



REQUEST FOR CEO ENDORSEMENT/APPROVAL
PROJECT TYPE: FULL SIZED PROJECT
THE GEF TRUST FUND

Submission Date: 25 January 2011

PART I: PROJECT IDENTIFICATION

GEFSEC PROJECT ID: 3976 **PROJECT DURATION:** 48 months
GEF AGENCY PROJECT ID: XX/CMB/09/X02
COUNTRY: Kingdom of Cambodia
PROJECT TITLE: Reducing Greenhouse Gas Emissions through Improved Energy Efficiency in the Industrial Sector
GEF AGENCY: UNIDO
OTHER EXECUTING PARTNER: Cambodia Cleaner Production Office (hosted by the Ministry of Industry, Mines & Energy (MIME))
GEF FOCAL AREA: Climate Change
GEF-4 STRATEGIC PROGRAM: CC-SP2
NAME OF PARENT PROGRAM/UMBRELLA PROJECT: N/A

INDICATIVE CALENDAR	
Milestones	Expected Dates
Work Program (for FSP)	June 2009
CEO Endorsement/Approval	October 2010
Agency Approval	November 2010
Implementation Start	December 2010
Mid-term Review	November 2012
Implementation Completion	November 2014

A. PROJECT FRAMEWORK

Project Objective: To improve the energy efficiency of Cambodia's industrial sector, leading to reduced global environmental impact from GHG emissions and enhanced competitiveness for the industrial sector in a country with an energy deficit.

Project Components	Indicate whether INV,TA or STA	Expected Outcomes	Expected Outputs	Indicative GEF Financing		Indicative Co-financing		Total (US\$) c = a + b
				(US\$) a	%	(US\$) b	%	
1. Implementation of Industrial energy efficiency pilot projects	TA and INV	Demonstrable energy savings in participating companies through IEE pilot projects	1. Energy efficiency projects for cumulative 45,000 TOEs** and related potential economic savings are identified by 40 enterprises participating in the Quick Scan process and appraised by project experts.	120,000	30%	280,000	70%	400,000
			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.	480,000	15%	2,561,600	85%	3,120,000
			3. Results of the pilot projects both in economic and environment context are compiled in a compendium for effective dissemination					

2. Capacity building and development of tools for implementing industrial energy efficiency	TA	Supply of national service providers in IEE available (to match demand in component 4)	<p>1. A cadre of at least 40 national experts from relevant support institutions (NCPO-C academic institutions, industry associations, Ministry of Industry, Mines 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.</p> <p>2. These professionals are registered and empanelled as resource person in a network of service providers (RECP) aimed to assist companies in implementing industrial energy efficiency.</p> <p>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> <p>4. Web-based guidance tool/manual on IEE developed</p>	150,000	65%	80,000	35%	230,000
3. Strengthening of institutional framework for industrial energy efficiency	TA	Stronger institutional framework in place to ensure long-term support for energy reduction efforts in enterprises	<p>1. Capacity building of relevant Govt. departments to promote industrial energy efficiency</p> <p>2. Companies are trained in preparation of bankable IEE project proposals</p> <p>3. Capacity building of financial institutions to assess investment proposals in IEE</p> <p>4. Practical Guide for the Implementation of Energy Management in Industry in compliance ISO 50001 international standards is developed</p>	150,000	64%	85,000	36%	235,000

4. Up scaling of IIE in Cambodia	TA	Increased adoption by Cambodian enterprises of energy efficient practices and technologies as an integral part of their business practices. The creation of a national market for industrial energy efficiency products and services.	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 program and results achieved by participating pilot units of the project. 2. Industry decision-makers understand their potential for energy efficiency gains and undertake energy efficiency activities. 3. Other stakeholders including technology/equipment suppliers will understand their role to promote industrial energy efficiency	140,000	67%	70,000	33%	210,000
5. Formulation and implementation of policies, regulations and programmes to promote and support sustainable industrial energy efficiency.	TA	Establishment of policy, legal and regulatory frameworks that sustainably promote and support industrial energy efficiency.	Mechanisms for mainstreaming IEE concepts and policy instruments have been created at suitable administrative levels in relevant RGOC policies and regulations 2. Procedures for tracking and benchmarking energy consumption in industry are developed and established 3. National Energy Auditor Accreditation (NEAA) programme is established	100,200	57%	75,000	47%	175,200
6. Project management				99,800	39%	158,400	61%	258,200
Total project costs				1,240,000		3,310,000		4,550,000

* INV = Investment; TA = Technical Assistance; STA = Scientific & Technical Analysis

** TOE = Tonnes of Oil Equivalent

B. SOURCES OF CONFIRMED CO-FINANCING FOR THE PROJECT

<i>Name of Co-financier (source)</i>	<i>Classification</i>	<i>Type</i>	<i>Project</i>	<i>%*</i>
1.0 UNIDO	Implementing Agency	In-kind	100,000	3.02
2.0 National Cleaner Production Office-Cambodia (Own Income generation & Seco Phase-2)	Executing Partner	In-kind	140,000	4.23
3.0 Ministry of Industry Mines and Energy	National Government	In-kind	150,000	4.53
4.0 Private sector for IEE Pilot				
4.1- Lyly Food Industry Co. Ltd.	Private sector	In-kind	30,000	0.91
		Cash	300,000	9.06
4.2- Phnom Penh Brewery	Private sector	In-kind		
		Cash	400,000	12.08
4.3- GHIM LY (Cambodia) Pte. Ltd.	Private sector	In-kind		
		Cash	300,000	9.06
4.4- Sky High (Cambodia) Co., Ltd	Private sector	In-kind		
		Cash	300,000	9.06
4.5- Vinh Cheang Rice Mill	Private sector	In-kind	30,000	0.91
		Cash	400,000	12.08
4.6- Norm Srim Rice Mill	Private sector	In-kind	30,000	0.91

		Cash	300,000	9.06
4.7– Chea Hap Rice Mill	Private sector	In-kind		
		Cash	100,000	3.02
4.8– Cam Brique-Lim Company	Private sector	In-kind		
		Cash	50,000	1.51
4.9– Buth Sothy Brick Company	Private sector	In-kind		
		Cash	50,000	1.51
4.10– Doeung Por Roka Kong Brick Company	Private sector	In-kind		
		Cash	200,000	6.04
4.11– Punleu Preah Atit Brick Company	Private sector	In-kind		
		Cash	50,000	1.51
4.12– Hong Vanin Co., Ltd.,	Private sector	In-kind		
		Cash	100,000	3.02
4.13 Miston Export Import Co. Ltd.,**	Private sector	In-kind		
		Cash		
5.0 Quick Scan in 40 enterprises ***	Private sector	Cash & Kind	280,000	8.46
Total Co-financing			3,310,000	100%

* Percentage of each co-financier's contribution at CEO endorsement to total co-financing.

** COMMITMENT LETTER FROM MISTON EXPORT IMPORT CO. LTD., IS STILL AWAITED HENCE NOT ACCOUNTED IN CO-FINANCING AT THIS STAGE.

*** COMMITMENT of 40 units participating in Quick scan were verbal rather than a formal letter like 13 Pilot enterprises

C. FINANCING PLAN SUMMARY FOR THE PROJECT (\$)

	<i>Project Preparation a</i>	<i>Project b</i>	<i>Total c = a + b</i>	<i>Agency Fee</i>	<i>For comparison: GEF and Co- financing at PIF</i>
GEF financing	60,000	1,240,000	1,300,000	130,000	1,240,000
Co-financing	60,000	3,310,000	3,370,000		2,640,000
Total	120,000	4,550,000	4,670,000	130,000	3,880,000

D. GEF RESOURCES REQUESTED BY AGENCY (IES), FOCAL AREA(S) AND COUNTRY(IES)¹

<i>GEF Agency</i>	<i>Focal Area</i>	<i>Country Name/ Global</i>	<i>(in \$)</i>		
			<i>Project (a)</i>	<i>Agency Fee (b)²</i>	<i>Total c=a+b</i>
N/A	N/A	N/A	N/A	N/A	N/A
(select)	(select)				
Total GEF Resources					

¹ No need to provide information for this table if it is a single focal area, single country and single GEF Agency project.

² Relates to the project and any previous project preparation funding that have been provided and for which no Agency fee has been requested from Trustee.

E. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

<i>Component</i>	<i>Estimated person weeks</i>	<i>GEF amount (\$)</i>	<i>Co-financing (\$)</i>	<i>Project total (\$)</i>
Local consultants/staff incl. support staff & driver*	59	16,800	64,500	81,300
Chief Technical advisor	47.3	198,000		198,000
International consultants*	24	106,000		106,000
Total	130	320,800	64,500	485,300

* DETAILS ARE PROVIDED IN ANNEX C.

F. PROJECT MANAGEMENT BUDGET/COST

Cost Items	Total Estimated person weeks	GEF amount (\$)	Co-financing (\$)	Project total (\$)
Local consultants*	416	83,200	100,000	183,200
International consultants*	0	0	0	0
Office facilities, equipment, vehicles and communications		7,600	35,400	43,000
Travel*		5,000	15,000	20,000
Others**		4,000	8,000	12,000
Total		99,800	158,400	258,200

* Details to be provided in Annex C. ** It may include promotional material

G. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT? yes no

(If non-grant instruments are used, provide in Annex E an indicative calendar of expected reflows to your agency and to the GEF Trust Fund).

H. DESCRIBE THE BUDGETED MONITORING & EVALUATION PLAN:

Project monitoring and evaluation (M&E) will be carried out in accordance with established UNIDO and GEF guidance and procedures.

The overall objective of the monitoring and evaluation process is to ensure successful and quality implementation of the project by: i) tracking and reviewing project activities execution and actual accomplishments; ii) providing visibility into progress as the project proceeds so that the implementation team can take early corrective action if performance deviates significantly from original plans; and iii) adjust and update project strategy and implementation plan to reflect possible changes on the ground, results achieved and corrective actions taken. A detailed monitoring plan for tracking and reporting on project time-bound milestones and accomplishments will be prepared by UNIDO in collaboration with the Project management Unit (PMU) and project partners at the beginning of project implementation and then periodically updated.

By making reference to the impact and performance indicators defined in the Project Results Framework, the monitoring plan will track, report on and review project activities and accomplishments in relation to:

1. Energy savings (Specific per unit of output and gross) and GHG emission reduction
2. Emission reductions directly generated by the UNIDO GEF project
These will include type and the number of energy efficiency projects identified and implemented in at least 13 pilot projects and 40 quick scans units implementing IEE providing technical support.
3. Industrial Energy efficiency investments generated/assisted by the UNIDO GEF project, directly and indirectly
4. Development of appropriate mechanism, policies conducive to environment and user friendly instruments aimed to promote, develop and support industrial energy efficiency and Energy management in the country. National Energy Auditor accreditation (NEAA) is established and executed together with Institute of technology (ITC) Cambodia/Royal University of Phnom Penh (RUPP).
5. Level of awareness and technical capacity for industrial energy efficiency and energy management within relevant institutions, in the market and within enterprises

The National Project Manager along with Chief Technical Advisor will be responsible for formulating work-plan, continuous monitoring of project activities execution, and performance and track progress towards milestones. However, tracking and monitoring project performance with respect to direct and in-direct energy savings and GHG emission reduction, and related information, will be integral part of the activities to be executed for establishing an industrial energy efficiency Monitoring, Tracking and Benchmarking Program under Project Component 5.

The UNIDO project manager will be responsible for tracking overall project milestones and progress towards the attainment of the set project outputs. The UNIDO project manager will also be responsible for narrative reporting to the GEF. A final external evaluation will be carried out after operational completion of the project. The following table provides the tentative budget for the final evaluation, which has been included in overall budget details.

Final evaluation budget

Source of funding	USD
GEF funding	14,000
Co-financing (NCPO-C)	4,000
Co-financing (UNIDO)	10,000
Total	28,000

PART II: PROJECT JUSTIFICATION:

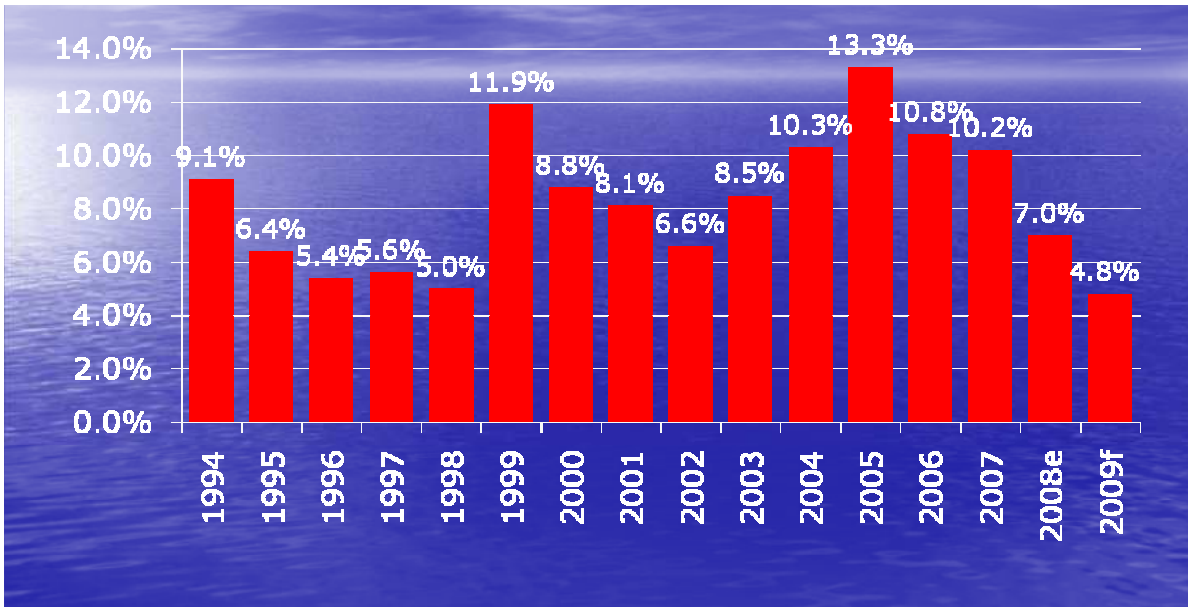
STATE THE ISSUE, HOW THE PROJECT SEEKS TO ADDRESS IT, AND THE EXPECTED GLOBAL ENVIRONMENTAL BENEFITS TO BE DELIVERED:

Cambodia is situated in the fast growing region of south-East-Asia and classified as least developed country (LDC). After climbing to an all time record of 13.4 percent in 2005, growth of real GDP slowed to 10.4 percent in 2006 and was pegged at 9.6 percent in 2007. Mainly due to the sustained high growth poverty incidence dropped from 35% in 2004 to an estimated 31% in 2007. During the decade ending 2007, Cambodia doubled the per capita GDP to US\$589 which is expected to reach to US\$1,000 by 2015, possibly even earlier when oil and gas production comes on stream.

Important contributions for the strong economic performance in recent years came from steady growth in agriculture (4.0 percent), sustained growth of tourism receipts (10.2 percent), the continued growth in garment exports (10 percent which was effected by global recession in 2008-9) and the continued expansion of financial services (22.2 percent) and construction activities (4.3 percent).

In year 2008-2009 GDP slowed down as a result of global recession particularly in export oriented sector like garment. Economic performance trend from 1994 onwards and projected for financial year 2009 showing impact of Global Financial meltdown on Cambodian GDP is presented below in Figure -1.

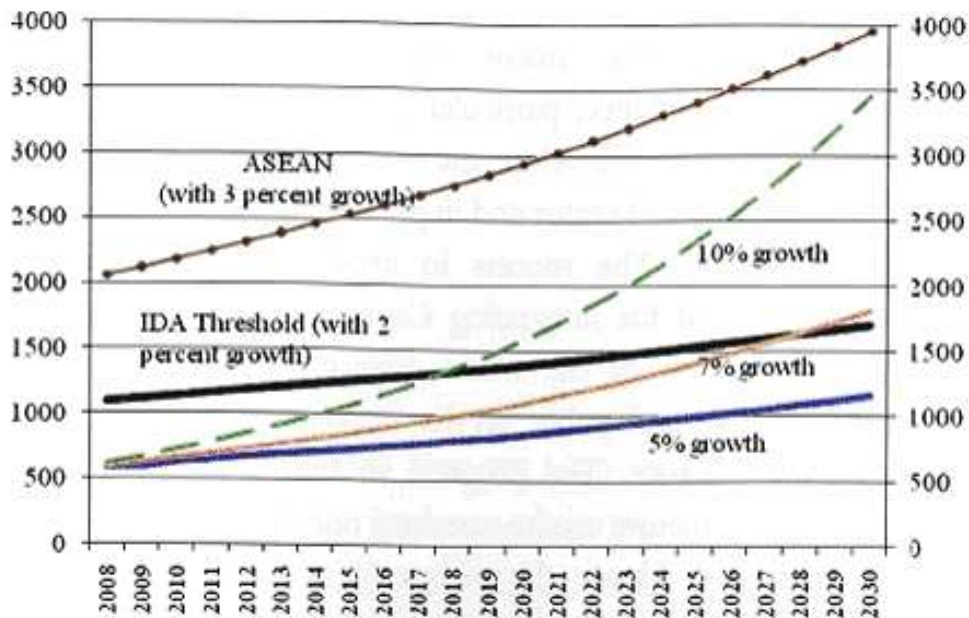
Figure 1: Global Financial Crisis Impact on Cambodia GDP



source: Naron,2009

It is projected that Cambodia will fare much better than other countries in the region due to lack of exposure of Cambodian banks to the US sub-prime. Cambodian resources position has been favorable and was doubled during the last two and a half years only, from \$1 billion in 2006 to \$2 billions in 2008. It took 12 years for Cambodia gross foreign income from \$100 millions in 1994 to \$ 1 Billion in 2006.

Figure-2: Illustrative Per Capita Real GDP Growth



Source: IMF Cambodia

Nevertheless, Cambodia is also currently facing two important albeit manageable challenges:

1. future industrial growth as well as the growth in its exports in what are becoming increasingly competitive regional and global markets: indirect impact of the global financial crisis particularly in export oriented sectors, tourism and construction sector
2. Slow progress in technology development to use alternative local sources of energy (needed because of the limited traditional energy resources in Cambodia) could well limit the country's future economic growth, and more specifically.

Gross Domestic Product by Sectors

Industry: The country's Industrial sector has been one of the main engines of real GDP growth, which accounted for 30 percent of GDP also saw significant growth of 12.3 percent in 2005, after an increase of 16.8 percent in 2004. Industry's growth continued to be strong though in 2007 it dropped to 7.5 percent. The key contribution came from construction and mining activities, as well as the exports of textiles and garments. The textile and garment sub sector, which accounts for nearly half of the value added of the industrial sector, grew at a slower pace. Rice sector is growing fast and Cambodia from 2009 onward is a net exporter of rice and is expected to double its production and processing in next 5 years.

Table 1: Share of GDP from Main economic sectors 1998 to 2007

Sectors	1998 (%)	1999 (%)	2000 (%)	2001 (%)	2002 (%)	2003 (%)	2004 (%)	2005 (%)	2006 (%)	2007 (%)
Agriculture	47.1	43.5	37.9	36.7	34.0	34.3	32.7	30.3	29.6	28.9
Industry	17.9	19.1	23.0	23.6	25.8	26.9	27.7	28.3	29.2	30.0
Service	35.0	37.5	39.1	39.7	40.2	38.8	39.6	41.4	41.2	41.1
Total GDP	100	100	100	100	100	100	100	100	100	100

Source: NIS, 2003a; and MEF, 2007

Agriculture: Agriculture sector traditionally was dominating in Cambodian economy having 29 percent share in 2001 which is presently placed at 3rd position after service sector and industrial sector contributing 41 percent and 30 percent share of GDP respectively. The growth of agriculture sector is highly dependent on climatic conditions which keep fluctuating year to year. Rice production accounts for over 10 percent of GDP and have significant potential to improve its share by fast increasing exports and specializing in organic rice production to create more value of their product.

Service: Services sector contributes 41 percent of GDP and plays a significant role in Cambodian economy. Service sector grew 12.1 percent in 2005 and 10.0 percent in 2007, the same rate as in 2006. All the sub sectors of services have shown robust growth. The expansion of the tourism and hotel industry continued, with a growth rate of 10.2 percent. In 2007, a total of 2 million tourists visited Cambodia.

Factors limiting Industrial development in Cambodia

Electricity: The most constraining factor to manufacturing firm development, as determined in BRC and NZIER survey (Bailey, 2009), was the cost of electricity. Many of the owners and managers interviewed were in opinion that high cost of electricity to be a function of Government and infrastructure inefficiency. Generally business people were aware of the comparable prices paid for power in neighboring countries and at the border where electricity was imported to Cambodia (almost half the price paid in Phnom Penh). A significant share of the electricity used in Phnom Penh, about 95 percent in 2007, is generated from diesel power plants. There is no national grid or high voltage transmission system which leads to large losses during transmission and distribution.

Energy cost specifically electricity cost constrain business development in Cambodia is the high use of generator electricity and the lack of electricity-intensive industry in the country. According to the World Bank, 36.2 percent of electricity in the manufacturing sector comes from the Generators (World Bank 2009). Better supply lower costs and energy efficiency policy may open the door for investment in energy intensive manufacturing sectors.

Finance: Access to finance was ranked as the second most severe constraint in BRC and NZIER 2009 survey (Bailey 2009) and as a minor or moderate constraint to many companies surveyed by the World Bank. To some extent these responses may have had something to do with timing. Food and beverage manufacturing firms consider access to credit a larger constraint than any other type of firm, and almost as much of a constraint as electricity costs. This is quite probably a consequence of their size and domestic origins. A number of the food and beverage firms participated in Cleaner production programme were of a size where they could no longer rely on traditional, generally informal, sources of credit for expansion. Hagar Soya, for example, reported that they had been seeking a US\$ 3 million loan for investing in a new plant and has winded up operations due to lack of finance . Ly Ly Food Industry Co., Ltd. (participating in GEF-UNIDO project), with more than 120 staff currently also reported difficulty borrowing from informal or formal lenders due to the relatively large amounts of capital they required for investments. Garment manufacturing firms, on the other hand, were generally provided capital for operating and expansion from their parent companies. The brick and rice millers surveyed were considerably smaller than the larger food and beverage companies surveyed. As such, finance from family and friends were reported to be enough to fund their investments.

Although bank credit has been growing rapidly in Cambodia the financial sector is still under-developed. Potential foreign investors should be aware of the difficulty involved with accessing credit domestically: demand is generally greater than Available supply. The cost of credit is relatively high; financial services are relatively under-developed; and it may be difficult to use land as collateral. On the other hand, Cambodian law was changed in 2007 to allow banks to use moveable and intangible assets as collateral and financial markets have been developing quickly with the presence of a number of new international banks.

Concern for Industrial Energy Efficiency: Cambodian industry is highly energy inefficient, with energy consumption per unit of output being higher than in many countries in the region and more than double that of the developed countries. On the basis of studies UNIDO is currently carrying out on the rubber refining sector, its the energy consumption is, on an output basis, equivalent to almost double international consumption norms, while the energy consumption levels of rice processing, when compared to international norms, suggests there is a potential for 30% savings. As per IFC energy benchmarking studies in garment sector (ILO, IFC, GMAC 2009), average energy intensity is 42 GJ/ton of garment produced which is very high compared to comparable garment sector in the region. In brick kiln as per survey conducted during PPG phase energy intensity per Kg brick fired in Cambodia is 8 MJ compared to 2-2.5 in similar kilns in other Asian countries and 1-1.2 in kiln using Vertical shaft Brick Kiln (VSBK) technology.

As per the Second National Communication (SNC) draft report (SNC-draft 2010), manufacturing industries consume large amounts of diesel and certain industries such as the garment industry and brick works also large amounts of fuel wood that contributes to deforestation. The mitigation options proposed in SNC include energy efficiency reducing emissions by about 20% and technology change that can reduce emissions about 40% for some even up to 70% for instance for rice mills using rice husk gasification technology or with combined heat and power generation or co-generation using other sustainable biomass sources.

Baseline Emissions Scenario (extracted from National Communication-2 Draft report)

The results of the analyses per sector and forecast till 2050 result in the Baseline Emissions Scenario (see Table-2) show an increase in total CO₂ eq. emissions from 2,712 Gg (thousand tones) in 2000 to 25,947 Gg (thousand ton) in 2050. These emissions are equal to 0.2 tCO₂ per capita in 2000 to 1.3 tCO₂ in 2050. The transport sector will have the largest share in 2050 with the Energy Industries (all emissions related to electricity generation) the second with 8,888 Gg. CO₂ equivalents.

TABLE-2: EMISSIONS IN GG CO₂ EQUIVALENTS FOR MANUFACTURING AND CONSTRUCTION INDUSTRIES

	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Rice Milling	108	157	201	221	244	270	298	329	363	401	443
Brick Works	2	6	9	11	13	16	19	23	27	33	40
Garment Industries	117	115	113	113	113	113	113	113	113	113	113
Rubber Factories	18	14	11	11	11	11	11	11	11	11	11
Cement Factories	3	4	6	7	9	11	13	16	19	23	28
Other Industries	84	217	349	465	533	604	691	779	881	998	1132
Total	333	513	689	828	923	1024	1144	1270	1414	1578	1766

Source: Generated with LEAP, 4% increase per year after 2010 for the rice milling, brick works, cement factories and Other Industries.

As per SNC draft report the industry (manufacturing sector) contribution in total GHG emission in 2010 is calculated as 12.2% excluding GHG contribution from electricity used by industries purchased from grid and accounted under energy sector. The total contribution of GHG by manufacturing sector workout to be more than 20% and if biogenic CO₂ is also accounted it will be approx 30% equivalent to its share in national GDP

TABLE-3: TOTAL EMISSIONS INCLUDING BIOGENIC CARBON DIOXIDE 2000-2050 IN GGCO₂ EQ.

Standard emissions	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
A1 Energy Industries	385	1,008	1,453	1,212	1,931	2,849	3,539	4,430	5,567	7,023	8,888
A2 Manufacturing Industries	333	513	689	828	923	1,024	1,144	1,270	1,414	1,578	1,766
A3 Transport	765	1,318	2,082	2,566	3,163	3,900	4,812	5,941	7,338	9,069	11,214
A4 Other Sectors	1,229	1,304	1,392	1,482	1,658	1,977	2,285	2,623	3,025	3,505	4,079
Sub Total	2,712	4,144	5,616	6,088	7,674	9,751	11,781	14,264	17,344	21,175	25,947
Biogenic CO₂ Emissions	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
A2 Manufacturing Industries	243	999	1,663	1,935	2,138	2,366	2,643	2,950	3,314	3,743	4,253
A4 Other Sectors	10,284	9,373	8,595	7,807	6,878	6,549	6,016	6,276	6,577	6,923	7,324
Sub Total	10,527	10,372	10,258	9,742	9,016	8,915	8,659	9,227	9,890	10,667	11,577
Total	13,239	14,516	15,874	15,830	16,690	18,666	20,440	23,491	27,234	31,842	37,524

Source: Generated with LEAP, using default emissions and emission for biogenic CO₂

Barriers for Adoption of Energy Efficiency

The significant increases in energy prices have had a significant impact on profits and production costs of Cambodian enterprises, making them well aware of the energy production cost issue. This is generating significant market potential for industrial energy efficiency (IEE) products and services. Nevertheless, Cambodian institutions and enterprises have so far failed, to a great extent, to respectively support and reap the benefits of such potential for efficiency improvement and subsequent energy and cost savings. Major limitation in penetration of such products and services into Cambodian industries are:

- a. *The lack of competent local suppliers of energy efficient technologies after-sales services, Inadequate IEE policies, institutions and regulatory framework, and the lack of resources to effectively promote and support energy efficiency in industry.*

Despite good progress over the last decade in preventive approach like application of cleaner production in private sector, institutional and legal framework is still inadequate and it has not generated tangible results. Government technical capacity remains seriously constrained by lack of financial and human resources, and expertise to implement substantive and effective policies and programs to promote and support energy efficiency in industry. In 1994, the Royal Government of Cambodia also promulgated a policy and plan on energy conservation and efficient use of renewable energy sources. Within the energy conservation part of this policy and plan, in 1997 the Ministry of Industry, Mines and Energy (MIME), with the assistance of the World Bank, created the Energy Efficiency Office. Since that time, with various development partners (World Bank, France's ADEME, ASEAN, UN-ESMAP, Japan's ECCJ, UNIDO, among others) the Energy Efficiency Office has been promoting energy efficiency, in both non-industrial sectors (the public, services sector, the tourism sector) and the industrial sector. In addition, slow progress in technology development to use alternative local sources of energy (needed because of the limited traditional energy resources in Cambodia) is acting as a brake on the country's future economic growth, and more specifically its future industrial growth as well as the growth in its exports in what are becoming increasingly competitive regional and global markets. Therefore, there is an urgent need for the country to identify and develop the options available to it to satisfy the country's energy requirements using locally available resources. However, this must be done while at the same time pursuing environmental and social sustainability through application of resource efficiency having energy efficiency as a cross cutting issue:

- b. *Lack of understanding among industry decision-makers of their economic potential for energy efficiency improvements*

While most enterprises now pay great attention to energy costs, they have limited awareness and understanding of the financial and qualitative benefits that energy management and energy efficiency can deliver. On the one hand, this is consequence of lack of information about what is technically feasible and what is commercially available with regard to IEE. There are limited structured IEE dissemination and education programs. On the other hand, inadequate energy data monitoring and analysis practices and insufficient technical capacity are the causes of poor energy performance assessments and subsequent impossibility to size the potential energy and costs savings.

- c. *Insufficient technical capacity within enterprises and in the market to identify, develop and implement industrial energy efficiency projects and measures.*

Energy audits carried out during the PPG as well as in ongoing CP programme of UNIDO, have shown limited understanding of energy benchmarks, energy system efficiency and impact of operating conditions. For instance, units employing thermal energy for various applications have low technical awareness in generation efficiency, distribution losses and optimum operating parameters which influence energy use. Major attention is focused on production against productivity of resources.

During PPG survey and also IFC benchmarking survey it was noticed that some export oriented enterprises particularly in garment sector has limited record and reports on specific energy consumption. But at the level of planning, implementation, and performance review practices show inconsistencies and lack of systematic approach. In the majority of Cambodian enterprises specially SME sector like rice milling, brick kilns, small food and beverage industries there is a lack of awareness on IEE benefits as well as structured approach to managing energy.

Interviews of equipment vendors and service providers to industry as well as meetings with representatives of other international technical assistance programs to enterprises have shown that there is very limited and partial availability of expertise and services on industrial energy efficiency. As most of vendors of technology suppliers are from other countries, major equipment vendors and suppliers interviewed by the GEF-UNIDO project team during the PPG phase realizes that after sale service as well as assistance in improving energy use and efficiency is missing. The lack/non-existence of qualified industrial energy efficiency auditors and experts has been reported by all ongoing

international technical assistance programs as well as identified by the Government as key barrier to improve energy efficiency in industrial sector in Cambodia.

d. Financing and credit constraints faced by private enterprises.

One of the most important requirements to implement IEE is often to upgrade their production technology, which requires substantial finance. Credit worthiness of most of SME's due to poor balance sheet coupled with high lending interest rates, have forced most of the enterprises to invest limited finance from their own resources and preference is given on expansion of production and investment for projects like environmental management and energy efficiency gets back seat. In the short term, the present anxiety regarding the economy is considered by most industries as a motivation for them to become more efficient to sustain and/or improve their cash flows.

Based on interviews with companies as well as market studies the shortage of funds for the development and preparation of IEE projects have surfaced as probably the most critical financing barrier to the implementation of IEE projects, because once shown with detailed cost-benefit analysis some enterprises would be prepared or able to invest. As of 2009 no dedicated fund and credit line was in place for supporting the development and implementation of industrial energy efficiency projects. These barriers all lead up to the core problem in the promotion and implementation of IEE&EM measures in industries, which are the *inefficient and wasteful use of energy in industrial facilities*. This core problem leads to the problem of *high energy consumption and demand, and increased GHG emissions from, Cambodian industries*.

How the project seeks to solve the problem.

Based on the analysis of the "means and ends" relationships of the desirable outcomes of the identified barriers to Industrial Energy Efficiency implementations, the following are the expected results of the project:

- a. Information on IEE technologies are documented, has easy access, and is disseminated. Regular campaign programs on the rational use of energy are provided to industries by the government /other autonomous bodies. Sector specific and equipment specific energy benchmarks are set and published.
- b. Industries become interested in investing in the implementation of EC&EE projects and practices that are economically and financially viable.
- c. Industry personnel are adequately trained on energy management.
- d. Incentives incl. financial is provided to industries to conserve energy.
- e. Financial institutions provide financing for EE&EC projects to interested industries.
- f. Energy efficient equipment becomes affordable to industries.
- g. Regulations on energy efficiency are formulated and enforced by the government.
- h. Local energy efficiency support services are promoted, strengthened and utilized.
- i. Significant IEE technology demonstration programs are implemented by the Government/institutes in collaboration with the private sector and financial institutions.

In view of the above and with the prospects of increased energy demand and consumption in the industry sector, the idea of removing the barriers to IEE implementation in industries has recently been accepted as a practical course of action for the country to undertake in order to attain its energy and environmental objectives. It also is one of the strategies identified by the UNFCCC to stabilize atmospheric GHG concentrations at levels that would prevent dangerous anthropogenic interference with global climate. The country is committed to identifying and implementing ways to achieve this objective. GEF-UNIDO IEE project will address the removal of the barriers to IEE&EM specifically in the industrial sector will improve the competitiveness of the locally manufactured products. At the same time, it will contribute to the reduction of GHG emissions.

The project is focused on potential energy savings and GHG emission reduction in energy intensive industrial sectors a) Garment, b) Rice milling, c) Rubber refining d) Brick kilns and e) Food and Beverage (proposed during consultation workshop) sector in Cambodia. During PPG stage different scenarios of selected sector, current baseline emissions, future demand and production forecast possible areas of IEE and GHG reduction were worked out and presented in a separate document annexure-F.

The project also seeks to address many of the existing barriers as mentioned above to industrial energy efficiency (IEE), to deliver measurable results and to make an impact on how Cambodian industry manages and uses energy through an integrated approach that combines technical and financial assistance in implementation of IEE pilot projects in selected enterprises (who has committed for co-financing) substantial capacity building with technical assistance interventions at the policy, energy efficiency standards , energy auditor accreditation and scale-up activities of IEE achievements through pilot demonstration.

To encourage energy efficiency with low carbon alternative technologies offers the most comprehensive solution for Cambodia to achieve these twin goals of energy security and sustainable energy solutions. Primary target groups of the project are manufacturing enterprises decision-makers (managers and engineers), industrial equipment/after sale service vendors, energy professionals and service providers (both in public and private sector), and energy efficiency policy-making and implementing institutions.

The project puts emphasis on process-related improvements that increase material and water efficiency. As materials and water consumption determine to a large extent energy consumption, such process measures contribute significantly to overall energy efficiency, whilst also enhancing productivity and hence profitability of companies. This will be complemented by a focus on efficiency in the typical industrial energy systems, i.e.:

Thermal Energy Efficiency: share of thermal energy in selected industrial sectors in Cambodia is quite significant and possibilities of mix of low cost IEE options, medium cost like retrofit of energy efficiency equipment where techno-economically viable and high cost options like deployment of existing state of art technologies, substitution of low carbon or carbon neutral fuel like biomass for thermal energy requirements.

Electrical Energy Efficiency: similar to thermal energy mix of low cost, medium cost and high cost IEE options will be evaluated for electrical energy consumption. In Cambodian context as electricity supply to manufacturing sector is unreliable in many areas, quite a significant share of electrical energy is captive generation, therefore, potential of efficient generation of energy will also be worked out and implemented.

Equipment Specific Energy Efficiency: equipments which are major consumer of energy like motors (which are responsible for approx. 85% of electric energy consumption as driver), pumps, air compressors, electricity generators, boilers, furnaces, kiln, dryers will be focused during implementation of GEF-UNIDO project. Short courses will be developed and offered on specific topics like energy savings in motors and motor systems; energy savings from boilers, furnace, kilns; and energy savings in cooling & refrigeration systems.

The project consists of five technical components in addition to project management.

Project Component 1 (PC-1): providing technical and part financial support for implementation of industrial energy efficiency projects in industrial sector to demonstrate financial and environmental benefits of industrial energy efficiency including reduction in green house gas (GHG) emissions. Compilation and publication of results from quick scans and pilot demonstrations in a compendium as tool for wider scale application.

Project Component 2 (PC-2): primarily focuses on building technical capacity within enterprises and in the support institutions and market to identify, develop, evaluate and implement industrial energy

efficiency projects and continually improve energy performance. As integral part of PC-2 component (capacity building) local suppliers for process technology and IEE services will be promoted to reduce cost of implementation and also network of IEE service provider will be established.

Project Component 3 (PC-3): strengthening of institutional framework for industrial energy efficiency aims to address the capacity building of Government department responsible for IEE promotion, financial institutions to evaluate IEE proposals for financing (total costing incl. environmental and health associated costs).

Project Component 4 (PC-4): aimed to facilitate multiplier effect of energy efficiency practices and technologies by Cambodian enterprises as an integral part of their business practices. PC-4 will also work with trained experts to identify and implement IEE in other industries in addition to 40 enterprises (Quick scan) on their own. Project will also assist in compiling a number of short case studies for dissemination and scaling up.

Project Component 5 (PC-5): aims to address the inadequacy of existing policies, institutions and regulatory framework to effectively promote and support industrial energy efficiency and the lack of technical expertise, resources and programs that lay behind it. PC-5 will also make a major contribution towards for developing tracking and benchmarking of energy consumption and establishing energy auditor accreditation programme.

Project Component 1 - Implementation of industrial energy efficiency pilot projects

Under project component 1 the project will provide company-specific technical assistance, including energy audits and project co-financing, to support the implementation of a limited number of demonstration IEE projects in selected 5 industrial sectors with high replication and/or energy savings potential. Sectoral profile based on survey conducted, preliminary audits carried out during PPG phase to work out potential of energy and GHG emission savings and also from available information from other sources are attached as annexure-2.

The project will also contribute financially toward the implementation of at least 13 selected pilot IEE projects. It has to be pointed out that these pilot companies will co-finance the major part of IEE implementation from their own resources, with the present project helping them in financial engineering and preparation of bankable proposals. On the basis of survey and preliminary energy audits carried out as well as discussions with industries & industry specific associations and equipment suppliers, significant opportunities for energy efficiency improvements exists both for thermal and electrical energy usage.

At the end of the PPG phase, the project has identified already 13 potential pilot projects and 40 quick scan projects from 5 identified sectors. In addition other potential projects have been proposed by few enterprises as part of up-scaling component. Letters of co-financing commitment have been secured from 12 enterprises participating in pilot project (list attached with commitment letter in separate document), however, for units participating in quick scan only verbal commitment has been obtained so far (list attached in separate document).

Based on the PPG survey and preliminary audits, sectoral report, interviews and survey information obtained from various industry representatives regarding energy technology applications in the sectors, the following projects are identified for the energy efficiency demonstration program:

- Brick Kiln Sector:*
- Modification of existing kilns by optimizing combustion, improving draft, insulation and avoiding short circuiting to reduce thermal energy losses.
 - Replacement of kiln with energy efficient kiln like Fixed Chimney Bull Trench Kiln (BTK) and/or feasibility of continuous production Vertical Shaft Brick Kilns (VSBK) using biomass as fuel.
 - Substitution of diesel used as fuel for electricity generation for mixing and brick molding section with producer gas using biomass based gasifiers.

- Food Sector:*
- Substitution of Diesel Generators used DO as fuel for electricity generation by replacing DO generators with dual fuel (70% gas & 30% DO).
 - Replacement of DG set with 100% Gas fired Engines.
 - Replacement of DO fired Dryers/Crispers with hot air dryer using producer gas.
 - Installation of appropriate size of Gasifier based on waste wood or other locally available agro residue depending on location and space available.
 - Substitution of inefficient piston type compressors with EE Screw compressor.
 - Collection reuses and recycles of hot water and condensate from various sources.
- Rice Milling Sector:*
- Substitution of Diesel Engines used as driver for milling equipments by replacing dual fuel engines (70% gas & 30% DO).
 - Replacement Engine with 100% gas based engines.
 - Replacement of paddy dryer using fossil fuel with hot air dryer using rice husk or producer gas from gasifiers.
 - Installation of appropriate size of Gasifier based on rice husk.
 - Implementation of EE rice milling technology using separate motors for different equipment to reduce high energy loss from single drive engine.
 - Installation of compact rice milling line.
- Garment Sector:*
- Substitution of Diesel used as fuel for captive Electricity generation
 - Substitution of Furnace oil or Diesel used as fuel for steam generation in boilers by replacing solid fuel fired boilers using available surplus biomass.
 - Replacement of wet processing machine (Washing/bleaching/dyeing) with low cloth: liquor ratio machine to reduce energy as well as other resource cons. and reduced waste water generation.
 - Substitution of inefficient piston type compressors with EE Screw compressors.
 - Substitution of inefficient dryers both mechanical (centrifuge) and thermal vertical front loading dyer using steam with EE squeezers and dryers.
 - Collection, reuse and recycle of hot water and condensate from various sources.
 - Optimizing lighting in production hall by replacing existing lights with EE lights, adjusting light proximity, install automatic control systems.
 - Installation of Capacitor bank to improve power factor.
- Rubber Sector:*
- Substitution of rubber dryer uses Diesel as fuel with hot air dryer using waste rubber wood as fuel.
 - Substitution of rubber dryer using diesel as fuel with producer gas by installing waste wood based gasifier.
 - Replacement of Cup Lumps washer/ cleaner with energy efficient drums and installation of high-pressure fan flat /fish tail like nozzles.
 - Installation of Capacitor bank to improve power factor.

Under this component the project activities will be managed by NCPO-C with Department of Energy Techniques, Industrial Techniques of Ministry of Industry, Mines & Energy (MIME) and other relevant institutions, NGO's, and technology suppliers to deliver the following outputs:

1. Energy efficiency projects for cumulative 45,000 TOEs per annum of energy savings and related potential economic savings are identified by 40 enterprises participating in the quick scan process and appraised by project experts (also refer Component 4 for scale up).
2. At least 12 pilot IEE projects for cumulative 15,000 TOEs per annum of energy savings over the investments duration are implemented from selected industrial sectors, partnering in the project.
3. Results of the pilot projects both in economic and environment context are compiled in a compendium for effective dissemination.

1) The objectives of the implementation of Industrial energy efficiency pilot projects are:

- *To develop and standardise (tailor made as per sector requirement) an energy audit and reporting format, worksheets and auditing tools to be used by the enterprises participating in Pilot project, quick scan and on their own audit using training tools.*

This will help in uniform recording and reporting for ease of compilation of results achieved and also monitoring and verifying the resource (Energy & Material) and environmental savings through implementation of GEF-IEE project.

- *Energy performance benchmarking*

Energy performance benchmarking focuses on a comparative analysis of energy use per unit of physical production, otherwise known as energy intensity. Determining the facility's energy intensity by fuel type specific indicators is necessary to workout potential of savings. Worksheets provided in energy audit format, energy calculator and GHG calculator will be used in collection and compilation of data. Comparison of energy intensity of selected sector and sub-sector with similar or comparable sector, equipment and/or product in Cambodia as well as other countries will be done. The available benchmarking reports for the sector industrial sectors will also be useful for benchmarking energy equipments like motors, fans, pumps, compressors, Diesel Generators, boiler etc.

- *Compendium of case studies from Pilot project*

Further, the project component 1 will also involve the documentation of relevant energy project profiles and case studies on energy efficient technology applications in developed and developing countries, and in ASEAN. A compendium of IEE techniques and technology applications will also be prepared. More importantly, a computerized database of IEE technology application projects implemented in Cambodia, ASEAN and in the developed countries will also be prepared. For wider dissemination of benefits of IEE, results achieved from pilot projects and quick scan participating units also will be compiled in a user friendly compendium both in English and Khmer language. Output of component 1 will contribute to stimulate the creation a national market for IEE product and services and enabling environment for steady growth of IEE performance.

Energy efficiency strategy, coupled with low-carbon alternative technologies offers the comprehensive solutions and most direct path in achieving energy security and sustained emissions reduction potential. At the heart of this potential is the transfer of already proven cleaner and efficient technologies from one country to another where it has not yet been applied. Transfer of climate change related technologies has been identified as an effective strategy both from business perspective as well as global response to climate change.

Experience has shown that it's not enough to merely invest in new technologies. For example, although many low-carbon technologies are already commercially viable, mainstreaming their use and transferring them to other markets is still a significant challenge in most countries. In some cases technologies are still too expensive compared to fossil-fuel technologies. In other cases, their uptake is slowed by market development barriers, limited access to information, inadequate government policies, regulations and procurement programmes, and insufficient or poorly implemented technology codes and standards.

Project component 2 - Capacity building and development of tools for implementing industrial energy efficiency

Project component 2 aims to build and strengthen technical capacity of national experts from relevant support institutions with respect to energy audit, energy benchmarking, working out energy saving

potential, energy management and system optimization at the institutional, market and enterprises level through a combined classroom cum on the job training approach. As result of the expert level trainings at least a cadre of minimum 30 National Experts in industrial energy efficiency is equipped to serve Cambodian industries.

The capacity building program to be implemented by the project component 2 will consists of following stages:

- 1st stage: Training of a group of selected professionals from pilot industries for data collection compilation to workout baseline before implementation of IEE options, gap analysis and identification and short-listing of techno-economically viable IEE options.
- 2nd stage: Out of short listed IEE technologies the most suitable, proven and techno-economically viable projects for implementation will be selected, elaborated, and supported to be implemented by the investors with support from the project.
- 3rd stage: Undertaking a detailed financial engineering of the selected options, with assistance from the project, to support company decision-making, vendor selection and the securing of financing for implementation.
- 4th stage: Training of group of national professional (National Experts) from relevant institutions for all 3 stages mentioned above.

A group of 30 professionals will be provided with in-depth training and equipped with the technical capacity and tools required to: a) develop and implement energy management systems and energy efficiency projects in industry, focusing both on thermal and electrical energy optimization; b) provide training to industry and energy professionals and offer commercial IEE services.

This group of professionals will comprise of energy efficiency consultants and service providers, representatives of relevant Government and public institutions such as Department of Industrial/Energy Techniques, MIME, Institute of Technology of Cambodia (ITC), equipment vendors, and engineers and managers from enterprises. Some of these trained professionals will subsequently work as Industrial Energy Efficiency (IEE), Energy Management (EM) experts and become a source of expertise and services for the GEF-UNIDO project, National Cleaner Production Office-Cambodia as well as Cambodian enterprises.

The expert training will consists of the following steps:

Step 1 Preparation of the training program

This involves the preparation of the training material, the selection of trainees, the identification of appropriate factories for in-plant group exercises, securing approval for site visits, classroom logistics, etc.

Step 2 1st training period

International experts provide training to national trainees in classroom and on the job in pilot plants. This first period covers the tools and techniques to conduct energy audit, energy audit reporting format, development and establishment of energy management systems (EnMS) in compliance with EN16001/ ISO50001. This will include the definition of the EnMS boundaries; identification of significant energy uses; definition of the energy profile, baseline and performance indicators; development of IEE options/solutions, action plans with responsibility and operational improvement measures, and so on. During the in-plant session trainees receive "on-the-job" training on how working with enterprises' management and personnel in getting an energy management plan started.

Step 3 Trainees apply knowledge, skills and tools provided

Trainees coming from manufacturing enterprises go back to their factories and apply the

knowledge, skills and tools that have been provided with to get an energy management system and develop operational improvement measures.

Trainees coming from institutions apply knowledge, skills and tools received in other manufacturing enterprises that have agreed to participate in the program (quick scan units). During this period of time, trainees have access to international experts' and technical advice. These trained IEE professionals in association with National Cleaner Production Office-Cambodia and energy service companies will establish a network of service providers aimed to assist companies in implementing industrial energy efficiency.

Step 4 2nd training period

International experts provide advanced training to national trainees both in classroom and on the job during IEE assessment, technology gap analysis, review (technical, financial and environmental) of identified options for implementation, implementation of technoeconomically viable options and performance evaluation of implemented options.

Step 5 Implementation of Energy Management System (EMS) and operational improvement measures

Trainees work with the manufacturing enterprises that have taken part in the training program to fully operationalize the energy management systems developed and reviewed by international experts, and to implement initial operational improvement measures.

Operational improvement measures often are low cost and do require only staff time and external expertise. In case of cost intensive options, capital investments might be needed, the GEF-UNIDO project will provide part financial assistance for implementation which will be useful for on the job training in implementation.

Step 6 Reporting of implemented EMS and improvement measures

Trainees will be required to work (based on individual contract) with the manufacturing enterprises to report annually, for the first two years after implementation, to the GEF-UNIDO project/ Agency for Energy Efficiency on energy performance improvements and energy savings achieved.

The envisaged composition of the group of professionals to be trained as expert consists of representatives from the Department of Industrial Techniques, Energy Techniques of MIME, Institute of Technology of Cambodia, the National Cleaner Production Office-Cambodia being established by UNIDO, managers/engineers from 13 participating enterprises, and about 10 independent consultants and experts providing energy efficiency or environmental management systems technical advisory services.

Local suppliers of relevant technologies (kilns, boilers, etc.) are also trained in IEE. Potential local suppliers are promoted, to ensure more cost-effective technology and more reliable after-sales service.

The project will also train personnel from existing technology suppliers in Cambodia (e.g., suppliers of kilns, boilers, generators, gasifiers etc.). Past experience has shown that technology suppliers can be an important source of knowledge for enterprises. In addition, for a small country like Cambodia much of the technology that is imported needs to be adapted to local scale of operations, and the energy efficiency of adapted technologies is very dependent on the manner in which it is done. In addition, the project will promote the development of local suppliers of technology where they do not exist. On the one hand, this creates a network of after-sales services, which is critical for the sustainability of renewable energy generation and energy efficiency, and on the other hand, it will encourage local suppliers to manufacture equipment locally to reduce the initial capital investment.

Web-based guidance tool/manual on IEE developed

The project will address the issue of sustained replicability by using an ICT (internet based) approach that will be populated with training material, relevant information and contact details of technology suppliers, experts, relevant links with useful sites on IEE..

Project component 3: Strengthening of institutional framework for industrial energy efficiency

Project component 3 aims for stronger institutional framework in place to ensure long-term support for energy security and reduced consumption efforts in enterprises. The component is specifically aimed to build capacity in relevant Government department and regulatory agencies for energy generation, distribution and policy makers.

Under this component project will work intensively with the Department of Energy Techniques (DOET) of Ministry of Industry, Mines and Energy, Climate Change Department (CCD) of Ministry Of Environment (MOE), and financial institutions like IFC and private /public sector, National and International banks to ensure long term sustainability of industrial energy efficiency implementation in Cambodia and deliver the following outputs:

1. Capacity building of relevant government departments to promote industrial energy efficiency: In addition to technical capacity building this component will also cover relevant transaction and contractual aspects - identification and fulfillment of the relevant contractual aspects between the various stakeholders such as the technology supplier, the technology recipient, financiers, and the government (the latter will be particularly important in ensuring a viable business proposition between technology supplier and recipients). The National Cleaner Production Office-Cambodia (NCPO-C) in association with MIME will play an important role here in overcoming any hurdles related to IPR in particular.
2. Companies are trained in preparation of bankable IEE project proposals: For the selected technology agreed for implementation by enterprise "bankable proposals" will be prepared, including full costing for all aspects like environmental costs and liabilities, social sustainability and risk mitigation, for potential financiers of the technology.
3. Capacity building of financial institutions to assess investment proposals in IEE: Financial institutions are key player in investment related EE technology implementation. Access to finance in Cambodia was ranked as the 2nd most severe constraint by the World Bank. In addition to other reasons accessing the credit worthiness of the proposed project is a bottleneck. Traditionally financial institutions assessment is based purely on economic criteria like Internal Rate of Return (IRR) for low investment projects, other factors like resource availability limitation, environmental aspects and related costs, potential liability, occupational health and safety (OHS) are often not accounted. Project will build capacity of financial institutions for total costing and also will attempt to use successful financial instruments like Mutual Credit Guaranteed Trust Fund (MCGTF) in India and Green Credit Line (GCL) of SECO in Vietnam and Columbia.

Project component 4: Up- scaling of industrial energy efficiency applications in Cambodia

Project component 4 is aimed at increased adoption by Cambodian enterprises of energy efficient practices and technologies as an integral part of their business practices and the creation of a national market for industrial energy efficiency products and services.

Under this component the project will work intensively with the Department of Industrial Techniques and Energy Techniques of Ministry of Industry, Mines and Energy, Climate Change Department (CCD) of Ministry Of Environment (MOE), academic institutions like ITC and RUPP and other relevant national institutions and private companies to upscale the energy efficiency implementation in Cambodia and deliver the following outputs:

1. The results of the pilot projects and quick scans are widely disseminated. It is envisaged that 50 IEE projects for cumulative 60,000 TOEs of energy savings are developed and implemented by industrial enterprises as result of their participation in the capacity building program and results achieved by participating pilot companies of the project.

2. Industry decision-makers understand their potential for energy efficiency gains both in term of economic and environmental aspects and undertake energy efficiency activities.
3. Other stakeholders understand their role and associated benefits to promote industrial energy efficiency.

The component 4 of the GEF-UNIDO project will address the issue of sustained replicability by using an integrated approach that will combine the technical support in the implementation, commissioning and performance evaluation of the pilot demonstrations, with interventions at the institutional and policy levels and in the market place so as to assure the development and adoption of energy efficiency and renewable energy technologies. In addition to upgrade the existing technologies (significant part of IEE implementation) need for energy efficient and renewable energy technology transfer mechanism appropriate for a country like Cambodia is evident. The design of the project will therefore be based on five key elements for successful implementation of energy efficiency related techniques and technology:

(1) Technology need (gap analysis) and technology assessment for technical, financial and environmental aspects using existing tools like (environmentally technology assessment) EnTa of UNEP (also will be part of project component1);

(2) Technology information based on technically available economically viable and environmentally desirable technologies. Preference would be given to technologies available locally or in the region to enable better after sale service network and also to foster south-south co-operation in the GEF-UNIDO project.

(3) Enabling policy level environment: The project will assist RGOC to strengthen, or if necessary develop, policies and regulations that can support development of mechanism and financial incentives for scaling up of the adoption, development and transfer of energy efficiency technologies. One such area of policy that will be targeted, together with the Electrical Energy Authority of Cambodia, the national utility Électricité du Cambodge (EDC), and MIME, is the development of the rules allowing private generators of electricity using renewable resources to feed their surplus generation into their local grid at a fair price (this would make the investments more economically viable).

(4) Capacity building: In combination with PC2&3 the project will train personnel from existing technology suppliers in Cambodia (e.g., suppliers of kilns, boilers, generators, gasifiers etc.). Past experience has shown that technology suppliers can be an important source of knowledge for enterprises. In addition, for a small country like Cambodia much of the technology that is imported needs to be adapted to local scale of operations, and the energy efficiency of adapted technologies is very dependent on the manner in which it is done. In addition, the project will promote the development of local suppliers of technology where they do not exist. On the one hand, this creates a network of after-sales services, which is critical for the sustainability of Renewable energy generation and energy efficiency, and on the other hand, it will encourage local suppliers to manufacture equipment locally to reduce the initial capital investment.

(5) Mechanism to facilitate institutional and financial support to technology cooperation, development and transfer.

(6) As results from the implementation of the energy management systems established in enterprises participating in the Energy Management Expert training will start to accrue, a Practical Guide to the Implementation of Energy Management in Industry in compliance with EN 16001/ISO 50001 international standards tailored to the Cambodian context will be developed building on the output of UNIDO parallel project. The Practical Guide will provide a very useful tool for wider dissemination of energy management best practices and supporting implementation.

Project component 5: Formulation and implementation of policies, regulations and programmes to promote and support sustainable industrial energy efficiency

The project will provide technical assistance to develop and help establish market oriented policies, programs and normative instruments needed to support sustainable progression of Cambodian industries towards international best energy performance and contribute to the creation of a national market for IEE products and services.

Under this component the project will work with the Ministry of Industry, Mines and Energy, Ministry Of Environment (MOE) and other relevant national institutions to build and strengthen institutional technical capacity and deliver the following outputs:

- 1) Develop and establish an IEE Monitoring, Tracking and Benchmarking Program.
- 2) Develop and establish a National IEE Best Practices Dissemination Program.
- 3) Develop and establish a National Energy Auditor Certification Program.

1) The objectives of the IEE Monitoring, Tracking and Benchmarking (MTB) Program during the implementation period of the GEF project are:

- ✓ To develop and establish a GEF-UNIDO project energy savings and GHG savings reporting structure to be used for/by the enterprises participating in the project.

This reporting structure would serve for the following purposes:

- Monitoring and verifying the energy and GHG emissions savings directly generated by and through the GEF-UNIDO project.
 - Mechanism to track indirect saving in energy and GHG through GEF-UNIDO project intervention like sensitization and training on IEE.
 - Identifying enterprises that in all the 5 identified sectors have achieved the greatest energy efficiency and energy performance improvements by setting the achievable target of national IEE best practices.
- ✓ To develop and establish a national reporting structure for energy consumption and savings in industry that allows defining and tracking energy performance and efficiency indicators at the sector and sub-sector level.

This national reporting structure would be an evolution of the GEF-UNIDO project structure. The purpose of this national structure would be to better inform the design and measure the impact of targeted short- and medium-term policies and programs aimed to support IEE; for example by prioritizing types of interventions and sectors/sub-sectors to receive Government support; developing target-setting agreements and others.

- ✓ To develop and test energy auditing and benchmarking methodology tailored to the Cambodian manufacturing sectors/sub-sectors.

The development of energy benchmarks would be beneficial to policy-makers in designing more targeted and quantitative based IEE supporting policies, such as energy efficiency target setting agreements, but it would be particularly beneficial also to enterprises, which would have the opportunity to better understand their energy performance and identify areas for improvements and/or further analysis. Based on the results of the IEE survey carried out by the project team during the PPG phase, most of surveyed enterprises believes that energy benchmarks would be very useful in identifying EE opportunities, potentials of savings and improve performance.

2) The objective of the National IEE Best Practices Dissemination (BPD) program is twofold:

- ✓ To raise awareness of an increasingly broader industrial audience about the best practices, the benefits as well as the costs of Energy Efficiency (EE) and Energy Management (EM) in the manufacturing sector of Cambodia.
- ✓ To offer a reference point for EE and EM practitioners as well as enterprises where to find information and resources for establishing an energy management system and identifying and developing IEE projects.

The IEE BPD program being established during the GEF-UNIDO project will consist of the following elements:

- a) Development of IEE case studies

These case studies will be produced in different ways: simply translating international

case studies; based on results and projects generated by the GEF-UNIDO project; based on results/ case studies generated by the Cambodia Cleaner Production Programme.

- b) Creation and maintenance of an IEE Best Practices Dissemination website as also part of project component 2.
- c) Development and production of user friendly pictorial guideline and EE posters in local language as IEE promotion material.
- d) Development of a Practical Guide to the Implementation of Energy Management in Industry in compliance with the EN 16001/ISO 50001 international standards.
- e) Organization of workshops/ seminars on the importance of energy efficiency in industry and IEE best practices for Management (2 hrs) manager level (1/2 day) and shop floor level for 1 full day.

3) The objectives of the National Industrial Energy Auditor Accreditation (NEAA) program are:

Another major activity in this project component is the creation of an accreditation program for National Energy experts, service providers, and local ESCOs. In coordination with relevant government institutions, an appropriate accreditation scheme will be developed including testing programs and the definition of the institutional mechanisms for the accreditation program. Moreover, a scheme will be developed to integrate the energy specialist accreditation program to existing related accreditation schemes in the country, in other ASEAN/ASIAN countries and in the developed countries.

- To provide a policy and normative instrument for supporting medium and long term sustainability and progression of energy savings in industry.
- To contribute to the creation of a national market for energy efficiency services and products for industry and other sectors.
- To compile course material, question answer booklet and evaluation paper for Energy auditor in Khmer language.

The NEAA will capitalize the resources and outputs produced mainly through the capacity building project component-2 &3 of the GEF-UNIDO project.

The ultimate goal of the GEF-UNIDO project is to demonstrate IEE benefits through assisting implementation and to reduce greenhouse gas emissions at wider scale by contributing to establish a policy and normative environment that enables and supports sustainable adoption of energy efficient technologies and management as an integral part of industries' business practices. Mechanism for up-scaling by creating an environment in which a cadre of well-trained and equipped experts in energy management and system optimization assists industries in developing and implementing energy efficiency improvement projects.

Expected Global Environmental Benefits to be delivered

Industrial decision makers from Cambodia, likewise most of other countries often links improved energy efficiency or cleaner production with new hardware, either being new production technologies or looking at individual components substitution (kilns, engines, motors, pumps, boilers, etc.) rather than how energy is managed and how energy producing and consuming systems are operated. NCPO-C experience in implementation of resource efficiency and cleaner production in Cambodia is also same and focus/understanding is mostly on new hardware for EE rather than optimizing the existing one before assessing the feasibility of new technologies. In many cases, such approach leads to significant unrealized energy savings or unattractive proposition due to high investment and capital cost. Strategy of energy efficiency in industry requires attention not only direct energy usage but also material and water intensity which is linked to energy intensity. Usage of energy is intertwined with the whole production process and the adoption of an energy system optimization approach. Past experience in OECD countries shows that:

- a. While equipment components substitution can usually deliver efficiency gains of 2-5%, energy savings in excess of 20% are achieved through system optimization. However, in context of Cambodia this is not relevant as most of technology used in 5 selected sector (except garment) is obsolete and inefficient and substitution of equipment/ change in technology both hardware and software has much higher saving potential contrary to OECD countries.
- b. Cambodian enterprises like other enterprises in developing countries having CP centres or CP institutions have implemented low cost/no cost energy efficiency measures in their business with attractive returns, however, low hanging fruits have a limit and it shall be clubbed together with cost involved technology related interventions.
- c. Based on the data collected and the energy audits carried out during the PPG phase, consideration of possible baseline trajectory, draft report of Second National Communication prepared by MOE to UNFCCC, review of existing literature on national experiences in other countries and international best practices, it has been estimated that over the period 2012-2021 the project will be instrumental to deliver between 195,000 to 260,000 tons CO_{2eq} of cumulative direct GHG emissions savings and 194,600 to 250,500 tons CO_{2eq} of indirect emissions savings by 2022. Please see Additional Annex F for a detailed description of how direct and indirect GHG emission savings have been estimated.

Institutional continuity and replicability, and sustainability of global environmental benefits

The outputs to be generated by the GEF-UNIDO Project is aimed and will contribute to create an enabling environment for a steady growth of energy efficiency performance in industry and stimulate the creation of a national market for industrial energy efficiency products and services. All planned outputs are consistent with and instrumental to achievements of the objectives of Cambodian MIME key energy policies and legislation as well as recommended plan of actions.

Project Component 1

Component-1 will motivate other industries in the country to adopt IEE as it will serve as show case to demonstrate the benefits of energy efficiency application in industries. Case studies/ results from other countries are not always the best tool to convince the local industries on benefits of IEE application. Part financial support from GEF-UNIDO project for implementation of identified IEE technologies has motivated industries for making commitments for co-financing (major part) of implementation of cost involved options a step forward over traditional low cost options preference. The results of the pilot project and quick scan participating units will be compiled in a compendium to help up-scaling the IEE implementation in Cambodia by convincing other units on economic, environmental and social benefits associated with IEE applications.

Project Component 2&3

The creation of a group of industrial energy efficiency experts highly skilled and fully equipped in the development and implementation of steam system optimization and energy management projects, provision of training on these subjects and other IEE services, is expected to play a most important role in generating and implementing new IEE projects during and after the completion of the GEF-UNIDO project implementation.

During the GEF-UNIDO project implementation period the trained national experts from institutions and energy management (EM) experts coming from the participating enterprises will become a resource of the GEF-UNIDO project and will work to deliver workshops and trainings on IEE and EM to engineers and managers of industrial enterprises. The awareness and capacity built through these "IEE User Trainings" will stimulate the development and implementation of new IEE projects and generate additional energy and GHG emission savings. It is important to note that all enterprises participating in the IEE trainings will be required to register with the project/national monitoring, tracking and benchmarking program and will be subsequently provided with the Practical Guide to the implementation of energy management as well as other material and tools to be developed by the GEF-UNIDO project. All trained experts also will be encouraged to join the Resource Efficient and Cleaner Production network in Cambodia managed by NCPO-C which will help them both technically and financially.

Project component 4

It is expected that trained national experts will continue offering and providing energy management and other IEE services to industry as result of increased demand for IEE services through demonstration of IEE benefits from component 1 implementation in the entire 5 selected sector. IEE application will also be offered to other sector as most of equipments are similar or comparable. Component 5 of project will further help in growth of a national IEE market through policy level intervention and incentives.

After the completion of the GEF-UNIDO project implementation trained energy management experts coming from public and private sector institutions such as the department of industrial and energy techniques, national energy efficiency office, academic institutions and private companies like SME renewable company will continue raising awareness, provide training and technical assistance as part of their mandate and/or portfolio of services to their clients. For instance, small scale enterprises-Renewable Energy Ltd., (SME-Renewable Ltd.,) Cambodia which is very active promoting renewable energy like gasifiers will have bigger market for their product and services.

The availability of increased financing for IEE through the Rural Development Bank for agro sector, commercial banks and the creation of Energy Service Companies (ESCOs) inherent in the forthcoming Law on Energy Efficiency will provide market conditions conducive for progressive and sustained scaling-up of industrial energy efficiency projects and performance improvements, and consequent global environmental benefits.

Project Component 5

The planned national IEE Best Practices Dissemination (BPD) programs will play a major role in determining the growth rate of IEE projects implementation during and after completion of GEF-UNIDO project implementation. It is expected to generate the level of awareness needed to boost the interest in and demand for IEE services and projects. The BPD program will be the integral part of the energy efficiency mandate. It will see also the involvement and active participation of private sector organizations, such as the Garment Manufacturers Association in Cambodia (GMAC), Phnom Penh Chamber of Commerce and other industry specific associations, which can rely on well established national networks and platforms, and have the provision of business-relevant information as one of their core services to constituent members.

The planned national Monitoring, Tracking and Benchmarking (MTB) program of industrial energy consumption and efficiency will provide a key "infrastructural" element for more effective IEE policy initiatives. To be developed and established in collaboration with MIME, it will allow better informed design and measure of impact of targeted short- and medium-term policies and programs aimed to support IEE, including target-setting agreements.

The planned National Energy Auditor Accreditation certification (NEAA) program will provide another key infrastructural IEE policy element considering that the Cambodia in future will come out with energy conservation act/law where annual energy audit of selected industrial sectors might be mandatory. The IEE Best Practices Dissemination and Recognition programs, the Monitoring, Tracking and Benchmarking program and the Industrial Energy Auditor Accreditation Certification program to be developed and established by the GEF-UNIDO project and the Agency for Energy Efficiency will provide key pillars of a new and robust IEE policy framework. The coherence and alignment of these programs with existing Cambodian energy policy objectives, plan of actions, institutions' mandate and forthcoming legislation, combined with the commitment of resources pledged by the Energy Efficiency Office of Ministry of Industry Mines & Energy and National Cleaner Production Office-Cambodia (please see Letters of Co-financing) provide strong foundations for institutional continuity, sustainability and further development of the GEF-UNIDO project outputs as well as achievement of expected project's outcomes.

B. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH NATIONAL AND/OR REGIONAL PRIORITIES/PLANS:

The project is fully consistent with Cambodia's national priorities and plans.

In 1994, the Royal Government of Cambodia promulgated a policy and plan on energy conservation and efficient use of renewable energy sources. Within the energy conservation part of this policy and plan, in 1997 the Ministry of Industry, Mines and Energy (MIME), with the assistance of the World Bank, created the Energy Efficiency Office. Since that time, with various development partners (World Bank, France's ADEME, ASEAN, UN-ESMAP, Japan's ECCJ, UNIDO, among others) the Energy Efficiency Office has been promoting energy efficiency, in both non-industrial sectors (the public services sector, the tourism sector) and the industrial sector. The Government is particularly interested in promoting higher levels of energy efficiency in the industrial sector because of the rapidly increasing weight of industry in the national GDP. This is increasing the demand for the importation of fossil fuels, the payment for which is currently an important element in the country's balance of payments and foreign exchange requirements. With respect specifically to the garments sub-sector, the Government is particularly concerned to do all that is possible to improve its competitiveness in the world markets, because it accounts for nearly half the value added of the country's industrial sector and exports the great majority of its output. In the country energy context (both in term of energy security and energy costs), the project is fully in line with Government priorities.

With respect to GHG emissions, the Royal Government of Cambodia strongly supported the promulgation of the Kyoto Protocol to achieve the ultimate goals of the UNFCCC and to this effect signed the Protocol in July 2002. Recently, the RGC revised sub-decree number 35 on the establishment of the National Committee for the Management of Climate Change (chaired by the Cambodian Prime Minister). The updated sub-decree, sub-decree number 174, was approved in October, 2009. The early ratification of UNFCCC and the relatively speedy preparation of the NAPA have been followed up by institutional strengthening for Climate Change. The Government has mandated Ministry of Environment (MoE) responsibility to supervise and coordinate the Government's Climate Change efforts. A climate Change Office was established in MoE in 2003 and in 2006 the Government established a National Climate Change Committee (NCCC) with current representation of 19 Ministries and agencies and chaired by the Minister of Environment (Sub-degree on the Established of the National Climate Change Committee, dated April 2006). In a recent NCCC resolution, the Prime Minister was made the honorary Chairman, thereby enhancing the Committee's status while elevating the CCO to become the Climate Change Department (CCD). The CCD serves as Secretariat for the NCCC, which is working both on Climate Change adaptation and mitigation. NCCC has the mandate to establish a Climate Change Technical Team, the purpose of which would be to provide the NCCC with technical expertise. This is yet to be done, but the process is initiated.

The National Committee focuses firstly on mainstreaming climate change into relevant sectors especially agriculture, water resources, forestry, industry and energy and health ensuring the sustainable agricultural development, the sustainable development of water resources and land, development of tourism sector, the people's health care and other sectors. The Government is contributing to the global efforts to achieve the objectives of the UNFCCC through several initiatives such as the preparation of the country's National Communications to the UNFCCC (Initial National communication (INC) submitted in 2002, second NC under preparation, draft report already discussed with stakeholders).

The Manufacturing Industries consume large amounts of fuel like diesel and certain industries such as the garment industries, brick kilns and food and beverage sector also consumes large amounts of fuel wood that contributes to deforestation. The mitigation options proposed in NC-2 include low cost system optimization related energy efficiency options, reducing emissions by about 20% and technology change options that can reduce emissions from 40-50% for some even up to 70% for instance for rice mills using rice husk gasification technology or with combined heat and power generation or co-generation using other sustainable biomass sources. The total savings reported in NC-2 add up to 1,471 Gg CO₂ eq. by 2050 which need to be verified and reassessed. The largest savings by the main four industrial sectors including garments, brick works, rubber factories and rice mills with expected 1,286 Gg CO₂ eq. by 2050. Food processing and Beverage sector was categorized under other sector hence not accounted for GHG reduction calculation in SNC report. Cambodia submitted its Technology Needs Assessment

(under the Climate Change Enabling Activity (CCEAP) project) in 2003, and its Initial National Communication in 2002, within the context of its obligations under the UNFCCC. Both documents emphasise the use of renewable energy as fuel to produce electricity. It is within the context of the Sector Programs on GHG Emission Mitigation that the elaboration and implementation of energy conservation initiatives has become stringent as a fundamental action in reducing GHG emissions.

In 2001, Prime Minister Samdech Hun Sen also recommended and solicited support of the private sector to promote renewable energy technologies to complement the Government's policies and objectives. The Renewable Electricity Action Plan (REAP), first published in 2003 and including a proposed 10 year programme of activities, was aimed at encouraging the generation of electricity from renewable energy sources. One of the sections in REAP covers the potential opportunities for private investment in the electricity sector. REAP envisions an active partnership between the public and private sectors to create a favourable environment for investment opportunities in renewable electricity sources.

Considering all the above, the proposed UNIDO-GEF project is perfectly in line with the strategic as well as specific objectives of Cambodian key policy documents and it is consistent with and supplemental to the recommended plan of actions. The proposed project would provide the additional international expertise, technical best-practices and financing inputs needed to demonstrate, support and effectively leverage national efforts. The project will contribute to the development of the human, institutional and industry capacity, and supporting structure necessary to realize the industrial energy efficiency related goals of the Energy Strategy, Energy Conservation Program and Energy Efficiency Law of the Kingdom of Cambodia.

Project has significant value in terms of demonstrating a strategy and approach that, if successful, could be replicated in other developing countries. Also, there is enormous potential for end-use efficiency improvements in the industrial sector in other developing countries in the region particularly.

C. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH GEF STRATEGIES AND STRATEGIC PROGRAMS:

The project falls under and supports GEF-4 Climate Change Strategic Program 2: Promoting energy efficiency in the industrial sector. The project is fully consistent with Strategic Program 2 "Promoting Energy Efficiency in the Industrial Sector", in the Climate Change Focal Area. As required in this program, the project will demonstrate and upscale the deployment and diffusion of energy-efficient technologies and practices in industrial production and manufacturing processes. The project will cover a wide spectrum of energy systems used by Cambodia's industries: electricity generators, furnaces, kilns, steam systems, combined heat and power systems on the energy generation side; motors, pumps, fans, compressed air, cooling towers, and refrigerating and cooling systems, on the energy consuming side.

In addition by addressing information dissemination, capacity building and policy level intervention for sustainable IEE in Kingdom of Cambodia, the project will directly contribute to upscale and sustain energy efficiency strategy in Cambodia. The project would also make a tangible contribution to stimulate the creation of a Cambodian market for IEE products and services.

D. JUSTIFY THE TYPE OF FINANCING SUPPORT PROVIDED WITH THE GEF RESOURCES.

The context and barriers analysis particularly for the selected sectors as well as stakeholders discussions and consultation workshops conducted during the PIF preparation and PPG implementation have clearly shown that:

- Royal Government of Cambodia (RGOC) has insufficient resources, lack the technical expertise and institutional capacity to autonomously structure and implement programs to promote and support energy efficiency in industry in the short- to medium-term.
- Despite operation of a resource efficiency and cleaner production programme in Cambodia over last 5 years, limited supplier of technologies and partial industrial energy efficiency expertise currently available in Cambodia is not going to be addressed without the transfer of expertise and best practices from countries with more advance IEE markets.

- To convince enterprises that investing in energy efficiency makes very good economic and environmental sense, the availability of a sufficient number of national success stories is a critical component of any effective promotional and educational campaign.

The project is targeted towards actual implementation of techno-economically viable industrial energy efficiency projects as pilot demonstration of IEE benefits and removes existing policy gaps and technical capacity barriers at the institutional and market level by providing technical assistance. GEF resources are needed to facilitate part funding for hardware/technologies for participating pilot projects and also to secure incremental international and national expertise, human resources and services needed to address and remove many of identified barriers to IEE by carrying out the described activities in 5 project components.

In addition project will also address in avoiding the formation of unintended POPs (viz. dioxins and furans) that are formed during open burning and the combustion of fossil fuels in the generators and boilers currently used. The emissions of other atmospheric pollutants (respirable suspended particulate matters (RSPM), nitrogen oxides, carbon monoxide, volatile organic compounds and sulphur dioxide) will also be reduced significantly.

E. OUTLINE THE COORDINATION WITH OTHER RELATED INITIATIVES:

The GEF-UNIDO project will collaborate with the Energy Efficiency Office established with the assistance of the World Bank in Department of Energy Techniques, Ministry of Industry, Mines and Energy (MIME). The Energy Efficiency Office in a modest way having limited resources has been promoting energy efficiency policy and programmes in Cambodia. National Cleaner Production Office-Cambodia an autonomous institution hosted by MIME and supported by UNIDO is promoting RECP concept in the county including IEE application will be major executive partner in the project.

Some of on-going or completed project in IEE/RE & climate change where project will synergise are:

1. Project with NEDO Japan, SIDA, other international and national institution including Prime Minister project to promote solar photovoltaic applications.
2. Project with Canada (CEDA), DEDE Thailand, FONDEM France on biomass gasification.
3. On-going project with UNIDO, JICA Japan on promotion of micro hydro.
4. MIME is collaborating with Korean Firm in electricity generation using landfill gas to reduce GHG emissions and improved environment of landfill site.
5. Cambodian Climate Changed Alliance (CCCA) a multi-donor initiative (funded by SIDA, DANIDA, EC and UNDP) with a comprehensive and innovative approach to address Climate Change and Disaster Risks Reduction in Cambodia. On the one hand, it aims at creating conditions in the form of capacity development and institutional strengthening to preparing for and mitigate Climate Change Risks, and on the other hand, to directly help vulnerable communities by enhancing their resilience to Climate Change and other natural hazards. The overall objective of the CCCA is that *Climate Change activities in Cambodia are nationally owned, led and aligned with Cambodia's development priorities, and are effectively coordinated and implemented.* CCCA has 3 results as the following (1) NCCC capacity to coordinate national policy making, capacity development, and outreach/advocacy efforts, and to monitor the implementation of national climate change strategy is strengthened; (2) A platform is established and in operation providing Cambodia with update knowledge and learning opportunities on Climate Change; and (3) Key ministries, agencies and civil society organizations have access to financial and technical resources to design, implement and monitor climate change adaptation interventions.

Over the last 5 years UNIDO with financial support from State Secretariat of Economic Affairs (SECO) is promoting RECP concept and implementation including information dissemination, capacity building, pilot demonstration and policy level advice to RGOC. UNIDO believes that the NCPO-C, Energy Efficiency office of MIME, Climate Change Department of MOE and the GEF-UNIDO project together can offer a comprehensive response to address almost all the existing barriers that are limiting the implementation

of IEE technologies and systems in Cambodian manufacturing enterprises. The following two areas have been identified for collaboration:

1) Building capacity of national experts and enterprise personnel

Financial experts from development bank like Rural Development Bank and commercial banks potential lender for IEE project like ANZ Royal bank will be invited to present the existing financing schemes and their project financing and eligibility criteria as part of the GEF-UNIDO trainings for experts as well as enterprise engineers and managers.

2) Provision of advisory services to enterprises and financing of IEE projects

The GEF-UNIDO project capacity building component will generate a pipeline of energy system optimization and energy management projects (other than those supported by GEF as pilot project under PC-1). These two categories of projects are both eligible for financing under the existing scheme of Rural Development Bank particularly for rice, rubber and brick sector. In case enterprises may face problems in preparing bankable proposals for financing the developed projects, the GEF-UNIDO project will coordinate with the financial institutions on total project costing and mechanism of timely recovery of loan and also to advise enterprises on financial engineering and workout total costing.

The project was formulated mainly based on co-financing by private sector from their own internal resources as the prevailing culture in Cambodia due to lack of collaterals and weak balance sheet not enough to obtain loan/finance from financial institutions. However, the existing financial scheme for selected sectors will be looked into and successful models for EE-CP financing in neighboring countries will be evaluated and their application in Cambodian context will be studied.

The GEF-UNIDO project will be executed in close co-operation with National Cleaner Production Office – Cambodia (upgraded as autonomous institution from Cambodian Cleaner Production Programme (CCPP) supported by SECO and UNIDO). The NCPO-C supports businesses and other organizations, directly and indirectly (for example by working to create an enabling policy environment) with all aspects of implementation of RECP. Specifically this involves the identification, evaluation and implementation of RECP opportunities at enterprise and/or sector-levels, including ensuring that the necessary skills, knowledge, technologies, regulatory approvals, policy incentives and finance for doing so are available.

NCPO-C is undertaking specific activities, which are expected to expand by synergizing with GEF-UNIDO IEE project, on the basis of the results and experiences of the 5 years of implementation of Cambodia Cleaner Production Programme (CCPP) into the following categories:

- 1. Information dissemination and awareness raising:** developing and disseminating information materials on RECP and related topics for different target groups, and planning and delivering awareness activities, for example through workshops, seminars, etc, at different locations in Cambodia and where possible in partnership with other government, private sector and/or civil society stakeholders.
- 2. Training:** in particular on methods, practices and technologies for RECP implementation, for various target groups, including industry technical staff, business advisors, executives, government representatives, etc.
- 3. Technical assistance and in-plant demonstrations:** providing specific assistance to businesses and/or other organizations for the identification, evaluation and implementation of RECP opportunities that are customized to the products, processes and operations of the respective business.
- 4. Policy advice:** supporting government agencies and possibly business representative and other intermediary organizations with designing and implementing policy instruments and other initiatives that would foster greater uptake of RECP by businesses and other organizations; and
- 5. Technology transfer:** facilitating the identification of Environmentally Sound Technologies (cleaner technologies) and sustainable product developments (where ever feasible), and adapting these into locally-relevant and culturally-appropriate technologies, practices and products that can be easily replicated in sectors of comparable small and medium industries.

The GEF-UNIDO project is discussing collaboration and co-financing with JICA having existing collaboration with implementing partner MIME. The technical assistance to be provided by the GEF-UNIDO project under Project Component 2&3 has been acknowledge and very well aligned with NEDO and JICA projects in Cambodia. However, formal commitment of funds by other donor agencies active in IEE and RE projects in Cambodia to the GEF-UNIDO project need to be discussed and formalized.

In addition, UNIDO and its Cambodian counterparts (Ministry of Industry, Mines and Energy) will continue to discuss with other donor/financing agency like NEDO, JICA Japan, IFC Cambodia, SECO (Green Credit Line) on the possibility of cash co-financing contribution to the GEF-UNIDO project.

F. DISCUSS THE VALUE-ADDED OF GEF INVOLVEMENT IN THE PROJECT DEMONSTRATED THROUGH INCREMENTAL REASONING :

Baseline scenario

Policy, legal and institutional framework

Presently only 26% household in Cambodia have access to electricity which is generated using imported fossil fuel (SNC draft, NEDO 2010). High electricity cost due to poor generation, distribution, low capacity utilisation and system inefficiencies are the major concern for sustainable and clean energy solution in Cambodia. The policy and legal framework for energy generation, distribution and energy efficiency has been under continuous development and improvement from 1994 onward when it was promulgated as policy by RGOC on energy conservation and efficient use of renewable energy sources.

In view of energy deficit and high costs there has been some progress at generation level however, as of end of 2009 very little has been achieved on application of energy management systems and real implementation of EE/low carbon technologies. This has been mainly due to the lack of institutional capacity and resources to support policies implementation combined with non-availability of Government supported mechanism and incentives to invest in energy efficient and renewable technologies.

RGOC has a National Policy on Rural Electrification by renewable energy with a goal to provide reliable and cost effective energy by promoting renewable energy usage with least negative impact on environment. According to a study done in 2004 by MIME with Japan's Institute for Global Environmental strategies (IGES) and the Cambodian Research Centre for Development (CRCD) (*De Lopez, T.T. 2004, Assessing Cambodia's potential for Bio-Energy, CRDC, Phnom Penh*), biomass – excluding biomass available from natural forest and waste timber from wood processing sector as well as rubber tree harvested at the end of their productive life. It has an estimated potential generation of nearly 19,000 GWhr per year from waste biomass alone.

However, there has been slow progress in technology development to use alternative local sources of energy is acting as a brake on the country's future economic growth, and more specifically its future industrial growth as well as the growth in its exports in what are becoming increasingly competitive regional and global markets. Therefore, there is an urgent need for the country to identify and develop the options available to it to satisfy the country's energy requirements using locally available resources. However, this must be done while at the same time pursuing environmental and social sustainability.

Future context: Cambodian Power Strategy 1999-2016 has following goals;

1. To provide reliable and affordable energy throughout country to people and to facilitate investment including Foreign Direct Investment (FDI) in Cambodia.
2. To encourage environmentally and socially acceptable energy resources required for all sector of Cambodian economy.
3. To encourage energy efficiency with low carbon alternative technologies offers the most comprehensive solution for Cambodia to achieve these twin goals of energy security and sustainable energy solutions.

4. By year 2020 all villages in Kingdom of Cambodia will have access to electricity and by 2030 at least 70% will have access to grid quality electricity. RGOC has also set up the Rural Electrification Fund (REF) and formulated Renewable Energy Electricity Plan (REAP).

The Government is also well aware of its resource and capability constraints and for this reason is seeking international support from both multilateral and bilateral donors.

Industrial Energy Efficiency Market

Energy has moved up to the top of the agenda for manufacturing sector due to non-availability of reliable energy in absence of national grid, increase of conventional energy prices and more importantly question mark on availability of current cheap fuel (waste rubber wood) over the last years. However, the low awareness and understanding of their energy performance level, of what can be done to improve efficiency and how it can be done, have prevented most enterprises in implementation of cost reduction in actual cost-effective energy savings. Most of the energy efficiency/GHG emission reduction improvements have been mainly achieved in some sectors through capital intensive options like replacement of boiler using fossil fuel (during the period when oil prices touched peak at 150US\$/barrel) with waste wood or other biomass. No structured awareness and education programs to inform and marketing energy efficiency to industrial enterprises top management is in place and will be in place in the short-term. The awareness raising and capacity building seminars and workshops to be delivered between enterprises by the NCPO-C represent just a good start. Without a comprehensive and sustainable approach, the existing major technical and economic potential for energy efficiency improvement in industry is likely to remain mainly untapped in the short-term.

This is also primary consequence of the very limited industrial energy efficiency expertise (experts and consultancies) currently available on the Cambodian market and a focus between industrial equipment vendors and suppliers to sell just "hardware" rather than a more comprehensive energy service. During the PPG phase in addition to collect and compile vendors profile from Cambodia and neighboring countries intensive discussions/consultation were done with major equipment vendors and suppliers. Technology/hardware supplier interviewed by the project team offer limited advice to clients on how improving energy use and efficiency related to their technologies and energy benchmarks were totally missing. None of the company visited during PPG were informed on energy performance of equipment they have procured. It is worth noting that the lack of energy service providers in the Cambodian market has been identified by the RGOC as a major barrier to improved energy efficiency of Cambodian Industries. The proposed Energy Efficiency Norms and mandatory annual energy audit certified by accredited energy auditor is supposed to pave the way to improved energy efficiency market and also the creation of energy service companies (ESCOs).

Financing

Despite of significant potential of savings by applying low cost/no cost energy management systems, still one of the most important requirements to implement IEE is to upgrade their production technology/ low carbon technology which requires substantial finance. Credit worthiness of most of SME's due to poor balance sheet coupled with high lending interest rates is recognized as the major bottleneck. Lack of financial availability due to poor developed financial sector have forced most of the enterprises to invest limited finance from their own resources and preference is given on expansion of production and investment for projects like environmental management and energy efficiency gets back seat. Therefore, a mechanism for financial support both as (subsidized) loan and/or (partial) subsidy or grant may be required. In consultation with relevant FI's some sort of credit line will be explored in order to make the Renewable energy technology techno-economically viable. This issue will be discussed with potential Financial Institutions IFC, ADB and the Green credit Line (GCL) of SECO after successful demonstration of the technology. Resource available from ongoing GEF-UNIDO funded project implemented by NCPO-C on energy efficiency and renewable energy will also be made available as per project document and selected sector.

Based on interviews with companies as well as market studies the shortage of funds for the development and preparation of IEE projects have surfaced as probably the most critical financing barrier to the implementation of IEE projects, because once shown with detailed cost-benefit analysis some enterprises would be prepared or able to invest. While it can not be argued that most Cambodian industries like industries in other LDC's face serious financial constraints, it can and has to be argued that financing is the main barrier to improved energy efficiency. The experience of on-going and past projects in Cleaner production-energy efficiency (CP-EE) in Asian region (UNEP-GERIAP), Cleaner Industrial production (UNIDO) has demonstrated that significant benefits can be achieved by harvesting low hanging fruits like process optimization, equipment modification and training of operators. Industry visits and preliminary energy audits carried out during the PPG phase and demo units of CCPP in a number of enterprises, have shown significant opportunities for energy savings at no or low costs (with payback period of less than 1 year and therefore fundable from the operational rather than the capital budget). The energy audits have also revealed that new technologies/equipment always do not necessarily mean improved efficiency. Efficiency of Major energy consuming equipments like furnace, boilers, kilns, dryers, chillers, air compressors can be improved significantly with simple good operating practice measures.

Financing can become the main barrier to increased energy efficiency when enterprises need to draw on external advisory services for project identification and development and they do not have the resources, or when all no and low costs improvement measures have been implemented.

Baseline trajectory

In the absence of the proposed GEF-UNIDO project very little steps, if any, towards the implementation of policies and programs to monitor, promote and support industrial energy efficiency are likely to be made in the short-term. The vast majority of manufacturing enterprises will continue to suffer from lack of energy efficiency information, understanding and technical capacity, missing sizeable opportunities for energy savings and costs reduction through better energy management practices and the implementation of no and low cost operational improvement measures.

No significant changes would happen in the market with respect to the provision of energy management and system optimization advisory services. It is very unlikely that the few equipment vendors that are now offering very limited energy efficiency advice related to their equipment/technology will broaden the scope of their services to encompass the entire system or factory, unless they clearly see its market potential and they can locally procure the required expertise.

Energy service companies (ESCOs) are non-existent in Cambodia so far and are likely to become operational only in the medium term, considering that IEE product is in demand and policy *on Energy Efficiency* is enforced and Energy Audit of energy intensive sector is made mandatory. Considering that and past experience of other countries like India and OECD countries, ESCOs generally prefer economically attractive and safe investments like commercial sector initially and only at a later stage might engage with industry. The establishment of baseline data and saving potential is critical for ESCOs and industry to come to an agreement before making investment. Disagreement on actual savings (Client and ESCOs) and baseline data for comparison has reported to be the main bottleneck in promotion of ESCOs in developing countries. GEF project will promote establishment of ESCOs as business companies by way of standardizing the format, methodology and performance evaluation mechanism of EE projects.

In short-term, the baseline scenario would not be able to bring about significant mitigation of most infrastructural barriers (like lack of National Grid forcing industry to generate own energy with lower efficiency) that are hampering energy efficiency progression in Cambodian industry and the creation of a modern industrial energy efficiency service market. Energy efficiency projects and investments will increase compared to the past due to energy cost and several on-going efforts like technical and financial assistance by Donors and National Government (in terms of tax incentives). However, there is a perceived fear that effective implementation of IEE or Internalization of IEE in business may be

restricted to relatively small number of companies. The underlying critical problem of the lack of adequate institutional capacity and supporting policy programs for IEE and good technical expertise and skills on the market would remain unresolved. Most enterprises would continue to lack structured approaches to and capacity for energy management and energy efficiency, jeopardizing the sustainability of the efficiency gains that some of them will achieve through EE investments made as well as determining the loss of those major potential energy savings and GHG emissions that could be reaped by most SMEs through no and low cost energy efficiency measures.

GEF Project Alternative scenario

The proposed UNIDO-GEF project would provide the incremental policy, technical and financial inputs required to support and effectively leverage national efforts in setting up and maintaining an infrastructure capable to support IEE policy development and implementation, effect sustainable energy efficiency in industry, stimulate the creation of a market for IEE services and products and obtain relevant GHG emission reductions. In so doing the project would greatly multiply the impact and global environmental returns of resources allocated to IEE and RE by the Cambodian Government as well as by other international initiatives and programs.

At the policy and institutional levels the project would add the technical assistance needed to strengthen local expertise, knowledge and capacity in developing, implementing and maintaining effective IEE policies and programs; to streamline and ensure timely development of planned and new policy and normative measures (i.e. IEE monitoring, tracking and benchmarking program, best practices information and dissemination program, certification/accreditation of industrial energy Auditors, energy management system implementation guidelines, etc.).

At the IEE market level the project would target all players.

To industry decision-makers, project will organize regular sector specific IEE Clinics (short duration 90 minutes each) for CEO's /owner of company to share the need, benefits and mechanism of implementation in their enterprises. For managers and engineers (middle management), the project would provide the knowledge to fully understand the economic and environmental benefits of energy efficiency and management in industry; the technical capacity and tools to go beyond simple equipment/component replacement and capture the real efficiency gains that stem from system optimization and integration of energy efficiency in industry corporate practices. Industry wide and increased awareness of IEE potential and benefits delivered by the project will boost demand for IEE services and products generating the pull for market creation.

Creating a cadre of national energy management and system optimization experts the project will remove a critical existing barrier, it will offer a response to the newly created demand for IEE services (from the above mentioned action) and will most likely kick-off the establishment of start-ups in the field of IEE services and products provision that may well develop then in relevant institutions, consulting/engineering firms and energy service companies (ESCOs).

At the IEE project implementation level the project would provide IEE project-specific technical assistance and financing support through Component 1 to facilitate the implementation of selected pilot IEE projects with high replication and/or energy savings potential in the selected energy intensive sectors in Cambodian manufacturing industry. The project would also secure the implementation of 40 IEE (including replacement of fossil fuel with carbon neutral fuel) projects including implementation in quick scan participating units as result of the expert training program to be executed under Component 2 &3. The implementation of these IEE projects would contribute in compiling a compendium on IEE best practices in Cambodia and demonstrated success stories to be then disseminated and up-scaled through the other GEF UNIDO project activities (component-4). This is expected to increase the interest of Cambodian industry in implementation of IEE strategies and also will reduce the associated perceived investment risk.

Considering the articulated structure of the GEF-UNIDO project and its high complementary, especially PC 1 to4, with other ongoing and planned IEE related technical assistance programs including UNIDO-UNEP supported RECP programme, project implementation would provide and receive critical

contributions for multiplying the overall impact of Climate Change related technical assistance to Cambodia.

G. INDICATE RISKS, INCLUDING CLIMATE CHANGE RISKS, THAT MIGHT PREVENT THE PROJECT OBJECTIVE(S) FROM BEING ACHIEVED AND OUTLINE RISK MANAGEMENT MEASURES:

Six categories of risks related to the project and its objectives being achieved are considered: i) Political; ii) institutional; iii) technical; iv) market; v) financial; vi) implementation; vii) sustainability.

Political risk : Low government commitment to Industrial energy efficiency and the GEF-UNIDO project

Potential impact: High

Probability: Very low

The project objectives and activities are perfectly in line with national energy policies objectives and actions plans for improving industrial energy efficiency (IEE) and creating a market for IEE products and services. It has to be pointed out that the project is also perfectly in line with the political will, the RGOC revised sub-decree number 35 on the establishment of the National Committee for the Management of Climate Change (chaired by the Cambodian Prime Minister). The updated sub-decree, sub-decree number 174, was approved in October, 2009.

Institutional risk: Delay in strengthening/upgrading Energy Efficiency Office

Potential impact: Low

Probability: Medium

The Energy Efficiency Office (EEO) was established in 1997 in MIME with support from World Bank project. Due to lack of resources and trained personnel's, the office is currently in low profile and need to be strengthened to fulfill the activities in project component 4&5. However, under the potential financial support from Climate Change Trust Fund, Cambodian Climate Changed Alliance (CCCA) a multi-donor initiative (funded by SIDA, DANIDA, EC and UNDP) with a comprehensive and innovative approach to address Climate Change and Disaster Risks Reduction in Cambodia technical support from on-going projects EEO is expected to be strengthened in near future.

Management: In close coordination with executing partner (NCPO-C), EEO will be provided support for professional staff and physical infrastructure. Regular communication and steering committee meetings representing policy makers and delegation of responsibility will ensure continuous active involvement of key policy/institutional counterparts. A dedicated unit will be formed by the GEF-UNIDO project and the MIME to receive training and work to the implementation of Project Component 5 activities. Once the EEO becomes operational, the project staff of the GEF UNIDO component-3 &5 will be integrated in the EEO.

Technical risk

Potential impact: High

Probability: Very Low

There are no noteworthy technical risks associated with the implementation of IEE project as it is well proven in many countries globally and to a limited extent in Cambodia by CCPP. No significant risk is envisaged with respect to policy measures and capacity building activities proposed by the UNIDO GEF project. UNIDO has already successfully completed project of this nature in Cambodia and many other countries. However, policy level intervention to Promote and develop IEE need to be addressed carefully.

Management: Execution of activities to be implemented under Project Component -1 will be carried out with the support of international experts/companies with demonstrated and successful past experience. With respect to the capacity building and enabling activities special attention will be given to further

defining the existing baseline in order to develop effective tailored and well-targeted training programs and curricula.

Market risk-1: Current market demand and supply of IEE services are poor and availability of hardware and software locally is poor and depends mostly on neighbouring countries.

Potential impact: High

Probability: Very Low

The project builds on existing market relationship between users and suppliers of technology and know-how by expanding these markets. Industrial customers trained through the project will request more frequently and place a higher value on IEE services from their vendors, consultants and suppliers. The project preparation phase has addressed this through intensive contact with vendors in minimizing/eliminating this risk.

Management: A tailored communication/ information strategy combined with an active dialogue and involvement of industrial associations during the whole project preparation was done. National consultation workshops ensured the desired industry/industry specific association response to the project.

Market risk-2: Industry Decision makers (top management) do not participate actively in the project

Potential impact: High

Probability: Low

The manufacturing sector in Cambodia is struggling to enhance its competitiveness in national as well as international markets. Energy intensity, high energy cost and access to finance have become areas of industry's primary attention. While the prospect of benefiting from significant energy savings and consequent production costs reduction is expected to drive and fuel industry participation in the project, there might still be the risk of not attracting the critical mass of enterprises needed for the project to make a sizeable impact. However, the level of interest and collaboration shown by enterprises during the PPG phase leads to legitimately expect strong participation.

Management: During the project preparation phase about 250 enterprises have been reached by the project through bilateral meetings, energy audits, questionnaires and a national seminar. The general response was of strong support and interest to participate in the project. An innovative mechanism like demand creation by conducting regular IEE clinics for top management will ensure the desired participation in the project.

Financial risk: Financial and credit constraints prevent enterprises from investing in IEE.

Potential impact: Medium.

Probability: Medium

Access to finance was reported to be the 2nd biggest constraint in industrial development in Cambodia by World Bank. For GEF –IEE project this could be a constraint as well, however, such constraints are expected to have low impact on the project's outputs, their impact on project outcomes i.e. indirect energy savings records/reports, might be greater.

Management: Selection of suitable partner enterprises for component-1 will offer an instrument to minimize the impact on project outputs. As for project outcomes, since significant gains in energy efficiency can be achieved at no or very limited costs, financial risk can be mitigated by ensuring that least-capital cost is not the sole appraisal criterion in enterprises' energy-related investment decisions. Market and industry experience in other developing countries shows that for several types of energy consuming equipment the premium price paid for higher energy efficiency is paid back in less than 1 year, well within the timeframe of commercial lending.

Implementation risk

Potential impact: Medium.

Probability: Very low.

UNIDO has long-standing direct experience in the development and implementation of IEE projects and it has a strong knowledge of the key variables that determine the success and the failure of project implementation. On the other hand initiatives like CCCA is creating conditions in the form of capacity development and institutional strengthening to preparing for and mitigate Climate Change Risks, and on the other hand, to directly help vulnerable communities by enhancing their resilience to Climate Change and other natural hazards.

Management: UNIDO will mitigate this risk through detailed development of activities plans in close cooperation with on going activities like CCCA, in-country project partners, stakeholders and developers. Agreed and transparent modus operandi will be defined before the start of the project implementation.

Sustainability risk: Failure to achieve project outcomes and objective after successful delivery of outputs

Potential impact: High

Probability: Low.

By making industries, suppliers and EE experts fully aware of the economic potential for EE improvements in manufacturing sector, and equipping them with capacity and tools to realize and reap the benefits of such potential, the project would generate a self-reinforcing market pull for EE in industry. In addition, the policy-making outputs of the project would create the conditions to produce and sustain a policy-driven push for IEE. Such balanced and flexible policy-push and market-pull being created by and through the delivery of project outputs is expected to ensure the attainment of the project outcomes and their sustainability

Management: Establishing a monitoring, tracking and benchmarking program, a national best practice dissemination program and a National Energy Auditor Certification program, the project would create the conditions to produce and sustain a policy and normative driven push for industrial energy efficiency. .

H. EXPLAIN HOW COST-EFFECTIVENESS IS REFLECTED IN THE PROJECT DESIGN:

The project takes a comprehensive approach to address many of the barriers that are preventing Cambodian manufacturing sector to achieve its full economic potential for energy efficiency improvements, in particular those related to awareness and capacity of industry as well as IEE relevant institutions and policy instruments. The strategy of the project to achieve high cost-effectiveness is geared on four principles: 1) build on and maximize leverage of national public and private resources; 2) training-the-trainers approach for industry-wide awareness raising of and capacity building on industrial energy efficiency, system optimization and energy management; 3) select pilot IEE projects and quick scan projects primarily on the basis of their short- and medium-term energy and GHG savings potential; 4) searching and maximizing synergies with ongoing and future programs and credit lines for investment in energy efficiency projects in industry.

Given its focus on addressing policy and technical capacity barriers, the GEF UNIDO project will generate the biggest share of GHG emission savings after the project implementation period, when the capacity built and the programs established will deploy their full impact at manufacturing sector-wide level on how industries manage energy and operate energy systems.

The project is expected to generate cumulative DIRECT GHG emission savings in the range of 195,000 to 260,000 tons CO₂ eq. and cumulative INDIRECT GHG emissions savings of 194,600 to 250,500 tons CO₂ eq. The GEF resources cost- efficiency for the DIRECT GHG emission savings would range from 5.2 to 7.0 USD/ton of CO₂ eq.; including the INDIRECT GHG emission savings cost-efficiency would significantly improve, going down to 2.7 – 3.5 USD/ton CO₂ eq.

PART III: INSTITUTIONAL COORDINATION AND SUPPORT

A. INSTITUTIONAL ARRANGEMENT:

UNIDO is the only GEF Implementing Agency involved in this project and no specific arrangement with other GEF Agencies is required.

B. PROJECT IMPLEMENTATION ARRANGEMENT:

As GEF Implementing Agency, UNIDO holds the ultimate responsibility for the implementation of the project, the delivery of the planned outputs and the achievement of the expected outcomes. The project will be directly executed by UNIDO in collaboration with the Climate Change Department (CCD) of the Ministry of Environment (MOE) Ministry of Industry Mines & Energy (MIME) and National Cleaner Production Office-Cambodia (NCPO-C) an autonomous institution hosted by MIME and supported by UNIDO RECP programme to promote resource efficiency and Cleaner production in Cambodia.

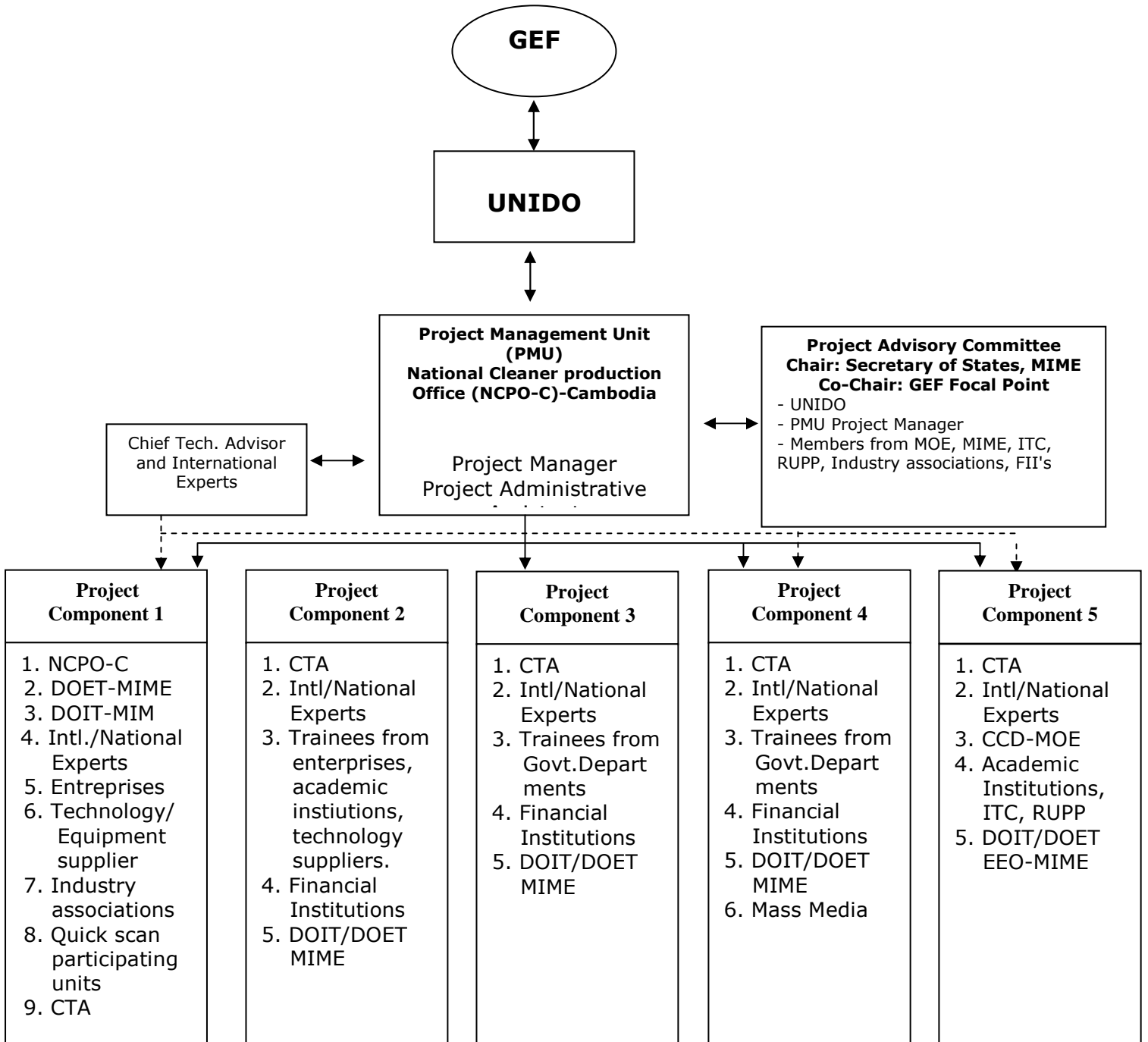
UNIDO will be responsible for the general management and monitoring of the project, and reporting on the project performance to the GEF. UNIDO will be in charge of procuring the international expertise needed to deliver the outputs planned under the three project components. It will manage, supervise and monitor the work of the international teams and ensure that deliverables are technically sound and consistent with the requirements of the project.

As agreed with the Royal Government of Cambodia and in line with the current legislation, the Energy Efficiency Office of the MIME will have overall coordination responsibility while the NCPO-C will be responsible for the substantive work to be performed under all the project components.

A Project Management Unit (PMU) will be established within the National Cleaner Production Office-Cambodia (NCPO-C) hosted by MIME. The PMU will consist of the National Project Manager (NPM), Deputy Project Manager, Interpreter/Translator and the Project Administrative Assistant (PAA). The PMU will be responsible for the day-to-day management, monitoring and evaluation of project activities as per agreed project work plan. In close collaboration with MIME, the Agency for Energy Efficiency, the PMU will coordinate all project activities being carried out by project national experts and partners. It will also be in charge of the organization of the various seminars and trainings to be carried out under project component 2 &3. The PMU will be funded by the GEF budget. During the whole implementation period of the project UNIDO will provide the PMU with the necessary management and monitoring support.

A Project Advisory Committee (PAC) will be established for periodically reviewing project implementation progress, facilitate co-ordination between project partners, provide transparency and guidance, and ensuring ownership, support and sustainability of the project results. The PAC will have a balanced representation from key ministries, public institutions, private sector, NGOs, UNIDO and other international organizations partnering in the project or having relevant ongoing programs, and it will be chaired by Secretary of States of MIME and co-chaired by the GEF Political Focal Point of Cambodia. The final composition of the PAC will be defined during the project implementation start-up phase. The PAC is envisaged to meet twice a year.

At the beginning of project implementation a detailed working plan for the entire duration of the project will be developed by UNIDO in collaboration with the PMU, the Ministry of Industry Mines & Energy and the international teams of experts. The working plan will clearly define roles and responsibilities for the execution of project activities, including monitoring and evaluation; it will set milestones for deliverables and outputs. The working plan will be used as management and monitoring tool by UNIDO and the PMU and reviewed and updated as appropriate on a biannual basis. Fig.-3 shows a diagram of the project implementation arrangement.



PART IV: EXPLAIN THE ALIGNMENT OF PROJECT DESIGN WITH THE ORIGINAL PIF:

The final design of the project is in line with the approved PIF and comments and suggestions from GEF council members and STAP. Further context analysis, review of existing barriers, meetings/consultation with various stakeholder groups and discussions with Energy Efficiency Office carried out during the PPG phase, have confirmed the strong relevance of the original UNIDO-GEF project and its additionality to ongoing and planned national and international programs to promote and support increased energy efficiency in Cambodian industry. Project Component 1 has shown the need and importance of pilot demonstration of IEE benefits and 2 -5 have shown to be particularly needed and synergetic to other initiatives that have been and are focusing primarily on making financing available or working with individual enterprises, but that have left in the background institutional strengthening and building capacity and expertise in the market for the provision of state-of-the-art and quality industrial energy efficiency services. Need for up-scaling the project in other units in selected sector and other sector of economy was also confirmed and stressed by stakeholders. As verified during the PPG and highlighted by several international programs on the ground, qualified and experienced national experts/ consultants in energy management and energy efficiency in industry are lacking and there is no existing mechanism of accreditation of energy auditors/energy managers in the country.

Considering the above, **Project Component 5 (PC5)** expected outputs have been slightly modified also to better focus available resources.

Mechanisms for mainstreaming IEE concepts and policy instruments have been created at suitable administrative levels in relevant RGOC policies and regulations has been added as output-1 in PC5 as suggested by various stakeholders during PPG phase. Though this output was part of output-1 in PIF but it has been recommended to take it as separate output in project document.

National Energy Auditor Accreditation (NEAA) programme is established has been added as an output in component-5. This component will be implemented in association with MIME, EEO and academic institution to develop course curricula, training material, model papers for energy efficiency in process and equipments. For certification of auditors examination papers will be formulated and conduction of Energy Efficiency Certification exam by competent agency viz. ITC/RUPP. Considering this additional output in PC-5 the budget allocation from component 2&4 (25,000 US\$ from GEF contribution and 25,000US\$ from co-financing) has been shifted to Component-5. Whether the NEEA certification program should be made mandatory or not is still an open question that needs further analysis and discussion with stakeholders.

Development of rules allowing private generators of electricity to feed their excess generation into the local grid (Outcome-2) has been taken out from the component-5. During consultation phase this was found to be irrelevant for the industrial energy efficiency project and is comprehensively covered under national power generation and distribution policy of RGOC.

With regard to **Project Component 1 (PC1)**, Food- processing and beverage sector which is the biggest in terms of number of units and significant both in terms of energy intensity and cause of deforestation using large amount of wood is included in the pilot project conduction as well as quick scan units. Therefore, project at the end of PPG phase has selected 13 pilot EE Demonstration units from 5 manufacturing sectors. However, the co-financing (during project document submission) from private sector and GEF contribution remain almost unchanged as only 1 unit from rubber refining committed co-financing against envisaged 3 in PIF which are replaced by 2 food processing and beverage companies.

As per comments/recommendation of STAP, possible areas of renewable energy application in IEE project has been explored and preliminary energy audits conducted in selected sector has indicated scope of application of renewable energy in most of the sectors and accordingly technology scoping and vendor profile for renewable energy application is being done during PPG phase.

The output -4 of PC-1, personnel from participating companies have been trained in industrial energy efficiency so that they are capable to undertake implementation of new IEE project will be covered PC-4 Up-scaling of IEE in Cambodia.

Discussion about co-financing for the UNIDO-GEF Project Components 2 and 3 partly by NCPO-C from SECO funded phase-2 project is not yet confirmed and NCPO-C is awaiting final clearance from Swiss Government and UNIDO-UNEP RECP programme. Nevertheless, in the view of the other ongoing projects and subcontracts of NCPO-C it will be able to meet the committed co-financing from its own generated income.

Project Component 3 Practical Guide for the Implementation of Energy Management in Industry in accordance with ISO 50001 international standards is developed has been added as additional output to facilitate IEE up-scaling efforts in Cambodian manufacturing sector. However, the budget allocation remains unchanged and it is estimated that budget allocation for component-3 will be able to absorb additional output alternatively additional resources will be explored from other resources.

	Original PIF Expected Outputs	Final Project Design Expected Outputs	Observation
PC1	<p>1. Energy efficiency projects for cumulative 45,000 TOEs** and related potential economic savings are identified by 40 enterprises participating in the Quick Scan process and appraised by project experts.</p> <p>2. At least 12 pilot IEE projects for cumulative 15,000 TOEs** of energy savings over the investments duration are implemented by enterprises, from 4 key industrial sectors, partnering in the project.</p> <p>3. Results of the pilot projects are compiled in a compendium and disseminated</p>	<p>1. Energy efficiency projects for cumulative 45,000 TOEs** and related potential economic savings are identified by 40 enterprises participating in the Quick Scan process and appraised by project experts.</p> <p>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.</p> <p>3. Results of the pilot projects both in economic and environment context are compiled in a compendium for effective dissemination</p>	<p>As the pilot project will be done for both thermal & electrical energy, it will be appropriate to use single unit to compare the results and it was agreed that Ton of Oil equivalent (TOEs) will be used which will also make GHG calculations easy.</p> <p>2 units from food processing and beverage sector has been selected for IEE pilot project.</p> <p>Confirmation of co-financing at least 1 more unit from rubber refining is awaited, however, due to 1 additional sector the project output will not change.</p>
PC2	<p>1. A cadre of at least 30 national experts from relevant support institutions (the Cleaner Production Centre, technical universities / university departments, industry associations, the Ministry of Industry, Mines and Energy) 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.</p> <p>2. These professionals are formed by the CPC into a network of service providers aimed to assist companies in implementing industrial energy efficiency.</p> <p>3. Local suppliers of relevant technologies (kilns, boilers, etc.) are also trained in IEE. Potential local suppliers are promoted, to ensure more cost-effective technology and more reliable after-sales service.</p> <p>4. Web-based guidance tool/manual on IEE developed</p>	<p>1. A cadre of at least 40 national experts from relevant support institutions (NCPO academic institutions, industry associations, Ministry of Industry, Mines 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.</p> <p>2. These professionals are registered and empanelled as resource person in a network of service providers (RECP) aimed to assist companies in implementing industrial energy efficiency.</p> <p>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> <p>4. Web-based guidance tool/manual on IEE developed</p>	<p>Expected output # 1 & 2 in PIF. Slightly rephrased text in project document.</p> <p>Increase in number of experts was based on PPG consultation and interest expressed by important stakeholders.</p> <p>UNIDO-UNEP joint programme on Resource Efficient and Cleaner Production (RECP) is establishing a global network of institutions, whereas national institutions like CP centre will enroll national experts in their network.</p>

PC3	<p>1. Capacity building of relevant Govt. departments to promote industrial energy efficiency</p> <p>2. Companies are trained in preparation of bankable IEE project proposals</p> <p>3. Capacity building of financial institutions to assess investment proposals in IEE</p>	<p>1. Capacity building of relevant Govt. departments to promote industrial energy efficiency</p> <p>2. Companies are trained in preparation of bankable IEE project proposals</p> <p>3. Capacity building of financial institutions to assess investment proposals in IEE</p> <p>4. Practical Guide for the Implementation of Energy Management in Industry in compliance ISO 50001 international standards is developed.</p>	<p>Minimum number of pilot projects reduced from 8 to 6 to reflect letter of commitments secured and negotiated.</p> <p>Increased energy savings based on findings of PPG activities.</p>
PC4	<p>1. The results of the pilot projects and Quick Scans are widely disseminated in the most appropriate manner.</p> <p>2. Industry decision-makers understand their potential for energy efficiency gains and undertake energy efficiency activities.</p> <p>3. Other stakeholders understand the role they can play to promote industrial energy efficiency</p>	<p>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 program and results achieved by participating pilot units of the project.</p> <p>2. Industry decision-makers understand their potential for energy efficiency gains and undertake energy efficiency activities.</p> <p>3. Other stakeholders including technology/equipment suppliers will understand their role to promote industrial energy efficiency</p>	<p>Based on PC-1 results from 40 quick scan units will be compiled to calculate IEE and GHG emissions specifically to use as a tool to up-scale the IEE project and to send the message that even with limited support, IEE can be implemented effectively.</p> <p>output#3 slightly rephrased</p>
PC5	<p>1. Procedures for tracking and benchmarking energy consumption in industry are developed and established.</p>	<p>1.Mechanisms for mainstreaming IEE concepts and policy instruments have been created at suitable administrative levels in relevant RGOC policies and regulations</p> <p>2. Procedures for tracking and benchmarking energy consumption in industry are developed and established</p> <p>3. National Energy Auditor Accreditation (NEAA) programme is established.</p>	<p>Output #2 in PIF was reported to be irrelevant for the IEE project therefore taken out of the project For effective uptake and reporting of IEE it was recommended to have accredited Energy auditors within the country</p>

PART V: AGENCY (IES) CERTIFICATION

This request has been prepared in accordance with GEF policies and procedures and meets the GEF criteria for CEO Endorsement.

Agency Coordinator, Agency name	Signature	Date (Month, day, year)	Project Contact Person	Telephone	Email Address
<i>R</i> Dmitri Piskounov Managing Director Programme Development and Technical Cooperation Division UNIDO		11/12/10	Heinz Leuenberger  Heinz Leuenberger 30/7/2010	0043 1 260 26 5611	HLeuenberger@unido.org

ANNEX A: PROJECT RESULTS FRAMEWORK

Project Strategy		Objectively verifiable indicators				
		Indicator (quantified and time-bound)	Baseline	Target	Source of verification	Risks and Assumptions
Goal	To reduce specific energy intensity and related emissions of greenhouse gases generated by Cambodian manufacturing sector	<ol style="list-style-type: none"> Incremental CO₂eq emission reduction (tons of CO₂eq) Specific energy consumption (energy use per ton/unit of output) for selected manufacturing sectors 	<ol style="list-style-type: none"> Specific energy consumption (SEC) for 5 manufacturing sub-sectors in the focus of the GEF project SEC referred to output quantities currently not available for many sub-sector. To be defined in Year 1 of project implement. under PC-1 	<p>Cumulative reduction of SEC by more than 20% over the period 2012-2023</p> <p>Cumulative reduction of GHG from pilot projects more than 50% over the project period</p>	<ol style="list-style-type: none"> Annual reports of NCPO-C and EEO End of project Survey/evaluation report Final project evaluation report 	<ol style="list-style-type: none"> Cambodian Governments remain committed in the medium and long-term to improve national energy security and effectively enforce the environmental laws. Energy costs reduction becomes a first priority for industry.
Objective of the project	To Improve Energy Efficiency of Cambodian 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.	<ol style="list-style-type: none"> Incremental direct CO₂eq emission reductions (tons of CO₂eq) Incremental indirect CO₂eq emission reductions (tons of CO₂eq) Specific energy consumption/energy intensity of selected sectors. 	<ol style="list-style-type: none"> No direct CO₂eq emission reductions No indirect CO₂eq emission reductions No SEC and related GHG generation for selected sector exists. 	<ol style="list-style-type: none"> Direct emission reductions: 195,000-260,000 tons CO₂eq over period 2012-2022 Indirect emission reductions: 194,600-250,500 tons CO₂eq over period 2012-2023 SEC average annual reduction of 5% over period 2012-2022 	<ol style="list-style-type: none"> Monitoring, tracking and benchmarking program established by the project with MIME and NCPO-C End of project Survey Final evaluation 	<ol style="list-style-type: none"> Sustained and solid Government support to the project. Industry drive for energy costs reduction and enhanced energy efficiency grows progressively stronger and widens. Various international IEE technical cooperation programs achieve good synergy and leverage of respective complementarities

Outcome 1	Demonstrable energy savings in participating companies through IEE pilot projects	<ol style="list-style-type: none"> 1. Number of IEE pilot and quick scan projects are selected with co-financing commitments 2. Anticipated savings in SEC and GHG emissions are estimated 3. Case study compiled document is published 	<ol style="list-style-type: none"> 1. No/ very few investment related IEE projects are in place (TA related projects are not considered) 2. No data/information on specific energy consumption, energy benchmarking and energy saving potential is available. 	<ol style="list-style-type: none"> 1. To develop and standardise energy audit reporting format, worksheets and tools to be used by IEE projects 2. Energy performance benchmark and saving potential of SEC and GHG emissions reduction. 3. compendium of case studies from Pilot projects 	<ol style="list-style-type: none"> 1. Energy Efficiency office and NCPO-C Annual Report 2. End of project Survey 3. Final evaluation 	<ol style="list-style-type: none"> 1. Sustained Government support to agreed project activities. A2. Participating companies can arrange to get requisite finance for IEE implementation.
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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 Scan process and appraised by project experts.	<ol style="list-style-type: none"> 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 techno-economical EE improvements but not the resources (human and/or financial) to develop and implement such projects.	<ol style="list-style-type: none"> 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 	<ol style="list-style-type: none"> 1. Environmental, financial and/or sustainability reports of Companies partnering in the IEE projects. 2. Energy Efficiency office (MIME) & NCPO-C annual report 3. Project report 4. IndependentFinal evaluation of project 	<ol style="list-style-type: none"> 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)
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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.	<ol style="list-style-type: none"> 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 techno-economical EE improvements but not the resources (human and/or financial) to develop and implement such projects.	<ol style="list-style-type: none"> 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 	<ol style="list-style-type: none"> 1. Environmental, financial reports of Companies partnering in the IEE projects. 2. Energy Efficiency office (MIME) & NCPO-C 3. Project progress report 4. Final project evaluation report 	<ol style="list-style-type: none"> 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 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.	<ol style="list-style-type: none"> 1. Energy Efficiency office (MIME) & NCPO-C 2. Project progress report 3. Final project evaluation report 	<ol style="list-style-type: none"> 1. Participating Industries particularly quick scan participating unit are ready to publish and share the results with others.
Outcome 2	Supply of National service providers in IEE are available (to match demand in component-4)	<ol style="list-style-type: none"> 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 hardware/technology and after sale services in the country 4. Web page on the project populated with relevant information and manual is in place. 	<ol style="list-style-type: none"> 1. No IEE /EM specific national experts in place and most of projects are implemented with assistance of foreign 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 	<ol style="list-style-type: none"> 1. 40 National Energy efficiency experts capable o delivering quality services are available 2. National IEE network is established. 3. Local supplier of technology are capable to providing IEE services to their clients as well as after sale service. 	<ol style="list-style-type: none"> 1. Annual reports of NCPO-C and EEO 2. End of project Survey 2. Final evaluation 	<ol style="list-style-type: none"> 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 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 academic institutions, industry associations, Ministry of Industry, Mines 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.	<ol style="list-style-type: none"> 1. Number of energy management system experts in the Cambodian market 2. . Number of energy efficiency experts in the Cambodian market 3. Number of energy system/equipment optimization experts in the Cambodian market 3. Number of IEE seminars and trainings delivered 	<ol style="list-style-type: none"> 1. No/rare energy management system experts in the Cambodian market 2. No industrial Energy efficiency system 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 	<ol style="list-style-type: none"> 1. 40 Industrial EE/energy management system experts trained 2. 20-25 seminars and trainings for enterprises managers and engineers delivered by EM and IEE national experts trained by the GEF project 	<ol style="list-style-type: none"> 1. Project progress report 2. End of project Survey 3. Final evaluation 	<ol style="list-style-type: none"> 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 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 efficiency	Network facility with specific area of specialization of experts is available Network is meeting regularly to exchange/share IEE developments/concerns.	No such network in Cambodia exists and client has no access to IEE experts	<p>A registry of IEE experts is available with EEO and NCPO.</p> <p>A formal network of IEE experts is in place</p>	<ol style="list-style-type: none"> 1. IEE program website 2. Project report 3. Final evaluation 	<ol style="list-style-type: none"> 1. Energy efficiency experts recognize the business potential of the IEE in Cambodia and also in neighboring countries
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.	<ol style="list-style-type: none"> 1. Number of local suppliers trained for providing IEE services 2. Number of suppliers assisted in collaboration /agents of foreign technology suppliers. 3. Number of private firms providing energy management system 	<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>	<ol style="list-style-type: none"> 1. At least 10 equipment and technology suppliers in Cambodia are trained in IEE tools and techniques. 2. Technical tie-up/sole selling agent of Energy efficient equipments from neighboring countries. 3. 10 companies implement at least 10 energy management or IEE project each year 	<ol style="list-style-type: none"> 1. Project progress report 2. Annual reports of Companies participating in the project 3. Number of IEE technical tie-ups in the country 4. Total investment done during project period. 	<ol style="list-style-type: none"> 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.

Output 2.4	Web based guidance tool/manual on IEE developed.	Dedicated web page for IEE is in place and populated for training material, information and links with relevant web sites.	No such ICT based instrument exists on IEE in Cambodia. Information on IEE experts/technology suppliers do not exist	GEF –IEE project web site with relevant information is continuously updated. EM/IEE manual relevant to Cambodian industries is available	Number of hits on the website and links to other websites. Khmer and English version IEE manual	No specific assumption and risk for this output.
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 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.	1. No institutional framework exist to promote IEE at implementation level. 2. Access to 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	1. At least 200 participants from Govt. and regulatory agencies are trained in IEE. 2. 100 personnel from Industry are trained in financial engineering (bankable proposals) 3. Guideline on IEE/EM/operation and maintenance of Boiler is available 4. At-least 20 companies gets access to finance through GEF project.	1. Project progress report 2. Annual reports of project implementing partners 3. Number of IEE projects selected for financing 4. Total investment done during project period	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 & Environmental saving potential of the IEE market in Cambodia
Project Component 3: Strengthening of institutional framework for industrial Energy efficiency						
Output 3.1	Capacity building of relevant Govt. departments to promote industrial energy efficiency	1. Number of training programme conducted on IEE 2. No. of Govt. staff trained in IEE /EM implementation support.	No such organized capacity building programme exists in Cambodia. Few seminars on Rural electrification, renewable energy are conducted by foreign experts	1. 12 Intensive Capacity building programme is conducted during project period. 2. 200 participants trained to promote industrial energy efficiency	1. Project progress report 2. Annual reports of project implementing partners 3. Final evaluation	1. Government interest & support to build capacity for IEE promotion 2. Policy level intervention in IEE is done by RGOC 3. Energy efficiency promoters recognize the need benefits of IEE in Cambodia

Output 3.2	Companies are trained in preparation of bankable IEE project proposals	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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. 3. 30 proposal for IEE financing are prepared and considered for financing 	<ol style="list-style-type: none"> 1. Annual reports of project implementing partners 2. End of project report 3. Final project evaluation 	<ol style="list-style-type: none"> 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 3.3	Capacity building of financial institutions to assess investment proposals in IEE	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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 	<ol style="list-style-type: none"> 1. Annual reports of project implementing partners 2. End of project report 3. Final project evaluation 4. Annual reports of participating FII's 	<ol style="list-style-type: none"> 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 3.4	Practical Guide for the Implementation of Energy Management in Industry in compliance ISO 50001 international standards is developed..	Tools available for supporting energy efficiency in industry	No tools are and will be most likely available during and immediately after the GEF-UNIDO project implementation period	<ol style="list-style-type: none"> 1. An Energy Management System Implementation Guide in compliance with EN 16001/ ISO 50001 standards is produced in English and Khmer language 	<ol style="list-style-type: none"> 1. IEE Best Practices dissemination program website 2. Project report 3. Final evaluation 	<ol style="list-style-type: none"> A1. Sustained Government support to agreed project activities for the National Energy Efficiency office MIME

Outcome-4	Stronger institutional framework in place to ensure long-term support for energy reduction efforts in enterprises	<ol style="list-style-type: none"> 1. Number of Awareness programmes conducted on IEE benefits 2. Number of energy efficiency projects implemented annually 3. Number of EN16001 or ISO 50001 certified companies 4. Number of IEE service contracts stipulated by Energy Management and Energy efficiency experts and technology suppliers trained by the GEF project 	<ol style="list-style-type: none"> 1. Not available. Numbers to be estimated during 1stYear of project impl. through Survey results and further data collection 2. So far no EN16001 or ISO 50001 certified companies 3. In past most IEE related projects are developed and implemented using foreign experts 4. Technology suppliers are not competent to provide IEE services to their clients 	<ol style="list-style-type: none"> 1. 100% increase of annual number of implemented projects between 2010 and 2023 2. 24 awareness prog. covering 5 selected sectors are conducted during project period. 3. At least fifteen companies get certified to EN16001 or ISO 50001 by 2015 4. More than 500 IEE services contracts stipulated by national experts/suppliers/vendors trained by the GEF project with Cambodian enterprises between 2013 - 2023 	<ol style="list-style-type: none"> 1. Energy Efficiency office EEO and NCPO-C Annual Report 2. Industry associations annual reports 3. End of project Survey 4. Cambodian standard authority or certification bodies 	<ol style="list-style-type: none"> A1. Energy prices remain high in the medium and long-term A2. Industry drive for energy costs reduction and enhanced energy efficiency grows progressively stronger A3. In the medium EN 16001 and ISO 50001 certification becomes tool and/or requirement for export oriented enterprises and for market access
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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 program and results achieved by participating pilot units of the project.	<ol style="list-style-type: none"> 1. Number of energy management system experts in the Cambodian market 2. Number of energy efficiency experts in the Cambodian market 3. Number of IEE seminars and trainings delivered 	<ol style="list-style-type: none"> 1. No energy management system experts in the Cambodian market 2. No industrial steam system optimization experts in the Cambodian market but few engineering companies provide partial services 3. IEE seminars and trainings bound to be delivered by international experts 	<ol style="list-style-type: none"> 1. 20 energy management system experts trained 2. 20 steam systems optimization experts trained 3. 20-25 seminars and trainings for enterprises managers and engineers delivered by EM and SSO national experts trained by the GEF-UNIDO project 	<ol style="list-style-type: none"> 1. Project progress report 2. End of project Survey 3. Final evaluation 	<ol style="list-style-type: none"> A1. Sustained Government support to agreed project activities for the National Energy Efficiency Agency A2. Industry drive for energy costs reduction is and will remain strong A3. Energy efficiency consultants, industrial equipment supplier and vendors, and other relevant entities recognize the economic potential of the IEE market in Cambodia
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Output 4.2	Industry decision-makers understand their potential for energy efficiency gains and undertake energy efficiency activities.	<ol style="list-style-type: none"> 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 	<ol style="list-style-type: none"> 1. No marketing tool for IEE like IEE clinic exist so far. Few trainings on EE/Boiler safety for manufacturing and commercial enterprises are planned for 2010 by National Cleaner production office Cambodia. 	<ol style="list-style-type: none"> 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 attend project energy management and IEE training seminars/workshops 	<ol style="list-style-type: none"> 1. Project progress report and NCPO annual report. 2. List of participants in IEE Clinics, training and seminars 3. Final evaluation report 	<ol style="list-style-type: none"> 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 4.3	Other stakeholders including technology/equipment suppliers will understand their role to promote industrial energy efficiency	<ol style="list-style-type: none"> 1. Number of technology & equipment suppliers participating in the project seminars/training 2. Number of contracts received by suppliers through GEF projects 	<ol style="list-style-type: none"> NO training/capacity building done for of technology & equipment suppliers on IEE Hardly suppliers get contract for EM/IEE in Cambodia 	<ol style="list-style-type: none"> 1. 50 suppliers/vendors participating in the project seminars and workshops 2. 20 contract related to IEE implementation is bagged by supplier trained by project. 	<ol style="list-style-type: none"> 1. Project progress report and NCPO annual report. 2. Balance sheet/annual report of suppliers. 2. End of project report 3. Final project evaluation 	<ol style="list-style-type: none"> A1. Sustained Government support to agreed project activities for the National Energy Efficiency Agency A2. Costs reduction remains a first priority for companies' top management.
Outcome-5	Establishment of policy, legal and regulatory frameworks that sustainably promote and support industrial energy efficiency	<ol style="list-style-type: none"> 1. Number of IEE policy, EM programs developed and put in operation 2. Adoption of regulatory measures to support IEE implementation and market transformation 	<ol style="list-style-type: none"> 1. No IEE/EM specific policy program is in place 2. No specific regulation to support IEE /EM is in place 	<ol style="list-style-type: none"> 1. At least 3 national IEE policy programs operate and develop smoothly: 2. IEE Monitoring, Tracking and Benchmarking (MTB) Program; IEE Best Practice Dissemination Program; 3. National Energy Auditor Accreditation Certification Program operational 	<ol style="list-style-type: none"> 1. Policy/ Government Act/decree on IEE. 2. Boiler Safety act & Operation & Maintenance guideline 3. NEAA Course developed and certifying agency in place 	<ol style="list-style-type: none"> A1. Sustained Government support to agreed project activities.
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	<ol style="list-style-type: none"> 1. Increased role for IEE in , energy , industry and environmental policies at national levels 2. IEE opportunities are recognised and utilised for achieving UNFCCC commitments. 	<ol style="list-style-type: none"> 1. No policy exist to promote and encourage implementation of IEE by Cambodian manufacturing sector 2. Role IEE in climate change mitigation from Cambodian industry is not well recognised 	<ol style="list-style-type: none"> 1. Policy document on Industrial energy efficiency is prepared for RGOC action. 2. Tools and instruments to calculate GHG reduction from IEE projects are in place 	<ol style="list-style-type: none"> 1. Annual report of NCPO-C, EEO 2. Independent final project evaluation 3. Publication of relevant policies, strategies and guidelines by RGOC 	Uptake of IEE by enterprises and other organisations is constrained by lack of government incentive
Output 5.2	Procedures for tracking and benchmarking energy consumption in industry are developed and established	<ol style="list-style-type: none"> 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 	<p>So far IEE has no significant role in Energy Policy in Cambodia.</p> <p>No structures, tools and methodologies are in place</p>	<ol style="list-style-type: none"> 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 	<ol style="list-style-type: none"> 1. Energy Efficiency office, MIME and NCPO Annual Report 2. Internet/Web 3. Project reports 4. Final evaluation 	A1. Sustained Government support to agreed project activities.
Output 5.3	National Energy Auditor Accreditation (NEAA) programme is established	<p>National accreditation body in place.</p> <p>List of professional certification programs accredited by national relevant body</p>	No national Industrial Energy Manager Certification Program is in place and will be in place in the near future	<ol style="list-style-type: none"> 1. National NEAA program is developed and offered to IEE/EM experts. 	<ol style="list-style-type: none"> 1. National accreditation institution 2. Continual education/ professional certifying institutions 	<ol style="list-style-type: none"> 1. Energy Efficiency will mainstreamed in law and Energy audit will be made mandatory. 2. In the medium and long term industry's demand for qualified IEE experts and their services increases

ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

PIF has received few comments and suggestions from STAP. Most of the comments made by the Reviewer are very positive.

(B-1) RESPONSE TO COMMENTS FROM COUNCIL MEMBER, GERMANY (REFERENCE TO GEF C.35/7)

COMMENT-1: ACCORDING TO THE WORLD RESOURCE INSTITUTE, AS OF 2005 CAMBODIA HAD "0" GHG EMISSION FROM THE INDUSTRIAL SECTOR, HOWEVER, IN THE PROPOSAL AS OF 2007, 20% OF THE COUNTRY EMISSIONS ARE FROM INDUSTRY. WOULD BE USEFUL TO KNOW THE SOURCE OF EMISSION DATA USED FOR THE PROPOSAL.

Response: *"0" Emission from industry even in 2005 is not reported realistically. In recently formulated Second National Communication-SNC2 (mitigation analysis), detailed analysis of various sectors has been done and referred on page 10-11 (table1&2) of this document. GHG contribution from manufacturing sector excluding energy sector is reported to be 12.2% and if energy use & corresponding GHG emission from energy usage from grid by industry is included it exceeds 20%. In another scenario if biogenic GHG from usage of wood as fuel in industry is also ACCOUNTED IT amounts to be 30%. (Enabling Activities for the Preparation of the Kingdom of Cambodia's Second National Communication to the UNFCCC (Project ID: 00044653: Climate Change Department, Ministry of Environment May 25, 2010).*

COMMENT-2: UNIDO'S EXPERIENCE IN IMPLEMENTING THIS TYPE OF PROJECT SHOULD BE MORE EXPLICITELY EXPLAINED

Response: *UNIDO has long –standing experience in the development and implementation of Industrial Energy Efficiency in developing countries and emerging economies. It has strong understanding of how policy, normative, technical, market ad financial variables can effect energy efficiency in manufacturing and process industries. In recent years UNIDO has built on and strengthen such expertise by incorporating in its approach to IEE the promotion and introduction of energy management systems and standards as principal tool to integrate energy efficiency in the manufacturing sector corporate practices. UNIDO is internationally recognized as leading advocate and technical assistance provider for IEE policies, industrial energy system optimization and energy management system/standards.*

(B-2) RESPONSE TO COMMENTS FROM COUNCIL MEMBER, FRANCE

COMMENTS

- It is clear that the high price of energy in Cambodia today is an incentive to develop energy efficiency projects. Nevertheless, the discovery of oil in the country and the development of several hydro power schemes might change this favorable context. *The feasibility of the project should look into the possible evolution of the energy price in Cambodia and the possible impact on the project.*

Response: *Oil discovery and its techno-economic viability due to slurry form at current global oil price is still a question mark and in any case oil prices is a global phenomenon and may not have so much effect on direct users in terms of pricing. Availability of hydro energy in future might have some impact on energy pricing provided country develop infrastructure for transmission and distribution (National Grid). However, the sector selected for the project except Garment is located in isolation close to agriculture production (rice, rubber) or in rural area having clay (brick sector), therefore, energy source for most of these sector still will remain same (their own generation). In addition significant contribution of energy usage and costs in the identified sector is thermal energy which might not affect so much from hydropower energy.*

- The development of a local production of energy efficient equipments to lower the price of those equipments should be looked into carefully. The development of such a production can be capital intensive while better deal might be reached with regional providers as long as a minimum market for such equipment is developing in Cambodia.

Response: *It is true that development of local producer for energy efficiency equipment is capital intensive and need a careful market survey for potential investors. As per recommendation of Council members during PPG phase possibility of technical tie-up, licensing arrangements and partially local fabrication of part equipment was explored and it is envisaged that during project period some local supplier of technology (in sector like brick kiln, Gasifiers for Rice mills, brick molding, rubber drying) will successfully collaborate with suppliers in the region and also develop after sale service network.*

(B-3) RESPONSE TO COMMENTS/GUIDANCE FROM STAP

Guidance from STAP:

1. The project considers only EE options, even though some of the industries considered are biomass based. RE options could also be explored. RE options such as biomass gasifiers for heat and power applications needs to be explored.

As per recommendation of STAP renewable energy based options were also considered and their techno-economic viability was worked out in consultation with supplier and user. Some of the identified RE based projects are:

- *Substituting Diesel oil in Rice milling sector with duel fired engine (70% producer gas 30% DO)using available rice husk*
 - *Substituting DO based dryers in rubber refining using hot air dryers using waste wood from rubber plantation*
 - *Substituting DO based electricity generation in Brick kilns for clay mixing, moulding with duel fuel engine using biomass based gasifiers.*
 - *Substitution of fossil fuel (oil) based boilers with surplus biomass like rice husk, waste wood and other agro residues.*
 - *Substitution of DO used in dryers. crisper in food industries with hot air dryer using biomass as fuel.*
2. Project emphasis on cleaner production technologies will have positive benefits on release of toxic chemicals in the environment. STAP recommends providing quantitative estimates of these co-benefits at the CEO endorsement phase.

Energy efficiency measures potentially reduce both, GHG emissions and releases of uPOPs. The actual benefits need to be evaluated taking into account the life cycle approach (LCA). In case of the direct use of fossil fuels, the switch from coal to fuel oil or to natural gas leads to decreasing CO2 emissions due to the increasing C to H ratio of the fuels. In case of an optimized control of combustion conditions, potential releases of POPs will be significantly reduced. The optimized combustion of natural gas reduces uPOPs emissions to almost zero. Operation conditions can be improved by buffer systems (hot water storage) and through regular maintenance and repair .In developing countries the use of improved kilns like brick kilns, cooking stoves does not only reduce uPOPs emissions, but also has a positive impact on human health through reduced indoor air.

Relative quantity of uPOPs emitted from the various types of fossil fuels or biomass combustion (utility and industrial boilers, furnaces, kilns, dryers, motor vehicles, etc.) vary greatly depending on the type of fuel, type of combustion technology used and efficiency of energy generation achieved, the amounts of uPOPs as well as the amounts of GHGs emitted are usually a direct function of the amount of fuel consumed.

To calculate the total amount of PCDD/PCDF emissions reduction from IEE project per year, the standard emission factors given by UNEP (UNEP Toolkit) was used;

Source Strength (PCDD/PCDF emissions per year) = Release Concentration x Flux

In the case of Industrial/power boilers the equation used is written as follows;

a) *PCDD/PCDF emissions per year* $f_{fuel} \times$ *Emission Factor* $f_{fuel} \times$ *Fuel Consumption per year* $f_{fuel} \times$

Table : Dioxin Emission Factors, in $\mu\text{gTEQ/TJ}$ (as per UNEP toolkit)

<i>Fuel type</i>	<i>Old Boiler</i>	<i>New boiler (UNEP Toolkit)</i>	<i>BAT/BEP Boiler</i>
Biomass	500	50	5
Coal	100	10	1
Fuel oil	10	2.5	2.5
Light oil/Natural gas	0.5	0.5	0.5

Depending on the type of technology selected, there is also the possibility of avoiding the formation of unintended POPs (viz. dioxins and furans) that are formed during the combustion of fossil fuels in the generators and boilers currently used

3. STAP recommends using a balanced approach to energy efficiency improvements in selected industrial sectors by promotion of EE at the system level through improved EE standards and management practices along sector-specific technological solutions.

As per the suggestion of STAP and also the experience of such initiatives in Cambodia a balanced approach will be used by applying EE at system level and EE standards. Outputs of component-5 have been modified accordingly.

4. Criteria for selecting technological interventions in pilot demonstrations should be explicitly defined at the CEO endorsement phase.

In addition to identifying suitable and proven technologies for IEE at acceptable costs, the following aspects were considered in detail during project preparation:

- a) *Biomass fuel collection and logistics: to assure guaranteed supply of specific quality and quantity a supply chain will be established, preferably with techno-legal agreements between supplier and user. Given the seasonal fluctuation in the availability of agricultural residues, this will be especially important to ensure a continued supply of biomass to the system.*
- b) *Infrastructure requirement: External infrastructure such as connecting roads, proximity to biomass markets, water availability, water discharge facility, ash disposal or usage (road construction, cement manufacturing, soil conditioner etc.) availability of a local electricity grid and internal infrastructure, mainly land suitable for the project with clear title and that is not an environmental hot-spot.*
- c) *Human Resource requirement: Availability of trained manpower both at the supervisory and operational level is critical for efficient operation, maintenance and trouble shooting of plant operation. Provision of required training of plant personnel by technology supplier will be made in addition to capacity building by NCPO-C and its network of international expert partners (see below for more details).*

Technology installation and operation: *On the basis of the techno-economic viability, the selected technology will be procured, installed, commissioned and run. The capacities of the technology recipients*

will be built to ensure that they can effectively operate and maintain the technology system and respective components.

from sustainability point of view, from the start of the project, knowledge and technical capacity for the process of technology assessment and transfer will be built up, to familiarize the relevant actors with technology assessment and its related environmental, social, financial and policy implications. The personnel from the enterprises involved in the pilot projects will of course be targeted, but so will MIME, the Council for Development of Cambodia (CDC), the Ministry of Environment(MOE), Électricité du Cambodge (EDC) , the Electricity Authority of Cambodia(EAC), the Institute du Technology Cambodge (ITC), and local banks. Part of this capacity building will relate to an understanding of intellectual property right (IPR), patent and trade secret regimes. In particular, with respect to IPR's, it will be explored if the WTO TRIPS agreement might give some flexibility for renewable energy technology transfer to enjoy a waiver similar to that of public health related technology transfer. Use of financial engineering tools will also be covered.

To assist in the general process of skills building and upgrading, the project will make available a web-based guidance tool/manual for technology transfer for renewable energy from biomass/agricultural residues. This will include a decision-making tool to assist enterprises select the most appropriate technologies for their needs. Trainings depending on requirement will be tailor made for different stakeholders and will be conducted by the NCPO-C with international experts having relevant expertise.

Removal of Financing Barriers: In parallel, the project will address the issue of how to overcome the major barrier of availability of finance to implement technology transfer. Existing mechanisms like the Special Climate Change Fund (SCCF), the Least Developed Country Fund (LCDF), and the Clean Development Mechanism (CDM) will be examined for their relevance. However, the project might conclude that it will be necessary to develop new financial products.

Policy Development: The project will assist RGOC to strengthen, or if necessary develop, policies and regulations that can support promotion, implementation and scaling up of IEE and renewable energy technologies in Cambodia. In addition strategies for development of mechanism and financial incentives for scaling up of the development and CC related transfer of technology.

5. Financial viability of EE interventions and the potential incremental investment cost and its implications for profitability of industries needs to be assessed

This suggestion was addressed during PPG stage and while identifying sector specific and CC related potential IEE technologies feasibility analysis of identified option on basis of indicative price offered was done. Only those technologies/techniques which are techno-economically viable considering the capital cost in country were short-listed. However, detail financial engineering will be done before selection any IEE technology for implementation.

ANNEX C: CONSULTANTS TO BE HIRED FOR THE PROJECT USING GEF RESOURCES

Position Titles	\$/ person week*	Estimated person weeks**	Tasks to be performed
For Project Management			
Local			
National Project Manager	300	104 (104 to be CO-financed by NCPO-C)	Responsible for the management, monitoring, coordination of all project activities in the countries in association with CTA and International experts. Responsible for the organization of some project activities, in particular the organization of the training sessions and workshops to be held under PC2.
Deputy Project Manager	200	104	Assisting the NPM/CTA in management, monitoring, coordination of all project activities in the countries. Co-coordinating the Pilot projects assessment, organization of the training sessions, workshops, CP clinics to be held under PC-2,3 &4.
Project Administrative officer	200	104	Responsible for the financial and administrative activities of the project, tracking and ensure timely disbursement of project funds, liaison with bank for disbursement of Investment component, assist the NPM in the organization of some project activities, in particular the organization of the training sessions and workshops to be held under PC2-4.
Project Driver	100	104	Driving the project car to facilitate implementation and field monitoring instrument transport.
National			
For Technical Assistance			
Local			
PC-1: 5 Sector specific experts for conduction of quick scan, detailed energy audit, gap analysis, techno-economic viable option for IEE in selected sectors	200	20 (4 week per sector)	These experts will be initially trained by CTA and international expert in IEE training and will be responsible for: <ol style="list-style-type: none"> 1. Providing the requisite support to international staff in conduction energy audits, EE Technology scoping. 2. Evaluations of identified IEE options and technology assessments 3. Assisting the PMU and NCPO-C in implementing the IEE technologies.

PC-2&3 - Experts for the IEE/EM training, methodologies, communication, web-designer	300	12.9	In collaboration with and under the guidance of CTA and the international experts for PC1 ,2 &3, these experts will assist and work with staff of NCPO-C, EEO to develop and translate IEE training material and toolkit into Khmer. To assist International and National experts in conducting trainings/workshops/seminars and clinics
PC4 - Experts for the national IEE results Dissemination (Business planning, training and communication/media, web-design, video production)	300	8.6	In collaboration with and under the guidance of the CTA & international Expert PC1 &4, these experts will assist and work with staff of the NCPO-C and Energy Efficiency office to develop, establish and operate the national IEE Best Practices Information and Dissemination, and Recognition programs
PC5 - Experts for the national Energy Auditor Certification Program (Professional certification, policy and legislation)	300	8.6	In collaboration with and under the guidance of the international contractor for PC1, these experts will assist and work with staff of the Energy Efficiency office and the Institute of Technology Cambodia to develop and establish a national Energy Auditor Certification Program
PC2 - Energy Management (EM) Expert trained by the GEF-UNIDO project	300	8.6	This expert will work under the supervision of UNIDO's international EM expert to adapt to the Cambodian context and translate in Khmer a Practical Guide to the Implementation of Energy Management in SMEs to be developed by project.
International			
PC1-5 Chief technical advisor	18,000**	47.3	Responsible for overall preparation of work-plan and project implementation plan in collaboration with UNIDO project manager. Assisting UNIDO finance/procurement div for financial support to 13 pilot plants Overall co-ordination with International experts, National experts, PMU, and National Government. Inputs in strategy, mechanism and policy formulation On IEE in Cambodia.
PC1 – Industrial Energy Efficiency and process Technology experts for the 13 IEE pilot projects	3,500	10	These experts will provide the technical expertise and will be responsible for: 4. Providing the specific technical expertise required to developing and support implementation of the targeted 13 pilot industrial energy efficiency projects identified during the PPG phase and for which enterprises have made a commitment of resources. 5. Developing training material and tools for the EM Expert training and User training 6. Guiding the PMU and NCPO-C in preparing the EM Expert training.

PC2 &3 - Senior Experts on IEE /EM trainings	3,500	6	These experts will provide the technical expertise and will be responsible for: 1. Developing training material and tools for the IEE/EM Expert training and User training 1. Guiding the PMU in preparing the EE/EM Expert training 2. Delivering the IEE Expert Training, including coaching to trainees on –the job inputs during the Pilot demonstration 3. Delivering 6 IEE trainings jointly with NCPO and trained national IEE experts
PC5 - Senior Experts on Energy Management System Implementation in Industry	3,500	6	1. The EM Expert Training and coaching to trainees during the development of the EM systems envisaged by the training program. 2. Delivering 2-3 EM User trainings jointly with NCPO-C and trained national EM experts 3. Providing technical advice and assistance to trained EM national experts and enterprises in the implementation of the 20 EM systems and operational improvements developed during Step 3 of the Expert training 4. Providing the technical expertise and supervision of national experts for developing a Practical Guide to the implementation of Energy Management in Industry targeted to the Cambodian context
PC5- Senior expert in IEE/EM policy formulation	3,500	2	Providing expert Inputs in strategy, mechanism and policy formulation On IEE in Cambodia. Compilation of IEE existing policies in ASEAN region
** CTA calculation is based on CTA cost to UNIDO Budget breakup for other activities is provided in table below:			

ANNEX D: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS

A. EXPLAIN IF THE PPG OBJECTIVE HAS BEEN ACHIEVED THROUGH THE PPG ACTIVITIES UNDERTAKEN.

PPG objectives have been almost fully achieved.

- i) The project document has been formulated on the basis of further analysis of the policy, legal and regulatory frameworks, capacity building needs assessment and stakeholders consultations at both national as well as bilateral level
- ii) Co-financing resources envisaged at the PIF stage has been fulfilled and committed by all partners. Co-financing by private sector was raised marginally and is expected to increase further.
- iii) Direct and in-direct energy savings and GHG emission reduction have been estimated/calculated and projected on the basis of rapid assessments and detailed energy audits conducted in representative units from selected sectors.

- iv) The project baseline and its trajectory have been better defined through additional information and data collection; energy performance and project impact indicators have been identified but representative values for the baseline was difficult to defined due to poor data availability. Such exercise deserves significant planning and much more time and human resources; for these reasons it will be carried out during the project implementation as integral part of the Quick scans and pilot demonstration under component 1 and Monitoring, Tracking and Benchmarking program of Project Component 5.

B. DESCRIBE FINDINGS THAT MIGHT AFFECT THE PROJECT DESIGN OR ANY CONCERNS ON PROJECT IMPLEMENTATION, IF ANY:

Findings that might affect project design

As it has been explained in PART II, SECTION E above the GEF-UNIDO project will continue to seek collaboration and discussing possible co-financing agreement with the phase-2 of Cambodian cleaner Production programme by NCPO-C expected to get funded by State Secretariat for Economic affairs (SECO). However, based on initial discussion between UNIDO, MIME and NCPO-C, potential collaboration and co-financing would not bring about significant changes to the design of the project, but they would mainly expand and strengthen the outputs of Project Components 2, 4 and 5. For PC-5 a National Energy Auditor Certification Program could be added as well as further work on benchmarking. For PC 2&3 Expert and User trainings on other energy systems would be added.

Any concerns on project implementation

No additional concern beside the risks discussed in PART II, SECTION G.

C. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES AND THEIR IMPLEMENTATION STATUS IN THE TABLE BELOW:

<i>Project Preparation Activities Approved</i>	<i>Implementation Status</i>	<i>GEF Amount (\$)</i>				<i>Co-financing (\$)</i>
		<i>Amount Approved</i>	<i>Amount Spent To date</i>	<i>Amount Committed</i>	<i>Uncommitted Amount*</i>	
Compilation of relevant industry background information and survey of Cambodia Industry; awareness raising inception workshop; discussions with project counterparts and other stakeholders on technical design parameters	Completed	26,000	18,393	0		17,000
Preparation of project document in cooperation with the Cleaner Production Centre, the Ministry of Industry and Ministry of Environment; circulation of draft document	To be completed	34,000	25,043	16,564		43,000
Total		60,000	43,436	16,564		60,000

ANNEX E: CALENDAR OF EXPECTED REFLAWS

Provide a calendar of expected reflows to the GEF Trust Fund or to your Agency (and/or revolving fund that will be set up)

ADDITIONAL ANNEXES

ANNEX F: ESTIMATE OF ENERGY SAVINGS AND GHG EMISSIONS REDUCTIONS

Please see separate file

ANNEX G: LETTERS OF CO-FINANCING

Please see separate file

List of Abbreviation

ADEME	Department of Alternative Energy Development and Efficiency
ANZ	Australia and New Zealand Banking Group Limited
ASEAN	Association of Southeast Asian Nations
BAT	Best Available Technology
BEP	Best Environmental Practice
BPD	Best Practices Dissemination
BRC and NZIER	Bangkok Research Center and New Zealand Institute of Economic Research
BTK	Bull Trench Kiln
CC	Climate Change
CCCA	Cambodian Climate Changed Alliance
CCO	Climate Change Office
CCD	Climate Change Department
CCEAP	Climate Change Enabling Activity Project
CCPP	Cambodian Cleaner Production Programme
CDC	Council for Development of Cambodia
CDM	Clean Development Mechanism
CEO	Chief Executive Officer
CIDA	Canadian International Development Agency
CP	Cleaner Production
CP-EE	Cleaner Production- Energy Efficiency
CRCD	Cambodian Research Centre for Development
CTA	Chief Technical Advisor
DANIDA	Danish International Development Agency
DEDE	Department of Alternative Energy Development and Efficiency
DG Sets	Diesel Generator Sets
DO	Diesel Oil
DOET	Department of Energy techniques
DOIT	Department of Industrial Technique
EAC	Electricity Authority of Cambodia
EC	European Commission
ECCJ	Energy Conservation Center Japan
EDC	Électricité du Cambodge
EE	Energy Efficiency
EEO	Energy Efficiency Office
EM	Energy Management
EnMS	Energy Management Systems
EnTA	Environmentally Technology Assessment
ESCOs	Energy Service Companies
FDI	Foreign Direct Investment
FII's	Financial Institutions
FONDEM	Fondation Energies pour le Monde
GCL	Green Credit Line
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GERIAP	Greenhouse Gas emission Reduction from Industry in Asia and the Pacific
GHG	Green House Gas
GJ	Gigajoule
GMAC	Garment Manufacturers Association of Cambodia
ICT	Information Communication Technology
IEE	Industrial Energy Efficiency
IFC	International Finance Corporation
IGES	Institute for Global Environmental strategies
IMF	International Monetary Funds

INC	Initial National Communication
INV	Investment
IPR	Intellectual Property Right
IRR	Internal Rate of Return
ISO	International Standard Organization
ITC	Institute of Technology of Cambodia
JICA	Japan International Cooperation Agency
LCA	Life Cycle Approach
LCDF	Least Developed Country Fund
LDC	Least Developed Country
LEAP	Long-range Energy Alternative Planning System
MCGTF	Mutual Credit Guaranteed Trust Fund
MIME	Ministry of Industry, Mines and Energy
M&E	Monitoring and Evaluation
MJ	Megajoule
MOE	Ministry of Environment
MTB	Monitoring, Tracking and Benchmarking
NAPA	National Adaptation Programme of Action
NC	National Committee
NCCC	National Climate Change Committee
NCPO-C	National Cleaner Production Office -Cambodia
NEAA	National Energy Auditor Accreditation
NEDO	Industrial Technology Development Organization
NGO	Non-Governmental Organization
NPM	National Project Manager
OECD	Organization for Economic Co-operation and Development
OHS	Occupational Health and Safety
PAC	Project Advisory Committee
PC	Project Component
PCDD	Polychlorodibenzodioxins
PCDF	polychlorodibenzofurans
PIF	Project Identification Form
PMU	Project Management Unit
POPs	Persistent Organic Pollutants
PPG	Project Preparation Grant
RE	Renewable Energy
REAP	Renewable Electricity Action Plan
RECP	Resource Efficient and Cleaner Production
RGOC	Royal Government of Cambodia
RSPM	Respirable Suspended Particulate Matters
RUPP	Royal University of Phnom Penh
SCCF	Special Climate Change Fund
SEMISE	Support to Energy Market Integration and Sustainable Energy
SIDA	Swedish International Development Cooperation Agency
SEC	Specific Energy Consumption
SECO	State Secretariat for Economic Affairs
SMEs	Small and Medium Enterprises
SNC	Second National Communication
SSO	Steam System Optimization
STA	Scientific & Technical Analysis
STAP	Scientific and Technical Advisory Panel
TA	Technical Assistance
TOEs	Tones of Oil Equivalent
TRIPS	Trade-Related Aspects of Intellectual Property Rights

UNDP	United Nation Development Programme
UNEP	United Nation Environmental Programme
UNIDO	United National Industrial Development Programme
UN-ESMAP	United Nations and Energy Sector Management Assistance Programme
UNFCCC	United Nation Framework on Climate Change Convention
US	United States
VSBK	Vertical Shaft Brick Kiln
WB	World Bank
WTO	World Trade Organization

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