

**EXECUTIVE SUMMARY**  
**Mid-Term Evaluation of the UNDP-GEF Project:**  
**Removal of Barriers to Biomass Power Generation and Cogeneration in Thailand**  
**(THA: RBBPGC Project)**

The seven-year RBBPGC Project represents a collaborative effort between GEF, UNDP, the National Energy Policy Office (NEPO) – now the Energy Policy and Planning Office (EPPO)/Ministry of Energy, and the Danish International Development Assistance (DANIDA) to promote the adoption of renewable energy by removing barriers to biomass power generation and cogeneration with an ultimate goal of reducing GHG emission.

The Energy for Environment Foundation (EFE), on behalf of the EPPO, is the Project executing agency. The implementing unit is the Biomass One Stop Clearing House (BOSCH), established to provide technical advices, financial consultation, knowledge and information about biomass and policy recommendations to potential developers, interested groups, government agencies and general public.

The mid-term evaluation finds that the Project has progressed well according to the work plan albeit a late start. Within a few years, BOSCH has undertaken a large number of activities and produced many outputs in a timely manner. Nonetheless, development has been uneven across different lines of work, with technical and information being the leading sectors and policy and finance lagging behind. Personnel has been a perennial problem; recruitment difficulty and high turn-over rate constitute the most significant threat to the future of this Project.

An analysis of output-outcome linkages shows that the linkages are stronger in technical, policy, information and outreach than in the area of finance. Another finding is that the two demonstration plants, which were expected to serve as successful models for large-scale and efficient biomass co-generation/power systems and project development models under the firm contract, have experienced many difficulties and delays, and therefore have contributed very little to the project objectives.

The evaluation reveals that the rapidly changing context is the most important challenge to the project objectives. The information barrier was rapidly overcome, partly as a result of this Project. A number of large biomass power generation projects have been established during the past few years, and the biomass raw material supply situation has swiftly shifted from plenty to scarcity. Most experts agree that the future of renewable energy lies in small-scaled projects – biomass, biogas, wind and solar. BOSCH has felt the need to respond to the changing situation and has expanded its scope of work into other renewable energy, especially biogas which has a very good development potential. The evaluation supports the expansion of the scope of the Project, and highlights the need for a project redesign.

Selected best practices are identified to represent BOSCH's endeavor to provide integrated services in biomass and biogas power co-generation, to conduct a quality policy study to guide future development of VSPP (Very Small Power Production), and to seek new opportunities to promote the use of renewable and clean energy through its CDM (Clean Development Mechanism) initiative.

Experiences from the Project shows that developers of power generation projects from renewable energy need back-stopping and institutional support, not only during project development, but also throughout the operation period. Although financing mechanisms are still limited, many developers have managed to secure commercial and soft-loan lending. Capacity building and institutional support are what the developers need most, especially when they face policy and regulatory problems.

The evaluation also highlights some conflicting demands and dilemma that has placed constraints on BOSCH's operation and its further development. The most significant challenge is for BOSCH to reconcile between the project objective of "removing the barriers in biomass power generation" and the expectation to become financially self-sustainable by the end of the Project. Related issues are the positioning of BOSCH, especially with regard to its professionalism and independence, the relationship with key stakeholders. Further, the evaluation also underscores a need to restore balance among the different lines of work and to expand the policy study and advocacy as well as public education work.

All in all, the evaluation highlights the need for project adjustment to broaden the scope of the project to include other renewable energy, to revise the project strategy to focus on smaller-scale projects, and to review some key components, e.g. the Credit/Risk Guarantee Facility, which may not be relevant or useful given the present situation. Such review should also address a restructuring of BOSCH's mission and objectives, roles and functions, as well as its operation module. An alternative module envisions a commercially-oriented BOSCH and not-for-profit EFE sharing the implementation responsibility of the project, with BOSCH focusing on technical and financial, EFE focusing on policy and advocacy, and both sharing the information function.

These issues need to be resolved urgently as an unsettling future would hamper the need to maintain and recruit high-caliber staff and thereby jeopardizing any chance of success in the second half of the Project. Other operational recommendations include performance improvement through enhanced project oversight, integrated internal work process, consolidated database management, expanded agency relations network, synthesis and sharing of lessons learned and best practices.

**Final Report**  
**Mid-Term Evaluation of the UNDP-GEF Project:**  
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**Project Background**

The RBBPGC Project is a Global Environment Facility (GEF) supported full size project (FSP) and is line with GEF Operational Programme No. 6, "Promoting the Adoption of Renewable Energy by Removing Biomass Development Barriers and Reducing Implementation Costs," implemented through the United Nations Development Programme (UNDP). The Project<sup>1</sup> 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.

Specific objectives of the Project are 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 power project investors;
- c) increase access to commercial financing for biomass co-generation and power projects;
- d) facilitate the implementation of two initial biomass power plants through support for commercial guarantees which will reduce technical risks associated with the deployment of this new technology in Thailand.

The initiative represents a collaborative effort between GEF, UNDP, the National Energy Policy Office (NEPO) – now the Energy Policy and Planning Office (EPPO)/Ministry of Energy, and the Danish International Development Assistance (DANIDA). To support this Project, the GEF provided US\$ 6,805,000; the government, private sector, bilateral donors, and regional banks collectively provided a total amount of US\$ 117,630,000 co-financing.

The Energy for Environment Foundation (EFE), on behalf of the EPPO, is the Project executing agency. The implementing unit is the Biomass One Stop Clearing House (BOSCH), established to provide technical advices, financial consultation, knowledge and information about biomass and policy recommendations through its Technical Service Cell, Financing Service Cell, Information and Outreach Cell, and Policy Cell, to potential developers, interested groups, government agencies and general public,

All parties signed the 7-year Project on 20 June 2001 that indicates official implementation of the Project. At the end of 2004, a mid-term evaluation was planned to provide all parties concerned a performance review, impact evaluation, lessons learned, best practices, and operational recommendations.

**Purpose and Scope of the Evaluation**

The mid-term evaluation of the RBBPGC Project aims to review the performance of the Project from the start up to the present. The review includes both evaluation of the progress in project implementation, measured against planned outputs set forth in the Project

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<sup>1</sup> Hereafter, the RBBPGC Project will be referred to as "the Project", while other biomass/biogas projects that BOSCH has been involved with will be referred to as "projects".

Document in accordance with rational budget allocation, and an assessment of features related to the impact of the Project. The evaluation also identifies lessons learned and best practices from the RBBPGC Project and offers recommendations to enhance its performance.

### **Evaluation Methodology**

As this project involves a number of individuals and organizations with different interests, in different capacities, at different levels of engagement, the evaluation places high emphasis on obtaining information and opinions from various perspectives to establish a balanced assessment.

Important individuals and organizations concerned can be categorized as follows:

**Direct stakeholders:** Direct stakeholders are organizations that play a critical and active role in contributing to the establishment and implementation of the Project. This includes national agencies that have a specific mandate and responsibility for the promotion of biomass and donors that provide technical and financial contribution. Direct stakeholders include some members of the PSC and are instrumental and accountable for the success of the Project through their guidance and approval authority.

**Indirect stakeholders:** Organizations, through their organizational mandate or expertise can contribute, although to a lesser degree, to the success of the Project. Their main contribution is in terms of ideas and other types of collaboration. Some members of the PSC are indirect stakeholders as they share the benefit from the success of the Project.

**Project management:** Project management line-up includes the Energy for Environment Foundation (EFE)<sup>2</sup>, the Project Management Office (PMO), and the Biomass One-Stop Clearing House (BOSCH). Together, these units serve as the project management structure and the nerve center of the Project. Supporting this structure are independent subcontractors and advisors as well as the Advisory Committees. Individuals involved in the project management line-up are directly responsible for the day-to-day operation and the transformation of policy into action. They are appointed or recruited for this Project on the basis of their technical or management expertise.

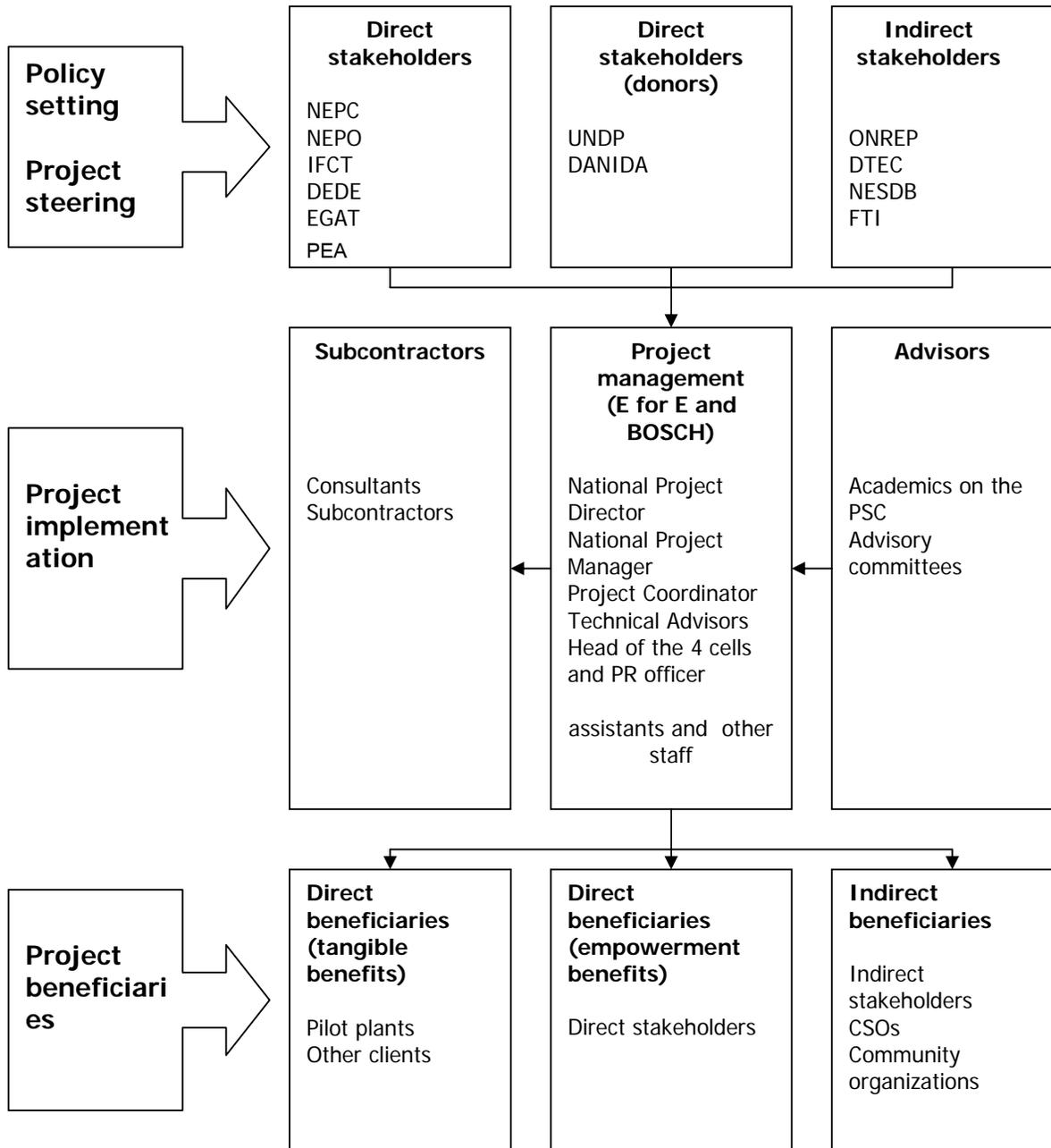
**Direct beneficiaries:** There are two groups of direct beneficiaries. The first group gain tangible benefits from the Project, namely the clients, especially the pilot plants. The other group consists of direct stakeholders that obtain intangible – empowerment - benefit. These organizations, through their participation in the Project, benefit from learning about the Project's best practices and lessons learned. This practical experience will result in cumulative knowledge and enhanced capacity of the individuals and organizations concerned to help further the development of biomass in Thailand and elsewhere.

**Indirect beneficiaries:** Indirect stakeholders are also indirect beneficiaries. The improvement of the overall biomass situation helps these organizations in performing their respective responsibilities. Civil society and community organizations in the areas can also benefit from increased farm income, renewable and environmental-friendly energy, as well as the empowerment aspect of the Project.

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<sup>2</sup> In practice, the EFE has not been directly involved in project management, and is more appropriately regarded as stakeholders.

The following chart simplifies and summarizes the evaluation team's understanding of the role and responsibility of the parties involved in this Project. It is also noted that contributions from all key parties are essential in advancing the implementation progress and delivering successful results.



The assessment of project implementation was based on the results of the internal evaluation, which was conducted in line with the monitoring and evaluation guidelines and success indicators stipulated by the Project Document. The evaluation focuses on verifying the results, and highlighting any issue that has impeded or advanced the implementation of the Project or any of its components, including actions taken and resolutions made. The

evaluation takes note of the work process, but analyzes it in-depth only in cases that there are signs of process bottleneck or any other problems.

### **Data Collection**

The evaluation is based on the following data collection methods.

- Review of documents related to the Project such as Project Document, quarterly, biannual and annual progress reports, other activity/component specific deliverables, reports and evaluation, etc, to obtain data on project objectives, historical development, institutional and management mechanism, project activities, etc.
- Structured interview with knowledgeable parties, i.e., project director, project personnel, UNDP Country Office counterpart, members of the project steering/advisory committee/s, community-based/people's organization/s, project beneficiaries or grantees, to obtain additional information and clarifications, as well as an assessment by each party on project implementation, impact, lessons learned & best practices, and operational recommendations. The evaluation team conducted approximately 50 interviews throughout the evaluation period. (See Annex 1 for list of interviewees, and Annex 2 for the result of the interviews).
- Group discussion. The evaluation team presented preliminary findings for comments, discussion and suggestions to BOSCH on April 1<sup>st</sup>. Copies of the preliminary findings were also sent to EFE board members for comments.
- Site visits to obtain data and viewpoints from project beneficiaries including field trips to Surat Thani, Roi-Et, and Surin provinces.

### **Communication of the Evaluation Findings**

Preliminary findings were shared with BOSCH on April 1<sup>st</sup> 2005. Draft report was submitted to the EFE by the end of April and presented to the EFE on April 24<sup>th</sup>, and the PSC on June 23<sup>th</sup>.

### **Evaluation Team**

The evaluation team, under the Foundation for the Promotion of Public Policy Studies (FPPS), consists of the following members:

Ms. Parichart Siwaraksa	team leader
Ms. Sunantha Natenuj	
Mr. Permsak Natenuj	
Dr. Keokam Kraisoraphong	
Mr. Suraphol Liamsoongnern	
Mr. Chatree Kuasirikun	
Ms. Chuenchom S. Greacen	technical advisor

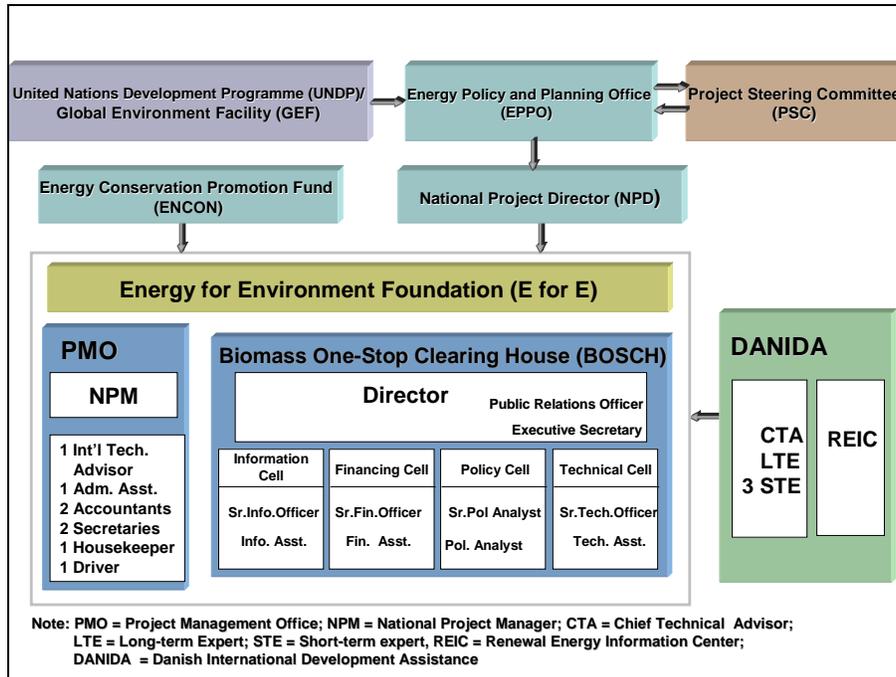
### **Evaluation Results**

The evaluation report is divided into 5 parts:

- 1) Project performance
- 2) Project impact
- 3) Lessons learned
- 4) Best practices
- 5) Operational recommendations

# 1. Project Implementation

## Organizational Structure



As of March 2005

## Work Plan

To evaluate the Project, the evaluation team studied the Project Document that outlines the immediate objectives, outputs, indicators and activities, but does not specify definite timeframe for each achievement.

Based on the Project Document, BOSCH<sup>3</sup> developed a detailed five-year work plan and an annual work plan. The annual work plan is revised every six month with the approval of the PSC. The system of the rolling work plan offers a realistic and up-to-date project assessment and planning. But PSC members who are not closely involved in the Project find it difficult to monitor the progress and achievement over time.

The reporting system serves as a continuous monitoring system. There are 3 important reporting requirements: (a) annual Project Implementation Review (PIR) to the GEF, (b) bi-annual report (not calendar year) to Energy Conservation Promotion Fund (EnCon Fund), and quarterly report to UNDP. The reports have different formats and overlapping reporting periods.

At mid-term interval, the project has progressed as planned to the satisfaction of all parties concerned. This is quite an extraordinary achievement given the complexity of the project and the difficulties that the project experienced during the initial phase.

<sup>3</sup> Hereafter, the reference to BOSCH also includes PMO.

Operation commenced in October 2001. The first year laid fundamental institutional and operational framework, including NEPO's appointment of EFE as project executor, the restructuring of EFE to assume the project responsibility, the recruitment of most staff, the constitution of the governance systems, namely the project steering committee (PSC), the financial and accounting system, the procurement of the office and equipments.

This development took place amid a significant change at top management level, namely the transfer of Dr. Piyasvasti Amranand, NEPO Secretary-General and the resignation of Dr. Pongpisit Visetkul, Director of Renewable Energy and Energy Conservation Division, both of them having played a key role during project formulation. Continuity was nonetheless restored and strengthened with Dr. Piyasvasti serving as EFE chairman, and Mr. Viraphol Jirapraditkul, the new Director of the Renewable Energy and Energy Conservation Division to the Power Division continuing as Project Director after his promotion to be NEPO Deputy Secretary-General.

Another major difficulty was the delay in recruiting BOSCH director. Given the highly technical and managerial qualifications required for this challenging job, it was not until a year after – in November 2002 that a successful placement was made.

BOSCH's activities expanded rapidly during 2003-2004. Until now, there have been only 3 major delays that affected the execution of the Project, namely the recruitment of BOSCH director, the second pilot plant, and the business plan. While the first was later compensated by speedy implementation, the other two factors had more enduring and significant impact on the Project as will be discussed later.

### **Scope of the Project**

Biomass was the Project's original scope. But within a few years, BOSCH has expanded its operation to include biogas and other renewable energy.

For example, BOSCH completed a study on wind and solar energy for EPPO, and participated in EFE's non-biomass, non-renewable energy studies, i.e. energy cost in major industries, the development of new IPP guidelines.

The evaluation team investigated what seems like a deviation from the project objectives and found that BOSCH has attempted to, and in most cases succeeded in fulfilling its role and responsibilities as per the Project Document. The activities which may seem to lie outside the scope of the Project are actually closely related to the fulfillment of the project objectives and are in line with the development of renewable and clean energy in Thailand.

The expansion of BOSCH's activities was primarily due to the close connection among renewable energy issues. A successful policy proposal, for example, requires an overview of, a comparison among, and the integration of different sources of energy. BOSCH and most experts on and outside the PSC agreed that the project should not be limited to biomass as the future of renewable energy lies in an energy mix of several small energy sources especially biogas, wind and solar energy.

Another reason for BOSCH to undertake these extra activities was the drive to become financially self-sustainable.

### **Project Oversight**

There are 3 levels of project oversight. First, the 8-member EFE board that meets approximately 4 times a year on a broader agenda. But the EFE board does not provide direct supervision of the Project. Second, the 14-member PSC, consisting of direct and indirect stakeholders and independent experts, convenes twice a year and assumes direct

project oversight. Third, the EFE chairman has a monthly review of the Project with BOSCH management.

Given the infrequent PSC meetings, the complexity of the Project, the rolling work plan, the various reporting formats, the substitutions and frequent changes among the ex-officio members, several PSC members have only limited knowledge of the progress of the project and little exchange with BOSCH, and feel that they are only "contributors", not "stakeholders" of the Project.

Although there are a number of experts on the PSC, there has been little opportunity for a discussion of substantive issues as the PSC meeting generally covers only operational matters. While some PSC members are satisfied with the existing system, some would like to have more substantive exchanges with BOSCH.

In sum, aside from the procurement, disbursement and financial management, BOSCH has managed the Project under minimal project oversight.

### **Personnel**

BOSCH and PMO staff expanded from 12 in early 2002 to 23 in 2004. In general, recruitments were difficult because of the temporary/short-term nature of the project and the high qualifications required for most posts.

BOSCH has a high turn-over rate especially in the policy and finance cells. The situation of the policy cell is most critical as the project has had either a staff shortage or an absence of a senior policy analyst since the beginning of the operation.

The project design was partly responsible for this problem. Due to the expectation that the project would be under the management of NEPO (now EPPO) – the national focal point for energy policy, the policy cell was expected to draw upon NEPO's policy expertise and designed to be very small, merely to provide supplementary support to NEPO staff. With a separate set-up under EFE, BOSCH found itself understaffed in this area. Although the problem was subsequently addressed by adding an additional staff to the policy cell, the unit continued to suffer from inadequate attention and recruitment difficulty, resulting in a sluggish development.

### **Activity-based Budget, Procurement and Disbursement**

BOSCH has 4 funding sources:

- a) the GEF budget of 6.8 US\$ million or 290 million Baht (excluding the risk guarantee fund). As of April 2004, budget allocation equaled 41.11 million Baht. Disbursement rose from 32% in the initial period to 83%.
- b) the EnCoN Fund of 22 million Baht (excluding 2,082 million Baht subsidy for SPP). As of April 2004, budget allocation equaled 9.8 million Baht. Disbursement rose from 72% to 88%.
- c) DANIDA's support fund of 8.178 Danish Krone or 40 million Baht for the service of an international expert. As of April 2004, 6.768 Krone or 83% of the budget has been disbursed.
- d) commissioned projects. Commissioned projects brought in 11.7 million Baht in 2003 and 11.9 million Baht in 2004.

Each budget has its own itemization system. While it is possible to keep some budget items separated, e.g. salaries for BOSCH staff and international consultants are covered by the GEF budget while salaries for PMO and office rental come from the EnCon Fund, other operating costs are shared by both sources.

It was not until late 2004 that BOSCH launched an activity-based budget plan, and accounting. The exercise, however, covers only the GEF budget. It would therefore be misleading to calculate BOSCH's efficiency rate based on only one source of budget.

The procurement and disbursement are generally efficient and transparent. Disbursement was stagnant in the beginning, but stayed above 80% at mid-term interval. (See Annex 3) The following table shows the project's disbursement pattern from the beginning to April 2004.<sup>4</sup>

<b>GEF fund disbursement ranking</b>	<b>EnCon Fund disbursement ranking</b>
Equipment (98.67%)	Management fee (100%)
BOSCH salaries (90.29%)	Office rental (97.88%)
Travel (89.28%)	Equipment (96.66%)
International experts (77.52%)	Others (92.09%)
Others (63.10%)	Disposable supplies (84.89%)
Seminar/workshop/PR (62.53%)	Operating expenses (83.40%)
Support fund for the pilot plants (0%)	PMO salaries (69.38%)

One notable exception to the otherwise very smooth operation is the delay of the EnCon Fund. The first phase covered May 2002-May 2004. But the second phase was not forthcoming until September 2004. If the EFE had not been able to provide a bridging fund, the project would have experienced a major set-back.

#### **In-house Collaboration**

BOSCH has a monthly meeting and a project-by-project collaboration system. For a task/project that requires close coordination among various cells, a task/project coordinator is designated to facilitate in-house collaboration and to act as account executive.

Horizontal coordination is generally good, and particularly close between the information and technical cells. The finance and policy cells are however more distant. Vertical coordination is good on a project basis. But junior staff still lack the Project overview. Information flow is apparently limited to senior staff.

#### **Collaboration with Partners and Other Agencies**

To a large extent, BOSCH is a customer-centered organizations and has managed to cultivate a good relationship with its clients especially potential developers. It has also made serious attempts to develop a good relationship with the communities and the public. BOSCH has established a wide range of contact with government agencies and academics, but has less contact with NGOs.

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<sup>4</sup> More up-to-date budget data use a different budget classification system.

### **Balance Between Different Lines of Work**

BOSCH's work overwhelmingly concentrates on information and technical aspects. This is also reflected by the staff profile. At present, there are 6 technical staff (2 are covered by DANIDA fund, 2 by cost-recovery commissioned projects), compared with 1-2 for each other lines of work.

According to BOSCH management, the following line-up represents a ranking from the strongest to the weakest line of work: technical, information, policy, outreach, and finance. This view is also shared by most stakeholders. More details on this issue will be presented later.

This imbalanced development is partly due to the technology-oriented management and staff, and partly due to the drive to become financially self-sustainable. The technology-driven development can be perceived as exploiting the organization's advantage, but it can and has also been perceived as a diversion from the project objectives of "removing biomass development barriers" toward a more commercial orientation, which could lead BOSCH toward becoming one of many energy/engineering consultancy firms.

The concern that BOSCH is moving away from or at best not focusing on the project objective of "removing biomass development barriers" is a legitimate one. Today, information and technology deficiency is no longer a formidable barrier for potential developers. The challenge lies in the lack of policy clarity, effective implementation and regulation, appropriate and flexible financial mechanisms, and public understanding of the benefits and risks of biomass projects. But these are not BOSCH's priority areas of work.

At present, the dilemma between the Project's primary objective of "removing biomass development barriers" and another objective of becoming "financially self-sustainable" is one of the most significant issues for all parties.

### **The Future of BOSCH**

Although the Project is only half way through, considerations on the future of BOSCH have been crucial for BOSCH's performance and development. An absence of a business plan during the first 2 years in operation deprived BOSCH of an opportunity to seriously and strategically contemplate and plan its development. The Business Plan, finalized in December 2004, also stops short of recommending a clear path ahead. It presents 3 options for BOSCH: a) continue under EFE, b) become legally independent but maintain a close link (financially) with EFE, c) become fully independent.

Up to now, BOSCH management and staff have operated under the assumption that by the end of the Project, BOSCH is to become financially self-sustainable, and most are preparing for c), which explains BOSCH's increasing disposition toward commercially promising projects.

The EFE and PSC members as well as the donors do not, however, adhere to the literary interpretation of "becoming financially self-sustainable" and prefer to weigh between options a) and b). The bottom-line is that this one-stop service and the "removing biomass development barriers" function continue, with or without some kind of subsidy, after the end of GEF funding. This view is supported by 2 reasons.

Firstly, the not-for-profit component of BOSCH's work provides a very useful missing link for the development of biomass and other renewable energy. An expansion of and improvement in information dissemination, outreach activities, public education, renewable policy study is needed to propel further development and overcome remaining barriers. In addition, all parties see a need for a "middleman" to help reconcile the differences and bridge

the gaps between state agencies and private developers. All these activities are likely to be curtailed in favor of more commercially rewarding activities should BOSCH become fully independent. Further, a policy study by a private consultant that relies on businesses from project developers is likely to be viewed as not being neutral and trustworthy as a study by a non-profit organization with a relatively neutral stance.

Secondly, without its not-for-profit functions and without funding from GEF and the EnCon Fund, BOSCH would lose its niche and prestigious status. It would also have high overheads, and may not be able to compete with other commercial consultancy firms and universities that have lower overheads and/or more in-house experts.

At mid-term point, the future of BOSCH becomes increasingly more important. Without a clear direction, recruiting and maintaining high-caliber staff would be more difficult. The management and staff would also be concerned about their future career.

#### **Fee and non-fee services**

BOSCH undertakes both fee and non-fee services. Preliminary consultancy, pre-feasibility study, second opinion are provided fee of charge. In general, BOSCH charges a fee when the interest starts to take on a commercial nature, e.g. feasibility study, contract review. Some policy studies are also conducted on a fee basis.

BOSCH has more than a financial reason when it charges a fee. The fee is to ensure that the potential developer is committed to the project. To help lower the barriers, the fee is charged at lower than the market rate.

#### **Quantity and Timeliness of Work**

Upon reviewing and verifying BOSCH's internal evaluation, the evaluation team shares a conclusion that BOSCH has a high delivery rate and has delivered most works in a timely manner.

<b>Activities with less than 70% achievement</b>	<b>Activities with more than 100% achievement</b>
Business plan (20%)	Workshops for various target groups (200%)
Second pilot plant (50%)	Technical proposals for new projects (200%)
Synthesis of biomass power plants experiences (60%)	
Public participation (50%)	
Radio-TV interview (50%)	
Recommendations of non-financial support measures (50%)	
Feasibility study on risk guarantee for the second pilot plant (50%)	
Technical network meetings (60%)	

Source: BOSCH internal evaluation, EnCon Report#4, May 2004.

There are, however, two points that should be noted here. First, while BOSCH's rolling work plan and self-targeting system provide for continuous realistic adjustment, it can also be perceived as accommodating slippages. On some occasions, the targets were revised downward when BOSCH had failed to achieve a more ambitious target. But it should also be noted that some targets were also revised upward in response to an overshooting performance in the previous planning cycle.

Second, while BOSCH deserves credit for having produced many pieces of work within a short time span, it is important to investigate whether these works had led to expected results. This issue will be examined under the topic "output-outcome linkage".

### **Quality of Work and Quality Control**

There is no quality control system such as readers, peer review for non-fee services. For fee-based projects, the customers/clients serve as an external quality control mechanism.

Quality of work has been uneven and inconsistent. Technical and information works are generally of better quality. The quality of policy work has dropped significantly with the resignation of the senior policy analyst. Finance is acknowledged by all parties to be the weakest link.

Quality is a serious issue for fee-based services provided to government agencies. Most common problem occurs when a project requires various types of expertise for which BOSCH has to put together a large team or sub-contract some components of the project. This requires integration and synthesis, effective project management and quality control which are occasionally lacking.

It should also be noted that the quality issue is more than the quality of work, but also includes customer relations, which could incur more significant and long-term effect.

### **Focusing on Information and Outreach**

BOSCH has established a database and a very good library on biomass and other renewable energy. Upon the completion of a GIS-based biomass resource distribution, BOSCH would have a very good database for its future work. This project has been long-awaited as the availability and affordability of biomass raw materials has become a critical factor for potential developers.

Information services are provided by way of website, web-board, phone-in, and walk in. Only general data are available on the website. BOSCH's website does not include "database" information such as lists of manufacturers, biomass consultancy firms, existing biomass projects, etc, which are among the first batch of data collected by BOSCH. Selected data are available upon request.

BOSCH has identified 3 target groups for its outreach activities, namely potential developers, academics, and the public. Main activities are seminar and training workshop, public education through the media, community participation. Nearly all outreach activities are on a non-fee basis. So far, most outreach activities have been focused on potential developers, especially large-scale clients.

BOSCH's seminar and training workshop serve different purposes and meet different degrees of appreciation. The most popular outreach activity is the annual seminars which are professionally organized, informative, useful, and are viewed as a very good "connecting" opportunity. List of keynote speakers and panelists includes high-ranking public figures and government officials such as Minister of Energy, Energy Permanent Secretary. With careful planning and follow-up, the seminar can boost BOSCH's policy advocacy. At present, it provides an excellent publicity opportunity for BOSCH. The training workshops serve more specific group of clients, and generally receive good reviews, except for some cases of mismatch interests.

In general, information and outreach services are of good quality. Fee and non-fee based information and outreach services have generated a large clientele and network. To a certain extent, it has served as BOSCH's "front office", by providing an important linkage and create opportunities for other lines of work.

### **Focusing on Technical**

Technical work is BOSCH's backbone, thanks to the expertise and connections of BOSCH director. DANIDA's expert and funding provide an extra edge. Most of the works are pre-feasibility studies, which are free-of-charge, but play an important role in removing the initial barrier for most developers. Other services include feasibility studies, second opinion, technical specification, supplier selection, EPC contract review, etc.

BOSCH's technical strength lies in the capacity to offer both biomass and biogas technologies. BOSCH staffs are particularly proud of their role in introducing the Completely Stirred Tank Reactor (CSTR) technology, and gasifier technology that helps overcome the economy of scale barrier.

In recent years, the focus of technical works has shifted from biomass to biogas especially for slaughter houses and CDM. This is understandable as there are more development opportunities in these areas. But BOSCH has also expanded its role in project design evaluation, which has higher financial return, but may generate less value added as far as the objective of "removing the barrier" is concerned.

### **Focusing on Policy**

The Business Plan, finalized in December 2004, cites policy study as BOSCH's niche area. But policy work still lags behind other lines of work, and falls short of expectation. In addition to policy studies outlined in the project document, BOSCH has undertaken 2-3 policy studies commissioned by EPPO and the Ministry of Industry.

Inadequate staff is the main reason for the limitation of BOSCH's policy study. The inadequacy was due to the project design, recruitment difficulty, and inadequate attention to policy work. BOSCH's policy study used to be of good quality and a niche. But the loss of a senior policy staff has had serious impact on the quality and credibility of BOSCH's work.

There are good opportunities for BOSCH to excel in this area. In recent years, there have been some policy setbacks and uncertainties, e.g. EGAT's stalling on implementing power purchase agreements, EGAT's plan to calculate "lost" in the grid, Department of Industrial Works' high emission standard for biomass power plant. If BOSCH were strong in policy study, it could play an important role and provide solid support to EPPO.

Policy studies pave a way for policy advocacy. BOSCH has demonstrated that through a few policy studies, it can influence policy development. A new policy often generates a next round of opportunities for BOSCH to strengthen its role and deepen its impact. So, if BOSCH has the interest and capacity, it could establish itself as an authoritative renewable policy think-tank.

The status of BOSCH is an important issue here. By project design, BOSCH was not meant to be genuinely independent, but an extended unit to provide support to NEPO (now EPPO). With all the institutional changes and the transfer of the management of BOSCH from NEPO to EFE, the linkage has become less apparent. At present, EPPO does not regard BOSCH as its extended unit, but a source of expert's opinion and a renewable energy policy consultant. The most important policy dialogue between BOSCH and EPPO is through the projects that EPPO commissions to BOSCH. Aside from the representation in the Environmental Impact Assessment Panel of Experts, BOSCH has not been a regular appointee on renewable energy committees/subcommittees/task forces, although it has often been invited to provide an "expert's opinion" on an ad hoc basis.

Ironically, other organizations see BOSCH as an extension to or closely related to EPPO, a perception that could limit BOSCH's maneuverability to expand its policy network.

Expanding the policy network is becoming increasingly crucial as energy policy-making is now a shared responsibility among EPPO, DEDE, and the Ministry of Energy.

Hence, if BOSCH is to establish itself as a renewable energy think-tank and to attain the same status as Thailand Development Research Institute (TDRI) in economic development or Thailand Environment Institute (TEI) in environment, it needs to enhance its image and reputation for professionalism and independence.

### **Focusing on Finance**

Finance is regarded as one of the most significant barriers, but finance is BOSCH's weakest link.

BOSCH's financial services include pre-feasibility study, feasibility study, preparation for loan application, negotiation with and selection of financial institution. Two other important tasks are the study on Biomass Risk/Credit Guarantee, and the capacity building agreement with IFCT.

By and large, BOSCH is still struggling to find an appropriate approach to handle its financial work, to integrate finance with other lines of work, and to liaise with financial institutions and clients. BOSCH has not been given much credit by financial institutions that have entered the biomass market, with or without BOSCH's facilitation.

The relationship between BOSCH and financial institutions is understandably difficult. If BOSCH positions itself as financial consultant for potential developers, BOSCH has to recommend the best source of finance for the interest of its client. Some financial institutions, however, prefer that BOSCH act as a neutral facilitator by limiting its role to informing a project developer of various financial options, providing help with the pre-feasibility or feasibility for loan application and staying out of business negotiation.

There are two fundamental problems. First, BOSCH has not been able to develop other financial mechanisms for biomass projects in addition to bank loans. The study on Credit/Risk Guarantee Facility has been slow due to the unavailability of benchmark cost/prices. According to BOSCH, other types of funding mechanism, e.g. equity fund, are difficult as project developers do not trust financial/funding agencies. But there have been some examples of biogas projects financed by equity fund, with a build-operate-and transfer arrangement.

Second problem relates to BOSCH's strategic partner, also a member of the PSC – the IFCT (now Thai Military Bank - TMB). In late 2003, IFCT was merged into the TMB, thereby ending its special status as a government development financial institution. This may have some impact on the BOSCH-IFCT cooperation scheme.

### **The One-Stop Service Clearing House**

BOSCH presents itself as a one-stop service clearing house for biomass projects and has been able to support its claim to a certain extent. At present, most parties acknowledge that BOSCH has different kinds of services. But the one-stop service is largely driven by the customer's demand rather than BOSCH's operation module and internal work process. Hence, it is likely that the opportunities to advance all dimensions of work have not been fully exploited, and there is room for maximizing the synergy among all lines of work.

It should also be noted that BOSCH's one-stop service is not a fully integrated service. The evaluation team has learned from an interview with one of BOSCH's ex-clients that he decided to opt for a more fully integrated service and is choosing between 2 companies that offer initial testing and a proposal for turnkey arrangement. These are large,

well-funded, and well-equipped companies that can move fast and offer a convenient package of services to potential biogas developers.

## 2. Project Impact

Since the Project is only halfway through its implementation, it is too early to assess the impact on the global environment. Therefore, the evaluation focuses on some performance results that are indicative of the ultimate success of the project.

### Capacity Development

The Project gives high emphasis on capacity development and provides considerable budget for the purpose. BOSCH has taken advantage of this opportunity and invested heavily on training and overseas study trips for staff and its partners (largely government agencies, especially EPPO, DEDE, ONREP, NESDB), which resulted in enhanced understanding and experience among BOSCH staff and partner organizations. These capacity development activities also presented excellent bonding opportunities for BOSCH and its partners. There is only one caveat: this investment would be wasteful if BOSCH cannot maintain its staff.

### Sustainability

Sustainability of biomass projects is one of BOSCH's considerable challenge. At present, shortage and uncertainty of feedstock, plus unclear and changing policies are the two most important threats for biomass projects. Most experts believe that without a more favorable policy, it is unrealistic to expect that raw materials will be available and affordable for additional biomass projects. But the prospect is better for existing projects, especially those that have their own raw materials.

BOSCH's consideration of long-term sustainability is evident in the conservative estimate of the rate of return (providing for a safety factor) used in the feasibility studies. This means that the developers have been protected from exposure to undue risks.

### Leverage

BOSCH has 3 main leverages, namely its semi-official status, the EFE umbrella, and the GEF and EnCon funding. Institutional leverages are apparently more significant than financial and play an important role in BOSCH's success.

All parties agreed that most important leverage is BOSCH's semi-official status and its close connection to EPPO. BOSCH has taken advantage of this by positioning itself as a middleman between relevant government agencies, e.g. EPPO, the EGAT, PEA, and the Board of Investment on one hand, and project developers on the others. This "gobetween" role helps bridge the gaps, and is beneficial to all parties.

BOSCH's semi-official status also allows it to voice an independent opinion to the government and public agencies. An example is BOSCH's leading role in bringing the issue of EGAT's suspension of PPA to the Minister of Energy and other relevant agencies, and in raising a concern about the high emission standard imposed on biomass power plants by the Department of Industrial Works in February 2004.

Affiliation with EFE is also a big advantage. BOSCH has obtained several consultancy projects on EFE's reputation and EPPO's recommendation.

GEF and EnCon funding provide not only necessary resources, but also additional credibility and prestige. BOSCH has also attempted to, and in some cases succeeded in

leveraging extra funding to support potential developers, e.g. the EnCon Fund for municipalities' slaughter house biogas projects, the National Science and Technology Development Agency's environment fund and the DEDE's energy efficiency fund, both of which offer low-interest loans. BOSCH's CDM initiative also has a potential to leverage additional funding for potential developers.

### **Awareness**

All parties acknowledged BOSCH's contribution in stimulating public awareness in biomass and renewable energy through its outreach activities. Up to now, public education accounts for only a small part of the budget, and all parties including BOSCH agreed that BOSCH should expand this line of work as community's opposition constitutes an important barrier to renewable and non-renewable energy projects.

### **Linkage between Outputs and Outcomes**

The evaluation team compiled information from various reports, documents and interviews to verify the results reported on the project's success indicators and analyzed the linkage between outputs and outcomes. (See Annex 4).

"Issues for consideration" aims to bring into attention issues that may have some positive or negative impacts on the achievement of the project objectives and therefore deserve a careful consideration by BOSCH and the parties concerned.

### ***Objective 1: To (build capacity to) provide relevant and useful information and services to potential biomass power developer and other players in the biomass areas***

The Project aims to achieve this objective through BOSCH's information and outreach activities. This is an area in which BOSCH reported implementation progress equal or higher than the target on most success indicators.

By 2004, more than 500 people have participated in BOSCH's seminars, 180 have attended training and workshops, 50 joined the study tours. In addition, there have been 20 published articles, approximately 27,000 hits/year at the EFE website, and 5 TV/radio interviews per year.

It is difficult to assess the output-outcome linkage of this objective independently of other objectives as there is a wide range of target beneficiaries and most activities are geared toward supporting BOSCH's other lines of work.

There are concrete evidences of many activities and outputs delivered, e.g. the website, the library, the up-coming GIS-based biomass resource distribution, the training workshops, seminars, published articles, community communication activities, etc. But BOSCH does not have a registration/record system that allows the evaluation team to identify and analyze the profiles of potential developers and other clients that requested the information.

This does not mean that such record does not exist as there are many partial listings, but there is apparently no consolidated registration system that cumulatively expands and is systematically updated and shared among all the units within BOSCH. With a good registration/record system, it would be possible to trace the contribution of this "front office" to other lines of work, and to develop a work process that maximizes the synergy.

*Issues for consideration:*

- *The focus of BOSCH's information and outreach activities has shifted from biomass to biogas and CDM especially in 2004.*
- *The public and the community have had some awareness about biomass projects but community's opposition is still one of the most important barriers of biomass projects.*
- *The public and the community have had very little awareness about the benefits and risks of biogas projects.*

***Objective 2: To improve regulatory framework to encourage biomass power/cogeneration projects.***

The Project aims to achieve this objective by BOSCH's policy studies/reports to support policy formation, regulatory changes.

At mid-term interval, BOSCH has produced 6 policy studies that provide an overview of international experiences, best practice (Indian experience), a review of the situation and problems of the existing power purchase agreement and recommendations for immediate solutions as well as long-term financial and non-financial support measures, and an assessment of potential of renewable energy for long-term planning and targeting. By and large, the studies provide a good coverage of important issues to support policy formulation as well as some specific recommendations on implementation measures.

In addition, BOSCH also completed a study on wind and solar energy, the role of CDM in increasing the value-added of renewable energy, 5 MW VSPP (as opposed to the existing 1 MW VSPP). This means that BOSCH has played an important role in supporting a policy shift toward smaller-scale renewable energy sources.

During this period, there were a total of 6 regulatory frameworks issued/reviewed and endorsed by NEPO/EPPO, and 5 investment incentives schemes newly issued or revised. Some had actually been in place prior to BOSCH. But since its inception, BOSCH has contributed or played a role in the formulation/revision of most renewable energy policies/regulations, especially those related to power purchase agreements and support measures for VSPP. BOSCH's success in convincing EGAT to allow more flexibility regarding the 65% maximum on-grid connection during off-peak hours for biomass projects is another commendable contribution.

By and large, the policy output-outcome linkage is quite strong. BOSCH has demonstrated that through a few policy studies, it can influence policy development, and a new policy often generates the next round of opportunities for BOSCH to strengthen its role and deepen its impact. In addition, BOSCH has established contact with several policy agencies such as EPPO, DEDE, BOI, EGAT, PEA, etc. But these contacts were largely established and maintained mainly through EPPO.

*Issues for consideration:*

- *Number of policy studies dropped from 4 in 2003 to 2 in 2004. If BOSCH does not improve its policy personnel situation, it is doubtful whether BOSCH would achieve an annual target of 5 for 2005-2007.*
- *BOSCH's policy study has also shifted in favor of VSPP. This may seem like a diversion from that project's specific objective of promoting large and medium-scale biomass projects, but it is still in line with the overall objective of reducing GHG emission, and in response the country's changing situation.*
- *Policy situation has changed rapidly in the past few years. At present, effective implementation of existing policies, clarifications on new policies and development of implementation mechanisms are much needed.*
- *BOSCH's active engagement in policy dialogue and implementation process as well as the capacity to do quick and quality policy studies on demand is more important than*

ever. But after the departure of a senior policy analyst in late 2004, there has been an "arrested development" in this line of work.

- BOSCH's shortage of policy personnel has posed limitation on its capacity to undertake policy studies. It may have to forego some policy studies that are highly crucial for the achievement of the project objectives and the promotion of biomass and other renewable energy. BOSCH thereby faces a dilemma of having to decide between passing up on a very good opportunity to advance its policy objective or taking on a task outside its areas of expertise.

**Objective 3: To increase access to commercial financing for biomass power/co-generation projects.**

The Project aims to achieve this objective mainly by providing training on biomass projects to personnel of commercial banks and reviewing/preparing pre-feasibility studies, feasibility studies, and project proposals for possible funding.

Between 2002-2004, approximately 60 banking staffs participated in BOSCH's training. Meanwhile, BOSCH reviewed 10 project proposals. During this period, 9 biomass/biogas project received bank loans; 3 were for the pilot projects (Roi-Et Green, Trang and Yala Plants), 2 for BOSCH's palm oil biogas clients (Natural Palm oil and Thachana Palm Oil), 1 for BOSCH's biomass client (Mungcharoen). The other projects were financed by IFCT, Siam Commercial Bank and Ekachart Finance, all of which had participated in BOSCH's training. Altogether, there have been 6 financial institutions involved in biomass/biogas lending in the past 3 years.

It is evident that BOSCH has had some kind of contribution in most biomass/biogas projects that received commercial bank's funding. But the number of biomass projects increased slowly from 2 in 2002 to 3 in 2003 and 4 in 2004 (including 2 biogas and 1 replacement 2<sup>nd</sup> pilot plant). BOSCH sets a target of 5 in 2005, 6 in 2006 and 7 in 2007. It is most likely that these targets will be fulfilled by biogas, not biomass projects.

There are several explanations for this. But most important reasons are

- Raw materials rapidly became scarce, discouraging new potential developers.
- Power purchase subsidy for biomass SPP has not been available since 2002, making it more difficult to start a new project.
- Unclear government policies and difficult regulations discourage potential developers.
- Due to the above, commercial banks are willing to provide loans only with collateral and guarantee. Project finance is considered too risky.

At present, the lack of understanding of biomass business among financial institutions is apparently not an important barrier. A more serious problem is a lack of good proposal and favorable policy environment. BOSCH's experience shows that a good project proposal could attract the interest of up to 4-5 commercial banks.

Lack of good funding facilities and funding options is, however, still an important barrier. BOSCH had placed emphasis on the development of a Credit/Risk Guarantee Fund, but the study has progressed slowly and is still beset with several obstacles. Given the emerging trend that almost all biomass projects are developed by owners of raw materials, such Credit/Risk Guarantee Facility is unlikely to be relevant.

*Issues for Consideration:*

- BOSCH is shifting from biomass to biogas which has a fast pay-back period.
- While BOSCH believes that equity fund is not suitable for Thai developers, some international corporations have promoted this option with some success. For

*example, Clean Energy Development (Thailand) finalized a biomass equity and BOT agreement with Sa-nguanwong Industry, one of the largest tapioca starch producers in Asia. Three similar projects are in progress, namely a 2.1 MW biogas plant at Somdej Tapioca, a 2.1 MW biogas plant at Jirat Pattanakarn, and a 2.1 MW biogas plant at VP Starch 2000.*<sup>5</sup>

- *BOSCH-IFCT (now TMB) collaboration in establishing of the Environment and Energy Development Center at IFCT has not yielded significant result.*

***Objective 4: To demonstrate the technical and financial viability and reduce risks for the biomass power/co-generation technologies.***

The Project aims to achieve this objective by supporting 2 biomass power plants, one using rice husk, the other using rubber woodchips as raw material. The 2 demonstration plants were selected during the project formulation and BOSCH's role is to provide necessary support especially the 50% risk guarantee fund, as well as to monitor the progress of the projects and disseminate the experience of the 2 pilot plants to potential developers and other parties.

By the end of 2004, only 1 pilot plant was in operation; the Roi-Et Green using rice husk started operating in April 2003. In the following year, the plant operated with 75% capacity, slightly less than the 81% target, due to some technical problems. A more serious problem is the inability to obtain rice husk at the contract price when the market price of rice husk shot from Baht 150/ton to Baht 400/ton.

The second demonstration plant – the Trang plant encountered strong public opposition and failed to get an environment impact assessment approval. A decision was made to shift to Yala Green, proposed by the same developer and designed to use rubber woodchips tree as raw material as envisioned by the Trang plant. Yala Green started construction in March 2004. The construction progressed behind schedule due to continued unrest in the area. (Yala is 1 of 3 Southern provinces that have experienced a surge in unrest and violence since early 2003). The agreement on the risk guarantee subsidy was signed in October 2004. The construction is expected to be completed in late 2005, and power generation start in April 2009.

BOSCH has fulfilled its role in visiting, providing technical support, arranging for 50% of the risk guarantee fund, monitoring the progress, and showing the demonstration plant(s) to various groups that have the interest in biomass power plants. But BOSCH has been slow in synthesizing and disseminating experiences of the pilot plants and other biomass power plants.

At this point, it is unfortunate that the demonstration plants have met many stumbling blocks and have not been able to serve their expected role and thereby making little contribution to the project objectives. At this point, the Roi-Et Green can best serve as "lesson learned".

*Issue for consideration:*

- *The first demonstration plant and the risk guarantee fund did not constitute an important factor in promoting biomass power plants in Thailand. This was evident in the establishment of other biomass plants without any risk guarantee subsidy at the same time as the project's first demonstration plant. Four other biomass power plants commenced operation in the same year as the Roi-Et Green. These plants are*

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[www.thaiday.com](http://www.thaiday.com), 25 April 2005.

therefore a better demonstration of the technical and financial viability of biomass power plants.

- The second pilot plant has been delayed for a long time. It is no longer a factor in the promotion of biomass power plants.
- During April 1999 to December 2003, the number of SPP projects from biomass and other alternative energy that have received EGAT's PPA pledge increased from 26 to 53, indicating the potential developers' willingness and readiness to enter this business.

<i>Fuel</i>	<i>Apr 1999</i>	<i>Dec 2003</i>
<i>Bagasse</i>	<i>14</i>	<i>30</i>
<i>rice husk or woodchips</i>	<i>6</i>	
<i>rice husk</i>		<i>8</i>
<i>rice husk &amp; woodchips</i>		<i>3</i>
<i>bagasse, slab/offcut, rice husk</i>		<i>2</i>
<i>woodchips &amp; palm empty bunch</i>		<i>1</i>
<i>rice husk, bagasse, eucalyptus slab/offcut</i>		<i>3</i>
<i>slab/offcut, woodchips, black liquer</i>		<i>1</i>
<i>Woodchips</i>		<i>2</i>
<i>Garbage</i>	<i>1</i>	<i>1</i>
<i>Biogas</i>	<i>1</i>	<i>1</i>
<i>black liquer</i>	<i>1</i>	<i>1</i>
<b>Total number of projects</b>	<b>26</b>	<b>53</b>
<b>Total installment capacity</b>	<b>481 MW</b>	<b>1,022 MW</b>
<b>Total electricity to be sold on grid</b>	<b>150 MW</b>	<b>471.2 MW</b>

Source: [www.eppo.go.th](http://www.eppo.go.th) (26 April 2005)

**Objective 5: Technical Service Cell as a component of the One-Stop Clearing House provides relevant and useful technical services on biomass utilization for power production to potential biomass developers and other players in the biomass area.**

The Project aims to achieve this objective by providing pre-feasibility studies, feasibility studies, second opinion, other technical advices, and organizing technical workshops for potential developers and other organizations.

Due to different ways of labeling and counting outputs, the evaluation team cannot reconcile a slight discrepancies among the GEF PIR, the EnCon Fund report, and BOSCH's powerpoint for internal use. The numbers in parentheses represent the outputs that the evaluation team identified and counted from the EnCon Fund report and BOSCH's internal documents. The numbers in regular font are from the GEF PIR.

In 2002, the outputs were mainly pre-feasibility studies for biomass/biogas. Nine studies were completed for 2 rice mills, 2 saw mills, 3 palm oil plants, 1 slaughter house and 1 food industry. Four projects (the 2 saw mills, 1 palm oil plant, and the food industry), continued on the next stage of project development in the following year. Most of the others were not feasible.

In 2003, technical services continued for rice mills, saw mills and other industries, and noticeably increased for biogas in palm oil, tapioca plants and slaughter houses. BOSCH completed and submitted to the EnCon Fund project proposals to develop biogas from the waste water for 8 municipalities' slaughter houses. CDM emerged as a new area of work. BOSCH prepared 9 CDM proposals for 5 rice mills, 2 palm oil plants, 1 tapioca plant, 1 power plant.

In 2004, BOSCH assisted 8 municipalities in contract preparation and detailed study of biogas plants. BOSCH also expanded its income-generating activities, e.g. feasibility studies, technical specifications, biogas plant detailed design, EPC contract, independent engineer consultancy. The clientele especially those concerning CDM became more diversified to include food and beverage industry, produce market, cement industry, motor industry, etc.

Most biomass power plant clients were small, between 1-2 MW. There have been only 3 medium-sized clients, namely the Trang pilot plant, the 9.9 MW Mungcharoen Green Energy, and the 18 MW Country Electricity (CDM only).

BOSCH also organized technical workshops to promote biomass/biogas technology. While the number of technical workshops was reported at 1-2 per year, most of BOSCH's other workshops, study tours and other capacity development activities also had a high technical content.

By and large, BOSCH has played an important role in helping potential developers overcome the initial barrier by offering pre-feasibilities free-of-charge. The popularity of BOSCH's service is evident by the sheer number and the range of the clientele. In addition, BOSCH is in a position to provide a rather full-scale technical service. Customer satisfaction rate was reported to be 80%.

In addition, BOSCH has also played a role in demonstrating the technical and financial viability of a 'pioneering' CSTR biogas technology which is now BOSCH's most recommended biogas technology.

*Issues for Consideration:*

- *BOSCH's technical service has increasingly been dominated by CSTR biogas technology and CDM proposal preparation.*
- *BOSCH has expanded its technical services to a point that it could lead to a diversion from the project objectives. These expanded services have better commercial prospect, but less contribution to the objective of removing the barrier.*

***Objective 6: Thai industry production and suppliers of components and equipment for biomass-fuelled power plants, such as biomass feeding systems and boilers, is strengthened.***

The Project aims to achieve this objective by supporting the formulation of a network, organizing technical seminar/workshop and matching local manufacturers with power plant investors.

Members of the technical network grew from 5 to 18 to 31 during 2002-2004. A technical seminar was held each year. There were 3 cases of matching success in 2003 and 7 potential cases in 2004.

All in all, this objective has received relatively less emphasis. This is understandable as there is less connection between this and other objectives and this aspect of the operation has not constituted an important obstacle to biomass/biogas development.

### 3. Lessons Learned

Lessons learned are based on the reflections of the parties concerned through interviews, meetings, and the observation of the evaluation team. The evaluation team analyzed these issues with an aim to develop:

- 1) operational recommendations for BOSCH,
- 2) lessons learned for the promotion of biomass power generation and co-generation and other renewable energy in Thailand,
- 3) lessons learned for the application of the Project's experiences in other countries.

### **The Rapidly Changing Context**

The Project has been subject to several major changes in terms of

- policy environment (high-level personnel changes, bureaucratic restructuring),
- overall development context (competing and alternative uses of biomass raw material, fast and risk-taking responses from potential biomass investors),
- specific development context (public opposition to the original second pilot plant in Trang, and civil unrest and violence that delayed the construction of the new second pilot plant in Yala).

Most of them are unanticipated project risks that cannot be effectively calculated or accommodated in the formulation of the project. But these are developments that have had an important impact on the project outcome. The project experience suggests that flexibility is much needed in the project design, especially for medium-to-large-scale projects.

### **Scarcity of Raw Materials**

Within a few years, Thailand's biomass situation has changed from plenty to scarcity. Although the reasons for this are debatable, most experts agreed that biomass raw materials that are easy to process and collect are becoming scarce or expensive. Unless there is a set of new policy incentives, or new technological breakthroughs in the processing of other biomass raw materials, the prospect for new medium or large-scale biomass power plants is not good.

### **Uncertainty of Raw Materials**

For a potential developer, scarcity is not as threatening as uncertainty. After one-year in operation, BOSCH concluded that the guarantee of biomass raw material supply is the most important pre-requisite for project development. Today, BOSCH insists that potential developers have the ownership of raw materials.

Meanwhile, the prospect for the Credit/Risk Guarantee Facility remains bleak as there is no fuel (raw material) price benchmark. Besides, the facility would not be necessary if most biomass generators have their feedstock.

### **Public Awareness and Public Opposition**

Although the public has had more awareness of and experience with biomass energy, public debates on the benefits and risks are still limited. Public opposition is still a major risk for any biomass project, as evident in the case of the original pilot plant in the Trang Province. Most stakeholders also cited public education and public communication as a priority area for BOSCH's work in the future.

It should be noted here that the public has very little awareness of the benefits and risks of biogas. At present, no authorities seem to have a clear mandate over this kind of activity, and there is a risk that any problem related to a biogas project could turn the public against this promising source of renewable energy. This is an area that needs more public education and policy advocacy.

### **Expansion into More Promising Renewable Energy Necessary**

Most policy experts confirmed that it is necessary to expand the scope of the project to include other renewable energy. Studies and experiences have also shown that smaller-scale renewable energy projects have better prospect than medium and large ones. At this point, biogas, wind and solar are among the most promising.

The potential for biogas is enormous as most palm oil, tapioca processing plants, many other types of production, slaughter houses, etc, have not reaped a full benefit of their waste water. Plentiful sources, low-investment and fast pay-back period will make biogas the most promising renewable energy. But all-around back-stopping, good public awareness campaign and effective regulations are needed to ensure its sustainable future.

Wind and solar have a good potential, but require strong policy support, which in turn requires further studies, advocacy and dialogues among the parties concerned as well as continued public awareness and education campaign.

### **Policy Uncertainty and Ineffective/Inconsistent Implementation Remain Most Important Barrier. Project Developers Need Overall Back-Stopping.**

During the past few years, information and technical barriers have dropped rapidly with the proliferation of biomass projects, renewable energy consultants, and renewable energy suppliers.

While financial mechanism remains limited, a large number of biomass projects have received funding and an increasing number of financial institutions have had knowledge or experiences with biomass projects.

Today, the most important impediment is the lack of policy clarity and policy consistency. In part, it was precipitated by the decentralization of energy policy-making in the aftermath of the bureaucratic restructuring in 2002. Lack of policy coordination and integration often leaves renewable energy business in the cold. An example is the Department of Industrial Works' Ministerial Regulation of 28 February 2004 that puts a more restrictive emission standard on biomass compared with fossil-based energy.

On top of this is the lack of effective implementation. Most biomass generators have had difficulties with the PPA which is insensitive to the nature of biomass power generation. Hence, most developers need technical and policy back-stopping from the beginning and throughout project development and operation.

### **One-Stop Service Is Very Much Needed, But BOSCH Needs to Prioritize Its Objectives and Clients**

Renewable energy requires multidisciplinary expertise which is rare and new to most parties. This is why a one-stop service can be very useful and very much appreciated by government agencies, potential developers, suppliers, financial institutions, non-government organizations and communities.

A one-stop service that serves many types of clients has to develop and offer different levels of information, expertise, types of services, and is therefore likely to run a risk of spreading itself too thin, exposing its weakness in one area or another.

At some point, it is important that the center review and prioritize its objectives and clients carefully to strengthen its core business.

## **Information and Institutional Support is More Significant than Financial Support**

Experiences have shown that biomass project developers need and benefit from BOSCH's information and institutional support more than financial support. This does not mean that they do not appreciate the provision of services at no cost or at discount rates. In some cases, this may have been a decisive factor in project development.

But the most important support that potential developers need is information, technical and non-technical advice to take full benefit from existing financial and non-financial support mechanisms such as the EnCon Fund, the DEDE's fund, CDM, as well as managerial and institutional support in dealing with various authorities and regulations during the project development and operation periods. In this regard, the most valuable support is embodied in BOSCH's personnel.

## **BOSCH's Conflicting Objectives/Roles**

BOSCH has a difficult job of reconciling between the Project's conflicting objectives of removing biomass development barriers to biomass development and becoming financially self-sustainable.

The dilemma becomes more pronounced when policy is identified as the most important remaining barrier. Renewable energy policy study and policy advocacy is hardly a lucrative business. Besides, heavy dependence on consultancy revenues from project developers could also compromise BOSCH's credibility as policy think-tank.

In any case, it should be noted that BOSCH's role as a go-between is appreciated by and benefit both government agencies and project developers. Its outreach activities have brought together project developers, academics, the community and the public, and stimulated a much needed dialogue among these parties. This neutral and continuous forum for exchanges of practical experiences, concept ideas, initiatives and feedbacks provides a solid foundation for policy advocacy and sound policy-making.

## **Roi-Et Green**

In several aspects, the case of Roi-Et Green offers an insight into several problems encountered by biomass power generators.

This 9.8 MW project in Roi-Et, a northeastern province 522 Km from Bangkok, originated with the interest of EGCO – a power utility subsidiary of EGAT. At the invitation of NEPO, EGCO, albeit its lack of experience, started a feasibility study of a biomass power plant that led to a joint investment with the Electric Power Development Company (EPDC) and Bua Sommai Rice Mill. The size of the project was determined by the availability of rice husk at Bua Sommai – project partner and raw material supplier. But it is arguable that the fact that a power plant with the capacity of 10 MW or more is legally required to prepare and submit an environmental impact assessment to the ONREP constituted an important consideration in the project design.

Roi-Et Green signed a 21-year firm-type PPA contract with EGAT on 22 October 2001 and started operation in April 2003. To date, the project has received 3 installments of risk guarantee support in the amount of US\$ 313,860. In 2004, the project recorded a 75% capacity utilization against a 81% target.

### **Problems**

Roi-Et Green has encountered 4 major problems.

1. The project had trouble securing fund. Unlike most biomass projects that were developed as sideline business by rice mill operators who can use existing land and assets as loan collateral, this was genuinely a project finance case. Had it not been for EGCO's guarantee, IFCT would not have extended the loan to Roi-Et Green.
2. Roi-Et Green experienced technical problem immediately after its launch. The boiler leaked and forced the plant to suspend operation 3 times during April-May 2004, resulting in a drop of monthly capacity factor to 66.3% in April and 76.7% in May. In rainy season, the problem was damp rice husk, which resulted in a drop of the annual gross electricity generation/the actual fuel consumption by 20%. Roi-Et Green is expanding the rice husk storage area to overcome this problem.
3. Roi-Et Green also had a problem with EGAT's PPA that placed a limit on power generation at 65% during off-peak hours. In addition, the monthly capacity factor and its penalty are not suitable for biomass power generation as this business is subject to seasonal fluctuation. The monthly capacity factor should be replaced by an annual capacity factor.
4. The problem with raw material is most serious. Roi-Et Green needs 7,500 tons of rice husk per month. Due to competing demands by other biomass projects and alternative uses, rice husk price soared sharply. Although Roi-Et Green had a supplier contract at a fixed price of Baht 150/ton, the supplier defaulted on the contract. Legal action is being taken on this matter.

This case is a particularly interesting as the supplier was Bua Sommai Rice Mill, a large rice mill situated in adjacent area, also a 5% shareholder in the project. Evidently, 5% is not enough to ensure a supplier's commitment to the project. Bua Sommai Rice Mill not only defaulted on the supplier's contract, but also set up its own rice husk power plant, with funding from IFCT (now TMB).

In this case, a supplier contract was signed between Bua Sommai and Agro Energy, EGCO's subsidiary. The latter's role was to procure rice husk for Roi-Et Green. As a result of this default, Agro Energy quickly ran a huge cumulative loss and finally discontinued its operation as it had to buy rice husk from other sources at considerably higher prices and sold it to the Roi-Et Green at a fixed price of Baht 150/ton. Today, Roi-Et Green procures the rice husk itself at approximately Baht 600/ton. At Baht 600/ton, the production cost is very close to income. If rice husk price continues to rise to 800-900 Baht/ton, Roi-Et Green will definitely go under.

For Roi-Et Green, an important lesson learned is that the future is very bleak for any biomass plant that does not have its own feedstock. Another lesson is that the design of a biomass plant should be flexible to accommodate alternative raw materials. Unfortunately, Roi-Et Green Plant does not have this adaptability.

### **The Role of BOSCH**

The role of BOSCH has been quite limited as the project was conceived before BOSCH. Hence, BOSCH had very little role in influencing the project development. In general, BOSCH serves the following roles:

- 1) Monitor Roi-Et Green's performance and verify its reports to GEF for disbursement of risk guarantee fund every 6 months,
- 2) Organize site visits for various groups including potential developers, communities in and outside the area, foreign visitors, e.g. the Malaysia-based Bio-Gen Project.
- 3) Facilitate Roi-Et Green's contact with EGAT to solve PPA problems.

Roi-Et Green does not regard itself as BOSCH's client. Most contacts have been with BOSCH's outreach (community communication) and technical personnel.

There was a period of tension. In September 2003, when Roi-Et Green reported a technical problem that led to excessive dust emission, BOSCH investigated the problem and ordered an urgent remedial action which required Roi-Et Green to disclose operation details that it regarded as confidential business information. As a result of this hiccup, the GEF disbursement was withheld for 2 months.

On a bright side, Roi-Et Green has a good record of community communication. The plant was able to cultivate a good relationship with the community as it held a promise to mitigate the community's long-standing problem of dust from the burning of rice husk at Bua Sommai Rice Mill. The project also organized several community meetings, a community survey, a site visit at a similar project at Jia Meng, Nakhon Ratchasima. Today, the project still has close contact with the community and actively participates in community activities.

#### 4. Best Practices

The evaluation team proposes 4 best practices that represent different aspects of BOSCH's achievement.

1. Mungcharoen Green – an example of BOSCH's biomass integrated service,
2. Natural Palm Oil – an example of BOSCH's biogas integrated service
3. Wind and Solar Study – an example of BOSCH's policy impact
4. Clean Development Mechanism – an example of BOSCH's pioneering initiative.

##### **1. Mungcharoen Green Power**

As a large rice miller located in the Surin province in the Northeast of Thailand, Mungcharoen Group started selling rice husk to the Roi-Et Green and Kaset Rungruang Group since 2003. Having witnessed a sharp price rise from Baht 150/ton to 500 Baht/ton, Mungcharoen Group started to explore a better use of its rice husk.

The result of an initial consultation with BOSCH director and his team was very positive as the company has its own raw material in large quantity.

Mungcharoen Green Power is a 9.9 MW power plant. It needs 270 tons of rice husk per day (85,000 tons/year). A loan agreement with Bank Thai has recently been signed and the construction contract is being finalized.

##### **The Role of BOSCH**

BOSCH's service to Mungcharoen is an example of an integrated service, including

- 1) pre-feasibility study, feasibility study<sup>6</sup>
- 2) initial environment evaluation<sup>6</sup>
- 3) preparing project proposal for bank loan

<sup>6</sup>

With under 10 MW capacity, the project is not required to prepare and submit an EIA to the ONREP. BOSCH and Mungcharoen volunteered to prepare an IEE as a precautionary and community communication measure. The IEE was completed in February 2005.

- 4) selecting funding source
- 5) selecting a contractor
- 6) project design
- 7) obtaining construction permit
- 8) community communications
- 9) construction oversight
- 10) process inspection and system testing
- 11) quality control and equipment installment
- 12) preparing the CDM project proposal.
- 13) providing advice on procurement of O&M personnel

With regard to community communication, BOSCH prepared a project briefing and initial environment evaluation, clarified some misunderstanding to lessen the concerns of community leaders, community members, and the local authority (Tambon Administrative Organization). BOSCH also organized a site visit to Roi Et Green for community leaders.

Although the community welcomes the project, it still has some concerns and needs more clarification especially on noise, dust and waste water.

#### **Why Best Practice?**

- 1) BOSCH demonstrated the capacity to deliver an integrated service that bears concrete result.
- 2) BOSCH applied a lesson learned from Roi-Et Green by recommending a flexible design that can use rice husk as well as Eucalyptus chips.
- 3) Mungcharoen is very satisfied with BOSCH's service, especially the fast delivery, commitment to the project, and a very reasonable fee.
- 4) One indication of BOSCH's commitment to this project was its endeavor to overcome a policy barrier – EGAT's suspension of SPP in late 2003. BOSCH submitted a letter to the Minister of Energy, EGAT and other relevant agencies, and was able to push through a PPA for Mungcharoen.

#### **Caveat**

Mungcharoen Green biomass power plant has a planned capacity of 9.9 MW, slightly under the 10 MW EIA requirement. Although BOSCH has a technical explanation for this specification, this project design could be construed as BOSCH's intention to circumvent the EIA law. This, in addition to the fact that the Roi-Et Green has a 9.8 MW capacity, has led to criticism and suspicion among environmental NGOs, and some communities, including those on site.

## **2. Natural Palm Oil**

Natural Palm Oil Co., Ltd. is one of over 40 palm oil processing plants in Thailand. It is situated in Surat Thani, a southern province 730 kilometers from Bangkok. Palm oil processing leaves a large amount of palm oil wastes and waste water. Foul smell from waste water at the plant persistently posed problem to nearby communities. With an engineering background, the company owner became interested in biogas cogeneration and started making investigation. He finally received a recommendation to seek the service of BOSCH.

The project has a 650 KW capacity. It managed to secure a 20 million Baht soft loan from DEDE's fund, and 50% consultant fee support from DANIDA.

## **The Role of BOSCH**

The main contact person or the project coordinator was the senior information officer.

BOSCH's role was one of an almost integrated service that included:

- 1) providing basic information
- 2) preparing a feasibility study
- 3) preparing project proposal to secure a low-interested loan (NSTDA, then DEDE)
- 4) preparing a CDM project proposal for DANIDA
- 5) designing the biogas power plant
- 6) arranging for bidding and select a contractor
- 7) start-up guarantee.

While the developer handled the following tasks:

- 8) concluding a VSPP power purchase agreement with PEA,
- 9) Supervising the construction of the power plant.

BOSCH did not have any service pertaining to 9). From Natural Palm's viewpoint, BOSCH should consider offering this service. Without an engineering background, other developers would have difficulty ensuring that the construction is up to the standard and specification.

## **Why Best Practice?**

Natural Palm Oil is one of BOSCH's happy customers for the following reasons:

- 1) The almost integrated service.
- 2) BOSCH personnel were committed to the project and consistently provided good quality services.
- 3) BOSCH provided advices beyond the scope of the TOR, e.g. the preparation of CDM free-of-charge.
- 4) BOSCH's feasibility study was prudent and conservative, thereby protecting its customers from excessive risks.
- 5) In spite of the initial high rate, BOSCH's final rate (with 50% consultancy fee support from DANIDA) was reasonable. It should be noted that Natural Palm Oil also had a biogas consultancy proposal from a German company. But the service was more limited and carried a higher fee compared with BOSCH's.

In the first year of operation, revenue from selling electricity to PEA covered the investment cost (as opposed to BOSCH's estimate of a 3 year pay-back period). Indirect benefit was the almost 100% eradication of the bad odor, which resulted in much better relations with nearby communities.

The developer believes that it is important that BOSCH's service is available after the end of the GEF/UNDP project, and that BOSCH has a good potential to compete with other consultancy companies. He also appreciates BOSCH's regular meetings/capacity building workshops for biogas operators that provide a forum for exchanges, consultation and further development.

The developer firmly believes in the future of biomass/biogas. There are many palm oil processing plants that can benefit from this technology. Natural Palm has commissioned BOSCH to prepare a feasibility study of a biomass power plant that uses palm oil wastes as fuel. But as the project would require a much larger investment than biogas, it is still under consideration.

### **Caveat**

This project has one caveat. The developer, with an engineering background, decided to improvise on BOSCH's design against BOSCH's precaution, by adding a huge balloon to store surplus biogas. Although the gas is not inflammable, the storage of biogas in huge quantity poses a leakage risk. Unfortunately, no authorities seem to have a jurisdiction over biogas and its related activities.

### **3. The Wind and Solar Study**

EPPO (formerly NEPO) was the key government agency implementing the SPP and VSPP programs to promote power generation from cogeneration plants and renewable energy sources. The SPP program was introduced in 1992, but there have been a limited number of renewable power projects, compared to the country's vast potential. Among the few renewable SPP, none was solar or wind power.

The VSPP program was introduced in 2001, with little implementation progress. Therefore, EPPO saw the need to commission a study to analyze and make recommendations on the promotion of solar and wind power.

*Study on approaches in supporting and promoting electricity generation from wind and solar energy ("Wind and Solar Study")* was a policy study commissioned by EPPO to BOSCH under the EFE in June 2003. The study was completed in January 2004.

Notwithstanding the project title, the scope of the study was broad, covering:

- review of international experience for promoting and supporting renewable energy
- study of externality costs of electricity generated using different fuel types
- recommended policies and mechanisms to promote electricity generated from renewable energy
- cost analysis of electricity generated from wind and solar energy
- recommendations on appropriate level of subsidies for wind and solar electricity
- recommended changes to the power purchase regulations for renewable energy (SPP and VSPP programs)
- public participation in renewable energy projects
- promotion of micro-hydroelectricity
- promotion of renewable energy under a liberalized power industry structure
- comments/advice on other related SPP/VSPP issues as assigned by EPPO.

### **The Role of BOSCH**

The focal point of this project was BOSCH's senior policy analyst who also mobilized and coordinated inputs from other BOSCH/EFE members and a short-term international consultant. During and after the study, BOSCH also attended relevant government committee meetings to present its findings and provide comments at the request of EPPO.

## **Why Best Practice?**

### *1) Client's satisfaction*

EPPO gave a high rating to this project. From EPPO's viewpoint, BOSCH fully fulfilled the requirements set out in the TOR and beyond. The study was based on relevant, well-researched analyses and close consultations with EPPO and stakeholders. The recommendations were neutral, useful and provided in a timely manner to EPPO and the government. The interaction between EPPO and the study team was cordial and cooperative. EPPO also benefited from BOSCH's advices and comments on relevant issues that were not explicitly stated in the scope of the study. Furthermore, BOSCH continued to assist EPPO throughout the implementation process.

### *2) Qualification and composition of the study team*

As most of the study team had energy policy/engineering experiences but no direct experience in renewable energy policies, BOSCH formed a large team of advisors consisting of Thailand's leading experts in renewable energy to guide the development of various components of the study. Among them were Dr. Sermkiat Jomjanyoung of Chiang Mai University who conducted extensive studies on village-scale micro-hydropower systems, Mr. Somchai Pooongpaibul, a wind expert from Fellow Engineers Consultants Co., Ltd. and Mr. Chaya Jivacate, a long-time solar expert for photovoltaics.

### *3) Study approach and analytical framework*

Despite its role as biomass promoter, BOSCH managed to maintain neutrality in its analysis and formulation of recommendations. BOSCH was able to draw a balanced assessment by continuously seeking inputs from diverse stakeholders, e.g. existing SPP, potential project developers, power utilities and experts in respective fields. This helped ensure that the study had gone through a "reality-check" and was favorably received.

The study thoroughly analyzes Thailand's existing situation of renewable energy policies and barriers as to what had been done, the consequences, and what needed to be done. It also reviews international experiences and incorporates lessons learned from other countries. This provides a solid framework for the policy recommendations. In case of data limitation, e.g. the investigation of externality costs for the Thai context, the study team provided a best estimate based on existing data, and explicitly stated the limitation of the study and make suggestions on further steps.

### *4) Relevance and usefulness of the study and recommendations*

The study was finalized in a timely manner and the findings were put forward to the government for consideration. As a policy-making/regulatory agency, EPPO was able to use the findings to inform and guide the government's renewable energy policy and regulations in two ways: 1) to propose support measures for renewable energy (including feed-in tariffs and Renewable Portfolio Standard - RPS); 2) to improve power purchase regulations to be more favorable to renewable energy generators.

### *5) Project outcome and impact*

The Wind and Solar Study was officially endorsed by the Subcommittee on Coordination of Future Operations of the Electric Utilities. The subcommittee was chaired by the Deputy Permanent Secretary of the Energy Ministry and included representation from the Ministry of Energy, DEDE, EPPO and the three power utilities.

The study also led to two direct policy outcomes: the adoption of renewable energy generator support measures (including RPS) and solutions to the VSPP power purchase deadlock. During the course of this study, BOSCH also had an opportunity to work with EPPO on the revision of the SPP power purchase agreement.

#### *6) Leverage*

The Wind and Solar Study led to follow-up studies, commissioned by EPPO to BOSCH. It has strengthened BOSCH's track record, fostered closer relations with EPPO, enhanced its status and credibility among energy policy makers as well as broaden an access to renewable energy decision-making bodies.

### **4. Clean Development Mechanism (CDM)**

Thailand signed the UN Convention on Climate Change in 1992, and ratified the Convention in 1994. The Kyoto Protocol was signed and ratified by Thailand in 1999 and 2002, respectively. The coming into effect of the Kyoto Protocol in February 2005 presents an opportunity for developing countries including Thailand to take part in Green House Gas (GHG) reduction by participating in CDM projects supported by Annex I country to promote clean and renewable technology.

At present, CDM-related activities are still in infancy as there has not been a clear policy directive. The ONREP of the Ministry of Environment - the CDM Designated National Authority (national focal point) is studying and making preparation on this matter.

In any event, some sectors have started to move ahead. DANIDA has been a major source of support for technical advice and financing of CDM preparatory activities for the energy sector, the most promising sector for GHG reduction in Thailand.

#### **The Role of BOSCH**

- 1) Capacity development is the focus of BOSCH's CDM activities. BOSCH has played an important role in introducing their clients and other groups to CDM and encouraging them to participate in CDM projects. BOSCH's capacity building activities include the preparation of CDM investor's guide, CDM workshops and training. In 2004, BOSCH assisted ESCAP/Institute for Global Environment Strategies (IGES); Takuma and Obayashi in their CDM capacity building.
- 2) BOSCH is becoming a major player in the CDM consultancy market. In 2003, 2 out of 5 CDM Project Information Note (PIN) proposals prepared by BOSCH were approved by DANIDA. BOSCH is continuing on Project Design Document (PDD) on these 2 projects. In 2004, BOSCH prepared CDM PIN proposals on biomass/biogas projects for Mungcharoen Green Power, C. Gigantic Carbon, Thachana Palm Oil, Kanchana group, and Better Textile Co., Ltd. Out of these 5 proposals, 4 won DANIDA's approval.
- 3) On the policy side, BOSCH has been an important source of technical advice and resource persons for the Climate Change Coordinating Unit, ONREP.

#### **Why Best Practice?**

- 1) BOSCH's endeavor to identify new opportunities for itself and its clients is commendable. CDM fits in with BOSCH's role and expertise, and has an explicit linkage to the project objectives. CDM has a good potential for lowering barriers and reducing implementation cost for potential biomass/biogas/renewable energy

project developers as the project would benefit from extra revenue earned through carbon trading.

- 2) Capacity development is the most impressive aspect. BOSCH has demonstrated that it is a learning organization capable of acquiring new expertise and applying it to the benefit of its clients. CDM proposals are highly technical. The application process involves technical requirements that demand knowledge in new areas which, in many respects, are still a challenge for Thai CDM consultants. BOSCH has been very fast at acquiring the technical know-how needed to respond to DANIDA's call for proposals and has proved, as demonstrated by the ratio of approved proposals, to be fairing well in the business.

### **Caveat**

BOSCH is regarded as one of 4-5 high-quality Thai CDM consultants. All of them still have less expertise and experience than international consultants. BOSCH has to continuously upgrade its expertise and quality of work to match the international standard.

## **5. Operational Recommendations**

All in all, the RBBPGC Project has generated valuable experiences, best practices and lessons learned to a large number of individuals and organizations, and supported and influenced policy changes for the promotion of renewable energy, and the reduction of GHG.

This evaluation aims to support the review and performance improvement to ensure that the Project continue to yield expected results and support the country's plans and strategies as well as the global objective of addressing the climate change problems.

The evaluation team has the following operational recommendations:

### **Project Adjustment: Project Strategy**

Due to the rapidly changing situation, the project is now in need of a major adjustment for the following reasons.

- Biomass raw materials have become scarce and expensive.
- It has become evident that large biomass power projects are less viable than smaller biomass and biogas projects.<sup>7</sup>
- Thailand's energy policy is shifting toward VSPP, including wind and solar projects.

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<sup>7</sup> Note that according to the explanation prepared by UNDP in response to GEF Council's comments on the project proposal, the rationale for the focus on the large-scale biomass projects is as follow "...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 plants has been a natural choice in the Thai context. 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" (See [www.gef.org](http://www.gef.org))

- The assumption that risk guarantee support would constitute a major factor in overcoming the barrier has been proven wrong. There have been several other projects, e.g. Rural Electricity – 18 MW, and Mungcharoen – 9.9 MW, that have been developed and operated without this subsidy.
- Pitfalls and lessons learned from the 2 pilot plants could guide the adjustment of the Project.

The Project should therefore be adjusted in response to the new reality. The adjustment should broaden the scope of the project to cover other renewable energy. It should also take advantage of the new situation – namely the rising cost of fuel-based energy, which boosts the popularity and viability of renewable energy. In addition, the adjustment should take into account a new policy environment and aim to enhance policy clarity and policy coordination among several key actors.

As far as the strategic direction is concerned, the evaluation team believes that the project objectives are best served by focusing on the two missing links.

First, bridging the capacity gap by providing information, policy study and advocacy, as well as technical, managerial support and trouble shooting.

Second, bridging the institutional gap by facilitating contacts and continued dialogue among various sectors, e.g. potential developers and existing generators, public authorities, civil society organizations and community groups.<sup>8</sup>

### **Project Adjustment: BOSCH**

The RBBPGC Project has two main vehicles to achieve the objectives – the 2 pilot plants and BOSCH. The pilot plants are unlikely to yield significant impact and the new project design should not place too much emphasis on this component.

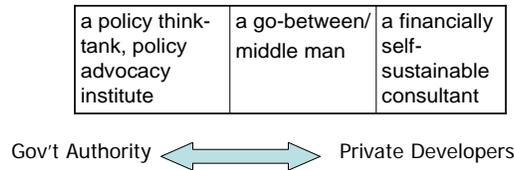
On the contrary, BOSCH has become an important instrument and has a good potential to leverage more impact. Whether BOSCH would be able to realize its full potential and maximize its impact depends on several factors.

First and foremost, BOSCH should be restructured to untangle the conflicting roles and objectives that BOSCH has been expected to fulfill to date.

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<sup>8</sup> Another approach would take BOSCH toward a more technical and operational orientation. This would require a much larger and well-funded BOSCH that is capable of delivering a fully integrated renewable energy services in the BOT/turnkey manner. BOSCH would need a strategic partner and would be largely driven by commercial/financial imperatives.

Conflicting demands on BOSCH:



**A policy think-tank entity** has to focus on policy study and policy advocacy and has to develop a good policy network especially with government agencies concerned. This line of work is likely to be a not-for-profit operation that requires long-term institutional funding, plus occasional project funding. Financial independence from private developers and professional neutrality are among critical success criteria of this operation.

**A financially self-sustainable entity** is likely to be one that works closely with private developers on a commercial basis. Such entity would share its organizational interest with the public interest in the promotion of the adoption of renewable energy. The more popular the renewable energy, the better its business. Its provision of service is likely to be technical, financial, and market-driven. The more integrated the services, the better chance of success. The services and the clientele facilitate the adoption and implementation of power generation from renewable energy and provide a feedback loop to the policy-making and policy advocacy.

Situated in the middle is a **Go-Between entity** that has managed to keep a close relationship with government agencies, earned trust from civil society organizations and community groups, and stayed in tune and in touch with private developers. Such role may not be necessary in some sectors that have an established system and process of interest representation and negotiation, but renewable energy is a relatively new sector, and there is a need for a go-between to reach out and bridge a gap among the parties concerned.

It is impossible to expect one organization to fulfill this range of roles/functions. And the evaluation shows that BOSCH has been struggling to find a right balance. An alternative is to redesign and reassign these various roles/functions to more than one organization.

Given the existing expertise and experience, the current BOSCH is inclined and suitable to become a financially self-sustainable entity. It can focus on the objective of removing technical and financial barriers. Most clients are private developers who expect to reap private benefit and are willing, can afford, and should pay for the services. BOSCH has developed a reputation and client network for this type of services and should be able to improve and expand the services on a commercial basis to achieve a sustainable future. Nonetheless, with the project funding, BOSCH should continue to offer services to weaker renewable energy sectors/groups at discount rates.

Policy and advocacy objectives/activities can be reassigned to EFE.<sup>9</sup> EFE has a good reputation among policy-making bodies and a network of policy researchers. By expanding its agency, policy-maker, researcher networks, it can easily become an authoritative

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<sup>9</sup> The idea of EFE assuming the policy and advocacy responsibility was discussed at the presentation of the evaluation report to EFE on 24 May 2005.

renewable policy think-tank. Most important consideration is funding. Policy study, policy advocacy and public education are crucial for the promotion of renewable energy, but they are public goods which need institutional funding, in addition to occasional project funding.

Both BOSCH and EFE should discuss how they can separately and jointly develop and share the information and database. To a certain extent, their operations require different sets and levels of data. But there are some common databases that should be shared between the two organizations, and some made available to other agencies and the public.

The go-between role should also be shared by BOSCH and EFE. Each entity would have the responsibility of mobilizing their clients and networks to the consultation process, and to identify opportunities for fostering cross-sectoral dialogue and cooperation on various renewable energy issues. This arrangement will not pose an impossible expectation on any one organization to keep a precarious balance among diverse and sometimes conflicting interest groups.

Under the new organization design, BOSCH and EFE should develop a work-process that maximizes coordination and synergy. The PMO should have the responsibility to ensure that the two entities operate separately and jointly toward the project objectives.

It should also be noted that under this new organization design, the “one-stop service center” will shift from a one-entity module to a twinning module. BOSCH and EFE would work jointly and closely toward the project objectives. The one-stop service will therefore be functional rather than organizational.

An urgent deliberation on this matter by BOSCH, EFE and PSC is critical for the success of this Project and the future of BOSCH.

### **Project Governance**

The evaluation shows that BOSCH's operation has been guided by the Project Document and it has operated with less than optimal project oversight. While BOSCH operates under the legal framework of EFE, it is the PSC that has a direct project oversight. More participation from the EFE and PSC and more exchanges especially on substantive issues are need among BOSCH, EFE and PSC.

BOSCH's relationship with EPPO and IFCT (now TMB) also needs a review. Many institutional and personnel changes have weakened the close and special rapport previously envisioned by the Project. Besides, BOSCH should keep an equal footing among financial institutions to project an image of neutrality and independence to broaden its financial network.

The issue of project governance needs a careful review to ensure that it fits with the new institutional design.

### **Performance Improvement**

The preceding sections have provided a performance review and suggestions for improvement on various aspects of BOSCH's operation. In sum, BOSCH can enhance its performance by focusing on:

- improving horizontal collaboration among various units and vertical information flow within BOSCH.

- Synthesizing several separate databases to develop an integrated and up-to-date database which should be used to drive the internal work process toward a more integrated service.
- Fostering closer agency relations to expand BOSCH's network.
- Instituting a quality control system.
- Expanding public education activities especially by way of synthesizing lessons learned and best practices from BOSCH's clients and other renewable energy projects.

This list should be revisited should a decision is made to adopt a new project strategy and structure.