Biomass-Based Power Generation and Cogeneration in Palm Oil Industry (BioGen) – Phase I

MAL/01/G31

Evaluation Report

By

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ACRONYMS AND ABBREVIATIONS

AAIBE	Akaun Amanah Industri Bekalan Elektrik (AAIBE)
BIOGEN	Biomass Power Generation and Cogeneration in Palm Oil Mills Project
BPMB	Bank Pembangunan Malaysia Berhad
CDM	Clean Development Mechanism
CHP	Combined Heat and Power
CTA	Chief Technical Advisor
EC	Energy Commission (English for ST)
EPU	Economic Planning Unit
ESSB	Eko-Synthesis Sdn Bhd
FFB	Fresh Fruit Bunches
FSM	Full Scale Model
GEF	Global Environmental Facility
HAZOP	Hazard Operationability
IRR	Internal Rate of Return
KOP	Kluang Oil Processing Sdn Bhd
MESITA	Malaysian Electricity Supply Industries Trust Account (English for AAIBE)
MEWC	Ministry of Energy, Water and Communications
MOA	Memorandum of Agreement
MPOB	Malaysian Palm Oil Board
NPD	National Project Director
POM	Palm Oil Mill
PTM	Pusat Tenaga Malaysia (Malaysia Energy Center)
RE	Renewable Energy
REPPA	Renewable Energy Power Purchase Agreement
RM	Malaysian Ringgit
SCORE	Special Committee for Renewable Energy
SREP	Small Renewable Energy Program
ST	Suruhanjaya Tenaga
TNB	Tenaga Nasional Berhad
UNDP	United Nations Development Programme

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EXECUTIVE SUMMARY

The implementation of the Biomass-Based Power Generation and Cogeneration in the Palm Oil Industry (BioGen) – Phase 1 started in January 2003 and was supposed to be completed in December 2004. Considering the delays in implementation, a year extension was recommended and granted placing the expected completion of Phase 1 to December 2005. This strategic move was decided realizing the need to change approach in project operations and management (which was noted during the Mid-Term Evaluation conducted in August 2004). Moreover, the important momentum needed to catapult the private sector interest in the utilization of oil palm biomass for energy on a commercial basis has not developed yet owing to what is claimed by proponents as unfeasible buy-in power tariff.

The support and guidance of the main agencies involved (MEWC, PTM, MPOB and BPMB) and UNDP-GEF in the implementation of the BioGen Project brought about the significant achievements of the Project which have contributed towards important measurable impacts that the Project has started to make in Malaysia. These contributions include building important networks, developing and establishing biomass energy policies, building capacities of the institutions, developing and establishing financing assistance programs, identifying full scale models to catalyze business/investment decisions and laying the groundwork for biomass energy technology development

In a nutshell, the BioGen Phase 1 has accomplished satisfactorily the performance of most of the lined-up activities and programs. It has prepared the cornerstones and platforms of the biomass energy utilization program to guide the advocacy and adoption by the private sector. However, in spite of these preparations, the first Full Scale Model (FSM) has not been put up as expected in Phase1.

Findings

Against the background and history of many challenges that confronted the BioGen Project, on the overall, it has met expected agreed standards of operational management and administration of the Project but with delays on the main milestone which is the actual FSM installation and related activities. It was affected by some factors, the biggest being the industry proponent's clamor for higher tariff rate to enhance the feasibility of biomass power generation. Most of the project stakeholders view this as something that is not immediately within the control of the BioGen Project. In the meantime, the BioGen Project management has continued to implement some operational changes such as change of the CTA after the mid-term assessment, strengthening of networking and institutional linkages and active monitoring and evaluation by UNDP, MEWC and PTM. The Project also saw the

renewed interest and more active participation of all stakeholders in pursuing the goals of the Project. There are also developments that somehow improved to the advantage of the biomass utilization projects, and the BioGen Project, in particular. The finalization of the basic terms of the REPPA, escalating costs of petroleum, improved economic conditions, heightened interest in environmental compliance and energy conservation and the fifth fuel policy of the Government of Malaysia have also contributed to wider acceptance of the technology.

In spite of generally favorable situation and satisfactory compliance by the BioGen Team and stakeholders of the inputs, plans, processes and methodologies prescribed in the Project design and annual plans, however, the delay of crucial milestone of installing the first FSM as expected in Phase 1 has also affected the completion of other major outputs. The first FSM should have fully catalyzed and integrated various other major supportive outputs which include a workable REPPA ushering an RE market for the power generated, a viable financing model and RE business facility, a sustainable physical demonstration of commercial-scale biomass/biogas oil-palm-residue utilization and a dependable biomass energy technology. All these are needed to build up the confidence of the private industry and the financial sectors.

The satisfactory compliance of the Phase 1 outputs of the BioGen Project is the precondition for continuing implementation of Phase 2. The issue therefore is how to go about the transition from Phase 1 to Phase 2. The next phase includes three more FSMs to be installed and operated for the purpose of further exemplifying the other typical situations of the oil palm mills in Malaysia. The overall strategy is towards a sustainable program of replication of palm oil biomass energy projects to tap the maximum energy potential of oil palm biomass resources.

Among the key achievements that mark the preparedness of the Project to transition to Phase 2 are the finalization of the REPPA pro forma, the establishment of the RE Business Facility, the organization of the Biomass One-Stop Centre, the energy audits of selected palm oil mills, different policy studies, biomass availability assessment, selection of host companies for the FSMs, different workshops and promotional activities, and institutionalization of the biomass energy program and organization.

In implementing its activities and programs, the BioGen Project drew on the stock of intellectual and technical resources of the country and utilized regional consultants where available and required. The Project also benefited from the services of national groups as sub-contractors and resource persons to assist in implementing the Project activities and at the same time build their own institutional capacity.

The UNDP/GEF funding support and inputs have been very valuable in developing the capacity of the stakeholders and the target beneficiaries of the program and ushering in new technical approaches and financing innovations that will be applied to the FSMs and the replication of projects in the long term.

The BioGen Project together with its stakeholders through the Biomass One-Stop Centre, have started to be recognized in the country as a credible source of knowledge and expertise. Its assistance is starting to be requested in technical and financial matters by the palm oil industry. It has become a centerpiece of the Government's RE program under the auspices of the MEWC/PTM. Partnerships were started to be forged in bringing in the banking and private sector involvement as co-financing and business facilities are established.

The Small Renewable Energy Program (SREP) of the government is also being assisted by the BioGen Project in the achievement of its goals in putting renewable energy in the energy mainstream. The palm oil industry has also started to benefit from the BioGen initiatives and awareness programs that resulted to identification of more project possibilities that can be supported through the BioGen and the SREP.

All the stakeholders and participants to the BioGen Project activities and sub-projects have recognized the value and the positive impacts that the BioGen Phase 1 has already contributed to their respective programs and areas of responsibilities. They are already look forward to fast-tracking the remaining Phase 1 outputs and activities, while initiating the other three FSMs under the Phase 2 of the BioGen Project that is very much needed by the palm oil industry.

On the overall, therefore, the Project is moving in the right direction as planned to achieve the milestones but with slower pace. The main obstacle is claimed to be the approval of tariff uplift and this hinders the implementation of the FSM to move ahead. One year has passed since February 2005 when the BioGen Project has selected the Host Company to be Eko Synthesis Sdn Bhd in partnership with Kluang Oil Processing Sdn Bhd, or referred to as ESSB-KOP. The FSM is proposed to include a new POM complex with 120 tons per hour milling capacity and a 14 MW biomass/biogas CHP power plant. ESSB-KOP though cannot sign the REPPA because of its claim that a higher tariff is necessary for the FSM installation to go ahead.

TNB has been firmed in its position to maintain the tariff at 16 to 17 sens/kWh as provided by existing tariff rates. BPMB requires the REPPA as one among the requirements for loan processing. Feasibility calculations indicate that additional 5 sens/kWh is needed. As a move to satisfy this clamor, the PTM/BioGen Project Team has completed related studies and proposed to MEWC in August 2005 several schemes and mechanisms to meet the requested tariff uplift. MEWC is still in the process of coordinating with other government agencies on the impact of the requested uplift with the prevailing power tariff policy.

Since the factors contributing to the project delay are external to the project, a decision has to be made within the Project to break this impasse confronting the financial closure for the first FSM and consequently for the other FSMs. If the tariff cannot be adjusted soon as desired by the industry, the FSM installations will continue to indefinitely drag.

The Phase 1 Project Evaluation has focused therefore on this barrier and analyzed the situation in order to prescribe an option and strategy so the Project may proceed with the Project Phase 1 compliance. In terms of schedule for this project preparation, the BioGen Team has to submit its proposal for completion of Phase 1 activities and initiation of Phase 2 in a Project Brief to UNDP/GEF by March 2006 for it to be included in the June 2006 project development cycle.

Summary of Recommendations

The BioGen Project has started to play the role of a catalyst in the palm oil biomass utilization for energy. It has proven its commitment and capacity to sustain and

complete the initiated activities and programs as it transitions from Phase 1 remaining activities to Phase 2 preparatory work. In view of the foregoing findings and considering the overall situation besetting the Project, **the completion of Phase 1 remaining activities and the start of Phase 2 of the BioGen Project are strongly recommended**.

The following main action points are proposed:

1. **Extend the duration of Phase 1 by at most nine (9) months to September 2006** in order to finish the remaining outputs, including the completion of the preparatory work for the First FSM as proposed using the modular approach described in No.2 below. This extension will also take care of the documentation and approval to commence Phase 2 implementation immediately thereafter following the prescribed timeline.
2. **Conduct follow-through activities in order to assist the government in arriving at pragmatic approaches in tariff setting** e.g. comprehensive financial feasibility studies and case analyses that will redound to the benefit of the biomass renewable energy program.
3. **Start with the existing 30 tph FFB POM** owned by KOP with a 3-5 MW biomass/biogas combined heat and power (CHP) plant to be the qualified BioGen FSM installation for Phase 1. The Host Company could still pursue the 14 MW proposal under more favorable conditions to the full blown capacity.
4. **Continue to develop alternative financing mechanisms such as CDM credits, grace period extension, loan guarantee coverage and others**, to suit the varied and unique situations of the POMs and CHP requirements.
5. **Complete and sustain the manpower complement of the BioGen Project Team and review compensation and incentive package**, subject to availability of funds, so that the Project can attract senior persons with relevant expertise and with capacity to deal with the industry counterparts and can expect them to devote ample attention to the Project.
6. **Hire a CTA** once a decision is reached to extend the Phase 1 and start Phase 2 **and emphasize that the CTA should perform the critical combined roles of project management and technical advisorship** for the BioGen Project to attain project objectives particularly for the four (4) FSMs.
7. **Continue to strengthen the network and organizational linkages among the stakeholders, particularly the members of the NSC and the PRC** so that they can respond effectively, innovatively and timely to the changing and continuing needs of all the target projects specially in coming up with flexible terms and conditions for the physical and financial requirements of the four FSMs.
8. **Develop, establish and sustain an effective monitoring and evaluation system for the pipeline of biomass/biogas projects** in support of the national renewable energy target within the institutional structure that includes the MEWC, PTM, MPOB, BPMB and other relevant stakeholders of the Project during its duration and for the continuing RE Program Management beyond the Project.
9. **Enhance the design and fast-track the establishment of the biomass information database and exchange system through the Biomass One-Stop Centre** that will facilitate decision making and business transactions, with regards to information needed in e.g. fuel supply availability and pricing, financing mechanisms, technology supply and services, best practices and lessons learned, M&E indicators and achievements, promotion and advocacy, etc. that will lead to a market-oriented biomass-based power generation and cogeneration in the palm oil industry.

10. **Review and formulate the foregoing new approach and project plans in detail for remaining activities in Phase 1 and the plans and activities for Phase 2 to be incorporated in a Project Brief** for submission to UNDP/GEF following the project development cycle for consideration by June 2006.

I. Introduction

The Malaysia: Biomass-based Power Generation and Cogeneration Project (BioGen) is a GEF OP-6 project, implemented by UNDP-Malaysia and executed by the Pusat Tenaga Malaysia (PTM) on behalf of the Ministry of Energy, Water and Communications (MEWC). The BioGen Project Phase 1 began implementation in January 2003 and should have been completed by end 2005. The goal of the two-phase BioGen project is the reduction of the growth rate of GHG emissions from fossil fuel fired combustion processes and unutilized biomass waste through the acceleration of the growth of biomass-based power generation and combined heat & power (CHP). It also aims to develop and exploit the energy potentials of biomass waste realized through the successful implementation of programs with activities such as:

1. Information services & awareness enhancement
2. Policy studies & capacity building
3. Financial assistance for biomass energy projects
4. Demonstration schemes; and
5. Biomass energy technology development.

Subject to the accomplishment of the agreed outputs in Phase 1, the BioGen project will continue with the planned activities that are intended for implementation in Phase 2. Depending on the outputs/outcomes during the first phase of the project, Phase 2 activities will be re-defined (if necessary) to facilitate any necessary adjustments to the earlier plan. To enable the MEWC/PTM to come up with a more effective follow-up to the earlier barrier removal activities, an evaluation of the Phase 1 outputs and implementation performance is required. This Project Evaluation therefore covers the three years of the project since inception.

In September 2004, a Mid-Term Evaluation of Phase 1 was conducted wherein the main recommendation is fast-tracking to ensure timely achievement of target outputs. The National Steering Committee decided as endorsed by the BioGen Project Team, a re-aligning of implementation activities to undertake the remaining activities within the remaining 46 weeks before Phase 1 completion date of end of December 2005.

II. The Evaluation Process

The objective of the Project Evaluation is to conduct a systematic and objective performance assessment of all activities carried out and the outputs produced under Phase 1 of the BioGen Project.

Basically, the evaluation process assessed if the specific BioGen Phase 1 targets were actually achieved in terms of the agreed performance indicators in quantitative and qualitative terms.

The evaluation mainly involved both field work and desk work. The evaluator shall review relevant project documents and reports (as stated in Item 4.a) and conduct focused group discussions with the major project actors including the National Project Director (NPD), Chief Technical Advisor (CTA) and project staff on topics and issues that relate to the implementation and impact of the project. Information needed for the evaluation was gathered through document review, group and individual interviews and site visits.

- Documents related to the project such as the project brief, the project document, Inception Report, quarterly and annual progress reports, project implementation reports other activity/component specific reports and evaluation, if there are any, etc.
- Structured interview with knowledgeable parties, i.e., NPD, Project Staff members, Sub-Contractors, International/National Consultants, UNDP Country Office Counterparts, members of the National Steering/Advisory Committee/s, Project Beneficiaries or grantees, etc.
- Visits to specific project sites, if feasible.

The evaluator conducted meetings with the various stakeholders in the schedule shown in Annex.

Regarding the rating of the progress of realization of the expected outputs or the improvement over the baseline, the following rating system will be adopted to reflect the degree to which an output's targets have been met:

Rating	Rate of Progress on the Output/Indicator
Highly Satisfactory	Fully on track (progressing fully as planned or beyond plan)
Satisfactory	Mostly on track (progressing mostly as planned)
Marginally Satisfactory	Partially on track (progressing behind schedule)
Unsatisfactory	Substantially off track (progressing substantially off-schedule)

III. The Findings and Recommendations

A detailed assessment of the actual accomplishments relative to the corresponding expected outputs was done and the results of the assessment and ratings are shown in Annex E. The ratings cannot be transformed to an overall rating in the absence of a weighted distribution among all the outputs. The project management and administration, financial management and the accrued and anticipated benefits to stakeholders and beneficiaries are also described in the following sections.

Immediately following the description of issues, recommendations are proposed as indicated in the sections.

III.1. BioGen Phase 1 Project Implementation and Outputs

In summary, based on the assessment presented in Annex E, most of the activities under each component were completed. However, the following are the significant variances:

Component 1 - Biomass Information Services and Awareness Enhancement Program

Delayed/Work in Progress:

1. Biomass technology database
2. Information exchange services program
3. Quarterly newsletters
4. Project profiles of biomass projects monitored
5. Biomass utilization rating scheme for companies

Deferred for Phase 2:

1. Accreditation program for local consultants on biomass-energy projects

Component 2 - Biomass Policy Study and Institutional Capacity Building

Delayed/Work in Progress:

1. Government policy on the promotion, development and utilization of biomass energy for power generation
2. Institutional framework for the implementation of biomass based power generation projects, including policy support for institutional framework

Component 3 - Biomass Initiatives Financing Assistance Program

Delayed/Work in Progress:

1. Documentation of alternative financing mechanism implementation
2. Approved financial assistance applications to eligible palm oil mills from financial institutions based on the financing assistance package for the 1st full scale model (FSM) demonstration

Deferred for Phase 2:

1. Documentation of evaluation report on annual production and sales as well as technical performance of RE electricity and the share of biomass energy in the national grid electricity generation mix

Component 4 - Biomass-based Power Generation and CHP Demonstration

Delayed/Work in Progress:

1. Documentation of verified & confirmed availability of biomass volumes and POME biogas to support demo schemes for the 4 FSMs
2. Signed long term biomass supply agreements for the 1st FSM
3. Approved REPPA for the 1st FSM

Deferred for Phase 2:

1. Energy audit of 1st FSM and the baseline performance data
2. Comprehensive technical and economic feasibility evaluations completed for all other FSMs
3. Installation and commissioning of demonstration facilities for 1st FSM

Component 5 - Biomass Energy Technology Development Program

Delayed/Work in Progress:

1. Energy audit reports on selected palm oil mills
2. Assessment reports of local equipment manufacturers capability

Deferred for Phase 2:

1. Customized HAZOP model for biomass based RE power projects Customized HAZOP model for biomass based RE power projects

Key Achievements

Among the key achievements that mark the preparedness of the Project to transition to Phase 2 are:

a. the finalization of the REPPA pro forma

The pro forma model contract which is referred to as the Renewable Energy Power Purchase Agreement (REPPA) has been finalized on July 31, 2005. Once signed by both transacting parties, it is the official document that have been agreed upon to be used by the banks in processing loan applications. Through the facilitation and inputs by the BioGen Project, this output has been made possible with the close coordination and cooperation of the Malaysian Government (MEWC, PTM, ST, TNB, EPU and other relevant agencies), the private sector, and the banking institutions, in consultation with the target participants. The REPPA represents the preparedness for commercialization of RE power.

The BioGen Project provided the template of the power purchase agreement through Component 2 on the Pricing Study on RE Tariff. Through the recommendations, the relevant issues were addressed and were used in the current amendments. The study also brought about the submission by the PTM/BioGen Project to the MEWC of the proposal for an RE tariff uplift that is being justified to make biomass projects viable.

At the present tariff rate of 16-17 sens/kWh, however, there are around seven (7) companies which signed by the REPPA but are not implementing their projects because of their claim of the need to uplift the tariff by at least 5 sens/kWh. The BioGen Project provides the important venue and policy study support for coordination and discussion of issues through the National Steering Committee.

In order to assist the SREP Programme, GoM intervention is being supported to address the feed-in RE tariff in Peninsular Malaysia. At present, five licenses have been issued to the developers compared to the 62 projects which have been approved by the SCORE committee. The program is looking at supporting up to 100MWe of RE projects.

b. Establishment of the RE Business Facility

The BioGen Project has established on April 1, 2005 the first financing scheme for RE projects, including biomass projects. At present, the REBF uses funds available from the UNDP/GEF to support biogas from palm oil biomass which is provided at 4% p. a. under a MOA with BPMB. The REBF will pave the way for other funding mechanisms that will be administered through the facility and encourage more funds to augment the current level of funding, such as the JBIC. Alternative financing means are also being explored by the BioGen Project, such as CDM credits.

c. Organization of the Biomass One-Stop Centre

The Biomass One-Stop Centre has been established through the BioGen Project under the auspices of the PTM. It has started to provide services, including consultancy for biomass energy utilization projects, technical advisory, financing facilitation and project identification. The Center has also assisted in the feasibility studies for the treatment of municipal solid wastes.

d. Energy audits of selected palm oil mills

Eight (8) mills were audited in terms of energy utilization and possibility for improving efficiency in the current usage. These mills are being studied for connection to the TNB grid for additional power supply from the excess generation. A report has been completed while the rest are being finalized.

e. Different policy studies

These are studies conducted under the BioGen project in support of the government RE program. The REPPA finalization and the proposed tariff uplift schemes have been supported by the BioGen Project also.

Among the major proposed amendments that were initiated by the BioGen Project are:

1. Performance Target
2. Energy Shortfall Attributable to TNB
3. Lost Delivery of Electrical Energy
4. TNB Delays Commercial Operation Date
5. Savings (Tax, financing and EPC)
6. Force Majeure Event Affecting TNB
7. Consequences of Termination
8. Change-in-Law

f. Biomass availability assessment

The BioGen Project reports that the total potential for biomass and biogas from palm oil mill wastes are now indicated at 2,600 MW. The data will be stored for easy access in the RE database that is being completed by the BioGen Project.

g. Selection of host companies for the FSMs

The first Full Scale Model (FSM) site has been selected to support a 14 MW palm oil biomass power plant. The plant site chosen is the palm oil processing complex to be established at the Kluang. The selection was conducted through a selection process developed and implemented by the BioGen Project.

h. Workshops and promotional activities

A number of seminar-workshops were conducted by the BioGen Project for the Phase 1 commitment in support of the capacity development of the various stakeholders.

i. Institutionalization of the biomass energy program and organization

The BioGen Project has been instrumental in the institutionalization of the biomass energy program. With the outputs of the different components and providing the Government of Malaysia the required relevant inputs, the biomass energy program and the needed organization support have been initiated by the BioGen Project. The overall framework is still being developed.

Stakeholder Inputs and Co-Financing

In implementing its activities and programs, the BioGen Project has utilized intellectual and technical resources of the country and regional consultants where available and required. The Project also benefited from the services of national groups as sub-contractors and resource persons to assist in implementing the Project activities and at the same time build their own institutional capacity. The MPOB has provided technical advisorship to the BioGen Project in terms of seconding senior staff to help in the manpower complement for the project.

The UNDP/GEF funding support and inputs have been very valuable in developing the capacity of the stakeholders and the target beneficiaries of the program and ushering in new technical approaches and financing innovations that will be applied to the FSMs and the replication of projects in the long term.

Based on the APR/PIR for 2005, the following co-financing partners were reported to have provided their committed inputs: BPMB, EiMAS, Universiti Kebangsan Malaysia, POMA, MPOB, Energy Commission (ST), EPU, Forest Research Institute of Malaysia, and Universiti Putra Malaysia

Impacts

The BioGen Project has become the centerpiece of the Government's RE program under the auspices of the MEWC/PTM. Partnerships were started to be forged in bringing in the banking and private sector involvement as co-financing and business facilities are established. It has started to be recognized in the country as a credible source of knowledge and expertise. Its assistance is starting to be requested in technical and financial matters by the palm oil industry.

The palm oil industry has also started to benefit from the BioGen initiatives and awareness programs that resulted to identification of more project possibilities that can be supported through the BioGen and the SREP.

The Small Renewable Energy Program (SREP) of the government is also being assisted by the BioGen Project in the achievement of its goals in putting renewable energy in the energy mainstream.

All the stakeholders and participants to the BioGen Project activities and sub-projects have recognized the value and the positive impacts that the BioGen Phase 1 has already contributed to their respective programs and areas of responsibilities. They are already look forward to fast-tracking the remaining Phase 1 outputs and activities, while initiating the other three FSMs under the Phase 2 of the BioGen Project that is very much needed by the palm oil industry.

Among the major project impacts reported vis-à-vis the Phase I targets are as follows:

Impact Measures	**Target for Phase 1**	**Accomplishment as reported in APR/PIR 2005**
Improvements in energy production, savings or installed capacities		
MW installed (OP6,7)	353 kW	14 MW
MWh/year delivered/ saved	2,165MWh/year	2,524.7 MWh/year (as of May 2005)
Emissions avoided (tons CO2 per year	1,300 ktons	1,514.8 ktons
Reduction of technology cost trajectories		
Cost of energy ($/kWh)	0.039 $/kWh	$0.039 $/ kWh
Cost of equipment ($/kW)**	US$ 1,316/kW	US$ 1,316 /kW
Expansion of business and supporting services for renewable energy and energy efficiency		
Number of additional businesses with project-related purposes (e.g. ESCOs, RE generation, PV manufacturers, etc.)	Approx. 100	60 companies
Increase of financing availability and mechanisms		

Impact Measures	Target for Phase 1	Accomplishment as reported in APR/PIR 2005
Financing modality (e.g. microfinance, credit risk facility, commercial credit, etc.)	4 Financing Institutions involved in RE	4 financing institutions involved (Maybank, RHB Sakura, Bank Industri & BCB)
Newly accessible lending volume for applications targeted by projects ($)	RM 2 billion (US$ 526.3 million)	RM 128 million as approved by 4 banks
Development of sectoral policies, laws and regulations that support project goals		
Development of power sector policies favorable to renewable energy and energy efficiency (e.g. grid access, subsidies, rates and tariffs, taxes, etc.)	4 policies (pricing, tariff, utilization and alternative financing)	1 policy completed on tariff uplift; 1 policy on going (Biomass utilization Policy); 1 policy on alternative financing completed.
Expected additional installation of on-grid renewable energy generation capacity triggered by policy changes (MW)	165 MW	0. Prospective 67 MW from approval of tariff uplift policy.

Way Forward Issues

On the overall, therefore, the Project is moving in the right direction as planned to achieve the milestones but with slower pace. The main obstacle is claimed to be the approval of tariff uplift and this hinders the implementation of the FSM to move ahead. One year has passed since February 2005 when the BioGen Project has selected the Host Company to be Eko Synthesis Sdn Bhd in partnership with Kluang Oil Processing Sdn Bhd, or referred to as ESSB-KOP. The FSM is proposed to include a new POM complex with 120 tons per hour milling capacity and a 14 MW biomass/biogas CHP power plant. ESSB-KOP though cannot sign the REPPA because of its claim that a higher tariff is necessary for the FSM installation to go ahead.

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The main factor contributing to the project delay is external to the project. A decision has to be made within the Project to break this impasse confronting the financial closure for the first FSM and consequently may be true also for the other FSMs. If the tariff cannot be adjusted soon as desired by the industry, the FSM installations will continue to indefinitely drag.

Recommendation No.1:

Extend the duration of Phase 1 by at most nine (9) months to September 2006 in order to finish the remaining outputs, including the completion of the preparatory work for the First FSM as proposed using the modular approach described in No.2 below. This extension will also take care of the documentation and approval to commence Phase 2 implementation immediately thereafter following the prescribed timeline.

An early decision on this proposed action point will be advantageous not only with regards to the project continuity and sustainability but also with the hiring of the CTA and completion of manpower complement and budget realignment.

III.2 Delay in the Installation of the First FSM

The project development for the first FSM has been delayed for more than a year. The first FSM will be hosted by EKO Synthesis Sdn Bhd (ESSB) in partnership with Kluang Oil Palm Processing Sdn Bhd (KOP), or ESSB-EKO. The FSM site was selected by the BioGen Project in February 2005.

In summary the chronology of events for the First FSM installation and related activities is as follows:

1. Tender Specification Committee meeting organised on 2 February 2005
2. Tender advertised on 3 -16 February 2005
3. FSM site selected on 4 February 2005
4. Tender Evaluation Committee meeting organised on 18 February 2005
5. Tender Committee meeting on 26 February 2005
6. FSM consultant appointed on 28 February 2005
7. Site visit to FSM site conducted on 9 March 2005
8. Concept design and initial tender specifications completed on 7 April 2005
9. CDM LOI executed on 22 April 2005
10. All the tender proposal submitted by supplier by 31 July 2005
11. Clarification of Technical Specification and financial planning in progress while waiting for uplift of tariff

In spite of all the preparatory work by the BioGen Team and ESSB-EKO, the award of contract was deferred until financial closure is achieved. ESSB-EKO has been concerned with the low financial returns projected from the existing tariff of 16.8 sens/kWh and has decided to wait until an uplift of the tariff can be provided to the project. BPMB has not proceeded to process the loan application because ESSB-EKO has to comply first with the following:

1. completion of the loan documents including the REPPA, fuel supply agreement, and land titles
2. submission of firm plans on the new milling complex
3. Department of Environment clearance
4. MPOB Permit to construct the palm oil mill complex

In a series of meetings and interviews conducted by the Project Evaluator, the project proponents for the Full Scale Models and other biomass projects in the pipeline have clamored for an increase in the buy-in tariff of the electricity generated from the proposed biomass/biogas power plants, from the existing rate that is fixed at 16.8 - 17 sens/kWh. The proposal is an uplift of 5 sens/kWh to increase the rate to 22 sens /kWh.

Importance of the First FSM

The Full Scale Model has the central role to integrate approaches among the following project major outputs:

- Commercialization Demonstration of the Biomass/Biogas CHP for palm oil mills
- Application of the REPPA
- Financing Model through the RE Business Facility
- Biomass Energy and Environmental Management Technology application
- Advocacy and promotion

However, it should be noted also that if a project has used GEF grant money, its availment of the Carbon Emission Reduction (CER) certificates to generate incremental cash flows will be limited. The first FSM biogas system may have to be supported from other non-GEF-assisted loans in order for it to avail of CER credits. The other future projects can already avail of the CERs fully.

Thus, the biogas systems of the FSMs should take this into account in the financial planning. The actual operational and financial experience of the first FSM could provide the parameters for financial analysis and loan packaging. It is for this reason that the financing plan for the FSMs be made more flexible for the FSM until it becomes operationally and financially stable, i.e., it is able to generate the desired revenues in the later years. A financing model which enables the REBF loan to have longer grace period, has been submitted by BioGen Project to the BITMB through the PTM and the BioGen Project Review Committee.

Recommendation No. 2:

Conduct follow-through activities in order to assist the government in arriving at pragmatic approaches in tariff setting e.g. comprehensive financial feasibility studies and case analyses that will redound to the benefit of the biomass renewable energy program.

Proposed ESSB-KOP Palm Oil Mill Complex for the FSM

The proposed complex is a new installation composed of the palm oil mill, biomass combined-heat-and-power (CHP) plant and biogas recovery system and will be located beside the existing POM owned by KOP. The existing POM has a capacity of 30 tons per hour FFB or an actual average milling throughput of 300,000 tons FFB per year. The ESSB-EKO FSM project is around four (4) times larger and is planned to be an expansion of said existing POM plant to have the following attributes:

Palm Oil Mill Capacity:	120 tons FFB per hour or
Biogas Recovery system:	600 cubic meter POME per day
Biogas Tank capacity:	4,000 cubic meter
Retention Time:	17 days
Biogas equivalent GHG:	40,000 tons per year
Biomass/Biogas Power Plant:	14 -16 MW
Power to be sold to the grid:	10 MW

Financial Analysis of the ESSB-EKO FSM project

Total investment requirement of the overall project is as follows:

Investment Components	Cost in RM million
Biomass Power Plant	77.5
Biogas	9.0
120 tph Palm Oil Mill	20-30
TOTAL	106.5 – 116.5

Investment on Biomass Power Plant	**RM million**	**Financing Plan**		
Main EPC	69.51	80%- Loan 55.2	REBF at 4% pa 28.0	BIPMB at 7.35% pa 27.2
		20%- Equity 14.31		
Land	4.35	Equity		
Financing Cost and IDC	3.64	Equity		
TOTAL	77.5			

	At 16.8 sens/kWh	At 22 sens/kWh
IRR	5%	10%
EIRR	2.4%	
Payback	10 years	3-4 years

Issues under the Proposed ESSB-KOP 14 MW Biomass Power Plant and 120 tph POM and Proponent's Response

The following are the issues arising that would further describe the situation and the implication on the potential additional project delay. In short, despite the assurance of the proponent regarding their ability to meet al the requirements, there is so much

uncertainty that prompted this Project Evaluation to explore of possibilities to overcome the impasse and still comply with the BioGen Project commitments.

Issues	EKO Synthesis Response	Evaluator's Remarks
1. ESSB-KOP cannot satisfy the BPMB's requirements, particularly the REPPA and FSA, while they wait for possible uplift of tariff	Maintains that they cannot sign the REPPA until the tariff uplift is granted	This could be indefinite and may further delay the project
2. BIOGEN has no control on the proposed POM complex that will install a 14 MW biomass/biogas power plant	Assures that they are in full control and everything are already in place, but start of implementation depends on resolution of Issue no.1	This could be indefinite and may further delay the project
3. MPOB license to extend the present capacity might take time to secure considering uncertain source of palm oil fruits and might further delay the project	Assures that they can handle MPOB's requirements and would be able to get approval since this is under RE which is of interest also with MPOB	Since they have not submitted MPOB application, this could be indefinite and may further delay the project
4. Department of Environment clearance I a major requirement to start construction and conditions needed also for the BPMB loan	Assures that they can secure the ECC and has already gotten verbal DOE acceptance	Since they have submitted ECC application , this could be indefinite and may further delay the project
5. Because of the magnitude of investment required, ESSB-KOP Synthesis yet to satisfy the BPMB requirement that financial gearing ratio be at 1:3.5	Assures that they can meet the financial ratios required	This could be indefinite and may further delay the project

The delay can be further aggravated as the BPMB will expect satisfactory compliance of the Conditions Precedent regarding the loan application. All technical aspects can be appropriately handled because the equipment and facilities are standard designs.

From the point of view of loan processing, BPMB has to develop first a procedure or mechanism to address the new processing requirements under the BioGen Project. The bank has several departments involved and the procedures could take lengthy processing if they have to follow the usual steps, templates and leadtime for processing loan applications.

III.3 Elaboration of Proposed Alternative Scheme for the First FSM of the BioGen Project

Considering the BioGen Project's needs in complying with its Phase 1 commitments and the issues involved causing the delay of the proposed ESSB-KOP's 14 MW Biomass/Biogas Power/POM Complex, the following is proposed:

Recommendation No. 3:

Start with the existing 30 tph FFB POM owned by KOP with a 3-5 MW biomass/biogas combined heat and power (CHP) plant to be the qualified BioGen FSM installation for Phase 1. The Host Company could still pursue the 14 MW proposal under more favorable conditions to the full blown capacity. The modular approach is suggested in the construction of the proposed larger ESSB-KOP POM Complex. This scheme is illustrated in Figure 1 in the following page.

The Biogen Project and the selected FSM Host Company, ESSB-KOP, should consider starting with smaller configuration first using the existing 30 tph POM owned by KOP (producing an average of 300,000 ton FFB) to be the first FSM where an appropriately-sized power plant (3-5 MW) and a biogas installation can be integrated.

This alternative FSM scheme is described in more detail to include the following:

1. A biomass boiler and power plant with capacity of 3-5 MW should be installed to make use of the biomass being presently produced in existing POM plus some more biomass that could be purchased from nearby POMs, if necessary.
2. The existing ponds for treating solid and liquid wastes and digester tanks could be rehabilitated to be fully operational to generate biogas which could supplement the boiler fuel requirements.
3. The net excess power can be sold to the grid at the prevailing buy-in tariff at 16 sens/kWh and could increase in the future.
4. ESSB-KOP will submit a new financing plan for the smaller configuration to be considered for the REBF and BPMB financing
5. ESSB-KOP to come up with a proposal to PTM/ BioGen Project to integrate the above components and to include this in the BioGen Phase 1 consistent with the UNDP/GEF project's objectives
6. As the project development for the larger 14 MW progresses, ESSB-KOP should plan that the above smaller scale installation (yet qualified to be a Full Scale Model under the BioGen Project) will be useful as a module of the total proposed complex. This will hasten the confidence of the investors having to see a working plant already.
7. Financial planning for the larger complex may continue to be considered by the BPMP under mutually acceptable terms considering that there will be so much experience that can be generated from the initial FSM and consequently, risks could be greatly mitigated.

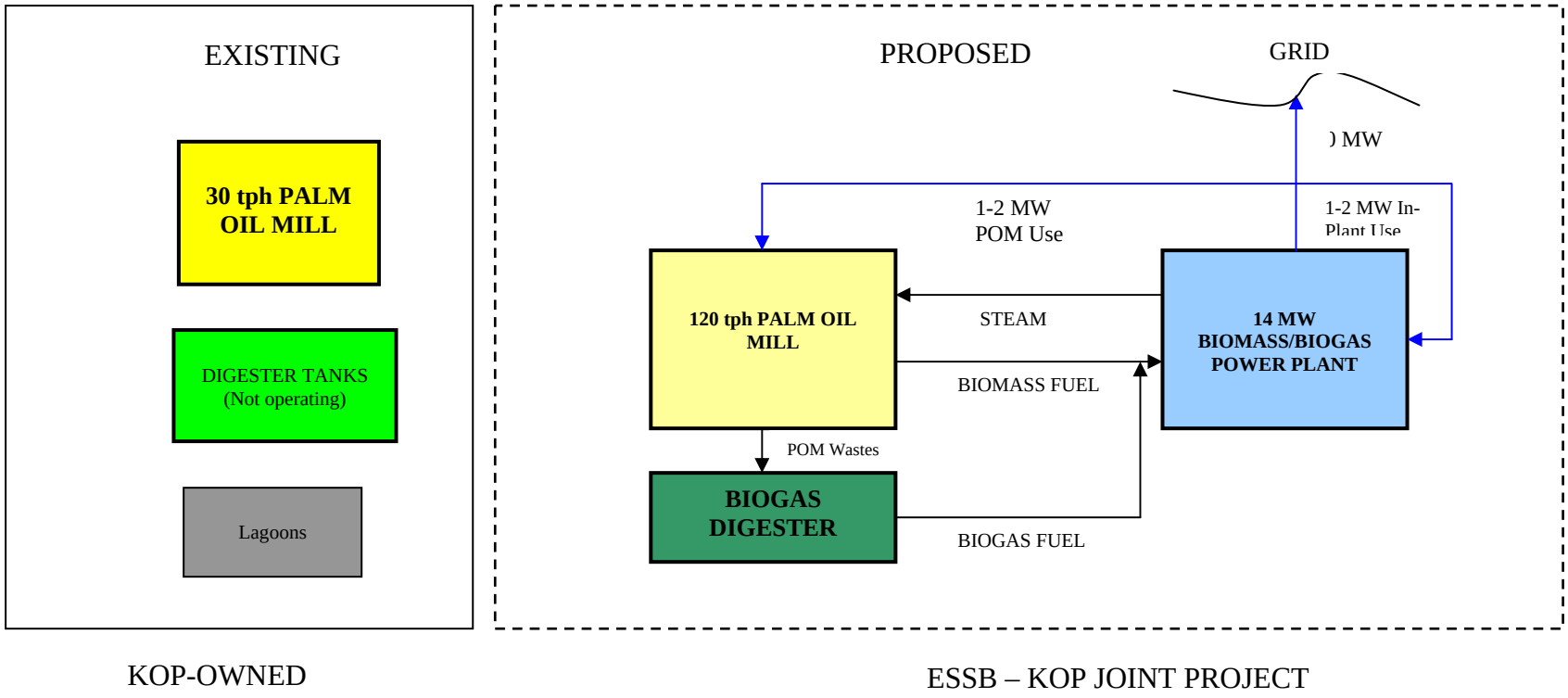


Figure 1. Existing POM owned by KOP and the Proposed New POM and Biomass Power Plant Complex

Financial Implications of the First FSM Modular Approach

Considering the financial dilemma being met by the larger ESSB-KOP POM Complex, the following analysis was made by this Project Evaluation on the basis of a reduced selling capacity and revenue, but with relatively lower investment cost magnitude.

It should be noted also that there will be some economies-of-scale effect from the final capacity of 14-16 MW to 5 MW capacity suggested for the First FSM in terms of cost per MW installed and thermal efficiency. For example, as seen in the following table, the total installed equipment investment cost for the 14 MW CHP is RM 77.5 million while for a 5 MW CHP, the cost could be RM 30-34 million.

Capacity Range	US$ Cost per KW Capacity Installed	Total Investment in power equipment	Thermal efficiency at 50 bars, 450^{o}C
10,000-15,000 KW	1,500	US$ 22.5 million	16%
5,000-9,000 KW	1,800	US$ 9.0 million	8%

Total investment requirement of the overall project is as follows:

Investment Components	Cost in RM million
Biomass Power Plant	30-34
Biogas	1.0
30 tph Palm Oil Mill	existing
TOTAL	35

Results of the Financial Calculation for the proposed alternative First FSM at 5 MW

	Case 1	Case 2	Case 3	Case 4
Base Case Assumptions				
Tariff, RM/kWh	0.168	0.168	0.220	0.220
Fuel, RM/ton	2.33	2.33	2.33	2.33
CER Availment	w/o CER	w/ CER	w/o CER	w/CER
Project Investment Costs, in RM thousands				
Main EPC and devt. cost	34,434	34,434	34,434	34,434
Land	2,178	2,178	2,178	2,178
Financing and legal fees	241	381	241	381
Interest during construction	1,643	1,707	1,643	1,707
Total Investment Cost	38,496	38,700	38,496	38,700
Base Case				
IRR Project, %	7.39	9.10	10.54	12.10
IRR Equity,%	5.73	7.25	9.10	10.48

	Case 1	Case 2	Case 3	Case 4
Payback Period, years	9.8	7.4	6.2	5.0
If 10% <u>INCREASE</u> in Main EPC and Devt Cost				
IRR Project, %	5.52	7.16	8.43	10.15
IRR Equity,%	2.53	4.29	5.89	7.54
Payback Period, years	10.1	8.3	7.3	6.4
If 10% <u>DECREASE</u> in Main EPC and Devt Cost				
IRR Project, %	9.43	11.35	12.84	14.67
IRR Equity,%	8.82	10.68	12.67	14.98
Payback Period, years	7.0	6.4	5.9	4.5

The results of the simulations show that the alternative modular FSM can be viable at certain levels considering the combination of cases that plays around with tariff rate, CER availment, and investment cost. The following assumptions were used:

(a) Installed capacity is 5 MW
(b) In-plant power used is 1.5 MW
(c) Grid connected at 3.5 MW and electricity is sold to TNB at RM 0.168 / kWh
(d) If tariff uplift (RM 0.22 / kWh) is approved duration of the support is maximize to 8 years (based on REBF loan tenure)
(e) Availability of CER is 58,000 tons GHG per year at US$ 5 per ton. This consists of 43,000 tons per year for biogas and 15,000 tons per year for biomass with a contract period until 2012
(f) 12 tons per day of palm oil biomass fuel required for power plant size of 5 MW.
(g) Biomass fuel cost is at RM 2.33 /ton
(h) Staffing cost (technical and administrative) is one-fourth of the estimated cost from the previous assumption for a 14 MW FSM
(i) Margin of financing is 80% on the main EPC and development cost (if REBF cannot fully cover project cost, the remainder will be financed through a commercial loan by BPMB at 7.35% per annum
(j) Loan tenure for REBF is 2 years grace period and 8 years, while for commercial loan is 2 years grace period and 12 years (no capitalization of interest is allowed during the construction period.
(k) Financial gearing ratio is 1:3

Based on the above assumptions and the same computational procedure used for the larger 14 MW FSM, the following are observed from the initial analysis:

1. In terms of *capital cost sensitivity*, for a total investment of RM 38.5 million for the 5 MW plant, the Project IRR is at 7.39 % (compared to 5.0 % for the

originally proposed 14 MW). If this cost assumption is considered at the high side, reducing the EPC investment and development cost by 10%, the Project IRR becomes 9.43%. On the other hand, by increasing it by 10 %, which may result when the project is further delayed, the Project IRR is greatly reduced to 5.52 %.

2. In terms of *tariff rate sensitivity*, with the Base Case at 16.8 sens/kWh, the Project IRR improves by more than 3 percentage points if placed at 22 sens per kWh.
3. In terms of *availment of CDM credits*, the Project IRR improves by about 1.5 percentage points.
4. The exercise did not do sensitivity analysis on the *effect of stretching the grace periods* of the loans. This is expected to have additional positive results on the IRR. Especially for the FSMs, this mechanism will be helpful because this will buffer the effects the initial adjustments in revenue generation as the project becomes stable in operational and financial aspects after several years of operation.
5. The exercise did not include also the *softening of risks through loan guarantee* which the Project could also explore with BPMB.

A more rigid financial analysis and modeling has to be done in order to ascertain the above observations and the effects of other financing approaches in ensuring the FSM success.

Recommendation No. 4

Continue to develop alternative financing mechanisms such as CDM credits, grace period extension, loan guarantee coverage and others, to suit the varied and unique situations of the POMs and CHP requirements.

III.4. Project Management and Administration

Project Organization and Manpower

The BioGen Project Team has maintained the same project organizational and administrative set-up. At present, the positions that have been vacant are: the CTA, since September 2005 and two (2) engineers, since mid 2005. The said positions, particularly the CTA, are very critical to the project and should be filled up soon. The PTM has designated a Project Coordinator who is also the Component Coordinator for Component 1 and 2.

While it appears that the project activities and coordination requirements are being met, the present void in the CTA role is assumed to be covered in supplementation by the designated Project Coordinator and the NPD. The completion of remaining activities of Phase 1 and the resolution of critical issues mentioned above and the preparatory activities for continuing Phase 2 requires full time attention and management administration.

Further, the secondment of senior Technical Advisors to assist in various activities and outputs of the Project components is also important especially in the coordination and mobilization of the requirements for the FSMs and related activities. For example, the

inputs of a senior Technical Advisor from MPOB and other stakeholder institutions, is needed as designed in the project.

The consultants used to be appointed based on the activities by each component. The actual hiring consisted of long tender processing. The Project management has noted that the fee offered is relatively low to attract the response from the international and local consultants. The team appointed a Project Management, Development and Engineering Consultant to expedite the FSM implementation and also other support activities.

After more than three years of project implementation, it is suggested that a review of the compensation and incentive package for project personnel and the need to update the rates be made that can be allowed by UNDP/GEF policies on the matter. This has reportedly become an issue for those seconded from their home offices. As mentioned in the Mid-Term Review, the ProDoc states that "If funds are available, the Program Managers can be paid from such funds so that it will attract persons with relevant expertise and provide them incentives to devote their time to the project."

Recommendation No. 5:

Complete and sustain the manpower complement of the BioGen Project Team and review compensation and incentive package, subject to availability of funds, so that the Project can attract senior persons with relevant expertise and with capacity to deal with the industry counterparts and can expect them to devote ample attention to the Project.

CTA Role

The role of the CTA as the project manager and technical advisor has been emphasized in the Mid-Term Evaluation. The performance of the first CTA has been gauged using this requirement of the post. The replacement of the first CTA by the second CTA has brought about enhancements in the operational and technical aspects of the project. According to the stakeholders interviewed, the second CTA has started to manifest its capacity to manage the project and provide the necessary link between private sector and the Project. However, the second CTA has resigned effective September 2005. Since the resignation of the second CTA, the BioGen Project Management has designated a Project Coordinator to perform the role of the CTA. This is definitely a vacuum on the needs of the Project for the CTA with the above-mentioned role, especially in the critical stage of completing remaining activities and preparing for the Phase 2.

If the CTA cannot be hired within the proposed extension of nine months up to September 2006, there should be a definite arrangement by the PTM to augment the services that can be delivered by the presently designated Project Coordinator. A decision should be reached earlier regarding the Phase 1 extension so that the appropriate management structure can be restored soon.

Recommendation 6:

Hire a CTA once a decision is reached to extend the Phase 1 and start Phase 2 **and emphasize that the CTA should perform the critical combined roles of project management and technical advisorship** for the BioGen Project to attain project objectives particularly for the four (4) FSMs.

Institutional Arrangement and Linkages

The situation has continued to improve regarding the institutional arrangement between and among the stakeholder institutions and agencies. Based on the interview with Project management and personnel, the NSC and the PRC has continued to perform their roles in the Project activities and decision making. The NSC meets twice a year while the PRC meets four times a year. Because of the pending critical issues affecting the Project implementation, the need to meet more than the regular number and to make the meetings more effective in discussing and resolving issues have been observed and needs improvement. The NSC and PRC are the only venues for project decision making and monitoring and evaluation.

Therefore, the number of meetings per year at the minimum should be followed. Meetings should be more organized and on schedule in order to make the meetings productive and directed towards resolving important issues and deciding on business matters

In terms of committed inputs and co-financing, e.g. REBF, the compliance and performance have been satisfactory.

Recommendation No. 7:

Continue to strengthen the network and organizational linkages among the stakeholders, particularly the members of the NSC and the PRC so that they can respond effectively, innovatively and timely to the changing and continuing needs of all the target projects specially in coming up with flexible terms and conditions for the physical and financial requirements of the four FSMs.

BioGen Project's Role in the National RE Target and successful implementation of the Four FSMs

As designed in the BioGen ProDoc, the four FSMs under the whole project are expected to influence the replication of more palm oil biomass projects to constitute a pipeline of firmed-up projects. The Project Evaluator has noted that the four FSMs have not been fully defined and planned as to the typical configurations. These projects if successfully implemented will all contribute to the attainment of the RE program goals in line with the target RE contribution of 5% to the national energy mix. Hence, it is necessary that this target be translated to the number of biomass projects that will be implemented. The four FSMS, representing the typical configurations of the entire POMs in the country, should be planned and their implementation should be monitored very closely in order to pave the way for a systematic replication program for palm oil biomass plants.

Recommendation No. 8:

Develop, establish and sustain an effective monitoring and evaluation system for the pipeline of biomass/biogas projects in support of the national renewable energy target within the institutional structure that includes the MEWC, PTM, MPOB, BPMB and other relevant stakeholders of the Project during its duration and for the continuing RE Program Management beyond the Project.

The table presents the possible configurations of the four FSMs that are suggested to be used as basis for planning and implementing a pipeline of palm oil biomass plants that will all be selling surplus power to the grid and to village community. The FSMs will demonstrate a progression of designs and applications in order to cover possible typical configurations of the palm oil biomass/biogas for the industry to follow. It maybe assumed that the supply of biomass FFB can either be sourced internally from own POM or procured totally or partially from nearby POMs, depending on the individual cases.

FSM Configuration	Heat and Power Supply Capacities	Replication Possibility
FSM 1: Rehabilitation of an Existing POM, biogas system and installing a new biomass/ biogas CHP	Process Steam 5 MW power to grid	20 sites up to total of 100 MW
FSM 2: Retrofit of an existing POM and biomass CHP to upgrade power capacity and installing a biogas system	Back pressure process steam Incremental Power (2 MW) from higher pressure boiler	100-300 sites totaling 200 to 600 MW
FSM 3: New State-of –the Art and Efficient Integrated POM, biomass/biogas CHP	Process steam 3 to 10 MW power to grid	No. of sites depending on Industry expansion and need to retire old plants
FSM 4: Existing or New POM and biomass/biogas CHP	Process steam 3-4 MW for off-grid community application	10 sites 30-40 MW

III.5 Budget and Financial Management

The status of BioGen Project Budget vs. Actual Expenditures in major components and activities is shown in Annex. In summary, the following are observed from the table of data submitted by the BioGen Financial Officer:

On the overall, of the total budgeted amount for BioGen Phase 1 at US$ 4,000,000, only about US$ 1,680,902, or 42 % of budget has been spent.

In terms of the Project Component budget and expenditures, the following are indicated as the extent of expenditures per component:

Component 1	54%
Component 2	84%
Component 3	42%
Component 4	17%
Component 5	29%
Whole Project	**42%**

In terms of activities and outputs, the following are indicated according to expenditure of budgeted amount for activity:

1. Activities that have spent all or most of the budget
    - Comprehensive Biomass Energy Resource Inventory
    - Biomass Energy Technologies Database
    - Biomass Energy Technology Training Courses
    - Biomass Policy Analysis
    - RE Electricity Pricing Study
    - Biomass-based Power Generation Implementation Methodology
    - Training course on RE project financing
    - Assistance services to financing applicants
    - Chief Technical Adviser

2. Activities that still have remaining budget
    - Biomass Energy Technology Information Exchange Service
    - New Initiatives in RE Power Generation Project
    - RE Policy Implementation Monitoring and Evaluation
    - RE Business Facility Establishment
    - Arrangements for financial assistance for eligible RE projects
    - Specific Demo Scheme Implementation Barrier Removal Activities
    - Evaluation of Energy Utilization Performance of Palm Oil Mills
    - Training for Palm Oil Mill Power Plant Engineers & Operators
    - Assessment of Capabilities of Local Steam and Power Generation Equipment Manufacturers

3. Activities that have budget overruns:
    - Integrated Information Dissemination Program
    - Biomass Energy Utilization Workshop Series (reclassified)
    - RE Electricity Generation and Sales Study
    - Financing scheme mechanics including eligibility criteria
    - Selection Criteria of Full Scale Model
    - Assessment of Other Energy-and Non-Energy Uses of Palm Oil Industry

4. Activities that have not spent any amount
    - RE Consultancy Service Industry Development
    - Biomass Industry Rating Program
    - Installation and Implementation Designs/Plans for the FSM Schemes
    - Training Course for local steam and power generation equipment manufacturers of high efficiency designs and production technologies
    - Financial assistance to local steam & power generation equipment manufacturers

Regarding the budget and financial implication on how to treat the accounting of the remaining/spent funds in the transition period from Phase 1 to Phase 2, the following cases describe the situation depending on the decision on the proposed extension:

Case 1; Extend Phase 1 to September 2006 or a period of 9 months (to finish remaining Phase 1 commitments before starting Phase 2)

Case 2: Terminate Phase 1 at a certain agreed date and all unspent budget and corresponding activities will be carried over to Phase 2 effective that date

The Project Evaluator suggests Case 1 as the accounting treatment of the remaining budget and activities. However, a more detailed budget analysis is suggested in order to validate the above observation based on submitted data.

III.6 Accrued and Anticipated Benefits to Stakeholders and Beneficiaries

Based on the discussion with stakeholders, the following were noted as the benefits derived from the BioGen Project - Phase 1:

1. The UNDP/GEF funding support and inputs have been very valuable in developing the capacity of the stakeholders and the target beneficiaries of the program and ushering in new technical approaches and financing innovations that will be applied to the FSMs and the replication of projects in the long term.
2. The BioGen Project together with its stakeholders through the Biomass One-Stop Centre, have started to be recognized in the country as a credible source of knowledge and expertise. Its assistance is starting to be requested in technical and financial matters by the palm oil industry. It has become a centerpiece of the Government's RE program under the auspices of the MEWC/PTM. Partnerships were started to be forged in bringing in the banking and private sector involvement as co-financing and business facilities are established.
3. The Small Renewable Energy Program (SREP) of the government is also being assisted by the BioGen Project in the achievement of its goals in putting renewable energy in the energy mainstream. The palm oil industry has also started to benefit from the BioGen initiatives and awareness programs that resulted to identification of more project possibilities that can be supported through the BioGen and the SREP.
4. All the stakeholders and participants to the BioGen Project activities and sub-projects have recognized the value and the positive impacts that the BioGen Phase 1 has already contributed to their respective programs and areas of responsibilities. They are already look forward to fast-tracking the remaining Phase 1 outputs and activities, while initiating the other three FSMs under the Phase 2 of the BioGen Project that is very much needed by the palm oil industry.
5. Stakeholders and interested parties have been made aware and they have started to appreciate the value of the access to reliable, timely and relevant information on biomass fuel availability, geographical sources, prices and similar information.

Recommendation No.9:

Enhance the design and fast-track the establishment of the biomass information database and exchange system through the Biomass One-Stop Centre that will facilitate decision making and business transactions, with regards to information needed in e.g. fuel supply availability and pricing, financing mechanisms, technology supply and services, best practices and lessons learned, M&E indicators and achievements, promotion and advocacy, etc. that will lead to a market-oriented biomass-based power generation and cogeneration in the palm oil industry.

IV. Transitioning of Remaining Phase I Activities and Phase II Coverage

In view of the status of activities and budget, the Project Evaluator has found that significant activities and outputs are on-going work in progress and need more time to complete. Based on the discussion with the BioGen Team, most of these backlogs and preparatory work for the First FSM can be completed up to September 2006. However, it is important that the logical framework of the project activities be reviewed and validated in order to configure the Phase 2 program. A suggested timeline of Phase 1 and Phase 2 transition is shown in **Annex G.** A new project brief to document the new plan shall be prepared by the BioGen Project and submitted through MEWC/PTM for approval again by UNDP/GEF.

Recommendation No. 10:

Review and formulate the foregoing new approach and project plans in detail for remaining activities in Phase 1 and the plans and activities for Phase 2 to be incorporated in a Project Brief for submission to UNDP/GEF following the project development cycle for consideration by June 2006.

V. Summary of Recommendations

As described in the foregoing sections above, the following is a summary of all the recommendations as a result of the Project Evaluation for BioGen Phase 1:

1. **Extend the duration of Phase 1 by at most nine (9) months to September 2006** in order to finish the remaining outputs, including the completion of the preparatory work for the First FSM as proposed using the modular approach described in No.2 below. This extension will also take care of the documentation and approval to commence Phase 2 implementation immediately thereafter following the prescribed timeline.
2. **Conduct follow-through activities in order to assist the government in arriving at pragmatic approaches in tariff setting** e.g. comprehensive financial feasibility studies and case analyses that will redound to the benefit of the biomass renewable energy program.
3. **Start with the existing 30 tph FFB POM** owned by KOP with a 3-5 MW biomass/biogas combined heat and power (CHP) plant to be the qualified BioGen FSM installation for Phase 1. The Host Company could still pursue the 14 MW proposal under more favorable conditions to the full blown capacity.
4. **Continue to develop alternative financing mechanisms such as CDM credits, grace period extension, loan guarantee coverage and others**, to suit the varied and unique situations of the POMs and CHP requirements.
5. **Complete and sustain the manpower complement of the BioGen Project Team and review compensation and incentive package**, subject to availability of funds, so that the Project can attract senior persons with relevant expertise and with capacity to deal with the industry counterparts and can expect them to devote ample attention to the Project.
6. **Hire a CTA** once a decision is reached to extend the Phase 1 and start Phase 2 **and emphasize that the CTA should perform the critical combined roles of project management and technical advisorship** for the BioGen Project to attain project objectives particularly for the four (4) FSMs.
7. **Continue to strengthen the network and organizational linkages among the stakeholders, particularly the members of the NSC and the PRC** so that they can respond effectively, innovatively and timely to the changing and continuing needs of all the target projects specially in coming up with flexible terms and conditions for the physical and financial requirements of the four FSMs.
8. **Develop, establish and sustain an effective monitoring and evaluation system for the pipeline of biomass/biogas projects** in support of the national renewable energy target within the institutional structure that includes the MEWC, PTM, MPOB, BPMB and other relevant stakeholders of the Project during its duration and for the continuing RE Program Management beyond the Project.
9. **Enhance the design and fast-track the establishment of the biomass information database and exchange system through the Biomass One-Stop Centre** that will facilitate decision making and business transactions, with regards to information needed in e.g. fuel supply availability and pricing, financing mechanisms, technology supply and services, best practices and lessons learned, M&E indicators and achievements, promotion and advocacy, etc. that will lead to a market-oriented biomass-based power generation and cogeneration in the palm oil industry.

10. **Review and formulate the foregoing new approach and project plans in detail for remaining activities in Phase 1 and the plans and activities for Phase 2 to be incorporated in a Project Brief** for submission to UNDP/GEF following the project development cycle for consideration by June 2006.

Annexes

Annex A: Phase 1 Evaluation TOR

Malaysia: Interim BioGen Project (Phase I) Evaluation

Terms of Reference for Consultancy Assignment

1. INTRODUCTION

The Malaysia: Biomass-based Power Generation and Cogeneration Project (BioGen) is a GEF OP-6 project, implemented by UNDP-Malaysia and executed by the Pusat Tenaga Malaysia (PTM) on behalf of the Ministry of Energy, Water and Communications (MEWC). BioGen Phase I began implementation in January 2002 and will be completed by end 2005. The goal of the 2-phase BioGen project is the reduction of the growth rate of GHG emissions from fossil fuel fired combustion processes & unutilized biomass waste through the acceleration of the growth of biomass-based power generation & combined heat & power (CHP). It also aims to develop & exploit the energy potentials of biomass waste realized through the successful implementation of programs such as: 1. Information services & awareness enhancement; 2. Policy studies & capacity building; 3. Financial assistance for biomass energy projects; 4. Demonstration schemes; and 5. Biomass energy technology development.

Subject to the accomplishment of the agreed outputs in Phase 1, the BioGen project will continue with the planned activities that are intended for implementation in Phase 2. Depending on the outputs/outcomes during the first phase of the project, Phase 2 activities will be re-defined (if necessary) to facilitate any necessary adjustments to the earlier plan. To enable the MEWC/PTM to come up with a more effective follow-up to the earlier barrier removal activities, an evaluation of the Phase 1 outputs and implementation performance is required. This document presenting the terms of reference for the required independent evaluation is the purpose for this consultancy.

2. OBJECTIVE

Systematic and objective performance assessment all activities carried out and the outputs produced under Phase I of the BioGen Project.

3. OUTPUT

Evaluation Report on the BioGen Phase I Outputs and Implementation Performance

4. ACTIVITIES

The scope of work for the consultancy will include, but not necessarily be limited to, the following activities:

General:

1. Assess all outputs[1] (overall as well as specific) produced under Phase 1 including the following outputs listed in the Project Document:

    - Biomass resource survey of palm oil waste, wood waste, rice husk, bagasse and MSW
    - Biomass technology database

[1] In UNDP-GEF context output is defined as: 'Goods and services provided by the project. Actual deliverables. Direct results of project Inputs, achieved through the completion of project activities'.

- Documentation of training programs (course materials and training evaluation reports) for PTM staff, palm oil mill personnel, local engineering consultants, government and financial institutions
- RE Technology in the curriculum of engineering universities, RE incorporation in science curricula of high schools
- Biomass Unit :One-Stop-Center"
- Information materials on biomass energy technology and resources included in PTM website
- Information exchange services program
- Quarterly newsletters
- Project profiles of biomass projects monitored
- Accreditation program for local consultants on biomass-energy projects
- Biomass utilization rating scheme for companies
- Government policy on the promotion, development and utilization of biomass energy for power generation
- Policy studies: Policy support activities to prospective biomass energy project developers; power tariff policy for biomass-based power generation and CHP projects
- Proceedings of annual national workshops on biomass energy promotion activities
- Strengthened terms and conditions for renewable energy power purchase agreement (REPPA)
- Institutional framework for the implementation of biomass based power generation projects, including policy support for institutional framework
- Documentation on public consultations on proposed policies
- Documentation of awareness programs on new financing mechanism
- Documentation of alternative financing mechanism implementation
- Documentation of evaluation report on annual production and sales as well as technical performance of RE electricity and the share of biomass energy in the national grid electricity generation mix
- RE Business Facility
- Approved financial assistance applications to eligible palm oil mills from financial institutions based on the financing assistance package for the 1st full scale model (FSM) demonstration
- Evaluation reports on all potential demo sites
- Comprehensive technical & economic feasibility evaluations for the 1st FSM demonstration
- Signed MOA of the 1st FSM
- Documentation of verified & confirmed availability of biomass volumes and POME biogas to support demo schemes for the 4 FSMs
- Signed long term biomass supply agreements for the 1st FSM
- Approved REPPA for the 1st FSM
- Energy audit of 1st FSM and the baseline performance data
- Basic engineering design of FSM
- Comprehensive technical and economic feasibility evaluations completed for all other FSMs
- Detailed engineering designs for the 1st FSM
- Installation and commissioning of demonstration facilities for 1st FSM
- Comprehensive report inclusive of recommendations for potential energy and non-energy related uses of palm oil biomass

- Comprehensive report for potential energy and non-energy related uses of palm oil biomass
- Energy audit reports on selected palm oil mills
- Customized HAZOP model for biomass based RE power projects
- Assessment reports of local equipment manufacturers capability

2. Rate progress of realization of the expected outputs.

Specific:

a) Describe project and its context within Malaysia and the ASEAN region;

b) Describe applied evaluation methodology;

c) Assess output status including whether or not they are produced or in the process of being produced;

d) Compare specified BioGen Phase I targets with outputs produced to date concerning the following criteria: i) quantity; and, ii) scope. Apply the following rating system concerning outputs, which reflects the degree to which an output's targets have been met: i) highly satisfactory, i.e., output/indicator fully on track (progressing fully as planned or beyond plan); ii) satisfactory, i.e., output/indicator mostly on track (progressing mostly as planned); iii) marginally satisfactory, i.e., output/indicator partially on track (progressing behind schedule); and, iv) unsatisfactory, i.e., output/indicator substantially off track (progressing substantially off-schedule). This serves as a proxy assessment of how successful the Project has been in achieving its outputs. The four ratings are meant to reflect the degree of achievement of outputs by comparing with the baseline (i.e., the non-existence of the output) with the target (i.e. the production of the output).

e) Assess BioGen Phase I outputs produced to date with regard to quality where applicable. Apply the following ratings: i) highly satisfactory; ii) satisfactory; iii) marginally satisfactory; and iv) unsatisfactory;

f) Assess implementation and management issues where they specifically relates to outputs: i) timeliness of outputs; and ii) the degree of stakeholder and partner involvement in the completion of the outputs;

g) Assess and rate where relevant and/or if applicable (taken the scope of the consultancy into consideration) key performance dimensions (e.g. relevance and cost-effectiveness)

5. METHODOLOGY

The evaluation would mainly involve both field work and desk work. The evaluator shall review relevant project documents and reports (as stated in Item 4.a) and conduct focused group discussions with the major project actors including the National Project Director (NPD), Chief Technical Advisor (CTA) and project staff on topics and issues that relate to the implementation and impact of the project. Information needed for the evaluation will be gathered through document review, group and individual interviews and site visits.

- Documents related to the project such as the project brief, the project document, Inception Report, quarterly and annual progress reports, project implementation reports other activity/component specific reports and evaluation, if there are any, etc.
- Structured interview with knowledgeable parties, i.e., NPD, Project Staff members, Sub-Contractors, International/National Consultants, UNDP Country Office Counterparts, members of the National Steering/Advisory Committee/s, Project Beneficiaries or grantees, etc.
- Visits to specific project sites, if feasible.

The evaluator will conduct an opening meeting with the NPD and relevant PTM staff to be followed by an "exit" interview with UNDP CO to discuss the findings of the assessment prior to the submission of the final report.

6. REPORTING REQUIREMENTS

The evaluator is required to prepare and submit an acceptable BioGen Phase I Evaluation Report, which include findings and recommendations based on the evaluation of the Phase I Outputs; conclusions; and, recommendations for issues to be addressed in BioGen Phase II.

a) The Evaluation Report that will be produced under this assignment must be available on or before 28 February 2006

b) The Evaluation Report shall be in Microsoft Word or Adobe Acrobat format;

c) The Evaluation Report must have no restriction in access;

d) The Consultant is free to use what he/she thinks is the most appropriate structure of the Evaluation Report but it should at least have an executive summary, and sections on: 1) findings and recommendations; 2) conclusions; and 3) recommendations for issues to be addressed in BioGen Phase II.

7. DOCUMENTARY SOURCES

Key documentary sources for the consultancy include:

a) GEF-approved BioGen Project Brief;

b) UNDP BioGen Phase I Project Document;

c) All output reports and documents produced under BioGen (Phase I); and

d) BioGen (Phase I) Mid-term Evaluation Report

Annex B: Schedule of Meetings

Evaluation Schedule
Biomass Power Generation and Co-generation Palm Oil Mills (BioGen)
13-24 Feb 2006

Date / Time		Location	Officer
Day1: Mon 13			
9:00-10:00	Briefing UNDP CO	UNDP	Asfa
10:00 - 10:30	courtesy call RR	UNDP	RR
11:30- 12:30	Briefing NPD	PTM	Dr. Anuar
14-16:00	Project Team - project status	PTM	Sikin & the team
Day 2: Tue 14			
9:00 - 12:30	BioGen all components including FSM, REPPA, REBF	PTM	BioGen Team
14:30- 16:30	MEWC & courtesy call TKSU	MEWC	Datin Seri Elena
Day 3: Wed 15			
9:00 - 10:30	EPU & courtesy call Director Energy	EPU	Nik Adnan
11:00 - 16:30	Continue PTM	PTM	BIOGEN Team
Day 4: Thu 16			
9:00 - 10:30	Bank Pembangunan & Industri	BPI	Abu Hassan
11:00- 12:30	Energy Commission (SREP Div.)	ST	Jamari
14:30 - 16:30	TNB	TNB	Tengku Azhar
Day 5: Fri 17			
9:30 - 12:00	MPOB	MPOB	Dr. Choo
15:00- 16:00	Discussion with NPD & key stakeholders	PTM	Dr. Anuar / invited
Day 6: Sat 18			
	Meeting Adan	Hotel	Roger / Adan
Day 7: Mon 20			
9:00-17:00	Report Writing / Discussion	UNDP	Asfa
Day 8 : Tue 21			
9:30 - 12:00	Additional data gathering	PTM	ALL
	Report Writing		
Day 9: Wed 22			
10:00 am 4:00 pm	Wrap up with PTM Wrap-up/Closing with UNDP	PTM UNDP	Asfa, Dr. Anuar Asfa, RR
Day 10: Thurs 23			
	Report Finalization		R.Z. Aldover

Annex C: List of Documents

Reference Documents and Reports

1. GEF-approved BioGen Project Brief;
2. UNDP BioGen Phase I Project Document
3. BioGen (Phase I) Mid-term Evaluation Report
3. Comprehensive Biomass Energy Resource Inventory in Malaysia – R070/04. Submitted to PTM by environment and Bioprocess Technology Centre SIRIM BERHAD. March 2004
4. Report on Biogen Parallel Workshops and Exhibitions. Selangor, 25-26 July 2005.
5. Report on BioGen Full Scale Model (FSM) Power Project Promotional Scheme and Financial Institution Awareness Seminar. 2003
6. Biomass Energy Technology Training. UNITEN. December 2005
7. Workshop on Business Opportunities in financing Renewable energy Projects. April 2004.
8. Biomass Awareness and Information Seminar, Bangi. October 21, 2005
9. Report on the forum on Renewable Energy Power Purchase Agreement (REPPA). November 2004
10. Assessment of Biomass Residues in the Palm Oil Industry. Achuthan Krishnan. Ashwin Acht Consultants. April 2004
11. Report on Group Evaluation for Selection of FSM: Naluri Venture Sdn Bhd. April 2005
12. Comprehensive Technical and Economic Feasibility Study on Pre-selected Sites for RE Power Generation using Palm Oil Mill Wastes. July 2004

Annex D: List of Persons Met/Interviewed

List of Persons Met/Interviewed

UNDP
Dr. Richard Leete
Resident Representative

Asfaazam Kasbani
Programme Manager

Pusat Tenaga Malaysia (PTM)
Dr. Anuar Abdul Rahman
Chief Executive Officer

Ahmad Zairin Ismail
Deputy Director

Norasikin A. Ludin
Project Coordinator and Component 1 Manager

Nor Azaliza Damiri
Research Officer

Mohd. Hafiz bin Mohd. Suib
Finance Executive

Zaimul Khalil b. Mustaffa
Research Officer

Haniff Bin Ngadi
Technical Support

Mohd. Azwan
Component 4 Manager

Mohamad Adan Yusof
CTA (February-September 2005)

EPU
Nik Adnan Nik Abdullah
Principal Assistant Director

EKO Synthesis
Neo Teck Siong
Director

MEWC
Mr. Teo Yen Hua
Deputy Secretary General (Energy)

Datin Seri Elena Chia
Principal Assistant Secretary

Mohd. Hairol
Energy Officer

BPMB
Rozlina Abdul Samad
Credit Project Finance

Roslina Mohamed
Head - Treasury

Mohd. Nordin Che Omar
Manager, High Tech Business Development

Aziah Hassan
Treasury

Zulkipli Mohd. Yunos

MPOB
Dr. Choo Yuen May
Director

Dr. Chow Mee Chin
Principal Research Officer

Hj. Zulkifli Abd. Rahman
Senior Research Officer

ST
Jamari bin Ibrahim
Deputy Director, Electricity Supply

TNB
Tengku Azhar Tengku Kasim
Senior Manager, Small Power Resources

Sansubari Che Mud
Manager SREP Coordinator

Annex E: Rating of BioGen Project Expected Outputs and Actual Accomplishments

Annex E: Rating of BioGen Project Expected Outputs and Actual Accomplishments

Regarding the expected Output/Indicators, these are the performance measures stated in the BioGen Project Annual Targets. Specifically, the latest is as of 2004 has been used as reference.

Assessment Items on Outputs (overall as well as specific) produced under Phase 1	Expected	Actual as of February 2006	Rating of Progress
Component 1- Biomass Information Services and Awareness Enhancement Program			
Biomass resource survey of palm oil waste, wood waste, rice husk, bagasse and MSW	Completed by May 2004	Completed Final Report	S
Biomass technology database	Completed Comprehensive Biomass Database by June 2005	Work in progress. Design is 70% complete.	MS
Documentation of training programs (course materials and training evaluation reports) for PTM staff, palm oil mill personnel, local engineering consultants, government and financial institutions	Completed by December 2005	Completed.	S
RE Technology in the curriculum of engineering universities, RE incorporation in science curricula of high schools	Proposal submitted by Nov. 2004; All high schools using new science curricula by end 2005	Completed.	S
Biomass Unit :One-Stop-Center"	Operational by June 2005	Completed. Operationalized	S
Information materials on biomass energy technology and resources included in PTM website	Operational by 2005	Completed	
Information exchange services program	Program completed by December 2005	Work in progress	MS
Quarterly newsletters	Publications started January 2004	Work in progress	MS
Project profiles of biomass projects monitored	7 projects monitored	Work in progress	MS
Accreditation program for local consultants on biomass-energy projects	At least 10 local consultants are providing consultancy on RE	DEFERRED Accreditation Program	U
Biomass utilization rating scheme for companies	Rating scheme proposed by December 2005	Work in progress	MS
Component 2 - Biomass Policy Study and Institutional			

Assessment Items on Outputs (overall as well as specific) produced under Phase 1	Expected	Actual as of February 2006	Rating of Progress
Capacity Building			
Government policy on the promotion, development and utilization of biomass energy for power generation	Policy recommendation on biomass considered in 9MP by June 2005	Work in progress	MS
Policy studies: Policy support activities to prospective biomass energy project developers; power tariff policy for biomass-based power generation and CHP projects	Completed by December 2005	Completed	S
Proceedings of annual national workshops on biomass energy promotion activities	May 2005	Completed	S
Strengthened terms and conditions for renewable energy power purchase agreement (REPPA)	Completed by June 2005	Completed. Presented to MEWC	S
Institutional framework for the implementation of biomass based power generation projects, including policy support for institutional framework	Completed by October 2005	Work in progress. Identified linkages with TNB, BITPB and the SREP; MOU signed but not yet implemented	MS
Documentation on public consultations on proposed policies	Completed by December 2005	Completed	S
Component 3 - Biomass Initiatives Financing Assistance Program			
Documentation of awareness programs on new financing mechanism	New financing mechanisms developed by December 2005	Completed identification of new financing mechanisms; training in July 2005 (Awareness program scheduled for June 2006)	S
Documentation of alternative financing mechanism implementation	Completed by December 2005	Work in progress. Mechanisms proposed; but not yet implemented	MS
Documentation of evaluation report on annual production	Started 2006	DEFERRED. Only two	U

Assessment Items on Outputs (overall as well as specific) produced under Phase 1	Expected	Actual as of February 2006	Rating of Progress
and sales as well as technical performance of RE electricity and the share of biomass energy in the national grid electricity generation mix		projects (outside the Biogen) were so far installed	
RE Business Facility	Established by BITMB by June 2005	Completed. RM 28 million funding for the FSM. Other sources being identified	HS
Approved financial assistance applications to eligible palm oil mills from financial institutions based on the financing assistance package for the 1st full scale model (FSM) demonstration	One approved by June 2005	Work in progress. Cannot proceed because there is no REPPA yet pending uplift of tariff	
Component 4 - Biomass-based Power Generation and CHP Demonstration			
Evaluation reports on all potential demo sites	Completed by December 2005	Completed for 4 sites based on 29 companies' submission. Energy audits and financial standing of possible host companies for FSMs were completed. Potential for rehabilitation projects including biogas site identified	S
Comprehensive technical & economic feasibility evaluations for the 1st FSM demonstration	Completed by December 2005	Completed. Sensitivity analyses done with respect to tariff, capacity, fuel price, etc.	S
Signed MOA of the 1st FSM	Completed by April 2005	Completed.	S
Documentation of verified & confirmed availability of biomass volumes and POME biogas to support demo	Completed by December 2005	Work in progress. Report submitted	MS

Assessment Items on Outputs (overall as well as specific) produced under Phase 1	Expected	Actual as of February 2006	Rating of Progress
schemes for the 4 FSMs			
Signed long term biomass supply agreements for the 1st FSM	Completed by July 2005	Work in progress. Draft FSA prepared. Issues on fuel pricing to be resolved yet considering alternative uses of EFB and transportation issue.	MS
Approved REPPA for the 1st FSM	Completed by July 2005	Work in progress. Pending the uplift of the tariff. Existing tariff is claimed to be unattractive.	MS
Energy audit of 1st FSM and the baseline performance data		DEFERRED. Pending actual operation of the FSM.	U
Basic engineering design of FSM	Completed by April 2005	Completed. Engineering drawings and initial calculations provided.	S
Comprehensive technical and economic feasibility evaluations completed for all other FSMs	Completed by December 2005	DEFERRED	U
Detailed engineering designs for the 1st FSM	Completed by May 2005	Completed. Equipment specifications identified for tender purposes.	S
Installation and commissioning of demonstration facilities for 1st FSM	Completed by December 2005	DEFERRED. Decision pending on the FSM decision.	U
Component 5 - Biomass Energy Technology Development Program			
Comprehensive report inclusive of recommendations for potential energy and non-energy related uses of palm oil	Completed by March 2005	Completed. Final Report submitted	S

Assessment Items on Outputs (overall as well as specific) produced under Phase 1	Expected	Actual as of February 2006	Rating of Progress
biomass			
Comprehensive report for potential energy and non-energy related uses of palm oil biomass	Completed by December 2005	Completed. Final Report submitted	S
Energy audit reports on selected palm oil mills	One audit report completed by March 2005	Work in progress. Eight mills audited, 1 report submitted.	S
Training sessions on biomass-based power generation and CHP as part of MPOB program	Two completed by December 2005	Completed	S
Customized HAZOP model for biomass based RE power projects		DEFERRED. Dependent on the implementation of the FSM	U
Assessment reports of local equipment manufacturers capability	Completed by December 2005	Work in progress. Survey of local equipments produced, capacity, clients, efficiency and other information gathered.	U

Annex F: Status of Budget vs. Actual Expenditures in Major Activities

Annex F. **Status of BioGen Phase 1 Budget vs. Actual Expenditures in Major Activities**

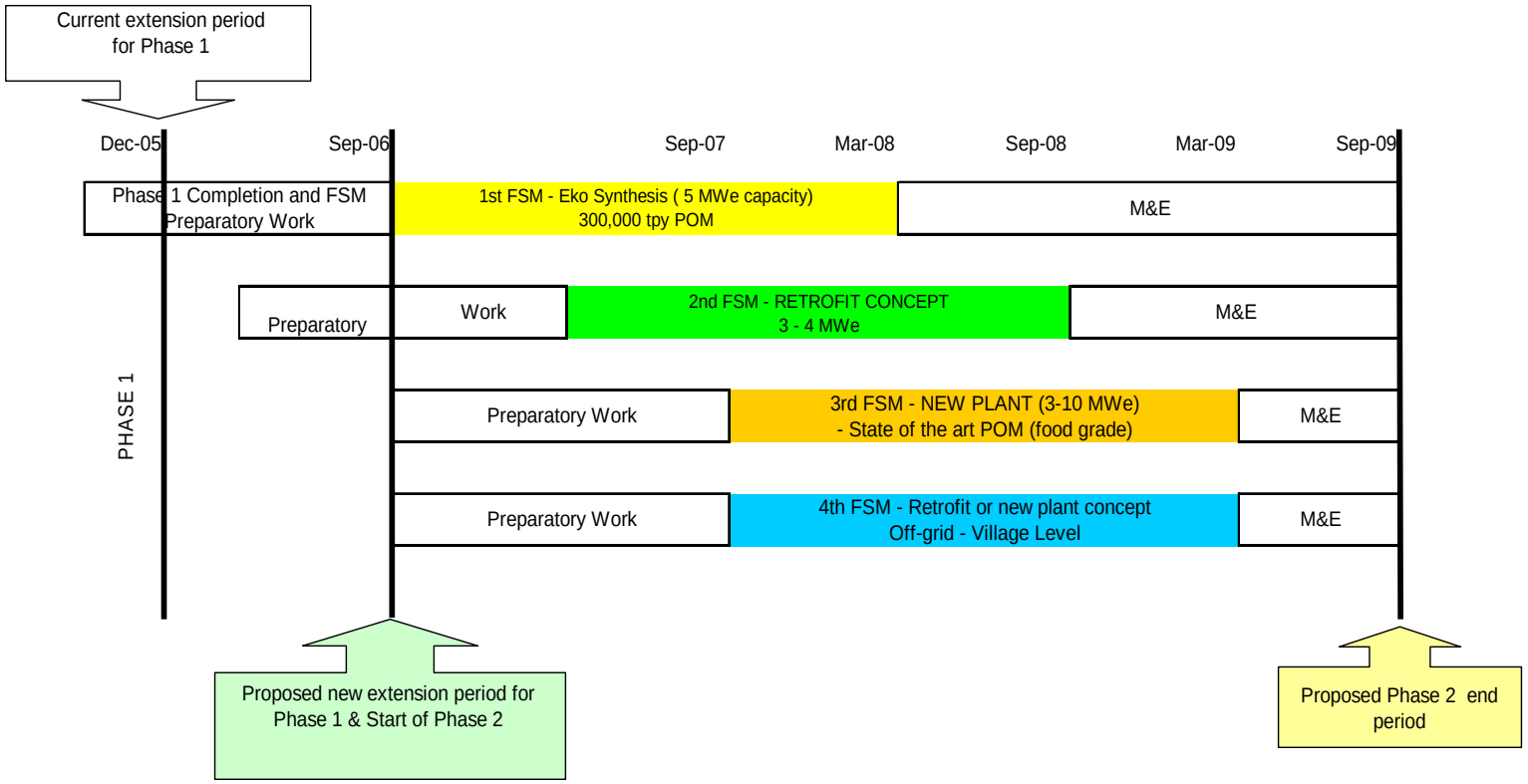
KEY ACTIVITIES		Budget before reallocation in US$	Actual Expenses 1.1.2003 to 31.12.05 in US$	Balance in US$	Percent of Budget Spent in %
Comp. 1. Biomass Information Services and Awareness Enhancement Programme					
1.1	Comprehensive Biomass Energy Resource Inventory	22,164.68	21,942.04	222.64	99%
1.2	Biomass Energy Technologies Database	57,118.00	56,755.83	362.17	99%
1.3	Biomass Energy Technology Training Courses	73,202.85	59,650.53	13,552.32	81%
1.4	Integrated Information Dissemination Program	6,730.00	7,857.32	(1,127.32)	-17%
1.5	Biomass Energy Technology Information Exchange Service	8,075.89	2,099.53	5,976.36	26%
1.6	RE Consultancy Service Industry Development	5,000.00		5,000.00	0%
1.7	Biomass Industry Rating Program	101,444.00		101,444.00	0%
	Subtotal	**273,735.42**	**148,305.25**	**125,430.17**	**54%**
Comp.2. Biomass Policy Study and Institutional Capacity Building					
2.1	Biomass Policy Analysis	11,068.84	11,068.84	-	100%
2.2	Biomass Energy Utilization Workshop Series	6,568.86	16,925.89	(10,357.03)	-158%
2.3	RE Electricity Generation and Sales Study	27,624.86	37,376.19	(9,751.33)	-35%
2.4	RE Electricity Pricing Study	5,256.86	5,256.86	-	100%
2.5	Biomass-based Power Generation Implementation Methodology	43,809.86	43,809.86	-	100%
2.6	New Initiatives in RE Power Generation Project	54,309.86	11,869.54	42,440.32	22%

2.7	RE Policy Implementation Monitoring and Evaluation	11,068.86	7,343.73	3,725.13	66%
	Subtotal	**159,708.00**	**133,650.91**	**26,057.09**	**84%**
Comp. 3. Biomass Initiatives Financing Assistance Program					
3.1	Training course on RE project financing	24,944.00	24,944.00	-	100%
3.2	RE Business Facility Establishment	2,443,478.00	990,591.20	1,452,886.80	41%
3.3	Financing scheme mechanics including eligibility criteria	35,000.00	37,085.54	(2,085.54)	-6%
3.4	Assistance services to financing applicants	5,000.00	5,000.00	-	100%
3.5	Arrangements for financial assistance for eligible RE projects	21,000.00	3,000.00	18,000.00	14%
	Subtotal	**2,529,422.00**	**1,060,620.74**	**1,468,801.26**	**42%**
Comp. 4. Biomass-based Power Generation and CHP Demonstration Program					
4.2	Selection Criteria of Full Scale Model	15,216.23	22,120.82	(6,904.59)	-45%
4.4	Specific Demo Scheme Implementation Barrier Removal Activities	21,680.52	10,662.44	11,018.08	49%
4.5	Installation and Implementation Designs/Plans for the FSM Schemes	156,405.95	738.06	155,667.89	0%
	Subtotal	**193,302.70**	**33,521.32**	**159,781.38**	**17%**
Comp. 5. Biomass Energy Technology Development Program					
5.1	Assessment of Other Energy-and Non-Energy Uses of Palm Oil Industry	22,000.00	28,379.31	(6,379.31)	-29%
5.2	Evaluation of Energy Utilization Performance of Palm Oil Mills.	45,875.00	11,273.21	34,601.79	25%
5.3	Training for Palm Oil Mill Power Plant Engineers & Operators.	72,635.00	14,717.28	57,917.72	20%
5.4	Assessment of Capabilities of Local Steam and Power Generation Equipment Manufacturers	13,000.00	6,502.88	6,497.12	50%

5.6	Training Course for local steam and power generation equipment manufacturers of high efficiency designs & production technologies	5,000.00		5,000.00	0%
5.7	Financial assistance to local steam & power generation equipment manufacturers	52,000.00		52,000.00	0%
	Subtotal	**210,510.00**	**60,872.68**	**149,637.32**	**29%**
Activity 6. Project Management Unit					
Chief Technical Adviser		267,422.88	230,596.42	36,826.46	86%
Support Staff					
Total		**267,422.88**	**230,596.42**	**36,826.46**	**86%**
Activity 7. Monitoring & Evaluation					
UNDP		268,278.00	13,335.61	254,942.39	5%
Reimbursement Cost		97,621.00		97,621.00	0%
GRAND TOTAL		**4,000,000.00**	**1,680,902.93**	**2,319,097.07**	**42%**

Annex G: Biogen Phase 1 and Phase 2 Transition Timeline

Please see Timeline in file EXCEL “Timeline”


Current extension period for Phase 1
Dec-05
Sep-06
Sep-07
Mar-08
Sep-08
Mar-09
Sep-09
PHASE 1
Phase 1 Completion and FSM Preparatory Work
1st FSM - Eko Synthesis (5 MWe capacity) 300,000 tpy POM
M&E
Preparatory
Work
2nd FSM - RETROFIT CONCEPT 3 - 4 MWe
M&E
Preparatory Work
3rd FSM - NEW PLANT (3-10 MWe) - State of the art POM (food grade)
M&E
Preparatory Work
4th FSM - Retrofit or new plant concept Off-grid - Village Level
M&E
Proposed new extension period for Phase 1 & Start of Phase 2
Proposed Phase 2 end period