



# Global Environment Facility

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CHIEF EXECUTIVE OFFICER  
AND CHAIRMAN

January 22, 2001

Dear Council Member:

UNDP, as the Implementing Agency for the project, *Thailand: Removal of Barriers to Biomass Power Generation and Co-generation*, has submitted the attached proposed project document for CEO endorsement prior to final approval of the project document in accordance with UNDP procedures.

The Secretariat has reviewed the project document. It is consistent with the proposal approved by the Council in December 1999 and the proposed project remains consistent with the Instrument and GEF policies and procedures. The attached explanation prepared by UNDP satisfactorily details how Council's comments and those of the STAP reviewer have been addressed. I am, therefore, endorsing the project document.

We have today posted the proposed project document on the GEF website at [www.gefweb.org](http://www.gefweb.org). If you do not have access to the Web, you may request the local field office of UNDP or the World Bank to download the document for you. Alternatively, you may request a copy of the document from the Secretariat. If you make such a request, please confirm for us your current mailing address.

Sincerely,

cc: Alternates, Implementing Agencies, STAP

## 1. Comments by STAP

Issue	Response
STAP reviewer' s comments on Project Brief.	Comments addressed as appropriate in Project Brief prior to submission to GEF Council.

## 2. Comments by GEF Council Members

The Work Program, of which this project was a part, was approved by the Council the at the December 1999 meeting. Technical comments were only received from one Council member, namely Switzerland.

Issue	Response
<p><u>Comments from Switzerland:</u></p> <p>“This project addresses OP6 by demonstration of technologies (2 pilot plants) and by removing barriers at institutional level.</p> <p>It is logically built and should contribute to the development of biomass based power generation. The biomass supply issue has been addressed by having major biomass suppliers as stakeholders in the two pilot plants.</p> <p>The questions which seem to be still opened are:</p> <p>The promotion of IPP biomass based technology differs from some other experiences in other countries where biomass based electricity generation is developed within the biomass industry itself. It gives smaller units, but cogeneration can sometime be applied in the process. It solves the problem of biomass procurement (under the same shelter) and allows to use some of the rejected heat. Is the model followed in Thailand an optimal one, considering the fact that some of the biomass industrialists could have developed their own project?</p> <p>When an industry has its own captive plant, the financial viability is enhanced by the fact that a large part of the power being self-consumption, avoided costs (not buying from the grid) are higher than buy-back from the grid.</p> <p>Conclusion and Recommendations:</p> <p>This project should be supported. The issues raised above should be considered when looking at various IPP models.”</p>	<p>The comments received from Switzerland were taken into consideration during the development of the full project document. In particular, Section B.3 (Project Description) of the project document addresses the issues raised. Here a short summary is given of the main issues:</p> <p>As pointed out by Switzerland, the project strategy is to remove barriers for biomass power production for specifically large-scale plants. The reasons for choosing this scope are many: At present the biomass power sector in Thailand is not very developed and many stakeholders perceive it as a high-risk investment. Basically, energy generation is traditionally not within the core business and area of competence of the biomass industry in Thailand, and the financial institutions are very reluctant to enter into this new business area.</p> <p>The Thai Government' s policies are to develop 300 MW of grid-connected biomass power capacity by 2004. Small-scale plants would be unlikely to fulfill the Thai Government' s goal for increased power capacity based on renewable energy. In addition, small-scale plants often does not utilize the most efficient combustion technologies available. Therefore, the focus on larger plans has been a natural choice in the Thai context.</p> <p>It should be mentioned that in addition to the GEF project, the Thai Government plans several initiatives with focus on smaller plants. Hence, the focus of this project does not in any way hamper development of small-scale biomass power development, instead it targets an area of large-scale project where the development so far has been very limited and the potential considerable.</p>

The full project document does not represent major changes in the project activities compared to the Project Brief.

**UNITED NATIONS DEVELOPMENT PROGRAMME**  
**GLOBAL ENVIRONMENT FACILITY**  
**Project of the Government of Thailand**  
**PROJECT DOCUMENT (draft of 15.12.00)**

**Project number:** THA/99/G31/A/1G/99  
**Project title:** Removal of Barriers to Biomass Power Generation and Co-generation in Thailand  
**Duration:** 7 Years  
**Estimated start date:** 1 Sep 2000  
**Management arrangement:** National Execution (NEX)  
**Designated institution:** National Energy Policy Office (NEPO)  
**Govt. GEF Focal Point:** Office of Environmental Policy and Planning (OEPP)  
**Project site:** Thailand  
**GEF Focal Area:** Climate Change  
**Country eligibility:** Thailand ratified UNFCCC on 28 Dec 1994  
**LPAC review date:** 4 Apr 2000  
**BPAC review date:** 29 Jun 2000

**Summary of project inputs (in US\$)**

Trust funds:	
GEF	6,805,000
Parallel financing:	
Government (in cash)	54,310,000
Government (in kind)	580,000
Private sector	15,000,000
JBIC	30,000,000
DANCED (DKK 8.06M)	930,000
IFCT	810,000
<b>Total:</b>	<b>108,435,000</b>

(UN official exchange rate at date of signature:  
 US\$ 1.00 = THB 43.695 = DKK 8.65)

**Classification information**

**ACC sector and subsector:** Environment; Environment enhancement and management  
**DCAS sector and subsector:** Natural resources; Sector policy and planning  
**Government sector and subsector:** Environment; Renewable energy  
**Primary areas of focus/sub-focus:** Promotion of environmental and natural resources; Promotion of sustainable energy and atmospheric quality  
**Secondary area of focus/sub-focus:** Promoting poverty eradication and sustainable livelihoods; Generation of employment and sustainable livelihoods opportunities  
**Primary type of intervention:** Capacity building; Institutional building  
**Secondary type of intervention:** Programme support; Programme technical support  
**Primary target beneficiaries:** Natural features; Atmosphere  
**Secondary beneficiaries:** The poor; Unemployed or without livelihoods

**Brief Description:** This project aims to reduce GHG emissions by accelerating the growth of biomass co-generation and power generation technologies to replace current fossil fuel consumption in Thailand. The objective of the project is to a) build capacity to provide information and services to potential biomass power project investors; b) improve the regulatory framework to provide financial incentives to biomass co-generation and power projects; c) increase access to commercial financing for biomass co-generation and power projects; and d) facilitate the implementation of two initial biomass power pilot plants through support for commercial guarantees which will reduce technical risks associated with the deployment of this new technology in Thailand.

On behalf of:	Signature	Date	Name/Title
Government GEF Focal Point	_____	_____	_____
Designated Institution	_____	_____	_____
UNDP	_____	_____	_____

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## ACRONYMS

AIJ	Activities Implemented Jointly
AIT	Asian Institute of Technology
ALGAS	Asia Least-Cost GHG Abatement Strategy
APR	Annual Project Report
CDM	Clean Development Mechanism
COGEN	Former EC-ASEAN COGEN (European Commission-Association of South East Asian Nations Co-Generation Program
DANCED	Danish Cooperation for Environment and Development
DEDP	Department of Energy Development and Promotion
DTEC	Department of Technical and Economic Cooperation
EGAT	Electricity Generating Authority of Thailand
EGCO	Electricity Generating Public Company Limited
EIA	Environment Impact Assessment
ENCON Fund	Energy Conservation Promotion Fund
EPDC	Electric Power Development Co., Ltd.
ESCO	Energy Service Company
FTI	The Federation of Thai Industries
GEF	Global Environment Facility
GHG	Greenhouse Gas
IFCT	The Industrial Finance Corporation of Thailand
IPP	Independent Power Producer
JBIC	Japan Bank for International Cooperation
KMUTT	King Mongkut University of Technology Thonburi
M&E	Monitoring and Evaluation
MEA	Metropolitan Electricity Authority
NEPC	National Energy Policy Council
NEPO	National Energy Policy Office
NEX	National Execution
NFFO	Non-Fossil Fuel Obligation
NPD	National Project Director
NPM	National Project Manager
OEPP	Office of Environmental Policy and Planning
O&M	Operation & Maintenance
PEA	Provincial Electricity Authority
PIR	Project Implementation Review
PMO	Project Management Office
PPA	Power Purchase Agreement
PSC	Project Steering Committee
RPS	Renewable Energy Portfolio Standard
SPP	Small Power Producers
TOR	Terms of Reference
UNFCCC	United Nations Framework Convention on Climate Change
UNDP	United Nations Development Programme

## A. CONTEXT

### A.1 Development Problem Being Addressed

#### *A.1.1 Energy and Electricity Sector in Thailand*

Thailand is currently heavily dependent on fossil fuels, with oil, gas, and coal accounting for 75% of total energy consumption. Large-scale hydropower provides only about 2% of the nation's total energy. Biomass fuels currently contribute to about one-quarter of the energy consumption in Thailand, of which two-thirds are wood and charcoal for rural household cooking, while the rest generate steam and power for on-site auto-consumption at wood and agro-industrial mills.

The installed capacity of Thailand's national grid reached about 18 GW in 1997. Electric power generation is dominated by fossil fuels, with gas, oil, and coal accounting for more than 80% of the total electricity supply. Large-scale hydropower makes up for the rest. To date, the development of renewable energy for power in Thailand has mainly been on a research and pilot demonstration scale. Due to the recent economic crisis in Asia, the national grid currently has excess capacity.

#### *A.1.2 Biomass Energy in Thailand*

##### *Biomass Resources and Biomass Industry Profile*

Thailand has abundant biomass resources. With a total potential of 28 million tons of biomass residues from bagasse, rice husk, palm oil wastes, and wood residues, the potential is estimated at nearly 3 GW of capacity (EC-ASEAN COGEN). Apart from this, there is a substantial amount of unexploited biomass resource potential that has not been accounted for, including logging wood residues, rice straw, sugar cane trash, coconut shells, and other residues. If these unexploited biomass residues are counted, the total potential of biomass resources and power generation capacity in the country will double.

Table 1 lists the available biomass residues, potential of power generation and power capacity in Thailand. The table also lists the number of mills above minimum threshold for which energy systems are appropriate for each biomass stream.

**Table 1. Biomass Resources Potential**

Sector	Residues (Kton/yr)	Potential Generation (GWh/yr)	Potential Capacity (MW)	No. of Mills (above minimum threshold)
Sugar industry	16,800	4,750	1,900	46
Rice mills	7,450	400	66	78
Wood industry	2,850	5,700	950	Data not available
Palm oil mills	950	350	69	15
Total	28,050	11,200	2,985	

Source: EC-ASEAN COGEN for NEPO/DANCED Joint Study, September 1998

As shown in Table 1, biomass processing in the industrial mills in Thailand produces a large

amount of residues. Currently, most of these residues are disposed of through open burning and dumping. A small portion is used as fuel for the mills' heat and power requirements in a very inefficient manner.

Table 1 shows four major biomass sectors in the country. The sugar and rice mills are mostly concentrated in the North and Northeast provinces of the country. Palm oil mills are found mostly in the Southern provinces. The Rubber wood industry is mostly found in the South; teak logs are highly concentrated in the Northern and Southern parts of the country; and Eucalyptus plantations in the Northeast provinces are also a potential source for wood wastes.

Rubber-wood residues is used here as an example to demonstrate the sustainability of the raw material and fuel supply. Less than 25% of the biomass in a rubber tree becomes final wood product, the rest is wood residues. Currently, the wood residues in the logging field and factories are either burned in the field or sold to local villagers to make charcoal and build houses. The lifetime of a rubber tree is 25 years and the wood residues are used as fuels only after the 25-year. Because of the commercial value of rubber plantation, the power plants will not cause deforestation. In addition, the Thai government provides financial aid to the farmers to replant new rubber trees every year from the Rubber Replanting Aid Fund, to ensure a sustainable supply.

### *Biomass Co-generation and Power Generation Technologies*

Compared to the abundant biomass resources in the country, the current installed capacity of biomass co-generation and power generation plants reach about 420 MW, among which only 125 MW export excess electric power to the grid. Bagasse co-generation accounted for most of these capacities. Almost all of these existing biomass co-generation plants in Thailand utilize small-scale, inefficient technologies, and provide the onsite power and steam needs for auto-consumption at the mills, under the non-firm contract with EGAT (see Section A.6 for details). Since most agro- and wood industries have excessive waste resources, the energy systems were designed to be cheap rather than efficient. Most of the existing biomass combustion systems in Thailand utilize low efficiency low-pressure boilers.

Although there are no efficient biomass power systems in operation in Thailand at this moment, commercially proven technologies are available in the international market for efficient production of power from major biomass resources – bagasse, wood waste, palm oil waste, and rice husk. The state-of-the-art modern technologies utilize efficient high-pressure boilers.

Currently, there is no local manufacturing capacity of high-pressure boilers in Thailand. Most of the equipment for a biomass co-generation or power plant needs to be imported. Therefore, the capital cost of a conventional biomass co-generation or power plant in Thailand is high (typically around \$1500/kW), much more than the average capital cost of a conventional coal-fired power plant (usually US\$1000/kW). Compared to a conventional fossil fuel power plant, although a biomass power/co-generation plant has much lower fuel cost but similar operation and maintenance (O&M) cost, the cost of electricity (in baht/kWh) of a biomass power plant is still much higher than that of a conventional fossil fuel power plant in Thailand. Annex 4 provides a detailed economic and financial analysis of a gas-fired power plant, and a biomass power plant with and without tariff and guarantee subsidies. Given the high market potential for biomass power and potential technical capacity within Thailand, many experts believe that, with a suitable government policy on power



pricing, the local boiler industry could take up the development and manufacturing of high-pressure biomass boilers, once the market and demand for efficient biomass power technology takes off.

### ***A.1.3 Barriers to Biomass Power Generation and Co-generation***

Due to considerable information, financing, market, and regulatory barriers to biomass co-generation and power development in Thailand, it remains on the margins of the energy sector. There is little experience with large-scale efficient biomass co-generation systems that sell surplus power to the grid under the firm contract. The key barriers seen as critical hindrances to the development of biomass co-generation and power generation in Thailand can be described as follows:

(a) *Lack of information and services provided to the potential biomass power and co-generation project developers.* There is no “one-stop-shop” in Thailand where potential biomass power project developers can obtain sufficient information as well as competent advisor services in matters related to the choice of technology, legal issues, preparation of agreements/contracts, financing, and etc. Since biomass power projects are new and not within the core business of wood and agro-industries, the potential investors usually do not have enough information related to the implementation of biomass power projects. In addition, the potential investors need a “honest broker” to provide services in conducting pre-feasibility studies and preparing agreements/contracts, to facilitate making an investment decision.

(b) *Limited regulatory framework to encourage biomass power projects.* Although the SPP scheme opened the window and provided the basic regulatory framework for biomass power projects to sell excess power to EGAT, the existing regulation did not provide an incentive in terms of the power buyback tariff favoring biomass projects. The DANCED/NEPO pricing policy study on renewable energy assessed the SPP scheme, identified areas for improvement, and proposed several financial incentive measures including renewable energy adder and investment subsidy. NEPO is currently planning to invite competitive bidding from SPPs, with a pilot period targeting at 300 MW of electricity from renewable energy to be connected to the grid, in particular biomass energy. The ENCON Fund will allocate 2.05 billion Baht to provide incentives in the form of subsidy per unit of power generated by renewable energy, initially for 5-7 years (see Section A.4 for details). As shown in the financial analysis in Annex 4, this financial incentive policy will greatly increase the financial viability of biomass power/co-generation projects in the future. However, further improvement in the regulatory framework to encourage biomass power/co-generation projects is still needed, particularly after the power sector deregulation in Thailand. Additional possible schemes for Thailand to adopt could include next-phase bidding procedure like the Non-Fossil Fuel Obligation (NFFO) approach, Renewable Energy Portfolio Standard (RPS) approach that requires a utility to have a minimum share of renewable energy in the power mix, and risk guarantee fund approach to buy down the risks for the biomass power SPPs at the initial stage.

(c) *Lack of appropriate financing mechanisms to support biomass co-generation/power projects.* It is difficult to obtain financing for biomass co-generation/power projects in Thailand. Financial institutions are not familiar with financing biomass co-generation/power

projects. Because of the perceived high risks, the financial institutions are cautious in lending to biomass co-generation projects. Biomass co-generation or power projects are often considered to be more risky partly because of the lack of confidence in the technology, and partly because of the insecure fuel supply. Based on the financial analysis in Annex 4, the financial return on biomass power projects is marginal, in addition to the high perceived risks. Under these circumstances, the financial institutions request for government support for the risk guarantee mechanism to share the high perceived risks of biomass power project, particularly at the initial development stage. The existing investment subsidy schemes usually require a long application and approval process, and are not sufficient for large-scale efficient biomass co-generation projects. In addition, the transaction costs for the project developers to deal and negotiate with the financial institutions are high for biomass power projects.

(d) *Uncertainties and Difficulties of Biomass Fuel Supply.* First, it is difficult to secure a long-term fuel supply contract with agro-based and wood industries. The sawmill owners/managers are reluctant to sign a 20-year fuel supply contract at a fixed price. The price of wood residues might increase in the future, as mill operators identify opportunities. Secondly, some other biomass fuels, such as bagasse, are only available during certain seasons, lack of secure and low-cost biomass fuel supply in the off-season is a major risk for grid-connected biomass power generation, under the firm contract with EGAT. In addition, it is also costly to collect biomass residues from the field, and transport them from the field to the plant.

(e) *Lack of successful models to demonstrate large-scale and efficient biomass co-generation/power systems and project development models under the firm contract.* By February 2000, there are about 20 biomass power/co-generation SPPs who signed power purchase contracts with EGAT. The total installed capacity of these SPPs reached 420 MW, among which only 125 MW sell the excess electricity to the grid. Most of these SPPs are non-firm contracts, with only three firm contracts. Two out of the three firm contracts changed from non-firm contracts to firm contracts in April 1999, and for the last the operation date is delayed to May 2000. Therefore, although there has been some experience with small-scale inefficient bagasse and rice husk co-generation systems, there has been limited successful experience utilizing large-scale efficient biomass co-generation/power systems that generate excess electric power for export to the grid under the firm contract. Exporting power requires more efficient co-generation technology reliant upon higher boiler pressure as well as more sophisticated power project development skills to deal with broader technical and contractual issues. The wood and agro-industries are conservative by nature. The owners and/or managers of these industries are experts in the processing of their products, but energy generation is beyond the scope of their core business and is not within their area of competence. In addition, the wood and agro-industries in Thailand are reluctant to take the risks of being the first to implement an efficient technology. Therefore, demonstrated, commercially successful experience with generation of surplus power and export to the grid is very limited in Thailand.

## **A.2 Previous Experiences and Lessons**

To this date, a number of renewable energy projects have been supported by multilateral and bilateral organizations in Thailand. Most of these projects have focused on establishing the technical performance of renewable energy systems. However, there has been little replication and limited sustainability. Previous efforts to promote biomass power technologies primarily emphasized supporting small-scale biomass co-generation projects. Future efforts must concentrate on the commercialization of renewable energy, if it is to become a viable option. This project primarily focuses on the commercialization of large-scale efficient biomass co-generation and power systems that generate excess power for sale to the grid. Apart from global environmental benefits, this project also has strong national benefits among which are reduced dependence on fuel import (75% of the current fuel consumption is imported), avoided local air pollution from field burning of wood wastes, and increased job opportunities at local community.

The EC-ASEAN COGEN Program, an economic cooperation program between European Commission (EC) and the Association of South East Asian Nations (ASEAN), and hosted by the Asian Institute of Technology (AIT) in Bangkok, has provided technical assistance and project financing to small-scale biomass co-generation demonstration projects in Thailand.

DANCED (Danish Cooperation for Environment and Development) and NEPO recently have finished a study on “Investigation of Pricing Incentives in a Renewable Energy Strategy”. The study elaborated the pricing mechanisms to promote renewable energy, assessed the level of pricing incentives, and made recommendations for pricing incentive policies to encourage biomass co-generation and off-grid solar photovoltaic development in Thailand.

The design of this project has drawn lessons learned from previous UNDP/GEF sponsored biomass projects. One of the most important lessons learned from the projects implemented to date is that long-term fuel-supply contracts – which is essential for project financing – is a tricky business in the biomass field. When biomass mill owners/managers discover that their waste can be sold, they may find many other profitable uses for it. In this project, the sawmill in Yala (Asia Plywood Co. Ltd.) and rice mill in Roi-Et (Sommai Rice Mill) are the stakeholders in the pilot plants, and they produce sufficient biomass wastes. These two mills are willing to sign a long-term fuel-supply contract to secure the supply of biomass fuels to the power plants. In addition, a comprehensive and detailed fuel supply availability study for the two pilot plants has been conducted. An Agro-Energy Company has been created between the project company and the fuel supply sources to secure a 21-year fuel supply contract with the other sawmills and rice mills in the neighborhood of the power plants. Therefore, the issue of ensuring biomass supply and availability has assumed a prominent role in the pilot plants. The One-Stop Clearing House to be established under this project will also help other developers to conduct fuel supply availability studies and propose measures to mitigate the fuel supply risk for the future potential biomass power projects.

Another important lesson is the importance of an appropriate level of power purchase price in the PPA to ensure the financial viability of the biomass power plants. As mentioned earlier, NEPO is currently planning to provide power purchase pricing subsidy to renewable energy connected to the grid from the ENCON Fund for up to 300 MW capacity, in particular biomass energy. In addition, the activities under Immediate Objective 2 of this project are also designed to address this issue.

### A.3 Development Objective

The project is related to the following development objective:

<p><b>Development objective:</b> Reduction of the potential adverse social, environmental and economic consequences of global climate change caused by GHG from combustion of fossil fuels through removal of the major barriers to the development of biomass co-generation and power generation in Thailand.</p>	<p><b>Indicators:</b> 1. The amount of net GHG emissions from energy sector in Thailand is reduced compared to baseline situation (conventional fuel) by project end. 2. Planning/implementation of new biomass power projects have increased by project end.</p>	<p><b>Verifiers:</b> 1. Calculation of GHG emissions level and development 2. Measurement of number and size of plants.</p>
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Apart from this, the project should also assist in reducing the country’s dependence on fuel imports, avoiding local air pollution and health hazards, and creating domestic job opportunities. In this manner, the primary focus on environmental issues is closely linked to a secondary project focus on poverty eradication and sustainable livelihoods through generation of employment opportunities.”

### A.4 National Strategy to Achieve the Development Objective

Both the 5-year National Plan and the 5-year Environmental Quality Management Plan have incorporated climate change issues into the social and economic development plans. The National Committee on Climate Change has played an important role by drawing up a national strategy to address climate change issues. The Climate Change Expert Committee has been established to provide technical recommendations to the Committee. Thailand ratified the United Nations Framework Convention on Climate Change (UNFCCC) on 28 December 1994.

To address climate change problems, Thailand has adopted a “win-win” policy in the choice of options to mitigate GHG emissions. “Win-win” options are those that are least economic cost and would normally be chosen solely on the basis of national interest. In addition, these measures also result in global environmental benefits. International and regional cooperation under the Framework Convention of Climate Change is another fundamental policy in the country. In this regard, Thailand has hosted several AJJ projects and has participated actively in research and development on climate change issues with other countries. It has also contributed to the CDM development process, both regionally and internationally.

In 1997, the energy mix in Thailand was as following: 42% oil, 26% renewable energy, 17% natural gas, 3% coal, and 3% purchased electricity. Although the percentage of renewable energy, primarily wood, charcoal, bagasses, and rice husk, is quite high, it is mainly used for rural household cooking and food industry. Among the total installed capacity of electricity power of 18 GW, however, the contribution of the biomass energy is still quite limited. Thailand has developed four major energy policies: 1) searching for reliable, cost effective, and good quality energy sources that are adequate to the country needs; 2) promoting efficient use of

energy; 3) increasing roles and competition of private sectors in the energy business; and 4) reducing environmental damages from energy production and consumption.

In the electricity sector, two measures have been set up in order to implement the national energy policies. First, environmentally friendly electric power technologies will be promoted. Secondly, purchase of power from IPP and SPP has been promoted, including purchasing hydropower electricity from Lao PDR. This will increase competition and efficiency of the power sector as well as increase energy efficiency. The government investment will be reduced and the consumers will get better services and higher electricity quality. To promote biomass power/co-generation technologies, the National Energy Policy Council has approved a policy that allow SPP to generate and supply electricity by using biomass fuels, other renewable energy sources and co-generation, and has drawn up the regulations for the purchase of electricity from SPP. The electricity generation from renewable energy will help reduce the financial burden of Government investment in electricity generation and distribution.

The policy on the restructuring and privatization of the electricity supply industry of Thailand to promote competition and private sector participation is ongoing. A cabinet resolution of 1 September 1998 gave consent to the Master Plan for State Enterprise Sector Reform, which will serve as a framework in determining the scope and direction of restructuring and privatization of four main economic sectors, including the energy sector.

In 1992, the Energy Conservation Promotion Act was put into force to be the Government instrument in determining regulatory measures and promoting efficient use of energy. Under the Act, the ENCON Fund was established as a working capital to provide financial grants or support to energy conservation-related activities. The ENCON Fund Committee will recommend guidelines, criteria, conditions, and priorities of Fund utilization, as well as consider Fund allocation in line with the stipulated guidelines.

Following Phase 1 of the ENCON Program, NEPO carried out carried out studies in order to establish implementation strategies for Phase 2 (2000-2004). With support from DANCED, a study was carried out in 1998 on determination of purchasing prices for power generated by renewable energy. DANCED recommended a subsidy for production as this method will help accelerate the change of technology used, from the current low-efficiency system to a high-efficiency one, to convert energy to electricity. Promotion of renewable energy utilization will be beneficial to the environment as well as the society. Compared with power generated by fossil fuel, the value of these benefits equals to 0.6 baht/kWh; two-third of this is the social benefit creating more labor employment in the locality. DANCED was of the opinion that the subsidy could be included in the power purchasing price in order to promote the use of renewable energy. Also, in order to ensure financial sources for such projects, DANCED suggested a solution by providing the subsidy at a higher level during the first 2-3 years.

Support for the development of biomass energy projects comes from two main sources: the program developed for the implementation of the Energy Conservation Act and the SPP scheme for supply of power to the grid. These incentives and promotion have been included in the Voluntary Program of the ENCON Fund for more than five years. A better incentive and strategy

to achieve the national development objective in the next five-year plan have been laid out to accelerate the biomass power generation.

To promote the commercial development of renewable energy generation in Thailand, under Phase 2 of the ENCON Program (2000-2004), a project – “Promotion of Small Power Producers Using Renewable Energy” – has been developed by NEPO under the Voluntary Program to accelerate the utilization of renewable and indigenous energy to supply power to the national grid, in particular biomass energy.

Under the new project, the ENCON Fund will allocate 2.05 billion baht (US\$54 million) to provide incentives in the form of subsidy per unit of power generated from renewable energy, in particular biomass. Such incentives will subsidize the purchasing price on top of EGAT’s purchasing price from SPP under the present SPP regulations. In order to implement this project, NEPO will use a competitive bidding procedure by issuing a Request for Proposals up to 300 MW of power purchase from SPPs using renewable energy during the period 2000 to 2004. The maximum level of the incentives provided to renewable energy generation, derived from the DANCED/NEPO study, will allow an additional tariff rate of 0.60 baht/kWh above the avoided costs, which is estimated as the additional benefits that renewable energy provides to the society. Activities of the NEPO project will be to 1) review the present regulations and status of electric power generation from renewable energy by SPPs; 2) develop a Request for Proposals and Bidding Evaluation Method; and 3) evaluate and select SPPs to be subsidized by the ENCON Fund. This project will complement the national strategy to promote the commercial development of biomass energy generation in Thailand.

In June 2000 NEPO announced the project on potential Government subsidy for SPPs using renewable energy. Request for Proposal tender packs were made available to interested parties in September 2000. Applicants would have 3 months from the announcement of the packs to complete and submit their proposal. The ENCON Fund committee is to announce the results of the competition around the end of March 2001.

## **A.5 Beneficiaries**

The main beneficiaries of this project are:

Global Environment: This project has global environmental benefits from the reduced GHG emissions, thereby mitigated global climate change impacts, particularly in small island nations and coastal areas.

Local Environment: Uncontrolled emissions and health hazards from field burning of biomass are avoided by plant incineration.

Groups Unemployed or Without Livelihoods: The biomass power projects will have social benefits for the local communities by providing more employment opportunities and additional income sources in the local communities where the biomass facilities are located.

The Thai Nation: About 75% of the fuel consumption in Thailand is imported, while only 25% is indigenous. This project can reduce fossil fuel import in Thailand and generate income to invest in environmentally friendly and indigenous fuels.

Private Sector (IPPs and biomass industry): The future private sector investment and development of biomass power and co-generation projects in Thailand will benefit from this project by increased access to investment information, improved power purchase tariff structure, increased access to commercial financing, successful demonstration of the pilot plants, and increased public awareness and support to biomass power/co-generation.

One-Stop Clearing House for Biomass Co-generation and Power Generation in Thailand: This project will provide essential funding and build capacities to set up a “One-Stop Clearing House”, which will provide the valuable information and services to the private project developers, NEPO and other stakeholders within the sector.

National Energy Planning Office (NEPO): This project will conduct studies and propose specific recommendations of financial incentive policies for biomass co-generation for NEPO. It will also provide capacity building for NEPO to improve its policy formulation capacities and facilitate policy dialogue between government agencies, private sector, and the Cabinet. This project will promote and support NEPO’s renewable energy policy, and complement NEPO’s existing activities and projects in the biomass energy field.

Yala Green Company and Roi-Et Green Company: These two power companies are established to own and operate the parawood residue power plant in Yala and the rice husk power plant in Roi-Et as the first pilot plants of biomass power generation in Thailand. As requested by JBIC, EGCO and EPDC will set up a Special Purpose Vehicle (SPV) as the holding company to receive JBIC’s loan. The SPV will then provide the loans to the power companies, with shareholders from Asia Plywood Co. Ltd. and Sommai Rice Mill. UNDP/GEF will pay directly to the power companies up to 50% of the risk guarantee fees as contingent financing for the two pilot plants. This project will facilitate the investment and reduce perceived risks for the pilot plants.

Industrial Finance Corporation of Thailand (IFCT): This project will help IFCT establish a specialized core unit for biomass power financing and build capacity for IFCT. It will also help generate a pipeline of bankable biomass co-generation projects for IFCT and other participating financial institutions. These project activities will help IFCT to be familiar and confident with biomass projects and increase their lending to such projects in Thailand.

Other Financial Institutions: This project will select a number of major financial institutions to participate in workshops, and study tours will be organized for senior managers of these participating financial institutions. The purpose is to increase familiarity and confidence with biomass power projects and increase lending to biomass power projects in Thailand.

## **A.6 Regulatory Framework**

The utility regulations with regard to power purchase from renewable power producers in Thailand are relatively advanced. Under the guidance of NEPO, EGAT has established regulations to purchase power from SPPs (power producers under 90 MW). The power purchase price of SPPs is

based on the avoided cost of EGAT. SPP schemes include non-firm contract and firm contracts. Non-firm contracts are offered for less than a five-year period, and do not require contracted demand, but they do not offer any capacity payment. They calculate energy payments to cover O&M and fuel costs. This type of contract is primarily for small-scale biomass co-generation projects, which generate electricity mainly for auto-consumption in the mills. It is presently the most common type of contract between EGAT and biomass power producers.

Firm contracts are offered for more than five years (typically for a 20-year contract period), and must specify contract demand. However, they can offer both capacity and energy payment. The capacity and energy payments for SPPs are classified into three categories: gas, oil, and coal. Biomass projects are classified under the same category as oil, and the fuel charge of biomass fuels is adjusted with international oil market prices. This has created an uncertainty for biomass power projects, as the risk related to the world market oil prices is transferred to the biomass power project. An additional constraint is posed by the fact that the SPPs must operate not less than 7,008 hours per year (80% plant availability) for fossil fuel based power generation, or 4,672 hours for renewable-based, during the system peak months (Mar-Jun, Sept, Oct). Furthermore, renewable energy SPPs may use up to 25% of fossil fuels.

## **A.7 National Resources**

Because large-scale biomass co-generation projects are still underdeveloped in Thailand, the country has limited national human resources and experience in technical aspects, policy formulation, and financing mechanisms to develop biomass power and co-generation projects. This project will address these issues by building in-country capacity to provide information and services, improve the regulatory framework, and create easier access to commercial financing for biomass power and co-generation projects.

## **B. PROJECT STRATEGY FOR USE OF UNDP RESOURCES**

### **B.1 Project Linkage to the UNDP Mandate**

Globally UNDP aims at building capacity for sustainable human development within its programme countries while ensuring national ownership of development goals, strategies, policies and programmes at all levels. UNDP's mission is defined in the five key focus areas of poverty eradication, good governance, sustainable livelihoods, the advancement of women and the sustainable management of environmental resources. UNDP is an implementing agency of the Global Environment Facility (GEF) which is a special-purpose fund that helps countries to translate global environmental concerns into national action.

It is recognized that energy issues relate to all five UNDP key focus areas, and that energy programmes and projects can be used as an instrument for sustainable human development. UNDP's policy in the area of renewable energy is based on the fact that traditional approaches to energy often make energy a barrier to socio-economic development and lack sustainability. Through promotion of renewable energy, the energy sector can become an important instrument



for poverty elimination, regenerating the environment, employment creation and the promotion of sustainable livelihoods (with increasing labor productivity), and the advancement of women.

The means for supporting sustainable human development must be consistent with the preservation and enhancement of the local, regional, and global environment. Within the United Nations Framework Convention for Climate Change (UNFCCC), UNDP/GEF seek ways to support low-carbon emission development paths, one being to remove barriers to renewable energy technology and thus to promote its sustainability. UNDP/GEF are exploring opportunities that would enhance national capacities to make promising renewable energy technology available and commercially viable in the country.

Though it is not included as an independent thematic area in the present Country Cooperation Framework for Thailand (1997-2001), environment is an important area, which receives strong support from UNDP. Numerous UNDP projects are carried out in the environmental area supported mainly by UNDP, GEF and the Multilateral Fund. According to national regulation, environmental activities financially supported by GEF are to be coordinated by the national GEF Focal Point, Office of Environmental Policy and Planning (OEPP). The project responds to an official request from OEPP for assistance to support the national priorities as mentioned in A.4.

This project addresses the need to find sustainable energy paths to meet the growing energy demand that use renewable energy in place of expansion of fossil fuel-based electricity generation. The project will facilitate the widespread sustainable use of low-carbon renewable energy-based electricity technologies to meet electricity needs in Thailand. It will significantly reduce the growth in GHG emissions that would otherwise result from fossil fuel based energy systems, and avoid the local health and environmental hazards from the use of fossil fuels, as well as avoiding local air pollution from field burning of biomass waste. The project is targeted to accelerate the use of indigenous and renewable energy sources in Thailand, to reduce the country's heavy dependence on fuel imports, and create job opportunities at local community. All these are consistent with UNDP's focus areas and overall mandate of sustainable human development. An overview of the environmental consequences of the project is presented in Annex 5.

The success of this project will demonstrate the technical and commercial viability of biomass power systems, and thereby would have a wide replication potential throughout Southeast Asia and the world.

UNDP stresses national execution and sustainability of projects and programmes, which means that the development process and positive outcomes should continue beyond the period of direct financial support. This includes a focus on the establishment of the capacity within developing countries to produce and manage the technologies that can support sustainable human development. This project is explicitly designed to establish a sustainable in-country capacity to provide information and services, and create easier access to financing for potential biomass power investors. It will also help improve the regulatory framework to provide financial incentives to biomass power and co-generation projects. All project components are coordinated with and complementary to national plans and priorities, and carried out under national execution.

## **B.2 Need for UNDP Intervention**

Thailand's increasing consumption of fossil fuels, and consequently, a growing dependence on fuel imports poses one of the major challenges facing the Thai Government. In addition, since the energy sector is a major source of GHG emissions in Thailand, increasing dependence on fossil fuels will result in rapid growth in GHG emissions.

The recently completed UNDP/GEF project – Asia Least-Cost GHG Abatement Strategy (ALGAS) – highlighted the important role the energy sector can play in reducing future GHG emissions in Thailand, and the need to accelerate the use of renewable energy sources in the country. Under the ALGAS project, the Government and Thailand has identified biomass fuels as the most promising source of renewable energy, and biomass co-generation technologies as a priority area in the GHG abatement strategies in Thailand. However, because of the existence of the above-mentioned barriers, there is little experience with large-scale biomass power and co-generation projects (>10 MW) which export excess electric power to the grid in Thailand to date.

Thailand signed the UNFCCC on 28 December 1994. The Government of Thailand has officially requested for UNDP/GEF funding and listed this project as a priority in Thailand to support and assist in the implementation of its policy on the promotion of biomass power generation and co-generation to substitute imported fossil fuels. Therefore, this project aims to remove these barriers to biomass co-generation and power generation in Thailand.

## **B.3 Project Description**

This project strategy involves removing the barriers to biomass power and co-generation in Thailand, reducing the risks for two pilot plants awaiting implementation, and monitoring those plants to provide lessons for dissemination and encouragement to the widespread adoption of biomass power in Thailand and neighboring countries.

Experiences to date, project-preparation activities, and previous studies have identified the various barriers preventing biomass electricity from playing a major role in the energy sector of Thailand, as listed in Section A.1.3. Setting up and building capacity for a One-Stop Clearing House (Immediate Objective 1) is targeted to remove the information barriers encountered in attempting to develop biomass power plants. Improving regulatory framework to encourage biomass power/co-generation (Immediate Objective 2) has been designed to strengthen the policies for biomass power to remove the policy barriers. Increasing access to commercial financing for biomass power projects (Immediate Objective 3) is intended to remove the financing barriers. Finally, supporting the Yala and Roi-Et pilot plants (Immediate Objective 4) is designed to assist in the reduction of the risks for the initial biomass power plants thereby providing successful models for expanded future biomass power development in the country and throughout the region by removing financing barriers and the barrier of lack of successful models.

The One-Stop Clearing House for biomass power generation and co-generation in Thailand to be set up under this project is a strategic one-stop shop that can provide professional information and services to all aspects of inquiries and requests related to biomass power and co-generation development in Thailand. It will be set up as an independent non-profit economic entity. Its mission is to promote a wide replication of large-scale grid-connected efficient biomass power

and co-generation development in Thailand. There should remain a close link with NEPO by appointing a senior NEPO official to the Board of Directors of the Clearing House. Other members of the Board could come from DEDP, EGAT, OEPP, FTI, and financial institutions. The Clearing House will be located at NEPO's premises at the initial stage, but administratively and financially independent from NEPO. It should be seen as a separate business-oriented and privately run organization, but can also play an important role to influence policy changes at national level.

The One-Stop Clearing House will consist of four cells: 1) Information and Outreach Cell; 2) Technical Service Cell; 3) Policy Cell; and 4) Financing Service Cell. The services include information provision and public awareness campaigns, technical information and assistance, financing advisory services, and policy facilitation/advice. The potential clients to the Clearing House cover all categories: government and public sectors, private power producers and investors, and equipment suppliers. The Clearing House should contribute to promotion and support of NEPO's renewable energy policies, and complement NEPO's existing activities and projects in the biomass energy field. Please see Annex 1 for the TORs of the director and staff of the Clearing House.

The project will provide financing to cover most of the costs for the Clearing House for the first five years. However, the Technical Service Cell under the Clearing House will be supported by a separate DANCED project with an estimated budget of DKK 8.06 million. NEPO will provide an in-kind contribution of office space and some officer supplies for the Clearing House. The Clearing House should become financially self-sustaining after five years. The experience in Thailand (such as COGEN program) and in other countries has shown that financial sustainability is achievable, if high quality of service has been provided, a good reputation has been built up among clients, a well-established network has been set up, and the management can steer the organization in the right direction. The lessons learned from existing institutions demonstrated that it is crucial to operate the Clearing House as an independent business-oriented organization, rather than running it as another government bureaucracy, to ensure its financial sustainability. This project will build capacity for the Clearing House to provide sufficient information and high-quality services under Immediate Objective 1 as specified in TOR for Subcontract 2.

Annex 4 gives a preliminary financial analysis of the projected incomes and expenses of the Clearing House. Incomes generated from the four cells will contribute to the financial sustainability of the Clearing House. The financial analysis concluded that the financial sustainability of the Clearing House after five years is feasible, but it will heavily depend on the entrepreneurship of the director and the staff as well as quality of services provided. In addition, this project has also allocated budget under Output 1.2 to further draw the experience and lessons learned from other similar institutions, prepare detailed financial analysis for the Clearing House including the income-generating sources, develop marketing strategy, and widely advertise the Clearing House, to ensure its financial self-sustaining (Please see TOR of Subcontract 1).

It is planned that a DANCED-funded project entitled "Technical Service Cell on Biomass Utilisation for Power Production and Renewable Energy Information Centre" will be undertaking the tasks related to the Technical Service Cell. A smaller component of the

DANCED project will assist NEPO to set up a renewable energy information center. It is essential that the Technical Service Cell promote the most appropriate technology and equipment available from around the world, not only technology and equipment from particular countries or regions. From DANCED's final draft project document dated November 2000, the following information on objectives and outputs is available at this stage:

*Overall Objective*

Reduced environmentally harmful GHG emissions from combustion of imported fossil fuels by efficient utilisation of indigenous resources of biomass and municipal waste, thereby also reduced import expenditures for fossil fuels, higher labour employment, poverty alleviation and more sustainable local livelihoods.

*Immediate Objectives (for Technical Service Cell activities only)*

Technical Service Cell as a component of the One-Stop Clearing House provides relevant and useful technical services on biomass utilisation for power production to potential biomass power developers and other players in the biomass area.

Thai industrial production of components and equipment for biomass fuelled power plants, such as biomass feeding systems and boilers, is strengthened.

*Outputs (for Technical Service Cell activities only)*

1. Technical Service Cell established within a One-Stop Clearing House on biomass utilisation for power and CHP production.
2. Manager and other local staff trained to fulfil obligations of Technical Service Cell.
3. Network of Thai expertise (institutes, organisations and private companies) in technical aspects of biomass utilisation for electricity production established.
4. Provision of Technical Services.
5. Contacts established between relevant Thai industries and foreign (e.g. Danish) manufacturers of components and equipment for biomass fuelled power plants. Local production of plant components, e.g. biomass feeding systems and boilers, established.
6. Bilateral knowledge exchange, incl. study tour to Denmark.

The DANCED project should be seen as an integrated component of the UNDP/GEF project. Hence, the design and timing of activities under the two projects should be closely coordinated. During implementation it is essential that maximum communication and cooperation between the projects be ensured. More information on the DANCED project is available in the project document, which is enclosed to this document (Annex 6).

The second immediate objective of this project is to improve the regulatory framework to encourage biomass power and co-generation in Thailand. This objective will be achieved by working closely with NEPO and complementing NEPO's existing biomass energy activities and projects. The component will evaluate different renewable energy policy schemes and recommend an appropriate one for Thailand. It will help NEPO and EGAT to develop an appropriate power tariff level for biomass power projects, after accumulating experience and data from NEPO's bidding process for up to 300 MW. It will help improve SPP regulations, and

recommend specific policy measures to encourage renewable energy after the power sector reform. It will also assess the permit process and recommend improvement measures to simplify the tedious permit procedures. Then, this project will help draft a policy framework, in particular financial incentive policies, to encourage biomass power development in Thailand. Finally, the Policy Cell under the Clearing House will conduct policy advocacy and policy dialogue between the government, private sector, and utility to reach consensus among the key stakeholders to facilitate approval of the draft regulation.

The third immediate objective of this project is to increase access to financing for biomass power developers. As mentioned in Section A.1.3 and shown in the financial analysis in Annex 4, major barriers to financing biomass power projects are the perceived high risks from the financial institutions and the real risks of insecure fuel supply issues, as well as the high transaction costs in dealing and negotiating with financial institutions. This project intends to remove these financing barriers by building capacities for financial institutions to reduce the perceived risks (Output 3.1-3.3), conducting a feasibility study to set up a risk/credit guarantee fund to reduce the real fuel supply risks (Output 3.4); and facilitating financing for biomass power developers to reduce the high transaction costs (Output 3.5-3.6). It will create and build capacity for a special unit under IFCT to specifically handle financing for biomass power projects, and increase confidence of a number of major financial institutions in biomass power co-generation technologies by organising workshops and study tours. It will conduct a feasibility study to set up a risk/credit guarantee fund by the government to provide fuel supply guarantee to share and reduce the fuel supply risks to the financial institutions. It will also generate a pipeline of a number of bankable projects, and help facilitate financing between the project developers and financial institutions for the identified projects through the Financing Cell under the Clearing House.

These activities together will improve the regulatory, institutional, and financing framework to promote biomass power and co-generation in Thailand. On top of that, this project will also provide contingent financing to support two pilot plants – the parawood residue power plant in Yala and the rice husk power plant in Roi-Et – as a show case to demonstrate the technical and financial viability of large-scale grid-connected efficient biomass power and co-generation technologies in Thailand. These two pilot plants are the first efforts in Thailand to utilize efficient combustion technology and to generate electricity for export to the grid with project financing under a long-term, firm contract with EGAT. The success of these two pilot plants can reduce future perceived technology risks, demonstrate project development and project financing model, increase the confidence and awareness of industry, financiers and general public in biomass power technologies, thereby ease the development of future biomass power and co-generation projects in Thailand. The successful experience and lessons learned from the Yala and Roi-Et pilot plants will be promoted and disseminated through the Information and Outreach Cell under the Clearing House.

The combined effects of these activities will be to “jump-start” biomass power and co-generation in Thailand by removing barriers, reducing initial technological risks to the investment in pilot plants, and promoting successful project replication through demonstration and dissemination of lessons learned. This project strategy is designed to support and complement the national strategy to promote biomass power and co-generation in Thailand described in Section A.4.

EGCO initially proposed this project and requested for UNDP/GEF funding for the Yala pilot plant through the GEF Government Focal Point (OEPP), and the Government of Thailand has identified the Yala plant as a priority project and officially requested for UNDP/GEF funding to support the Yala plant in late 1998. As requested by the Government of Thailand, UNDP/GEF sent missions to Thailand in February and August 1999 to help the Government to formulate a UNDP/GEF project brief. After a series of wide consultation with all the major stakeholders in Thailand, these project activities were formulated by September 1999. The project brief was officially endorsed by the Government of Thailand by the end of September 1999 and approved by GEF Council in December 1999.

These two pilot plants will be the first efforts in Thailand to utilize efficient combustion technology and to generate excess electricity for export to the grid with project financing under a long-term, firm-contract with EGAT. The parawood residue Pilot Plant at Yala is proposed to have a total installed capacity of 22 MW, while the rice husk Pilot Plant is planned to have a total installed capacity of 10 MW. The total capital investment cost for both Pilot Plants is estimated to be around US\$45 million, among which US\$15 million will be equity investment from EGCO, EPDC, Asia Plywood Co. Ltd, and Sommai Rice Mill; and US\$30 million will be loans from JBIC.

EGCO is the first and largest independent power producer (IPP) in Thailand. EGCO was established in 1992, as a partial privatization of EGAT. It is a solid power company in Thailand with excellent credit ranking, and it knows the power business extremely well. EGCO has an installed capacity of 2 GW, out of a total installed capacity of 18 GW in Thailand. A majority of the stakeholders in the biomass energy field in Thailand, including government agencies, private sector, and financial institutions, are very supportive of choosing Yala and Roi-Et pilot plants as demonstration plants under this project.

In addition to demonstrate the technical and financial viability of biomass power/co-generation technologies, the two pilot plants will also demonstrate the project development model of IPP-led institutional framework to develop biomass power projects in Thailand. As mentioned in Section A.1.3, energy generation is traditionally not within the core business and area of competence of biomass industry in Thailand. The industry is not familiar with the sophisticated power project development skills to deal with the complexity of technical and contractual issues involved in implementing such projects. In addition, the credit of most biomass mills is poor in Thailand. The financial institutions are unlikely to provide project financing to the biomass industry for a biomass power plant, due to the poor credit, low power business development and management skills, and high perceived risks, at least at the initial development stage. Because of these reasons, the Asia Plywood Co. Ltd. and Sommai Rice Mill invited EGCO to set up a joint-venture project company, to bring in the power project development and management expertise, excellent credit, and strong capital investment and financing from EGCO to make the pilot plants happen. Thus, this project development model should be promoted in Thailand, at least at the initial development stage. With the accumulation of experience, expertise, and credit of biomass power projects by biomass industry, the biomass power projects may be gradually developed within biomass industry itself, as in some other countries.

Because these pilot plants are the first of their kind in Thailand, the project investors and financial institutions are assuming a risk that is greater than that encountered for more conventional investments. JBIC, as a lender, requested a risk guarantee from a local financial institution to secure

the loan, and EGCO to secure the fuel supply risk. Therefore, the local financial institution will charge around 2% of the outstanding loan amount per semi-annually for the cost of guarantee fees and EGCO will charge another 1-1.5% for the cost of fuel supply guarantee fees. The cost of this guarantee fee will not only cover credit and currency risks, but also more importantly, the incremental risks resulting from the new technology.

UNDP/GEF will provide funding to cover the incremental risks associated with this first deployment of this technology in Thailand. This project will pay up to 50% of the cost of the guarantee premium, or that portion of the total attributable to the adoption of this novel technology. It will thereby facilitate the investment, ensuring the effectiveness of the associated loans from JBIC. In this case, JBIC financing and private sector investment would cover the bulk of investment costs for the two pilot plants. GEF funding will help to cover the increased initial transaction costs to share part of the perceived technology performance risk through contingent financing arrangements. This activity will directly address the financing barrier listed in Section A.1.3 – the lack of financing and high perceived risks for biomass power projects. The success of the pilot plants will demonstrate the technical and commercial viability of large-scale efficient biomass power plants. It will therefore ease the development of future biomass power and co-generation projects in Thailand and reduce future perceived technology risks.

This project is a model for GEF funding to test the contingent financing mechanism to support renewable energy development, and build a strategic partnership with JBIC to co-fund in projects with global environmental benefits. It will have a large replication potential in Thailand and the world.

## **B.4 Expected Outcome**

This project, in complement with a series of initiatives from the Government of Thailand, will build and transform the market to accelerate a large-scale replication of biomass power/co-generation projects in Thailand by removing the information, policy, and financing barriers. By the end of the project, biomass power and co-generation technologies are expected to have lower technology risks, higher power tariff, and thereby higher financial returns.

As a consequence of this project, the two biomass power pilot plants could lead to a reduction of 62,000 tons of carbon per year by replacing new coal-fired power plants. Given the total potential of biomass power capacity of 3 GW in Thailand, using biomass power to replace fossil fuels could potentially reduce GHG emissions by 4.2 million tons of carbon per year.

Specifically, the expected project outcomes would be as following:

1. Increased information and services available to potential biomass power/co-generation investors.
  - 1) The Information and Outreach Cell in the Clearing House can provide sufficient information and database on biomass power/co-generation technologies, biomass resource potential and distribution, equipment suppliers, as well as government regulations and permit requirement to potential investors.

- 2) Through the Information and Outreach Cell, the potential investors, financiers, government officials, and general public will have an increased awareness and confidence in biomass power and co-generation technologies through workshops, seminars, and study tours to the successful demonstration plants to learn the experience and lessons within and outside Thailand.
  - 3) The Technical Service Cell will provide technical advisory services, including technical feasibility study, fuel supply availability feasibility study, and technical trouble shooting service, to potential developers.
  - 4) The Financing Service Cell will provide information on financing sources and potential biomass power/co-generation projects to potential investors within and outside Thailand.
  - 5) The Financing Service Cell can provide competent advisory services to conduct financial feasibility studies, prepare agreements and contracts, and arrange project financing package to potential investors.
2. Improved regulatory framework for biomass power/co-generation projects.
    - 1) Specific proposal on financial incentive policies for biomass power and co-generation projects will be recommended.
    - 2) The Policy Cell in the Clearing House will conduct policy advocacy and policy dialogue between the government, private sector, and utility.
    - 3) The Policy Cell in the Clearing House will promote NEPO's renewable energy policy, and conduct policy study and recommendations for NEPO.
    - 4) The Policy Cell in the Clearing House will complement NEPO's existing biomass energy activities and projects.
    - 5) The power purchase price from the biomass power producers is expected to increase, and thereby resulting in higher financial return of biomass power project.
  3. Increased access to financing for biomass power and co-generation projects.
    - 1) A specialized core unit for biomass power financing is set up within IFCT
    - 2) IFCT staff will have increased capacity to evaluate biomass power projects and improved lending guidelines.
    - 3) The major financial institutions in Thailand will have increased confidence in biomass power/co-generation technologies
    - 4) A feasibility study to set up a risk/credit guarantee fund to provide fuel supply guarantee will be conducted.
    - 5) A pipeline of bankable biomass power and co-generation projects will be generated.
    - 6) The financing advisor under the Financing Cell in the Clearing House will play a central role to facilitate financing for the identified pipeline, and make a deal happen for the potential investors by presenting bankable proposals to the financial institutions.
    - 7) The financing advisor in the Clearing House will seek bilateral and multilateral concessional financing and international IPP investment for local biomass power developers.
  4. Successful demonstration of the pilot plants.
    - 1) The success of the pilot plants will demonstrate the technical and commercial viability of biomass power plants in Thailand and Southeast Asia.



- 2) The success of the pilot plants will demonstrate the power project development model and process for other potential IPPs and biomass industry owners/managers.
  - 3) The success of the pilot plants will increase the confidence of the potential investors and financiers in biomass power projects.
  - 4) The success of the pilot plants will reduce future perceived technology risks associated with biomass power and co-generation technologies in Thailand and Southeast Asia.
  - 5) The success of the pilot plants will become a show case for the Clearing House to promote and disseminate experience and lessons learned in Thailand.
5. A large-scale of replication of biomass power and co-generation projects in Thailand as a result of the lower risks, higher power tariff, and hence, higher financial return of biomass power projects benefited from the barrier-removal activities.

## C. IMMEDIATE OBJECTIVES, OUTPUTS, INDICATORS AND ACTIVITIES

### C. 1 Immediate Objective 1:

<p><b>Immediate Objective 1:</b> To (build capacity to) provide relevant and useful information and services to potential biomass power developers and other players in the biomass area.</p>	<p><b>Indicators:</b> 1.1 A large proportion of the potential developers is requesting information and other services from the Clearing House. 1.2 Other clients than developers, such as government organizations and donors, are requesting services from the Clearing House 1.3 The information provided by the Clearing House is relevant and useful for the customers.</p>	<p><b>Verifiers:</b> 1.1 Record requests and serviced provided yearly 1.2 Record requests and services provided yearly 1.3 Yearly determine % satisfied according to customers evaluation form</p>
<p><b>Output 1.1:</b> Clearing House and Board of Directors established.</p> <p><b>Activities:</b> 1.1.1 Formulate institutional arrangement and structure of the Clearing House. It will put together under a single management an operating unit responsible for the services to be provided by the four cells: (1) Information and Outreach Cell; (2) Technical Service Cell; (3) Financing Service Cell; and (4) Policy Cell. 1.1.2 Prepare and ensure approval of the Special Act legal document to define the legal status of the Clearing House as an independent non-profit economic entity.</p>	<p><b>Indicators:</b> 1.1.1 All staff of the Clearing House is recruited within 6 months of project start. 1.1.2 The Board of Directors has had first meeting within 9 months of project start. 1.1.3 Information and services on biomass power/cogen available</p>	<p><b>Verifiers:</b> 1.1.1 Contracts 1.1.2 Minutes of meeting 1.1.3 Record of requests and services</p>

- 1.1.3 Recruit the Director, Senior Information Officer, Information Assistant, Senior Policy Analyst, Senior Financing Advisor, Financing Assistants, and Executive Secretary for the Clearing House.
- 1.1.4 Establish the Board of Directors for the Clearing House.
- 1.1.5 NEPO advise office location for the Clearing House.
- 1.1.6 Equip office for the Clearing House.

for customers within 6 months of project start.

<p><b>Output 1.2:</b> A financial analysis prepared and a business plan prepared and implemented to ensure sound economy and sustainability of the Clearing House.</p> <p><i>Activities:</i></p> <p>1.2.1 Draw experience and lessons learned from the similar institutions set up within and outside Thailand in the past.</p> <p>1.2.2 Draft the mandate, mission statement, and operation guidelines for the Clearing House.</p> <p>1.2.3 Identify income-generating sources and develop a detailed financial analysis and plan for the “Clearing House”, to ensure its financial sustainability. The preliminary financial analysis in Annex 4 should be used as base.</p> <p>1.2.4 Develop marketing strategies and network within the biomass and power industry.</p> <p>1.2.5 Widely advertise and promote the Clearing House within Thailand through news media, and development and dissemination of promotion material.</p>	<p><i>Indicators:</i></p> <p>1.2.1 A detailed financial analysis and a business plan for the Clearing House prepared within 6 months of project start.</p> <p>1.2.2 The Clearing House becomes financially self-sustaining by the end of the project.</p>	<p><i>Verifiers:</i></p> <p>1.2.1 Documents</p> <p>1.2.2 Yearly statement of income and expenses to be produced</p>
<p><b>Output 1.3 :</b> Information management and documentation capabilities of the Information and Outreach Cell established.</p> <p><i>Activities:</i></p> <p>1.3.1 Provide training in internet capabilities, database management, and documentation capabilities for Clearing House staff.</p> <p>1.3.2 Create and maintain a web site for the Clearing House, linked to related web sites with key government agencies such as NEPO, DEDP and EGAT. Establish operational links with a few key renewable energy centers in the world (such as US, Japan, Australia, Brazil and Denmark) to leverage their information sources.</p> <p>1.3.3 Set up and maintain a well endowed library with documentation about biomass power technologies, projects from around the world, and international biomass power journals and books.</p> <p>1.3.4 Summarize and disseminate the detailed successful experience and lessons learned from Thailand and other countries on large-scale biomass power/co-generation projects.</p> <p>1.3.5 Provide support for information management and dissemination.</p>	<p><i>Indicators:</i></p> <p>1.3.1 At least 3 people trained in information management and documentation within 2 years of project life.</p> <p>1.3.2 A web site for the Cell created within 1 year of project life and regularly updated thereafter.</p> <p>1.3.3 A library set up within the Information Cell</p>	<p><i>Verifiers:</i></p> <p>1.3.1 Training curriculum</p> <p>1.3.2 Site up and running</p> <p>1.3.3 Documents registered and available to customers</p>
<p><b>Output 1.4 :</b> Increased access to investment information.</p> <p><i>Activities:</i></p> <p>1.4.1 Compile all the potential financing sources for biomass power and co-generation projects.</p> <p>1.4.2 Facilitate the flow of investment information on potential biomass power and co-generation projects among potential investors inside and outside Thailand.</p>	<p><i>Indicators:</i></p> <p>1.4.1 Matchmaking efforts should result in concrete cooperation</p> <p>1.4.2 Seminars or workshops should be held at least every 6 month with participation from major stakeholders</p>	<p><i>Verifiers:</i></p> <p>1.4.1 Record of matchmaking efforts/results</p> <p>1.4.2 Seminar/workshop program and list of participants</p> <p>1.4.3 Number of</p>

<p>1.4.3 List potential projects according to location, type of biomass fuels, and technology. The listing will be placed on the web site.</p> <p>1.4.4 Provide matchmaking service for international IPPs and local partners.</p> <p>1.4.5 Hold seminars and workshops as well as publish newsletter to exchange above information as well as information regarding the development experience of biomass power projects and the potential role of ESCOs.</p>	<p>1.4.3 Newsletter should be published and distributed at least every 6 months.</p>	<p>newsletters distributed, timing of distribution</p>
<p><b>Output 1.5:</b> Information database for the Information and Outreach Cell compiled.</p>	<p><i>Indicators:</i></p> <p>1.5.1 A biomass power/co-generation information database set up within one year of project start.</p> <p>1.5.2 A GIS system of biomass resource distribution set up within two years of project start.</p>	<p><i>Verifiers:</i></p> <p>1.5.1 Availability and easy access to information for customers</p> <p>1.5.2 Availability of information for customers</p>
<p><i>Activities:</i></p> <p>1.5.1 Identify existing biomass resource database in Thailand, including those developed by COGEN and KMUTT.</p> <p>1.5.2 Collect information from Output 1.3 and 1.4 and other relevant sources for input to information database.</p> <p>1.5.3 Compile an information database for potential biomass power investors both inside and outside of Thailand. The information database should include: (1) technical and economic information of biomass co-generation technologies; (2) biomass resource potential and distribution; (3) profile and scale distribution of biomass industries in Thailand; (4) profile of potential equipment suppliers; (5) potential investors' profile and financing sources; as well as (6) government rules, procedures, regulations, incentive policies, and permit requirements for biomass co-generation.</p> <p>1.5.4 Set up a GIS system of biomass resource distribution across the country.</p>	<p><i>Indicators:</i></p> <p>1.6.1 At least 4 people trained in providing advisory services within 2 years of project start</p> <p>1.6.2 Competent advisory services on biomass power/co-generation project development available to potential investors.</p>	<p><i>Verifiers:</i></p> <p>1.6.1 Training curriculum and list of participants</p> <p>1.6.2 Specified and regularly updated list of advisory services to be kept from 6 months after project start and made available to potential customers</p>
<p><b>Output 1.6:</b> Capacity for the Clearing House staff to provide advisory services strengthened.</p>	<p><i>Activities:</i></p> <p>1.6.1 Provide training to the Clearing House staff in conducting project financial feasibility studies</p> <p>1.6.2 Provide training to the Clearing House staff in preparing agreements and contracts, including power purchase agreements, fuel supply agreements, tender documents, as well as equipment, procurement and construction contracts</p> <p>1.6.3 Provide training to the Clearing House staff in arranging project financing package, including preparation of business proposals and loan arrangements.</p>	<p><i>Indicators:</i></p> <p>1.7.1 Updated information on performance and experience learned from Thai biomass power projects available to the potential investors within 1 year of project start.</p> <p>1.7.2 Study tours, seminars and workshops organized in connection</p>
<p><b>Output 1.7:</b> Public awareness of biomass power/co-generation technologies increased.</p>	<p><i>Activities:</i></p> <p>1.7.1 Monitor the performance and document the experience of successful models of Thai biomass power and co-generation projects.</p> <p>1.7.2 Document and disseminate the experience and lessons learned in the Yala and Roi-Et Pilot Plants to potential investors and industry representatives through study tours, seminars and workshops.</p> <p>1.7.3 Disseminate the experience of other successful projects on the web site and through workshops.</p>	<p><i>Verifiers:</i></p> <p>1.7.1 Documents or records</p> <p>1.7.2 Record of activities, participants and timing</p> <p>1.7.3 Documents or records</p> <p>1.7.4 Conduct surveys year 1 and 5 in project life</p>

- 1.7.4 Establish and transfer best practices for biomass co-generation technologies through inter-provincial study tours and workshops.
- 1.7.5 Feed and update the performance, experience, and lessons learned from the successful models of biomass power projects in the database compiled under Output 1.5.
- 1.7.6 Organize international study tours for private sector representatives, utility, and government officials.
- 1.7.7 Develop public awareness campaign materials tailored to target a wide range of concerned stakeholders.
- 1.7.8 Design the media vehicle or a combination of media tools for the public awareness campaign. It may include posters, brochures, radio broadcasts, and video tapes etc.
- 1.7.9 Conduct public awareness campaign.

with pilot plants and other projects conducted regularly

1.7.3 Experience and lessons learned from the 2 pilot plants disseminated throughout project life.

1.7.4 Increased public awareness in biomass power and co-generation projects in Thailand

## C.2 Immediate Objective 2:

<p><b>Immediate Objective 2:</b> To improve regulatory framework to encourage biomass power/co-generation projects.</p>	<p><b>Indicators:</b> 2.1 Regulatory framework improves investment environment. 2.2 Regulatory framework removes practical barriers for biomass projects.</p>	<p><b>Verifiers:</b> 2.1 Financial analysis of new framework similar to Annex 4. 2.2 Analysis of barrier removal and effect</p>
<p><b>Output 2.1 :</b> Specific recommendations of renewable energy policies for biomass co-generation proposed.</p> <p><b>Activities:</b></p> <p>2.1.1 Hold a series of consultations with NEPO to complement NEPO' s existing biomass energy activities and projects.</p> <p>2.1.2 Evaluate the major schemes of renewable energy policies requiring utility to purchase power from renewable energy, including the Non-Fossil Fuel Obligations (NFFO) approach in the UK; Renewable Energy Portfolio Standard (RPS) approach in the US; and avoided costs plus a premium approach in Germany and Denmark.</p> <p>2.1.3 Recommend a scheme that is most appropriate for Thailand.</p> <p>2.1.4 Investigate and evaluate each option for financial incentives to encourage biomass power projects, including capacity and energy payment, renewable energy adder, and investment subsidy.</p> <p>2.1.5 Develop an appropriate level of capacity and energy payment specifically for biomass power projects under SPP schemes, particularly after the accumulation of the experience and data from the NEPO' s bidding process for up to 300 MW grid-connected renewable energy power projects;</p> <p>2.1.6 Develop an appropriate level for a renewable energy adder, a pricing incentive in terms of additional baht per kWh output, for biomass power projects.</p> <p>2.1.7 Identify financing sources and implementation plan to cover the renewable energy adder, including both passing on to consumers and subsidy from ENCON Fund;</p> <p>2.1.8 Recommend improvement in EGAT SPP regulations regarding fuel charge adjustment method and plant availability for biomass power/co-generation projects.</p>	<p><b>Indicators:</b> 2.1.1 A report of recommendations of renewable energy policies, in particular financial incentive policies, for biomass power/co-generation. 2.1.2 A report of recommendations of improvement in SPP regulations, including an appropriate level of capacity and energy payment and renewable energy pricing adder. 2.1.3 A report of recommendations of policy measures to encourage renewable energy after the power sector reform 2.1.4 A report of recommendations of simplified permit process. 2.1.5 A draft renewable energy policy framework, in particular financial incentive</p>	<p><b>Verifiers:</b> 2.1.1 Record document 2.1.2 Record document 2.1.3 Record document 2.1.4 Record document 2.1.5 Record document</p>

- 2.1.9 Summarise lessons learned for renewable energy after power sector restructuring in other countries.
- 2.1.10 Recommend specific policy measures to encourage renewable energy after the power sector restructuring in Thailand.
- 2.1.11 Draft a renewable energy policy framework, in particular financial incentives, to encourage biomass power projects.
- 2.1.12 Assess the permit process for renewable power producers as well as the institutional framework at the national and provincial level to issue license permits.
- 2.1.13 Suggest alternative options to simplify the tedious permitting process and procedures.

policies, for biomass power/co-generation.

**Output 2.2:**

A draft renewable energy policy framework approved

*Activities:*

- 2.2.1 Hold consultation with NEPO regarding the policy recommendations.
- 2.2.2 The Policy Cell conduct policy advocacy campaign to coordinate policy dialogue between government agencies, utility, private sector, and the Cabinet to get the draft renewable energy policy framework approved.
- 2.2.3 The Policy Cell will promote and support NEPO's renewable energy policy, and provide policy recommendations and studies for NEPO.
- 2.2.4 The Policy Cell will complement NEPO's existing biomass energy projects and activities.

*Indicators:*

- 2.2.1 Consensus reached among the stakeholders regarding the draft policy framework.
- 2.2.2 The draft renewable energy policy framework approved and passed.
- 2.2.3 Renewable policy support and recommendations available for NEPO through the Policy Cell.

*Verifiers:*

- 2.2.1 Meeting minutes, letters or notes.
- 2.2.2 Record document
- 2.2.3 Record document

### C. 3. Immediate Objective 3:

**Immediate Objective 3:**

To increase access to commercial financing for biomass power/co-generation projects.

*Indicators:*

- 3.1 Financial institutions are willing to provide financing to biomass projects, and under improved conditions compared to current baseline.
- 3.2 Financing for new projects is possible and favorable.

*Verifiers:*

- 3.1 Survey of financial institutions
- 3.2 Survey of financing conditions for new and old biomass projects

**Output 3.1:**

A specialized core unit for biomass power financing established and operating within IFCT.

*Activities:*

- 3.1.1 Establish a core unit within IFCT to specifically evaluate technical and management aspects of biomass co-generation projects. At this initial stage, the core unit staff may work part-time on biomass co-gen projects. With growing demand from the industry and increasing confidence in the technology within IFCT, the core unit staff may gradually shift to full-time work on biomass power and co-

*Indicators:*

- 3.1.1 IFCT staff appointed for the core unit within six months from project start.
- 3.1.2 The specialized core unit for biomass power financing established within eight months from project start

*Verifiers:*

- 3.1.1 Record number, TORs and dates
- 3.1.2 Record date of operation

gen projects.

3.1.2 Prepare terms of reference for the staff in the core unit. The staff who will be selected to compose the core unit should have (1) engineering and financing backgrounds; (2) knowledge of IFCT's loan processing guidelines and project monitoring procedures; and (3) experience in project loan evaluation and project packaging. A senior-ranked Bank staff should be appointed as the head of the core unit.

3.1.3 Set up office and provide supplies.

3.1.4 Prepare work program.

3.1.5 Establish institutional arrangements for the core unit, with co-funding from IFCT.

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**Output 3.2:**

Project evaluation capacity and lending guidelines for the core unit at IFCT improved.

*Activities:*

3.2.1 Provide training to the core unit staff in the technical evaluation and management of biomass power and co-generation investments, particularly in the area of biomass resource assessment and equipment performance.

3.2.2 Identify the training needs and requirements of the selected staff for the core unit, as well as determine and formulate a training plan.

3.2.3 Provide an extensive on-the-job training program in technical evaluation and site inspection through training workshops.

3.2.3 Set up appraisal guidelines specific to biomass power and co-generation projects, with focus on project technical and management evaluation and loan processing guidelines.

3.2.4 Review and assess IFCT's current lending policies and loan processing guidelines for biomass power projects.

3.2.5 Prepare a user-friendly project preparation format.

3.2.6 Develop technical and financial guidelines and investment criteria.

3.2.7 Establish a simplified evaluation and approval process for biomass projects.

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*Indicators:*

3.2.1 Improved technical knowledge and skills in biomass resource assessment and co-generation systems at IFCT.

3.2.2 Improved and simplified lending guidelines and procedures for biomass co-generation financing.

3.2.3 Increased IFCT lending to biomass power projects.

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*Verifiers:*

3.2.1 Record training activities undertaken by core unit staff

3.2.2 Documents

3.2.3 Record biomass loans from IFCT

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**Output 3.3:**

The knowledge and awareness of biomass power/co-generation technologies increased among major financial institutions.

*Activities:*

3.3.1 Select a number of major banks in Thailand as candidates for the awareness campaign. The potential candidates include Bangkok Bank, Siam Commercial Bank, Thai Farmers Bank, and Bank of Asia.

3.3.2 The Financing Cell will invite the senior management at these selected banks to hold a series of workshops and seminars to introduce biomass power/co-generation technologies and disseminate the successful experience of biomass power/co-generation plants within and outside Thailand.

3.3.3 Organise domestic and international study tours for these financiers to visit the successful models of biomass power/co-generation plants within and outside Thailand.

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*Indicators:*

3.3.1 Workshops and study tours are organised and conducted

3.3.2 Awareness and confidence of financial institutions in biomass power/co-generation technologies increased.

3.3.3 Increased lending to biomass power/co-generation projects by the participating financial institutions.

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*Verifiers:*

3.3.1 Record training activities

3.3.2 Survey among financial institutions

3.3.3 Record biomass loans from financial institutions

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**Output 3.4:**

A feasibility study to set up a risk/credit guarantee fund to provide fuel supply risk guarantee conducted.

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*Indicators:*

3.4.1 A report of feasibility study to set up

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*Verifiers:*

3.4.1 Document

3.4.2 Document

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<p><i>Activities:</i></p> <p>3.4.1 Hold wide consultations with NEPO, bilateral and multilateral funding organizations, private sector, and financial institutions.</p> <p>3.4.2 Conduct feasibility study to set up a risk/credit guarantee fund to provide fuel supply risk guarantee to share and reduce the risks to the financial institutions, in addition to the tariff subsidy by NEPO. The risk/credit guarantee could be offered to the biomass power developers at the initial stage, combined with the renewable energy tariff incentives, and gradually be phased out.</p> <p>3.4.3 Identify financing sources and develop implementation plan for the risk/credit guarantee fund.</p>	<p>a risk/credit guarantee fund to provide fuel supply risk guarantee</p> <p>3.4.2 A report of recommendations of the implementation plan for the risk/credit guarantee fund.</p>	
<p><b>Output 3.5</b></p> <p>A pipeline of bankable biomass co-generation projects generated.</p> <p><i>Activities:</i></p> <p>3.5.1 Identify and generate a pipeline of bankable biomass projects in Thailand for the financial institutions to finance, in close link to the NEPO' s planned 300 MW bidding process.</p> <p>3.5.2 Prepare business proposal packaged for approval.</p> <p>3.5.3 Provide on-the-job training to the core unit staff in project pipeline development.</p>	<p><i>Indicators:</i></p> <p>3.5.1 A pipeline for biomass co-generation projects generated.</p> <p>3.5.2 Business proposal package for the pipeline prepared.</p>	<p><i>Verifiers:</i></p> <p>3.5.1 Number of projects in pipeline</p> <p>3.5.2 Documents</p>
<p><b>Output 3.6:</b></p> <p>Financing for the pipeline of bankable biomass power projects identified and secured.</p> <p><i>Activities:</i></p> <p>3.6.1 Hold wide consultations with NEPO, bilateral and multilateral funding organizations, private sector, and financial institutions.</p> <p>3.6.2 Seek financing sources for the pipeline of biomass power projects identified from Output 3.5, including concessional or contingent financing from bilateral and multilateral fundings and domestic capital as well as commercial financing.</p> <p>3.6.3 Identify and invite international IPP investors to invest in biomass power/co-generation projects in Thailand.</p> <p>3.6.4 Facilitate the financing transaction between the project developers and financial institutions under the Financing Cell. This Cell must be able to judge the validity of developers' plans against strict professional guidelines, while playing a central role in making the deal viable and attractive to the developer. The Cell must also have the will and the authority to persuade the banks to participate.</p>	<p><i>Indicators:</i></p> <p>3.6.1 Number of pipeline projects, for which financing have been secured.</p>	<p><i>Verifiers:</i></p> <p>3.6.1 List of projects</p>

## C.4 Immediate Objective 4:

<p><b>Immediate Objective 4:</b></p> <p>To demonstrate the technical and financial viability and reduce risks for the biomass power/co-generation technologies.</p>	<p><i>Indicators:</i></p> <p>4.1 Increased experience on biomass projects through the demonstration plants.</p>	<p><i>Verifiers:</i></p> <p>4.1 Major stakeholders are familiar with pilot plant features.</p>
<p><b>Output 4.1</b></p>	<p><i>Indicators:</i></p>	<p><i>Verifiers:</i></p>

<p>Completion and monitoring of the two pilot plants.</p> <p><i>Activities:</i></p> <p>4.1.1 Reimburse 50% of the costs of guarantee fees as direct payment to the Yala Green Company and Roi-Et Green Company every six months, within 10-15 working days upon receiving the receipt of payment. The actual payment will be in Thai Baht, at UN official exchange rate at the time of reimbursement. The total guarantee fees supported from GEF will not exceed US\$3 million. Although other project activities will be completed in five years, this activity could last up to seven years. In case the two pilot plants, or one of them, can only be implemented with considerable delay or cannot be implemented at all, appropriate alternative biomass pilot plant(s), which fully meet Immediate Objective 4, should be selected as replacement(s).</p> <p>4.1.2 Develop performance benchmark for monitoring and evaluation.</p> <p>4.1.3 Conduct monitoring and evaluation of the performance of the pilot plants.</p>	<p>4.1.1 The two plants are finalized according to specifications and timetable.</p> <p>4.1.2 Demonstrated practical technical and commercial viability of biomass power technology.</p> <p>4.1.3 Reduced technology risks of biomass power/co-generation projects is demonstrated.</p>	<p>4.1.1 Set and monitor benchmarks for construction phase.</p> <p>4.1.2 Record plants out-of-operation time and compare to market average.</p> <p>4.1.3 Record fuel supply shortages and other major technological problems</p>
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## D. INPUTS

### D.1 UNDP Inputs

The total GEF contribution is US\$6,805,000 provided through the facilities of the UNDP as a GEF implementing agency. The detailed UNDP-format budget is listed in Section J.

#### *D.1.1 International Consultants:*

- 1) Technical Advisor: \$168,000

TOR for this position is provided in Annex 1. The input of the technical advisor is a total of 12 months throughout project life. Payment for international consultants will include the consultant's fees, DSA, and travel costs. The total budget for international consultants is US\$168,000.

#### *D.1.2 National Consultants/Professionals:*

- 1) National Project Manager: \$300,000
- 2) Administrative assistant/bookkeeper for PMO: \$60,000
- 3) Director of the One-Stop Clearing House: \$300,000
- 4) Senior Information Officer of the One-Stop Clearing House: \$180,000
- 5) Information Assistant of the One-Stop Clearing House: \$90,000
- 6) Senior Policy Analyst of the One-Stop Clearing House: \$180,000
- 7) Senior Financing Advisor of the One-Stop Clearing House: \$180,000
- 8) Financing Assistants of the One-Stop Clearing House (2): \$180,000
- 9) Executive Secretary of the One-Stop Clearing House: \$90,000
- 10) Driver of the One-Stop Clearing House: \$10,000



TORs for these positions are provided in Annex 1. Payment for national consultants will include the consultant's fees. The total budget for national consultants is US\$1,570,000.

### ***D.1.3 Mission Cost/Duty Travel***

This component will cover the costs for duty travel and DSA for NEPO/project staff, and monitoring and evaluation by UNDP and Government staff. It will also include the costs for two project evaluation missions. The total budget for the component is US\$140,000.

### ***D.1.4 Subcontracts***

- 1) Prepare business plan and advertisement for the Clearing House: \$120,000
- 2) Build capacity of the One-Stop Clearing House: \$450,000
- 3) Prepare newsletters/publications for the Clearing House: \$100,000
- 4) Recommend financial incentive policies: \$350,000
- 5) Build capacity for IFCT: \$100,000
- 6) Generate a pipeline of biomass projects: \$258,000
- 7) External project auditing: \$100,000
- 8) Provide contingent financing for the pilot plants: \$3,000,000

TORs for these subcontracts are provided in Annex 2. The total budget for subcontracts is US\$4,478,000.

### ***D.1.5 Training***

The project will support in-country training seminars, workshops, as well as international and domestic study tours. These include:

- 1) In-country regional workshops and seminars to disseminate information: \$150,000
- 2) International and domestic study tours: \$170,000

The training costs will include travel costs and DSA for trainees/staff, hiring translators, renting rooms, preparing training materials. The total budget for training is US\$320,000.

### ***D.1.6 Equipment***

The project will provide necessary equipment for the One-Stop Clearing House, including capital costs and operating costs of a vehicle, computers and printers, fax machine, and advanced computers for database management and GIS analysis. The total budget for equipment is US\$82,000.

### ***D.1.7 Miscellaneous***

Administrative and other costs will be incurred in the implementation of the project. These include preparation of required reports and sundries. Apart from this a budget is established for UNDP public information activities related to the project. The total budget for miscellaneous is US\$47,000.

## **D.2 Government Inputs**

The Government of Thailand has provided substantial support to the design and development of the project. The Government will provide US\$54,890,000 co-funding to this project, including US\$54,310,000 (2.05 billion Baht) in cash and US\$580,000 in-kind.

The cash contribution of the Government of Thailand will cover:

- An incentive premium on the power tariff to cover the price difference between the costs of biomass power/co-generation projects and the baseline avoided costs (long-run marginal costs).

The in-kind contributions of the Government of Thailand include the following:

- Salaries, allowances, and time of NEPO personnel involved in the project (other than the National Project Manager, Technical Advisor, and secretary to be hired for PMO);
- Office space and some office supplies for the PMO;
- Office space for the One-Stop Clearing House.
- Baseline costs to propose recommendations on financial incentive policies;
- Administrative support for project related staff, rent for office and meeting room, water, electricity, sanitary management charges, and various kinds of depreciation charges of office equipment; and
- In-country mission support for project related staff and transport services in an available basis.

## **D.3 Private Sector and JBIC**

The total capital investment cost for the 22 MW Yala parawood residue power plant and the 10 MW Roi-Et rice husk power power plant Pilot Plants is estimated to be around US\$45 million. EGCO, EPDC, Asia Plywood Co. Ltd, and Sommai Rice Mill will invest US\$15 million as equity, and JBIC will provide US\$30 million concessional loans.

## **D.4 IFCT**

IFCT will provide US\$810,000 in-kind contribution for the office space and staff time for the core unit to be set up within IFCT for 5 years.

## **D.5 DANCED**

DANCED will provide approximately DKK 8.06 million to support the Technical Service Cell under the One-Stop Clearing House. The detailed DANCED project activities and budget are further elaborated in a separate project document prepared by DANCED in consultation with UNDP and NEPO. The DANCED project document will be attached to this document once it is approved.

## **E. RISKS AND PRIOR OBLIGATIONS**

### **E.1 Risks and Steps Taken to Minimize Them**

#### ***E.1.1 Uncertainties of Raw Material Supply***

It is expected that the rice industry in Thailand will steadily grow, and the rubber wood industry will also have a sustainable supply of raw materials from the replanting of rubber wood. Thus, the rice mills and rubber wood industries have the least uncertainties of sustainable fuel supply for biomass energy projects. In other industries, the market is expected to grow less, because of the economic crisis and the El Nino phenomenon. Many experts believe that these effects are transient and the wood and agro-industries in Thailand will recover over the next few years. Therefore, the status of raw material supplies will have to be carefully monitored as part of the project.

#### ***E.1.2 Uncertainties of Fuel Supply***

Although Thailand has abundant biomass resources, there exist risks and uncertainties of secure fuel supply at a set price contract for 20 years. Asia Plywood Co. Ltd. and the 20 wood mills nearby (within 50 km) will have sufficient fuel to supply the Yala Pilot Plant. Roi-Et is in an excellent location because it is located at the middle of rice producing area. Sommari Rice Mill can provide 100% of the fuel supply to the Roi-Et Pilot Power Plant. The Yala Green Company and Roi-Et Green Company have signed a 20-year fuel supply contract with the fuel suppliers. Hence, these risks are considered moderate to the pilot plants, but the situation will have to be carefully studied for each potential replicant being considered for financing.

#### ***E.1.3 Uncertainties of Power Purchase by EGAT***

The current restructuring and privatization of EGAT, together with the excess capacity, will increase the risks of power purchase by EGAT. Under the present policy followed by NEPO, EGAT is obligated to continue to purchase power from renewable SPPs under the SPP scheme, although EGAT has stopped issuing new PPAs to purchase power from large power producers (over 90 MW) using commercial fuels. For the pilot projects, an agreement has already been reached. But for future projects, this risk will have to be carefully monitored, and can be mitigated by NEPO's policy.

#### ***E.1.4 Uncertainties of the Financial Sector in Thailand***

The economic crisis has greatly affected the banking system in Thailand. Many banks have closed down, and the financial sector is facing serious problem of weakening asset quality and limited liquidity. However, IFCT indicates that they currently have excessive liquidity, and a low percentage of non-performing loans, as their clients are mostly in the industrial sector. In terms of financing, IFCT has mobilized funds from different sources. This project will also build capacity for other major banks in Thailand to reduce the risk of IFCT failure. Hence, the current weaknesses of the financial sector poses no real threat to the pilot projects, but the improving health of the Thai financial sector will be of continued interest to future project success.

### ***E.1.5 Uncertainties of the Financial Sustainability of the One-Stop Clearing House***

UNDP/GEF will provide funding for the Clearing House for the first five years, and it is expected to become financially self-sustaining after five years. This is a rather challenging task. This project will prepare a financing plan and marketing strategy for the Clearing House at the beginning of the project, and widely advertise and promote the Clearing House. The main responsibilities and roles for the Director of the Clearing House will be to steer the direction of the Clearing House and to ensure its financial sustainability. The Clearing House will be initially set up as an independent non-profit economic entity that is business-oriented and runs like a private company. This project will build capacity for the Clearing House staff so that they can provide a range of competent professional services to serve a variety of clients. The function of the Clearing House will also be evolved with market demand. The financial analysis in Annex 4 concluded that the financial sustainability of the Clearing House after five years is feasible, but it will heavily depend on the entrepreneurship of the director and the staff as well as quality of services provided. The combined effects of these measures are designed to reduce this risk, but it should be carefully monitored, and alternative plans should be formulated if necessary.

### ***E.1.6 Institutional Risks***

NEPO is in charge of national energy policy. It is the chairman of the Energy Tariff Committee and the Secretariat of the Energy Conservation Fund Committee. Therefore, NEPO is in a critical strategic position to remove the key barriers to biomass power and co-generation in Thailand. As NEPO is the designated institution for this project, cooperation with other government agencies and the private sector will be very strong. Hence, the institutional risk is considered not to be a significant factor.

### ***E.1.7 Operating Risks***

There are limited manpower skills in the country to operate and maintain the modern efficient biomass power equipment in the wood and agro-industries. The equipment suppliers, however, will provide a comprehensive training program for the operators of the equipment. This will be included in the overall package of the technology offered by the supplier. Hence, this risk is considered not to be a significant factor.

## **E.2 Prior Obligations or Conditions**

There are no prior obligations under this project. The project prerequisites are as follows:

- The Government will support the assignment or use of staff time by suitably qualified professionals to support the project activities. The Government will also seek the participation of qualified academic institutions, non-governmental organizations (NGOs), and private sector in conducting project-related activities.
- The Government agrees to provide the project staff, consultants, and affiliates with data and information as may be required for Project implementation.
- The Project Steering Committee and the Project Management Office (PMO) as outlined in Section F.2 have been established.

- The co-financing sources must be secured.

The project document will be signed by UNDP and UNDP assistance to the project will be provided, subject to UNDP receiving satisfaction that the preconditions listed above have been fulfilled or are likely to be fulfilled. When anticipated fulfillment of one of more prerequisites fails to materialize, UNDP may, at its discretion, either suspend or terminate its assistance.

The comments received from GEF Council Members, STAP, LPAC, BPAC and other stakeholders in connection with the development of the project have been incorporated in this document.

## **F. MANAGEMENT**

### **F.1 Institutions Involved in the Project**

In Thailand, national energy policies are formulated by NEPO, who also chairs the Energy Tariff Committee responsible for setting up electricity pricing. NEPO is also the Secretariat of the ENCON Fund Committee as well as the National Energy Policy Council (NEPC). In addition to the SPP scheme, NEPO supports a New and Renewable Energy Program through the ENCON Fund. Under the fund, NEPO provides up to 50% subsidy to renewable projects under 300 kW (e.g. solar photovoltaic projects), and provides up to 10 million baht (US\$300,000) subsidy for each renewable project above 300 kW (e.g. biomass power projects). The new five-year plan (year 2000-2004) of the ENCON Fund is described under Section A.4.

OEPP under the Ministry of Science, Technology and Environment is responsible for establishing national environmental policies and plans. As the Government has assigned OEPP as the national GEF Operational Focal Point, OEPP will have the role as Government coordinating authority for the project.

The Department of Energy Development and Promotion (DEDP) under the Ministry of Science, Technology and Environment is the implementing agency for the energy sector. DEDP is responsible for research and development of new and renewable energy technologies. Its function also encompasses issuance and/or control of regulations, standards, utilization rates, procurement, promotion, dissemination and transfer of information and technology pertaining to energy production, uses, and transformation. DEDP is authorized under the Compulsory Program in the ENCON Act to supervise and facilitate both designated and non-designated factories/buildings in order that they are able to operate in compliant to the requirement for energy conservation.

EGAT is a government-owned utility under the supervision of the Prime Minister's Office. EGAT is responsible for generating and transmission of electricity. EGAT is currently under restructuring and privatization. The Provincial Electricity Authority (PEA) and Metropolitan Electricity Authority (MEA) are government entities under the Ministry of Interior, responsible for distribution of electricity in rural areas and metropolitan cities respectively.

IFCT is the only development finance institution in Thailand to promote private sector industrial investment and develop the domestic capital market. Its operation is private sector oriented. The

Corporation has around 6,500 shareholders, consisting of local and foreign commercial banks, financial institutions, insurance companies, industrial and commercial enterprises, and the individuals as well as the government sector through the Ministry of Finance, the Government Savings Bank, and Krung Thai Bank.

EGCO is the first and largest independent power producer (IPP) in Thailand. EGCO was established in 1992, as a partial privatization of EGAT. EGCO's major shareholders include EGAT (26%), CLP Power in Hong Kong (15%), Crown Property Bureau (1%), and general public (58%). EGCO has an installed capacity of 2 GW, out of a total installed capacity of 18 GW in Thailand. EGCO is considered as a firm and solid company with excellent credit ranking.

COGEN is an energy services provider, promoting the efficient use of renewable energy resources and co-generation technologies. Established in 1991 as the EC-ASEAN COGEN Program and based at the Asian Institute of Technology (AIT), Bangkok, Thailand, COGEN has been at the forefront of the promotion, development and implementation of biomass energy projects in the ASEAN countries.

## **F.2 Implementation Arrangements**

NEPO will be the national designated institution and thereby the national executing agency for this project. NEPO will provide logistical as well as financial support. Staff from the NEPO will be seconded to the project, along with material support such as office space, use of equipment and transportation. In 2000 an NGO under the name Energy for Environment Foundation was established to – among other things – assist with NEPO activities and the tasks under the ENCON Fund. NEPO has informed that the Foundation will be assigned to undertake the implementation of the One-Stop Clearing House.

A Project Steering Committee (PSC) will be established to provide policy guidance and oversee the implementation of the project. The PSC will include – but necessarily not be confined to – representatives from NEPO, OEPP, DTEC, UNDP, DANCED, DEDP, EGAT, FTI, PEA and IFCT and meet at least twice a year. The dates for the PSC meetings will be established by the designated institution in consultation with UNDP, OEPP and other stakeholders concerned. Invitation and relevant documentation should be forwarded to the participants at least one month before a PSC meeting. The functions of the PSC will include (i) review of Annual Project Reports; (ii) review of documents outlining project strategy and targets for the following six months; and (iii) provision of general advice to project management as required.

In order to ensure that relevant entities and interests are consulted, the PSC can co-opt other stakeholders on a consultative basis when appropriate and no conflicts of interest exist. Also, management sub-committees under the PSC may be established in order to involve appropriately other stakeholders than PSC members.

NEPO shall appoint a NEPO official as National Project Director (NPD). The NPD shall be responsible for providing coordination between the Government and the agencies involved and providing general policy guidance to the Project Management Office (PMO). The NPD should ensure that project activities funded by GEF are coordinated with the activities financed by

parallel funding as well as existing and planned activities within NEPO. The project will recruit a full-time National Project Manager (NPM) to handle day-to-day project implementation and management, coordinate the timely delivery of all inputs from the Government to the project. The project manager will be responsible for the GEF funded activities and for ensuring appropriate timing of linkages to the activities being financed by parallel funding. Working closely with the NPD, the international technical advisor and other staff at PMO, the NPM shall be responsible for procurement and payment of all services, subcontracts and equipment in accordance with UN rules and procedures. The NPM will also be responsible for monitoring of project activities in accordance with UNDP rules and regulations as well as technical and financial reporting to UNDP/GEF. An international technical advisor will – through short-term inputs during project life - support the NPM and PMO. NEPO will also appoint several national staff to work within the PMO on a day-to-day basis.

The PMO will be established in NEPO to assist the day-to-day implementation and management of the project. The roles of the PMO will be to: (i) assist the NPM in the day-to-day implementation and management of the Project; (ii) prepare all work plans and reports, quarterly, semi-annually and annually; (iii) prepare the terms of reference for all project inputs (e.g. sub-contracts, international and national experts, international and in-country training) and assist in the management and monitoring of their implementation; and (iv) prepare all documentation for the meetings of the PSC, organise the meetings, and act as secretary to the meetings. The PMO will be staffed by the NPM, an international part-time technical advisor, and an administrative assistant/bookkeeper (hired under the project) as well as several national staff from NEPO, and will be technically back-stopped by the national and international staff as appropriate (TORs for the NPM, technical advisor, and the administrative assistant are given in Annex 1). In Annex 3, an organigram of the most important entities in the project organization is presented.

Sub-contracts will be issued by the PMO through competitive bidding on the basis of terms of reference developed by the PMO. Outline TORs for each sub-contract is included in Annex 2.

Successful project execution will require close cooperation with DEDP, EGAT, and the Federation of Thai Industry. DEDP is a member of the energy tariff committee and one of the implementing agencies of the ENCON Fund. It has a mandate to promote biomass fuel applications in Thailand. EGAT will play a critical role in implementing the improved power tariff policy. Since the power tariff for biomass projects can be negotiated with EGAT on a case-by-case basis under the SPP scheme, EGAT is in a critical position to support (or discourage) biomass projects. The Federation of Thai Industry will help the Clearing House to reach the biomass industries and developers, thereby bringing the industries' viewpoint into the Policy Cell under the Clearing House.

Several other project stakeholders will assist the PMO by undertaking key roles in project execution. COGEN can provide the technical expertise and help transfer the database to the Information and Outreach Cell and Financing Service Cell. This project will build capacity for IFCT, and it can play an important role in financing biomass power and co-gen projects as well as coordinate with the Financing Cell in the Clearing House. EGCO, EPDC, Asia Plywood Co. Ltd., and Sommai Rice Mill are the investors in the Yala and Roi-Et Pilot Plants, and so will play a critical role to ensure the success of the pilot plants.

Upon request from the designated institution, UNDP may provide support services, which would normally be undertaken by the designated institution. The following support services may be provided by UNDP:

- Identification and recruitment of project personnel,
- Identification of training activities and assistance in carrying them out, and
- Procurement of goods and services

In agreement with the designated institution, the costs of providing these support services are recovered from the project budget. The costs and related payments may be agreed at a later stage, however before the actual support services are provided. This will require a Letter of Agreement between the Government and UNDP, as well as specification of type and costs of support services to be provided by UNDP.

## **G. MONITORING AND EVALUATION**

The likely changes in energy supply patterns as impacts of this project can be measured by the forecast of installed capacity of biomass power in Thailand. By the time of project completion, two biomass power pilot plants with a total capacity of 32 MW will be installed with the direct support from this project. Over the near term, 300 MW biomass power plants will be promoted and provided with tariff incentives during the 5-year project implementation period as replication, as targeted in NEPO's plan. Over the medium term, it is expected that the project will result in an additional 500-1000 MW of biomass power being installed in Thailand. The total potential of 3 GW, identified in 1995, is very significant but not all of it is expected to be accessibly utilized.

The project will be monitored and evaluated in line with UNDP rules and procedures, and the GEF guidelines for monitoring and evaluation. NEPO, through PMO, is responsible for monitoring the project since it is the designated institution responsible for the overall management of the project. UNDP also will undertake monitoring actions to ensure that the project is implemented effectively and efficiently, and achieve the desired results. Two external project evaluations – one mid-term and one terminal evaluation – are expected to take place. UNDP is responsible for ensuring that the evaluations are carried out at the appropriate time and follow the required methodology.

Data – including appropriate baseline data – should be collected on the key performance indicators and results of the monitoring and evaluation survey will be used to implement changes to the project, if necessary and for future reference in the development of similar projects. Annual Project Reports (APR) should be prepared by NEPO in consultation with the involved stakeholders. The APR shall be prepared in draft sufficiently in advance (one month prior to the meeting) to allow review by Government, UNDP and UNDP/RBAP/GEF, during the project. The APR will be reviewed by the PSC. During these meetings, the project performance will be measured against established workplans, expenditures will be reviewed and the overall technical performance will be discussed, leading to specific recommendations to improve project impact and implementation. Apart from these activities which are required by UNDP, the annual GEF Project Implementation Review (PIR) will be carried out jointly by NEPO and UNDP between June and September. At the end of the project, a Terminal Report should be prepared by NEPO



in consultation with the involved stakeholders.

Quarterly reports will be prepared by NEPO and submitted to UNDP. These quarterly reports will include a financial statement and description of activities and outcomes for the previous quarter, and a work plan and request for advance of funding for the subsequent quarter. Monthly project meetings with representatives from NEPO, the project and UNDP will be held regularly to discuss project implementation, financial issues, reports and to identify necessary corrective actions to improve project impact and implementation. Also, project monitoring missions should regularly visit the pilot plants.

NEPO will through PMO undertake continuous self-monitoring of project activities and carefully monitor the project risks mentioned in E.1. At the outset, the indicators in section C will be refined and detailed by PMO in consultation with UNDP, NEPO, and other concerned stakeholders. Concrete goals should be defined for each indicator, and additional strategic indicators may be defined. The performance of the project will be measured through assessment of the indicators at least every six months. The indicators will apply not only to project activities, but also progress made in the implementation of the pilot plants and other potential sites. The monitoring will be used to continuously refine the project approach and activities.

At the outset of project implementation, an inception report should be prepared by the PMO. The inception report constitutes the finalization of the project design and represents the overarching work plan, as well as the first detailed annual work plan. Also, a monitoring and evaluation (M&E) plan should be developed by PMO, detailing the timetable for crucial M&E activities supposed to take place during the lifetime of the project, reporting requirements, data collection, responsibilities and budget for M&E activities. Please refer to Section I for other activities to be carried out at the outset of the project.

Annual external financial audits of the projects will be carried out by the authorized agency, which will be determined later.

## **H. LEGAL CONTEXT**

This project document shall be the instrument envisaged in the Standard Supplemental Provisions to the Project Document.

The following types of revision may be made to this project document with the signature of the UNDP Resident Representative only, provided that he or she is assured that the other signatories of the project document have no objections to the proposed changes:

- Revisions in, or addition of, any of the annexes of the project document and the agreement, which is a precondition for UNDP assistance.
- Revisions, which do not involve significant changes in the immediate objectives, outputs or activities of the project, but are caused by the rearrangement of inputs already agreed to or by cost increases due to inflation.

- Mandatory revisions, which re-phase the delivery of agreed project inputs or increased expense of other costs or which take into account agency expenditure flexibility.

## **I. WORK PLAN**

The general work plan should be further detailed out and if necessary revised by PMO at the outset of the project, and subsequently updated at least once per year. The work plan will form the basis of budget revisions.

At the beginning of the project, the institutional mechanisms for project implementation and management will be established and the following activities carried out:

- 1) Appoint National Project Director (NPD) by NEPO
- 2) Establish Project Management Office (PMO)
- 3) Recruit National Project Manager (NPM) and Assistant to PMO
- 4) Recruit Technical Advisor to PMO
- 5) Appoint national staff from NEPO for PMO
- 6) Hold inception workshop, and prepare detailed work plans for the first year, including detailed TORs for all activities to be implemented in the first year.
- 7) Train PMO staff in project management
- 8) Establish appropriate monitoring system based on indicators

## J. BUDGETS (UNDP/GEF Contribution)

Main Source of Funds: 1G - GEF  
 Executing Agency: NEX - National Execution

Sbln	Description	Implementing	Funding	Total	2000	2001	2002	2003	2004	2005	2006	2007
10 PROJECT PERSONNEL												
11 International Experts & Consultants												
1101	Technical Advisor	NEX	Net Amount	168,000	56,000	42,000	28,000	14,000	14,000	14,000		
			W/M	12	4	3	2	1	1	1	0	0
1199	Line Total	-----	Net Amount	168,000	56,000	42,000	28,000	14,000	14,000	14,000		
			W/M	12	4	3	2	1	1	1	0	0
13 Admin. Support Personnel												
1301	Administrative assistant	NEX	Net Amount	60,000	4,000	12,000	12,000	12,000	12,000	8,000		
			W/M	60	4	12	12	12	12	8	0	0
1302	Driver	NEX	Net Amount	10,000	667	2,000	2,000	2,000	2,000	1,333		
			W/M	60	4	12	12	12	12	8	0	0
1303	Information Assistant	NEX	Net Amount	90,000	6,000	18,000	18,000	18,000	18,000	12,000		
			W/M	60	4	12	12	12	12	8	0	0
1304	Financing Assistants (2)	NEX	Net Amount	180,000	12,000	36,000	36,000	36,000	36,000	24,000		
			W/M	120	8	24	24	24	24	16	0	0
1305	Executive Secretary	NEX	Net Amount	90,000	6,000	18,000	18,000	18,000	18,000	12,000		
			W/M	60	4	12	12	12	12	8	0	0
1399	Line Total	-----	Net Amount	430,000	28,667	86,000	86,000	86,000	86,000	57,333		
			W/M	360	24	72	72	72	72	48	0	0
15 Duty Travel												
1501	Monitoring and evaluation	NEX	Net Amount	120,000	4,000	8,000	8,000	48,000	8,000	44,000		
1599	Line Total	-----	Net Amount	120,000	4,000	8,000	8,000	48,000	8,000	44,000		
16 Mission Costs												
1601	Domestic travel	NEX	Net Amount	20,000	2,000	4,000	4,000	4,000	4,000	2,000		
1699	Line Total	-----	Net Amount	20,000	2,000	4,000	4,000	4,000	4,000	2,000		
17 National Professionals												
1701	National Project Manager	NEX	Net Amount	300,000	20,000	60,000	60,000	60,000	60,000	40,000		
			W/M	60	4	12	12	12	12	8	0	0
1702	Director of the Clearing House	NEX	Net Amount	300,000	20,000	60,000	60,000	60,000	60,000	40,000		
			W/M	60	4	12	12	12	12	8	0	0
1703	Senior Information Officer	NEX	Net Amount	180,000	12,000	36,000	36,000	36,000	36,000	24,000		
			W/M	60	4	12	12	12	12	8	0	0
1704	Senior Policy Analyst	NEX	Net Amount	180,000	12,000	36,000	36,000	36,000	36,000	24,000		
			W/M	60	4	12	12	12	12	8	0	0
1705	Senior Financing Advisor	NEX	Net Amount	180,000	12,000	36,000	36,000	36,000	36,000	24,000		
			W/M	60	4	12	12	12	12	8	0	0
1799	Line Total	-----	Net Amount	1,140,000	76,000	228,000	228,000	228,000	228,000	152,000		
			W/M	300	20	60	60	60	60	40	0	0
19 PROJECT PERSONNEL TOTAL												
		-----	Net Amount	1,878,000	166,667	368,000	354,000	380,000	340,000	269,333		
			W/M	672	48	135	134	133	133	89	0	0



## **ANNEXES**

- Annex 1: TOR for Consultants (to be finalized by Programme Manager upon Project Document signature)
- Annex 2: TOR for Subcontracts (to be finalized by Programme Manager upon Project Document signature)
- Annex 3: Organigram of Project Organization
- Annex 4: Financial and Economic Analysis
- Annex 5: Environmental Overview of Project
- Annex 6: Incremental Cost Matrix



**United Nations Development Programme  
GLOBAL ENVIRONMENT FACILITY**

28 December 2000

Dear Mr. El-Ashry,

**Subject: THA/99/G31 Removal of Barriers to Biomass  
Power Generation and Co-generation in Thailand**

I am pleased to enclose the project for Thailand entitled "Removal of Barriers to Biomass Power Generation and Co-generation" approved by the GEF Executive Council in December 1999. Also enclosed is the response to comments provided by the GEF Secretariat and Council.

As per paragraph 29 and 30 of the GEF Project Cycle, we are submitting this project to you for circulation to the Executive Council Members for comments and, subsequently for your final endorsement.

Thank you in advance for expediting the review and approval of this project.

Yours sincerely,

Nick Brown  
Officer-in-Charge

Mr. Mohamed El-Ashry  
Chief Executive Officer  
Global Environment Facility  
Room G6005  
1776 G Street  
Washington D.C. 20433

**ANNEX 1 (TO BE FINALISED UPON PRODOC SIGNATURE):  
TERMS OF REFERENCE FOR CONSULTANTS**

- 1) Technical Advisor**
- 2) Director of the Clearing House**
- 3) Senior Information Officer of the Clearing House**
- 4) Information Assistant of the Clearing House**
- 5) Senior Policy Analyst of the Clearing House**
- 6) Senior Financing Officer of the Clearing House**
- 7) Financing Assistant of the Clearing House**
- 8) Executive Secretary of the Clearing House**
- 9) National Project Manager**
- 10) Administrative Assistant/Bookkeeper**

**ANNEX 2 (TO BE FINALISED UPON PRODOC SIGNATURE):  
TERMS OF REFERENCE FOR SUBCONTRACTS**

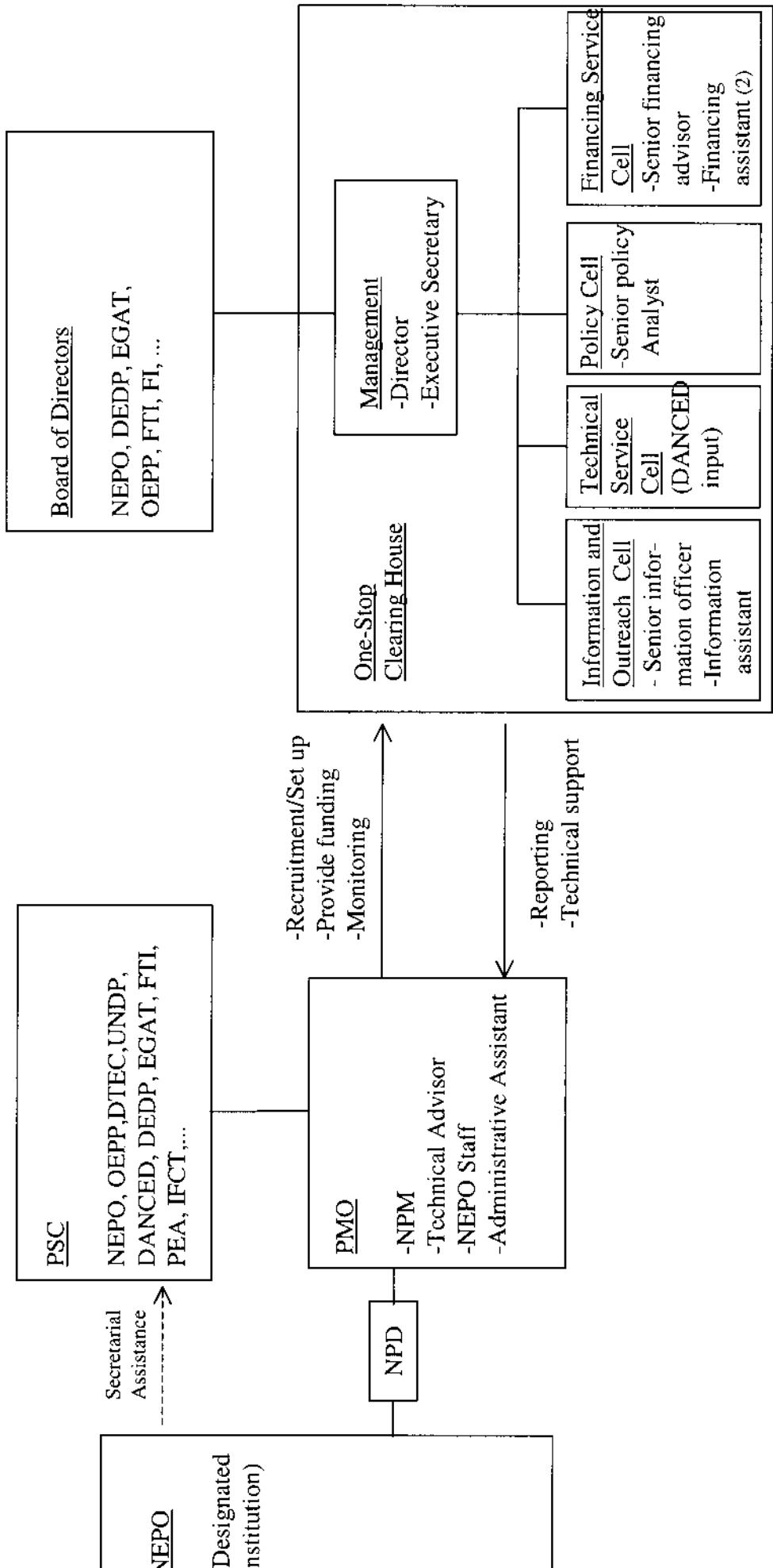
- 1) Subcontract 1: Prepare financial analysis and advertisement for the Clearing House**
- 2) Subcontract 2: Build capacity for the Clearing House**
- 3) Subcontract 3: Conduct public awareness campaign**
- 4) Subcontract 4: Recommend financial incentive policies**
- 5) Subcontract 5: Conduct feasibility study for a guarantee fund**
- 6) Subcontract 6: Build capacity for IFCT**
- 7) Subcontract 7: Generate a pipeline of biomass projects**
- 8) Subcontract 8: Provide contingent financing to the pilot plants**



# Annex 3: Organigram of Project Organization

Role: Project Implementation Management (5 years)

Role: Promote Biomass Power/Co-generation (> 5 years)



Secretarial Assistance

-Recruitment/Set up  
-Provide funding  
-Monitoring

-Reporting  
-Technical support

## **ANNEX 4: FINANCIAL AND ECONOMIC ANALYSIS**

- 1) Financial Assessment and Economic Impacts of the Biomass Power Plant**
- 2) Financial Assessment for the Gas Power Plant**
- 3) Financial Assessment for the Biomass Power Plant (non subsidy)**
- 4) Financial Assessment for the Biomass Power Plant (Tariff & Guarantee fee subsidy)**
- 5) Financial Sustainability of the Clearing House.**
- 6) Projected Income and Expenses of the Clearing House.**
- 7) Financial Assessment for the Biomass Power Plant (Tariff subsidy)**

**2) Financial Assessment for the Gas Power Plant**

**Assumptions for project calculation.**

1) Electricity Capacity	120	MW
2) Generating Volume	840,960	MWh
3) Tariff Rate :		
Capacity Charge	7.55	USD/KW/month
Energy Charge	0.02	USD/KWh
4) Natural Gas Cost	2.00	USD/MBTU
5) Natural Gas Usage	7,568,640	MBTU
6) Interest Rate (all in)	9.00%	per annum
7) Loan period	15	Years
8) Grace Period	2.5	Years
9) Total Investment Cost	116	Million USD
10) Equity	30%	
11) Bank loan	70%	
12) Employment	125	Persons
13) Tax Holiday	8	Years

Projected Performance

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
INCOME:									
Capacity Charge	10,872,000	10,872,000	10,872,000	10,872,000	10,872,000	10,872,000	10,872,000	10,872,000	10,872,000
Energy Charge	18,080,640	18,080,640	18,080,640	18,080,640	18,080,640	18,080,640	18,080,640	18,080,640	18,080,640
Steam	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000
Total income	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640
EXPENSES:									
Fuel cost	15,137,280	15,137,280	15,137,280	15,137,280	15,137,280	15,137,280	15,137,280	15,137,280	15,137,280
Direct labour	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Depreciation & Write off	3,252,308	3,252,308	3,252,308	3,252,308	3,252,308	3,252,308	3,252,308	3,252,308	3,252,308
Plant overhead	2,000,000	2,100,000	2,205,000	2,315,250	2,552,563	2,680,191	2,814,201	2,954,911	3,102,656
Distribution & Management	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
Total Expenses	21,989,588	22,089,588	22,194,588	22,420,600	22,542,151	22,669,779	22,803,789	22,944,499	23,092,244
Profit Before Interest & Tax	10,713,052	10,613,052	10,508,052	10,282,040	10,160,489	10,032,861	9,898,851	9,758,141	9,610,396
Less: Interest	7,317,692	7,317,692	7,176,967	6,614,068	6,051,169	5,488,269	4,925,370	4,362,470	3,236,672
Profit before Tax	3,395,360	3,295,360	3,331,085	3,783,734	4,230,871	5,107,491	5,536,381	5,958,570	6,373,724
Less: Tax	0	0	0	0	0	0	0	0	1,912,117
Net Profit	3,395,360	3,295,360	3,331,085	3,783,734	4,230,871	5,107,491	5,536,381	4,170,999	4,461,607
Return on Equity (ROE)	9.74%	9.46%	9.56%	10.86%	12.14%	14.66%	15.89%	11.97%	12.80%
Average ROE	6.02%								

Unit: USD

Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
INCOME:									
Capacity Charge	10,872,000	10,872,000	10,872,000	10,872,000	10,872,000	10,872,000	10,872,000	10,872,000	10,872,000
Energy Charge	18,080,640	18,080,640	18,080,640	18,080,640	18,080,640	18,080,640	18,080,640	18,080,640	18,080,640
Steam	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000	3,750,000
Total income	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640
EXPENSES:									
Fuel cost	15,137,280	15,137,280	15,137,280	15,137,280	15,137,280	15,137,280	15,137,280	15,137,280	15,137,280
Direct labour	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Depreciation & Write off	3,252,308	3,252,308	3,252,308	3,252,308	3,252,308	3,252,308	3,252,308	3,252,308	3,252,308
Plant overhead	3,257,789	3,420,679	3,591,713	3,771,298	3,959,863	4,157,856	4,584,037	4,813,238	5,053,900
Distribution & Management	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
Total Expenses	23,247,377	23,410,266	23,581,300	23,760,886	23,949,451	24,147,444	24,355,337	24,802,826	25,043,488
Profit Before Interest & Tax	9,455,263	9,292,374	9,121,340	8,941,754	8,753,189	8,555,196	8,347,303	8,129,016	7,899,814
Less: Interest	2,673,772	2,110,873	1,547,973	985,074	422,175	0	0	0	0
Profit before Tax	6,781,491	7,181,501	7,573,366	7,956,680	8,331,015	8,555,196	8,347,303	8,129,016	7,899,814
Less: Tax	2,034,447	2,154,450	2,272,010	2,387,004	2,499,304	2,566,559	2,504,191	2,438,705	2,369,944
Net Profit	4,747,044	5,027,051	5,301,356	5,569,676	5,831,710	5,988,637	5,843,112	5,690,311	5,529,870
Return on Equity (ROE)	13.62%	14.43%	15.21%	15.98%	16.74%	17.19%	16.77%	16.33%	15.87%
Average ROE	15.39%								

Internal Financial Rate of Return

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
<b>INFLOW:</b>										
Total Income	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640
Residual value	0	0	0	0	0	0	0	0	0	0
Sub Total A	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640
<b>OUT FLOW:</b>										
Fixed Investment Cost	24,392,308	56,915,385								
Total Expenses	21,989,588	22,089,588	22,194,588	22,304,838	22,420,600	22,542,151	22,669,779	22,803,789	22,944,499	23,094,499
Less : Depre&write off	-3,252,308	-3,252,308	-3,252,308	-3,252,308	-3,252,308	-3,252,308	-3,252,308	-3,252,308	-3,252,308	-3,252,308
Income Tax	0	0	0	0	0	0	0	0	0	1,787,571
Sub Total B	18,737,280	18,837,280	18,942,280	19,052,530	19,168,293	19,289,843	19,417,471	19,551,481	19,694,491	19,844,491
Net Cash Flow (A-B)	-24,392,308	-56,915,385	13,865,360	13,760,360	13,534,348	13,412,797	13,285,169	13,151,159	13,022,149	12,897,149

Internal Financial Rate of Return

	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
<b>INFLOW:</b>											
Total Income	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640
Residual value	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640	32,702,640
Sub Total A	65,405,280	65,405,280	65,405,280	65,405,280	65,405,280	65,405,280	65,405,280	65,405,280	65,405,280	65,405,280	65,405,280
<b>OUT FLOW:</b>											
Fixed Investment Cost	23,092,244	23,247,377	23,410,266	23,581,300	23,760,886	23,949,451	24,147,444	24,355,337	24,573,624	24,802,826	25,043,488
Total Expenses	-3,252,308	-3,252,308	-3,252,308	-3,252,308	-3,252,308	-3,252,308	-3,252,308	-3,252,308	-3,252,308	-3,252,308	-3,252,308
Less : Depre&write off	1,912,117	2,034,447	2,154,450	2,272,010	2,387,004	2,499,304	2,566,539	2,504,191	2,438,705	2,369,944	2,297,746
Income Tax	21,752,054	22,029,517	22,312,409	22,601,003	22,895,582	23,196,448	23,461,695	23,607,220	23,760,021	23,920,463	24,088,926
Sub Total B	10,950,586	10,673,123	10,390,231	10,101,637	9,807,058	9,506,192	9,240,945	8,942,619	8,782,177	8,782,177	8,782,177
Net Cash Flow (A-B)	54,454,694	54,732,157	55,015,049	55,303,643	55,597,722	55,908,882	56,234,335	56,572,661	56,923,659	57,283,103	57,652,403

3) Financial Assessment for the Biomass Power Plant (non subsidy)

Assumptions for project calculation (Yala project).

1) Electricity Capacity	21	MW
2) Generating Volume	129,140	MWh
3) Tariff Rate :		
Capacity Charge	9.35	USD/KW/month
Energy Charge	0.02	USD/KWh
4) Fuel Cost (wood)	5.00	USD/MT
5) Fuel(wood) Usage	240,900	MT
6) Interest Rate (all in)	9.00%	per annum
7) Loan period	15	Years
8) Grace Period	2.5	Years
9) Total Investment Cost	32	Million USD
10) Equity	30%	
11) Bank loan	70%	
12) Employment	15	Persons
13) Tax Holiday	8	Years







**4) Financial Assessment for the Biomass Power Plant (Tariff & Guarantee fee subsidy)**

**Assumptions for project calculation. (Yala Project)**

1) Electricity Capacity	21	MW		
2) Generating Volume	129,140	MWh		
3) Tariff Rate :				
Capacity Charge	9.35	USD/KW/month		
Energy Charge (5 yrs)	0.03	USD/KWh	After 5 years	0.02 USD/KWh
4) Fuel Cost (wood)	5.00	USD/MT		
5) Fuel(wood) Usage	240,900	MT		
6) Interest Rate (all in)	9.00%	per annum	Subsidy	1.50% 2,000,000 USD
7) Loan period	15	Years		
8) Grace Period	2.5	Years		
9) Total Investment Cost	32	Million USD		
10) Equity	30%			
11) Bank loan	70%			
12) Employment	15	Persons		
13) Tax Holiday	8	Years		

Projected Performance

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Unit USD									
INCOME									
Capacity Charge	2,356,200	2,356,200	2,356,200	2,356,200	2,356,200	2,356,200	2,356,200	2,356,200	2,356,200
Energy Charge	3,551,348	3,551,348	3,551,348	3,551,348	2,292,234	2,292,234	2,292,234	2,292,234	2,292,234
Steam	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000
Total Income	6,532,548	6,532,548	6,532,548	6,532,548	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434
EXPENSES									
Fuel cost	1,204,500	1,204,500	1,204,500	1,204,500	1,204,500	1,204,500	1,204,500	1,204,500	1,204,500
Direct labour	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Depreciation & Write off	882,000	882,000	882,000	882,000	882,000	882,000	882,000	882,000	882,000
Plant overhead	500,000	525,000	551,250	578,813	607,753	638,141	670,048	703,550	738,728
Distribution & Management	825,000	825,000	825,000	825,000	825,000	825,000	825,000	825,000	825,000
Total Expenses	3,431,500	3,456,500	3,482,750	3,510,313	3,539,253	3,569,641	3,601,548	3,635,050	3,670,228
Profit Before Interest & Tax	3,101,048	3,076,048	3,049,798	3,022,235	2,993,295	1,703,793	1,671,886	1,638,383	1,603,206
Less: Interest	1,984,500	1,984,500	1,946,337	1,793,683	1,641,029	1,488,375	1,335,721	1,183,067	1,030,413
Plus: Guarantee fee subsidy	-330,750	-330,750	-330,750	-305,308	-279,865	-254,423	-228,981	-168,154	-877,760
Profit before Tax	1,447,298	1,422,298	1,434,211	1,533,860	1,632,131	469,841	565,145	623,470	572,792
Less: Tax	0	0	0	0	0	0	0	0	171,838
Net Profit	1,447,298	1,422,298	1,434,211	1,533,860	1,632,131	469,841	565,145	623,470	400,955
Return on Equity (ROE)	15.32%	15.05%	15.18%	16.23%	17.27%	4.97%	5.98%	6.60%	4.24%
Average ROE	9.40%								5.10%

Internal Financial Rate of Return

Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
INFLOW									
Total Income	6,532,548	6,532,548	6,532,548	6,532,548	6,532,548	6,532,548	6,532,548	6,532,548	6,532,548
Residual value									
Sub Total A	6,532,548	6,532,548	6,532,548	6,532,548	6,532,548	6,532,548	6,532,548	6,532,548	6,532,548
OUT FLOW									
Fixed Investment Cost	22,050,000								
Total Expenses	3,431,500	3,456,500	3,482,750	3,510,313	3,539,253	3,569,641	3,601,548	3,635,050	3,670,228
Less: Depr & write off	-882,000	-882,000	-882,000	-882,000	-882,000	-882,000	-882,000	-882,000	-882,000
Income Tax	0	0	0	0	0	0	0	0	171,838
Sub Total B	22,050,000	2,549,500	2,574,500	2,600,750	2,628,313	2,657,253	2,687,641	2,719,548	2,753,050
Net Cash Flow (A-B)	-22,050,000	3,983,048	3,958,048	3,931,798	3,904,235	3,875,295	3,846,907	3,818,000	3,789,498
Internal Financial Rate of Return	12.97%								

	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
	2,356,200	2,356,200	2,356,200	2,356,200	2,356,200	2,356,200	2,356,200	2,356,200	2,356,200	2,356,200
	2,292,234	2,292,234	2,292,234	2,292,234	2,292,234	2,292,234	2,292,234	2,292,234	2,292,234	2,292,234
	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000
	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434
	1,204,500	1,204,500	1,204,500	1,204,500	1,204,500	1,204,500	1,204,500	1,204,500	1,204,500	1,204,500
	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
	882,000	882,000	882,000	882,000	882,000	882,000	882,000	882,000	882,000	882,000
	814,447	855,170	897,928	942,825	989,966	1,039,464	1,091,437	1,146,009	1,203,310	1,263,475
	825,000	825,000	825,000	825,000	825,000	825,000	825,000	825,000	825,000	825,000
	3,745,947	3,786,670	3,829,428	3,874,325	3,921,466	3,970,964	4,022,937	4,077,509	4,134,810	4,194,975
	1,527,486	1,486,764	1,444,005	1,399,109	1,351,968	1,302,469	1,250,496	1,195,924	1,138,624	1,078,458
	725,106	572,452	419,798	267,144	114,490	0	0	0	0	0
	802,580	914,312	1,024,207	1,131,965	1,237,477	1,302,469	1,250,496	1,195,924	1,138,624	1,078,458
	240,714	274,294	307,262	339,589	371,243	390,741	375,149	358,777	341,587	323,338
	561,666	640,018	716,945	792,375	866,234	911,729	875,347	837,147	797,037	754,921
	5.94%	6.77%	7.59%	8.38%	9.17%	9.65%	9.26%	8.86%	8.43%	7.99%

	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434
	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434	5,273,434
	3,707,164	3,745,947	3,786,670	3,829,428	3,874,325	3,921,466	3,970,964	4,022,937	4,077,509	4,134,810	4,194,975
	-882,000	-882,000	-882,000	-882,000	-882,000	-882,000	-882,000	-882,000	-882,000	-882,000	-882,000
	206,553	240,714	274,294	307,262	339,589	371,243	390,741	375,149	358,777	341,587	323,338
	3,031,717	3,104,661	3,178,963	3,254,690	3,331,914	3,410,709	3,479,705	3,516,086	3,554,286	3,594,397	3,636,513
	2,241,717	2,168,772	2,094,470	2,018,743	1,941,520	1,862,725	1,793,729	1,757,347	1,719,147	1,679,037	1,646,921

## 5) Financial Sustainability of the Clearing House.

### Description:

As the One Stop Clearing House is a new organization under this project, and the UNDP/GEF funding will provide financial support only for the first five years. Therefore, the financial sustainability of the Clearing House in the long term is depended on its income generations of which at the initial stage the sources of income could come from :

- Advisory/study fee for biomass power investment to the potential private investors.
- Advisory/study fee for policy recommendation to the concern government agencies.
- Technical assistance for the implementation of biomass power project.
- Operating and Maintenance(O&M) services for biomass power project.

From the Projected Income and Expenses of the Clearing House, it was found that the minimum level of income generations to become self sustainability organization(Breakeven) should be USD 260,000 per annum, to ensure the sustaining at the end of the project. It is notice that the Clearing House should earn an income as soon as possible especially to provide service for the first 300 MW plants. Moreover, to develop the long term permanent income is the most importance sources such as the services related to an Operating & Maintenance for Biomass Power Plant.

The Projected Income and Expenses of the Clearing House in this report is a preliminary estimation in order to demonstrate the awareness of operating expenses if it becomes a financially independent organization. In addition, this will lead to detailed evaluation of the possibility options of income generations for the Clearing House. However, the key success factor of the financial self sustainable depends on the entrepreneurship of Director and staffs.

### Assumptions and expenditure break down:

1) The Clearing House will consist of 9 employees as follow :

<u>Position</u>	<u>No.</u>	<u>Salary/Month</u>	<u>Unit : USD</u> <u>Total salary</u>
Director	1	5,000	5,000
Executive secretary	1	1,500	1,500
Senior information Officer	1	3,000	3,000
Information assistant	1	1,500	1,500
Senior policy analyst	1	3,000	3,000
Senior financing advisor	1	3,000	3,000
Financing assistants	2	1,500	3,000
Driver	1	200	200
<b>Total</b>	<b>9</b>	<b>18,700</b>	<b>20,200</b>

2) NEPO will provide in-kind contribution to the office space and office equipment for the Clearing House for the first five years.

- 3) The income calculation is base on the new bidder for 300 MW biomass power plant and using average 10 MW capacity per plant .So, it has around 30 projects become a potential customer.
- 4) For the first five years, only 50% of the total projects (30) become the customers.
- 5) The Clearing House will generate the income at the beginning stage eventhough its receives financing support . from UNDP/GEF.
- 6) The income during the first five years will be accumulated and tranfer to the Independent Clearing House.
- 7) Advisory fee for the investor is estimated USD 12,500 per project.
- 8) Advisory fee for the government is estimated USD 50,000 per project.
- 9) Technical consultancy fee is estimated USD 12,500 per project.
- 10) Operating & Maintenance fee is estimated USD 10,000 per project per year.
- 11) After the first five years the Clearing House will has only 2 customers for each type of services per year and without O&M customers.
- 12) The salary for the first five years is under contract rate which is cover all benefit and welfare.
- 13) The salary would be decreased by 20% due to the permanent employment after the first five years.

6) Projected Income and Expenses of the Clearing House.

	2000(4 mths)	2001	2002	2003	2004	2005	2006	2007	2008	2009
<b>INCOME :</b>										
Cash Transfer(Beginning cash)						625,000	620,592	546,097	499,509	378,616
Advisory fees for the investors		62,500	125,000			25,000	25,000	25,000	25,000	25,000
Policy advisory fee		50,000		50,000		50,000		50,000		50,000
Technical consultancy fee		25,000	37,500	62,500	62,500	25,000	25,000	25,000	25,000	25,000
Operating & Maintenance fee				50,000	100,000	150,000	150,000	150,000	150,000	150,000
<b>Total Income</b>		<b>137,500</b>	<b>162,500</b>	<b>162,500</b>	<b>162,500</b>	<b>875,000</b>	<b>820,592</b>	<b>796,097</b>	<b>699,509</b>	<b>628,616</b>
<b>EXPENSES :</b>										
Salary	80,800	242,400	242,400	242,400	242,400	193,920	213,312	234,643	258,108	283,918
Rent the office space						30,000	30,000	30,000	30,000	30,000
Office supplies						6,000	6,000	6,000	6,000	6,000
Petrol	1,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Stationary	1,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Car maintenance	1,000	3,000	3,000	3,000	3,000	3,000	3,300	3,630	3,993	4,392
Telephone & Mobile fee	1,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500
Traveling expenses	1,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Welfare	0	0	0	0	0	3,000	3,000	3,000	3,000	3,000
Miscellaneous expenses/Reserve	1,726	5,178	5,178	5,178	5,178	4,988	5,382	5,815	6,292	6,816
<b>Total Expenses</b>	<b>88,026</b>	<b>264,078</b>	<b>264,078</b>	<b>264,078</b>	<b>264,078</b>	<b>254,408</b>	<b>274,494</b>	<b>296,589</b>	<b>320,893</b>	<b>347,627</b>
<b>Ending Cash</b>						<b>620,592</b>	<b>546,097</b>	<b>499,509</b>	<b>378,616</b>	<b>280,989</b>

← ←

In kind NEPO contribution

In kind NEPO contribution

**7) Financial Assessment for the Biomass Power Plant (Tariff subsidy)**

**Assumptions for project calculation. (Yala Project)**

1) Electricity Capacity	21	MW	
2) Generating Volume	129,140	MWh	
3) Tariff Rate :			
Capacity Charge	9.35	USD/KW/month	
Energy Charge	0.03	USD/KWh After 5 years	0.02 USD/KWh
4) Fuel Cost (wood)	5.00	USD/MT	
5) Fuel(wood) Usage	240,900	MT	
6) Interest Rate (all in)	9.00%	per annum	
7) Loan period	15	Years	
8) Grace Period	2.5	Years	
9) Total Investment Cost	32	Million USD	
10) Equity	30%		
11) Bank loan	70%		
12) Employment	15	Persons	
13) Tax Holiday	8	Years	







## **Annex 5. Environmental Overview of Project**

This project has significant global environmental benefits in the form of GHG emission reductions by removing the major barriers to the development of biomass co-generation and power generation to replace fossil fuel use in Thailand. As a consequence of this project, the two biomass power pilot plants – a 22 MW wood residues power plant in Yala and a 10 MW rice husk power plant in Roi-Et – could lead to a reduction of 62,000 tons of carbon per year by replacing new coal-fired power plants. Given the total potential of biomass power capacity of 3 GW in Thailand, using biomass power to replace fossil fuels could potentially reduce GHG emissions by 4.2 million tons of carbon per year.

This project is intended to promote a sustainable energy path for Thailand. It not only has significant global environmental benefits, it has strong local environmental benefits as well by reducing local air pollution from the field burning of wood wastes and reducing waste disposal areas.

With regard to the two pilot plants supported under this project – rubber wood chips-fired power plant in Yala and rice husk fired power plant in Roi-Et – EGCO has prepared and submitted detailed EIA reports to OEPP to be approved for construction and operation of both power plants. According to the Environment Act 1992, the power plant with generating capacity of more than 10 MW has to have Environment Impact Assessment (EIA) document prepared for approval by OEPP as part of the permitting process.

These EIA reports have to be undertaken to be consistent with the section 46 to 51 of the Enhancement and Conservation of the National Environment Quality Act B.E 2535 administered by Ministry of Science, Technology, and Environment. The EIA reports evaluated air pollution impacts, water pollution impacts, waste management, and process noise from both biomass power plants. The results of the EIA are summarized as following:

Air Pollution Impacts: As rubber wood and rice husks have very minimal sulfur content, the emission of SO<sub>2</sub> will be well below the standard. In order to meet emission standard of particulate, an electrostatic precipitator (ESP) will be employed to clean the fuel (stack) gases. The air emissions of the power plants will meet the emission standard of coal-fired power plant imposed by OEPP. In addition, a Continuous Emission Monitoring (CEM) will be installed if required by OEPP.

Water Pollution Impacts: Blow down water from boiler and cooling tower water and other effluents will be treated before discharging to the public waterway.

Waste Management: The total annual amount of ash from the Yala power plant is 4,300 tons. The landfill will be 20 rais or 8 acres for the whole project life.

Process Noise: The noise generation will be limited to the a maximum of 85 dB(A) at 1 meter distance from the machine and 70 dB(A) at the plant boundary.

## ANNEX 6: INCREMENTAL COST

### BROAD DEVELOPMENT GOALS

1. *The overall development objective of the project is the provision or supply of sufficient electricity and energy to meet national development needs at the lowest possible cost. Without GEF intervention, meeting this goal will require increased use of imported fossil fuels for power generation and direct consumption.*

### BASELINE

2. *The baseline consists of what the Government would do without GEF support. Under the baseline, a number of barriers exist to the large-scale application of biomass power generation and co-generation in Thailand. Without these barriers being removed through this project, biomass power and co-generation will continue to operate inefficiently on a very small-scale. The share of biomass power in the national power mix is likely to remain negligible.*

### GLOBAL ENVIRONMENT OBJECTIVES

3. *The global environmental objective of this activity is the reduction of GHG emissions by removing the major barriers to the development of biomass co-generation and power generation to replace fossil fuel use in Thailand. This project has been designed to be consistent with GEF Operational Program #6 on "Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs".*

### GEF ALTERNATIVE

4. *Biomass resource assessment studies have indicated that Thailand has a potential of 3 GW power capacity from biomass residues. Although the private sector showed a high degree of interest in advancing the development of biomass projects, the barriers that exist prevent Thailand's enormous potential from being realized. Even without the project, NEPO is planning to develop policy strategies to improve the tariff structure for biomass power developers. Without the other barriers being removed through this project, however, a widespread national program of replication of biomass power and co-generation is unlikely to take place. GEF support will play a catalyzing role to help Thailand to tap its enormous potential.*
5. *Activity 1 is designed to establish a "One-Stop Clearing House" for biomass projects in Thailand. This activity will establish a "One-Stop Clearing House" for biomass co-generation and power generation in Thailand. The clearinghouse will be composed of three cells: 1) Information-Service Cell; 2) Policy Cell; and 3) Financing Cell. The "One-Stop Clearing House" will be housed in the National Energy Policy Office (NEPO). The Information-Service Cell's role will be to 1) develop an information database and library for potential biomass co-generation investors; 2) disseminate information through web site, workshops, seminars, newsletters, and publications; 3) identify and promote investment opportunities for*

potential investors; 4) provide technical, financial, and business advisory services; and 5) conduct monitoring and dissemination of successful models of biomass co-generation plants in Thailand. This activity is designed to remove the information barriers thereby facilitating further investments. GEF will contribute US\$2.305 million to support the establishment and activities of this clearinghouse. NEPO will provide US\$350,000 in-kind contribution for office space and supplies, as the Clearing House will be housed in NEPO. This is an activity entirely focused on removing barriers, which would not take place without this project.

6. Activity 2 is intended to improve financial incentive policies for biomass power and co-generation projects. This activity will build on the existing DANCED/NEPO study on "Investigation of Pricing Incentives in a Renewable Energy Strategy", and aims to remove the pricing barrier to biomass co-generation development in Thailand (Barrier No. 2). This activity will propose specific recommendations for financial incentive policies to encourage biomass co-generation development in Thailand, including the capacity and energy payment as well as a renewable energy adder for biomass power projects under SPP scheme; formulation of an implementation plan; and facilitation of policy dialogues. Without the project, NEPO would undertake this project in a small way, contributing US\$50,000 to it. However, to successfully remove the barrier, it is estimated that an additional US\$450,000 will be required. As this additional activity is incremental, GEF will contribute this amount to this activity.
7. Activity 3 will establish a biomass power financing mechanism to facilitate the financing of future biomass power plants through a number of concessional or contingent financing tools. This extra support is needed to ensure that biomass projects get favorable treatment. Biomass co-generation and power projects are often considered more risky because 1) the financial institutions lack confidence and experience in the technology; 2) current power tariff is too low; and 3) it may be difficult to ensure the long-term fuel supply. This activity aims to 1) strengthen the technical capability of an existing financial institution to evaluate financing for biomass power projects by establishing a special unit under the financial institution; 2) generate a pipeline of biomass power projects for financing; and 3) set up a financing mechanism to provide concessional financing for the potential replication projects. This activity is designed to accomplish these goals, directly remove the financing barriers (Barrier No. 3), and facilitate future replication of biomass power generation in Thailand. In the absence of the project, about US\$810,000 would be utilized for these activities. Under the project, however, NEPO has agreed to make US\$20 million from an existing fund available for biomass projects. GEF is contributing US\$600,000 to build capacity for the core unit at IFCT, generate a pipeline of follow on activities, and design the financing mechanism for the Fund.
8. Under Activity 4, GEF will provide a grant to pay for that part of the value of the guarantee premium associated with the technical risks of two pilot plants being financed through Japanese OECF: the parawood residue power Pilot Plant in Yala and the rice husk power Pilot Plant in Roi-Et. As these two plants will be the first of their kind in Thailand to utilize efficient combustion technology and generate excess electricity for export to the grid, under EGAT's firm 21-year contract, they are

*perceived of as being riskier than equivalent fossil-fuel powered plants. This perceived incremental risk translates itself into a higher than normal guarantee premium. The Yala Pilot Plant is proposed to have a total installed capacity of 22 MW, among which 20 MW will be sold to EGAT, 2 MW will provide the power need for the plant itself. The Roi-Et Pilot Plant is planned to have a total installed capacity of 9.8 MW, among which 6.8 MW will be supplied to EGAT at firm contract for 21 years, 2 MW will be sold to Sommai Rice Mill, and 1 MW for in-plant use.*

9. *The main shareholders of both projects are Electricity Generating Public Company (EGCO) and Electric Power Development Co. Ltd. (EPDC). EGCO is the first and largest independent power producer (IPP) in Thailand. EGCO has an installed capacity of 2 GW, out of a total installed capacity of 18 GW in Thailand. Because these plants are the first of their kind in Thailand, they are viewed as especially risky by the financial sector. The risk guarantee required for these loans is therefore considered to be higher than for similar plants utilizing fossil fuels. GEF will pay one half of the cost of these commercial risk premiums, or US\$3m total. For the two Pilot Plants, Japanese OECF is financing \$30m and the equity investors are contributing at least another \$15m, making the total value of the baseline investment approximately US\$45m.*

#### *INCREMENTAL COST MATRIX*

10. *The incremental costs and benefits of the proposed project are summarized in the following incremental cost matrix. The incremental cost of the project, US\$27,360,000, is required to remove barriers to the widespread deployment of biomass power and cogeneration in Thailand. Of this amount, US\$6,830,000 is requested for GEF support and US\$20,530,000 will come from NEPO. The total project costs also include US\$45,860,000 baseline costs, among which US\$30,000,000 from OECF; US\$15,000,000 from EGCO, EPDC, Asia Plywood Co. Ltd. and Sommai Rice Mill; US\$810,000 from IFCT; and US\$50,000 from NEPO.*
11. *Without these barrier removal activities, it is very unlikely that the large-scale national replication of biomass power and cogeneration would take place. The rationale for each project activity and the barriers they are designed to remove are explained in the body of the brief and under the "GEF Alternative" in the Incremental Cost Annex.*

## Incremental Cost Matrix

<b>Activity</b>	<b>Baseline</b>	<b>Alternative</b>	<b>Increment</b>
Activity 1. Establish "Clearing House"	<p>There is no existing national institution acting as a focal point for biomass power &amp; co-gen developers and "one-stop information center" for potential biomass project developers.</p> <p>Cost: 0</p>	<p>A "One-Stop Biomass Cogen Clearing House" established to provide info, services, policy advice, and financing for biomass project developers. The capability of information management and advisory services will be built. Biomass cogen information database will be set up. Investment opportunities will be promoted.</p> <p>Cost: US\$2,655,000</p>	<p>A national institution established as a one-stop shop for biomass developers. The "Information-Service Cell" will provide sufficient information and competent services for potential biomass developers.</p> <p>Cost: GEF: US\$2,305,000 (Cash) NEPO: US\$350,000 (in-kind)</p>
Activity 2. Reform Tariff Policy	<p>Current power tariff does provides no incentive to favor biomass power projects. Under current power tariff, most biomass projects are not viable.</p> <p>Cost: US\$50,000</p>	<p>Recommendations regarding "biomass-friendly" power tariff and renewable energy adder will be made, in policy dialogue between the policy makers and industries.</p> <p>Cost: US\$500,000</p>	<p>Financial incentive policies for biomass projects, in terms of power buyback tariff, will be improved. Economic viability of biomass projects will be increased.</p> <p>Cost: GEF: US\$450,000 (Cash)</p>
Activity 3. Establish Financing Mechanism	<p>Developers cannot obtain financing for biomass projects. Financial institutions lack confidence &amp; experience with biomass projects.</p> <p>Cost: US\$810,000</p>	<p>Financing mechanism for biomass projects will be set up. The financial institutions will be educated and trained in biomass projects.</p> <p>Cost: US\$21,410,000</p>	<p>Increased access to financing for biomass developers. Increased confidence &amp; interests from local institutions to finance biomass projects.</p> <p>Cost: NEPO: US\$20,000,000 (Cash) GEF: US\$600,000 (Cash)</p>

<p>Activity 4: Support Pilot Plants</p>	<p>Because Yala and Roi-Et Pilot Plants are the first large-scale efficient biomass cogen plants in the country, the project investors are undertaking a high risk for being first.</p> <p>Cost: US\$45,000,000</p>	<p>GEF supports up to 50% of the guarantee fee to help reduce the risks associated with the OECF loans. As a result, the pilot projects can move ahead.</p> <p>Cost: US\$48,000,000</p>	<p>The pilot plants will demonstrate both technical and commercial viability as well as the project development model for biomass projects in Thailand and elsewhere.</p> <p>Cost: GEF: US\$3,000,000 (Cash)</p>
<p><b>Global Environment Benefits</b></p>	<p>Biomass projects remain undeveloped. Barriers prevent widespread deployment of biomass power &amp; co-gen.</p> <p>Baseline carbon emissions of 62,000 tons of carbon/year from an equivalent coal-fired power plant of the two pilot plants, and 4.2million tons of carbon/ year from the equivalent coal consumption of the total 3 GW biomass potential.</p>	<p>Biomass power &amp; co-gen is widely replicated. Information, pricing, financing, &amp; market barriers removed.</p> <p>Assuming 100% of the biomass fuels will replace fossil fuels, alternative carbon emission = 0 tons of carbon per year.</p>	<p>Significant GHG emissions are attained.</p> <p>Direct carbon emission reduction of 62,000 tons for the two pilot plants within the project lifetime, and up to 4 million tons of carbon per year possible for the total 3 GW biomass potential beyond project lifetime.</p>
<p><b>Domestic Benefits</b></p>	<p>Continuing reliance on import of fossil fuels to meet domestic energy demand. Local air pollution from field burning of biomass residues remains.</p>	<p>Indigenous biomass fuels can provide electricity to meet development needs. Biomass cogen business grows.</p>	<p>Reduced dependence on fuel import. Increased job opportunities at local community. Avoided air pollution from field burning of wood residues.</p>
<p><b>Costs</b></p>	<p>Total Baseline Costs: US\$45,860,000</p> <p>US\$50,000 NEPO US\$810,000 IFCT US\$30,000,000 OECF US\$15,000,000 Private Sector</p>	<p>Total Project Costs: US\$73,220,000</p>	<p>Total Incremental Costs: US\$27,360,000:</p> <p>US\$6,830,000 GEF US\$20,530,000 NEPO</p>

## **Annex 7: Financial Arrangements: Support to Biomass Pilot Plants and Terms of Reference for Subcontract 8 : Providing contingent financing to the Pilot Plants**

This annex describes in detail the financial arrangements relating to the project's support of the two biomass pilot plants.

### **Financing of Pilot Plants**

The capital investment for the two pilot plants will be US\$ 45 million, whereof US\$ 15 million will be provided as equity investment by EGCO, EPDC, Asia Plywood Co. Ltd. and Sommai Rice Mill. In this connection two project companies named Yala Green Co. Ltd. and Roi-Et Green Co. Ltd. are set up by the parties involved. The remaining US\$ 30 million capital investment will be provided through a loan from JBIC. A Special Purpose Vehicle (SPV) named EGCO Green Energy Co. Ltd. has been set up as the holding company to receive JBIC's loan and provide loans to Yala Green Co. Ltd. and Roi-Et Green Co. Ltd.. It is expected that the total loan repayment period will be 17 years with a 3 year grace period on the principal even though interest should be paid back already from the first year.

Due to the risks related to the two biomass plants, JBIC has requested that a guarantee for the two project companies should be provided by local institutions. It has been agreed that EGCO will cover the risks related to fuel supply risks, whereas the local financial institution IFCT will cover the loan guarantee for the projects. Therefore, the two project companies will semi-annual (simultaneously with the repayment of the loan from JBIC) be obliged to pay risk guarantee fees equal to 1.75% of the outstanding loan from EGCO and around 1.75% of the outstanding loan from IFCT. These fees – which are still to be finalized – will cover credit, currency, technology and other risks.

#### **Current Status of Pilot Plants (as of 1 December 2000)**

The planning and design of the two pilot plants has been going on for some time already, the Engineering Procurement and Construction (EPC) contractors are being finalized and it is expected that the construction phase for both plants is imminent. At present, the SPV EGCO Green Energy Co. Ltd. and the Roi-Et Green Co. Ltd. both have been officially registered as companies, whereas Yala Green Co. Ltd. is still under establishment as company. Currently the Yala plant is undergoing an Environmental Impact Assessment approval process as required by the Thai authorities and expecting to receive the approval in next few months, whereas the Roi-Et plant is not subject to this process due to its smaller size.

After some negotiations IFCT has been accepted by JBIC as the local financial institution to provide the loan guarantee. The Guarantee Letter on the loan from JBIC is still being negotiated by the parties.

### **Description of GEF Support to Pilot Plants**

Recognizing that a large part of the risk guarantee fees will relate to (perceived) risks in connection with introducing new biomass technology in Thailand, the GEF project will reimburse the two companies up to 50% of the risk guarantee fees as contingent financing, with a total amount not exceeding US\$ 3 million. The budget allocation is US\$ 2 million to Yala Green Co., Ltd. and US\$ 1 million to Roi-Et Green Co., Ltd. GEF will through the project pay up to 50% of the total cost of the guarantee fees (EGCO's fuel supply risk guarantee fee and IFCT's loan guarantee fee) directly to the project companies (Yala Green Co., Ltd. and Roi-Et Green



Co., Ltd.) on the reimbursement basis semi-annually within 10-15 days upon receiving the invoice and receipt from the project companies. At the fifth year which is the last year of this programme, UNDP Bangkok office will pay the remaining balance of US\$ 3 million directly to the project companies. The purpose is to demonstrate the technical and financial viability of biomass plants and reduce risks related to the biomass technologies.

As the two project companies do not perform any direct services for UNDP except from finalizing their respective plants and paying back the loans, which they would do in any case, the payment to the companies should be considered as grants rather than procurement. In line with this the US\$ 3 million will be reflected under budget line 71/72 for grants. Grants are not covered by the requirements of UNDP's Procurement Framework and a formal competitive bidding process would therefore not be required.

## **Agreement on GEF Support to Pilot plants**

The designated institution (NEPO), should sign a Memorandum of Understanding (MOU) with each of the project companies (Yala Green Co. Ltd. and Roi-Et Green Co. Ltd.) regarding the grants. The MOU should specify i.e. amounts to be paid, timing of payments, terms of payment and consequences of non-performance (e.g. delay or non-realization of the plants). The UNDP standard Capital Grant Agreement for Credit Related Activities will in a slightly modified form (since this activity is not a credit related activity) serve as the MOU between NEPO and the project companies. After the GEF project is approved the parties will proceed to finalize and sign the MOU under the guidance and supervision of UNDP. The exact terms in the MOU regarding reimbursement of the risk guarantee fee cannot be finalized before an agreement is reached on the JBIC loan and the risk guarantee.

During implementation of the NEPO would request UNDP to undertake direct payment according to the conditions contained in the MOU. UNDP's role would be to undertake payment as requested by NEPO and carry out adequate monitoring according to the terms in the MOU.

In case any of the plants cannot be realized or are very much delayed (this seems not to be the case at this stage), UNDP and NEPO jointly should identify alternative projects.

## **Terms of Reference: Provide Contingent Financing to the Pilot Plants Subcontract 8**

### **Description:**

This project will provide contingent financing to support two pilot plants -- the parawood residue power plant in Yala and the rice husk power plant in Roi-Et -- as a show case to demonstrate the technical and financial viability of large-scale grid-connected efficient biomass power and co-generation technologies in Thailand. These two pilot plants are the first efforts in Thailand to utilize efficient combustion technology and to generate electricity for export to the grid with project financing under a long-term, firm-contract with EGAT. The success of these two pilot plants can reduce future perceived technology risks, demonstrate project development and project financing model, increase the confidence and awareness of industry, financiers and general public in biomass power technologies, thereby ease the development of future biomass power and co-generation projects in Thailand. The successful experience and lessons learned from the Yala and Roi-Et pilot plants will be promoted and disseminated through the Information Cell under the One-Stop Clearing House.

EGCO initially proposed this project and requested for UNDP/GEF funding for the Yala pilot plant through the government focal point, and the Government of Thailand has identified the Yala plant as a priority project and officially requested for UNDP/GEF funding to support the Yala plant in late 1998. As requested by the Government of Thailand, UNDP/GEF sent a mission to Thailand in February and August 1999 to help the Government to formulate a UNDP/GEF project brief. After a series of wide consultation with all the major stakeholders in Thailand, these project activities were formulated by September 1999. The project brief was officially endorsed by the Government of Thailand by the end of September 1999 and approved by GEF Council in December 1999.

As mentioned in Section A.1.3, one of the important barriers to biomass power development in Thailand identified under this project is a lack of successful demonstration models of large-scale efficient grid-connected biomass power/co-generation plants in Thailand. This is because of a lack of know-how in the biomass industry to develop a power project, and reluctance to take the risks of being the first one in biomass industry to implement a large-scale efficient technology.

The parawood residue power plant in Yala and the rice husk power plant in Roi-Et will be the first efforts in Thailand to utilize efficient combustion technology and to generate excess electricity for export to the grid with project financing under a long-term, firm-contract with EGAT. The parawood residue Pilot Plant at Yala is proposed to have a total installed capacity of 22 MW, while the rice husk Pilot Plant is planned to have a total installed capacity of 10 MW. The total capital investment cost for both Pilot Plants is estimated to be around US\$45 million, among which US\$15 million will be equity investment from EGCO, EPDC, Asia Plywood Co. Ltd, and Sommai Rice Mill; and US\$30 million will be loans from JBIC.

EGCO is the first and largest independent power producer (IPP) in Thailand. EGCO was established in 1992, as a partial privatization of EGAT. It is a solid power company in Thailand with excellent credit ranking, and it knows the power business extremely well. EGCO has an installed capacity of 2 GW, out of a total installed capacity of 18 GW in Thailand. A majority of the stakeholders in the biomass energy field in Thailand, including government agencies, private

sector, and financial institutions, are very supportive of choosing Yala and Roi-Et pilot plants as demonstration plants under this project.

In addition to demonstrate the technical and financial viability of biomass power/co-generation technologies, the two pilot plants will also demonstrate the project development model of IPP-dominated institutional framework to develop biomass power projects in Thailand. As mentioned in Section A.1.3, energy generation is traditionally not within the core business and area of competence of biomass industry in Thailand. They are not familiar with the sophisticated power project development skills to deal with the complexity of technical and contractual issues involved in implementing such projects. In addition, the credit of most biomass mills is very poor in Thailand. The financial institutions are unlikely to provide project financing to the biomass industry for a biomass power plant, due to the poor credit, low power business development and management skills, and high perceived risks, at least at the initial development stage. Because of these reasons, the Asia Plywood Co. Ltd. and Sommai Rice Mill invited EGCO to set up a joint-venture project company, to bring in the power project development and management expertise, excellent credit, and strong capital investment and financing from EGCO to make the pilot plants happen. Thus, this project development model should be promoted in Thailand, at least at the initial development stage. With the accumulation of experience, expertise, and credit of biomass power projects by biomass industry, the biomass power projects may be gradually developed within biomass industry itself, as in some other countries.

Because these pilot plants are the first of their kind in Thailand, the project investors and financial institutions are assuming a perceived risk that is greater than that encountered for more conventional investments. JBIC, as a lender, requested the risk guarantee from a local financial institution to secure the loan, and also requested EGCO to provide fuel supply risk guarantee. EGCO is negotiating with the Bangkok Bank and IFCT as the local financial institution to provide loan guarantee. Under the current arrangement, the local financial institution will charge around 2% of the outstanding loan amount per semi-annual for the cost of guarantee fees, and EGCO will charge around 1-1.5% for the cost of guarantee fee for fuel supply risks. The cost of this guarantee fee will not only cover credit and currency risks, but also more importantly, the incremental risks resulting from the new technology.

GEF through the UNDP Bangkok office will provide funding to cover the incremental risks associated with this first deployment of this technology in Thailand. As requested by JBIC, EGCO and EPDC will set up a special purpose vehicle (SPV) holding company to receive the loan from JBIC. Then, the SPV will lend the loans to the two project companies (Yala Green Company and Roi-Et Green Company), which will be set up to own and operate the two pilot plants. As requested by NPD, UNDP Bangkok office will pay up to 50% of the total cost of the guarantee fees directly to the power operating companies on the re-imbursalment basis semi-annually within 10-15 days upon receiving the invoice and receipt from the power operating companies. The actual payment will be in Thai Baht, at the official UN exchange rate at the time of reimbursement. However the total guarantee fee amount supported by GEF will not exceed US\$ 3 million. Although other project activities will complete in five years, this Subcontract could last up to seven years. The Information Cell under the Clearing House, in close cooperation with PMO and UNDP, will conduct monitoring and evaluation on the performance of the two pilot plants.

It will thereby facilitate the investment, ensuring the effectiveness of the associated loans from JBIC. In this case, JBIC financing and private sector investment would cover the bulk of

investment costs for the two pilot plants. The project developer will pay that portion of the guarantee premium (approximately 50%) associated with the currency risk inherent in the project. GEF funding will help to cover the remaining portion of the guarantee premium associated with the perceived technology performance risk. This represents a form of contingent financing to cover incremental risks of a renewable energy technology. This will directly address the financing barrier listed in Section A.1.3, the lack of financing capabilities for biomass power projects. The success of the pilot plants will demonstrate the technical and commercial viability of large-scale grid-connected efficient biomass powered power plants in Thailand and the southeast Asian context. It will therefore ease the development of future biomass power and co-generation projects in Thailand, thereby reducing future perceived technology risks.

This project is a model for GEF funding to test the contingent financing mechanism to support renewable energy development, and build a strategic partnership with JBIC to co-fund in projects with global environmental benefits. It will have a large replication potential in Thailand and the world.

**Tasks:**

- As requested by NPD, UNDP Bangkok office will reimburse 50% of the costs of guarantee fees directly to the Yala Green Company and Roi-Green Company every six months, within 10-15 working days upon receiving the receipt of payment. The actual payment will be in Thai Baht, at UN official exchange rate at the time of reimbursement. The total guarantee fees supported from GEF will not exceed US\$3 million. Although other project activities will complete in five years, this Subcontract could last up to seven years.
- Develop performance benchmark for monitoring and evaluation.
- Conduct monitoring and evaluation of the performance of the pilot plants.

Annex 9: Draft Memorandum of Understanding (MOU) for Capital Grant (discussions to finalise this MOU are underway)

*CAPITAL GRANT*

*AGREEMENT*

## For Credit Related

***Activities***

August 2000

## DESCRIPTION

### Capital Grant Agreement

Chapters 4 and 6 of the UNDP Programming Manual provide the requirements for use of capital grants within UNDP programmes. One of the requirements for providing a capital grant is that a memorandum of understanding (MOU) be established between the designated institution (executing entity) of the programme or project and the recipient institution. This model MOU, or Grant agreement contains the elements that UNDP considers necessary for this type of agreement. The model can be adapted to the specific needs of a particular programme and/or the requirements of the designated institution. When used for credit-related activities, UNDP funds must be used in line with "Small and Micro enterprise Finance Guiding Principles for Selecting and Supporting Intermediaries". These guidelines are available on the Programming Manual Reference Centre on the UNDP Intranet. Capital Grant Agreements should be approved by an independent mechanism such as a Steering Committee, to be established in accordance with the programme support document within which the grant is provided. This grant agreement serves to register the commitments and results that the recipient institution [Microfinance Institution or RECIPIENT INSTITUTION for credit activities] has agreed to produce, and the level of funding to be provided by the designated institution. It is recommended that funds be released in tranches, based on results. These results should be clearly specified, such that it is clear to all parties when a recipient institution qualifies for release of tranches of funds.

It is suggested that for credit related programmes, the targeted results should focus on 1] Outreach: Number of active clients; 2] Sustainability: Operational Self Sufficiency; and 3] Portfolio Quality: Portfolio at Risk at 30 days. These indicators demonstrate a microfinance institution that is expanding its services in a sustainable manner. Definitions of these terms are contained in the Programming Manual Resource Center, Chapter 6, Reporting Requirements for credit related activities.

## CAPITAL GRANT AGREEMENT

### MODEL CAPITAL GRANT AGREEMENT BETWEEN THE DESIGNATED INSTITUTION AND THE RECIPIENT INSTITUTION FOR THE PROVISION OF GRANT FUNDS UNDER A UNDP-SUPPORTED PROGRAMME/PROJECT

This Agreement (hereinafter referred to as the "Agreement") is made between the [INSERT NAME OF Designated Institution] and [INSERT NAME OF Recipient Institution].

WHEREAS [Insert name of the Designated Institution] (hereinafter referred to as "the Designated Institution") has been requested by the United Nations Development Programme ("UNDP") to manage the programme/project defined in programme/project document [Insert programme/project number and title] (hereinafter referred to as "the Programme/Project"), implemented at the request of the Government of [Insert name of country]

WHEREAS the Designated Institution and UNDP desire to provide funding, in the form of a capital grant (hereinafter referred to as "the Grant") made by the Designated Institution to the [INSERT NAME OF Recipient Institution] (the Recipient Institution is hereinafter referred to as the "Recipient Institution") in the context of the Programme/Project, and on the terms and conditions set forth in this Agreement; and

WHEREAS the **RECIPIENT INSTITUTION** is ready and willing to accept such funds from the Designated Institution for the activities described in the following, and on the said terms and conditions;

NOW, therefore, the parties hereto agree as follows:

#### **I. Responsibilities of the RECIPIENT INSTITUTION**

1.1 The RECIPIENT INSTITUTION agrees to:

1. Undertake the activities described in its **Workplan** and **Budget** which are attached to this Agreement as Annex 1, or subsequent updates hereof to be approved by the Steering Committee of the Programme/Project;
2. Report to the Designated Institution on the utilization of the Grant in accordance with Article IV below; and

1.2 The RECIPIENT INSTITUTION shall manage its operations in order to maximize its performance in the following three categories:

- 
- Implement the pilot plants successfully and timely
- Demonstrate technical and commercial viability of biomass power technology
- Disseminate experience and lessons learned from the pilot plants

1.3 The RECIPIENT INSTITUTION commits itself to reaching the performance targets set out in Annex 2 to this Agreement for Plant Completion, Plant Output to EGAT, and Plant Availability for years 1, 2, 3, 4 and 5. If the RECIPIENT INSTITUTION fails to meet its responsibilities outlined in article 1.1, or to attain at least 70% of any one performance target for any given year, the Steering Committee of the Programme/Project will have the right to suspend all or part of the capital grant support to the RECIPIENT INSTITUTION under the Programme/Project. Upon request of the Steering Committee, and for its consideration in determining the period of the extension, the RECIPIENT INSTITUTION shall be obligated to produce a written explanation detailing the reasons the target was missed, and measures taken by the RECIPIENT INSTITUTION to remedy the situation. The suspension shall remain in effect until the Steering Committee is satisfied that the RECIPIENT INSTITUTION has achieved the target.

1.4 The RECIPIENT INSTITUTION shall inform the Designated Institution and UNDP about any problems it may face in attaining the objectives agreed upon, as soon as such problems are encountered.

## II. Duration

2.1 This Agreement will come into effect on [INSERT DATE/MONTH/YEAR] and shall expire on 5 years after the effectuation of this Agreement, covering the anticipated term of the project. The Agreement may be extended beyond this period through an exchange of letters between the Parties, noting the new expiration date.

## III. Payments

3.1 UNDP shall provide funds to the RECIPIENT INSTITUTION in an amount up to **US\$ 3,000,000 (Three million U.S. dollar)** according to the schedule of the project budget set out in Annex 1. The budget allocation is up to US\$ 2 million to Yala Green Co., Ltd. and up to US\$ 1 million to Roi-Et Green Co., Ltd. GEF through the UNDP Bangkok office will pay up to 50% of the total cost of the guarantee fees (EGCO's fuel supply risk guarantee fee and ICT's loan guarantee fee) directly to the project companies (Yala Green Co., Ltd. and Roi-Et Green Co., Ltd.) on the reimbursement basis semi-annually within 10-15 days upon receiving the invoice and receipt from the project companies. At the fifth year which is the last year of this programme, UNDP Bangkok office will pay the



remaining balance of US\$ 3 million directly to the project companies. Payments are subject to the **RECIPIENT INSTITUTION** meeting the outputs as specified in the Performance Targets (Annex 2).

3.2 All payments shall be deposited into the **RECIPIENT INSTITUTION'S** bank account of which the details are as follows:

[NAME OF THE BANK]  
[BANK ROUTING NUMBER]  
Yala Green Co., Ltd  
[BENEFICIARY ACCOUNT NUMBER]

[ADDRESS OF THE BANK]

[NAME OF THE BANK]  
[BANK ROUTING NUMBER]  
Roi-Et Green Co., Ltd  
[BENEFICIARY ACCOUNT NUMBER]

[ADDRESS OF THE BANK]

3.3 The amount of payment of such funds is subject to any adjustment or revision due to changes in prices, exchange rates or the actual costs incurred by the **RECIPIENT INSTITUTION** in the performance of the activities under this Agreement. However, the total amount of payment of such funds is not over US\$ 3 million.

#### **IV. Records, Information and Reports**

4.1 The **RECIPIENT INSTITUTION** shall maintain clear, accurate and complete records in respect of the funds received under this Agreement.

4.2 The **RECIPIENT INSTITUTION** shall furnish, compile and make available at all times to the Designated Institution, UNDP any records or information, oral or written, which the Designated Institution or UNDP may reasonably request in respect of the funds received by the **RECIPIENT INSTITUTION**.

4.3 Within sixty days after completion of programme/project activities, the **RECIPIENT INSTITUTION** shall provide the Designated Institution and UNDP with a final report with respect to all expenditures made from such funds (including salaries, travel

and supplies) and indicating the progress made toward the goals of the activities undertaken, utilizing the reporting format contained in Annex 3 of this Agreement.

4.4 Provide quarterly reports to the Steering Committee in accord with the Attached Reporting Formats (Annex 3); and Provide Annual Audited Statements [Income Statement and Balance Sheet].

4.5 All correspondence regarding the implementation of this Agreement shall be addressed to:

For the **Designated Institution**

[INSERT NAME OF AUTHORIZED OFFICIAL AND ADDRESS]

For UNDP:

[INSERT NAME OF UNDP RESIDENT REPRESENTATIVE AND ADDRESS]

For the **RECIPIENT INSTITUTION:**

[INSERT NAME OF AUTHORIZED OFFICIAL AND ADDRESS]

## V. General Provisions

5.1 This Agreement and the Annexes attached hereto shall form the entire Agreement between [INSERT NAME OF ENTITY] and the Designated Institution, superseding the contents of any other negotiations and/or agreements between the Parties, whether oral or in writing, pertaining to the subject of this Agreement.

5.2 The **RECIPIENT INSTITUTION** shall carry out all activities described in its Workplan with due diligence and efficiency. Subject to the express terms of this Agreement, it is understood that the **RECIPIENT INSTITUTION** shall have exclusive control over the administration and implementation of the activities referred to above in paragraph 1.1 and that the Designated Institution and UNDP shall not interfere in the exercise of such control. However, both the quality of work and the progress being made toward successfully achieving the goals of such activities shall be subject to review by the Steering Committee. If at any time the Steering Committee is not satisfied with the quality of work or the progress being made toward achieving such goals, the Steering Committee may advise the Designated Institution to: (i) withhold payment of funds until in its opinion the situation has been corrected; or (ii) declare this Agreement terminated by written notice to the **RECIPIENT INSTITUTION** as described in paragraph 5.6 below; and/or seek any other remedy as may be necessary. The Steering Committee's determination as to the quality of work being performed and the progress being made toward such goals shall be final and shall be binding and conclusive upon the **RECIPIENT INSTITUTION** insofar as further payments are concerned.

5.3 Neither the Designated Institution nor UNDP undertakes any responsibilities whatsoever in respect of life, health, accident, travel or any other insurance coverage for any person employed by the RECIPIENT INSTITUTION to undertake activities under this Agreement. Such responsibilities shall be borne by the **RECIPIENT INSTITUTION**.

5.4 The rights and obligations of the **RECIPIENT INSTITUTION** are limited to the terms and conditions of this Agreement. Accordingly, the **RECIPIENT INSTITUTION** and personnel performing services on its behalf shall not be entitled to any benefit, payment, compensation or entitlement except as expressly provided in this Agreement.

5.5 The **RECIPIENT INSTITUTION** shall indemnify, hold and save harmless, and defend, at its own expense, the United Nations, UNDP, its officials, agents, servants and employees from and against all suits, claims, demands, and liability of any nature or kind, including their costs and expenses, arising out of acts or omissions of the **RECIPIENT INSTITUTION**, or its employees, officers, agents or sub-contractors, in the performance of this Memorandum of Understanding. This provision shall extend, *inter alia*, to claims and liability in the nature of workmen's compensation, products liability and liability arising out of the use of patented inventions or devices, copyrighted material or other intellectual property by the **RECIPIENT INSTITUTION**, its employees, officers, agents, servants or sub-contractors. The obligations under this provision do not lapse upon termination of this Memorandum of Understanding.

5.6 This Agreement may be terminated at any time by either Party giving thirty (30) days written notice to the other Party. Upon termination of the Agreement, the **RECIPIENT INSTITUTION** shall promptly return any unutilized funds to UNDP.

5.7 No modification of or change to this Agreement, waiver of any of its provisions or additional contractual provisions shall be valid or enforceable unless previously approved in writing by the parties to this Agreement or their duly authorized representatives in the form of an amendment to this Agreement duly signed by the parties hereto.

5.8 Any controversy or claim arising out of, or in accordance with this Agreement or any breach thereof, shall unless it is settled by direct negotiation, be settled in accordance with the UNCITRAL Arbitration Rules as at present in force. Where, in the course of such direct negotiation referred to above, the parties wish to seek an amicable settlement of such dispute, controversy or claim by conciliation, the conciliation shall take place in accordance with the UNCITRAL Conciliation Rules as at present in force.

The parties shall be bound by any arbitration award rendered as a result of such arbitration as the final adjudication of any such controversy or claim.

5.9 Nothing in or relating to this Agreement shall be deemed a waiver of any privileges and immunities of the United Nations, or UNDP.

IN WITNESS WHEREOF, the undersigned, duly appointed representatives of the Designated Institution, and the **RECIPIENT INSTITUTION**, respectively, have on behalf of the Designated Institution and the **RECIPIENT INSTITUTION** signed the present Memorandum of Agreement on the dates indicated below their respective signatures.

**On behalf of Designated Institution:**

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

**On behalf of the RECIPIENT INSTITUTION:**

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_




General Category of Expenditures	Tranche 1	Tranche 2	Tranche 3	Tranche 4	Tranche 5
50% of Risk Guarantee Fees for Yala Project					
50% of Risk Guarantee Fees for Roi-Et Project					
<b>TOTAL</b>					

General Category of Expenditures	Tranche 6	Tranche 7	Tranche 8	Tranche 9	Tranche 10
50% of Risk Guarantee Fees for Yala Project					
50% of Risk Guarantee Fees for Roi-Et Project					
<b>TOTAL</b>					

\* Please note that all budget lines are for costs related only to finance activities.  
 \*\* These budget categories and number of tranches are suggested guidelines. The RECIPIENT INSTITUTION may choose alternates which more accurately reflect their expense items and needs.

## Annex 2 RECIPIENT INSTITUTION Performance Targets

RECIPIENT INSTITUTION NAME	BASELI NE	YEAR 1		YEAR 2		YEAR 3	
		Proposed	Actual	Proposed	Actual	Proposed	Actual
Plant Completion		NA		100%		NA	
Plant Output to EGAT		NA		NA		60%	
Plant Availability		NA		NA		70%	

RECIPIENT INSTITUTION NAME	BASELI NE	YEAR 4		YEAR 5	
		Proposed	Actual	Proposed	Actual
Plant Completion		NA		NA	
Plant Output to EGAT		70%		80%	
Plant Availability		80%		90%	

\*Additional Years can be added for longer programmes

**Annex3 RECIPIENT INSTITUTION Reporting: Required Formats**

**Performance Report**

Recipient Institution _____			
Performance Report _____			
FOR THE QUARTER ENDING _____			
(In Local Currency)			
QUARTERLY	Current Period	Previous Period	Change from
	Amount	Amount	Last Amount
Current Exchange Rate to \$ US:			
<b><u>Risk Guarantee Fees</u></b>			
Yala Project			
Roi-Et Project			
<b>Operating Efficiency Ratios</b>			
Plant Output to EGAT			
Plant Availability			

\* These ratios reflect the 6-month period ending at this reporting date.

**Comments (reasons for achieving or not achieving specific targets, challenges behind and ahead)**

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