goods and services which result from an intervention; may also include changes resulting from the intervention which are relevant to the achievement of outcomes.
Relevance	The extent to which the objectives of an intervention are consistent with beneficiaries' requirements, country needs, global priorities and partners' and donor's policies.
Risks	Factors, normally outside the scope of an intervention, which may affect the achievement of an intervention's objectives.
Sustainability	The continuation of benefits from an intervention, after the development assistance has been completed.
Target groups	The specific individuals or organizations for whose benefit an intervention is undertaken.

Executive summary

Purpose and methodology of the evaluation

The main purpose of the evaluation was to provide GEF, UNIDO and partners in Cambodia with an opportunity to review the advances made by the GEF-funded project “Reducing Greenhouse Gas Emissions through Improved Energy Efficiency in the Industrial Sector” (herein referred to as the “IEE Project” or “Project”), as well as its activities, results, achievements, relevance, and to propose recommendations that could increase efficiency and effectiveness of project activities. Ultimately these lessons learned would be used to replicate the experience on other projects.

The main issues addressed were project relevance and design, effectiveness and efficiency as well as an assessment of sustainability of project outcomes, monitoring and evaluation systems, project management and processes affecting attainment of project results.

This independent final evaluation followed evaluation guidelines and policies of UNIDO and according to the terms of reference, included as annex 1. The evaluation was commissioned by UNIDO, conducted using a participatory approach through a field mission that took place at the beginning of the 5th year of implementation (June 10-24, 2015) in Phnom Penh. The evaluation team (ET) was composed of Mr. Roland Wong as International Evaluation Consultant and Team Leader, and Dr. In Sokneang as National Evaluation Consultant.

Methodological remarks, sources of information

Through the documentary information and the information collected in the field, the evaluators consider that there was sufficient evidence to allow them to establish a baseline for the project; sources of information were sufficient to verify and document the progress and constraints encountered during the assessment; data and information derived from interviews were qualitatively satisfactory and verified through comparison of figures from different sources and crosschecked interviews with relevant actors in an independent way, showing that respondents views and contributions were in full agreement.

Sector specific issues of concern

In its efforts to keep pace with the economic development of other ASEAN countries, the Royal Government of Cambodia (RGoC) has recognized the need for its industrial sector to become more competitive as the cost of production and energy continues to rise. Energy intensities of industrial production in Cambodia are high in comparison to the industrial sector of other ASEAN countries. This can be attributed the country’s ongoing recovery commencing in 1994 from years of conflict, and the emergence of a fledgling but vibrant industrial sector. The predominant industries in Cambodia are generally small-to-medium enterprises (SMEs) where entrepreneurs have not had much benefit from foreign experiences in industrial development¹. Many of them have had no formal

¹ In 2013, the Ministry of Commerce estimates that there are 505,000 SMEs in the country where only 3.5% of these SMEs have been registered. They have also estimated that 72% of the SMEs are family-run businesses 1 to 3 employees.

training and critical business decision making often rests with the owner without the benefit of trained technical personnel. More importantly, procurement decisions are almost always based on the lowest cost notwithstanding the risks associated with inferior equipment. As a consequence, many of these SMEs are primarily profit-driven without knowledge of how energy costs can reduce their operational costs.

Project summary

The main goal of the project was to reduce greenhouse gas (GHG) emissions and specific energy consumption (SEC) of the Cambodian industrial sector. This was to be achieved through a number of project activities with the following intended outcomes:

- Demonstrated energy savings on industrial energy efficiency (IEE) pilot projects;
- Availability of national service providers in IEE;
- Stronger institutional framework in place to ensure long-term support for energy reduction in industrial enterprises;
- Increased adoption by Cambodian industrial enterprises of EE practices and technologies that would create a national market for IEE products and services; and
- Established policy, legal and regulatory framework that will sustain promotion and support of IEE.

Targeted stakeholders of the project include owners and managers of energy-intensive industrial operations from five sectors (food processing including rice milling, ice making, brick making, rubber processing and the garments sector), industrial sector policy makers, consulting engineering companies, energy professionals, suppliers of industrial equipment and academic institutions.

Project activities included providing technical support to MoIH and MoME to develop and help establish market oriented policy and regulatory instruments needed to support sustainable progression of Cambodian industries towards international best achievable energy performance and to stimulate the creation of a market for industrial energy efficiency (IEE) products and services.

History of project implementation

The National Cleaner Production Office of Cambodia (NCPO-C) is a part of a global network of cleaner production offices globally under UNIDO. Many of the projects at NCPO-C between 2004 and 2010 were related to resource efficiency including energy efficiency for industries with higher energy intensities; as such, the NCPO-C was well suited to serve as an executing partner of the IEE Project. The preparatory phase for the GEF-supported IEE Project was undertaken during 2009 and 2010, led by the CTA of NCPO-C with support from NCPO-C staff. Project commenced operations in November 2010 with NCPO-C serving as the primary executing partner. Much of the project design was based on previous and current projects being implemented at various UNIDO-supported Cleaner Production Centers in other countries.

Project assessment

Main findings and conclusions

This project achieved a great degree of technical success that significantly raised awareness of industrial SMEs to the benefits of industrial energy efficiency. Specifically, the project's contributions that have led to this raised awareness and subsequent investment includes: i) exposure of participating enterprises to successful IEE demonstrations; ii) completed training and certification of national energy experts; iii) pilot adoption of environmental management systems into industrial operations under the framework of ISO 50001; and iv) encouragement of foreign suppliers to work with local equipment vendors on the supply of IEE equipment that meets international standards for quality and sustain operations

The project, however, did not fully address issues related to strengthening of institutions and regulatory framework including: i) lack of institutional adoption of a reporting structure for monitoring industrial energy consumption and GHG emission reductions; ii) no success in effective engagement of financial institutions to finance IEE measures that will create future difficulties for industrial enterprises who do not have sufficient financial support in obtaining loans for IEE implementation; and iii) no industrial energy efficiency standards have been set by the Energy Efficiency Department under the Ministry of Mines and Energy raising the risk of slowing down IEE implementation after the EOP.

Despite these difficulties, there is a general consensus amongst industrial entrepreneurs in Cambodia that there is high demand for continued technical assistance on IEE. In addition, RGoC seeks continued external support to improve IEE after the end of this project. It is uncertain at this time, however, what organization would carry on IEE promotion after 2016.

Key recommendations and lessons learned

For the Royal Government of Cambodia, there is a need to strengthen its commitment to IEE in a more effective manner. The RGoC should ensure the establishment of IEE standards and regulations by MoIH and MoME as its highest priority and should include:

- Regulations, standards and labelling for IEE equipment and manufacturing facilities;
- Policies and standards that regulate specific energy consumption for specific industrial sectors and processes; and
- Effective enforcement mechanisms.

This will raise the confidence of potential IEE investors and will provide the basis on which consulting firms and technical experts will invest their time and effort to develop contracts and employment with SMEs on IEE.

Even when IEE standards and regulations are established, there are still attendant issues related to the establishment of any post-project organization that promotes IEE. The Royal Government of Cambodia as well as its development partners should make efforts to overcome these unresolved issues including:

- Who will continue to support such an organization that is similar to NCPO-C: donors, industrial enterprises, government or a combination thereof?
- Will it be possible for this organization to be quasi-independent (to maintain its impartiality towards IEE measures) but have broad-based support for its IEE mandate from all relevant Government departments and SMEs?
- How will this organization be able to retain its well-qualified personnel to provide effective IEE development services to industrial enterprises?
- Is there sufficient capacity conduct the business plan for such an organization? If not, the business planning should be cognizant of sources of funding for IEE promotion.

In addition, the Royal Government of Cambodia should also consider the following actions to promote IEE development:

- Actively foster strategic partnerships between foreign technology providers and local manufacturers. Their efforts would also be bolstered through the establishment of IEE standards and regulations;
- Actively encourage industrial enterprises *with growth plans* to seek low carbon measures and technologies for energy efficiency; and
- Consider the setup of a revolving fund that would provide project preparation support, low interest loans or buy-downs to strongly encourage all industrial SMEs on IEE and the use of low carbon technologies.

Lessons learned on the implementation of the IEE Project include:

- Delivery of technically strong pilot projects is essential to achieving any success in market transformation projects. The IEE project had the services of technically strong personnel in the delivery of knowledge transfers of foreign practices and technologies, and good management of the technical aspects of the project. Without effective knowledge transfers to the host country, there would be no foundation on which to scale up knowledge transfers and development of IEE projects;
- Improvements to the delivery of EE knowledge transfers in Cambodia could have been realized with the emergence of a local EE champion. Notwithstanding the technical success of the IEE Project, there was no emergence of a such a person;
- The need for more thorough project preparations that importantly include the need for understanding how business is conducted. The business environment of an LDC should be well integrated into future project designs. With the benefit of hindsight, the business environment of industrial SMEs participating with the Cambodian IEE Project played a significant role in the project outcomes;
- Future GEF project designs should incorporate assessments of local knowledge absorption capacities of participating enterprises that will allow project designers to incorporate appropriate steps and time frames to achieve intended outcomes.

1. Evaluation objectives, methodology and process

1.1 Information on the evaluation

The Independent Final Evaluation of the UNIDO Project in Cambodia: “Reducing Greenhouse Gas Emissions through Improved Energy Efficiency in the Industrial Sector” (herein referred to as “IEE Project” or “Project”) was included as part of the design of the project as of November 2011. The Request for CEO Endorsement/approval, indicates that in accordance with UNIDO’s procedures, the project will be subjected to an independent external evaluation as follows:

“An independent Final Evaluation will be undertaken at the end of the second year of implementation. The Final Evaluation will determine progress being made towards the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project’s term”

The present evaluation was conducted at the end of the fourth year of implementation, between May and July 2015, in Phnom Penh, Cambodia and Vienna, Austria. The evaluation team was composed of Mr. Roland Wong as International Evaluation Consultant and Team Leader, and Dr. IN Sokneang as National Evaluation Consultant.

1.2 Scope and objectives of the evaluation, main questions to be addressed

The purpose of the final evaluation is for the GEF, UNIDO and partners of the host country to:

- a) Review:
 - Project advances towards achievement of energy efficiency in the industrial sector of Cambodia;
 - activities and project results and achievements through their indicators;
 - relevance of objectives and other design elements of the project;
- b) Propose recommendations that would increase efficiency and effectiveness of Project activities;
- c) Draw lessons learned in the process to replicate the experience in other projects.

The main issues addressed by the evaluation team were the following:

- Project relevance and design;
- Effectiveness: attainment of objectives and planned results (progress to date);

- Efficiency;
- Assessment of sustainability of project outcomes;
- Assessment of monitoring and evaluation systems and project management;
- Assessment of processes affecting attainment of project results.

1.3 Information sources and availability of information

Information sources used for the assessment consisted of official project related documents, presentations by experts, progress reports, annual reports, case studies, assessment reports, project products, and interviews with key players as listed in annex 3.

Documentation was provided by the UNIDO Project Manager based in Vienna, the Project Management Unit (PMU) housed within NCPO-C in Phnom Penh, representatives from the various ministries of the Royal Government of Cambodia (RGoC) and the owners and managers who implemented the IEE pilot projects. Most of this information was accessible and made available in a timely manner to the evaluation team.

There were 31 interviews conducted with key stakeholders from the RGoC (8), the CTA and PMU personnel (3), the UNIDO Field Office in Phnom Penh (1), UNIDO staff in Vienna (11), owners and managers (7) of the various industrial enterprises implementing IEE pilot projects, and former UNIDO staff in Vienna (1).

Additional interview time had been scheduled with the CTA but could not take place due to last minute health concerns of the CTA.

1.4 Methodological remarks, limitations encountered and validity of the findings

The methodology for the evaluation consisted of:

- A review of project documents;
- Briefings at UNIDO HQ in Vienna prior to mission travel to Cambodia;
- Interviews with the project management Unit (PMU) at the National Cleaner Production Office (NCPO-C) in Phnom Penh, personnel associated with present and past Project management, country focal points from key ministries of the RGoC, and project beneficiaries;
- Field visits to various SME industrial facilities that were targeted as pilot IEE projects to validate progress and effectiveness of IEE measures undertaken;
- De-briefing with PMU staff in Phnom Penh;
- De-briefing with UNIDO HQ in Vienna on mission findings;
- Follow-up phone conversations, emails and reporting writing from home base; and
- A period of additional gathering of information, validation of findings and editing of draft report to reflect factual accuracy of the findings.

Through documentary information and information collected from interviews with the industrial SMEs, Project personnel and government focal points, the evaluators determined that there was sufficient evidence to establish a baseline; the sources of information were sufficient to verify and document the progress and constraints encountered during the assessment. The quality of data and information from case studies of IEE measures undertaken was verified through interviews with SME and Project personnel, and the experience of the Evaluators. Information and figures were verified through comparison of information from other similar EE projects and interviews with other project personnel; this provided cross checks improving the confidence of the conclusions drawn on the impact of the project interventions.

Moreover, much of this data and information was used by the Evaluators to verify project progress against the indicator targets, activities, outputs and outcomes as provided in the logical framework of the project. A list of interviews as prepared jointly by the evaluators with project staff ensured that the views and experiences of all relevant stakeholders were appropriately included during the evaluator's mission. The work plan is presented in the following table.

Activity	Dates			
	May 19-22, 2015	June 9-24, 2015	June 25-30, 2015	July 1-August 28, 2015
Collection of documentary information and data				
Briefings with UNIDO in Vienna				
Field visits to pilot EE projects with interviews with SMEs around Phnom Penh				
Interviews with key government focal points				
Interviews with key project staff				
Follow up phone interviews				
Report writing				

2. Country and project background

2.1 Brief country context of Cambodia

Demographics

Cambodia is situated in the fast growing region of south-East-Asia and classified as a least developed country (LDC). The current population of Cambodia is 15.2 million with an estimated 20% of its population in urban areas². As of 2013, an estimated 76% of households did not have access to the electricity (around 10.1 million at the rural areas and 1.1 million at the urban) and only 24% of the total population has access to electricity (60% in urban and 10% in rural areas)³.

Economy

After peaking in GDP growth in 2005 at 13.4%, real GDP growth slowed to 10.4% in 2006, 9.6 % in 2007, and averaging 7% between 2010 and 2013. Cambodia's growth since 2004 has been in garments, construction, agriculture, and tourism. This includes the fast-growing rice milling sub-sector with Cambodia becoming a net exporter of rice since 2009. Rice production now accounts for over 10% of Cambodia's GDP with significant potential for growth through rapidly increasing exports and specializing in organic rice production to create added value. As of 2007, Cambodia doubled its per capita GDP to USD 589 from the previous 10 years; the per capita GDP is now over USD 1,084 as of 2014, and is expected to rise when oil and gas production comes on stream.

Despite this economic growth, Cambodia remains one of the poorest countries in Asia. More than 50% of the government's budget comes from donor assistance. There is an estimated 4 million people who live on less than USD 1.25 per day, and more than 35% of Cambodian children under the age of 5 suffer from chronic malnutrition. In addition, a significant proportion of the more than 50% of the population being less than 25 years old, do not have education and productive skills to contribute to the advancement of the country. This issue is particularly acute in the impoverished rural areas. The key economic challenge for Cambodia in the long term is to sustain growth of the agricultural and tourism sectors that have the potential to reduce poverty and to expand and sustain growth in all of its industrial sectors. Table 1 provides key economic indicators of Cambodia.

² CIA World Fact Book 2013

³ UNIDO-NPO-C, 2013, NIS, 2011

Economic Indicators of Cambodia

Cambodian economy (for 2014) ⁴	
GDP (nominal)	\$ 16,709 million
GDP variation	7%
GDP per capita	\$1,084
Human Development Index	0.584 (2013) ⁵
<i>The values are expressed in U.S. dollars</i>	

Energy sector

Most of Cambodia's primary energy supplies consist of imported heavy fuel oil and diesel oil as well as imported hydroelectricity from Viet Nam, Thailand and Laos PDR. While there is some growth in Cambodia's hydropower generation capacities, the country's first coal-fired power plant was commissioned in 2014. Cambodia's capital, Phnom Penh, however, consumes 90% of Cambodia's total electricity generation. Distribution of electricity to the country's rural areas and industries is limited. As of 2013, only 22.5% of Cambodian households had access to electricity. These figures show that the majority of Cambodians do not have regular access to electricity, and the distribution of electricity infrastructure and access between urban and rural populations remains disproportionate. These facts are indicators that many industrial enterprises in Cambodia do not have access to reliable sources of electricity.

While hydropower development is an important part of the country's strategic energy plans, the impact of its development will likely result in a significant reduction of fish production in Tonle Sap, an important food source for Cambodia. Other alternative forms of renewable energy in Cambodia includes biomass which is abundant in the form of rice husk and wood from rubber and cassava trees.

RGoC formulated an energy sector development policy in October 1994 that is still valid today with the objectives⁶ to:

- provide an adequate supply of energy throughout Cambodia at reasonable and affordable price;
- ensure a reliable, secure electricity supply at prices, which facilitate investment in Cambodia and development of the national economy;

⁴ <http://www.worldbank.org/en/country/cambodia/overview>

⁵ http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/KHM.pdf

⁶ JNEIDO, 2011 (Japan's New Energy and Industrial Development Organization): Possibility of Smart Community Development in Cambodia's South Economic Corridor Industrial Zones; CESS, undated

- encourage exploration and environmentally and socially acceptable development of energy resources needed for supply to all sectors of the Cambodian economy;
- encourage efficient use of energy; and
- minimize detrimental environmental effects resulting from energy supply and use.

Given the higher energy intensities of production experienced in Cambodia's industrial sector and the importance of the industrial sector to the growth of Cambodia's economy, the transformation of Cambodia's industrial sector towards energy efficiency is of national importance that will improve the sector's sustainability and competitiveness in the global market.

2.2 Policy and institutional context in Cambodia

Key policies and plans of the Government of Cambodia to improve the competitiveness of its industrial sector through energy efficiency are contained in:

- The Energy Sector Development Plan, 2005–2024;
- The National Policy, Strategy and Action Plan on Energy Efficiency in Cambodia (The Ministry of Mines and Energy) that was developed in 2013 and lists a number of activities to support industrial energy efficiency including amongst other actions improving energy data collection and processing, promoting good energy management practices with industrial enterprises, and implementation of energy efficiency and conservation laws and regulations on industrial energy use; and
- The National Strategic Development Plan 2014–2018 that specifically seeks to ensure efficient management and use of energy as well as fostering development of all types of renewable energy such as biomass⁷.

At the commencement of the IEE Project in 2011, NCPO-C was hosted by the former Ministry of Industry, Mines and Energy. In 2014, this Ministry was restructured into the Ministry of Industry and Handicrafts (MoIH) and the Ministry of Mines and Energy (MoME). As a consequence, NCPO-C which houses the IEE Project Management Unit (PMU) was hosted by MoIH in 2015.

2.3 Sector-specific issues of concern to the project and important developments during the project implementation period

The GEF-supported IEE Project was focused on potential energy savings and GHG emission reductions in 5 energy intensive industrial sectors: garment manufacturing, rice milling, rubber refining, brick making and food processing. The Project focus on the sectors was to seek and implement the means of removing barriers to industrial energy efficiency (IEE), deliver measurable results and impact the business-as-usual approaches to Cambodian industrial management, specifically through an integrated approach on reducing energy costs and consumption. The outcome of these activities was to be an informed industrial sector with the desire and ability to reduce its production costs through

⁷ Paras 4.122 to 4.127

reduced energy consumption and subsequently reduce the cost of its products and improve their market competitiveness.

Achievement of this outcome would involve overcoming of the most constraining factor to the industrial sector, a reliable energy supply. The cost of electricity in Cambodia is basically a function of the inefficiencies of electricity delivery as well as the country's exposure to global fuel prices based on its heavy reliance on imported fossil fuels. The country also currently lacks a national grid or high voltage transmission systems which is a primary cause of large losses during transmission and distribution. These only serve to raise energy and electricity costs that are constraints to stronger industrial growth Cambodia. Many industrial enterprises, notably those outside of Phnom Penh, currently consume diesel and fuel oil as primary sources of energy for various manufacturing processes such as garments, rice milling, food processing, and brick making.

During implementation of the IEE Project, there has been a growth in reliable electricity supplies, notably around Phnom Penh, highlighted by the commissioning of the 100 MW coal-fired power plant in 2014 near Sihanoukville, south of Phnom Penh. The increased reliability of electricity around Phnom Penh has encouraged industrial SMEs to use electricity instead of generation of their own electricity from biomass. Furthermore, the new coal-fired power plant is likely to start a trend towards cheaper electricity prices from the current tariff of USD 0.22/kWh around Phnom Penh. This is not favourable for the development of energy efficient practices and renewable energy generation for industries around Phnom Penh. However, for those industries located outside of Phnom Penh where transmission and distribution infrastructure is still poor, the development of energy efficiency practices and renewable energy generation is still relevant and cost-effective. As such, demand for industrial energy efficiency measures and technologies are likely to be in high demand for the foreseeable future.

2.4 Project summary

Objectives

The objective of the project was to improve the energy efficiency of Cambodia's industrial sector, leading to reduce global environmental impact from greenhouse gas (GHG) emissions and enhanced competitiveness for a fledgling industrial sector in a country with an energy deficit.

A primary objective of the project was to demonstrate Industrial Energy Efficiency (IEE) benefits, build local technical capacity, strengthen supporting institutions and institutional framework, and support up-scaling of implementation for IEE and climate change mitigation in the Cambodian manufacturing sector. Initially, the directly involved partners, namely the Ministry of Industries and Handicrafts (MoIH) and the Ministry of Mines and Energy (MoME) as well as co-financing industrial enterprises, were to be given priority for IEE capacity building and implementation support for demonstration. The initial IEE capacity building and demonstrations would inform other government agencies and the other industrial enterprises of the benefits of IEE, and provide them with the required confidence to promote and adopt IEE measures.

The project had been designed to:

- provide technical support to MoIH and MoME to develop and help establish market oriented policy and regulatory instruments. These were needed to support sustainable progression of Cambodian industries towards international best achievable energy performance and to stimulate the creation of a market for industrial energy efficiency (IEE) products and services;
- provide partial financial assistance for implementation of technology options to participating units which have committed co-financing of identified techno-economical IEE measures;
- build knowledge and in-depth technical capacity for IEE that focuses on energy management and system optimization for enterprises, industry and energy efficiency professional and relevant institutions; and
- provide investment-specific technical assistance including financial engineering studies and project financing to support the development and implementation of a limited number of pilot IEE projects with high replication or energy saving potential in key sectors of Cambodian industries, namely food processing, ice making, garments, rubber processing, rice processing and brick manufacturing.

Implementation of the project was to be governed by annual work plans (AWPs) to be prepared by the Project Management Unit (PMU) and NCPO-C in collaboration with a Chief Technical Advisor (CTA) and UNIDO Project manager, for endorsement by the Project Advisory Committee (PAC). The intended duration of the IEE Project was 4 years (2010-2014) from an intended starting date of November 2010. The total budget of the Project was USD 4,734,000 which comes from UNIDO (USD 100,000), GEF (USD 1,240,000 plus USD 124,000 for the 10% support cost on IEE equipment plus USD 60,000 for the PPG Phase), Cambodian Government (USD 150,000), NCPO-C Cambodia (USD 140,000), private sector (USD 90,000) and private sector (Cash committed USD 2,830,000).

Approved IEE project summary facts

Project components/outcomes	Co-financing (\$)	Approved GEF allocation (\$)	Total (\$)
Outcome 1: Demonstrable energy savings in participating companies through IEE pilot projects	2,841,600	324,655	3,166,255
Outcome 2: Supply of national service providers in IEE are available	80,000	243,872	323,872
Outcome 3: Stronger institutional framework in place to ensure long-term support for energy reduction efforts in enterprises	85,000	76,918	161,918
Outcome 4: Increased adoption by Cambodian enterprises of energy efficiency practices and technologies as an integral part of their business practices	70,000	442,982	512,982

Outcome 5: Establishment of policy, legal and regulatory frameworks that sustainably promote and support industrial energy efficiency	75,000	62,232	137,232
Project management	158,400	89,341	247,741
Sub-totals:	3,310,000	1,240,000	4,550,000
10% support cost for IEE equipment		124,000	124,000
PPG Phase		60,000	60,000
Totals:	3,310,000	1,424,000	4,734,000

Overall costs (Including Co-financing)

Dates

Milestone	Expected date	Actual date
Agency approval date	October 2010	March 2011
Implementation start	November 2010	April 2011
Midterm evaluation	November 2012	September 2013
Project completion	November 2014	November 2015
Terminal evaluation completion	August 2014	August 2015
Project closing	November 2014	November 2015

Project framework

Project component	Activity type ⁸	GEF Financing (in \$)		Co-financing (in \$)	
		Approved	Actual ⁹	Promised	Actual
Outcome 1: Demonstrable energy savings in participating companies through IEE pilot projects	a, c	324,655	n/a	2,841,600	3,947,018
Outcome 2: Supply of national service providers in IEE are available	a, b	243,872	n/a	80,000	100,000

⁸ Activity types are:

- a) Experts, researches hired
- b) Technical assistance, workshop, meetings or experts consultation scientific and technical analysis
- c) Promised co-financing refers to the amount indicated on endorsement/approval.

⁹ Project expenditures were not monitored according to outcomes.

Project component	Activity type ⁸	GEF Financing (in \$)		Co-financing (in \$)	
		Approved	Actual ⁹	Promised	Actual
Outcome 3: Stronger institutional framework in place to ensure long-term support for energy reduction efforts in enterprises	a, b	76,918	n/a	85,000	140,000
Outcome 4: Increased adoption by Cambodian enterprises of energy efficiency practices and technologies as an integral part of their business practices	a, b, c	442,982	n/a	70,000	5,551,508
Outcome 5: Establishment of policy, legal and regulatory frameworks that sustainably promote and support industrial energy efficiency	a, b, c	62,232	n/a	75,000	75,000
Project Management	a	89,341	n/a	158,400	75,000
Total		1,240,000	1,238,206¹⁰	3,310,000	9,888,526

¹⁰ USD 1,794 to be expended in July 2015 on the accreditation and certification process for energy managers

Project outcomes and annual disbursements¹¹:

Outcome	2011*	2012	2013	2014	2015**	Total Disbursed	Remainder for Project	Total Remaining
Outcome 1: Demonstrable energy savings in participating companies through IEE pilot projects	n/a	n/a	n/a	n/a	n/a	0		
Outcome 2: Supply of National service providers in IEE are available	n/a	n/a	n/a	n/a	n/a	0		
Outcome 3: Stronger institutional framework in place to ensure long-term support for energy reduction efforts in enterprises	n/a	n/a	n/a	n/a	n/a	0		1,794
Outcome 4: Increased adoption by Cambodian enterprises of energy efficiency practices and technologies as an integral part of their business practices	n/a	n/a	n/a	n/a	n/a	0		
Outcome 5: Establishment of policy, legal and regulatory frameworks that sustainably promote and support industrial energy efficiency	n/a	n/a	n/a	n/a	n/a	0		
Project Management Unit	n/a	n/a	n/a	n/a	n/a	0		
Total (Actual)	286,993	285,891	233,910	361,049	70,363	1,238,206	98.6%	1,794
Total (Cumulative Actual)	286,993	572,884	806,794	1,167,843	1,238,206			
Annual Planned Disbursement (from ProDoc)	n/a	508,000	329,000	212,000	207,000			
% Expended of Planned Disbursement	n/a	56%	71%	170%	34%			

¹¹ Yearly expenditures by component/outcome were not monitored and hence, not available for the evaluation.

2.5 Project timeline

Outcome	2011			2012				2013				2014				2015			
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Outcome 1: Demonstrable energy savings in participating companies through IEE pilot projects																			
Outcome 2: Supply of National service providers in IEE are available																			
Outcome 3: Stronger institutional framework in place to ensure long-term support for energy reduction efforts in enterprises																			
Outcome 4: Increased adoption by Cambodian enterprises of energy efficiency practices and technologies as an integral part of their business practices																			
Outcome 5: Establishment of policy, legal and regulatory frameworks that sustainably promote and support industrial energy efficiency																			
Project Management																			

2.6 History of project implementation

Project preparatory phase

The UNIDO PIF on the Industrial Energy Efficiency was submitted in 2009 to GEF for approval. During 2010, project preparation activities for the IEE Project were conducted by NCPO-C including detailed energy audits in 24 selected enterprises that were selected from a survey of more than 200 units in selected 5 industrial sectors. This survey and detailed energy audits provided the basis for preparing a full project document proposal on “**Reducing Greenhouse Gas Emissions through Improved Energy Efficiency in the Industrial Sector**”, a GEF-funded full size project of a 4-year duration with a total budget of USD 4.67 million USD of which USD 1.24 million would come from GEF in the form of technical assistance.

The project design in 2010 was to focus on energy intensive sectors such as brick-making, rubber-refining, rice milling, food processing and garment sector. Overall objectives of the project were designed to demonstrate the application of energy efficiency in energy intensive industrial sectors to reduce the generation of GHG emissions. The outcomes resulting from output activities will also contribute to reduce production costs leading to a competitive edge both for export and domestic markets as well as decreased GHG emissions, reduced environmental impacts and improved energy security for Cambodia.

Using available data from national statistics and the former Ministry of Industry Mines and Energy, the industrial sub-sectors were profiled based on a criterion that includes:

- Total energy consumption in manufacturing sector in Cambodia;
- End-use energy consumption (electrical and thermal);
- Source of primary energy in the country (such as liquid fossil fuels and biomass);
- Number of enterprises in the industrial sub-sector;
- Size of the enterprises in terms of employees and output; and
- General economic performance and prospective growth rate.

The project was designed to address these issues through an integrated approach that combines interventions at the policy level, in the market place, and on the shop floor. The project’s primary target groups were to be the industry’s decision-makers (such as owners, managers, production line engineers), potential service providers, and relevant policy-making institutions. Specifically:

- a) The project was to provide investment-related technical assistance to support the implementation of pilot industrial energy efficiency projects with high replication and energy savings potential, in representative units of Cambodia’s key energy intensive industrial sectors. This would entail pilot project support including 3 each from the brick-making sector, the rubber-refining sector, the rice milling sector, food processing and the garments sector (focusing on washing, dyeing and finishing);

- b) The project was to train personnel from existing technology suppliers in Cambodia (such as kiln, boiler, gasifier, generator suppliers). In addition, the project was to promote the development of local suppliers of technology where they do not exist;
- c) The project was designed to build knowledge and technical capacity to implement industrial energy efficiency. Personnel from the enterprises involved in both the pilots IEE projects and replicated projects (or otherwise referred to as “*quick scan projects*” or “*quick scans*”) were to receive training. To ensure cost effective replication and up-scaling, national experts from relevant support institutions such as the Institute of Technology of Cambodia (ITC), the Royal University of Phnom Penh (RUPP), the Phnom Penh Small and Medium Industry Association (PSMIA), other relevant industry associations or groupings, the Department of Industrial Techniques under the former Ministry of Industry Mines and Energy (MIME), as well as the National Cleaner Production Office-Cambodia (NCPO-C-C), were to also receive training;
- d) The project design was to build capacity for RGoC institutions tasked with supporting industrial energy efficiency. The former Ministry of Industry, Mines and Energy (MIME) was the original targeted agency; however, the Council for the Development of Cambodia (which oversees all incoming investment projects), the Ministry of Environment, and the Ministry of Agriculture, Forestry and Fishery (MAFF) (which has oversight responsibilities for the rice processing and rubber refining) were also to be involved;
- e) To promote the dissemination of industrial energy efficiency, the results from the pilots were to be promoted throughout the targeted industrial sectors by NCPO-C as well as through other relevant mechanisms such as workshops, seminars, publications, television and radio. An important partner for dissemination activities was to be Cambodia’s industrial sector-specific associations;
- f) The project was to assist relevant RGoC departments to strengthen, or if necessary, develop policies and regulations that can support Cambodian enterprises in their efforts to reach international best energy performance and to stimulate the creation of a market for IEE products and services.

2.7 Project implementation arrangement

The GEF Agency for the IEE project was the United Nations Industrial Development Organization (UNIDO). UNIDO was responsible for both the implementation and the direct execution of the project. This included responsibilities for the general management, project monitoring, reporting on project performance to GEF and disbursement of funds required or project operations as well as recruitments of international expertise other related international expenditures.

The project design originally had a project Advisory Committee (PAC) to guide the project Management Unit (PMU) on issues brought up by a broader range of

stakeholders. This would ensure that the project activities are relevant and beneficial to all stakeholders. During the project, however, the PAC was renamed as the Project Steering Committee (PSC) chaired by MoIH with more than 16 committee members from various government ministries including MoIH, MoME, Ministry of Commerce (MoC), MAFF and Ministry of Environment (MoE) as well as ITC, Garment Manufacturers Association in Cambodia (GMAC), the Cambodian Chamber of Commerce (CCC), Phnom Penh Small & Medium Industry Association (PSMIA), National Cleaner Production Office-Cambodia (NCPO-C) and UNIDO. PSC meetings are usually held once or twice annually to discuss project progress, issues and adaptive management plans.

The National Cleaner Production Office-Cambodia (NCPO-C) in Phnom Penh served as an executing partner of UNIDO for the Project, responsible for execution of the Project in Cambodia. The Project was originally designed to provide technical support to the Ministry of Industry, Mines and Energy (MIME) to promote industrial energy efficiency. In 2014, MIME was divided into two ministries: Ministry of Industries and Handicrafts (MoIH) and the Ministry of Mines and Energy (MoME). MoIH hosted NCPO-C after this division.

The Project Management Unit (PMU) had been established within the premises of NCPO-C. NCPO-C was staffed by a Chief Technical Advisor (CTA), a Project Coordinator (PC), an administrator and five full time energy experts. NCPO-C also employed a several part-time personnel serving as energy experts who provided assistance in collecting energy-related information from various industrial SMEs. This would have included baseline and post-project energy consumption data from IEE pilot projects and quick scan projects.

3. Project assessment

3.1 Project design

The IEE Project design is rated as **moderately satisfactory** as it:

- provides adequate measures to address the country's problems related to high specific energy consumption (SEC) in its industrial sector and the integration of Cambodia into the global trade market;
- does not have a complete set of verifiable indicators that are specific, measurable, attainable, relevant and time bound (SMART) within the Project log frame. This is related to the Project design not providing a better definition of actions that would have strengthened the regulatory framework and sustain IEE adoption after the end of the project (EOP).

With Cambodia's growth in exports, future industrial growth will depend on how the country remains competitive within regional and global markets. One of the primary barriers constraining industrial growth throughout much of Cambodia is the high opportunity costs related to unreliable electricity supplies and the high cost of electricity in some instances. In the 2010 baseline, SMEs were unable to overcome the high cost of electricity through adoption of energy efficient technologies and measures, mainly due to their lack of knowledge on such technologies and measures, the lack of qualified local suppliers of such technologies, and insufficient capacity within enterprises to identify and develop IEE projects and measures. There were also constraints regarding the availability of appropriate financing to implement IEE projects and measures.

Adding to the design challenges of this project has been a recent growth in reliable electricity supplies, notably around Phnom Penh, highlighted by the 2014 commissioning of 100 MW coal-fired power plant near Sihanoukville south of Phnom Penh as well as abundant hydropower during the monsoon. The impact of increased reliability of electricity around Phnom Penh has been the migration of some industrial SMEs towards the use of electricity instead of generating their own power from biomass. Another impact of the new coal-fired plant is the likely commencement of a trend towards cheaper electricity prices from the 2015 tariff of UST 0.22/kWh. This has resulted in slowing the pace of adoption of IEE measures around Phnom Penh including the development of local sources of energy that can potentially reduce reduction costs and improve competitiveness. However, for industrial enterprises located away from Phnom Penh, improvements in the supply of reliable electricity supplies is not expected in the near future due to lack of planned investments into transmission and distribution systems. As such, there will still be considerable interest with these industrial enterprises in the near and long-term in IEE measures and developing local sources of energy.

The 2010 design of the IEE project incorporated an approach to pilot IEE measures within the most energy intensive industrial sectors with the intention of demonstrating tangible benefits of IEE practices and technologies. Concurrently,

the project design included building local technical and managerial capacities to plan, implement, operate and maintain IEE measures with the intention of increasing and replicating IEE adoption amongst other SMEs. With lessons learned from implementing IEE pilot projects and strengthened local technical and managerial capacities, the project was to play a role in assisting the Government in strengthening its regulatory framework and policies to promote IEE on a national scale.

The process for designing the IEE project commenced during the 2010 PPG phase. With information collected during 2009, NCPO-C and UNIDO in close collaboration with MIME commenced the profiling of energy intensive industrial sectors in 2000. A survey was conducted on more than 200 SMEs in five selected industrial sectors for inclusion into the project document. Out of these 200 SMEs surveyed, 24 were selected for detailed profiling in February 2010.

As an activity of the IEE Project Preparation Grant (PPG), the project design was formulated based on the logical framework approach that included a workshop in February 2010 where the results of the SMEs surveyed were shared. This PPG workshop was attended by more than 45 participants from the former MIME, the Ministry of Environment, academia and private sector industrial enterprises. Other topics discussed during the workshop included energy audits done by NCPO-C on the garment, brick making, rubber refining and rice milling industries of Cambodia, and incorporation into the project activities, the concepts of resource efficiency and cleaner production as well as cleaner production techniques and methodology. During the PPG phase, personnel from former MIME emerged as being the most appropriate national counterparts.

Considering there were two outputs related to financial aspects of IEE measures, it is somewhat surprising that there were no financial institutions participating on these workshops during the PPG phase. Output 3.3 contained “soft” targets including the number of personnel from financial institutions trained, and “50 proposals for IEE financing are received and considered for financing”. However, the expectations and ambition of this output were reduced given the lack of readiness of the banking sector in Cambodia to finance IEE with SMEs in the industrial sector.

Despite these efforts that led to the IEE Project having a clear thematically focused development objective, some of the baselines and targets are not entirely clear; the indicators do not meet SMART criteria, lacking specificity, measurability and time-bound attributes. To some extent, the lack of a full set of SMART indicators and targets has made it difficult to conduct proper progress reporting of the project. Clearer baselines and SMART indicators of expected results would have made project implementation and monitoring simpler. Specific issues include:

- The lack of indicators that can properly reflect the intended outcomes of the project. For example, there is a target for the setup of a webpage (output 2.4) but no indicators on its subsequent usage. Another example is the set of indicators in component 4 which only cover the various training sessions offered by the project; there are however, no indicators

to gauge the success of the training sessions and the subsequent and expected adoption of IEE by the industrial sector in Cambodia;

- Some indicators not being specific or measurable. An example is the indicator for Output 5.1 is “increased role for IEE in industry, energy and environmental policies at national levels”;
- Most of the indicators not being time bound. As such, there are no indications as to when the targets should be achieved;
- The presence of outcome targets and indicators which are not necessary since these targets and indicators are already covered under the outputs. Outcome targets and indicators only contribute to the lack of clarity in the project framework. Outcomes are to be achieved through delivery of the outputs which also have their separate indicators and targets;
- There are some targets without indicators.

The lack of a full set of verifiable indicators only served to contribute to difficulties in achieving all project outcomes that would include most significantly on this project, strengthened institutions and regulatory frameworks for sustained development of IEE. The original project log frame is provided on annex 5 with comments of the evaluation team in red font.

3.2 Project relevance

The relevance of the IEE Project’s outcomes to the country’s national priorities is **highly satisfactory** that is attributed to:

- its strong alignment with national development and environmental priorities and strategies of the RGoC;
- a strong focus on the target beneficiaries of the project, namely the industrial sector and supporting and relevant government institutions;
- climate change mitigation activities under GEF-4 and with Strategic Objective 2: *“To promote energy efficient technologies and practices in industrial production and manufacturing processes;*
- its design that fits within the UNIDO’s mandate of industrial energy efficiency aimed at reducing environmental impacts while maintaining economic growth through reducing industrial energy intensity and GHG emissions.

The project is strongly aligned with national development and environmental priorities and strategies of the RGoC. Since 1994, RGoC has been promoting energy efficiency in the industrial sector through the Energy Efficiency Department (EED) under MoME. The drivenness of RGoC in IEE stems from their concerns on climate change impacts and the increasing importance of the industrial sector in the national GDP. The issues of IEE had been raised to the level of the Prime Minister who has been promoting energy efficiency and renewable energy development since 2003 by the private sector and the means of reducing industrial production costs.

Subsequent national plans that support IEE in Cambodia include:

- The Energy Sector Development Plan, 2005-2024;
- The National Policy, Strategy and Action Plan on Energy Efficiency in Cambodia (MoME) that was developed in 2013 and lists a number of activities to support industrial energy efficiency including amongst other actions improving energy data collection and processing, promoting good energy management practices with industrial enterprises, and implementation of energy efficiency and conservation laws and regulations on industrial energy use;
- The Strategic Framework of the General Department of Industry (2010-2015) that reflects RGoC commitment through its MoIH and MoME to reduce poverty by developing a dynamic industrial sector that promotes efficiency, equity, employment and growth leading to improved competitiveness of industrial enterprises¹²; and
- The National Strategic Development Plan 2014–2018 that specifically seeks to ensure efficient management and use of energy as well as fostering development of all types of renewable energy such as biomass¹³.

With respect to international agreements, RGoC is a signatory of the Kyoto Protocol and has prepared national communications to the UNFCCC (Initial National Communications of 2002 and with the Second National Communications nearing completion). The IEE Project design responds well to the country's targets for GHG emission reductions, especially considering the industrial sector's growing fossil fuel consumption. A Climate Change Department (CCD) has been established under the MoE with representation of 19 ministries and agencies with a mandate to monitor and report on GHG reductions, as well as mainstreaming climate change into relevant sectors including industry and energy.

The IEE project also has strong relevance to the target beneficiaries of the Project, namely the industrial enterprises in Cambodia and supporting and relevant government institutions:

- Private sector industrial enterprises were to benefit from the outputs of this project. This includes the pilot IEE projects of Component 1 that provide tangible evidence of the benefits to Cambodia's industrial enterprises, training that was provided to potential energy experts to make available energy expertise to these industries; and
- Institutions such as the Energy Efficiency Department, CCD and the MoIH were to benefit from capacity building activities of the Project including classroom sessions and practical hands-on field work in monitoring baseline and post-project energy consumption.

The IEE Project is fully compliant with the priorities identified for climate change under GEF-4 and with Strategic Objective 2: "To promote energy efficient technologies and practices in industrial production and manufacturing

¹² http://www.ide.go.jp/English/Publish/Download/Brc/pdf/07_chapter2.pdf

¹³ Paras 4.122 to 4.127

processes". This strategic objective was designed to have a direct impact on improvements in energy efficiency in industrial production. This strategic GEF objective was to lead to successful outcomes including appropriate policy, legal and regulatory frameworks adopted and enforced; sustainable financing and delivery mechanisms established and operational; and GHG emissions avoided. The design outcomes of the IEE project were strongly aligned with these intended outcomes.

The IEE Project fit within the UNIDO's mandate of industrial energy efficiency that is aimed at reducing environmental impacts while maintaining economic growth through reducing industrial energy intensity and GHG emissions. Furthermore, the project fit within the core of UNIDO's priorities and mandates to provide technical assistance that support adoption of energy management standards and policy measures. The project also strongly aligned with UNIDO's mandate to deliver tailor-made training tools that focus on industrial energy system optimization. UNIDO's mandate is to target all players in the IEE market including government, regulators, industrial enterprises, service providers and equipment vendors; the design of the IEE Project targets all these players.

During the project, changes in the energy scenario of Cambodia were experienced, notably improvement in the availability of reliable electricity supplies around Phnom Penh. While this has an impact with industries around Phnom Penh in terms of the supply of reliable electricity and thereby reducing their energy costs, industrial enterprises located outside of the Phnom Penh area still do not have reliable electricity supplies. Furthermore, energy costs for all industrial enterprises in Cambodia still remain as a significant portion of their operating costs. As such, there is still high demand amongst these industrial enterprises for energy efficient measures to reduce these operating costs and improve their competitiveness within the global trade market. For these reasons, the evaluators are of the opinion that the project design is still highly relevant precluding the need to reformulate future project designs on IEE in Cambodia.

3.3 Effectiveness

The effectiveness of the project was assessed against the intended outcomes, as stated in the November 2010 Project document, and effectiveness has been determined by the evaluation team to be **satisfactory**. Justification for this rating is provided with ratings of each outcome, summarized below and provided in detail later in this section:

- Outcome 1: Demonstrable energy savings in participating companies through IEE pilot projects. The completion of 12 pilot projects provided and demonstrated energy savings and GHG emission reductions in 5 industrial and energy intensive sectors, consistent with the intended outcome. Effectiveness of the activities supporting this outcome were **highly satisfactory**;
- Outcome 2: Supply of National service providers in IEE are available. With approximately 40 energy experts trained in Cambodia, this outcome was realized. A minor issue included the lack of documentation on the

quality of these experts and the lack of project monitoring if these experts were still available to work on IEE as of 2015. The effectiveness of the activities supporting this outcome were **satisfactory**;

- Outcome 3: Stronger institutional framework in place to ensure long-term support for energy reduction efforts in enterprises. This outcome was only partially achieved. Personnel from government departments involved with IEE had received training on IEE issues from the project. In addition, training was provided to service providers on the preparation of bankable IEE proposals, and information on the ISO 50001 Energy Management System was disseminated to industrial enterprises. There was, however, a lack of participation of financial institutions in related training events, and a lack of demand for IEE financing from these institutions. The effectiveness of these activities was **moderately satisfactory**;
- Outcome 4: Increased adoption by Cambodian enterprises of energy efficiency practices and technologies as an integral part of their business practices. This outcome was achieved based on the observed high rate of adoption of IEE measures and technologies throughout Cambodia. The effectiveness of these activities was **highly satisfactory**;
- Outcome 5: Establishment of policy, legal and regulatory frameworks that sustainably promote and support industrial energy efficiency. Support documents for policy, legal and regulatory framework have been prepared for RGoC, as well as the establishment of a National Energy Auditor Accreditation Program. However, the EED has yet to establish IEE policies and standards as well as the policy, legal and regulatory frameworks at the time of writing of this report. This includes the fact that there were no mechanisms created at various administrative levels to promote and enforce policies and regulations for IEE. In addition, there are no established procedures for tracking and benchmarking industrial energy consumption that have been transferred from industrial enterprises to responsible government departments such as EED and CCD. The effectiveness of activities to achieve this outcome was **moderately unsatisfactory**.

Details of the effectiveness of each of the outcome activities is provided in the following text.

Outcome 1 - Demonstrable energy savings for participating companies through IEE pilot projects

The evaluation team found that the effectiveness of the activities supporting this outcome were **highly satisfactory**.

A total of 12 pilot projects and 40 quick scan projects were implemented during the Project from 2011 to 2014, all of which successfully demonstrated energy savings for industrial enterprises. Systematic approaches towards technical assistance were undertaken for all pilot projects. The objective of the technical assistance provided was to demonstrate techno-economic viability of energy

efficient applications of five different industrial sectors. The results of IEE measures undertaken in these enterprises were shared at IEE workshops to encourage replication amongst other industrial SMEs. Some examples of pilot project results are provided in the following table with further details in the following text.

Industrial enterprise name	Investment level (USD)	Annual savings (USD)	Payback period	SEC reduction (%)	GHG reduced/ yr (tonnes CO ₂)
Norm Srim Rice Mill	370,000	410,000	8 mos.	-53 ¹⁴	693
Ly Ly Food Industries	390,000	240,000	20 mos	-29 ¹⁵	940
Pop Ice Factory	75,000	167,700	6 mos	21	10,832
Sun Rise Brick Factory	502,000	370,000	16 mos	38	1,338
Dignity Knitter Limited	114,500	126,500	11 mos	1.9 to 4.2	815

- *Norm Srim Rice Mill, Kandal near Phnom Penh.* To reduce the electricity cost (comprising 25% of total processing costs), the project provided technical assistance to:
 - install power generation equipment using a dual fuel generator (70% producer gas and 30% diesel oil) to substitute a 100% diesel engine;
 - install paddy dryers using hot air from direct rice husk burning; and
 - install two electrical pneumatic rubber roller huskers with a vibrating cleaning sieve.

The total cost of these interventions was USD 370,000 resulting in a reduction of diesel oil usage in 2011 totaling USD 410,000, a simple payback period on investment of less than eight months, and a reduction of GHG emission of 693 tonnes per year.

Despite the rapid payback of the investment and growth of his plant, the owner had purchased new rice milling machines in 2014 that were powered from electricity from the grid. A primary reason for this switch of technology was the lack of room for an additional gasifier and the convenience of having a technology that did not require dedicated personnel for its operation. With the additional milling efficiencies of his plant, he was able to sell rice at a higher price, further contributing to the benefits of IEE measures. However, without a gasifier to consume rice husks, excess rice husks were dangerously accumulating on the mill site¹⁶. Under a separate contractual arrangement between Norm Srim and

¹⁴ SEC increased due to displacement of diesel oil with rice husk

¹⁵ SEC increased when electricity from the grid was used at a rate of 860 kcal/kWr

¹⁶ There is a danger of dust explosions within the enclosure where the rice husks are stored.

a Chinese company, excess rice husks were being converted on the premises of the Norm Srim Rice Mill into briquettes that are sold to local garment factories for steam generation;

- Ly Ly Food Industry Company Limited, Phnom Penh. The objective of the technical assistance provided by the project was to reduce consumption of electricity and diesel oil used in the crisping ovens and edible oil heating and operation of several motorized equipment for mixing. Primary IEE measures consisted of:
 - captive power generation using dual fuel generator (70% syngas and 30% diesel oil) to offset electricity purchased from the grid and diesel fuel for captive electricity generation;
 - substitution of energy efficient motors into batch extruders; and
 - five energy efficient packing machines.

The USD 390,000 investment resulted in more than USD 240,000 in cost savings in reduced consumption of electricity and diesel oil. This equated to a simple payback of the investment in 20 months, and GHG emission reductions of 940 tonnes per year. Ly Ly foods had previously purchased a gasifier from a local supplier in 2011 for a reportedly lower cost than gasifier is being supplied by the Project. The operation of this gasifier lasted only one year as there was no tar removal system in the gasifier that eventually resulted in seizure of the engine operation. The occurrence of this technology malfunction only served to increase the value of technical assistance of the project;

- POP Ice Factory, Phnom Penh. The objective of this pilot project was to reduce the consumption of electricity in the production of ice as well as improving the ice production site that would improve working conditions and hygiene. Measures undertaken in 2012 to reduce electricity consumption and GHG emissions included:
 - replacement of old motor and compressor set with a more energy efficient model;
 - cleaning of all cooling towers and condensers and replacement of honeycomb in cooling towers;
 - addition of a condenser to one of the ice making machines;

With a total investment of USD 75,000, the ice factory reduced its specific energy consumption between 2011 and 2012 from 597 MJ to 471 MJ per ton of ice produced. In addition, the Project also replaced R-22 refrigerant gas leakages in the system with an ammonia system that resulted in improved ice product quality and better factory working conditions. Both measures, notably the replacement of the R-22 refrigerant gas with an ammonia system led to substantial GHG emission reductions amounting to 10,800 tonnes CO₂ per year (assuming 16,000 tonnes of ice produced per year). Furthermore, the investment of USD 75,000 was paid back within less than six months as a result of reduced electricity consumption and offsetting of R-22 refrigerant gas with ammonia;

- *Sun Rise Brick Company, Kandal.* The objective of this pilot project located 20 km north of Phnom Penh was to reduce the specific energy consumption in brick manufacturing. The baseline energy consumption of this company consisted of wood for the making of the bricks and diesel oil as fuel for the molding and extrusion processes. IEE measures undertaken with the assistance of the project in 2012 included:
 - the replacement of diesel engine for brick molding and extrusion with automatic molding machine using electricity;
 - substitution of diesel oil generators with dual fuel generators (70% producer gas and 30% diesel oil); and
 - installation and operation of two rotary clay kilns to reduce biomass fuel consumption for firing.

This investment of USD 502,000 has resulted in a reduction in the use of diesel oil by more than 70%, the reduction of the use of wood with rice husk for firing the kilns, and a reduction of the SEC per 1,000 bricks from 5.5 GJ to 3.4 GJ, a reduction of 40%. Payback of the USD 502,000 investment was in the order of 16 months. The owner of the plant also stated that the dual fuel generators for captive power generation were only used for 10 hours each day. Due to this intermittent use, the gasifier was shut down and replaced by reliable electricity supplies from the grid. The primary reason for the conversion was the convenience of a reliable electricity supply to the plant as opposed to the gasifier which required personnel to bring in stock and to operate and maintain the equipment;

- *Dignity Knitter Limited, Kandal.* This pilot project located 20 km southwest of Phnom Penh involved an energy audit that analyzed baseline energy consumption data to work out potential savings in production costs and GHG emissions. A number of options were considered and implemented including:
 - insulating and sealing leakages in water and steam pipes;
 - installation of variable frequency drive to reduce electricity consumption of boiler house watering machines;
 - substituting clutch motors with servo motors;
 - replacement of low efficiency T8 fluorescent lamps with T5 fluorescent lamps;
 - replacement of the chiller system with a cooling pad system;
 - installation of roof openings for natural sunlight that would offset the need for electrical lamps.

An investment of USD 114,500 has reduced the SEC for sweater and sock production lines by 4% and 2% respectively, GHG emissions by 12% and 3% respectively, and produced production cost savings of USD 126,500 in 2013 for over 3,500 tonnes of sweaters and socks produced. Dignity Knitter has hired a full time energy manager for the plant to seek other means of reducing energy in production costs of their garments.

In summary, the project generated an average reduction in SEC of 5% meeting the targets of the log frame. In addition, the Project managed to

demonstrate over 43,687 tonnes of CO_{2eq} reduced annually from pilot and quick scan IEE projects (lifetime GHG reductions of 436,870 tonnes CO₂). This exceeds the log frame target by a factor of 2. Annex 4 provides a complete listing of pilot and quick scan IEE projects and their estimated GHG emission reductions. More details of these IEE projects are provided on the National Cleaner Production Office website¹⁷.

Outcome 2 - Supply of national service providers in IEE are available

The evaluation team found that the effectiveness of the activities supporting this outcome were **satisfactory**.

With approximately 40 energy experts trained in Cambodia and registered on a network, this outcome was realized. The only issue of this component was minor regarding the lack of any formalized feedback mechanisms to gauge the effectiveness of the training sessions. Outputs delivered to achieve this outcome included:

- Output 2.1: A cadre of 40 national experts from relevant support institutions and consulting engineers that have technical capacity and tools required to develop and implement IEE measures;
- Output 2.2: IEE trained professionals who are registered within a formal network as qualified resource personnel to assist companies in implementing IEE;
- Output 2.3: Local suppliers of relevant technologies who are trained in IEE;
- Output 2.4: Web-based guidance manual on IEE.

The activities of output 2.1 involved considerable effort invested into the preparation of training and reference material. This involved inputs from international experts from Europe and India. The methods of training ranged from IEE clinics to in-company training programs and classroom training sessions. More than 24 IEE clinics were conducted from 2011 to 2014 in close collaboration with the Provincial Departments of Industry, Mines and Energy. The IEE clinics were designed as half-day to full day information sessions targeting enterprise owners and CEOs from all five selected industrial sectors. These clinics were well attended with an average of 28 attendees per session using the facilities at the Institute of Technology of Cambodia (ITC). Those enterprises and persons interested in more intensive information sessions attended the classroom training sessions followed by in-company training programs. There were 8 sessions that were usually 2 to 3 days in duration with only 2 to 3 sessions held every year during the Project. While the project did enlist feedback from the participants as to the effectiveness of the IEE clinics and training sessions, the feedback reports were in Khmer language. The effectiveness of these sessions, however, can be gauged through the high number of participants who attended clinics and training sessions to implementation of IEE measures.

In 2013, the project made substantial progress on output 2.2 by setting up a registry and database of industrial energy experts who can implement IEE

¹⁷ <http://www.cambodian-cpc.org/ccpp/index.php/en/publication/2013-04-18-08-58-51>

measures for industrial SMEs in Cambodia. The IEE registry is maintained jointly by MoIH and NCPO-C.

For output 2.3, more than 10 local equipment vendors for kilns and boilers had attended the IEE training workshops. The issue, however, with training of local equipment vendors is a lack of feedback from them on the effectiveness of the training. Furthermore, there are few if any local IEE equipment suppliers who have successfully demonstrated the sale of IEE local equipment to local industrial SMEs. This includes the sale but unsuccessful operation of locally made gasifiers and boilers.

For output 2.4, the website for the National Cleaner Production Office (NCPO-C) has been set up since 2012. The website does provide general information on industrial energy efficiency along with 40 case studies of IEE implementation under the IEE Project. In addition, the website does have a link to existing UNIDO and UNEP manuals and tools required to design and implement IEE measures.

Outcome 3 - Stronger institutional framework in place to ensure long-term support for energy reduction efforts in enterprises

The evaluation team found the effectiveness of these activities was **moderately satisfactory** due to IEE technical training provided to institutional personnel, training on preparation of bankable IEE proposals to service providers, lack of financial institutional participation on IEE training programs, and dissemination of an energy management system that complies with ISO 50001. Outputs to deliver this outcome included:

- Output 3.1: More than 200 trained institutional personnel to promote IEE;
- Output 3.2: Companies trained in preparation of bankable IEE proposals;
- Output 3.4: Practical guide for implementation of energy management industry compliance with ISO 50001.

Activities to deliver output 3.3 did not result in financial institutions with strengthened capacities to assess and consider investment proposals in IEE.

For output 3.1, capacity building for relevant government departments was combined with the IEE training programs under output 2.1. For hands-on training or institutional staff, personnel from government departments, notably the Energy Efficient Department under MoME, were paid by the project to determine energy baselines for quick scan SMEs, and to determine energy consumption after IEE measures were implemented. Capacity building activities of this output focused on technical training to provide knowledge to relevant government departments in effectively promoting IEE. The design of this output did not include feedback on the effectiveness of activities related to the quality of training. However, many of these government officers did undertake small assignments to design IEE measures.

For output 3.2, 4 persons from NCPO-C were trained in the use of COMFAR 2, a software model developed by UNIDO for feasibility analysis of an investment. Up to late 2013, these NCPO-C trainers provided assistance in various service

providers of this software. The design of the activities of this output did not include any feedback on the use of the software at EOP. However, many of the energy specialists trained on the project used this software to prepare IEE proposals that were self-financed by the industrial enterprises. There were no targets in the project results framework for the number of persons to be trained on this software.

For output 3.3, very few personnel from financial institutions attended any of the projects workshops on the preparation of bankable IEE Project proposals. Moreover, there was a lack of presence of these personnel at these workshops that is reflected in the lack of utility of loan services from financial institutions by SMEs wanting to implement IEE measures. With all of the IEE pilot and quick scan investments on this project being self-financed, the PMU felt that no training programs were necessary specifically for personnel from financial institutions. In addition, the short payback periods of IEE projects demonstrated in Component 1 convinced most industrial enterprises that IEE measures were worth financing without the assistance of financial institutions. *The evaluators, however, surmise that there is a significant but unknown number of industrial SMEs wanting to implement IEE measures but without access to finance.*

For output 3.4, the project did provide training and tools 3-stage training modules on energy management systems compliant with ISO 50001. The tools consisted of an energy management system implementation guide produced in English and Khmer languages. The evaluation team observed that two enterprises, Ly Ly Food Industries and Media GB Enterprises have adopted certified for compliance with ISO 50001.

A high proportion of attendees at the intensive IEE and ISO 50001 training modules were from government agencies. Their attendance at these training modules has increased institutional knowledge of energy efficiency in the industrial sector and the management systems required to sustain their energy efficiency.

Outcome 4 - Increased adoption by Cambodian enterprises of energy efficiency practices and technologies as an integral part of their business practices

The evaluation team found the effectiveness of these activities was **highly satisfactory** due to adoption of IEE measures for almost all industrial sectors where pilot measures were undertaken. The outputs delivered to achieve this outcome included:

- Output 4.1: Wide dissemination of the pilot projects and quick scans for 40 IEE projects as well as energy management;
- Output 4.2: More than 600 industry decision-makers and personnel from 400 industrial enterprises who attended IEE seminars now understand the potential for energy efficiency gains and undertake EE activities;
- Output 4.3: Less than 20 local technology and equipment suppliers who understand their role to promote IEE.

For outputs 4.1 and 4.2, the success of the pilot projects in quick scans was quickly noticed by other industrial SMEs. With a high level of competitiveness between all the SMEs in Cambodia and associated pressures to increase profitability, almost all private sector industrial decision-makers have demonstrated an understanding for the need to become energy efficient. This has also been demonstrated in the number of IEE initiatives amongst other industrial SMEs. Some examples include:

- the brickmaking industry where the evaluation team was informed by Sun Rise Brick Company in Kandal that neighbouring brickmaking companies (over 10 other enterprises) had all converted to the energy efficient rotary Hoffman kiln. Their initiative to convert came from the pilot project at Sun Rise Brick Company. The other brick companies sought the services of the Vietnamese kiln designers and brought them to Cambodia to assist in the setup and operation of their new EE kilns;
- the setup of gasifiers that use rice husk to generate producer gas for dual fuel power generation (30% diesel fuel and 70% producer gas) for industries outside of Phnom Penh where electricity supplies are not reliable. The pilot projects in the food processing, ice making, rice milling and rubber processing sectors considerably raised awareness of industrial SMEs on the means to reduce their production costs.

For output 4.3, local technology and equipment suppliers do recognize IEE opportunities and have tried to become involved with IEE retrofits with many of the industrial SMEs. The outcome of their involvement, however, has not been too successful based on frequent breakdowns of locally sold and manufactured equipment, despite the best efforts of the project to encourage foreign partnerships with local companies. To a large extent, these partnerships have not materialized due to a general lack of trust of foreign companies by local firms and the lack of knowledge of producing quality equipment. The other significant reason for the lack of partnerships is the perception that the local market can only support demands for the lowest cost products, and that foreign partnerships would only increase the cost of locally assembled EE equipment.

Outcome 5 - Establishment of policy, legal and regulatory frameworks that sustainably promote and support industrial energy efficiency

The evaluation team found the effectiveness of policy-related activities to be **moderately unsatisfactory** due to:

- no mechanisms created at various administrative levels to promote and enforce policies and regulations for IEE;
- no transfers of established procedures for tracking and benchmarking industrial energy consumption from the industries to responsible government departments such as EED and CCD.

Outputs achieved included:

- Output 5.1: Drafted policy documents for IEE and to calculate GHG reductions;
- Output 5.2: Simplified and friendly template for IEE monitoring reports and benchmarks for SEC for 5 industrial sectors;
- Output 5.3: Established National Energy Auditor Accreditation program.

For output 5.1, a policy document on IEE was prepared outlining SME power requirements and preferred technologies, cost comparisons and benefits of certain technologies such as steam engines and turbines, feasibility of cogeneration systems for SMEs, technical and economic evaluation of captive power utility for small industries, necessity of SMEs to have a certified plant manager, and recommendations to institutionalize certification of energy managers. In addition, the project has prepared tools and instruments to calculate GHG reductions from IEE measures that were used extensively by NCPO-C. The policy document provides details of a number of technical issues regarding steam engines, steam turbines and other economical means of captive power generation that can be used in a standards and policy document for IEE.

The issue for the evaluators, however, has been that no mechanisms have been created at various administrative levels to promote and enforce policies and regulations for IEE. While the project has a very strong collaborative working relationship with MoIH, the Energy Efficiency Department (EED) under MoME has raised the issue of a lack of effective communication between the Project PMU and their department who are responsible for formulation and enforcement of energy efficient policies, regulations and standards. The lack of a collaborative working relationship between the project and EED raises the question as to whether or not the policy work done by the PMU on the IEE project has been effectively disseminated to all relevant institutional counterparts.

For output 5.2, the evaluators have not seen any established procedures for tracking and benchmarking energy consumption in industries. This is in part due to the diverse nature of all industrial enterprises and the need for tailor-made benchmarks and unique measures for each industrial process. Instead, the Project has produced case studies which provide real examples of benchmarking and measuring post-intervention energy consumption. These case studies can arguably be used to guide other industrial SMEs in their benchmarking and tracking energy consumption. However, no efforts have been made to establish an institutional mechanism for reporting energy consumption to EED and GHG emission reductions from IEE measures to the Climate Change Directorate (CCD), the agency under MoE responsible for reporting GHG emissions. This may in part due to the fact that this was not specified in the IEE Project Results Framework.

For output 5.3, the project has used its resources to prepare a training program with the intention of graduating certified energy managers. During 2015, the project made substantial progress on output 2.2 by seeking international advice on setting up certification programs for industrial energy experts who can implement IEE measures for industrial SMEs in Cambodia. A training program as a part of output 5.3 to formally certify auditors was scheduled for late July 2015.

With over 25 participants scheduled for this training program, the project aimed to certify a minimum of 5 certified energy experts.

3.4 Efficiency

The efficiency of the project is assessed by the evaluation team as **satisfactory** that is attributed to the following:

- Delivery of most project outputs in a cost-effective and efficient manner within a reasonable expected time frame of 4.5 years;
- Project funds were provided by UNIDO in a timely manner to meet requirements annual work plans;
- While synergies were developed with other NCPO-C projects to provide a solid technical basis for the pilot IEE projects, the IEE project did not have any synergies with projects outside of NCPO-C, notably with other UNIDO projects in Cambodia.

The project has delivered cost-effective IEE measures to Cambodia's industrial sector within a 4-year period resulting in an outcome of demonstrable GHG emission reductions that have exceeded the original targets by a factor of 3. To achieve this outcome, the project utilized a considerable portion of its resources to plan, install, operate and maintain IEE measures with industrial SMEs, and to conduct training to create a pool of local technical expertise.

The IEE measures were considered by the project to be least cost options in consideration of life cycle costs of the technologies that account for capital cost, operating costs and costs related to the risks and consequences of technology malfunction. Initially, many of the entrepreneurs participating considered the project's IEE measures too costly from only a capital cost perspective, opting for lowest capital cost options and incurring higher risks of technology breakdowns. There are several examples of procuring lower cost and lower quality equipment in Cambodia, including locally made boilers and gasifiers of inferior quality which do not meet international standards for efficiency, performance and duration. The consequences to these entrepreneurs for procuring inferior equipment has been equipment failure, lower production and higher costs of operation. For these entrepreneurs, the lessons learned are that lowest cost options need to consider lifecycle costs of equipment that includes operations and maintenance as well as risk of breakdowns.

As observed on the table on page 21, project expenditures were reasonably even between the main 4-year period of the project, 2011 to 2014, with less than 6% expended during the unscheduled 5th year of the project (2015). This is also reflected in the number of pilot IEE and quick scan projects implemented throughout the 2011-2014 period the project, as shown in the table below.

Number of training/awareness raising sessions conducted and pilot and quick scan projects implemented by year					
Activity description	2011	2012	2013	2014	2015
High level dissemination seminars	-	-	-	1	
IEE clinics	13	5	6	1	
In-company training program	-	ongoing	ongoing	ongoing	
Intensive IEE training modules	-	3	2	3	-
Training module on ISO 50001	-		1 ¹⁸	1 ¹⁹	-
Cumulative number of pilot and quick scan IEE projects implemented	-	9	27	14	-

With a total project budget of USD 1,240,000, an average annual expenditure over the 2011- 2014 period of the project was expected to be USD 310,000. As illustrated in the table below, the first 2 years of project implementation experienced expenditures of USD 285,000 or 91% of the average expenditure of USD 310,000. The third year of implementation (2013) saw project expenditures decreased slightly to USD 233,000 or 75% of the USD 310,000 expenditure. Expenditures of the 4th year of implementation (2014) were USD 386,002, essentially higher to meet the demand for quick scan IEE projects and training. Expenditures in the 3rd and 4th years of the project focused more on training on environmental management systems to sustain reductions in energy and GHG emissions from industrial processes after the EOP. Given the results of the pilot and quick scan IEE projects and the interest generated in IEE over the first two years, *the cost-effectiveness of project expenditures was highly satisfactory.*

Annual disbursements of GEF Funds to IEE project	
Year	Disbursement, USD
2011	286,993
2012	285,891
2013	233,910
2014	361,049
2015	72,157
Total	1,240,000

In the context of implementation to deliver outcomes in a most cost-effective manner, early activities of the project focused on raising awareness, providing more detailed IEE training to meet demand, and supporting pilot projects to demonstrate tangible energy reductions at selected industrial SMEs. Most importantly, the PMU focused on ensuring that IEE pilot projects were well planned and executed. With the outcome of successful IEE pilot projects, a solid foundation was laid for replication of IEE measures for other industrial SMEs.

¹⁸ Only introduction training module

¹⁹ Consists of 3-stages of training: one 2-day classroom session, and two separate on-the-job training sessions

Although the project was scheduled to commence in November 2010, UNIDO approval for the project was not received until March 2011. The project then commenced in April 2011 and generated most of the intended outputs and outcomes within its designed 4-year timeframe.

The project's scheduled completion was delayed by 12 months to November 2015 that will enable the project to complete the process of certification of energy managers. Six months of the 12-month delay can be attributed to agency delays in approval of the project in early 2011. The remaining six months of delay can be attributed to delays from scheduling conflicts with holidays, availability of international consultants.

The achievements of the project over the 4.5 year period compares favourably to other similar and well-managed projects on energy efficiency in the region and globally. Despite a deficiency of not strongly linking project expenditures with respect to project components, the PMU has guided the project to a reasonably successful conclusion that meets the obviously high demand for knowledge on IEE.

Project funds were provided by UNIDO in a timely manner to meet the requirements of annual work plans. This includes timely inputs by the PMU in Phnom Penh, UNIDO Project management and support from UNIDO in Vienna for recruitment of international expertise, approval of project disbursements and transmittal of funds to the PMU in Phnom Penh.

The IEE project was well integrated into the operations of NCPO-C. NCPO-C also had 5 other projects related to cleaner production in the industrial sector that served to enhance the technical outputs of the IEE project including:

- i) the GEF supported "Climate Change Related Technology Transfer for Cambodia: Using Agricultural Residue Biomass for Sustainable Energy Solutions" or herein referred to as the "TT Project";
- ii) a Swiss government supported project managed through UNIDO entitled "Industrial Waste Minimization for Low Carbon Production";
- iii) the privately funded Project entitled "Sustainable Action and Vision for a Better Environment (SAVE)" to provide assistance to supply chain factories in footwear and garments in developing countries that includes Cambodia through reducing their consumption of energy and water, and minimizing their generation of waste and CO₂ emissions;
- iv) the EU funded SPIN project under the SWITCH-Asia program that promoted sustainable product innovation in Cambodia, Viet Nam and Laos targeting the food processing sector and government institutions responsible for environment and innovation policy;
- v) the Japan government funded project subcontracted by IETC-UNEP and managed by UNIDO entitled "Waste Agricultural Biomass Project (WAB2E)" that provided assistance to RGoC in promoting conversion of waste agricultural biomass into energy.

These NCPO-C managed projects provided good synergies with the IEE project, notably with regards to NCPO-C's working relationships with a network of industrial enterprises for pilot and quick scan IEE projects.

Synergies with other projects outside of NCPO-C were not fully developed by the PMU. The evaluation team observed a lack of IEE project involvement with other donor projects that includes other UNIDO projects in Cambodia. The root cause of this issue has been the aforementioned lack of a full collaborative working relationship between the PMU of the IEE Project and a group of Government counterparts (see page 39 in relation to Output 5.1), notably with those who work with other UNIDO projects that have agreed to fall under the monitoring regime of the Office of the Head of UNIDO in Cambodia (HUO). These UNIDO projects include:

- i) Hot-Spot and TEST project in Cambodia designed to address the increasing pollution loads discharged by industries located along the Mekong River and its tributaries in Cambodia;
- ii) a UNIDO-Samsung supported project for “Transforming e-waste in the job and business opportunities” where one of the aims of the project is to substantially reduce the carbon footprint of electronics manufacturers in Cambodia;
- iii) a GEF supported project entitled “Reduction of GHG emissions through the Promotion of Commercial Biogas Plants” that is being executed through MoE and the Ministry of Agriculture, Forestry and Fisheries (MAFF). The purpose of this project is to promote investments in biogas-based electricity enterprises using animal waste and to increase rural electrification.

With the lack of synergies developed between the IEE project and the UNIDO projects listed above, there have been some lost opportunities for more efficient delivery of industrial development projects by UNIDO. An example includes a garment factory south of Phnom Penh that received technical assistance from both the IEE project on the installation of an energy efficient boiler as well as the Hot-Spot and TEST project that provided assistance on minimizing water consumption and waste generation. A more efficient delivery mechanism for UNIDO would have been bundling these technical assistance packages into a cleaner production assistance program, and making a greater impact on the industrial enterprise.

3.5 Sustainability

The overall project sustainability rating is moderately likely (ML). This is primarily due to:

- Financing of IEE measures are available within the larger industrial enterprises of Cambodia. However, there is a lack of access to finance for smaller industrial enterprises due to the lack of financial products from Cambodian financial institutions that would support IEE investments;
- Willingness of most industrial enterprises to pay for IEE consulting services has not been fully embraced and is at best uncertain;
- The availability of a pool of national energy experts to assist industrial entrepreneurs in implementing IEE;
- A weak institutional framework and weak capacity to enforce regulations and standards.

Details of the sustainability dimensions follow.

From a financial perspective, the sustainability of project outcomes is *moderately likely* (ML). At this time, larger industrial enterprises in Cambodia have the financial resources available to implement IEE measures. However, given that there are no financial products developed by financial institutions, smaller industrial enterprises who require financial assistance to implement IEE measures may not have access to resources from financial institutions. Although the project was designed to work with the local financial institutions to make them more aware of IEE financing opportunities and to consider financing IEE measures, this was not successfully achieved, likely due to the lack of any effective consultations with financial institutions during the PPG phase and the possibility that financial institutions in Cambodia were not ready to finance IEE measures. It is also unclear of the proportion of smaller industrial enterprises that would require access to financial resources to implement IEE measures and procure low carbon technologies. As such, the impact of smaller industrial enterprises not having access to financing is somewhat unknown. A quantified view of the proportion of industrial enterprises that need financial assistance to implement IEE measures is needed in Cambodia.

One other financial perspective on sustainability includes the willingness of industrial enterprises to pay for professional technical assistance. While it is clear that many of the SMEs have financial resources to implement IEE measures and technologies, they were also very clear on their need for continued technical assistance to identify IEE measures for their enterprises. Currently, NCPO-C is providing this technical assistance at no cost to industrial SMEs on cleaner production as well as energy efficiency.

Questions arise as to how industrial enterprises will obtain technical assistance for scoping IEE measures after the EOP, and their willingness to pay for it. In the case of Medai Enterprises (Ganzberg Brewery) as well as Dignity Knitters Limited, the owners hired an energy manager to be on staff. Smaller industrial enterprises, however, will likely not have sufficient funds to hire a full time energy expert. The evaluators surmise that the option of hiring an energy expert as a consultant has not yet been fully embraced by industrial enterprises. This would include the possibility of hiring NCPO-C personnel as consultants. While NCPO-C appears to be the only dedicated organization in Cambodia providing technical assistance to industrial enterprises, there are advantages for Government support of an independent organization that can provide consulting assistance to industrial enterprises wanting to implement IEE measures. Government support of this organization is required to ensure that the consulting assistance meets established national standards. Such an organization similar to NCPO-C can be established, managed and operated with one of the following operational modalities:

- Operations as a government agency. This, however, is not feasible due to lack of available public funds and administrative issues related to recruiting private expertise;
- Direct consulting hires by industrial SMEs. The issue with this operational mode is related to the difficulties during the start-up phase of an independent organization when consulting assignments are expected to

be sporadic due to low awareness of the availability of these services. This will require some form of outside government or donor support until a critical mass of industrial SME contracts for IEE consultation and a stabilized revenue stream has been attained; and

- At the time of writing of this report, there are no confirmed sources of funding for an independent organization including NCPO-C after April 2016 to continue the development of IEE. There is a possibility; however, of obtaining an extension of two years for the GEF supported TT project which would provide some basic support to NCPO-C until the end of 2017.

In conclusion with regards to financial perspectives on the sustainability of IEE, the evaluators believe that:

- financial resources for the capital cost of IEE measures are available from larger industrial enterprises;
- the willingness of almost all industrial enterprises to pay for consulting services for technical for energy efficiency technical assistance has not been fully embraced and is uncertain;
- if NCPO-C no longer provides IEE technical services, a likely outcome will be IEE adoption by larger and well-managed industrial enterprises, and a lack of adoption by an unknown number of smaller industrial enterprises due to their lack of access to technical assistance finance and capital cost loans;
- with the above scenario, the sustainability rating of the IEE project from a financial perspective is moderately likely.

From a socio-political perspective, the sustainability of project outcomes is *likely* (L). This is based on strong support from Cambodia's industrial enterprises and RGoC on the basis of their policies and strategies to mitigate the impacts of climate change and the issues of long-term energy security, and the availability of national energy experts to assist industrial enterprises in implementing IEE. Sustainability from this perspective has also been demonstrated in the response of the industrial sector to the IEE project that has catalyzed their interest in energy efficiency and its linkages with increased profitability, and has leveraged co-financing investments from several industrial enterprises of over USD 9.0 million, more than three times the co-financing envisaged in the original project documents.

From an institutional framework and governance perspective, the sustainability of project outcomes is *moderately likely* (ML). The institutional framework and regulations for IEE are still in development. The main issue is the weak institutional capacity to enforce any policies or regulations related to IEE development (in part caused by a weakening working relationship with EED). More importantly, Cambodia still needs standards and regulations for IEE that covers equipment, installation and operation. While there have been many lessons learned from the pilots and quick scan projects implemented on this Project, the formal establishment or adoption of international IEE equipment regulations and standards would encourage initiatives towards local manufacturing of IEE equipment. Moreover, industrial enterprises wanting to

implement IEE measures will have more confidence on what these measures should entail.

At this time, there are some foreign suppliers of IEE equipment making efforts to partner with local IEE vendors; however, the lack of an established regulatory regime that is enforced with equipment standards does not provide these local and foreign companies with required confidence on what equipment to bring to the local market. Establishment of the regulatory regime would facilitate investments by these companies on an appropriate local manufacturing facility to meet these equipment standards.

From an environmental perspective, sustainability of project outcomes is *likely* (L) with the assessment that there are minimal environmental risks. IEE measures that have been promoted on this project are removing a number of environmental risks including decay of biomass material, attendant problems with infectious vectors, and reduced air pollution from fossil fuel combustion. In addition, all IEE measures are considered reduce GHG emissions.

Catalytic impact and replication

It is also worth noting that the IEE project had a strong catalytic and replication effect on all industrial sectors on generating interest in industrial energy efficiency. Much of this is in part due to the competitive nature of all the industries and their intense interest in undertaking any measures that would result in more profit in their operations. Evidence of the catalytic effect of the project was the high attendance numbers at many of the IEE workshops held throughout the country.

The replication effect of the project amongst industrial entrepreneurs was also very strong. Replication of IEE measures of the pilot projects included:

- The brickmaking sector where there has been replication of the energy efficient rotary kilns (as promoted by the project) throughout clusters of brick kilns in the vicinity of Phnom Penh. Replication rate for some clusters has been as high as 90%. A number of the other brick making enterprises used their own funds higher the Vietnamese consultant energy efficient rotary kilns;
- The rubber processing sector where the growth in the number of energy-efficient boilers occurred after the early pilot projects;
- The ice making sector where an additional 10 businesses have installed gasifiers for the purposes of captive power generation. There have also been reports of replacements of inefficient compressors, condensers and accumulators with more energy efficient models;
- The food processing subsector that experienced an increase in the number of energy-efficient boilers and captive power generation equipment after pilot projects were completed in 2011 and 2012.

Replication within the food processing subsector as well as the garments sector was not as high given that within each factory, there are unique IEE measures

that could be undertaken; prior to making IEE investments, these entrepreneurs would require technical assistance from certified or trained energy experts.

Some of the IEE solutions for several industrial enterprises included the use of gasifiers. Industrial enterprises located in dense urban areas (such as Pop Ice), however, have avoided the use of these gasifiers citing attendant problems in gasifier noise and increased heavy traffic to bring in feedstock such as rice husk and wood. Fortunately, most industrial enterprises participating on the IEE Project were located in less dense areas where there was a predominance of industrial occupants.

3.6 Assessment of monitoring & evaluation systems

The evaluation team notes that there was a monitoring and evaluation (M&E) plan provided in the original project documents. The evaluation team has received M&E reports in the normal GEF format of PIR that closely linked project indicators and targets of the log frame. Overall the M&E component was assessed as **moderately satisfactory**.

M&E design is rated as **moderately satisfactory**. This was based on the existence an M&E system plan as specified in the project document, and the fact that the log frame of this project did not have a complete set of SMART indicators (as mentioned on page 27).

The M&E design in the project document also included special provisions to track:

- energy savings and GHG emission reductions;
- emission reductions directly generated by the IEE project;
- industrial energy efficiency investments generated by the IEE project;
- the development of appropriate mechanisms and policies conducive to supporting IEE, and accreditation of energy auditors;
- level of awareness and technical capacity for IEE and energy management amongst all relevant stakeholders.

The current version of the log frame is too wordy leading to some confusion over how to measure the targets. For example, the outcome indicators and “targets” are not necessary since many of the outcomes are already covered within the outputs. The project log frame is contained in Annex 5 with specific comments from the evaluation team on these issues.

M&E plan implementation has been rated **satisfactory**. The evaluation team did verify that a formal M&E system was in place for the IEE Project and summarized on the PIR reports. Progress was tracked according to the outputs on the log frame notwithstanding issues with the lack of SMART indicators. Findings on these reports were backed by the documentation on NCPO-C’s annual reports from 2010 to 2014 (2015 annual report will not be available until 2016). These reports also documented progress of other projects of NCPO-C.

The project document had in place a Project Advisory Committee (PAC) to provide a forum for guidance and management of the project from government and other important stakeholders. The PAC was renamed as a Project Steering Committee (PSC). PSC meetings were only held once per year and on convenient dates when the 16+ committee members could attend; with this frequency and arrangement of PSC meetings, *the PSC could not function as designed to advise on the preparation of annual work plans*. The evaluation team was only able to obtain PSC meeting minutes from 2014 and 2015 that were combined with issues from the other GEF supported TT Project on agricultural residues. The PSC meeting minutes summarize the challenges in implementing the IEE Project, notably regarding the lack of progress in setting industrial energy efficiency standards. Such standards would spur the growth of energy auditors who could support industrial enterprises wanting to implement IEE measures.

Budgeting and funding of M&E activities has been rated **moderately unsatisfactory**. With the evaluation team unable to verify if existence of any separate budgets for M&E activities, it is doubtful if there was any budget allocated for M&E. Despite this lack of attention to M&E, the project was able to achieve an important target, GHG emission reductions from pilot and quick scan projects.

3.7 Monitoring of long-term changes

Potential longer-term impacts of the project are considered to be fully aligned with the expectations as expressed in the original project document. This includes the adoption of IEE by many of the industrial SMEs over the long term. Most if not all of the industrial SMEs are driven towards IEE adoption to remain competitive within their own markets. As a result, the long-term impacts of this project with regards to raised awareness of IEE will likely be sustained.

The IEE project with its case studies on IEE measures undertaken provides a solid foundation for the establishment of long term monitoring system for IEE measures undertaken after the EOP. A reporting structure for monitoring industrial energy consumption was developed by the project and is in use by NCPO-C personnel. However, during the evaluation, none of the government agencies who might be responsible for collecting such information such as EED or CCD, have reported any project efforts to make such arrangements. Given the aforementioned lack of effective communication between the project and EED on this issue, this would seem likely. Stronger institutional arrangements and mechanisms for measuring, reporting and verification (MRV) for the industrial sector are required for Cambodia. The impact of such arrangements and mechanisms would be to sustain and optimize long-term energy efficiency in the industrial sector.

To address this shortcoming, there needs to be improvements in the collaborative working relationship between NCPO-C and EED (under MoME) and CCD (under MoE) that will work towards properly embedding of this system within EED under MoME (for energy-related data) as well as CCD under MoE (for GHG emissions related data). This may involve NCPO-C working more closely with the head of UNIDO in Cambodia who potentially can assist this project and other GEF projects under NCPO-C in strengthening its collaborative working relationship

with EED and CCD. While it is likely that IEE measures will continue to draw intense interest from industrial SMEs after the EOP, it is imperative that the system is properly embedded within EED and CCD to monitor and report on industrial energy efficiency and associated GHG emission reductions respectively. Moreover, such information will enable RGoC to set IEE standards that can provide confidence to industrial enterprises in investing in IEE measures.

3.8 Assessment of processes affecting attainment of project results

Preparation and readiness

At the entry of the project, UNIDO's preparations for the IEE project were **satisfactory**. The preparation of the project objectives and components were clear and practical with the exception of Component 3, the strengthening of the institutional framework where during implementation, capacity building of financial institutions to assess IEE investment proposals was deemed impractical. Some of the baseline information concerning the financial institutions of Cambodia paint a picture of a very weak financial system within the country. As such, strengthening these financial institutions with the intention of the financing of IEE proposals within the 4-year period may not have been feasible. Moreover, the project was not able to implement measures to strengthen financial institutions for IEE investments as the PMU determined there was little or no demand.

The capacity of NCPO-C as an executing partner was appropriate for this project. Since the capacities of the government counterpart agencies were considered weak, namely the former Ministry of Industry, Mines and Energy or MIME (that was split into MoIH and MoME in 2014), direct execution of the project was assigned to NCPO-C. In addition, NCPO-C during the period of 2006-2010 were involved with several donor supported projects in cleaner industrial developments and resource efficiency. This provided a strong technical foundation on which NCPO-C is qualified to execute this project. During project preparations, this execution arrangement had strong support from the RGoC, namely the former MIME and now MoIH.

Country ownership/drivenness

There was strong country ownership drivenness for the IEE Project. Key policies and plans of the RGoC to improve the competitiveness of its industrial sector through energy efficiency are contained in:

- The Energy Sector Development Plan, 2005–2024;
- The National Policy, Strategy and Action Plan on Energy Efficiency in Cambodia (prepared by MoME) that was developed in 2013 and lists a number of activities to support industrial energy efficiency including amongst other actions improving energy data collection and processing, promoting good energy management practices with industrial enterprises, and implementation of energy efficiency and conservation laws and regulations on industrial energy use; and

- The National Strategic Development Plan 2014–2018 that specifically seeks to ensure efficient management and use of energy as well as fostering development of all types of renewable energy such as biomass²⁰; and
- The draft Second National Communications (SNC) of Cambodia that identifies manufacturing industries as large consumers of fossil fuels and other industries such as garments, food processing and brick making consuming large amounts of biomass fuel would that contributions to deforestation²¹.

The project outcomes all contribute to these national priorities. The most relevant government agencies were involved on the preparation and implementation of the IEE Project including MoIH, MoME and MoE. One of the project activities was to assist in the formulation of policies and legal frameworks to promote and sustain development of IEE. Some policy support documents using lessons learned from the implementation of the IEE pilot projects have been prepared at the time of writing of this report; however, the government has not yet adopted the contents from these policy support documents.

Stakeholder involvement

As previously mentioned in this report, the project has had adequate stakeholder involvement from the project preparation phase to implementation. Stakeholder perceptions of the quality of outputs were generally positive given the high level of participation of training attendees in discussions on IEE related issues during the workshops and the high level of adoption of IEE by the industrial stakeholders.

The only area of weakness in stakeholder involvement has been the lack of an effective collaborative working relationship between the PMU and some government counterparts, most importantly with the Energy Efficiency Department of MoME. Considering the importance of the EED role in oversight of energy efficiency in Cambodia and in setting EE policies and standards for MoME, full engagement of EED on the project was crucial to achieving greater success on the IEE project.

Financial planning

In light of the aforementioned comments on the issues of the log frame and its lack of SMART indicators, annual work plans (AWPs) of the project were not prepared using the Project Results Framework. Rather, the AWPs comprised a list of activities (with some activities related to the Project Results Framework) proposed by the PMU with cost estimates attached. This would explain the lack of accounting of project expenditures to project components and their outputs as reflected on the cost tables on pages 21 and 22.

Despite this, the project still achieved significant and useful outcomes for IEE in Cambodia efficiently and in a cost-effective manner. From the *technical*

²⁰ Paras 4.122 to 4.127

²¹ Approval of the draft SNC is expected in late 2015

perspective, the project achieved its clear mandate to implement pilot IEE and quick scan projects and demonstrate tangible energy savings. The modest annual expenditures of the project and the positive outcomes of the pilot IEE scan projects implies that the cost-effectiveness (and by extension financial planning) of this project was satisfactory. Decisions on implementation plans of the project were made by the CTA, and shared with UNIDO HQ in Vienna for the timely disbursement of funds. This finding is based on discussions with NCPO-C personnel and PSC meeting minutes from 2014 and 2015 where some implementation plans were presented with information to the PSC members.

UNIDO's supervision and backstopping

The overall rating of UNIDO's supervision and backstopping is rated as **moderately satisfactory**. This is based on:

- The positive technical outcomes of the project, mainly related to implementation of IEE pilot and quick scan projects as well as the training activities;
- The aforementioned issues related to institutional strengthening outcomes and the lack of an effective collaborative working relationship between the PMU and some government counterparts including EED; and
- Issues related to the poor relationship that has developed between NCPO-C and the UNIDO Chief in Cambodia, and the subsequent alienation of the UNIDO Chief from all of NCPO-C projects. This only serves to increase the risk that the NCPO-C activities in planning and implementing IEE projects with industrial SMEs become unsustainable.

Co-financing and project outcomes and sustainability

Co-financing leveraged by this project has been more than three times that expected in the project document. The main co-financing has been from the private sector industrial SMEs indicating a high level of interest in IEE. This is an excellent outcome that partially contributes to the sustainability of EE in the industrial sector for larger SMEs.

However, sustainability of IEE after the EOP will also depend on the ability of the RGoC to strengthen its regulatory framework and enforce compliance of IEE policies, regulations and standards. A strong regulatory framework for IEE in Cambodia will ensure its sustained and robust growth for all industrial SMEs, including both large and small industrial SMEs.

Delays and project outcomes and sustainability

Project delays have been minor and have been attributed to elections and delays in recruiting international expertise. These delays have not affected the project outcomes or the sustainability of the project.

Implementation approach

The implementation approach of the IEE Project has been assessed as **moderately satisfactory**. The approach of the project was to increase adoption of IEE by Cambodian industrial enterprises and to build capacity of all relevant institutions for IEE within RGoC. The approach implemented, however, was weak for all non-engineering related activities. With the CTA in charge of planning and implementing project activities, there was a strong emphasis on the engineering of IEE pilot projects and addressing the training needs for IEE. This approach did result in widespread support amongst industrial enterprises. However, despite strong results in demonstrating energy savings on IEE pilot projects, the approach has not fully engaged the EED in strengthening an IEE regulatory framework that most importantly includes the setting of IEE policies and standards. This approach that has not resulted in the setting of IEE policies and standards, places some risk on the sustainability of IEE development after the EOP, sustained reductions in energy consumption and country's ability to become economically competitive.

3.9 Project coordination and management

National management and overall coordination mechanisms of the PMU have been effective in ensuring the provision of appropriate technical assistance to implement IEE pilot and quick scan projects that generated demonstrable energy savings. However, project coordination and management has only been partially effective in the context of institutional strengthening, due to full collaborative working relationships developed with MoIH but not with the Energy Efficiency Department under MoME.

Roles played by PMU local staff included the collection of baseline information, information and analysis, monitoring and reporting on implementation and energy savings. This information was forwarded to the CTA who served as the primary conduit and communicator of technical information and project management decisions to government counterparts. The IEE Project also had a project coordinator who work directly under the CTA and coordinated implementation of IEE pilot and quick scan projects. The project coordinator, however, was not encouraged to provide technical inputs into the pilot and quick scan projects.

By late 2014, more than five staff resigned from NCPO-C who were then replaced by less experienced staff in early 2015. Reasons for these resignations ranged from the limited roles assigned to local staff to accessing better paid assignments. For the PMU, however, these resignations were a loss of corporate memory and technical capacity of the organization in their 2015 operations. Fortunately, the 2015 operations only represented only 6% of the IEE project budget.

As previously mentioned, several government counterparts expressed the need for the PMU to improve its collaborative working relationship with institutional stakeholders. The evaluators consider this to be important especially as the RGoC is seeking assistance in building its capacity to set and enforce policy.

Management and coordination from UNIDO HQ has provided the Phnom Penh based PMU with timely delivery of sufficient resources and international expertise to deliver most of the outputs of the project. This also included monitoring and quality control of technical inputs since the delivery of technical aspects of the IEE measures was strong.

However, despite a strong relationship between MoIH and the IEE project, UNIDO HQ and regional management have made few if any efforts to reverse a weakening IEE project relationship with other institutional counterparts, most importantly, the EED. A key person to resolve these relationships was the UNIDO Chief in Cambodia; however, this person was in past alienated from IEE project operations, further exacerbating this issue.

The national management and coordination mechanisms were to be implemented through a Project Advisory Committee (renamed during the project as the Project Steering Committee or PSC) that was chaired by a representative from the MoIH. As mentioned on page 46, *the PSC could not function as designed to advise on the preparation of annual work plans*. The evaluation team was only able to obtain PSC meeting minutes from 2014 and 2015 that were combined with issues from the other GEF supported TT Project on agricultural residues. The PSC meeting minutes summarize the challenges in implementing the IEE project, notably regarding the lack of progress in setting industrial energy efficiency standards.

3.10 Assessment of gender mainstreaming

This project did not make significant contributions to gender mainstreaming from the baseline scenario. Almost one half of the industrial SMEs visited during the evaluation were headed by female CEOs. The evaluators also observed that many of the factories had a workforce consisting of greater than 50% female, notably the garment industry which had more than 75% female employees. One of the desired outcomes of this project was increased competitiveness of industrial enterprises through reduction of energy costs. While this project has demonstrated the means to increase industrial competitiveness, it has also demonstrated the potential for reduced operational costs of industrial enterprises, increased financial stability of an enterprise that employs a high proportion of females, and increased opportunities for higher-quality jobs for both males and females.

3.11 Procurement issues

Procurement on the IEE project can be categorized as follows: a) international expertise; b) local expertise and staff; d) outsourced services; e) equipment.

The process for procurement of international expertise was initiated by the CTA through the preparation of the ToRs followed by posting of the consulting position on the UNIDO E-Recruitment system. In streamlining the process to find suitable candidates, the project manager based in Vienna as well as the CTA would have preliminary discussions with prospective candidates to ensure their participation and availability for the assignments. Due to the specialized nature of the

international expertise, there was little if any tendering of these positions. International recruitment would often be sole sourced.

Procurement of local expertise and PMU staff were often open tenders advertised in local newspapers for persons with a critical mass of working experience required by the IEE project. One of the main issues of recruitment staff in Cambodia is the paucity of locally qualified people. To streamline the recruitment process for IEE experts and PMU staff, NCPO-C targeted graduating students from ITC, notably graduates who had succeeded in finding engineering or construction jobs. Once they had accrued a minimum of three months of experience, these candidates were encouraged to make applications for NCPO-C vacancies.

Outsourced services such as preparation and printing of promotional material would be procured through a request for quotation (RFQ) to prospective vendors. Once NCPO-C receives the prices and informs NCPO-C, the successful vendor is informed followed by execution of services. Upon completion of services, invoices are sent to NCPO-C which are then transmitted to Vienna HQ for transmittal of funds for payment to the vendors. Prior to 2014, NCPO-C used the administrative services of UNDP to procure outsourced services.

Procurement of equipment for pilot and quick scan IEE projects was done with the assistance of the CTA in identifying an appropriate foreign equipment supplier. With the project offering a 10 to 20% buy down of the imported equipment, the industrial enterprise would finance the remainder of the cost of the equipment. The involvement of the project, notably the CTA, in equipment procurement for the industrial enterprise was necessary in ensuring the procured equipment would meet the technical standards required for sustained reductions in energy consumption. In several cases, the entrepreneur would bypass the advice of the CTA, opting for lower cost equipment (usually from local suppliers) that generally did not meet performance standards or would be secondhand equipment. In this latter case, the entrepreneur would not be eligible for a buy down from the project.

In conclusion, the procurement process on the IEE project did not serve as a hindrance to its progress and was generally effective and efficient. This is also reflected in the total expenditures to date versus the achieved energy reductions over a four-year project implementation period.

3.12 Overall ratings of the project

Criterion	Evaluator's summary comments	Evaluator's rating
Attainment of project objectives and results (overall rating) Sub criteria (below)		S
Design	Project results framework does not have a complete set of verifiable SMART indicators	MS
Relevance	Project outcomes are all relevant towards meeting national priorities	HS
Effectiveness	Technical effectiveness in implementing pilot and quick scan projects. There was reduced effectiveness of institutional strengthening efforts: <ul style="list-style-type: none"> • a lack of participation of financial institutions in training; and • no established procedures of tracking and benchmarking of industrial energy consumption and GHG emissions transferred to EED and CCD respectively 	S
Efficiency	Majority of planned project activities was achieved within the 4-year period with significant direct and GHG emission reductions	S
Sustainability of project outcomes (overall rating) Sub criteria (below)	Based on willingness of the larger industrial SMEs to finance IEE measures combined with a weak institutional framework to support IEE	ML
Financial	Large industrial enterprises have finance for IEE measures. However, an unknown proportion of smaller industrial SMEs do not have access to finance. Willingness of industrial enterprises to pay for IEE consulting services is uncertain.	ML
Socio political	Strong support from the government and the private sector for continued IEE technical assistance to the SMEs that is mainly provided free of charge	L

Criterion	Evaluator's summary comments	Evaluator's rating
Institutional framework and governance	Institutional framework to support IEE is still weak notably with the absence of established IEE standards	ML
Environmental	All project outcomes worked towards GHG emission reductions and improvements to air quality	L
Monitoring and evaluation (overall rating) Sub criteria (below)		MS
M&E Design	Design was well laid out in Project document. However, there was some lack of clarity in Project Results Framework adding to difficulties in monitoring institutional strengthening progress	MS
M&E plan implementation (use for adaptive management)	Evaluation team was able to verify the existence of M&E reports in the form of PIRs	S
Budgeting and funding for M&E activities	No evidence of separate budgeting and funding for M&E activities notwithstanding that the Project achieve some important targets such as GHG emission reductions	MU
UNIDO specific ratings		MS
Quality at entry (preparation and readiness)	Process for preparing project was participatory and reflective of the country's needs	S
Implementation approach	Despite a strong technical approach, approaches towards institutional strengthening and regulatory framework could have been stronger	MS
UNIDO supervision and backstopping	Despite robust support for technical aspects, stronger support was required to achieve financial institutional strengthening outcomes and the development of more collaborative working relationships with relevant institutional counterparts	MS
Overall rating		S

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.”

All other ratings will be on the GEF six point scale.

HS	= Highly satisfactory	Excellent
S	= Satisfactory	Well above average
MS	= Moderately satisfactory	Average
MU	= Moderately unsatisfactory	Below average
U	= Unsatisfactory	Poor
HU	= Highly unsatisfactory	Very poor (Appalling)

4. Conclusions, recommendations and lessons learned

This project achieved a great degree of technical success that significantly raised awareness of industrial SMEs to the benefits of industrial energy efficiency, increased demand for IEE technologies and measures, and catalyzed investments in the sector. In parallel, the Project also created an enabling environment for industrial SMEs to implement IEE measures through:

- training of over 40 national energy experts and the certification of a select group of experts to support further development of IEE;
- introducing and embedding of environmental management systems into the operations of industrial enterprises in Cambodia; and
- encouragement of foreign suppliers to work with local equipment vendors on the supply of IEE equipment that meets international standards for quality and sustained operation

While these are excellent achievements, there were shortcomings that will impact the pace and quality of future industrial energy efficiency activities in Cambodia:

- Financial institutions were not fully engaged on this Project. With no success in effective engagement of financial institutions to finance IEE measures, future difficulties in accessing finance will be manifested for an unknown but significant number of industrial SMEs
- There still remains a weak institutional framework and capacity that includes no established IEE regulations and standards. There is an absence of established mechanisms at various administrative levels to promote and enforce policies and regulations for industrial energy efficiency. While the Project has generated numerous IEE case studies, procedures or protocols for tracking, benchmarking and reporting on industrial energy consumption to government departments have not yet been established. The absence of these procedures and protocols makes it more difficult for government to set policies and regulate IEE development in Cambodia.

Design

The IEE project design was assessed in terms of the clarity in the project results Framework and its set of verifiable SMART indicators. In general, project design was satisfactory in that it provided appropriate measures to address high specific energy consumption of Cambodia's industrial sector. The project results framework, however, lacked a complete set of verifiable SMART indicators. This served to contribute to difficulties in achieving all project outcomes, most significant of which is outcome 5: Establishment of policy, legal and regulatory framework that sustainably promote and support IEE, where there was a lack of clarity on targets and indicators. In addition, the lack of a full set of SMART indicators and targets has made it difficult to conduct proper progress reporting of

the project. Clearer baselines and SMART indicators of expected results would have made project implementation and monitoring simpler.

Lastly, the outputs within Component 3 to engage the financial sector in financing IEE projects did not materialize. Considering the demonstrated lack of interest on the financial sector on this project during the project preparation phase, the design should have accounted for their lack of readiness to be involved in IEE measures with SMEs. Given the global history of the financial sector's risk aversion with SMEs, scaled-down project targets with the financial sector would have been more appropriate (such as IEE awareness raising or sourcing funds for concessional finance).

Relevance

Relevance of this project was assessed against the national priorities of Cambodia. To this end, the project remains highly relevant in Cambodia, most notably for industrial SMEs outside of Phnom Penh. The efforts of this project to introduce and embed energy efficiency practices and measures to the industrial sector provides a significant contribution towards reducing the significantly higher operational costs of the Cambodian industrial sector. This supports the country's ambitions to improving overall competitiveness of its industrial outputs in the global market.

Effectiveness

The effectiveness of the IEE project was assessed against the expected outcomes in the project results framework. Overall effectiveness of the IEE project was satisfactory.

A breakdown of this rating includes the IEE project being highly effective in its technical support of pilot IEE projects to demonstrate reduced industrial operational costs, and in catalyzing IEE investments throughout the industrial sector of Cambodia. The project demonstrated the importance of a well-managed program of implementing pilot IEE projects, facilitating demonstration of tangible reductions in fossil fuel usage and investment paybacks of less than 2 years for several industrial SMEs. Most importantly for this GEF-CCM project, the pilot IEE measures were effective in successfully demonstrated GHG emission reductions to the extent that it exceeded the targets set in the project results framework.

To bolster the efforts of IEE development in Cambodia, the project also provided effective capacity building activities to create an enabling environment. This included the training of national energy experts, institutional personnel and local suppliers of IEE technology; web-based knowledge products on IEE; training companies on preparing bankable IEE proposals; and embedding certified energy management systems within and ISO 50001 framework.

The two areas where the effectiveness of project activities could have been improved included capacity building of financial institutions to assess IEE investment proposals (output 3.3) and the establishment of policy, legal and regulatory frameworks to sustainably promote support IEE (outcome 5). As explained in the previous section on project design, more effective engagement

of the financial sector stakeholders during the project preparation phase would have provided more meaningful activities. The lack of the effectiveness of activities under outcome 5 are mainly related to the lack of full engagement of relevant institutions on the IEE project. While the project has developed excellent relationships with MoIH, it had not fully engaged the Energy Efficiency Department under MoME, the agency responsible for setting regulations and standards for energy efficiency in Cambodia. In addition, the Climate Change Directorate, the agency within MoE that compiles and reports national GHG emissions, was also not fully engaged on the project.

Efficiency

The efficiency of the project was assessed on the basis of delivering project outputs on target, within schedule and implemented in a cost-effective and efficient manner. On this basis, the IEE project has delivered cost-effective IEE measures to Cambodia's industrial sector within a 4-year period resulting in an outcome of demonstrable GHG emission reductions that have exceeded the original targets by a factor of 3.

Contributing to the efficiency was the quality and timeliness of UNIDO services including the timely information of funds to support project activities. In addition, the procurement process of the IEE project did not serve as a hindrance to its progress and was generally effective and efficient. This is reflected in the total expenditures to date versus the achieved energy reductions over the 4-year implementation period.

Improvements to the efficiency of the delivery of the IEE project could have been improved by bundling its activities with other UNIDO technical assistance projects related to cleaner production. This would have resulted in a greater impact to an industrial enterprise of UNIDO technical assistance activities.

Sustainability

Based on GEF criteria for assessing sustainability, the overall sustainability rating for the IEE Project is moderately likely (ML). While there appears to be high demand for industrial energy efficiency amongst industrial SMEs, the pace of IEE development Cambodia will be constrained by a number of factors including:

- a lack of access to finance for smaller industrial SMEs whose proportion amongst all industrial enterprises in Cambodia is unknown but believed to be significant;
- the uncertainty of the willingness of industrial SMEs to pay for IEE consulting services;
- a lack of IEE standards and regulations and weak capacity to enforce regulations and standards; and
- abilities of national energy experts to deliver IEE solutions for industrial SMEs. With the conclusion of the IEE Project, NCPO-C will no longer be delivering the assistance on IEE to industrial SMEs unless NCPO-C receives funding.

Monitoring and evaluation system and project management

A monitoring and evaluation system was in place during the project to monitor progress of the outputs based on the indicators and targets in the project results framework. PIRs were prepared by UNIDO HQ with inputs from the PMU in Phnom Penh. Given the aforementioned issues of the lack of a full set of SMART indicators in the project results framework, there were issues related to the linkages between the AWP and the project outputs. This resulted in no accounting of project expenditures against the various components of the project.

The project was well managed from a technical perspective in implementing IEE pilot and quick scan projects to generate demonstrable energy savings. However, as previously mentioned, management of the institutional strengthening issues was not as strong due to the project not managing to fully engage all relevant institutions that includes the Energy Efficiency Department under MoME. The lack of involvement of the UNIDO Chief in Cambodia only exacerbated this issue.

Assessment of processes affecting attainment of project results

The excellent technical achievements of the project are a resultant of clear, practical and achievable project plans for IEE pilot projects and scale up. However, the shortcomings of the project with financial sector capacity building were due to an inaccurate presentation of the baseline of financial institutions in Cambodia. With Cambodia having a very weak financial sector, strengthening these financial institutions with the intention of “having them consider financing IEE proposals” within a 4-year period, was not achievable.

At the entry of the project, UNIDO’s preparations for the IEE project were adequate with the appropriate involvement of NCPO-C as a partner executing agency. At the commencement of the project in 2011, NCPO-C had 5 years of previous involvement with the industrial sector in Cambodia.

In light of the strong results in demonstrating energy savings on IEE pilot projects, the implementation approach of the project for engineering related activities was strong. However, the implementation approach for all non-engineering related activities did not result in the full engagement of the EED and the strengthening of an IEE regulatory framework that most importantly would include the setting IEE policies and standards. Similarly, the project developed a reporting structure for monitoring industrial energy consumption. This structure has not yet been adopted by EED (for energy-related data) or CCD (for GHG emissions related data). This has placed additional risk on the sustainability of IEE development after the EOP, sustained reductions in industrial energy consumption and the country’s ability to become economically competitive.

Lessons learned

Implementing market transformation projects in least developed countries (LDCs) presents a different set of challenges. For the IEE project, delivery of strong pilot projects was essential to achieving any success. This required the presence of technically strong personnel in the delivery of knowledge transfers of foreign practices and technologies, and good management of the technical aspects of the project. Without effective knowledge transfers to the host country, there would be no foundation to scale up knowledge transfers on the IEE project.

Improvements to the delivery of EE knowledge transfers in Cambodia could have been realized with the emergence of a local EE champion. Notwithstanding the technical success of the IEE Project, there was no emergence of a local EE champion.

Another lesson learned would be the need for more thorough project preparations that importantly include the need for understanding how business is conducted. The business environment within an LDC should be well integrated into future project designs. With the benefit of hindsight, the business environment of industrial SMEs participating with the Cambodian IEE Project played a significant role in the project outcomes:

- many of the industrial enterprise owners were not previously unaware of reducing energy costs as a means of reducing production costs;
- the owner makes the majority of technical decisions without the benefit of technical expertise. Occasionally, they may also seek the advice of friends and families;
- business decisions always consider the lowest cost options;
- many of the industrial SMEs who are able to participate on the project are able to self-finance industrial improvements including energy efficiency; and
- there is generally no long-term business planning.

During implementation of the IEE Project, project personnel recommended the best and most cost-effective technology available. Since local entrepreneurs are almost always drawn to the lowest cost options, there were a number of instances during the project when certain entrepreneurs under their own initiatives would purchase the lowest cost equipment. Almost all of them experienced equipment failure, higher energy costs and resulting increased production costs. Lessons were learned by some of these entrepreneurs who had subsequently come back to IEE Project personnel for technical assistance to address underperforming industrial processes. Unless these entrepreneurs have the ability to assess technologies that addresses lifecycle costs (i.e. equipment capital cost plus operating costs plus costs the risk due to equipment failure or breakdown), they will continue to pursue the lowest cost options.

Recommendations

To UNIDO and GEF:

Future GEF project designs should incorporate considerations of local knowledge absorption capacities of participating enterprises that will allow project designers to incorporate appropriate steps and time frames to achieve intended outcomes. This would also allow project designers to identify local business-related risks to the achievement of specified outcomes involving increased adoption of low carbon technologies and practices. An assessment of how local businesses interact with foreign technology suppliers and their fear of full disclosure (for proprietary and taxation reasons) would have been useful in the design of the IEE Project.

To the Royal Government of Cambodia:

As a high priority, RGoC needs to facilitate the establishment of IEE standards and regulations by MoIH and MoME to include:

- standards and labelling for IEE equipment and manufacturing facilities;
- policies and standards that regulate specific energy consumption for specific industrial sectors and processes; and
- effective enforcement mechanisms.

With the conclusion of this project, the future of IEE technical assistance is uncertain. With the absence of IEE standards and regulations, the development of technical assistance entities or companies to advance IEE development in Cambodia will be stunted. For the RGoC, the establishment of IEE standards and regulation will strengthen its commitment to IEE in a more effective manner. This will also raise the confidence of potential IEE investors and provide the basis on which consulting firms and technical experts will invest in efforts to pursue contracts and employment with SMEs on IEE.

The RGoC together with its developmental partners should facilitate the establishment of a post-project organization that promotes IEE, and address the attendant organizational issues including:

- Who will continue to support such an organization that is similar to NCPO-C: donors, industrial enterprises, government or a combination thereof?
- Will it be possible for this organization to be quasi-independent (maintain its impartiality towards IEE measures) but have broad-based support for its IEE mandate from all relevant Government departments and SMEs?
- How will this organization be able to retain its well-qualified personnel to provide effective IEE development services to industrial enterprises?
- Is there sufficient capacity conduct the business plan for such an organization? If not, the business planning should be cognizant of sources of funding for IEE promotion.

The RGoC should also consider the following actions to promote IEE development:

- Actively foster strategic partnerships between foreign technology providers and local manufacturers. There are currently a few foreign technology providers that have set up satellite offices for the purposes of identifying business opportunities in Cambodia. However, their efforts would be bolstered through local partnerships that increase the likelihood of success of these business ventures and a stronger likelihood of higher quality and more robust IEE equipment being deployed in Cambodia. Their efforts would also be bolstered through the establishment of IEE standards and regulations;
- Actively encourage industrial enterprises with growth plans to seek low carbon measures and technologies for energy efficiency. Incremental energy demands to service these growth plans will result in lower production costs in the long term;
- Consider the setup of a revolving fund that would provide project preparation support, low interest loans or buy-downs to strongly encourage all industrial SMEs on IEE and the use of low carbon technologies.

Annex A: Terms of reference

Independent terminal evaluation of UNIDO project:

Reducing Greenhouse Gas Emissions through Improved Energy Efficiency in the Industrial Sector

UNIDO Project numbers: GF/CMB/11/001

UNIDO SAP ID: 104034

GEF Project number: 3976

I. Scope and purpose of the evaluation

The terminal evaluation (TE) will cover the whole duration of the project from its starting date in April 2011 to the estimated completion date in November 2015. It will assess project performance against the evaluation criteria: relevance, effectiveness, efficiency, sustainability and impact.

The TE has an additional purpose of drawing lessons and developing recommendations for UNIDO and the GEF that may help for improving the selection, enhancing the design and implementation of similar future projects and activities in the country and on a global scale upon project completion. The TE report should include examples of good practices for other projects in a focal area, country, or region.

The evaluation team should provide an analysis of the attainment of the main objective and the five technical components. 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 according to the project evaluation parameters defined in chapter VI.

The key question of the TE is whether the project has achieved or is likely to achieve its main objective of reducing Green House Gas (GHG) emissions and specific energy consumption from Cambodian industry.

II. Evaluation approach and methodology

The TE 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 UNIDO Office for Independent Evaluation (ODG/EVA) 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, as necessary: 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), mid-term evaluation/review report, output reports (case studies, action plans, sub-regional strategies, etc.), BTOMR, end-of-contract report 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 head of field operations in Cambodia, as well as UNIDO FO in Thailand, which covers Cambodia, 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 evaluation team shall also gain broader perspectives from discussions with relevant GEF Secretariat staff.
9. Other interviews, surveys or document reviews as deemed necessary by the evaluation team and/or UNIDO ODG/EVA.
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 and the Project Team in Cambodia 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 evaluation is scheduled to take place in the period from 1 April 2015 to 30 June 2015. The field mission is planned for 20-26 April 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 Cambodia.

After the field mission, the evaluation team leader will come to UNIDO HQ for debriefing and presentation of the preliminary findings of the Terminal Evaluation. The draft TE 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.

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 Cambodia, and regional and international agreements. See possible evaluation questions under "Country ownership/drivenness" 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.).
- GEF's focal areas/operational programme strategies: In retrospect, were the project's outcomes consistent with the focal areas/operational program strategies of GEF? 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 of Climate Change (CC-2).
- 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 organization 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 (M&E) 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. Where 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 M&E 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 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. **Co-financing and project outcomes and sustainability.** 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?
- 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 5, 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 agreed/corrective actions...)?
- The UNIDO HQ-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 agreed/corrective actions...)?

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:

- a. To which extent were socioeconomic benefits delivered by the project at the national and local levels, including consideration of gender dimensions?

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 9 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 does the procurement process take (e.g. by value, by category, by exception...)
- 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? 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 (ToR) 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). It will be discussed with and approved by the responsible UNIDO Evaluation Officer. 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 timetable²².

Evaluation report format and review procedures

The draft report will be delivered to UNIDO Office for Independent Evaluation – ODG/EVA (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 UNIDO ODG/EVA 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 terminal 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 at UNIDO HQ after the field mission.

The TE 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.

²² The evaluator will be provided with a Guide on how to prepare an evaluation inception report prepared by the UNIDO Office for Independent Evaluation.

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 Appendix 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 gamete 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 terminal evaluation report will be forwarded electronically to the UNIDO Office for Independent Evaluation and circulated to main stakeholders.
6. Final terminal evaluation report will incorporate comments received.

Evaluation phases	Deliverables
Desk review	Development of methodology approach and evaluation tools
Briefing with UNIDO Office for Independent Evaluation, project managers and other key stakeholder at HQ	Interview notes, detailed evaluation schedule and list of stakeholders to interview during field mission
Data analysis	Inception evaluation report
Conduct of field mission. Present preliminary findings and recommendations to key stakeholders in the field	Presentation of main findings to key stakeholders in the field.
Present preliminary findings and recommendations to the stakeholders at UNIDO HQ	Presentation slides
Analysis of the data collected	Draft terminal evaluation report
Circulation of the draft report to UNIDO/relevant stakeholders and revision	Final terminal evaluation report

VII. Quality assurance

All UNIDO evaluations are subject to quality assessments by the UNIDO Office for Independent Evaluation. Quality assurance and control is exercised in different ways throughout the evaluation process (briefing of consultants on methodology and process of UNIDO's Office for Independent Evaluation, providing inputs regarding findings, lessons learned and recommendations from other UNIDO evaluations, review of inception report and evaluation report by the Office for Independent Evaluation). The quality of the evaluation report will be assessed and rated against the criteria set forth in the checklist on evaluation report quality, attached as annex 4. The applied evaluation quality assessment criteria are used as a tool to provide structured feedback. UNIDO's Office for Independent Evaluation should ensure that the evaluation report is useful for UNIDO in terms of organizational learning (recommendations and lessons learned) and is compliant with UNIDO's evaluation policy and these terms of reference. The draft and final evaluation report are reviewed by UNIDO Office for Independent Evaluation, which will submit the final report to the GEF Evaluation Office and circulate it within UNIDO together with a management response sheet.

Appendix 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

I. 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

II. 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 project²³ 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 (other initiatives of government, other donors, private sector, etc.)
 - Counterpart organization(s)

III. 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)

²³ Explicit and implicit assumptions in the logical framework of the project can provide insights into key-issues of concern (e.g. relevant legislation, enforcement capacities, government initiatives, etc.)

- 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)
- 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, co-financing 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.

IV. Conclusions, recommendations and lessons learned

This chapter can be divided into three sections:

A. 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.

B. 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

C. 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 B: Bibliography

- Original project document
- Request for CEO endorsement/Approval (February 2012)
- Annual financial expenditure reports of UNIDO
- GEF PIR and annual progress reports on IEE Project
- IEE Project work plans of 2012, 2013 and 2014
- Project Steering Committee meeting minutes of 2014 and 2015
- Annual NCPO-C reports on project progress for 2010 to 2014
- IEE Project Back to Office Reports of 2015
- Industrial Energy Policy - Draft Document for Industrial Energy Efficiency Policy Relevant to SMES in Cambodia, prepared by Arvind Kumar Asthana for submission to UNIDO and NCPO-C
- Independent Mid Term Evaluation Report of the UNIDO. Reduce Green House Gas Emissions through Improving Energy Efficiency in the Industrial Sector in Cambodia. Project Number: GFC/CMB/11/001 (September 2013)
- 10 training modules of the IEE Project from 2012, 2013 and 2014
- National Policy, Strategy and Action Plan on Energy Efficiency in Cambodia by the Ministry of Industry, Mines and Energy of the RGoC (2013)
- Global Industrial Energy Efficiency Benchmarking, An Energy Policy Tool (Working Paper) of UNIDO (November 2010)
- Policies by UNIDO Industrial Energy Efficiency in Developing Countries and Transition Economies (2008)
- National Strategic Development Plan 2014-2018 of the RGoC

Annex C: Interviews with key players

Place	Name	Position	Institution
Vienna	Mr. Patrick Nussbaumer	Project Manager, IEE Project	UNIDO
Vienna	Mr. Javier Guarnizo	Senior Evaluation Officer for the Office of Independent Evaluation	UNIDO
Vienna	Ms. Silvia Alamo	Senior Evaluation Officer	UNIDO
Vienna	Mr. René Van Berkel	Unit Chief, Industrial Resource Efficiency Unit, Environment Branch	UNIDO
Vienna	Mr. Juergen Hierold	GEF Coordinator and Unit Chief	UNIDO
Vienna	Ms. Anya Onysko	UNIDO Liaison Officer of Partnerships and Results Monitoring Branch	UNIDO
Phnom Penh	Dr. Permod Gupta	Chief Technical Advisor of IEE Project	UNIDO
Phnom Penh	Mr. Sok Narin	Head of UNIDO Operations Cambodia	UNIDO
Phnom Penh	Mr. Va Chanmakaravuth,	Project Coordinator of IEE Project	PMU
Phnom Penh	Dr. Sat Samy	Secretary of State	Ministry of Industry and Handicrafts (MoIH) of the Royal Government of Cambodia (RGoC)
Phnom Penh	Mr. Hang Seiha	Chief of Office	Ministry of Industry and Handicraft of RGoC
Phnom Penh	Mr. Chong Bou	Chief of Office	Ministry of Industry and Handicraft of RGoC
Phnom Penh	Mr. Lieng Vuthy	Deputy Director	Energy Efficiency Department of the Ministry of Mines and Energy of RGoC
Phnom Penh	Mr. Toch Sovanna,	Director	Department of New and Renewable Energy, Ministry of Mine and Energy of

Annex C: Interview with the key players

Place	Name	Position	Institution
			RGoC
Phnom Penh	Mr. Long Rithirak	GEF Operational Focal Point	Ministry of Environment of RGoC
Phnom Penh	Mr. Mr. Chen Sengheang	Deputy Director,	Cambodian Institute of Standards
Phnom Penh	Mr. Ly Dalin	Assistant Brewery Manager	Medai Enterprises (Ganzburg Brewery)
Phnom Penh	Ms. Keo Mom	CEO	Ly Ly Food Industry Co. Ltd.
Near Phnom Penh	Mr. Pov Norm	CEO	Norm Srim Rice Mill
Near Phnom Penh	Ms. Khim Nary	CEO	Pop Ice Factory
Near Phnom Penh	Mr. Ly Sonhour	CEO	Sun Rise Brick Factory
Near Phnom Penh	Mr. Chhun Panha	Energy Manager	Dignity Knitter Limited
Phnom Penh	Mr. Salil Dutt	Country Manager	Thermax Limited of India
Phnom Penh	Mr. Rogier van Mansvelt	Consultant	Simplon Cambodia
From home base by Skype	Dr. Heinz Leuenberger	former IEE Project Manager	UNIDO

Annex D: Summary of GHG emission reductions from implementation of IEE measures

1. Brick Kiln Sector

No.	Company's name	Investment (US\$)	Saving (US\$)	GHG savings (Ton/year)	Remarks
1	Be Rithy Brick Company	262,100	137,655	576	In Phase-II 2 nd kiln is under implementation
2	Suong Va Brick Company	240,000	107,235	290	2nd phase under implementation
3	Angkor Brick Company	200,000	223,630	1,730	
4	Nguon Sam Ath Brick Company	1,600	15,600	145	Unit is arranging resources to imp. identified IEE options
5	Doeum Por Roka Kong Brick Company	405,000	183,500	1,095	Unit plan to switch over to electrical energy
6	Punleu Preah Atith (Sun Rise) Brick Company	502,000	373,000	1,338	Unit will switch over to electrical energy
7	Buth Sothy Brick Company	445,000	270,500	2,136	3rd kiln is under implementation
8	Heng Phally Brick Company	150,000	77,765	243	
9	Huy Kim Ly Brick Company	1,600	13,600	36	Depending on resource FBHDK Kiln will be installed.
10	Balaing Prak Brick Kiln	110,000	62,040	438	Under expansion and in phase-2 brick drying will be included
11	Kuy Kim An Brick Kiln Company	NA	800	9	Saving is from GHK options, no major option identified was implemented
Total		2,317,300	1,465,325	8,036	

2. Food Processing Sector

No.	Company's name	Investment (US\$)	Saving (US\$)	GHG (Ton/year)	Remarks
1	Ly Ly Food Industries Co., Ltd	390,000	237,600	941	Unit plan to shift to bigger location with captive energy generation
2	Full Moon Rice Noodle Factory	168,000	65,486	161	Unit plan to expand current production to 2 time
3	Heng Heang Company	12,010	37,920	79	Only part Implementation reported
4	Leng Seng Hout Fa Fa Group Co., Ltd	79,640	58,806	146	Unit upgraded and in phase-3 further implementation is planned
5	Ngouy Kveng Heng Noodle Enterprise	35,400	34,670	61	Based on current production
6	Tuy Veng Khoy Noodle Enterprise	8,770	8,012	9.3	Based on current production
7	Eung Peng Heng Soy Sauce	15,000	21,509	122	Small scale unit
8	Medai GB Enterprises	410,000	300,500	5,592	Major GHG reduction was by substituting HCFC based refrigerant to Ammonia
Total		1,118,820	764,503	7,111.3	

3. Ice Making Sector

No.	Company's name	Investment (US\$)	Saving (US\$)	GHG (Ton/year)	Remarks
1	Peng Kim Heng Ice Factory	62,000	249,340	634	
2	Pop Ice Factory	276,660	263,100	14,336	Major GHG reduction from R-22 savings
3	Chum Kriel Ice Factory	43,500	62,172	2,058	Major GHG reduction due to R-22 savings
4	Ponleu Preah Chan Ice Factory	168,000	70,376	1,297	Analysis based on current production
5	Tracheak Chit Ice Factory	13,150	128,809	409	
6	Boeung Mealea Ice Factory	32,000	210,000	533	In Phase-2 2 nd line with gasifier will be installed
7	Sen Ry Soya Company	237,760	148,800	1,041	Unit is working on captive co-gen. project
8	Kan Keomony Ice Factory	40,000	206,250	277	
9	Phnom Pich Ice Factory – Kampong Chhnang	72,352	82,810	-324	GHG emission increase due to higher default figure of GHG from electricity
10	Ros Chenda Ice Factory	266,000	356,000	1,680	Part substitution of R-22 with ammonia
11	Tomnup Rolok Ice Factory	37,000	37,116	157	Not convinced with R-22 replacement with ammonia
12	Phnom Pich Ice Factory – SHV (unit 2)	126,800	97,169	-238	GHG emission increase due to high default value of GHG from electricity
13	Seang Ty Ice Factory	32,000	25,213	66	Partly implemented
14	Lak Sray Ice Factory	40,000	96,810	-264	GHG emission increase is due to higher default figure of GHG from electricity
15	Sok Heng Ice Factory	81,200	124,443	332	Expected saving after impl.
Total		1,528,422	2,158,408	21,994	

4. Garment Sector

No.	Company's name	Investment (US\$)	Saving (US\$)	GHG (Ton/year)	Remarks
1	Sky High (Cambodia) Co., Ltd	109,100	396,000	2,112	
2	Dignity Knitters Limited	114,498	126,500	815	Phase-2 results yet to be compiled
3	Full Fortune Knitting Limited	84,678	119,690	615	
4	Chung Fai Knitwear Limited-1	710	13,948	84	Part implementation till compilation
5	Chung Fai Knitwear Limited-2	18,043	15,738	119	Part implementation till compilation
6	Great Honor Textile Ltd.,	78,815	52,719	250	Installed boiler still not operational
7	Kennetex International	---	---	--	No data reported from Unit
Total		405,844	724,595	3,995	

5. Rice Milling Sector

No.	Company's name	Investment (US\$)	Saving (US\$)	GHG (Ton/year)	Remarks
1	Norm Srim Rice	370,000	601,920	693	Substituted gasifier with grid electricity
2	Vinh Cheang Rice Company	1,480,000	612,800	510	Substituted gasifier with grid electricity
3	Chea Hap Rice Mill	450,000	246,000	191	Unit under expansion
4	Hakse Modern Rice Mill	1,606,000	234,850	232	Based on 30% production
5	Men Sarun Rice Processing Factory	56,900	8,450	58.5	Expected saving after implementation
Total		3,962,900	1,102,702	1,685	

6. Rubber Sector

No.	Company's name	Investment (US\$)	Saving (US\$)	GHG (Ton/year)	Remarks
1	Tum Ring Rubber Factory	102,000	132,473	251	Expected saving after implementation
2	Rithy Munysamng Leap Co.Ltd	11,000	29,134	59	Expected saving after implementation
3	Sre Preal Dried Rubber Exploitation	24,920	52,200	158	Expected saving after implementation
4	Sopheak Nika Investment Group Co., Ltd	41,120	125,427	291.7	Expected saving after implementation
5	Chamkar Andaung Rubber Factory	13,200	66,000	106	Expected saving after implementation
6	Heng Sok Nguon	NA	NA	NA	
Total		192,240	405,234	865.7	

7. Summary of IEE measures

- Total company participated: 52
- Implementation results reported by: 44
- Under implementation/not implemented or reported: 8
- Co-financing committed: USD 2.83 million
- Investments made: USD 9.50 million (335% of projected financing)
- Annual savings reported: USD 6.60 million
- Pay back: <18 months
- GHG reductions projected: 157,800 tonnes CO₂ for 10-year life
- GHG reductions achieved : 436,870 tonnes CO₂ for 10-year life

Annex 5: Project results framework (with evaluator's comments in red font) Project strategy		Objectively verifiable indicators					
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and assumptions	Evaluator comments
Goal	To reduce specific energy intensity and related emissions of greenhouse gases generated by Cambodian manufacturing sector	1. Incremental CO ₂ eq emission reduction (tons of CO ₂ eq) 2. Specific energy consumption (energy use per ton/unit of output) for selected manufacturing sectors	1 Specific energy consumption (SEC) for 5 manufacturing sub-sectors in the focus of the GEF project 2. SEC referred to output quantities currently not available for many sub-sector. 3. To be defined in Year 1 of project implements. under PC-1	Cumulative reduction of SEC by more than 20% over the period 2012-2023 Cumulative reduction of GHG from pilot projects more than 50% over the project period	1. Annual reports of NCPO-C-C and EEO 2. End of project Survey/evaluation report 3. Final project evaluation report	1. Cambodian Governments remain committed in the medium and long-term to improve national energy security and effectively enforce the environmental laws. 2. Energy costs reduction becomes a first priority for industry.	
Objective of the project	To Improve Energy Efficiency of Cambodian	1. Incremental direct CO ₂ eq emission reductions	1. No direct CO ₂ eq emission reductions	1. Direct emission reductions: 195,000-260,000	1. Monitoring, tracking and benchmarking program	1. Sustained and solid Government support to the project. 2. Industry drive for energy	Indirect emission reductions cannot be credibly monitored during

Annex 5: Project results framework (with evaluator's comments in red font) Project strategy		Objectively verifiable indicators					Evaluator comments
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and assumptions	
	Industrial Sector leading to reduced global environmental impact from GHG missions and enhanced competitiveness for the industrial sector in a country with an energy deficit.	(tons of CO ₂ eq) 2. Incremental indirect CO ₂ eq emission reductions (tons of CO ₂ eq) 3. Specific energy consumption/energy intensity of selected sectors.	2. No indirect CO ₂ eq emission reductions 3. No SEC and related GHG generation for selected sector exists.	tons CO ₂ eq over period 2012-2022 2. Indirect emission reductions: 194,600-250,500 tons CO ₂ eq over period 2012-2023 3. SEC average annual reduction of 5% over period 2012-2022	established by the project with MIME and NCPO-C-C 2. End of project Survey 3. Final evaluation	costs reduction and enhanced energy efficiency grows progressively stronger and widens. 3. Various international IEE technical cooperation programs achieve good synergy and leverage of respective complementarities	Project implementation.
Outcome 1	Demonstrable energy savings in participating companies through IEE pilot projects	1. Number of IEE pilot and quick scan projects are selected with co-financing commitments 2. Anticipated savings in SEC and GHG emissions are	1. No/ very few investment related IEE projects are in place (TA related projects are not considered)	1. To develop and standardise energy audit reporting format, worksheets and KPI tools to be used by IEE projects 2. Energy performance benchmark and	1. Energy Efficiency office and NCPO-C-C Annual Report 2. End of project Survey 3. Final evaluation	1. Sustained Government support to agreed project activities. 2. Participating companies can arrange to get requisite finance for IEE implementation.	Outcome indicators are not necessary. Intended outcomes are to be achieved by outputs which have their own set of indicators and targets

Annex 5: Project results framework (with evaluator's comments in red font) Project strategy		Objectively verifiable indicators					
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and assumptions	Evaluator comments
		estimated 3. Case study compiled document is published	2. No data/information on specific energy consumption, energy benchmarking and energy saving potential is available.	saving potential of SEC and GHG emissions reduction. 3. compendium of case studies from Pilot projects			
Project Component 1: Implementation of industrial energy efficiency pilot project							
Output 1.1	.Energy efficiency projects for cumulative 45,000 TOEs** and related potential economic savings are identified by 40 enterprises participating in the Quick	1. Number of quick scan IEE projects are implemented with direct support from the GEF project 2. Energy savings (TOEs) achieved annually as well as over the project lifetime	Most companies, particularly in selected sectors, have major potential for technological EE improvements but not the resources (human and/or	1. 40 IEE projects quick scan implemented with direct support from the GEF project 2. Cumulative 45000 TOEs of energy savings over the EE investments lifetime	1. Environmental, financial and/or sustainability reports of Companies partnering in the IEE projects. 2. Energy Efficiency office (MIME) & NCPO-C-C	1. Companies partnering with the GEF project improve their economic and environmental performance. 2. Companies partnering with the GEF project fulfill their co-financing commitments (verbal in case of quick scan)	Indicator 1 is not time bound. The assumption is that 40 IEE projects in quick scans are implemented over the entire duration of the Project

Annex 5: Project results framework (with evaluator's comments in red font) Project strategy		Objectively verifiable indicators					
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and assumptions	Evaluator comments
	Scan process and appraised by project experts.		financial) to develop and implement such projects.		annual report 3. Project report 4. Independent Final evaluation of project		
Output 1.2	13 pilot IEE projects for cumulative 15,000 TOEs** of energy savings over the investments duration are implemented by enterprises, from selected 5 industrial sectors, partnering in the project.	1. Number of pilot projects are implemented with direct support from the GEF project 2. Energy savings (TOEs) achieved annually as well as over the project lifetime	Most companies, particularly in selected sectors, have major potential for technological EE improvements but not the resources (human and/or financial) to develop and implement such	1.13 IEE pilot projects implemented with direct support (technical and part financial) from the GEF project 2. Cumulative 15,000 TOEs of energy savings over the EE investments lifetime	1. Environmental, financial reports of Companies partnering in the IEE projects. 2. Energy Efficiency office (MIME) & NCPO-C-C 3. Project progress report 4. Final	1. Companies partnering with the GEF project improve their economic and environmental performance. 2. Companies partnering with the GEF project fulfill their co-financing commitments	Output description too wordy

Annex 5: Project results framework (with evaluator's comments in red font) Project strategy		Objectively verifiable indicators					
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and assumptions	Evaluator comments
			projects.		project evaluation report		
Output 1.3	Results of the pilot projects both in economic and environment context are compiled in a compendium for effective dissemination	Compendium of case studies/success stories is published in English and local language	No such information/ document is available in Cambodia on IEE for manufacturing sector	Compendium is printed by end of 3rd year when most of IEE projects are implemented.	1. Energy Efficiency office (MIME) & NCPO-C-C 2. Project progress report 3. Final project evaluation report	1. Participating Industries particularly quick scan participating unit are ready to publish and share the results with others.	Description of output is worded as an outcome Indicator description is also worded as an outcome
Outcome 2	Supply of National service providers in IEE are available (to match demand in component-4)	1. Number of IEE and energy management (EM) experts in the country. 2. Formal set up of IEE expert network in the country 3. Increased availability of	1. No IEE /EM specific national experts in place and most of projects are implemented with assistance of foreign	1. 40 National Energy efficiency experts capable of delivering quality services are available 2. National IEE network is established.	1. Annual reports of NCPO-C-C and EEO 2. End of project Survey 2. Final evaluation	1. Sustained Government support to agreed project activities. 2. Energy efficiency consultants, industrial equipment supplier and vendors, and other relevant entities recognize the economic potential of the IEE market in	Outcome indicators are not necessary. Intended outcomes are to be achieved by outputs which have their own set of indicators and targets

Annex 5: Project results framework (with evaluator's comments in red font) Project strategy		Objectively verifiable indicators					
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and assumptions	Evaluator comments
		hardware/ technology and after sale services in the country 4. Web page on the project populated with relevant information and manual is in place.	experts 2. Limited or no IEE service is provided by equipment/technology suppliers. 3. No ICT based tool is available on IEE?EM in the country	3. Local supplier of technology is capable to providing IEE services to their clients as well as after sale service.		Cambodia	
Project component 2: Capacity building and development of tools for implementing Industrial energy efficiency							
Output 2.1	A cadre of at least 40 national experts from relevant support institutions (NCPO-C-C academic institutions, industry associations, Ministry of Industry, Mines	1. Number of energy management system experts in the Cambodian market 2. Number of energy efficiency experts in the Cambodian	1. No/rare energy management system experts in the Cambodian market 2. No industrial Energy efficiency system	1. 40 Industrial EE/ energy management system experts trained 2. 20-25 seminars and trainings for enterprises managers and	1. Project progress report 2. End of project Survey 3. Final evaluation	1. Sustained Government support to agreed project activities for the National Energy Efficiency Agency 2. Industry drive for energy costs reduction is and will remain strong 3. Energy efficiency consultants, industrial equipment supplier and vendors, and other relevant entities recognize the	Output description is too wordy There are indicators but only two targets. There is limited use of this part of the log frame to monitor progress of this output

Annex 5: Project results framework (with evaluator's comments in red font) Project strategy		Objectively verifiable indicators					
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and assumptions	Evaluator comments
	and Energy) consulting Cos. and independent engineers, are equipped, though classroom and on the job training (in the Quick Scans and pilots) with the technical capacity and tools required to develop and implement energy efficiency measures in industry.	market 3. Number of energy system/equipment optimization experts in the Cambodian market 3. Number of IEE seminars and trainings delivered	optimization experts in the Cambodian market only few engineering companies provide partial services 3. IEE seminars and trainings bound to be delivered by international experts	engineers delivered by EM and IEE national experts trained by the GEF project		economic potential of the IEE market in Cambodia	
Output 2.2	IEE trained professionals are registered and empanelled as resource person in a network of service providers (RECP) aimed to assist companies in implementing industrial energy	Network facility with specific area of specialization of experts is available Network is meeting regularly to	No such network in Cambodia exists and client has no access to IEE experts	A registry of IEE experts is available with EEO and NCPO-C. A formal network of IEE experts is in place	1. IEE program website 2. Project report 3. Final evaluation	1. Energy efficiency experts recognize the business potential of the IEE in Cambodia and also in neighboring countries	Output description is worded as an outcome. Indicators are worded as outcomes adding to difficulties in measuring the targets

Annex 5: Project results framework (with evaluator's comments in red font) Project strategy		Objectively verifiable indicators					
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and assumptions	Evaluator comments
	efficiency	exchange/share IEE developments/concerns.					
Output 2.3	Local suppliers of relevant technologies (kilns, boilers, etc.) are also trained in IEE. Potential local suppliers are supported, to ensure more cost-effective technology and more reliable after-sales service.	<p>1. Number of local suppliers trained for providing IEE services</p> <p>2. Number of suppliers assisted in collaboration /agents of foreign technology suppliers.</p> <p>3. Number of private firms providing energy management system</p>	<p>Few equipment supplier/technology providers are equipped to provide IEE /EM services in Cambodia</p> <p>No enterprise has expertise and facilities of after sale service in Cambodia.</p>	<p>1. At least 10 equipment and technology suppliers in Cambodia are trained in IEE tools and techniques.</p> <p>2. Technical tie-up/sole selling agent of Energy efficient equipments from neighboring countries.</p> <p>3. 10 companies implement at least 10 energy management or IEE project each year</p>	<p>1. Project progress report</p> <p>2. Annual reports of Companies participating in the project</p> <p>3. Number of IEE technical tie-ups in the country</p> <p>4. Total investment done during project period.</p>	<p>1. Vendors/ suppliers partnering in the expert capacity building program with the GEF project improve their business performance and adequate finance for implementation of IEE project is available.</p>	Output description is worded as an outcome
Output 2.4	Web based guidance	Dedicated web page for IEE is	No such ICT based	GEF –IEE project web site	Number of hits on the	No specific assumption and risk for this output.	"Web based guidance

Annex 5: Project results framework (with evaluator's comments in red font) Project strategy		Objectively verifiable indicators					
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and assumptions	Evaluator comments
	tool/manual on IEE developed.	in place and populated for training material, information and links with relevant web sites.	instrument exists on IEE in Cambodia. Information on IEE experts/technology suppliers do not exist	with relevant information is continuously updated. EM/IEE manual relevant to Cambodian industries is available	website and links to other websites. Khmer and English version IEE manual		tool/manual on IEE developed" is an outcome. The indicator of a "dedicated webpage for IEE..." is an output, and the "number of hits on the website and links to other websites...." should be the indicator for this output. The target should then be a numerical figure on the number of hits on the website.
Outcome-3	Stronger institutional framework in place to ensure long-term support for energy reduction efforts in enterprises	1. List of institutional participants trained to promote industrial energy efficiency 2. No. of	1. No institutional framework exists to promote IEE at implementation level. 2. Access to	1. At least 200 participants from Govt. and regulatory agencies are trained in IEE. 2. 100 personnel from Industry are	1. Project progress report 2. Annual reports of project implementing partners	1. Sustained Government support to agreed project 2. Industry drive for energy costs reduction is and will remain strong 3. Energy efficiency promoters, financial institutions recognize the need and economic &	Outcome indicators are not necessary as they are being repeated in the outputs. Intended outcomes are to be achieved by outputs which

Annex 5: Project results framework (with evaluator's comments in red font) Project strategy		Objectively verifiable indicators					
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and assumptions	Evaluator comments
		experts trained in preparation of bankable IEE proposals 3. No of financial institutions participated in financial Engineering training 4. Guide for the Implementation of IEE & Energy Management in compliance ISO 50001 international standards is developed.	finance is problem due to lack of knowledge in preparing bankable proposals 3. Financial institutions evaluates the project on conventional basis rather than incl. all factor incl. environment, safety and liability in mind. 4 No IEE Guidance manual exists	trained in financial engineering (bankable proposals) 3. Guideline on IEE/EM/operation and maintenance of Boiler is available 4. At-least 20 companies get access to finance through GEF project.	3.Number of IEE projects selected for financing 4. Total investment done during project period	Environmental saving potential of the IEE market in Cambodia	have their own set of indicators and targets
Project component 3: Strengthening of institutional framework for industrial energy efficiency							
Output 3.1	Capacity building of relevant Govt. departments to promote industrial	1. Number of training programme conducted on	No such organized capacity building	1. 12 Intensive Capacity building programme is conducted during	1. Project progress report	1. Government interest & support to build capacity for IEE promotion 2. Policy level intervention in	Output is poorly worded as "capacity building" is not an output

Annex 5: Project results framework (with evaluator's comments in red font) Project strategy		Objectively verifiable indicators					
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and assumptions	Evaluator comments
	energy efficiency	IEE 2. No. of Govt. staff trained in IEE /EM implementation support.	programme exists in Cambodia. Few seminars on Rural electrification , renewable energy are conducted by foreign experts	project period. 2. 200 participants trained to promote industrial energy efficiency	2. Annual reports of project implementing partners 3. Final evaluation	IEE is done by RGOC 3. Energy efficiency promoters recognize the need benefits of IEE in Cambodia	There are no indicators to gauge the success of the training programs within this output
Output 3.2	Companies are trained in preparation of bankable IEE project proposals	1.Number of training programme conducted on IEE financial engineering 2. No. of experts trained in preparation of bankable IEE proposals	No facility on financial engineering and technology assessment exist in Cambodia	1.2 training programme conducted in year-1 and 1 each in subsequent years. 2. At least 100 personnel from Cambodian manufacturing industries are trained in preparing bankable proposal.	1. Annual reports of project implementing partners 2. End of project report 3. Final project evaluation	1. Industry drive for energy costs reduction is and will remain strong 3. Energy efficiency promoters, financial institutions recognize the need and benefits of the IEE market in Cambodia	Output description is worded as an outcome There are no indicators to gauge the success of the training programs within this output

Annex 5: Project results framework (with evaluator's comments in red font) Project strategy		Objectively verifiable indicators					
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and assumptions	Evaluator comments
				3. 30 proposal for IEE financing are prepared and considered for financing			
Output 3.3	Capacity building of financial institutions to assess investment proposals in IEE	1. Number of training programme conducted for FII's in Cambodia 2. No. of experts trained in comprehensive technology evaluation to facilitate financing.	No organized training on total costing including environmental and social liability in technology assessment for FII's exist in Cambodia	1. 4 training programme conducted during project period 2. At least 60 personnel from FII's are trained in assessing IEE project for financing 3. 50 proposal for IEE financing are received and considered for financing	1. Annual reports of project implementing partners 2. End of project report 3. Final project evaluation 4. Annual reports of participating FII's	1. FII's recognize IEE as a business opportunity for their lending operations. 2. Industry drive for energy costs reduction is and will remain strong 3. RGOC support industrial development bank/FII's through dedicated fund allocation for IEE.	Output is poorly worded as "capacity building" is not an output There are no indicators to gauge the success of the training programs within this output
Output 3.4	Practical Guide for the Implementation of Energy Management in Industry in compliance ISO 50001 international standards is	Tools available for supporting energy efficiency in industry	No tools are and will be most likely available during and immediately after the GEF-UNIDO	1. An Energy Management System Implementation Guide in compliance with EN 16001/ ISO 50001 standards	1. IEE Best Practices dissemination program website 2. Project report	1. Sustained Government support to agreed project activities for the National Energy Efficiency office MIME	Output description is too wordy

Annex 5: Project results framework (with evaluator's comments in red font) Project strategy		Objectively verifiable indicators					
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and assumptions	Evaluator comments
	developed.		project implementation period	is produced in English and Khmer language	3. Final evaluation		
Outcome-4	Stronger institutional framework in place to ensure long-term support for energy reduction efforts in enterprises	<p>1. Number of Awareness programmes conducted on IEE benefits</p> <p>2. Number of energy efficiency projects implemented annually</p> <p>3. Number of EN16001 or ISO 50001 certified companies</p> <p>4. Number of IEE service contracts stipulated by energy management and energy</p>	<p>1. Not available. numbers to be estimated during 1stYear of project implementation through survey results and further data collection</p> <p>2. So far no EN16001 or ISO 50001 certified companies</p> <p>3. In past most IEE related projects are developed</p>	<p>1. 100% increase of annual number of implemented projects between 2010 and 2023</p> <p>2. 24 awareness progress covering 5 selected sectors are conducted during project period.</p> <p>3. At least fifteen companies get certified to EN16001 or ISO 50001 by 2015</p> <p>4. More than 500 IEE services contracts stipulated by national</p>	<p>1. Energy efficiency office EEO and NCPO-C-C Annual Report</p> <p>2. Industry associations annual reports</p> <p>3. End of project survey</p> <p>4. Cambodian standard authority or certification bodies</p>	<p>1. Energy prices remain high in the medium and long-term</p> <p>2. Industry drive for energy costs reduction and enhanced energy efficiency grows progressively stronger</p> <p>3. In the medium EN 16001 and ISO 50001 certification becomes tool and/or requirement for export oriented enterprises and for market access</p>	<p>Outcome indicators are not necessary as they are already reflected in the outputs. Intended outcomes are to be achieved by outputs which have their own set of indicators and targets</p>

Annex 5: Project results framework (with evaluator's comments in red font) Project strategy		Objectively verifiable indicators					
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and assumptions	Evaluator comments
		efficiency experts and technology suppliers trained by the GEF project	and implemented using foreign experts 4. Technology suppliers are not competent to provide IEE services to their clients	experts/suppliers /vendors trained by the GEF project with Cambodian enterprises between 2013 - 2023			
Project component 4: Up-scaling of industrial energy efficiency in Cambodia							
Output 4.1	The results of the pilot projects and quick scans are widely disseminated. At least 40IEE projects for cumulative 45,000 TOEs of energy savings are developed and implemented by industrial enterprises as result of their participation in the capacity building	1. Number of energy management system experts in the Cambodian market 2. Number of energy efficiency experts in the Cambodian market	1. No energy management system experts in the Cambodian market 2. No industrial steam system optimization experts in the Cambodian market but few	1. 20 energy management system experts trained 2. 20 steam systems optimization experts trained 3. 20-25 seminars and trainings for enterprises managers and	1. Project progress report 2. End of project survey 3. Final evaluation	1. Sustained government support to agreed project activities for the National Energy Efficiency Agency 2. Industry drive for energy costs reduction is and will remain strong 3. Energy efficiency consultants, industrial equipment supplier and vendors, and other relevant entities recognize the economic potential of the IEE market in Cambodia	Output description is too long and worded as an outcome There are no indicators to gauge the success of the training programs within this output

Annex 5: Project results framework (with evaluator's comments in red font) Project strategy		Objectively verifiable indicators					
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and assumptions	Evaluator comments
	program and results achieved by participating pilot units of the project.	3. Number of IEE seminars and trainings delivered	engineering companies provide partial services 3. IEE seminars and trainings bound to be delivered by international experts	engineers delivered by EM and SSO national experts trained by the GEF-UNIDO project			
Output 4.2	Industry decision-makers understand their potential for energy efficiency gains and undertake energy efficiency activities.	1. Number of CEOs/owner attended IEE clinics. 2. Number of companies participating in the project seminars 3. Number of companies personnel participating in the project trainings	1. No marketing tool for IEE like IEE clinic exists so far. Few trainings on EE/Boiler safety for manufacturing and commercial enterprises are planned for 2010 by National Cleaner	1. 500 CEOs attend the 24 CP Clinics organized sector-wise/thematic 2. 400 companies participating in the project seminars and workshops 3. 200 enterprises staff	1. Project progress report and NCPO-C annual report. 2. List of participants in IEE Clinics, training and seminars 3. Final evaluation	1. Sustained Government support to agreed project activities for the National Energy Efficiency Agency 2. Costs reduction remains a first priority for companies' top management.	Output description is worded as an outcome No indicators to gauge the success of the seminars and workshops

Annex 5: Project results framework (with evaluator's comments in red font) Project strategy		Objectively verifiable indicators					
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and assumptions	Evaluator comments
			production office Cambodia.	attend project energy management and IEE training seminars/workshops	report		
Output 4.3	Other stakeholders including technology/equipment suppliers will understand their role to promote industrial energy efficiency	1. Number of technology & equipment suppliers participating in the project seminars/training 2. Number of contracts received by suppliers through GEF projects	NO training/capacity building done for of technology & equipment suppliers on IEE hardly suppliers get contract for EM/IEE in Cambodia	1. 50 suppliers/vendors participating in the project seminars and workshops 2. 20 contracts related to IEE implementation is bagged by supplier trained by project.	1. Project progress report and NCPO-C annual report. 2. Balance sheet/annual report of suppliers. 2. End of project report 3. Final project evaluation	1. Sustained Government support to agreed project activities for the National Energy Efficiency Agency 2. Costs reduction remains a first priority for companies' top management.	Output description is worded as an output
Outcome-5	Establishment of policy, legal and regulatory frameworks that sustainably promote and support	1.Number of IEE policy, EM programs developed and put in operation	1. No IEE/EM specific policy program is in place	1.At least 3 national IEE policy programs operate and develop smoothly:	1. Policy/ Government Act/decree on IEE. 2. Boiler	A1. Sustained Government support to agreed project activities.	Outcome indicators are not necessary. Intended outcomes are to be achieved by

Annex 5: Project results framework (with evaluator's comments in red font) Project strategy		Objectively verifiable indicators					Evaluator comments
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and assumptions	
	industrial energy efficiency	2. Adoption of regulatory measures to support IEE implementation and market transformation	2. No specific regulation to support IEE /EM is in place	2. IEE Monitoring, Tracking and Benchmarking (MTB) Program; IEE Best Practice Dissemination Program; 3. National Energy Auditor Accreditation Certification Program operational	Safety act & Operation & Maintenance guideline 3.NEAA Course developed and certifying agency in place		outputs which have their own set of indicators and targets
Project component 5: Formulation and implementation of policies, regulations and programmes to promote and support sustainable industrial energy efficiency.							
Output 5.1	Mechanisms for mainstreaming IEE concepts and policy instruments have been created at suitable administrative levels in relevant RGOC policies and regulations	1.Increased role for IEE in , energy , industry and environmental policies at national levels 2. IEE opportunities are recognised	1. No policy exist to promote and encourage implementation of IEE by Cambodian manufacturing sector 2. Role IEE in climate change	1. Policy document on Industrial energy efficiency is prepared for RGOC action. 2. Tools and instruments to calculate GHG reduction from IEE projects are	1.Annual report of NCPO-C-C, EEO 2.Independent final project evaluation 3. Publication of	Uptake of IEE by enterprises and other organisations is constrained by lack of government incentive	Indicators are not measurable and specific. As a result, it is not clear exactly what the Project is trying to achieve.

Annex 5: Project results framework (with evaluator's comments in red font) Project strategy		Objectively verifiable indicators					
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and assumptions	Evaluator comments
		and utilised for achieving UNFCCC commitments.	mitigation from Cambodian industry is not well recognized	in place	relevant policies, strategies and guidelines by RGOC		
Output 5.2	Procedures for tracking and benchmarking energy consumption in industry are developed and established	1. Increased role for IEE in other energy related policies of RGOC. 2. Structures, tools and methodologies to monitor, tracking and benchmarking energy consumption and efficiency in industry	So far IEE has no significant role in Energy Policy in Cambodia. No structures, tools and methodologies are in place	1. Reporting structure is put in place 2. Reporting templates are developed and used 3. Website is created 4. Benchmarking methodology is developed and tested	1. Energy Efficiency office, MIME and NCPO-C Annual Report 2. Internet/Web 3. Project reports 4. Final evaluation	A1. Sustained Government support to agreed project activities.	Output description is worded as an outcome There are two indicators but four targets Indicators are not specific and hence cannot be measured. As a result, it is unclear exactly what the project is supposed to achieve
Output 5.3	National Energy Auditor Accreditation (NEAA) programme is established	National accreditation body in place. List of professional	No national Industrial Energy Manager Certification Program is in	1. National NEAA program is developed and offered to IEE/EM experts.	1. National accreditation institution 2. Continual education/	1. Energy Efficiency will mainstream in law and Energy audit will be made mandatory. 2. In the medium and long term industry's demand for	Output description is worded as an outcome There are two indicators but only

Annex E: Project results framework (with evaluator's comments)

Annex 5: Project results framework (with evaluator's comments in red font) Project strategy		Objectively verifiable indicators					
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and assumptions	Evaluator comments
		certification programs accredited by national relevant body	place and will be in place in the near future		professional certifying institutions	qualified IEE experts and their services increases	<p>one target</p> <p>The indicator "list of professional certification programs....." does not have relevance to establishing and NEAA</p>