Compendium of Gasifier based Power Plant Operation Data

Biomass Energy for Rural India

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CONTENTS

ACRONYMS

Acronym	Meaning
BERI	Biomass Energy for Rural India
BERIS	Biomass Energy for Rural India Society
BESCOM	Bangalore Electricity Supply Company
CGPL	Combustion and Gas Propulsion Laboratory
CDR	Combined Delivery Report
DF	Dual Fuel
EB	Electric Board
EEU	Energy & Environment Unit
GAG	Gross Annual Generation – Annual (kWh)
GEF	Global Environmental Facility
GGC	Guaranteed Gross Output at generator terminals (kW)
GHG	Green House Gases
GoK	Government of Karnataka
GoI	Government of India
GW	Giga Watt
GWh	Giga Watt-hour
ICEF	India Canada Environment Facility
IIM	Indian Institute of Management
IISc	Indian Institute of Science
KPCL	Karnataka Power Corporation Limited
KREDL	Karnataka Renewable Energy Development Limited
KSCST	Karnataka State Council for Science and Technology
KPTCL	Karnataka Power Transmission Corporation Limited
kWh	Kilowatt-hours
MNRE	Ministry of New and Renewable Energy
MRV	Monitoring, Reporting and Verification
MW	Mega Watt
MWh	Mega Watt hour
mTOE	Million Tonnes of Oil Equivalent
PGT	Performance Guarantee Tests
PLF	Plant Load Factor
PPA	Power Purchase Agreement
PSS	Power Sub Station
RDPR	Rural Development and Panchayat Raj
SFC	Specific Fuel Consumption
SMEs	Small and Medium Enterprises
UNDP	United Nations Development Programme
USD	United States Dollar

PREFACE

A biomass availability of 270 million tonnes per annum is sufficient to generate 18,000 MW of green power in the country. Biomass Power stands untapped with low installed capacities cumulating to 2,665 MW across India. While the methods to produce biomass power are from the wide ranging technology choices in combustion and gasification process, the contribution from gasification based biomass power plants is abysmally low at 264 MW.

Gasification based biomass power plants have been most viable in the sub mega watt range which is well suited to the power needs of a typical rural village cluster. The ability of gasification based power plants to produce power round the clock both for decentralized distribution and tail end generation makes it one of the best suited renewable energy technologies for rural applications in India. Operating biomass based power plants can lead to additional earnings for the farmers of the order of Rs 2 crores per MW annually, by way of purchase of biomass. This is over and above the sea change induced in livelihoods due to enhanced access to energy.

Confidence of the public as well as agencies involved in energy production and supply business, in such technologies, can be greatly enhanced by demonstrating their viability and sustainability through pilot projects in rural areas. Biomass Energy for Rural India (BERI) is one such project funded by GEF through UNDP to showcase the use of biomass power to rural communities. The project is implemented through the Ministry of Rural Development of Panchayat Raj (RDPR) in the state of Karnataka, India. One of the prime components of the project was to demonstrate how biomass gasification technology could be successfully deployed for tail end power production and subsequently fed into the grid. Three such plants have been set up in the *Kabbigere, Borigunte* and *Seebanayanapalya* clusters of the Tumkur district in Karnataka with the installed capacity adding up to 1 MW.

This 'Compendium of Data' contains a compilation of the generation based parameters logged in respect of the 500 kW_e *Kabbigere* plant since its commissioning from June 2007. It documents the specifications of this plant, the benchmarks set for its performance guarantee and inferences pertaining to plant operations that were drawn based on an analytical examination of the data gathered. The document is expected to serve as a good reference – the only one of its kind – for industries and academic institutions alike, that gives detailed insight into typical operational aspects of a sub mega watt biomass power plant.

We would like to thank all plant personnel whose dedicated effort in operating the plant, logging data regularly and maintaining accurate records on set templates has enabled us develop an understanding of such operations that is very close to the true picture. We are grateful and extend our thanks to Ms Chitra Narayanswamy, EEU of UNDP who has compiled the document and done the needed analysis required to arrive at the stated inferences.

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S N Srinivas[2]

[1] Mr G S Prabhu was Project Coordinator from 2008 to 2012 for BERI project and is currently Addn. Principal Chief Conservator of Forests, Eval. Work Plans & Training, GoK

[2] Dr S N Srinivas is Programme Analyst, EEU, UNDP for the BERI project

ACKNOWLEDGEMENTS

The Compendium of Data has been made possible due to the efforts of the Kabbigere plant personnel (see Figure 1) in logging all relevant parameters on a daily basis and subsequently entering it to the computer on set templates. Our due thanks to Mr Rangaraju (project officer, energy) for his supervision of plant operations, Mr Mansoor (plant supervisor), Mr Gangaraju (plant operator), Mr Harsha Naik and Mr Puttalingaiah (former Project Engineers) who have meticulously logged the data. Mr G S Prabhu*, as Project Coordinator during the plant's prime operating years from 2008 to 2012 was instrumental in designing and creating the database to store all the logged data in set templates. We duly acknowledge his useful endeavor.

Figure 1 Staff at the Kabbigere plant handling its daily operations[+3]

The efforts of the support staff at the plant are also acknowledged herewith for carrying out their tasks to operate the power plant. The women biomass cutters play a key role in providing cut wood for the gasifier systems, while the plants are safeguarded theft and damage by the BERI security.

[3] Names of all plant personnel is given in Annex III

SUMMARY

The prime objective of the BERI project is to showcase bioenergy as a viable and sustainable option to meet the rural energy needs of India. Use of bioenergy would reduce our dependence on fossil fuels and lead to the reduction of CO2 emissions making way for a cleaner environment in the decades to come. The project is designed with 5 components (see ANNEX IV) of which one of the key components, is the 'Technology Demonstration and Proof of Concept', of biomass based gasification power production thereby addressing the foreseen technological barriers.

A total of 1 MW installed capacity of bioelectricity power plants were set up at Kabbigere (500 kW), Borigunte (250 kW) and Seebanayanapalya (250 kW). The Kabbigere plant was commissioned and began operations in June 2007. Values of key operational parameters recorded during the plants operational phase were logged on data sheet, which includes the generation and exported units, pressure & temperature log of the producer gas at different stages, details on effluent water treatment cycles and the biomass utilized for gasifier operations. A repair log helps understand the kind of maintenance issues in the plant.

The Compendium of Data is a document compiling all the recorded data along with analysis that leads to useful inferences as in the form of

1. Percentage of exported units of power of the generated units
2. Specific fuel consumed (SFC) under BERI operations
3. Plant Load Factor (PLF) and
4. Generation costs as a function of each of the operation costs involved
5. Percent of grid non-availability when BERI plant is running
6. Percent of Auxiliary load for the BERI systems

The data shows that a total of 1,344,055 units have been generated since June 2007 of which 800,802 units were exported to the grid. The average SFC worked out to be 1.36 kgs/kWh. The system wise PLF of the Kabbigere plant recorded is very low, contributed by various factors. The costs therefore are not economical but are in the range of Rs 6.57/unit for generation and Rs 11.86/unit for exporting it to the grid. The raw logged plant operation data for the 4 gasifier based systems at Kabbigere has been provided in annexure, which will serve as useful inputs for an academic study on biomass gasifiers for power generation.

1 BACKGROUND

1.1 The BERI project

The Biomass Energy for Rural India (BERI) project was conceptualized to provide a bioenergy technology package to reduce Green House Gas (GHG) emissions and to promote a sustainable and participatory approach in meeting rural energy needs. It was implemented in five village clusters (or taluks) with a total of 26 villages in the state of Karnataka, India. Biomass power plants with their installed capacity totaling to of 1 MW were set up at *Kabbigere* (500 kW), *Borigunte* (250 kW) and *Seebanayanapalya* (250 kW).

The BERI project was initiated in April 2001, with a total budget of USD 8.6 million. The project is funded by the Global Environment Fund (GEF) with co-financing partners of Indo-Canadian Environment Fund (ICEF), Govt. of Karnataka (GoK), Govt. of India (GoI) and others. It is implemented under the mandate of Department of Rural Development & Panchayat Raj, GoK where the day-to-day activities are managed by a band of dedicated staff stationed at the BERI-Project Management Unit based in Bangalore.

1.2 Power produced from biomass gasifier based systems

The cumulative installed capacity of grid interactive biomass gasifier based power plants set up under the BERI project, is about 1 MW.

The power plant at Kabbigere was commissioned and began operations in June 2007. The plant has three gasifier based producer gas driven engines and one unit that is operated on dual fuel (70:30 producer gas to diesel) mode. The capacities of the 3 gasifier based systems installed are

- 200 kWe (Genset I (DDG1)
- 100 kWe (Genset II (DDG2),
- 100 kWe Genset III (DDG3)), and
- 100 kWe (Genset IV (DDG4) operated on dual mode system

The power generated is evacuated to the grid through 11 kV dedicated line and fed to the Power Sub Station (PSS) at *Tovenkere*. Operational parameters specific to generation were logged daily and fed into computer. This included down time due to various reasons such as non-availability of 11 kV feeder due to load shedding schedule of the Electric Board (EB) – amongst others, auxiliary power consumption, etc. A log of the repairs has also been compiled for reference.

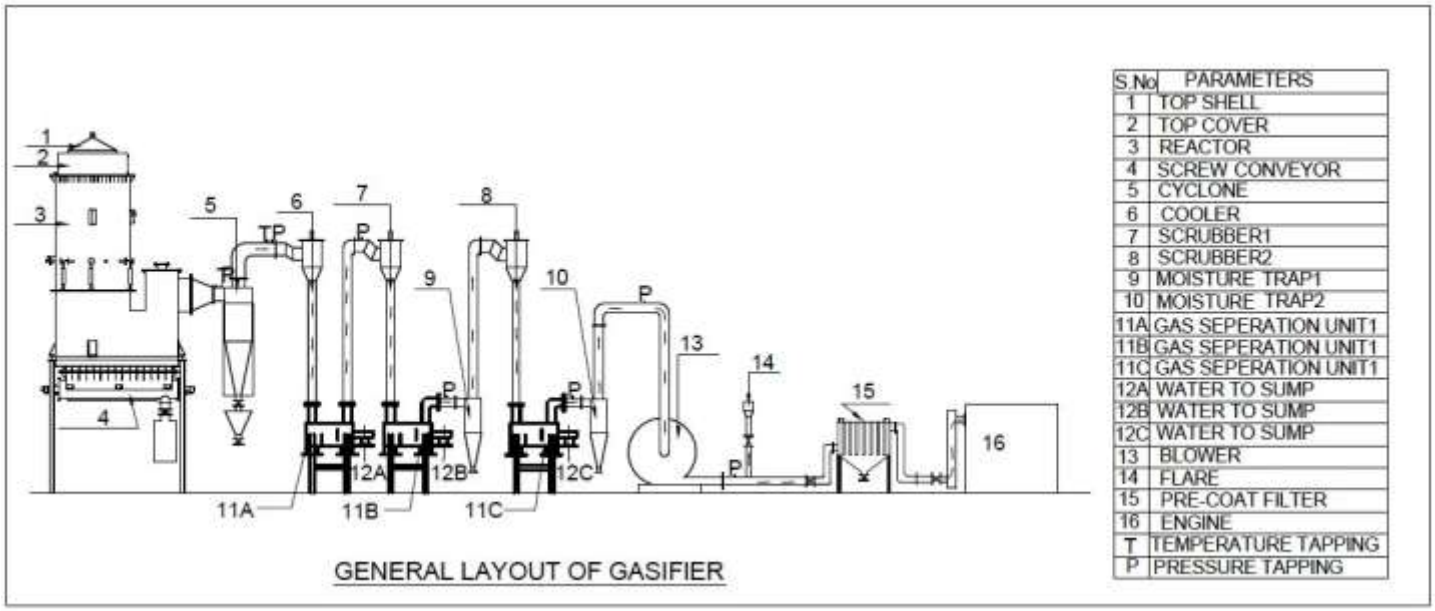
This Compendium of Data is a knowledge product containing operations related data obtained from the BERI project. Most of the data contained herein pertains to the biomass gasifier based power plant at Kabbigere (500 kW), compiled from operations records maintained since June 2007.

The 250 kWe producer gas based plant at Borigunte cluster was run twice under the Performance Guarantee Tests (PGT) by the agency Netpro Renewable Energy Pvt. Ltd., who had installed it. The operations could not meet the benchmark specifications of the PGT. Therefore, the data presented in context of this unit is is what was logged during the trial runs.

Further, the 250 kWe capacity plant at Seebanayanaplaya is yet to be commissioned for daily operations.

This virtual goldmine of primary operations data can provide deep insight into the functioning of a sub Megawatt scale gasifier based power plants in a rural setting. It can of immense use to future researchers, planners and policy makers who can use it to draw significant inferences in respect of .

1.3 Schematic of biomass gasification process



source: CGPL, IISC, Bangalore

Figure 2 Schematic shows the components in the gasification process to produce clean producer gas fed to the gas engine

2 DATA COLLECTION METHODOLOGY

Four different log sheet formats have been maintained to collect the data on different parameters for each of the systems for bioenergy power generation. Given below are the templates used to record the selected parameters:

The template in Figure 3 is the log sheet to collect the daily cut wood biomass consumption by each of the gensets operated in the Kabbigere plant. It also logs the char and the ash collected and the SFC is calculated based on the units generated.

BIOMASS ENERGY FOR RURAL INDIA PROJECT- GREEN POWER

GG2 100kW — Gasifier Plant , Kabbigere — Biomass Recording.

Date:

N0.	Time	Biomass in kgs	CHR Extrn in Kgs	Ash Extrn. in Kgs	Load kW	SFC	Remarks
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
Total:							

Verified:

Date :

N0.	Time	Biomass in kgs	CHR Extrn in Kgs	Ash Extrn. in Kgs	Load kW	SFC	Remarks
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
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18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
Total							

Verified:

Figure 3 Log sheet template for daily biomass consumption for each genset operated at Kabbigere plant.

The template in

Figure 4 is the log sheet for the Engine and EB (Electric Board) readings that help capture the parameters of the engine operations and the units exported to the grid.

BIOMASS ENERGY FOR RURAL INDIA PROJECT- GREEN POWER

Gasifier Plant , Kabbigere

BERI- 100kw GG2 ENGINE & EB READINGS Date :

	EB READINGS		Aux	MFR		DG HRS	EB OV/UV		EB Fail	
	EXPORT	IMPORT	Units	Energy	HRs		No	Dur	No	Dur
Final Reading										
Initial Reading										
	800X	800X								

Time	Engine Readings in MFR							EB meter Readings				Water Temp	Lub Oil Temp	Exh gas temp	Speed in rpm	Remarks
	Vlg in Volts	Current in Amps			Freq. in Hz	Load in kW	Cumulative Kwh	Export	Units	Import	11 kV Vlg					
		R-ph	Y-ph	B-ph												

Electrical Engineer
Gasifier Plant
BERI-Kabbigere

Shift Technician

Figure 4 Template log sheet for gas engine operations and EB (Electric Board) readings of power export

The template in Figure 5 is the log sheet for static pressure at various points in the producer gas cleaning-cooling train and the prevailing temperatures of the producer gas at the exit of the reactor and chiller.

BIOMASS ENERGY FOR RURAL INDIA PROJECT- GREEN POWER

Gasifier Plant , Kabbigere

BERI-100 kW GG -2

GASSIFIER READINGS

Time	Reactor Outlet	Cyclone Outlet	Cooler Outlet	Scrubber Outlet	Moisture trap1 outlet	Chiller Scrubber Outlet	Moisture trap2 inlet	Δ Across Venturi	Δ Across Filter	Blower outlet	Regulator inlet	Load In KWH	Reactor outlet temp.	Chiller temp.	REMARKS
	P1	P2	P3	P4	P5	P6	P7	ΔP8	ΔP9	P10	P11	P12	T1	T2	

Shift Technician

Electrical Engineer

Figure 5 Template log sheet for monitoring pressure and temperature at different locations in gas cooling-cleaning train

The template log sheet in Figure 6 is to gather data related to the effluent treatment of the water used in the chillers for gas cleaning-cooling and the process details.

BIOMASS ENERGY FOR RURAL INDIA PROJECT- GREEN POWER

Gasifier Plant , Kabbigere

Effluent Treatment Log - WATER TREATMENT

Date	System no.	Batch no.	Treatment Start Time	Agitation Start Time	Flocculation Start Time	Settling Start Time	Pump back Start Time	Treatment End Time	Operator Signature

Verified by: _____

Signature: _____

Figure 6 Template log sheet to record effluent treatment parameter data and process details

3 INSTRUMENTS USED FOR DATA COLLECTION

Pressure and temperature of the producer gas and the engine are monitored at various stages of the power cycle. The instruments used to measure the parameters are provided in Table 1 as below:

No.	Instrument	Specifications	Purpose
1	Moisture meter [%]	Mextech, Model: MD – 8G, serial no. S536168	To measure the biomass fuel moisture prior to loading in reactor
2	Manometer using water in glass tubes [psi]	Designed by Netpro Pvt Ltd/ Energreen Pvt Ltd	Pressures are monitored at: P1 – gas pressure at reactor outlet P2 – gas pressure at cyclone outlet P3 – gas pressure at scrubber 1 outlet P4 – gas pressure at scrubber 2 outlet P5 – gas pressure at moisture trap 1 P6 – gas pressure at chiller scrubber P7 - gas pressure at moisture trap 2 P8 – gas pressure at blower outlet P9 – gas pressure at fabric filter outlet P10 – gas pressure at regulator outlet
3	Temperature meter (reactor) [^{o}C]	Digicon, Model: Digital Temperature meter	To measure the temperature inside the reactor, at the combustion point
4	Temperature meter (chiller) [^{o}C]	Subzero, Model: SZ-7510P	To measure the temperature of the coolant water circulating in the chiller
5	Engine oil temperature [^{o}C]	All analog meters in the engines whose make is given as: GGI - Cummins (200 kW): Model GTA – 1710 – G, serial no. 35152 GG II - Cummins (100 kW): Model GTA – 855 – G – BC, serial no. 25305185 GG III – Cummins (100 kW): Model GTA – 855 – G – BC, serial no. 25301573	To measure the engine oil temperature
6	Engine water temperature [^{o}C]		To measure the coolant temperature of the engine
7	Engine oil pressure [psi]		To measure the engine oil pressure
8	Engine speedometer [rpm]		

		DG IV – Kirloskar (100 kW) dual mode: Model 6SL1500 – TAI, serial no. F-63401/0400002	
9	Waste gas temperature [^{o}C]	Murphy, Model: BE - 054871	To measure the exhaust gas temperature from the engine
10	Multi Function Relay	GGI: Woodward, serial no. 182504961207 GGII: Woodward, serial no. 149449490610 GG III: Woodward, serial no. 141405040501 DG IV: Woodward, serial no. 141405020501	To log amperes, voltage, frequency , load on generator (kW), output of generator (kWh), load on grid (kW)

Table 1 Set of instruments used to measure various parameters in the Kabbigere power plant

4 SYSTEM SPECIFICATION

Kabbigere

Two of the gasifier and producer gas engines for the Kabbigere plant were installed by the private operator – M/s Netpro Renewable Energy (India) Pvt. Ltd., No. 139B, 10th Main, Raj Mahal Vilas Extn., Bangalore 560080. They are Genset (GGI) – 200 kW_e and Genset (GGII) – 100 kW_e.

The gasifier specification for each of these systems is as given below:

4.1 Biomass Gasifier (200 kW_e) – Genset I

S No	Parameter	Specification
1	Type	Open Top Down draft
2	Rating	Suitable for 215 kW_e gross output at generator terminals
3	Biomass Feed stock (as received)	Solid biomass with bulk density > 250 kg/m³ (predominantly eucalyptus, casuarinas), maxm moisture content of 10 to 15%, ash less than 5%
4	Typical gas composition	CO: 21 +/- 1%; CO_2: 10 +/- 1%; H_2: 17 +/- 1%; CH_4: 2 +/- 1%; N_2: 51 +/- 1%
5	Turn down ratio (max/min load)	1:0.3 (min)
6	Starting time a) from torching to flaring b) from torching to supply to the engine	 20 to 30 mins in the first start & 5 mins in subsequent start 25 mins
7	Lower calorific value of gas	1150 – 1050 kcal/Nm³
8	Application	Power generation

4.2 Biomass Gasifier (100 kW_e) – Genset II

S No	Parameter	Specification
1	Type	Open Top Down draft
2	Rating	Suitable for 110 kW_e gross output at generator terminals
3	Biomass Feed stock (as received)	Solid biomass with bulk density > 250 kg/m³ (predominantly eucalyptus, casuarinas), maxm. moisture content of 10 to 15%, ash less than 5%
4	Typical gas composition	CO: 21 +/- 1%; CO_2: 10 +/- 1%; H_2: 17 +/- 2%; CH_4: 2 +/- 1%; N_2: 51 +/- 1%
5	Turn down ratio (max/min load)	1:0.3 (min)
6	Starting time a) from torching to flaring) b) from torching to supply to the engine)	 20 to 30 mins in the first start & 5 mins in subsequent start 25 mins
7	Lower calorific value of gas	1150 (min. load) – 1050 (rated condition)

		kcal/Nm^3
8	Application	Power generation

The other 2 systems one of the producer gas engine and the other of dual fuel engine for the Kabbigere plant were installed by the private operator – M/s Energreen Power Ltd, First Floor. Ashroff, No. 1, Second Street, Nandanam Extn, Chennai - 600035. They are Genset (GGIII) – 100 kW_e and Genset (GGIV) – 100 kW_e.

Borigunte

4.3 Biomass Gasifier (240 kW_e)

S No	Parameter	Specification
1	Type	Open Top Down draft
2	Rating	Suitable for 240 kW_e gross output at generator terminals
3	Biomass Feed stock (as received)	Woody biomass (predominantly eucalyptus, casuarinas), maximum moisture content of 20%, ash content less than 5%
4	Typical gas composition	CO: 20 +/- 2%; CO_2: 12 +/- 2%; H_2: 20 +/- 2%; CH_4: 2 +/- %; N_2: 45 +/- 2%
5	Turn down ratio (max:min load)	1:0.3 (min)
6	Starting time a) From torching to flaring b) From torching to supply to engine	 120 minutes in the first start & 10-15 mins in the subsequent hot starts 240 minutes
7	Lower calorific value of gas	1050 – 1100 kCal/Nm^3
8	Application	Power generation

Seebanayanapalya

4.4 Biomass gasifier (240 kW_e)

S No	Parameter	Specification
1	Type	Open Top Down draft
2	Rating	Suitable for 240 kW_e gross output at generator terminals
3	Biomass Feed stock (as received)	Woody biomass (predominantly eucalyptus, casuarinas), maximum moisture content of 20%, ash content less than 5%
4	Typical gas composition	CO: 20 +/- 2%; CO_2: 12 +/- 2%; H_2: 20 +/- 2%; CH_4: 2 +/- %; N_2: 45 +/- 2%
5	Turn down ratio (max:min load)	1:0.3 (min)
6	Starting time c) From torching to flaring d) From torching to supply to engine	 120 minutes in the first start & 10-15 mins in the subsequent hot starts 240 minutes
7	Lower calorific value of gas	1050 – 1100 kCal/Nm^3

S No	Parameter	Specification
8	Application	Power generation

5 PERFORMANCE GUARANTEE TESTS (PGT)

The Performance Guarantee benchmarks were agreed upon in the agreement signed by the private operators M/s Netpro Pvt Ltd., and M/s Energreen Power Ltd. with BERI PMU towards installation and operation of the systems.

5.1 Schedule of Performance Guarantee Test (Kabbigere) for Genset I (200 kW_e) & Genset II (100 kW_e) for gas engine mode.

S No	Parameter to be guaranteed	Details	
		200 kW_e	100 kW_e
1	Guaranteed o/p at engine generator terminals at site conditions with standard biomass fuel [maxm. Ambient temp. of 38 deg C and relative humidity of 60%. Height above mean sea level of 863.5 m]	215 kW_e	110 kW_e
2	Guaranteed (max.) auxiliary power consumption	27.21 kW_e	19.01 kW_e
3	Specific biomass consumption at guaranteed output	1.25 kg/kWh	1.25 kg/kWh
4	Producer gas quality (the total dry deposits collected in the engine components guaranteed output during 50 hours continuous test run using std. biomass)	5 grams	5 grams
5	Plant Load Factor	68.5%	68.5 %
6	Duration sustainable for uninterrupted continuous operation	360 hours	360 hours
7	Guaranteed Noise Level	85 dBA	85 dBA
8	Engine Exhaust Emissions	As per CPCB/SPCB norms	As per CPCB/SPCB norms
9	Non-Availability of the system during testing schedule – down time for any & all reasons cumulatively	5% of the total test duration	

5.2 Schedule of Performance Guarantee Test (Kabbigere) for Genset III (100 kW_e) gas engine mode & Genset IV (100 kW_e) dual fuel mode.

S No	Parameter to be guaranteed	Details	
		100 kW_e (gas engine mode)	100 kW_e (dual fuel mode)
1	Guaranteed o/p at engine generator terminals at site conditions with standard biomass fuel [maxm. Ambient temp. of 38 deg C and relative humidity of 60%. Height above mean sea level of 863.5 m]	110 kW_e	110 kW_e
2	Guaranteed auxiliary power consumption	23.5 kW_e	23.5 kW_e

3	Specific biomass consumption at guaranteed output for gas engine/dual fuel engine	1.25 kg/kWh	1.1 kg/kWh
4	Producer gas quality (the total dry deposits collected in the engine components guaranteed output during 50 hours continuous test run using std. biomass) Specific diesel consumption for guaranteed output for dual fuel engine using standard biomass	5 grams -	5 grams 90 ml/kWh
5	Plant Load Factor	68.5%	75 %
6	Duration sustainable for uninterrupted continuous operation	360 hours	360 hours
7	Guaranteed Noise Level	As per tender specs	As per tender specs
8	Engine Exhaust Emissions	As per CPCB/SPCB norms	As per CPCB/SPCB norms
9	Non-Availability of the system during testing schedule – down time for any & all reasons cumulatively	5% of the total test duration	5% of the total test duration

5.3 Schedule of Performance Guarantee Test (Borigunte)

S No	Parameter to be guaranteed	details
1	Guaranteed o/p at engine generator terminals at site conditions with standard biomass fuel [maxm. Ambient temp. of 38 deg C and relative humidity of 60%. Height above mean sea level of 863.5 m]	240 kW_e
2	Guaranteed auxiliary power consumption	48 +/- 2 kW_e
3	Specific biomass consumption at guaranteed output	1.25 +/- 0.1 kg/kWh
4	Producer gas quality (the total dry deposits collected in the engine components guaranteed output during 50 hours continuous test run using std. biomass)	5 grams
5	Plant Load Factor	68.5%
6	Duration sustainable for uninterrupted continuous operation	360 hours
7	Guaranteed Noise Level	85 dBA
8	Engine Exhaust Emissions	As per CPSB/SPCB norms
9	Non-Availability of the system during testing schedule – down time for any & all reasons cumulatively	5% of the total test duration

5.4 Schedule of Performance Guarantee Test (Seebanayanapalya)

S No	Parameter to be guaranteed	details
1	Guaranteed o/p at engine generator terminals at site conditions with standard biomass fuel [maxm. Ambient temp. of 38 deg C and relative humidity of 60%. Height	240 kW_e

	above mean sea level of 863.5 m]	
2	Guaranteed auxiliary power consumption	48 +/- 2 kW_e
3	Specific biomass consumption at guaranteed output	1.25 +/- 0.1 kg/kWh
4	Producer gas quality (the total dry deposits collected in the engine components guaranteed output during 50 hours continuous test run using std. biomass)	5 grams
5	Plant Load Factor	68.5%
6	Duration sustainable for uninterrupted continuous operation	360 hours
7	Guaranteed Noise Level	85 dBA
8	Engine Exhaust Emissions	As per CPSB/SPCB norms
9	Availability of the system during testing schedule – down time for any & all reasons cumulatively	5% of the total test duration

6 GENERATION BASED DATA FINDINGS

6.1 Genset I (DDG1)

The Genset I at Kabbigere is a 200 kW_e gasifier based system that has been generating power since June 2007. The generation based data logged for the system is as given in Table 2

YEAR	ENGINE HOURS	SYNC HOURS	GENERATION (kWh)	EXPORT (kWh)
+2007	366*	Not logged	54955	Cumulative logged for all 4 systems
2008	342*	Not logged	79999	Cumulative logged for all 4 systems
2009	54*	Not logged	4907	Cumulative logged for all 4 systems
2010	0	0	0	Cumulative logged for all 4 systems
2011	796	699	117093	Cumulative logged for all 4 systems
2012	966	900	152241	Cumulative logged for all 4 systems
Total	2,524		4,09,200	

Table 2 Generation data logged for Genset I – 200 kW at Kabbigere plant

* data was logged as days, where a average of a 6 hour operation per day has been taken
+ data for 2007 from June;

6.2 Genset II (DDG2)

The Genset II at Kabbigere is a 100 kW_e gasifier based system that has been generating power since June 2007. The generation based data logged for the system is as given in Table 3

YEAR	ENGINE HOURS	SYNC HOURS	GENERATION (kWh)	EXPORT (kWh)
+2007	258*	Not logged	16,274	Cumulative logged for all 4 systems
2008	114*	Not logged	20,738	Cumulative logged for all 4 systems
2009	48*	Not logged	2,034	Cumulative logged for all 4 systems

YEAR	ENGINE HOURS	SYNC HOURS	GENERATION (kWh)	EXPORT (kWh)
2010	0	0	0	Cumulative logged for all 4 systems
2011	2,801	2,565	214,405	Cumulative logged for all 4 systems
2012	2,653	2,441	2,14,499	Cumulative logged for all 4 systems
Total	5,874		4,67,948	

Table 3 Generation data logged for Genset II - 100 kW at Kabbigere Plant

* data was logged as days, where a average of a 6 hour operation per day has been taken
+ data for 2007 from June;

6.3 Genset III (DDG3)

The Genset III at Kabbigere is a 100 kW_e gasifier based system that has been generating power since June 2007. The generation based data logged for the system is as given in Table 4

YEAR	ENGINE HOURS	SYNC HOURS	GENERATION (kWh)	EXPORT (kWh)
+2007	114*	Not logged	4,414	Cumulative logged for all 4 systems
2008	522*	Not logged	37,166	Cumulative logged for all 4 systems
2009	336*	Not logged	46,068	Cumulative logged for all 4 systems
2010	1,339	1211[i]	196,240	Cumulative logged for all 4 systems
2011	1,660	1463	117,920	Cumulative logged for all 4 systems
2012	854	768	61,200	Cumulative logged for all 4 systems
Total	4,825		463,010	

Table 4 Generation data logged for Genset III - 100 kW at Kabbigere Plant

i data logged from Aug 2010
* data was logged as days, where a average of a 6 hour operation per day has been taken
+ data for 2007 from June;

6.4 Genset IV (DDG4)

The Genset IV at Kabbigere is a 100 kW_e dual based gasifier system that has been operational since June 2007. The generation based data logged for the system is as given in Table 5

YEAR	ENGINE HOURS	SYNC HOURS	GENERATION (kWh)	EXPORT (kWh)
+2007	0*	0	0	0
2008	0*	0	0	0
2009	0*	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	23	17	1362	Cumulative logged for all 4 systems
Total	23	17	1,362	

Table 5 Generation data of Genset IV - 100 kW at Kabbigere Plant

*data was logged as days, where a average of a 6 hour operation per day has been taken
+ data for 2007 from June;

6.5 Genset I – Borigunte (240 kWe)

The performance guarantee trials conducted twice (see Table 6) on the system as per the schedule given could not be met by the contractor Netpro Pvt. Ltd. The plant has yet to be run under optimal conditions and commissioned for daily operations.

YEAR	ENGINE HOURS	SYNC HOURS	GENERATION (kWh)	EXPORT (kWh)
2009	400	366	87124	-

Table 6 Generation data of Genset I - 240 kW at Borigunte during the trails runs

6.6 Genset I – Seebanayanapalya (240 kWe)

The plant has yet to be commissioned and the performance guarantee trials have to be conducted in order to optimize operations.

7 ADDITIONAL DATA

7.1 EB Interruptions

The BESCOM grid supply through the dedicated 11 kV transformer line is shutdown due to load shedding, repairs & maintenance in the lines or the substation at Tovenkere. Non availability of the grid limits the units exported to the grid, the generated power being not utilized or dissipated in the plant. The EB interruptions in **Error! Reference source not found.** are a record of the number of hours each month when the grid was not available while the plant engines were running and unable to evacuate generated power[4]. While a total of 725 hours of grid shutdown has happened in 18 months, on an average, there is 40 hours of shutdown for a month which implies that the daily shutdown has been for 1 hour and 20 minutes.

MONTH	Hours of grid shutdown
Jul-11	40:00:00
Aug-11	28:31:00
Sep-11	48:00:00
Oct-11	36:00:00
Nov-11	32:35:00
Dec-11	70:27:00
Jan-12	43:00:00
Feb-12	29:18:00
Mar-12	63:41:00
Apr-12	40:10:00
May-12	29:28:00
Jun-12	40:25:00
Jul-12	25:48:00
Aug-12	25:12:00
Sep-12	63:23:00
Oct-12	16:42:00
Nov-12	46:08:00
Dec-12	46:37:00
TOTAL	725:25:00
AVG.	40:18:03

Table 7 Hours of grid non availability per month recorded from July 2011

7.2 Auxiliary Power Consumption

The auxiliary power consumption recorded as given in Table 8 is the cumulative consumption per month of the internal load which includes the load from the system components, lighting load, biomass cutting load, line & transformer losses.

[4] EB interruptions are not noted at times when all systems are shutdown & no power is being generated. Therefore, the figures are not indicative of the actual grid non availability in a rural grid

MONTH	Auxiliary load consumption (kWh)
Jul-11	13604
Aug-11	16467
Sep-11	16666
Oct-11	20009
Nov-11	24212
Dec-11	24506
Jan-12	15778
Feb-12	9841
Mar-12	30438
Apr-12	17996
May-12	24627
Jun-12	25745
Jul-12	12243
Aug-12	7678
Sep-12	16637
Oct-12	5400
Nov-12	15922
Dec-12	2760
TOTAL	300529
AVG.	17516

Table 8 Auxiliary power consumption in the plant as logged from July 2011 to December 2012

8 MAINTANENCE LOG

The format in which the repair log of each of the genset and gas engine systems were maintained is given in the 4 subsequent tables (see Table 9, Table 10, Table 11, Table 12). The repairs and the time taken to correct it indicate the down time and the resulting reduction in the PLF of the systems.

8.1 REPAIR LOG: Genset I – 200 kW_e (see Table 9)

SNo	Description of technical fault/ breakdown/problems	Date of notice/ occurrence	Date of repaired	Remarks
1	Engine could not be synchronized due to control panel problem	11-Apr-11	15-Apr-11	Synchronized with help of e-lins staff
2	Impeller bolt was cut inside the blower and found air leakage near turbo	18-Apr-11	19-Apr-11	Attended by BERI staff
3	Observed red-hot near cyclone inlet	20-Apr-11	23-Apr-11	Attended by Zigma Engg.
4	Engine low load (80-100kW)	2-May-11	20-May-11	Attended by CGPL and Zigma Engg. Staff. (observed gas low pressure in scrubber and water entering in to fabric filter)
5	Engine failed to start	21-Sep-11	21-Sep-11	Thermostat wire found cut attended by BERI staff
6	Again Engine starting problem	30-Sep-11	1-Oct-11	Attended by Maniranjan staff (Butterfly valve not working)
7	Cooling tower motor fault	8-Oct-11	8-Oct-11	Cooling motor fault due to short-circuit in cable and it was replaced by BERI staff
8	Found crack at screw and bumps on gasifier reactor	9-Oct-11	20-Oct-11	Repaired by Zigma after CGPL inspection on 14-10-11
9	water seal leakage found on gasifier top	1-Dec-11	10-Dec-11	Welding was done on suggestion from Zigma Engg.
10	Dryer blower bearing broken	1-Dec-11	10-Dec-11	Bearing were replaced by new pair
11	Scrubber pump faulty	1-Dec-11	1-Dec-11	Repaired by BERI Staff
12	Chiller fault due to Low gas pressure	26-Dec-11	27-Dec-11	GG1 chiller gas quantity found less by Vin-Air Engg. Then it is refilled by R22 gas & attended temporarily
13	Unbalanced load on engine	31-Dec-11	14-Jan-12	Control panel MCCB Fault found by e-lins and then MCCB replaced by new MCCB by e-lins on 14-1-2012
14	Engine cooling pump faulty	16-Jan-12	16-Jan-12	Repaired by BERI Staff
15	Unbalanced load in MFR	17-Jan-12	19-Jan-12	Fault found in MFR relay, MFR sent for service
16	Load found decreased to 150kW	20-Jan-12		Load decreased gradually and all maintenance works on gasifier

SNo	Description of technical fault/ breakdown/problems	Date of notice/ occurrence	Date of repaired	Remarks
				and engine done by BERI staff
17	Again Load found decreased to 130kW	22-Jan-12		Attended by CGPL and Maniranjan staff.
18	Again Chiller faulty	31-Jan-12	3-Mar-12	Chiller sent to Vin-Air Engg. for its repair
19	Engine load decrease	20-Jan-12	28-Feb-12	Muffler at Engine exhaust found blocked and muffler no1 is cleaned on 23-2-12 muffler no2 cleaned on 28-2-12 and refitted, load found increased on 3-3-12

Table 9 Repair log from April 2011 to Feb 2012 for Genset I - 200 kW at Kabbigere Plant

8.2 REPAIR LOG: Genset II – 100 kW_e (see Table 10)

SNo	Description of technical fault/ breakdown/problems	Date of notice/ occurrence	Date of repaired	Remarks
1	Screw Conveyor cable fault	4/21/2011	4/21/2011	Cable replaced by BERI Staff
2	Governor fault	5/8/2011	5/13/2011	Attended by Maniranjan staff
3	Engine Low load (60+ kW)	5/14/2011	5/17/2011	Attended by Maniranjan staff (After cooler and turbo cleaned)
4	Blower cable failure	6/19/2011	6/19/2011	Cable replaced by BERI Staff
5	Low load, Negative Pressure at Moisture trap1	6/26/2011	6/26/2011	Investigated by BERI staff and reported to CGPL
6	Moisture trap2 water suction, low load	6/27/2011	6/28/2011	Water flow adjusted after consulting CGPL
7	MFR faulty	8/1/2011	8/17/2011	MFR sent for service to AVR
8	Motorized pot failed	8/10/2011	8/17/2011	Motorized pot sent to manufactures for repair (BESCOM 66kV Earthing fault)
9	Gasifire panel neutral fault	9/14/2011	9/15/2011	Attended by BERI staff (Busbar earthing fault)
10	Engine temperature high	10/24/2011	10/25/2011	Cooling pump foot valve found clogged
11	Engine heat exchanger block	10/28/2011	10/28/2011	Attended by BERI Staff (Heat exchanger clogged)
12	Chiller fail due exhaust fan	11/3/2011	11/6/2011	Chiller fan winding failed
13	Engine cooling pump trip	11/26/2011		Repaired after fault found in cable
14	Generator voltage found abnormal rise	11/30/2011	10/1/2011	Motorized pot fault
15	water seal leakage found on gasifier top	12/1/2011	12/10/2011	Welding was done on suggestion from Zigma Engg.
16	Motorized pot found not working properly	12/1/2011	12/1/2011	Changed to spare by BERI Staff
17	Governor found not working	1/10/2012	1/10/2012	Governor motor was replaced by

SNo	Description of technical fault/ breakdown/problems	Date of notice/ occurrence	Date of repaired	Remarks
				new governor motor by Maniranjan Staff
18	Governor wheel found not working	12/11/2011	12/12/2011	Attended by BERI Staff (Wheel fitted properly to governor motor)
19	Generator speed unstable	12/22/2011	12/23/2011	irregular fault, attended by BERI staff temporarily
20	Low load observed (70+ kW)	12/22/2011		Load decreased gradually and all maintenance works on gasifier and engine done by BERI staff
21	Motorized pot found not working properly	12/23/2011	12/23/2011	Changed to spare
22	MFR found no signal	12/24/2011		irregular fault
23	Chiller trip due to LP	12/25/2011	12/25/2011	No problem was traced after consulting Vin-Air engg.
24	Low load observed (60+ kW)	12/26/2011		Attended by CGPL and Maniranjan staff.
25	Generator speed unstable	1/8/2012	1/10/2012	Attended by BERI staff and Maniranjan staff, Governor wheel adjusted
26	Chiller faulty due to Low gas pressure	1/9/2012	1/12/2012	GG3 chiller repaired by cool world by replacing expansion valve
27	Again Chiller faulty due to Low gas pressure	1/25/2012	2/16/2012	Gas leak found and cool world attended temporarily, GG2 Chiller sent for service to Vin Air on suggestion form manufacture(Vin Air Engg)
28	Engine load decrease	12/22/2012	2/21/2012	Muffler at Engine exhaust found blocked and muffler is cleaned on 21-2-12 Load found increased after cleaning

Table 10 Repair log of Genset II - 100 kW at Kabbigere Plant from April 2011 to Feb 2012

8.3 REPAIR LOG: Genset III – 100 kW_e (see Table 11)

SNo	Description of technical fault/ breakdown/problems	Date of notice/ occurrence	Date of repaired	Remarks
1	Engine low load (70+ kW)	4/19/2011	4/19/2011	Maintenance done by BERI Staff
2	Hoist fault	4/24/2011	4/25/2011	Attended by BERI staff
3	Engine low load (60+ kW)	4/28/2011	6/29/2011	Attended by Maniranjan staff, Governor motor taken to repair by

SNo	Description of technical fault/ breakdown/problems	Date of notice/ occurrence	Date of repaired	Remarks
				Maniranjan on 14-5-11
4	Ignition coil failure	6/29/2011	6/30/2011	Attended by Maniranjan staff
5	Generator high frequency	7/1/2011		Attended by Maniranjan staff (governor problem)
6	Scrubber motor trip due to pipe line leakage	7/6/2011	7/6/2011	Leakage fixed by BERI Staff
7	Engine cooling hose leakage	7/8/2011	7/8/2011	Leakage fixed by BERI Staff
8	Scrubber motor trip due to pipe line leakage	7/9/2011	7/9/2011	Pipe line repaired by BERI staff
9	low load & governor problem	7/16/2011	6/17/2011	Attended by Maniranjan Staff, Governor motor was replaced by 2nd hand motor and corrected gear liver
10	Generator over voltage (AVR Problem)	7/19/2011	7/19/2011	Replaced by new AVR by Maniranjan (BESCOM 66kV Earthing fault)
11	Generator low voltage (AVR Problem)	7/27/2011	8/10/2011	Replaced by new AVR by Maniranjan (BESCOM 66kV Earthing fault)
12	Motorized pot failed	8/10/2011	8/17/2011	Motorized pot sent to manufactures for repair (BESCOM 66kV Earthing fault)
13	Load decreased gradually	10/20/2011	10/21/2011	Attended by BERI Staff
14	Transformer voltage not equal	10/28/2011	10/30/2011	Transformer cable found loose connection
15	Chiller fail	11/3/2011	11/4/2011	Attended by BERI staff (Chiller fuse blown)
16	Again Chiller fail	11/5/2011	11/5/2011	Attended by BERI staff(Chiller fuse blown due to reverse circulation)
17	Low load observed (70+kW)	11/26/2011	11/26/2011	Gasifier check conducted by BERI Staff
18	Load decreased further to 60kW	12/6/2011	12/10/2011	Attended by Maniranjan staff, Engine head, After cooler and turbo sent for service
19	GG3 assembled after service, but load found 65kW	1/14/2012		Attended by Maniranjan staff
20	Engine temperature found abnormal high	1/18/2012	1/23/2012	Engine thermostat fault, Thermostat replaced on 30-1-12 by Maniranjan staff
21	Oil leakage found on Engine	1/24/2012	1/30/2012	Gasket and LLOP were replaced by new by Maniranjan Engineers
22	Gas leakage found in Chiller	2/4/2012	2/7/2012	Leakage fixed by Perfect

SNo	Description of technical fault/ breakdown/problems	Date of notice/ occurrence	Date of repaired	Remarks
				Refegrators
23	Engine load decrease	1/14/2011	2/16/2012	Muffler at Engine exhaust found blockedand muffler is cleaned on 17-2-12Load found increased after cleaning
24	Scrubber trip to pipe line broken	2/19/2012	2/19/2012	Pipe line repaired by BERI staff

Table 11 Repair log of Genset III - 100 kW at Kabbigere Plant from April 2011 to Feb 2012

8.4 REPAIR LOG: Genset IV – 100 kW_e (Dual Mode) (see Table 12)

SNo	Description of technical fault/ breakdown/problems	Date of notice/ occurrence	Date of repaired	Remarks
1	Test run, Found broken pipes, hoses and week battery	11/4/2011	11/17/2011	Engine run idle for testing by Kirloskar Service dealer Power Green Services on 4-11-2012 Engine reconditioned and again run idle on 17-11-2011
2	Panel rework			work started on 12-11-2011 by e-lins
3	Governor fault	11/24/2011	12/14/2011	Power Green Services and e-lins staff found governor not responding to signal on 24-11-2011, new governor unit replaced on 14-12-2011
4	Transformer to Panel cable not connected	12/14/2011	12/14/2011	Temporary connected on 14-12-2011 for synchronization test and permanent connection done on 21-12-2011 Synchronization to EB grid performed successfully
5	Motorized pot found not working properly	12/22/2011	12/22/2011	Replaced to spare pot by e-lins
6	Unstable load	12/22/2011		Attended by e-lines and Power Green Services Problem not solved

Table 12 Repair log of Genset IV at Kabbigere Plant from April 2011 to Feb 2012

9 RESULTS AND CONCLUSIONS

9.1 Kabbigere Plant – Generated and Exported Units

The Kabbigere plant has exported on an average of 62% of the electricity generated from operating the 4 systems to the grid from June 2007 upto December 2012. The Table 13 gives the logged data on monthly basis of what was generated cumulatively for all 4 gensets and the quantity of electricity that could be exported to the grid.

YEAR	MONTH	Generated (kWh)	Exported (kWh)	Percentage
2007	June	8121	Not logged month-wise	
	July	10228		
	August	3996		
	September	5423		
	October	5845		
	November	9016		
	December	33118		
TOTAL		75747	45288	60
2008	January	6014	3824	64
	February	22915	14256	62
	March	30752	19632	64
	April	16368	10376	63
	May	13374	8560	64
	June	13080	7688	59
	July	14050	11504	82
	August	3003	1816	60
	September	0	0	0
	October	2375	1528	64
	November	6214	3656	59
	December	9834	5352	54
TOTAL		137979	88192	64
2009	January	11602	6792	59
	February	1164	560	48
	March	0	0	0
	April	0	0	0
	May	0	0	0
	June	0	0	0
	July	0	0	0
	August	0	0	0
	September	326	216	66
	October	509	576	Discarded
	November	32618	23648	72
	December	6807	4960	73
TOTAL		53026	36752	69
2010	January	377	272	72
	February	0	0	0
	March	0	0	0

YEAR	MONTH	Generated (kWh)	Exported (kWh)	Percentage
	April	0	0	0
	May	12497	8744	70
	June	56054	39048	70
	July	23463	16840	72
	August	18751	13536	72
	September	19418	13842	71
	October	16599	11032	66
	November	10835	7552	70
	December	38243	27362	72
TOTAL		196237	138228	70
2011	January	16166	10732	66
	February	18057	12426	69
	March	21243	14236	67
	April	35905	19224	54
	May	44443	20688	47
	June	47359	24032	51
	July	36667	23063	63
	August	41235	24768	60
	September	41834	25168	60
	October	46865	26856	57
	November	51812	27600	53
	December	50178	25672	51
TOTAL		451764	254465	56
2012	January	32042	16264	51
	February	24825	14984	60
	March	74358	43920	59
	April	39492	21496	54
	May	50115	25488	51
	June	66513	40768	61
	July	31507	19264	61
	August	18542	10864	59
	September	32885	16248	49
	October	12169	6769	56
	November	28350	12428	51
	December	18504	9384	51
TOTAL		429302	237877	55
CUMULATIVE		1,344,055	800,802	

Table 13 Power generation and power exported data on monthly basis at Kabbigere plant

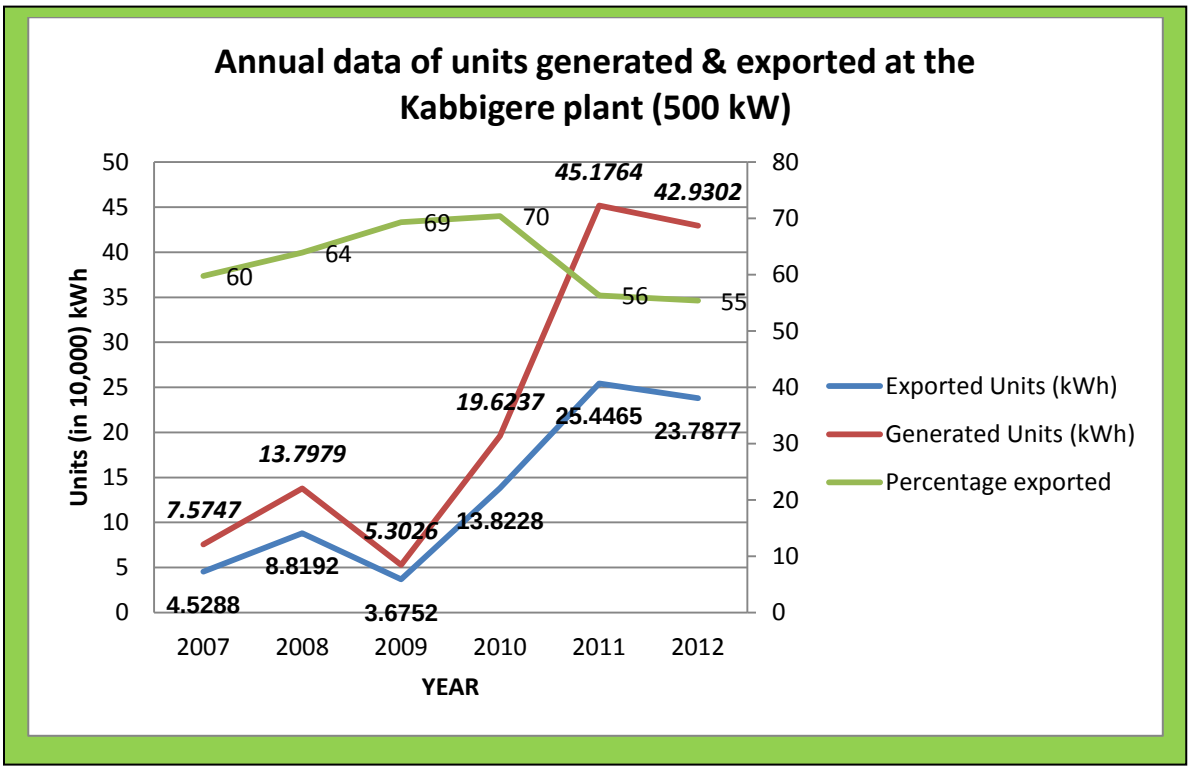

Figure 7 Average annual electricity generation and export from Kabbigere plant since its operations from June 2007

The units exported (see

Figure 7) depend upon the real time synchronization match with the grid supply. The frequency at (60 Hz) or voltage (440 V) mismatch results from quality of grid supply at 11 kV or from performance of the gas turbine in power generation. The export of the generated units is also limited by auxiliary load and the EB interruptions from non-availability of grid supply.

$$exported\ units = func\ [sync.hours, auxiliary\ load, EB\ interruptions]$$

9.2 Specific Fuel Consumption

The specific fuel consumption[5] is in the range of 1.0 kg/kWh to 2.0 kg/kWh and averages at 1.36 kg/kWh (see Figure 8). The biomass used is primarily that of Eucalyptus and a mix of jungle wood with a moisture content of 10% or less.

The cumulative biomass use for the units generated annually is given in Table 14:

MONTH	Generation Units (kWh)	Biomass Used (kgs)	Specific Fuel Consumed (kg/kWh)
Apr-11	35905	50015	1.39
May-11	44443	48750	1.10
Jun-11	47359	49320	1.04
Jul-11	36667	46481	1.27
Aug-11	41235	60850	1.48
Sep-11	41834	67010	1.60
Oct-11	46865	59590	1.27
Nov-11	51812	58010	1.12
Dec-11	50178	71700	1.43
Jan-12	32042	62580	1.95
Feb-12	24825	35130	1.42
Mar-12	74358	109970	1.48
Apr-12	39492	49500	1.25
May-12	50115	52110	1.04
Jun-12	66513	104040	1.56
Jul-12	31507	47380	1.50
Aug-12	18541.8	26820	1.45
Sept - 12	32885	38070	1.16
Oct -12	12169	17100	1.41
Nov-12	28350	32760	1.16

[5] Of dry cut biomass with moisture content 10% or less

Dec-12	18504	28260	1.53

Table 14 Monthly biomass consumed (with less than 10% moisture) and power generated at Kabbigere

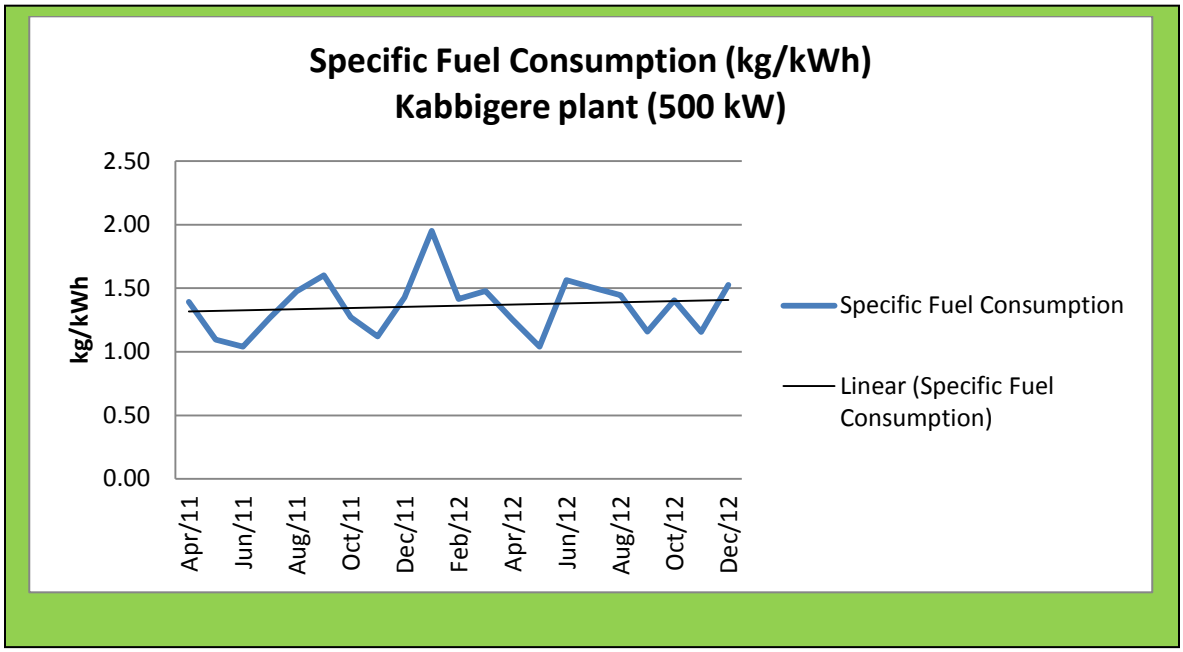

Figure 8 Monthly average specific fuel (biomass) consumption at Kabbigere plant

9.3 Plant Load factor (PLF)

9.3.1 PLF for Genset I – 200kW (see Table 15)

YEAR	2007[6]	2008	2009	2010	2011	2012
Ideal minimal power generation[7] (units)	703,630	1,200,100	1,200,100	1,200,100	1,200,100	1,200,100
Actual power generation (units)	54,955	79,999	4,907	0	117,093	152,241
PLF (actual)	5.3	4.6	0.28	0	6.7	8.7

Table 15 PLF of Genset I - 200kW

9.3.2 PLF for Genset II – 100kW (see Table 16)

YEAR	2007	2008	2009	2010	2011	2012
Ideal	351,820	600,060	600,060	600,060	600,060	600,060

[6] Only from June 2007 when the plant became operational
[7] The benchmark as per the PGT for the PLF is 68.5%. The ideal quantity of minimum units to be generated annually is 0.685 (8760 x GGC)

minimal power generation (units)						
Actual power generation (units)	16,274	20,738	2034	0	214,405	214499
PLF (actual)	2.2	1.64	0.16	0	16.8	16.8

Table 16 PLF of Genset II - 100 kW

9.3.3 PLF for Genset III – 100kW (see Table 17)

YEAR	2007	2008	2009	2010	2011	2012
Ideal minimal power generation (units)	351,820	600,060	600,060	600,060	600,060	600,060
Actual power generation (units)	4,414	37,166	46,068	196,240	117,920	61,200
PLF (actual)	0.89	4.2	5.3	22.4	13.5	7.0

Table 17 PLF of Genset III - 100 kW

9.3.4 PLF for Genset IV – 100kW (dual mode) (see Table 18)

YEAR	2007	2008	2009	2010	2011	2012
Ideal minimal power generation (units)	351,820	600,060	600,060	600,060	600,060	600,060
Actual power generation (units)	0	0	0	0	0	1362
PLF (actual)	0	0	0	0	0	0.23

Table 18 PLF of Genset IV - 100 kW (dual mode)

The plant has recorded a system wise low PLF since its operations in June 2007. Various factors have contributed to performance – (i) Since its operation, each genset at the Kabbigere plant has been run singly, while the other 3 were idle not realizing the full capacity of the plant. Gas engines are not run primarily due to maintenance and repairs of the systems and delays in rectifying it due to single authorized dealers or governmental procedures needed for approvals. (ii) Uptake time to start a gasifier system post a grid shutdown each time also reduces the number of engine hours operated. (iii) The 100 kW dual mode system – Genset IV has been operated for very limited hours (due to high costs of diesel) generating 1362 units until date.

9.4 Generation costs as a function of operation costs

The operation costs for the plant consists of (i) Labour cost, (ii) Maintenance cost, (iii) Biomass cost, & (iv) Cutting cost and (v) Diesel fuel costs (when Genset IV is operated). Proportion of labour and biomass fuel costs for every unit produced is represented as inFigure 9:

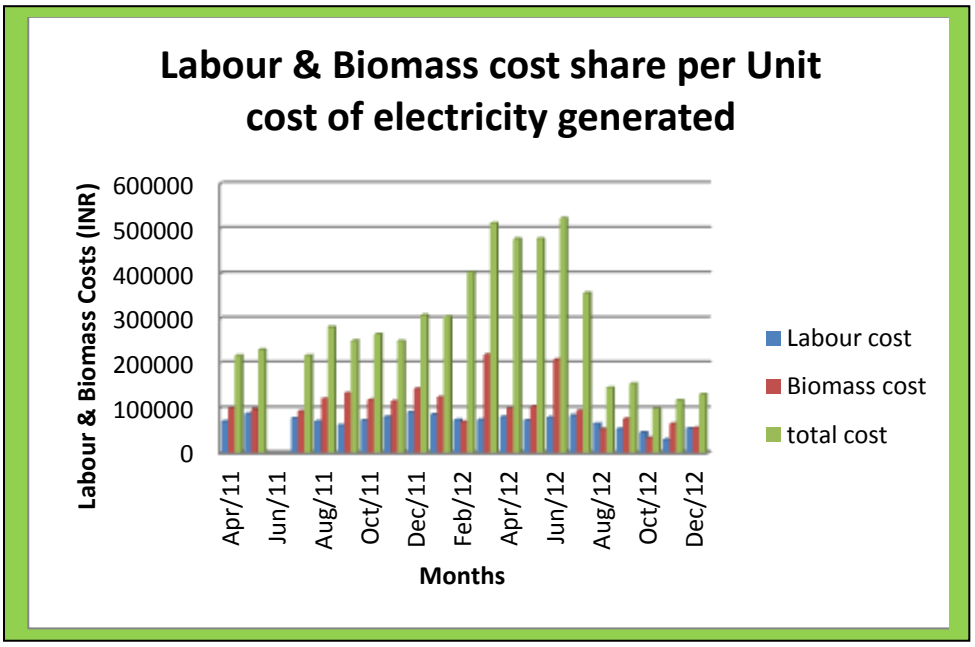

Figure 9 Labour & Biomass cost share per unit cost of electricity generated

The monthly operation costs of the labour (daily wages plant work force), and biomass fuel used, are a function of the power generated, whereas the maintenance costs (due to repairs & servicing), wages for biomass cutting are not directly correlated since these costs are incurred on an as and when need basis. The diesel fuel costs are only for those months when the Genset IV is operated. The generation costs per unit averages to Rs 6.57/unit and the exported costs to Rs 11.86/unit. The average labour cost share per unit generated is Rs 2.16 and the average biomass cost [8]share per unit generated is Rs 2.75. It must be noted that for the different operating costs the listed elements have not been accounted for:

- Labour: includes the costs of the daily wages plant labour and not the salaries paid to the permanent plant staff of BERI
- Maintenance costs: The costs accounted for are as per the bills received for the service & repairs. It does not account for expenditure on service travel or other consumables
- Capital costs: The per unit generation costs does not include the capital costs or the interests paid on it
- Production costs: The exported costs are increased on account of downtime due to non-availability of grid supply or grid supply frequency not matching for synchronization.

[8] Cost adjusted for reduced weight of dry biomass

ANNEX I

A. Monthly data logged for units generated from June 2007 to July 2010 - Kabbigere plant

Year	Month	GG I kWh	No.of Days working	GG II kWh	No.of Days working	GG III kWh	No.of Days working	Total Generation kWh	Total No.of working days	Export kWh
2007	Jun-07	1325	6	3976	9	2805	8	8121	23	-
	Jul-07	4737	10	5456	10	15	1	10228	21	-
	Aug-07	293	3	3692	8	0	0	3996	11	-
	Sep-07	3842	8	1568	5	0	0	5423	13	-
	Oct-07	4582	10	794	4	455	3	5845	17	-
	Nov-07	7984	9	772	4	247	3	9016	16	-
	Dec-07	32192	15	16	3	892	4	33118	22	45288
TOTAL		**54955**	**61**	**16274**	**43**	**4414**	**19**	**75747**	**123**	**45288**
2008	Jan-08	3260	4	0	0	2750	11	6014	15	3824
	Feb-08	3179	2	16566	8	3160	7	22915	17	14256
	Mar-08	26976	13	1713	4	2046	6	30752	23	19632
	Apr-08	13681	7	0	0	2680	10	16368	17	10376
	May-08	8144	5	261	1	4963	10	13374	16	8560
	Jun-08	7482	6	0	0	5592	8	13080	14	7688
	Jul-08	8658	10	0	0	5382	12	14050	22	11504
	Aug-08	263	1	0	0	2739	6	3003	7	1816
	Sep-08	0	0	0	0	0	0	0	0	0
	Oct-08	0	0	486	2	1887	4	2375	6	1528
	Nov-08	1543	3	0	0	4668	10	6214	13	3656
	Dec-08	6813	6	1712	4	1299	3	9834	13	5352
TOTAL		**79999**	**57**	**20738**	**19**	**37166**	**87**	**137979**	**163**	**88192**
2009	Jan-09	4907	9	2034	8	4644	17	11602	34	6792
	Feb-09	0	0	0	0	1164	6	1164	6	560
	Mar-09	0	0	0	0	0	0	0	0	0
	Apr-09	0	0	0	0	0	0	0	0	0
	May-09	0	0	0	0	0	0	0	0	0
	Jun-09	0	0	0	0	0	0	0	0	0
	Jul-09	0	0	0	0	0	0	0	0	0
	Aug-09	0	0	0	0	0	0	0	0	0
	Sep-09	0	0	0	0	326	1	326	1	216
	Oct-09	0	0	0	0	509	3	509	3	576
	Nov-09	0	0	0	0	32618	23	32618	23	23648
	Dec-09	0	0	0	0	6807	6	6807	6	4960
TOTAL		**4907**	**9**	**2034**	**8**	**46068**	**56**	**53026**	**73**	**36752**
2010	Jan-10	0	0	0	0	377	2	377	2	272
	Feb-10	0	0	0	0	0	0	0	0	0
	Mar-10	0	0	0	0	0	0	0	0	0
	Apr-10	0	0	0	0	0	0	0	0	0
	May-10	0	0	0	0	12497	14	12497	14	8744
	Jun-10	0	0	0	0	56054	30	56054	30	39048
	Jul-10	0	0	0	0	23463	17	23463	17	16840
TOTAL		**0**	**0**	**0**	**0**	**92391**	**63**	**92391**	**63**	**64904**

B. Monthly data logged for unit generated from Aug 2010 to March 2011 – Kabbigere plant

	GG I 200kw			GG II 100 kw			GG III 100 kw			GG IV 100 kw DM			Total Gen (kWh)	Export (kWh)	Total biomass used (kg)	Diesel Used (Lts)	Diesel Cost	Labour Cost	Maint, Cost	Biomass Cost	Cutting Cost	Total Cost	Cost per Unit	
	Engine Hrs	Synch Hrs	Units	Engine Hrs	Synch Hrs	Units	Engine Hrs	Synch Hrs	Units	Engine Hrs	Synch Hrs	Units											at Plant	at BUS
Aug-10	0:00:00	0:00:00	0	0:00:00	0:00:00	0	226:54:00	214:38:00	18751	0:00:00	0:00:00	0	18751	13536	22000	0.0	0.00			44000.0	6600.00	50600.00	2.70	3.74
Sep-10	0:00:00	0:00:00	0	0:00:00	0:00:00	0	228:06:00	222:24:00	19418	0:00:00	0:00:00	0	19418	13842	24400	0.0	0.00			48800.00	7320.00	56120.00	2.89	4.05
Oct-10	0:00:00	0:00:00	0	0:00:00	0:00:00	0	212:05:00	207:58:00	16599	0:00:00	0:00:00	0	16599	11032	21925	0.0	0.00			43850.00	6577.50	50427.50	3.04	4.57
Nov-10	0:00:00	0:00:00	0	0:00:00	0:00:00	0	135:06:00	133:25:00	10835	0:00:00	0:00:00	0	10835	7552	13850	0.0	0.00			27700.00	4155.00	31855.00	2.94	4.22
Dec-10	0:00:00	0:00:00	0	0:00:00	0:00:00	0	474:01:00	432:22:00	38243	0:00:00	0:00:00	0	38243	27362	45130	0.0	0.00			90260.00	13539.00	103799.00	2.71	3.79
Jan-11	0:00:00	0:00:00	0	0:00:00	0:00:00	0	219:51:00	185:49:00	16166	0:00:00	0:00:00	0	16166	10732	21600	0.0	0.00			43200.00	6480.00	49680.00	3.07	4.63
Feb-11	0:00:00	0:00:00	0	0:00:00	0:00:00	0	227:55:00	200:03:00	18057	0:00:00	0:00:00	0	18057	12426	22205	0.0	0.00			44410.00	6661.50	51071.50	2.83	4.11
Mar-11	0:00:00	0:00:00	0	0:00:00	0:00:00	0	290:45:00	246:21:00	21243	0:00:00	0:00:00	0	21243	14236	29380	0.0	0.00			58760.00	8814.00	67574.00	3.18	4.75

C. Monthly data logged for units generated from April 2011 to August 2012 – Kabbigere plant

	GG I 200kw			GG II 100 kw			GG III 100 kw			GG IV 100 kw DM			Total Gen (kWh)	Export (kWh)	Total biomass used (kg)	Diesel Used (Lts)	Diesel Cost	Labour Cost	Maint, Cost	Biomass Cost	Cutting Cost	Total Cost	Cost per Unit	
	Engine Hrs	Synch Hrs	Units	Engine Hrs	Synch Hrs	Units	Engine Hrs	Synch Hrs	Units	Engine Hrs	Synch Hrs	Units											at Plant	at BUS
Apr-11	52:50:00	41:08:00	5830	163:46:00	142:26:00	13273	241:59:00	222:28:00	16802	0:00:00	0:00:00	0	35905	19224	50015	0.0	0.00	70694.00	21580.00	100030.00	25007.50	217311.50	6.05	11.30
May-11	8:15:00	6:12:00	602	532:37:00	485:40:00	40519	17:28:00	15:38:00	973	0:00:00	0:00:00	0	44443	20688	48750	0.0	0.00	88164.00	20460.00	97500.00	24375.00	230499.00	6.51	15.38
Jun-11	1:56:00	1:53:00	171	612:55:00	559:53:00	47188	0:00:00	0:00:00	0	0:00:00	0:00:00	0	47359	24032	49320	0.0	0.00						4.77	9.41
Jul-11	60:42:00	55:12:52	9178	0:00:00	0:00:00	0	385:03:00	340:27:00	27489	0:00:00	0:00:00	0	36667	23063	46481	0.0	0.00	77810.00	23968.00	92962.00	23240.50	217942.50	5.94	9.45
Aug-11	262:18:00	239:58:00	39532	12:15:00	9:45:00	1021	11:30:00	7:49:00	682	0:00:00	0:00:00	0	41235	24768	60850	0.0	0.00	70835.00	64056.00	121700.00	24340.00	280931.00	6.81	11.34
Sep-11	253:33:00	215:22:00	38689	41:54:00	31:15:00	3145	0:00:00	0:00:00	0	0:00:00	0:00:00	0	41834	25168	67010	0.0	0.00	62534.00	27063.00	134020.00	26804.00	250421.00	5.99	9.95
Oct-11	57:22:00	54:05:00	8663	329:01:00	308:38:00	27905	150:54:00	138:07:00	10297	0:00:00	0:00:00	0	46865	26856	59590	0.0	0.00	73625.00	48850.00	119180.00	23836.00	265491.00	5.67	9.89
Nov-11	11:52:00	10:58:00	1499	588:59:00	560:18:00	47126	51:28:00	48:28:00	3187	0:00:00	0:00:00	0	51812	27600	58010	0.0	0.00	80475.00	30488.00	116020.00	23204.00	250187.00	4.83	9.06
Dec-11	87:16:00	74:30:00	12929	519:42:00	466:48:00	34228	63:07:00	58:20:00	3021	0:00:00	0:00:00	0	50178	25672	71700	0.0	0.00	91550.00	44114.00	143400.00	28680.00	307744.00	6.13	11.99
Jan-12	119:35:00	106:10:00	14858	105:24:00	89:07:00	5687	184:47:00	170:40:00	10460	17:07:00	12:00:00	1037	32042	16264	62580	336.0	15583.68	86200.00	52528.00	125160.00	25032.00	304503.68	9.50	18.72
Feb-12	0:00:00	0:00:00	0	2:35:00	2:20:00	184	316:37:00	287:34:00	24528	1:45:00	1:27:00	113	24825	14984	35130	33.3	1544.45	74750.00	242728.00	70260.00	14052.00	403334.45	16.25	26.92
Mar-12	319:27:00	296:30:00	49691	197:20:00	182:07:00	17455	98:20:00	89:30:00	7089	2:06:00	1:37:00	123	74358	43920	109970	44.0	2040.72	74350.00	172183.70	219940.00	43988.00	512502.42	6.89	11.67
Apr-12	0:00:00	0:00:00	0	336:35:00	314:10:00	26820	162:13:00	142:30:00	12583	1:50:00	1:35:00	89	39492	21496	49500	25.3	1173.41	80825.00	276816.00	99000.00	19800.00	477614.41	12.09	22.22
May-12	0:00:00	0:00:00	0	562:51:00	535:09:00	49893	3:40:00	3:30:00	222	0:00:00	0:00:00	0	50115	25488	52110	0.0	0.00	72675.00	280591.00	104220.00	20844.00	478330.00	9.54	18.77
Jun-12	323:45:00	302:17:00	55003	138:11:00	131:37:00	11510	0:00:00	0:00:00	0	0:00:00	0:00:00	0	66513	40768	104040	0.0	0.00	79475.00	194725.50	208080.00	41616.00	523896.50	7.88	12.85
Jul-12	158:46:00	154:06:00	25189	0:00:00	0:00:00	0	88:45:00	74:15:00	6318	0:00:00	0:00:00	0	31507	19264	47380	0.0	0.00	84050.00	158875.50	94760.00	18952.00	356637.50	11.32	18.51
Aug-12	44:17:00	41:27:00	7500	131:11:00	124:51:00	11042	0:00:00	0:00:00	0	0:00:00	0:00:00	0	18542	10864	26820	0	0	65825	15872.00	53640.00	10728.00	146065.00	7.88	13.44

ANNEX II

A. Daily data logged for 2010 (July to December 2010)

i. JULY 2010

SNo	Date	GG-3 Hrs	Sync Hrs	Generated Units (kWh)	Biomass Used	Exported Units (kWh)	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for Gen.	Cost/kWh for Export
1	1-Jul	23:55:00	21:23:00	1859	2500	1320			5000	750	5750	3.09	4.36
2	2-Jul	21:30:00	16:00:00	1471	2200	992			4400	660	5060	3.44	5.10
3	3-Jul	24:00:00	21:21:00	1849	2500	1328			5000	750	5750	3.11	4.33
4	4-Jul	24:00:00	21:50:00	1938	2450	1432			4900	735	5635	2.91	3.94
5	5-Jul	24:00:00	21:57:00	1960	2450	1464			4900	735	5635	2.88	3.85
6	6-Jul	24:00:00	19:58:00	1797	2400	1272			4800	720	5520	3.07	4.34
7	7-Jul	24:00:00	19:32:00	1663	2400	1128			4800	720	5520	3.32	4.89
8	8-Jul	24:00:00	19:34:00	1577	2600	1024			5200	780	5980	3.79	5.84
9	9-Jul	12:06:00	9:36:00	717	1200	448			2400	360	2760	3.85	6.16
10	10-Jul												
11	11-Jul												
12	12-Jul												
13	13-Jul												
14	14-Jul												
15	15-Jul												
16	16-Jul												
17	17-Jul												
18	18-Jul												
19	19-Jul												
20	20-Jul												
21	21-Jul												
22	22-Jul												
23	23-Jul	0:15:00	0:10:00	16	550	13			1100	165	1265	79.06	97.31
24	24-Jul	18:42:00	18:09:00	1487	2400	1000			4800	720	5520	3.71	5.52
25	25-Jul	8:20:00	8:12:00	617	1050	400			2100	315	2415	3.91	6.04
26	26-Jul	7:50:00	7:40:00	645	1250	448			2500	375	2875	4.46	6.42
27	27-Jul	24:00:00	23:59:00	1985	2450	1440			4900	735	5635	2.84	3.91
28	28-Jul	21:20:00	20:52:00	1691	2400	1208			4800	720	5520	3.26	4.57
29	29-Jul	20:50:00	20:44:00	1663	2050	1192			4100	615	4715	2.84	3.96
30	30-Jul	6:45:00	6:31:00	535	800	368			1600	240	1840	3.44	5.00
31	31-Jul												

Total	309:33:00	277:28:00	8639	12950	6069			25900	3885	29785	3.45	4.91

ii. AUGUST 2010

SL NO	Date	GG-3 Hrs	Sync Hrs	Generated Units (kWh)	Biomass Used	Exported Units (kWh)	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for Gen.	Cost/kWh for Export
1	1-Aug												
2	2-Aug												
3	3-Aug												
4	4-Aug												
5	5-Aug												
6	6-Aug												
7	7-Aug												
8	8-Aug												
9	9-Aug												
10	10-Aug												
11	11-Aug												
12	12-Aug	2:00:00	1:42:00	113	300	48			600	90	690	6.11	14.38
13	13-Aug	14:20:00	12:50:00	1121	1500	808			3000	450	3450	3.08	4.27
14	14-Aug	8:43:00	8:19:00	753	1200	552			2400	360	2760	3.67	5.00
15	15-Aug												
16	16-Aug	10:16:00	7:33:00	624	1500	376			3000	450	3450	5.53	9.18
17	17-Aug	22:00:00	21:16:00	1805	2600	1264			5200	780	5980	3.31	4.73
18	18-Aug	17:05:00	14:43:00	1248	1750	824			3500	525	4025	3.23	4.88
19	19-Aug												
20	20-Aug												
21	21-Aug												
22	22-Aug												
23	23-Aug												
24	24-Aug												
25	25-Aug	12:00:00	11:55:00	969	1350	696			2700	405	3105	3.20	4.46
26	26-Aug	24:00:00	24:00:00	2309	2400	1800			4800	720	5520	2.39	3.07
27	27-Aug	24:00:00	23:50:00	2070	2150	1496			4300	645	4945	2.39	3.31
28	28-Aug	24:00:00	23:58:00	2160	2450	1616			4900	735	5635	2.61	3.49
29	29-Aug	24:00:00	21:57:00	1923	2450	1376			4900	735	5635	2.93	4.10
30	30-Aug	24:00:00	22:05:00	1951	2350	1416			4700	705	5405	2.77	3.82
31	31-Aug	20:30:00	20:03:00	1705	1950	1264			3900	585	4485	2.63	3.55
Total		226:54:00	214:11:00	18751	22000	13536			47900	6600	54500	2.91	4.03

iii. SEPTEMBER 2010

SL NO	Date	GG-3 Hrs	Sync Hrs	Generated Units (kWh)	Biomass Used	Exported Units (kWh)	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for Gen.	Cost/kWh for Export
1	1-Sep												
2	2-Sep												
3	3-Sep												
4	4-Sep												
5	5-Sep												
6	6-Sep												
7	7-Sep												
8	8-Sep												
9	9-Sep												
10	10-Sep												
11	11-Sep												
12	12-Sep												
13	13-Sep												
14	14-Sep												
15	15-Sep												
16	16-Sep	5:40:00	5:25:00	381	800	240			1600	240	1840	4.83	7.67
17	17-Sep												
18	18-Sep												
19	19-Sep												
20	20-Sep	4:35:00	4:25:00	320	650	200			1300	195	1495	4.67	7.48
21	21-Sep	12:15:00	11:39:00	991	1400	672			2800	420	3220	3.25	4.79
22	22-Sep	23:52:00	23:04:00	2019	2880	1464			5760	864	6624	3.28	4.52
23	23-Sep	24:00:00	23:24:00	2077	2570	1512			5140	771	5911	2.85	3.91
24	24-Sep	22:15:00	21:27:00	1902	2500	1400			5000	750	5750	3.02	4.11
25	25-Sep	24:00:00	23:39:00	2128	2450	1552			4900	735	5635	2.65	3.63
26	26-Sep	24:00:00	23:55:00	2196	2400	1600			4800	720	5520	2.51	3.45
27	27-Sep	24:00:00	24:00:00	2202	2400	1634			4800	720	5520	2.51	3.38
28	28-Sep	24:00:00	23:10:00	2034	2400	1360			4800	720	5520	2.71	4.06
29	29-Sep	23:54:00	23:37:00	2011	2400	1408			4800	720	5520	2.74	3.92
30	30-Sep	15:35:00	14:39:00	1157	1550	800			3100	465	3565	3.08	4.46
Total		228:06:00	222:24:00	19418	24400	13842			48800	7320	56120	2.89	4.05

iv. OCTOBER 2010

SL NO	Date	GG-3 Hrs	Sync Hrs	Generated Units (kWh)	Biomass Used	Exported Units (kWh)	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for Gen.	Cost/kWh for Export
1	1-Oct												
2	2-Oct												
3	3-Oct												
4	4-Oct	10:35:00	10:20:00	850	1375	552			2750	825	3575	4.21	6.48
5	5-Oct	24:00:00	23:43:00	2039	2500	1456			5000	1500	6500	3.19	4.46
6	6-Oct	24:00:00	23:17:00	2073	2500	1360			5000	1500	6500	3.14	4.78
7	7-Oct	23:55:00	23:53:00	2098	2400	1528			4800	1440	6240	2.97	4.08
8	8-Oct	24:00:00	24:00:00	2101	2400	1512			4800	1440	6240	2.97	4.13
9	9-Oct	19:30:00	17:55:00	1578	1900	1120			3800	1140	4940	3.13	4.41
10	10-Oct	24:00:00	23:07:00	1609	2600	952			5200	1560	6760	4.20	7.10
11	11-Oct	24:00:00	24:00:00	1862	2350	1216			4700	1410	6110	3.28	5.02
12	12-Oct	23:10:00	23:05:00	1627	2300	1008			4600	1380	5980	3.68	5.93
13	13-Oct	9:50:00	9:40:00	447	1100	128			2200	660	2860	6.40	22.34
14	14-Oct												
15	15-Oct												
16	16-Oct												
17	17-Oct												
18	18-Oct												
19	19-Oct												
20	20-Oct												
21	21-Oct												
22	22-Oct												
23	23-Oct												
24	24-Oct												
25	25-Oct	5:05:00	4:58:00	315	500	200			1000	300	1300	4.13	6.50
26	26-Oct												
27	27-Oct												
28	28-Oct												
29	29-Oct												
30	30-Oct												
31	31-Oct												
Total		212:05:00	207:5800	16599	21925	11032			43850	13155	57005	3.43	5.17

v. NOVEMBER 2010

SL NO	Date	GG-3 Hrs	Sync Hrs	Generated units (kWh)	Biomass Used	Exported Units (kWh)	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for Gen.	Cost/kWh for Export
1	1-Nov												
2	2-Nov												
3	3-Nov												
4	4-Nov												
5	5-Nov												
6	6-Nov												
7	7-Nov												
8	8-Nov												
9	9-Nov												
10	10-Nov												
11	11-Nov												
12	12-Nov												
13	13-Nov												
14	14-Nov												
15	15-Nov												
16	16-Nov												
17	17-Nov												
18	18-Nov												
19	19-Nov												
20	20-Nov												
21	21-Nov												
22	22-Nov	4:42:00	4:32:00	228	600	120			1200	180	1380	6.05	11.50
23	23-Nov	12:17:00	11:12:00	725	1350	408			2700	405	3105	4.28	7.61
24	24-Nov	24:00:00	24:00:00	1944	2400	1400			4800	720	5520	2.84	3.94
25	25-Nov	23:32:00	23:23:00	1635	2300	1000			4600	690	5290	3.24	5.29
26	26-Nov												
27	27-Nov												
28	28-Nov	22:35:00	22:18:00	2002	2400	1456			4800	720	5520	2.76	3.79
29	29-Nov	24:00:00	24:00:00	2124	2400	1544			4800	720	5520	2.60	3.58
30	30-Nov	24:00:00	24:00:00	2177	2400	1624			4800	720	5520	2.54	3.40
Total		135:06:00	133:25:00	10835	13850	7552			27700	4155	31855	2.94	4.22

vi. DECEMBER 2010

SL NO	Date	GG-3 Hrs	Sync Hrs	Generated units (kWh)	Biomass Used	Exported units (kWh)	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for Gen.	Cost/kWh for Export
1	1-Dec	22:10:00	22:08:00	1969	2300	1496			4600	1150	5750	2.92	3.84
2	2-Dec	19:30:00	19:25:00	1643	1850	1096			3700	925	4625	2.81	4.22
3	3-Dec	24:00:00	23:33:00	2177	2400	1496			4800	1200	6000	2.76	4.01
4	4-Dec	24:00:00	24:00:00	2155	2400	1656			4800	1200	6000	2.78	3.62
5	5-Dec	9:10:00	9:05:00	830	950	632			1900	475	2375	2.86	3.76
6	6-Dec	11:55:00	11:33:00	946	1200	632			2400	600	3000	3.17	4.75
7	7-Dec	23:50:00	22:10:00	2028	2300	1480			4600	1150	5750	2.84	3.89
8	8-Dec	23:42:00	23:09:00	2039	2300	1504			4600	1150	5750	2.82	3.82
9	9-Dec	24:00:00	22:42:00	2067	2220	1552			4440	1110	5550	2.69	3.58
10	10-Dec	24:00:00	20:54:00	1919	2165	1440			4330	1082.5	5412.5	2.82	3.76
11	11-Dec	19:10:00	17:59:00	1634	1670	1224			3340	835	4175	2.56	3.41
12	12-Dec												
13	13-Dec	12:15:00	9:09:00	823	1170	528			2340	585	2925	3.55	5.54
14	14-Dec	23:15:00	19:56:00	1815	2160	1232			4320	1080	5400	2.98	4.38
15	15-Dec	24:00:00	21:18:00	1920	2160	1536			4320	1080	5400	2.81	3.52
16	16-Dec	23:15:00	22:44:00	1761	2160	1328			4320	1080	5400	3.07	4.07
17	17-Dec	19:55:00	18:16:00	1571	1710	1104			3420	855	4275	2.72	3.87
18	18-Dec	23:25:00	23:00:00	1858	2250	1090			4500	1125	5625	3.03	5.16
19	19-Dec	24:00:00	23:04:00	1872	2070	1090			4140	1035	5175	2.76	4.75
20	20-Dec	11:35:00	11:24:00	968	1080	1090			2160	540	2700	2.79	2.48
21	21-Dec	0:00:00	0:00:00										
22	22-Dec	7:56:00	6:43:00	564	900	354			1800	450	2250	3.99	6.36
23	23-Dec												
24	24-Dec												
25	25-Dec												
26	26-Dec												
27	27-Dec	2:55:00	1:22:00	160	540	96			1080	270	1350	8.44	14.06
28	28-Dec	10:58:00	6:03:00	519	1235	264			2470	617.5	3087.5	5.95	11.70
29	29-Dec	17:05:00	16:31:00	1434	1530	984			3060	765	3825	2.67	3.89
30	30-Dec	24:00:00	13:28:00	1427	2250	936			4500	1125	5625	3.94	6.01
31	31-Dec	24:00:00	22:46:00	2144	2160	1520			4320	1080	5400	2.52	3.55
Total		474:01:00	432:22:00	38243	45130	27362			90260	22565	112825	2.95	4.12

B. Daily data logged for 2011 (Jan to Dec 2011)

i. January 2011

SL NO	Date	GG-3 Hrs	Sync Hrs	Generated units (kWh)	Biomass Used	Exported units (kWh)	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for Gen.	Cost/kWh for Export
1	1-Jan	24:00:00	22:29:00	2083	2160	1520			4320	648	4968	2.39	3.27
2	2-Jan	2:30:00	2:30:00	234	180	168			360	54	414	1.77	2.46
3	3-Jan												
4	4-Jan	7:38:00	7:03:00	579	810	336			1620	243	1863	3.22	5.54
5	5-Jan	10:05:00	5:55:00	592	990	352			1980	297	2277	3.85	6.47
6	6-Jan	10:05:00	9:43:00	843	990	560			1980	297	2277	2.70	4.07
7	7-Jan	7:16:00	6:19:00	558	720	360			1440	216	1656	2.97	4.60
8	8-Jan	10:53:00	9:46:00	829	1125	644			2250	337.5	2587.5	3.12	4.02
9	9-Jan	8:30:00	2:20:00	307	855	136			1710	256.5	1966.5	6.41	14.46
10	10-Jan	9:35:00	9:25:00	804	990	560			1980	297	2277	2.83	4.07
11	11-Jan												
12	12-Jan	12:17:00	9:45:00	886	1170	568			2340	351	2691	3.04	4.74
13	13-Jan	8:30:00	6:18:00	576	810	336			1620	243	1863	3.23	5.54
14	14-Jan	13:00:00	12:33:00	1039	1260	744			2520	378	2898	2.79	3.90
15	15-Jan	8:45:00	8:18:00	700	810	496			1620	243	1863	2.66	3.76
16	16-Jan												
17	17-Jan	8:07:00	7:43:00	523	720	416			1440	216	1656	3.17	3.98
18	18-Jan	4:15:00	3:45:00	278	450	176			900	135	1035	3.72	5.88
19	19-Jan												
20	20-Jan	9:26:00	9:07:00	739	990	480			1980	297	2277	3.08	4.74
21	21-Jan	10:00:00	6:53:00	781	990	536			1980	297	2277	2.92	4.25
22	22-Jan	9:46:00	8:26:00	779	990	536			1980	297	2277	2.92	4.25
23	23-Jan												
24	24-Jan	9:13:00	7:41:00	703	900	464			1800	270	2070	2.94	4.46
25	25-Jan	9:00:00	6:23:00	515	990	272			1980	297	2277	4.42	8.37
26	26-Jan												
27	27-Jan	9:25:00	9:02:00	663	900	400			1800	270	2070	3.12	5.18
28	28-Jan	9:15:00	7:40:00	620	990	368			1980	297	2277	3.67	6.19
29	29-Jan	8:20:00	6:45:00	535	810	304			1620	243	1863	3.48	6.13
30	30-Jan												
31	31-Jan												
Total		219:51:00	185:49:00	16166	21600	10732			43200	6480	49680	3.07	4.63

ii. February 2011

SL NO	Date	GG-3 Hrs	Sync Hrs	Generated units (kWh)	Biomass Used	Exported units (kWh)	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for Gen.	Cost/kWh for Export
1	1-Feb	0:00:00	0:00:00	0	0	0	1979.5	939.25	0	0	2918.75		
2	2-Feb	0:00:00	0:00:00	0	0	0	1979.5	939.25	0	0	2918.75		
3	3-Feb	2:35:00	1:53:00	150	490	88	1979.5	939.25	1568	245	4731.75	31.55	53.77
4	4-Feb	8:50:00	7:02:00	641	900	456	1979.5	939.25	2880	450	6248.75	9.75	13.70
5	5-Feb	9:42:00	7:13:00	702	880	496	1979.5	939.25	2816	440	6174.75	8.80	12.45
6	6-Feb						1979.5	939.25	0	0	2918.75		
7	7-Feb	7:15:00	4:22:00	425	720	272	1979.5	939.25	2304	360	5582.75	13.14	20.52
8	8-Feb	9:35:00	8:16:00	753	900	522	1979.5	939.25	2880	450	6248.75	8.30	11.97
9	9-Feb	8:58:00	8:05:00	681	900	440	1979.5	939.25	2880	450	6248.75	9.18	14.20
10	10-Feb						1979.5	939.25	0	0	2918.75		
11	11-Feb	9:25:00	7:41:00	728	900	512	1979.5	939.25	2880	450	6248.75	8.58	12.20
12	12-Feb	14:05:00	11:02:00	949	1350	608	1979.5	939.25	4320	675	7913.75	8.34	13.02
13	13-Feb	8:49:00	8:18:00	795	720	600	1979.5	939.25	2304	360	5582.75	7.02	9.30
14	14-Feb	9:34:00	9:10:00	775	990	536	1979.5	939.25	3168	495	6581.75	8.49	12.28
15	15-Feb	12:49:00	11:55:00	1056	1260	768	1979.5	939.25	4032	630	7580.75	7.18	9.87
16	16-Feb	8:00:00	7:51:00	770	810	536	1979.5	939.25	2592	405	5915.75	7.68	11.04
17	17-Feb	10:00:00	9:39:00	836	900	552	1979.5	939.25	2880	450	6248.75	7.47	11.32
18	18-Feb	9:33:00	8:45:00	805	990	576	1979.5	939.25	3168	495	6581.75	8.18	11.43
19	19-Feb	13:45:00	13:17:00	1177	1260	880	1979.5	939.25	4032	630	7580.75	6.44	8.61
20	20-Feb	8:00:00	7:42:00	717	720	536	1979.5	939.25	2304	360	5582.75	7.79	10.42
21	21-Feb	9:15:00	7:55:00	718	990	448	1979.5	939.25	3168	495	6581.75	9.17	14.69
22	22-Feb	6:37:00	4:03:00	385	720	216	1979.5	939.25	2304	360	5582.75	14.50	25.85
23	23-Feb	10:00:00	8:46:00	756	945	424	1979.5	939.25	3024	472.5	6415.25	8.49	15.13
24	24-Feb	9:10:00	8:47:00	760	900	520	1979.5	939.25	2880	450	6248.75	8.22	12.02
25	25-Feb	10:40:00	8:26:00	705	990	432	1979.5	939.25	3168	495	6581.75	9.34	15.24
26	26-Feb	13:53:00	13:39:00	1266	1350	912	1979.5	939.25	4320	675	7913.75	6.25	8.68
27	27-Feb	8:35:00	8:30:00	819	720	608	1979.5	939.25	2304	360	5582.75	6.82	9.18
28	28-Feb	8:50:00	7:46:00	688	900	488	1979.5	939.25	2880	450	6248.75	9.08	12.80
Total		227:55:00	200:03:00	18057	22205	12426	55426	26299	71056	11102.5	163883.5	9.08	13.19

iii. March 2011

SL NO	Date	GG-3 Hrs	Sync Hrs	Generated units (kWh)	Biomass Used	Exported units (kWh)	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for Gen.	Cost/kWh for Export
1	1-Mar	9:45:00	9:01:00	820	810	576			1620	243	1863	2.27	3.23
2	2-Mar										0		#DIV/0!
3	3-Mar	6:27:00	5:35:00	426	810	364			1620	243	1863	4.37	5.12
4	4-Mar	9:05:00	7:15:00	691	990	528			1980	297	2277	3.30	4.31
5	5-Mar	12:40:00	9:33:00	836	1260	544			2520	378	2898	3.47	5.33
6	6-Mar	8:32:00	8:21:00	794	720	608			1440	216	1656	2.09	2.72
7	7-Mar	9:33:00	7:39:00	737	990	472			1980	297	2277	3.09	4.82
8	8-Mar	9:55:00	8:37:00	800	990	536			1980	297	2277	2.85	4.25
9	9-Mar	8:57:00	6:09:00	602	900	408			1800	270	2070	3.44	5.07
10	10-Mar	10:10:00	9:20:00	830	990	576			1980	297	2277	2.74	3.95
11	11-Mar	9:22:00	8:55:00	792	900	528			1800	270	2070	2.61	3.92
12	12-Mar	14:15:00	13:50:00	1139	1350	792			2700	405	3105	2.73	3.92
13	13-Mar	8:40:00	7:50:00	720	990	512			1980	297	2277	3.16	4.45
14	14-Mar	10:00:00	6:05:00	644	990	400			1980	297	2277	3.54	5.69
15	15-Mar	9:22:00	8:53:00	722	990	488			1980	297	2277	3.15	4.67
16	16-Mar	9:30:00	7:55:00	700	900	464			1800	270	2070	2.96	4.46
17	17-Mar	8:50:00	7:57:00	678	990	456			1980	297	2277	3.36	4.99
18	18-Mar	9:55:00	4:35:00	443	990	240			1980	297	2277	5.14	9.49
19	19-Mar	13:20:00	11:36:00	959	1350	600			2700	405	3105	3.24	5.18
20	20-Mar	8:30:00	8:30:00	691	900	480			1800	270	2070	3.00	4.31
21	21-Mar	9:45:00	8:51:00	726	990	464			1980	297	2277	3.14	4.91
22	22-Mar	9:05:00	8:00:00	672	1030	440			2060	309	2369	3.53	5.38
23	23-Mar	9:40:00	3:10:00	364	900	160			1800	270	2070	5.69	12.94
24	24-Mar	9:02:00	8:42:00	639	900	416			1800	270	2070	3.24	4.98
25	25-Mar	9:35:00	8:27:00	760	990	544			1980	297	2277	3.00	4.19
26	26-Mar	13:10:00	11:35:00	864	1350	544			2700	405	3105	3.59	5.71
27	27-Mar	8:45:00	6:45:00	629	810	416			1620	243	1863	2.96	4.48
28	28-Mar	9:25:00	9:01:00	671	900	432			1800	270	2070	3.08	4.79
29	29-Mar	7:10:00	6:13:00	450	810	280			1620	243	1863	4.14	6.65
30	30-Mar	8:55:00	8:48:00	706	900	504			1800	270	2070	2.93	4.11
31	31-Mar	9:25:00	9:13:00	738	990	464			1980	297	2277	3.09	4.91
Total		290:45:00	246:21:00	21243	29380	14236			58760	8814	67574	3.18	4.75

iv. April 2011

Date	DG Hrs			Sync Hrs			Generated units kWh			Total kWh Gen/day	Exported units kWh	Total biomass used	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for gen.	Cost/kWh for Export
	DG 1	DG2	DG3	DG1	DG2	DG3	DG1	DG2	DG3										
1-Apr			13:30:00			12:54:00			964	964	640	1350	2719	830	2700	675	6924	7.18	10.82
2-Apr			15:20:00			12:39:00			1041	1041	648	1350	2719	830	2700	675	6924	6.65	10.69
3-Apr																			
4-Apr																			
5-Apr																			
6-Apr													2719	830			3549		
7-Apr													2719	830			3549		
8-Apr													2719	830			3549		
9-Apr			9:35:00			8:39:00			726	726	312	990	2719	830	1980	495	6024	8.30	19.31
10-Apr																			
11-Apr	5:30:00	1:05:00	12:25:00	0:00:00	0:55:00	12:17:00		92	935	1027	120	3170	2719	830	6340	1585	11474	11.17	95.62
12-Apr			8:49:00			8:40:00			718	718	520	990	2719	830	1980	495	6024	8.39	11.58
13-Apr			10:30:00			8:40:00			731	731	488	1080	2719	830	2160	540	6249	8.55	12.81
14-Apr			13:15:00			12:33:00			993	993	672	1350	2719	830	2700	675	6924	6.97	10.30
15-Apr	3:45:00		16:30:00	2:51:00		15:27:00	257		1171	1428	736	2400	2719	830	4800	1200	9549	6.69	12.97
16-Apr			24:00:00			19:23:00			1579	1579	1008	2160	2719	830	4320	1080	8949	5.67	8.88
17-Apr			10:15:00			9:55:00			765	765	512	990	2719	830	1980	495	6024	7.87	11.77
18-Apr	4:23:00		13:00:00	4:11:00		12:55:00	625		919	1544	952	2640	2719	830	5280	1320	10149	6.57	10.66
19-Apr	14:10:00	0:58:00	11:45:00	12:45:00	0:00:00	9:29:00	2062	0	759	2821	760	4430	2719	830	8860	2215	14624	5.18	19.24
20-Apr	13:40:00	7:40:00		12:54:00	6:15:00		1919	825		2744	2248	4080	2719	830	8160	2040	13749	5.01	6.12
21-Apr		23:00:00			16:00:00			1377		1377	808	1680	2719	830	3360	840	7749	5.63	9.59
22-Apr		10:28:00	5:25:00		6:47:00	5:08:00		691	288	979	352	1680	2719	830	3360	840	7749	7.92	22.01
23-Apr			24:00:00			21:56:00			1515	1515	824	2095	2719	830	4190	1047.5	8786.5	5.80	10.66
24-Apr			9:00:00			8:58:00			700	700	448	790	2719	830	1580	395	5524	7.89	12.33
25-Apr		10:35:00	13:50:00		10:30:00	13:45:00		878	946	1824	1016	2270	2719	830	4540	1135	9224	5.06	9.08
26-Apr		14:00:00	21:05:00		13:43:00	20:51:00		1191	1513	2704	1616	2940	2719	830	5880	1470	10899	4.03	6.74
27-Apr	8:12:00	24:00:00		5:40:00	21:50:00		688	2092		2780	1136	4000	2719	830	8000	2000	13549	4.87	11.93
28-Apr		24:00:00	9:45:00		21:40:00	8:19:00		2108	539	2647	1368	3020	2719	830	6040	1510	11099	4.19	8.11
29-Apr	3:10:00	24:00:00		2:47:00	22:30:00		279	1983		2262	976	2640	2719	830	5280	1320	10149	4.49	10.40
30-Apr		24:00:00			22:16:00			2036		2036	1064	1920	2719	830	3840	960	8349	4.10	7.85
TOTAL	52:50:00	163:46:00	241:59:00	41:08:00	142:26:00	222:28:00	5830	13273	16802	35905	19224	50015	70694	21580	100030	25007.5	217311.5	6.05	11.30

v. May 2011

Date	DG Hrs			Sync Hrs			Generated units kWh			Total kwh Gen/day	Exported units kWh	Total biomass used	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kwh for gen.	Cost/kwh for Export
	DG 1	DG2	DG3	DG1	DG2	DG3	DG1	DG2	DG3										
1-May		9:40:00			8:55:00			820		820	504	1520	2844	660	3040	760	7304	8.91	14.49
2-May	3:17:00	5:11:00		3:05:00	5:05:00		170	400		570	224	1280	2844	660	2560	640	6704	11.76	29.93
3-May		24:00:00	4:05:00		23:28:00	3:53:00	184	2151	272	2607	1216	2450	2844	660	4900	1225	9629	3.69	7.92
4-May	1:15:00	24:00:00		1:00:00	22:45:00		34	2100		2134	944	2560	2844	660	5120	1280	9904	4.64	10.49
5-May		24:00:00			21:57:00			1980		1980	920	1920	2844	660	3840	960	8304	4.19	9.03
6-May		24:00:00			23:05:00			1841		1841	880	1920	2844	660	3840	960	8304	4.51	9.44
7-May		24:00:00			22:43:00			1730		1730	336	1920	2844	660	3840	960	8304	4.80	24.71
8-May		7:15:00			7:07:00			522		522	672	800	2844	660	1600	400	5504	10.54	8.19
9-May		10:35:00			8:43:00			647		647	256	1200	2844	660	2400	600	6504	10.05	25.41
10-May		24:00:00	3:20:00		23:24:00	3:00:00		1935	157	2092	984	1680	2844	660	3360	840	7704	3.68	7.83
11-May	3:43:00	12:15:00	5:00:00	2:07:00	11:46:00	4:35:00	214	968	315	1497	512	1040	2844	660	2080	520	6104	4.08	11.92
12-May		10:00:00	4:58:00		7:05:00	4:05:00		538	229	1541	496	1520	2844	660	3040	760	7304	4.74	14.73
13-May		16:51:00			8:53:00			563		2138	152	1600	2844	660	3200	800	7504	3.51	49.37
14-May		23:46:00			15:39:00			1029		1029	312	1920	2844	660	3840	960	8304	8.07	26.62
15-May		4:10:00			4:00:00			232		232	104	880	2844	660	1760	440	5704	24.59	54.85
16-May		13:40:00			12:45:00			997		997	488	1180	2844	660	2360	590	6454	6.47	13.23
17-May		23:55:00			21:10:00			1801		1801	960	1920	2844	660	3840	960	8304	4.61	8.65
18-May		18:15:00			13:28:00			1272		1272	608	1600	2844	660	3200	800	7504	5.90	12.34
19-May		24:00:00			23:47:00			2020		2020	1088	1920	2844	660	3840	960	8304	4.11	7.63
20-May		24:00:00			23:36:00			2034		2034	1136	1920	2844	660	3840	960	8304	4.08	7.31
21-May		24:00:00			22:00:00			1992		1992	1056	1920	2844	660	3840	960	8304	4.17	7.86
22-May		9:00:00			8:51:00			758		758	440	880	2844	660	1760	440	5704	7.53	12.96
23-May		13:50:00			13:20:00			1133		1133	600	1120	2844	660	2240	560	6304	5.56	10.51
24-May		14:20:00			14:05:00			1104		1104	592	1920	2844	660	3840	960	8304	7.52	14.03
25-May		24:00:00			23:27:00			2023		2023	1024	1920	2844	660	3840	960	8304	4.10	8.11
26-May		24:00:00			22:13:00			1802		1802	936	1920	2844	660	3840	960	8304	4.61	8.87
27-May		24:00:00			23:25:00			1988		1988	1056	1840	2844	660	3680	920	8104	4.08	7.67
28-May		24:00:00			23:57:00			1939		1939	1064	1920	2844	660	3840	960	8304	4.28	7.80
29-May		9:50:00			9:45:00			713		713	392	800	2844	660	1600	400	5504	7.72	14.04
30-May		9:45:00			8:48:00			742		742	376	960	2844	660	1920	480	5904	7.96	15.70
31-May		9:13:00			8:33:00			745		745	360	800	2844	660	1600	400	5504	7.39	15.29
TOTAL	8:15:00	532:37:00	17:28:00	6:12:00	485:40:00	15:38:00	602	40519	973	44443	20688	48750	88164	20460	97500	24375	230499	6.51	15.38

vi. July 2011

Date	DG Hrs			Sync Hrs			Generated units kWh			Total kwh Gen/day	Exported units kWh	Total biomass used	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /Kwh for gen.	Cost/Kwh for Export
	DG 1	DG2	DG3	DG1	DG2	DG3	DG1	DG2	DG3										
1-Jul			5:09:00			1:23:00			168	168	88	480	2510	1049	960	240	4759	28.33	54.08
2-Jul			6:24:00			5:28:00			457	457	320	560	2510	639	1120	280	4549	9.95	14.22
3-Jul										0			2510	601			3111		
4-Jul			10:15:00			6:44:00			618	618	384	960	2510	777	1920	480	5687	9.20	14.81
5-Jul			24:00:00			23:30:00			2056	2056	1464	1920	2510	697	3840	960	8007	3.89	5.47
6-Jul			21:05:00			19:54:00			1818	1818	1320	1920	2510	677	3840	960	7987	4.39	6.05
7-Jul			23:17:00			21:55:00			1886	1886	1336	1920	2510	833	3840	960	8143	4.32	6.10
8-Jul			21:45:00			21:06:00			1877	1877	1328	1920	2510	767	3840	960	8077	4.30	6.08
9-Jul			22:25:00			21:30:00			1822	1822	1255	1920	2510	723	3840	960	7965	4.37	6.35
10-Jul			24:00:00			22:36:00			1881	1881	1272	1920	2510	655	3840	960	8055	4.28	6.33
11-Jul			24:00:00			22:28:00			1963	1963	1352	1920	2510	745	3840	960	8025	4.09	5.94
12-Jul			24:00:00			18:22:00			1745	1745	1160	1920	2510	715	3840	960	7995	4.58	6.89
13-Jul			24:00:00			21:29:00			1823	1823	1240	1920	2510	685	3840	960	7995	4.39	6.45
14-Jul			23:40:00			22:30:00			1535	1535	896	1920	2510	745	3840	960	8055	5.25	8.99
15-Jul			24:00:00			21:35:00			1388	1388	728	1920	2510	809	3840	960	8119	5.85	11.15
16-Jul			4:16:00			2:12:00			105	105	32	480	2510	989	960	240	4699	44.75	146.84
17-Jul			9:00:00			6:15:00			703	703	432	800	2510	857	1600	400	5367	7.63	12.42
18-Jul			11:50:00			10:06:00			649	649	304	1170	2510	733	2340	585	6168	9.50	20.29
19-Jul			16:55:00			15:41:00			1204	1204	720	1820	2510	684	3640	910	7744	6.43	10.76
20-Jul	2:40:00		9:00:00	2:06:00		8:35:00	316		616	932	312	1680	2510	1083	3360	840	7793	8.36	24.98
21-Jul	8:40:00			8:01:00			1259			1259	736	1600	2510	723	3200	800	7233	5.75	9.83
22-Jul	8:42:00		8:32:00	8:03:52		7:55:00	1277		553	1830	1088	2401	2510	1083	4802	1200.5	9595.5	5.24	8.82
23-Jul	8:35:00			7:15:00			1318			1318	808	2160	2510	749	4320	1080	8659	6.57	10.72
24-Jul													2510	573			3083		
25-Jul			12:30:00			10:05:00			640	640	320	880	2510	707	1760	440	5417	8.46	16.93
26-Jul			23:00:00			18:58:00			1253	1253	632	1440	2510	737	2880	720	6847	5.46	10.83
27-Jul			12:00:00			10:10:00			729	729	440	880	2510	667	1760	440	5377	7.38	12.22
28-Jul	12:45:00			10:45:00			1830			1830	1088	3250	2510	1037	6500	1625	11672	6.38	10.73
29-Jul	19:20:00			19:02:00			3178			3178	2008	4800	2510	639	9600	2400	15149	4.77	7.54
30-Jul													2510	1127			3637		
31-Jul													2510	463			2973		
TOTAL	60:42:00		385:03:00	55:12:52		340:27:00	9178		27489	36667	23063	46481	77810	23968	92962	23240.5	217942.5	5.94	9.45

vii. August 2011

Date	GG Hrs			Sync Hrs			Generated units kWh			Total kWh Gen/day	Exported units kWh	Total biomass used	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for gen.	Cost/kWh for Export
	GG 1	GG2	GG3	GG1	GG2	GG3	GG1	GG2	GG3										
1-Aug	7:31:00			6:23:00			1019			1019	608	1680	2285	2128	3360	672	8445	8.29	13.89
2-Aug	6:50:00			6:05:00			829			829	456	1760	2285	2078	3520	704	8587	10.36	18.83
3-Aug	9:50:00			9:17:00			1333			1333	760	1760	2285	2270	3520	704	8779	6.59	11.55
4-Aug	8:55:00			7:52:00			1232			1232	704	1440	2285	2116	2880	576	7857	6.38	11.16
5-Aug	10:15:00			9:56:00			1398			1398	776	2000	2285	2182	4000	800	9267	6.63	11.94
6-Aug	9:45:00			9:05:00			1320			1320	776	1520	2285	2028	3040	608	7961	6.03	10.26
7-Aug	6:51:00			6:30:00			975			975	568	1600	2285	1918	3200	640	8043	8.25	14.16
8-Aug	9:40:00			9:17:00			1383			1383	824	1760	2285	2094	3520	704	8603	6.22	10.44
9-Aug	10:06:00			8:51:00			1468			1468	864	2240	2285	2116	4480	896	9777	6.66	11.32
10-Aug			3:20:00			0:30:00			86	86	16	1260	2285	2378	2520	504	7687	89.38	480.44
11-Aug	9:10:00			8:07:00			1414			1414	888	2000	2285	2050	4000	800	9135	6.46	10.29
12-Aug	8:35:00			8:15:00			1354			1354	872	1920	2285	2006	3840	768	8899	6.57	10.21
13-Aug	10:25:00			10:10:00			1635			1635	1048	2080	2285	2028	4160	832	9305	5.69	8.88
14-Aug	10:15:00			9:33:00			1576			1576	976	2160	2285	1940	4320	864	9409	5.97	9.64
15-Aug	10:20:00			9:07:00			1509			1509	928	2160	2285	1896	4320	864	9365	6.21	10.09
16-Aug	9:30:00			7:29:00			1370			1370	808	2160	2285	2098	4320	864	9567	6.98	11.84
17-Aug	9:30:00		2:40:00	9:10:00		2:25:00	1774		199	1973	1192	2620	2285	2198	5240	1048	10771	5.46	9.04
18-Aug	9:35:00			9:27:00			1596			1596	1056	880	2285	2094	1760	352	6491	4.07	6.15
19-Aug	8:30:00			8:15:00			1365			1365	872	1600	2285	1978	3200	640	8103	5.94	9.29
20-Aug	7:55:00			7:50:00			1322			1322	856	1360	2285	2120	2720	544	7669	5.80	8.96
21-Aug	9:35:00			8:15:00			1336			1336	800	2160	2285	1872	4320	864	9341	6.99	11.68
22-Aug	8:55:00			7:10:00			1174			1174	648	2080	2285	2068	4160	832	9345	7.96	14.42
23-Aug	9:45:00			8:10:00			1460			1460	872	2240	2285	2048	4480	896	9709	6.65	11.13
24-Aug	10:00:00			9:48:00			1716			1716	1096	2240	2285	2094	4480	896	9755	5.68	8.90
25-Aug	9:40:00			8:45:00			1552			1552	984	2160	2285	2054	4320	864	9523	6.14	9.68
26-Aug	9:45:00			7:33:00			1427			1427	776	3360	2285	2118	6720	1344	12467	8.74	16.07
27-Aug	13:50:00			12:50:00			2192			2192	1384	3040	2285	2220	6080	1216	11801	5.38	8.53
28-Aug	7:55:00			7:53:00			1342			1342	856	1920	2285	1668	3840	768	8561	6.38	10.00

29-Aug		2:50:00	5:30:00		0:40:00	4:54:00		154	397	551	200	2890	2285	2152	5780	1156	11373	20.64	56.87
30-Aug		9:25:00			9:05:00			867		867	400	800	2285	2048	1600	320	6253	7.21	15.63
31-Aug	9:25:00			8:55:00			1461			1461	904	2000	2285	1998	4000	800	9083	6.22	10.05
TOTAL	262:18:00	12:15:00	11:30:00	239:58:00	9:45:00	7:49:00	39532	1021	682	41235	24768	60850	70835	64056	121700	24340	280931	6.81	11.34

viii. September 2011

Date	GG Hrs			Sync Hrs			Generated units kWh			Total kWh Gen/day	Exported units kWh	Total biomass used	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for gen.	Cost/kWh for Export
	GG 1	GG2	GG3	GG1	GG2	GG3	GG1	GG2	GG3										
1-Sep	0:00:00			0:00:00			0			0	0	0	2084.47	455.00	0.00	0.00	2539.47	0.00	0.00
2-Sep	9:45:00			6:12:00			1169			1169	608	2320	2084.47	855.00	4640.00	928.00	8507.47	7.28	13.99
3-Sep	10:00:00			7:58:00			1473			1473	888	2400	2084.47	829.00	4800.00	960.00	8673.47	5.89	9.77
4-Sep	9:45:00			6:28:00			1411			1411	840	2450	2084.47	904.00	4900.00	980.00	8868.47	6.29	10.56
5-Sep	9:40:00			9:14:00			1613			1613	1040	2400	2084.47	851.00	4800.00	960.00	8695.47	5.39	8.36
6-Sep	8:40:00			6:55:00			1257			1257	752	2160	2084.47	895.00	4320.00	864.00	8163.47	6.49	10.86
7-Sep	10:15:00			9:30:00			1645			1645	1040	2400	2084.47	917.00	4800.00	960.00	8761.47	5.33	8.42
8-Sep	9:50:00			9:27:00			1755			1755	1168	2240	2084.47	1015.00	4480.00	896.00	8475.47	4.83	7.26
9-Sep	8:55:00			7:51:00			1397			1397	856	2080	2084.47	895.00	4160.00	832.00	7971.47	5.71	9.31
10-Sep	9:45:00			9:29:00			1639			1639	1064	2320	2084.47	855.00	4640.00	928.00	8507.47	5.19	8.00
11-Sep	9:25:00			8:43:00			1463			1463	928	2160	2084.47	609.00	4320.00	864.00	7877.47	5.38	8.49
12-Sep	9:40:00			8:52:00			1570			1570	992	1920	2084.47	835.00	3840.00	768.00	7527.47	4.79	7.59
13-Sep	0:33:00			0:08:00			0			0	0	320	2084.47	943.00	640.00	128.00	3795.47	-	-
14-Sep	8:55:00			6:17:00			1290			1290	664	2400	2084.47	961.00	4800.00	960.00	8805.47	6.83	13.26
15-Sep	8:40:00			7:52:00			1383			1383	848	2240	2084.47	1027.00	4480.00	896.00	8487.47	6.14	10.01
16-Sep	9:20:00			8:35:00			1539			1539	960	2240	2084.47	943.00	4480.00	896.00	8403.47	5.46	8.75
17-Sep	10:10:00			9:45:00			1756			1756	1136	2400	2084.47	1035.00	4800.00	960.00	8879.47	5.06	7.82
18-Sep	10:10:00			8:54:00			1575			1575	960	2400	2084.47	1069.00	4800.00	960.00	8913.47	5.66	9.28
19-Sep	6:35:00	7:30:00		3:47:00	3:12:00		752	406		1158	504	2880	2084.47	1061.00	5760.00	1152.00	10057.47	8.69	19.96
20-Sep	10:00:00			9:47:00			1692			1692	1072	2480	2084.47	905.00	4960.00	992.00	8941.47	5.28	8.34
21-Sep	7:10:00			7:05:00			1133			1133	696	1920	2084.47	925.00	3840.00	768.00	7617.47	6.72	10.94
22-Sep	9:00:00			8:11:00			1448			1448	912	2320	2084.47	815.00	4640.00	928.00	8467.47	5.85	9.28
23-Sep	10:30:00			9:57:00			1675			1675	1048	2560	2084.47	855.00	5120.00	1024.00	9083.47	5.42	8.67
24-Sep	8:05:00			6:27:00			1187			1187	712	2080	2084.47	899.00	4160.00	832.00	7975.47	6.72	11.20
25-Sep	7:30:00			7:25:00			1343			1343	904	2080	2084.47	855.00	4160.00	832.00	7931.47	5.91	8.77

26-Sep	9:15:00			5:48:00			1243			1243	672	2240	2084.47	855.00	4480.00	896.00	8315.47	6.69	12.37
27-Sep	9:00:00	7:52:00		4:10:00	3:10:00		963	456		1419	640	3040	2084.47	899.00	6080.00	1216.00	10279.47	7.24	16.06
28-Sep	10:55:00	9:37:00		10:40:00	9:33:00		1669	821		2490	1536	3360	2084.47	1219.00	6720.00	1344.00	11367.47	4.57	7.40
29-Sep	9:45:00	8:05:00		7:55:00	6:35:00		1307	649		1956	1104	3120	2084.47	939.00	6240.00	1248.00	10511.47	5.37	9.52
30-Sep	2:20:00	8:50:00		2:00:00	8:45:00		342	813		1155	624	2080	2084.47	943.00	4160.00	832.00	8019.47	6.94	12.85
TOTAL	253:33:00	41:54:00	0:00:00	215:22:00	31:15:00	0:00:00	38689	3145	0	41834	25168	67010	62534.00	27063.00	134020.00	26804.00	250421.00	5.99	9.95

ix. October 2011

Date	GG Hrs			Sync Hrs			Generated units kWh			Total kWh Gen/day	Exported units kWh	Total biomass used	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for gen.	Cost/kWh for Export
	GG 1	GG2	GG3	GG1	GG2	GG3	GG1	GG2	GG3										
1-Oct	3:55:00		2:25:00	3:05:00		2:10:00	697		125	822	368	2060	2375.00	1569.26	4120.00	824.00	8888.26	10.81	24.15
2-Oct	10:00:00			9:19:00			1484			1484	864	2400	2375.00	1589.26	4800.00	960.00	9724.26	6.55	11.25
3-Oct	9:35:00	8:30:00	4:15:00	9:05:00	8:05:00	4:15:00	1502	766	283	2551	1472	3590	2375.00	1745.26	7180.00	1436.00	12736.26	4.99	8.65
4-Oct	10:05:00			9:57:00			1688			1688	1104	2320	2375.00	1567.26	4640.00	928.00	9510.26	5.63	8.61
5-Oct										0			2375.00	1245.26	0.00	0.00	3620.26	-	-
6-Oct										0			2375.00	1329.26	0.00	0.00	3704.26	-	-
7-Oct	9:55:00	7:25:00		9:40:00	7:20:00		1499	656		2155	1312	3040	2375.00	1461.26	6080.00	1216.00	11132.26	5.17	8.48
8-Oct	4:17:00	8:27:00		4:08:00	7:40:00		470	727		1197	528	3200	2375.00	1573.26	6400.00	1280.00	11628.26	9.71	22.02
9-Oct	9:35:00	9:10:00		8:51:00	8:28:00		1323	790		2113	1232	3120	2375.00	1511.26	6240.00	1248.00	11374.26	5.38	9.23
10-Oct		9:45:00	7:55:00		9:13:00	7:33:00		860	544	1404	800	2130	2375.00	1485.26	4260.00	852.00	8972.26	6.39	11.22
11-Oct		9:40:00	7:50:00		9:05:00	7:10:00		818	472	1290	688	1780	2375.00	1493.26	3560.00	712.00	8140.26	6.31	11.83
12-Oct		9:45:00	8:09:00		9:40:00	8:06:00		877	534	1411	792	1770	2375.00	1531.26	3540.00	708.00	8154.26	5.78	10.30
13-Oct		9:55:00	8:53:00		9:25:00	8:35:00		790	590	1380	792	1780	2375.00	1559.26	3560.00	712.00	8206.26	5.95	10.36
14-Oct		9:42:00	8:45:00		9:12:00	8:29:00		940	573	1513	816	1780	2375.00	1567.26	3560.00	712.00	8214.26	5.43	10.07
15-Oct		9:50:00	8:35:00		7:56:00	6:46:00		810	485	1295	688	1780	2375.00	1525.26	3560.00	712.00	8172.26	6.31	11.88
16-Oct		6:35:00	3:35:00		6:33:00	3:25:00		580	194	774	384	1170	2375.00	1485.26	2340.00	468.00	6668.26	8.62	17.37
17-Oct		9:55:00	1:00:00		9:08:00	0:50:00		763	77	840	424	1150	2375.00	1655.26	2300.00	460.00	6790.26	8.08	16.01
18-Oct		9:15:00	8:20:00		8:20:00	7:22:00		804	621	1425	872	1610	2375.00	1966.26	3220.00	644.00	8205.26	5.76	9.41
19-Oct		10:00:00	9:30:00		9:50:00	9:12:00		880	784	1664	1120	1780	2375.00	2305.26	3560.00	712.00	8952.26	5.38	7.99
20-Oct		9:15:00	5:40:00		6:40:00	5:10:00		625	317	942	536	1430	2375.00	1529.26	2860.00	572.00	7336.26	7.79	13.69
21-Oct		9:25:00	6:57:00		7:54:00	6:53:00		715	539	1254	744	1520	2375.00	1589.26	3040.00	608.00	7612.26	6.07	10.23
22-Oct		9:25:00	9:15:00		8:09:00	8:00:00		767	671	1438	904	1700	2375.00	1589.26	3400.00	680.00	8044.26	5.59	8.90
23-Oct		9:45:00	9:00:00		9:33:00	8:52:00		822	736	1558	1032	1700	2375.00	1479.26	3400.00	680.00	7934.26	5.09	7.69
24-Oct		10:57:00	9:05:00		10:17:00	8:55:00		851	723	1574	968	1780	2375.00	1675.26	3560.00	712.00	8322.26	5.29	8.60

25-Oct		16:30:00	7:45:00		15:59:00	7:21:00		1324	582	1906	1112	2170	2375.00	1585.26	4340.00	868.00	9168.26	4.81	8.24
26-Oct		24:00:00	8:55:00		22:23:00	7:51:00		2000	620	2620	1512	2820	2375.00	1565.26	5640.00	1128.00	10708.26	4.09	7.08
27-Oct		24:00:00			23:50:00			2145		2145	1256	1920	2375.00	1495.26	3840.00	768.00	8478.26	3.95	6.75
28-Oct		17:40:00	6:40:00		17:27:00	2:50:00		1484	259	1743	896	1600	2375.00	1605.26	3200.00	640.00	7820.26	4.49	8.73
29-Oct		24:00:00			22:05:00			2010		2010	1056	1920	2375.00	1561.26	3840.00	768.00	8544.26	4.25	8.09
30-Oct		24:00:00			22:47:00			2145		2145	1232	1920	2375.00	1405.26	3840.00	768.00	8388.26	3.91	6.81
31-Oct		22:10:00	8:25:00		21:39:00	8:22:00		1956	568	2524	1352	2650	2375.00	1605.26	5300.00	1060.00	10340.26	4.10	7.65
TOTAL	57:22:00	329:01:00	150:54:00	54:05:00	308:38:00	138:07:00	8663	27905	10297	46865	26856	59590	73625.00	48850.00	119180.00	23836.00	265491.00	5.67	9.89

x. November 2011

Date	GG Hrs			Sync Hrs			Generated units kWh			Total kWh Gen/day	Exported kWh	Total biomass used	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for gen.	Cost/kWh for Export
	GG 1	GG2	GG3	GG1	GG2	GG3	GG1	GG2	GG3										
1-Nov		24:00:00			22:49:00			2140		2140	1248	1920	2682.50	537.23	3840.00	768.00	7827.73	3.66	6.27
2-Nov		24:00:00			19:47:00			1903		1903	1048	1920	2682.50	973.23	3840.00	768.00	8263.73	4.34	7.89
3-Nov		20:00:00			20:00:00			1808		1808	1112	1600	2682.50	827.23	3200.00	640.00	7349.73	4.07	6.61
4-Nov			11:57:00			11:53:00			825	825	480	1260	2682.50	1127.23	2520.00	504.00	6833.73	8.28	14.24
5-Nov			14:40:00			13:04:00			931	931	592	1530	2682.50	1141.23	3060.00	612.00	7495.73	8.05	12.66
6-Nov		11:30:00	13:00:00		10:57:00	13:00:00		819	878	1697	968	2290	2682.50	877.23	4580.00	916.00	9055.73	5.34	9.36
7-Nov		15:18:00	2:40:00		14:43:00	2:30:00		1103	152	1255	592	1960	2682.50	971.23	3920.00	784.00	8357.73	6.66	14.12
8-Nov		24:00:00			22:58:00			2030		2030	1072	1920	2682.50	993.23	3840.00	768.00	8283.73	4.08	7.73
9-Nov		24:00:00			23:44:00			2042		2042	1144	1920	2682.50	1017.23	3840.00	768.00	8307.73	4.07	7.26
10-Nov		24:00:00			23:42:00			1950		1950	1096	1920	2682.50	971.23	3840.00	768.00	8261.73	4.24	7.54
11-Nov		24:00:00			23:42:00			1999		1999	1024	2190	2682.50	1103.23	4380.00	876.00	9041.73	4.52	8.83
12-Nov		24:00:00			23:43:00			2017		2017	1128	1920	2682.50	1048.23	3840.00	768.00	8338.73	4.13	7.39
13-Nov		24:00:00			22:47:00			1896		1896	1056	1920	2682.50	837.23	3840.00	768.00	8127.73	4.29	7.70
14-Nov		24:00:00			22:44:00			1936		1936	1040	1920	2682.50	947.23	3840.00	768.00	8237.73	4.26	7.92
15-Nov		19:23:00	5:32:00		18:52:00	4:24:00		1507	284	1791	840	2230	2682.50	1037.23	4460.00	892.00	9071.73	5.07	10.80
16-Nov		24:00:00			22:35:00			1854		1854	1016	1920	2682.50	941.23	3840.00	768.00	8231.73	4.44	8.10
17-Nov		24:00:00			23:28:00			1948		1948	1032	1920	2682.50	993.23	3840.00	768.00	8283.73	4.25	8.03
18-Nov		24:00:00			22:29:00			1949		1949	1112	1920	2682.50	907.23	3840.00	768.00	8197.73	4.21	7.37
19-Nov		20:05:00			19:55:00			1622		1622	672	1440	2682.50	1045.23	2880.00	576.00	7183.73	4.43	10.69
20-Nov	5:52:00	10:17:00	3:39:00	5:15:00	10:15:00	3:37:00	584	762	117	1463	648	3430	2682.50	1430.23	6860.00	1372.00	12344.73	8.44	19.05
21-Nov		13:32:00			12:58:00			1064		1064	584	1200	2682.50	1081.23	2400.00	480.00	6643.73	6.24	11.38

22-Nov		24:00:00			22:47:00			1878		1878	1008	1920	2682.50	1037.23	3840.00	768.00	8327.73	4.43	8.26
23-Nov		24:00:00			23:02:00			2013		2013	1088	1920	2682.50	1302.23	3840.00	768.00	8592.73	4.27	7.90
24-Nov		24:00:00			19:25:00			1722		1722	816	1920	2682.50	1101.23	3840.00	768.00	8391.73	4.87	10.28
25-Nov		24:00:00			20:53:00			1752		1752	848	1920	2682.50	1075.23	3840.00	768.00	8365.73	4.77	9.87
26-Nov		19:49:00			18:41:00			1590		1590	808	1840	2682.50	983.23	3680.00	736.00	8081.73	5.08	10.00
27-Nov		24:00:00			23:52:00			1864		1864	976	1920	2682.50	1151.23	3840.00	768.00	8441.73	4.53	8.65
28-Nov		24:00:00			23:52:00			1913		1913	1016	1920	2682.50	951.23	3840.00	768.00	8241.73	4.31	8.11
29-Nov		24:00:00			23:23:00			1870		1870	944	1920	2682.50	1017.23	3840.00	768.00	8307.73	4.44	8.80
30-Nov	6:00:00	3:05:00		5:43:00	2:15:00		915	175		1090	592	2480	2682.50	1061.23	4960.00	992.00	9695.73	8.90	16.38
TOTAL	11:52:00	588:59:00	51:28:00	10:58:00	560:18:00	48:28:00	1499	47126	3187	51812	27600	58010	80475.00	30488.00	116020.00	23204.00	250187.00	4.83	9.06

xi. December 2011

Date	GG Hrs			Sync Hrs			Generated units kWh			Total kWh Gen/day	Exported units kWh	Total biomass used	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for gen.	Cost/kWh for Export
	GG 1	GG2	GG3	GG1	GG2	GG3	GG1	GG2	GG3										
1-Dec	12:42:00	4:30:00		12:17:00	4:20:00		1850	242		2092	1144	3040	2953.23	913.74	6080.00	1216.00	11162.97	5.34	9.76
2-Dec		24:00:00			17:10:00			1536		1536	696	1760	2953.23	1445.74	3520.00	704.00	8622.97	5.61	12.39
3-Dec		23:47:00			21:23:00			1729		1729	976	1920	2953.23	1379.74	3840.00	768.00	8940.97	5.17	9.16
4-Dec		24:00:00			23:47:00			1936		1936	1120	1920	2953.23	1563.74	3840.00	768.00	9124.97	4.71	8.15
5-Dec	4:30:00	23:21:00		3:45:00	20:53:00		608	1725		2333	1120	3520	2953.23	1527.74	7040.00	1408.00	12928.97	5.54	11.54
6-Dec		14:05:00	8:00:00		14:04:00	7:38:00		966	330	1296	576	2370	2953.23	1467.74	4740.00	948.00	10108.97	7.80	17.55
7-Dec			9:08:00			7:40:00			345	345	96	810	2953.23	1247.74	1620.00	324.00	6144.97	17.81	64.01
8-Dec			11:21:00			10:13:00			627	627	312	1350	2953.23	1421.74	2700.00	540.00	7614.97	12.15	24.41
9-Dec			23:03:00			22:24:00			1218	1218	488	2160	2953.23	1445.74	4320.00	864.00	9582.97	7.87	19.64
10-Dec		3:36:00	11:35:00		3:34:00	10:25:00		281	501	782	312	1730	2953.23	1387.74	3460.00	692.00	8492.97	10.86	27.22
11-Dec		24:00:00			22:15:00			1610		1610	808	1920	2953.23	1247.74	3840.00	768.00	8808.97	5.47	10.90
12-Dec		23:25:00			20:14:00			1691		1691	960	1920	2953.23	1329.74	3840.00	768.00	8890.97	5.26	9.26
13-Dec		24:00:00			22:21:00			1875		1875	1040	1920	2953.23	1313.74	3840.00	768.00	8874.97	4.73	8.53
14-Dec		17:30:00			16:50:00			1260		1260	680	1600	2953.23	1767.74	3200.00	640.00	8560.97	6.79	12.59
15-Dec		24:00:00			20:28:00			1678		1678	864	1920	2953.23	1401.74	3840.00	768.00	8962.97	5.34	10.37
16-Dec		24:00:00			22:25:00			1706		1706	920	1920	2953.23	1313.74	3840.00	768.00	8874.97	5.20	9.65
17-Dec		21:20:00			20:34:00			1592		1592	880	1680	2953.23	1401.74	3360.00	672.00	8386.97	5.27	9.53
18-Dec		24:00:00			23:36:00			1755		1755	928	1920	2953.23	1379.74	3840.00	768.00	8940.97	5.09	9.63
19-Dec		24:00:00			23:32:00			1680		1680	856	1920	2953.23	1379.74	3840.00	768.00	8940.97	5.32	10.45
20-Dec		24:00:00			16:58:00			1386		1386	568	1920	2953.23	1335.74	3840.00	768.00	8896.97	6.42	15.66

21-Dec		24:00:00			22:13:00			1523		1523	704	1920	2953.23	1449.74	3840.00	768.00	9010.97	5.92	12.80
22-Dec		23:30:00			18:47:00			1423		1423	768	1920	2953.23	1735.74	3840.00	768.00	9296.97	6.53	12.11
23-Dec		16:43:00			12:48:00			853		853	400	1520	2953.23	1467.74	3040.00	608.00	8068.97	9.46	20.17
24-Dec		24:00:00			21:34:00			1482		1482	648	1920	2953.23	1445.74	3840.00	768.00	9006.97	6.08	13.90
25-Dec		23:05:00			21:00:00			1303		1303	464	1920	2953.23	1401.74	3840.00	768.00	8962.97	6.88	19.32
26-Dec		23:30:00			21:52:00			1258		1258	432	1920	2953.23	1445.74	3840.00	768.00	9006.97	7.16	20.85
27-Dec		24:00:00			21:35:00			1115		1115	248	1920	2953.23	1593.74	3840.00	768.00	9154.97	8.21	36.92
28-Dec	9:50:00	13:20:00		8:53:00	12:35:00		1607	623		2230	1120	4000	2953.23	1555.74	8000.00	1600.00	14108.97	6.33	12.60
29-Dec	24:00:00			22:51:00			4139			4139	2712	5440	2953.23	1555.74	10880.00	2176.00	17564.97	4.24	6.48
30-Dec	24:00:00			20:17:00			3660			3660	2248	5760	2953.23	1475.74	11520.00	2304.00	18252.97	4.99	8.12
31-Dec	12:14:00			6:27:00			1065			1065	584	4240	2953.23	1313.74	8480.00	1696.00	14442.97	13.56	24.73
TOTAL	87:16:00	519:42:00	63:07:00	74:30:00	466:48:00	58:20:00	12929	34228	3021	50178	25672	71700	91550.00	44114.00	143400.00	28680.00	307744.00	6.13	11.99

C. Daily Data logged for 2012 (January to December 2012)

i. January 2012

Date	GG Hrs				Sync Hrs				kWh Generated				Total kWh /day	Export	Total biomass used	Diesel Used (Lts)	Diesel Cost	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Rs/kWh Gen.	Rs/kWh Export
	GG 1	GG2	GG3	DG4	GG1	GG2	GG3	DG4	GG1	GG2	GG3	DG4												
1-Jan													0		0			2780.65	1283.00	0.00	0.00	4063.65		
2-Jan													0		320			2780.65	1587.00	640.00	128.00	5135.65		
3-Jan													0		0			2780.65	1607.00	0.00	0.00	4387.65		
4-Jan													0		0			2780.65	1357.00	0.00	0.00	4137.65		
5-Jan													0		0			2780.65	1605.00	0.00	0.00	4385.65		
6-Jan													0		0			2780.65	1631.00	0.00	0.00	4411.65		
7-Jan	0:35:00	2:00:00		4:12:00		1:45:00		2:15:00	75	75		185	335	192	800	60	2782.8	2780.65	1773.00	1600.00	320.00	9256.45	27.63	48.21
8-Jan		7:55:00		6:30:00		7:15:00		5:20:00		403		475	878	480	800	150	6957	2780.65	1689.00	1600.00	320.00	13346.65	15.20	27.81
9-Jan		14:35:00		1:55:00		12:31:00		1:40:00		763		147	910	450	1280	45	2087.1	2780.65	1511.00	2560.00	512.00	9450.75	10.39	21.00
10-Jan													0	0	0			2780.65	1683.00	0.00	0.00	4463.65		
11-Jan													0	0	0			2780.65	1571.00	0.00	0.00	4351.65		
12-Jan		0:20:00				0:15:00				18			18	0	100			2780.65	2073.00	200.00	40.00	5093.65	282.98	
13-Jan		8:26:00	0:20:00			7:41:00				447			447	56	1200			2780.65	1649.00	2400.00	480.00	7309.65	16.35	130.53
14-Jan		8:10:00	4:35:00			8:01:00	4:00:00			487	133		620	136	1540			2780.65	1963.00	3080.00	616.00	8439.65	13.61	62.06

15-Jan	5:10:00		10:15:00		4:10:00		10:00:00		578		620		1198	578	2840			2780.65	1187.00	5680.00	1136.00	10783.65	9.00	18.66
16-Jan	10:45:00				10:10:00				1625				1625	976	3040			2780.65	1507.00	6080.00	1216.00	11583.65	7.13	11.87
17-Jan	1:30:00		20:25:00		1:00:00		20:08:00		140		1512		1652	816	3140			2780.65	1527.00	6280.00	1256.00	11843.65	7.17	14.51
18-Jan	0:55:00		23:50:00				23:15:00				1793		1793	952	2960			2780.65	1547.00	5920.00	1184.00	11431.65	6.38	12.01
19-Jan	10:45:00		2:25:00	1:05:00	10:40:00		0:10:00	1:00:00	1580		161	78	1819	1136	3300	24	1113.12	2780.65	1663.00	6600.00	1320.00	13476.77	7.41	11.86
20-Jan	24:00:00			1:15:00	19:10:00			1:05:00	3091			86	3177	1872	5760	27	1252.26	2780.65	1623.00	11520.00	2304.00	19479.91	6.13	10.41
21-Jan	24:00:00		0:07:00		23:40:00		0:05:00		3156		10		3166	1704	5860			2780.65	1583.00	11720.00	2344.00	18427.65	5.82	10.81
22-Jan	24:00:00				19:55:00				2767				2767	1440	5760			2780.65	1609.00	11520.00	2304.00	18213.65	6.58	12.65
23-Jan	13:45:00		5:05:00		13:30:00		5:00:00		1421		314		1735	896	3960			2780.65	1667.00	7920.00	1584.00	13951.65	8.04	15.57
24-Jan	1:50:00		23:02:00		1:35:00		20:51:00		161		1350		1511	608	3360			2780.65	1793.00	6720.00	1344.00	12637.65	8.36	20.79
25-Jan	2:20:00		24:00:00		2:20:00		20:35:00		264		1569		1833	936	3440			2780.65	1687.00	6880.00	1376.00	12723.65	6.94	13.59
26-Jan			24:00:00				23:22:00				1543		1543	792	2400			2780.65	1575.00	4800.00	960.00	10115.65	6.56	12.77
27-Jan		3:15:00	20:25:00			3:00:00	19:01:00			179			179	404	2600			2780.65	2076.00	5200.00	1040.00	11096.65	61.99	27.47
28-Jan		23:33:00				19:45:00				1327			1327	456	1920			2780.65	1589.00	3840.00	768.00	8977.65	6.77	19.69
29-Jan		22:40:00				17:00:00				1228			1228	424	1920			2780.65	1555.00	3840.00	768.00	8943.65	7.28	21.09
30-Jan		14:30:00	2:53:00			11:54:00	2:58:00			760	194		954	352	1880			2780.65	1943.00	3760.00	752.00	9235.65	9.68	26.24
31-Jan			23:25:00	2:10:00			21:15:00	0:40:00			1261	66	1327	608	2400	30	1391.4	2780.65	1815.00	4800.00	960.00	11747.05	8.85	19.32
TOTAL	119:35:00	105:24:00	184:47:00	17:07:00	106:10:00	89:07:00	170:40:00	12:00:00	14858	5687	10460	1037	32042	16264	62580	336	15584	86200	50928.00	125160.00	25032.00	302903.68	9.45	18.62

ii. Febraury

Date	GG Hrs				Sync Hrs				Generated units kWh				Total kWh Gen/day	Exported units kWh	Total biomass used	Diesel Used (Lts)	Diesel Cost	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for gen.	Cost/kWh for Export
	GG 1	GG2	GG3	DG4	GG1	GG2	GG3	DG4	GG 1	GG 2	GG3	DG 4												
1-Feb			20:23:00				18:56:00				1567		1567	776	2300		0	2577.59	745.66	4600.00	920.00	8843.24	5.64	11.40
2-Feb			19:00:00				16:10:00				1140		1140	536	1900		0	2577.59	705.66	3800.00	760.00	7843.24	6.88	14.63
3-Feb			21:50:00				19:42:00				1104		1104	384	2400		0	2577.59	699.66	4800.00	960.00	9037.24	8.19	23.53
4-Feb			9:15:00				8:13:00				449		449	168	1000		0	2577.59	661.66	2000.00	400.00	5639.24	12.56	33.57

5-Feb													0				0	2577.59	685.66	0.00	0.00	3263.24		
6-Feb				1:45:00				1:27:00				113	113	104		33.3	1544.45	2577.59	685.66	0.00	0.00	4807.70	42.55	46.23
7-Feb													0				0	2577.59	691.66	0.00	0.00	3269.24		
8-Feb			5:50:00				5:37:00				283		283	96	800		0	2577.59	665.66	1600.00	320.00	5163.24	18.24	53.78
9-Feb													0				0	2577.59	619.66	0.00	0.00	3197.24		
10-Feb			4:20:00				4:00:00				210		210	88	700		0	2577.59	665.66	1400.00	280.00	4923.24	23.44	55.95
11-Feb													0				0	2577.59	597.66	0.00	0.00	3175.24		
12-Feb													0				0	2577.59	597.66	0.00	0.00	3175.24		
13-Feb													0				0	2577.59	734.66	0.00	0.00	3312.24		
14-Feb													0				0	2577.59	685.66	0.00	0.00	3263.24		
15-Feb			1:10:00				0:40:00				25		25	0	400		0	2577.59	815.66	800.00	160.00	4353.24	174.13	
16-Feb			3:57:00				2:57:00				248		248	88	800		0	2577.59	1165.66	1600.00	320.00	5663.24	22.84	64.36
17-Feb			9:30:00				9:28:00				876		876	628	1000		0	2577.59	705.66	2000.00	400.00	5683.24	6.49	9.05
18-Feb			24:00:00				21:40:00				2060		2060	1364	2400		0	2577.59	745.66	4800.00	960.00	9083.24	4.41	6.66
19-Feb			21:25:00				20:12:00				1823		1823	1184	2400		0	2577.59	739.66	4800.00	960.00	9077.24	4.98	7.67
20-Feb			9:00:00				8:50:00				814		814	576	1000		0	2577.59	283.66	2000.00	400.00	5261.24	6.46	9.13
21-Feb													0				0	2577.59	265.66	0.00	0.00	2843.24		
22-Feb			12:30:00				12:25:00				1117		1117	752	1400		0	2577.59	621.66	2800.00	560.00	6559.24	5.87	8.72
23-Feb			15:50:00				15:08:00				1365		1365	896	2100		0	2577.59	757.66	4200.00	840.00	8375.24	6.14	9.35
24-Feb			23:32:00				21:55:00				2048		2048	1216	2760		0	2577.59	739.66	5520.00	1104.00	9941.24	4.85	8.18
25-Feb		2:35:00	24:00:00			2:20:00	22:35:00			184	2033		2217	1416	2670		0	2577.59	779.66	5340.00	1068.00	9765.24	4.40	6.90
26-Feb			24:00:00				23:29:00				2168		2168	1424	2400		0	2577.59	631.66	4800.00	960.00	8969.24	4.14	6.30
27-Feb			24:00:00				19:27:00				1881		1881	1192	2400		0	2577.59	699.66	4800.00	960.00	9037.24	4.80	7.58
28-Feb			24:00:00				22:27:00				2028		2028	1344	2400		0	2577.59	655.66	4800.00	960.00	8993.24	4.43	6.69
29-Feb			19:05:00				13:43:00				1289		1289	752	1900		0	2577.59	723.66	3800.00	760.00	7861.24	6.10	10.45
TOTAL	0:00:00	2:35:00	316:37:00	1:45:00	0:00:00	2:20:00	287:34:00	1:27:00	0	184	24528	113	24825	14984	35130	33	1544	74750	19773.00	70260.00	14052.00	180379.45	7.27	12.04

iii. March 2012

Date	GG Hrs				Sync Hrs				kWh Generated				Total kWh Gen/day	Export	Total biomass used	Diesel Used (Liters)	Diesel Cost	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for gen.	Cost/kWh for Export
	GG 1	GG2	GG3	DG4	GG1	GG2	GG3	DG4	GG1	GG2	GG3	DG4												
1-Mar			18:20:00				12:42:00				1245		1245	688	1900		0	2398.39	907.70	3800.00	760.00	7866.09	6.32	11.43
2-Mar			24:00:00				22:10:00				1948		1948	1192	2400		0	2398.39	841.70	4800.00	960.00	9000.09	4.62	7.55
3-Mar	3:00:00	16:50:00	1:15:00		2:40:00	14:35:00	0:45:00		481	1421	62		1964	984	3080		0	2398.39	973.70	6160.00	1232.00	10764.09	5.48	10.94
4-Mar	24:00:00				18:38:00				3888				3888	2488	6210		0	2398.39	885.70	12420.00	2484.00	18188.09	4.68	7.31
5-Mar	22:40:00				20:45:00				3810				3810	2456	6390		0	2398.39	841.70	12780.00	2556.00	18576.09	4.88	7.56
6-Mar	22:35:00				18:42:00				3507				3507	2152	6120		0	2398.39	819.70	12240.00	2448.00	17906.09	5.11	8.32
7-Mar	15:45:00	8:10:00			13:51:00	6:45:00			2425	628			3053	1768	4590		0	2398.39	883.70	9180.00	1836.00	14298.09	4.68	8.09
8-Mar	24:00:00				19:55:00				3650				3650	2256	5850		0	2398.39	929.70	11700.00	2340.00	17368.09	4.76	7.70
9-Mar	24:00:00	10:00:00			23:50:00	9:02:00			3707	876			4583	2840	6660		0	2398.39	775.70	13320.00	2664.00	19158.09	4.18	6.75
10-Mar	24:00:00				22:55:00				3481				3481	2072	5400		0	2398.39	888.70	10800.00	2160.00	16247.09	4.67	7.84
11-Mar	24:00:00				23:50:00				3657				3657	2240	5400		0	2398.39	687.70	10800.00	2160.00	16046.09	4.39	7.16
12-Mar	24:00:00				23:35:00				3583				3583	2160	5400		0	2398.39	709.70	10800.00	2160.00	16068.09	4.48	7.44
13-Mar	18:55:00				18:40:00				2869				2869	1784	4230		0	2398.39	885.70	8460.00	1692.00	13436.09	4.68	7.53
14-Mar	24:00:00				23:27:00				3657				3657	2264	5580		0	2398.39	803.70	11160.00	2232.00	16594.09	4.54	7.33
15-Mar	24:00:00				21:37:00				3343				3343	1936	5400		0	2398.39	863.70	10800.00	2160.00	16222.09	4.85	8.38
16-Mar	15:40:00				15:35:00				2208				2208	1312	3330		0	2398.39	885.70	6660.00	1332.00	11276.09	5.11	8.59
17-Mar	8:35:00	7:30:00			8:35:00	7:27:00			1647	704			2351	1416	4050		0	2398.39	995.70	8100.00	1620.00	13114.09	5.58	9.26
18-Mar	20:17:00	0:45:00			19:55:00	0:42:00			3778	72			3850	2592	7380		0	2398.39	775.70	14760.00	2952.00	20886.09	5.42	8.06
19-Mar		24:00:00				22:58:00				2389			2389	1432	2160		0	2398.39	819.70	4320.00	864.00	8402.09	3.52	5.87
20-Mar		24:00:00				23:14:00				2220			2220	1248	2160		0	2398.39	817.70	4320.00	864.00	8400.09	3.78	6.73
21-Mar		9:35:00	5:30:00			9:27:00	5:00:00			914	477		1391	736	1900		0	2398.39	871.70	3800.00	760.00	7830.09	5.63	10.64
22-Mar			10:15:00				10:15:00				757		757	448	1000		0	2398.39	709.70	2000.00	400.00	5508.09	7.28	12.29
23-Mar																	0	2398.39	445.70	0.00	0.00	2844.09		
24-Mar																	0	2398.39	445.70	0.00	0.00	2844.09		
25-Mar																	0	2398.39	445.70	0.00	0.00	2844.09		
26-Mar			1:20:00				1:17:00				97		97	48	470		0	2398.39	819.70	940.00	188.00	4346.09	44.81	90.54
27-Mar		5:15:00	16:15:00			5:13:00	16:15:00			493	974		1467	696	2140		0	2398.39	1013.70	4280.00	856.00	8548.09	5.83	12.28
28-Mar		24:00:00		2:06:00		23:40:00		1:37:00		2249		123	2372	1208	2260	44	2040.72	2398.39	1017.70	4520.00	904.00	10880.81	4.59	9.01

29-Mar		23:20:00	5:20:00			18:56:00	5:08:00			1739	399		2138	944	2760		0	2398.39	929.70	5520.00	1104.00	9952.09	4.65	10.54
30-Mar		24:00:00	10:55:00			21:23:00	10:53:00			2098	763		2861	1536	3260		0	2398.39	885.70	6520.00	1304.00	11108.09	3.88	7.23
31-Mar		19:55:00	5:10:00			18:45:00	5:05:00			1652	367		2019	1024	2490		0	2398.39	929.70	4980.00	996.00	9304.09	4.61	9.09
TOTAL	319:27:00	197:20:00	98:20:00	2:06:00	296:30:00	182:07:00	89:30:00	1:37:00	49691	17455	7089	123	74358	43920	109970	44	2041	74350	25507.70	219940.00	43988.00	365826.42	4.92	8.33

iv. April 2012

Date	Engine Hrs				Sync Hrs				Generated units kWh				Total kWh Gen/day	Exported units kWh	Total biomass used	Diesel Used (Liters)	Diesel Cost	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for gen.	Cost/kWh for Export
	GG 1	GG2	GG3	DG4	GG1	GG2	GG3	DG4	GG 1	GG2	GG3	DG 4												
1-Apr													0		0		0	2694.17	965.47	0.00	0.00	3659.63		
2-Apr		10:00:00				9:55:00				928			928	504	990		0	2694.17	924.47	1980.00	396.00	5994.63	6.46	11.89
3-Apr			7:30:00				6:35:00				474		474	248	800		0	2694.17	1036.47	1600.00	320.00	5650.63	11.92	22.78
4-Apr		10:00:00	8:05:00			9:15:00	7:20:00			903	696		1599	928	1880		0	2694.17	1218.47	3760.00	752.00	8424.63	5.27	9.08
5-Apr			9:05:00				8:10:00				714		714	448	1000		0	2694.17	990.47	2000.00	400.00	6084.63	8.52	13.58
6-Apr		9:20:00	7:15:00	0:45:00		9:15:00	7:10:00	0:35:00		898	633	28	1559	952	1790	9	417.42	2694.17	1052.47	3580.00	716.00	8460.05	5.43	8.89
7-Apr		7:00:00	9:30:00			6:25:00	8:55:00			615	634		1249	784	1810		0	2694.17	936.47	3620.00	724.00	7974.63	6.38	10.17
8-Apr		8:30:00	10:05:00			8:30:00	10:05:00			780	860		1640	992	2000		0	2694.17	950.47	4000.00	800.00	8444.63	5.15	8.51
9-Apr		9:35:00	10:15:00			9:35:00	10:00:00			883	854		1737	1048	2090		0	2694.17	1000.47	4180.00	836.00	8710.63	5.01	8.31
10-Apr		9:25:00				9:03:00				802			802	424	720		0	2694.17	1066.47	1440.00	288.00	5488.63	6.84	12.94
11-Apr		10:45:00				9:45:00				971			971	560	360		0	2694.17	1174.47	720.00	144.00	4732.63	4.87	8.45
12-Apr		12:50:00				11:25:00				1091			1091	552	1350		0	2694.17	1200.47	2700.00	540.00	7134.63	6.54	12.93
13-Apr		10:50:00				9:45:00				778			778	430	1190		0	2694.17	1040.47	2380.00	476.00	6590.63	8.47	15.33
14-Apr													0		0		0	2694.17	1144.47	0.00	0.00	3838.63		
15-Apr		5:10:00				4:50:00				465			465	210	1450		0	2694.17	1084.47	2900.00	580.00	7258.63	15.61	34.56
16-Apr		20:10:00				17:42:00				1732			1732	880	1980		0	2694.17	1136.47	3960.00	792.00	8582.63	4.96	9.75
17-Apr		22:00:00				18:37:00				1573			1573	768	2160		0	2694.17	1290.47	4320.00	864.00	9168.63	5.83	11.94
18-Apr		23:45:00				23:15:00				2173			2173	1168	2070		0	2694.17	1282.47	4140.00	828.00	8944.63	4.12	7.66
19-Apr		19:25:00				15:35:00				1398			1398	776	1890		0	2694.17	1182.47	3780.00	756.00	8412.63	6.02	10.84
20-Apr		24:00:00				22:10:00				1977			1977	928	2250		0	2694.17	1323.47	4500.00	900.00	9417.63	4.76	10.15
21-Apr		20:00:00	4:28:00			20:00:00	4:24:00			1576	331		1907	928	1800		0	2694.17	1112.47	3600.00	720.00	8126.63	4.26	8.76
22-Apr			24:00:00				23:45:00				1943		1943	1248	2400		0	2694.17	1092.47	4800.00	960.00	9546.63	4.91	7.65
23-Apr		8:00:00	22:00:00	1:05:00		5:53:00	19:48:00	1:00:00		513	1677	61	2251	1336	3210	16.3	755.994	2694.17	1350.47	6420.00	1284.00	12504.63	5.56	9.36
24-Apr			24:00:00				13:18:00				1818		1818	1128	2400		0	2694.17	1194.47	4800.00	960.00	9648.63	5.31	8.55

25-Apr			24:00:00				21:00:00				1781		1781	1080	2400		0	2694.17	1100.47	4800.00	960.00	9554.63	5.36	8.85
26-Apr		3:00:00	2:00:00			3:00:00	2:00:00			194	168		362	176	960		0	2694.17	1054.47	1920.00	384.00	6052.63	16.72	34.39
27-Apr		24:00:00				22:38:00				1540			1540	632	2070		0	2694.17	1080.47	4140.00	828.00	8742.63	5.68	13.83
28-Apr		24:00:00				23:30:00				1710			1710	752	2160		0	2694.17	1026.47	4320.00	864.00	8904.63	5.21	11.84
29-Apr		23:40:00				23:25:00				1769			1769	840	2160		0	2694.17	1030.47	4320.00	864.00	8908.63	5.04	10.61
30-Apr		21:10:00				20:42:00				1551			1551	776	2160		0	2694.17	1056.47	4320.00	864.00	8934.63	5.76	11.51
TOTAL	0:00:00	336:35:00	162:13:00	1:50:00	0:00:00	314:10:00	142:30:00	1:35:00	0	26820	12583	89	39492	21496	49500	25	1173	80825	33100.00	99000.00	19800.00	233898.41	5.92	10.88

v. May 2012

Date	Engine Hrs				Sync Hrs				Generated units kWh				Total kWh Gen/day	Exported units kWh	Total biomass used	Diesel Used (Liters)	Diesel Cost	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for gen.	Cost/kWh for Export
	GG 1	GG2	GG3	DG4	GG1	GG2	GG3	DG4	GG 1	GG2	GG 3	DG 4												
1-May		18:20:00				18:03:00				1619			1619	856	1980		0	2344.35	1071.66	3960.00	792.00	8168.02	5.05	9.54
2-May		24:00:00				21:32:00				1903			1903	912	2160		0	2344.35	1216.66	4320.00	864.00	8745.02	4.60	
3-May		24:00:00				22:35:00				1856			1856	808	2160		0	2344.35	1149.16	4320.00	864.00	8677.52	4.68	10.74
4-May		18:15:00				16:45:00				1335			1335	624	1710		0	2344.35	1081.66	3420.00	684.00	7530.02	5.64	12.07
5-May		24:00:00				20:35:00				1975			1975	920	2160		0	2344.35	1131.66	4320.00	864.00	8660.02	4.38	9.41
6-May		24:00:00				24:00:00				1996			1996	960	2250		0	2344.35	1081.66	4500.00	900.00	8826.02	4.42	9.19
7-May		24:00:00				24:00:00				2052			2052	976	2160		0	2344.35	1046.66	4320.00	864.00	8575.02	4.18	8.79
8-May		24:00:00				22:40:00				1939			1939	856	2160		0	2344.35	1029.16	4320.00	864.00	8557.52	4.41	10.00
9-May		20:10:00				16:53:00				1457			1457	640	1800		0	2344.35	1031.66	3600.00	720.00	7696.02	5.28	12.03
10-May		9:25:00				8:58:00				619			619	256	900		0	2344.35	1071.66	1800.00	360.00	5576.02	9.01	21.78
11-May		15:40:00				13:13:00				1078			1078	416	1440		0	2344.35	1089.16	2880.00	576.00	6889.52	6.39	16.56
12-May													0	0	0		0	2344.35	961.66	0.00	0.00	3306.02	-	-
13-May													0	0	0		0	2344.35	989.16	0.00	0.00	3333.52	-	-
14-May													0	0	0		0	2344.35	1034.16	0.00	0.00	3378.52	-	-
15-May													0	0	0		0	2344.35	1049.16	0.00	0.00	3393.52	-	-
16-May		8:23:00				8:05:00				836			836	464	810		0	2344.35	1009.16	1620.00	324.00	5297.52	6.34	11.42
17-May		24:00:00				21:54:00				2386			2386	1216	2160		0	2344.35	1131.66	4320.00	864.00	8660.02	3.63	7.12
18-May		11:20:00	3:25:00			11:20:00	3:15:00			1164	203		1367	760	1790		0	2344.35	1246.66	3580.00	716.00	7887.02	5.77	10.38
19-May		22:00:00	0:15:00			20:42:00	0:15:00			1998	19		2017	1064	2170		0	2344.35	1137.16	4340.00	868.00	8689.52	4.31	8.17
20-May		23:40:00				23:06:00				2345			2345	1280	2160		0	2344.35	1004.16	4320.00	864.00	8532.52	3.64	6.67
21-May		19:28:00				17:38:00				1684			1684	872	1710		0	2344.35	1041.66	3420.00	684.00	7490.02	4.45	8.59
22-May		13:00:00				13:00:00				1254			1254	664	1260		0	2344.35	989.16	2520.00	504.00	6357.52	5.07	9.57
23-May		24:00:00				23:25:00				2319			2319	1280	2160		0	2344.35	1059.16	4320.00	864.00	8587.52	3.70	6.71
24-May		24:00:00				23:00:00				2396			2396	1272	2070		0	2344.35	1049.16	4140.00	828.00	8361.52	3.49	6.57
25-May		24:00:00				23:55:00				2371			2371	1320	2160		0	2344.35	1019.16	4320.00	864.00	8547.52	3.61	6.48
26-May		24:00:00				23:35:00				2224			2224	1152	2160		0	2344.35	1221.66	4320.00	864.00	8750.02	3.93	7.60
27-May		23:10:00				22:05:00				1855			1855	904	2070		0	2344.35	1035.66	4140.00	828.00	8348.02	4.50	9.23
28-May		24:00:00				23:50:00				2231			2231	1176	2160		0	2344.35	1061.66	4320.00	864.00	8590.02	3.85	7.30

29-May		24:00:00				23:53:00				2402			2402	1336	2160		0	2344.35	1004.16	4320.00	864.00	8532.52	3.55	6.39
30-May		24:00:00				23:27:00				2298			2298	1248	2160		0	2344.35	1181.66	4320.00	864.00	8710.02	3.79	6.98
31-May		24:00:00				23:00:00				2301			2301	1256	2070		0	2344.35	974.16	4140.00	828.00	8286.52	3.60	6.60
TOTAL	0:00:00	562:51:00	3:40:00	0:00:00	0:00:00	535:09:00	3:30:00	0:00:00	0	49893	222	0	50115	25488	52110	0	0	72675	33201.00	104220.00	20844.00	230940.00	4.61	9.06

vi. June 2012

Date	Engine Hrs				Sync Hrs				kWh Generated				Total kWh Gen/day	Export	Total biomass used	Diesel Cost	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for gen.	Cost/kWh for Export
	GG 1	GG2	GG3	DG 4	GG1	GG2	GG3	DG4	GG1	GG2	GG 3	DG 4											
1-Jun		24:00:00				22:37:00				2190			2190	1128	2160	0	2649.17	835.83	4320.00	864.00	8669.00	3.96	7.69
2-Jun		23:50:00				23:10:00				2077			2077	1048	2160	0	2649.17	1120.83	4320.00	864.00	8954.00	4.31	8.54
3-Jun		24:00:00				23:35:00				1888			1888	944	2160	0	2649.17	815.83	4320.00	864.00	8649.00	4.58	9.16
4-Jun		10:30:00				10:30:00				785			785	312	810	0	2649.17	808.33	1620.00	324.00	5401.50	6.88	17.31
5-Jun		0:50:00				0:47:00				70			70	32	180	0	2649.17	868.33	360.00	72.00	3949.50	56.42	123.42
6-Jun		6:20:00				6:00:00				511			511	256	630	0	2649.17	708.33	1260.00	252.00	4869.50	9.53	19.02
7-Jun		10:30:00				9:40:00				826			826	424	990	0	2649.17	825.83	1980.00	396.00	5851.00	7.08	13.80
8-Jun		24:00:00				22:58:00				2107			2107	1128	2160	0	2649.17	803.33	4320.00	864.00	8636.50	4.10	7.66
9-Jun	1:25:00	12:37:00			0:25:00	12:20:00			90	1056			1146	584	3150	0	2649.17	813.33	6300.00	1260.00	11022.50	9.62	18.87
10-Jun																0	2649.17	690.83	0.00	0.00	3340.00	-	-
11-Jun	6:00:00	0:10:00			4:40:00	0:00:00			812	0			812	456	2610	0	2649.17	700.83	5220.00	1044.00	9614.00	11.84	21.08
12-Jun	9:20:00				8:48:00				1253				1253	696	2610	0	2649.17	685.83	5220.00	1044.00	9599.00	7.66	13.79
13-Jun	1:40:00				0:40:00				164				164	80	720	0	2649.17	703.33	1440.00	288.00	5080.50	30.98	63.51
14-Jun	1:40:00				0:22:00				128				128	40	630	0	2649.17	423.33	1260.00	252.00	4584.50	35.82	114.61
15-Jun																0	2649.17	670.83	0.00	0.00	3320.00	-	-
16-Jun	8:10:00				7:54:00				1452				1452	920	2340	0	2649.17	838.33	4680.00	936.00	9103.50	6.27	9.90
17-Jun	8:20:00				5:17:00				918				918	456	2880	0	2649.17	958.33	5760.00	1152.00	10519.50	11.46	23.07
18-Jun	12:35:00				12:23:00				2292				2292	1536	3600	0	2649.17	898.33	7200.00	1440.00	12187.50	5.32	7.93
19-Jun	24:00:00				23:31:00				4200				4200	2768	6480	0	2649.17	828.33	12960.00	2592.00	19029.50	4.53	6.87
20-Jun	24:00:00				23:55:00				4438				4438	2952	6480	0	2649.17	823.33	12960.00	2592.00	19024.50	4.29	6.44

21-Jun	24:00:00				23:25:00				4333				4333	2840	6480	0	2649.17	853.33	12960.00	2592.00	19054.50	4.40	6.71
22-Jun	24:00:00	1:24:00			21:28:00	0:00:00			4056				4056	2504	6660	0	2649.17	885.83	13320.00	2664.00	19519.00	4.81	7.80
23-Jun	21:35:00				19:15:00				3623				3623	2288	5850	0	2649.17	913.33	11700.00	2340.00	17602.50	4.86	7.69
24-Jun	24:00:00				21:41:00				4029				4029	2512	6300	0	2649.17	765.83	12600.00	2520.00	18535.00	4.60	7.38
25-Jun	24:00:00				23:52:00				4432				4432	2936	6480	0	2649.17	918.33	12960.00	2592.00	19119.50	4.31	6.51
26-Jun	24:00:00				23:33:00				4091				4091	2568	6480	0	2649.17	888.33	12960.00	2592.00	19089.50	4.67	7.43
27-Jun	24:00:00				23:35:00				4262				4262	2768	6480	0	2649.17	1173.33	12960.00	2592.00	19374.50	4.55	7.00
28-Jun	21:15:00				20:20:00				3912				3912	2552	5760	0	2649.17	838.33	11520.00	2304.00	17311.50	4.43	6.78
29-Jun	15:45:00				14:45:00				2601				2601	1648	4320	0	2649.17	958.33	8640.00	1728.00	13975.50	5.37	8.48
30-Jun	24:00:00				22:28:00				3917				3917	2392	6480	0	2649.17	945.83	12960.00	2592.00	19147.00	4.89	8.00
TOTAL	323:45:00	138:11:00	0:00:00	0:00:00	302:17:00	131:37:00	0:00:00	0:00:00	55003	11510	0	0	66513	40768	104040	0	79475	24962.50	208080.00	41616.00	354133.50	5.32	8.69

vii. July 2012

Date	Engine Hrs				Sync Hrs				Generated units kWh				Total kWh Gen/day	Exported units kWh	Total biomass used	Diesel Used (Liters)	Diesel Cost	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for gen.	Cost/kWh for Export
	GG 1	GG2	GG3	DG4	GG1	GG2	GG3	DG4	GG1	GG2	GG3	DG4												
1-Jul	24:00:00				23:29:00				4085				4085	2600	5760		0	2711.29	511.40	11520.00	2304.00	17046.69	4.17	6.56
2-Jul	22:16:00				22:06:00				3572				3572	2200	5440		0	2711.29	660.90	10880.00	2176.00	16428.19	4.60	7.47
3-Jul	10:45:00				10:45:00				1648				1648	1000	2880		0	2711.29	681.40	5760.00	1152.00	10304.69	6.25	10.30
4-Jul	7:30:00				7:08:00				1254				1254	800	2000		0	2711.29	758.90	4000.00	800.00	8270.19	6.60	10.34
5-Jul	24:00:00				23:25:00				4067				4067	2584	5760		0	2711.29	486.40	11520.00	2304.00	17021.69	4.19	6.59
6-Jul	24:00:00				22:52:00				3669				3669	2176	5600		0	2711.29	618.90	11200.00	2240.00	16770.19	4.57	7.71
7-Jul	24:00:00				22:16:00				3673				3673	2216	5600		0	2711.29	781.40	11200.00	2240.00	16932.69	4.61	7.64
8-Jul	19:45:00				19:45:00				2911				2911	1672	4720		0	2711.29	556.40	9440.00	1888.00	14595.69	5.01	8.73
9-Jul													0		90		0	2711.29	716.40	180.00	36.00	3643.69	-	-
10-Jul													0		0		0	2711.29	581.40	0.00	0.00	3292.69	-	-
11-Jul			2:00:00				1:20:00				45		45	16	360		0	2711.29	408.90	720.00	144.00	3984.19	88.54	249.01
12-Jul			3:30:00				1:30:00				240		240	112	450		0	2711.29	613.90	900.00	180.00	4405.19	18.35	39.33
13-Jul			3:15:00				0:00:00						0	0	450		0	2711.29	588.90	900.00	180.00	4380.19	-	-
14-Jul			13:10:00				8:50:00				853		853	480	1260		0	2711.29	603.90	2520.00	504.00	6339.19	7.43	13.21
15-Jul			22:10:00				22:02:00				1858		1858	1232	1980		0	2711.29	691.40	3960.00	792.00	8154.69	-	-
16-Jul			24:00:00				21:36:00				1857		1857	1192	2160		0	2711.29	676.40	4320.00	864.00	8571.69	4.62	7.19
17-Jul			19:50:00				18:17:00				1423		1423	808	1800		0	2711.29	558.90	3600.00	720.00	7590.19	5.33	9.39

18-Jul			0:50:00				0:40:00				42		42	8	270		0	2711.29	683.90	540.00	108.00	4043.19	96.27	505.40
19-Jul													0				0	2711.29	663.90	0.00	0.00	3375.19	-	-
20-Jul													0				0	2711.29	658.90	0.00	0.00	3370.19	-	-
21-Jul													0				0	2711.29	663.90	0.00	0.00	3375.19	-	-
22-Jul													0				0	2711.29	558.90	0.00	0.00	3270.19	-	-
23-Jul													0				0	2711.29	628.90	0.00	0.00	3340.19	-	-
24-Jul													0				0	2711.29	568.90	0.00	0.00	3280.19	-	-
25-Jul	2:30:00				2:20:00				310				310	168	800		0	2711.29	718.90	1600.00	320.00	5350.19	17.26	31.85
26-Jul													0				0	2711.29	616.40	0.00	0.00	3327.69	-	-
27-Jul													0				0	2711.29	208.90	0.00	0.00	2920.19	-	-
28-Jul													0				0	2711.29	551.40	0.00	0.00	3262.69	-	-
29-Jul													0				0	2711.29	573.90	0.00	0.00	3285.19	-	-
30-Jul													0				0	2711.29	618.90	0.00	0.00	3330.19	-	-
31-Jul													0				0	2711.29	663.90	0.00	0.00	3375.19	-	-
TOTAL	158:46:00	0:00:00	88:45:00	0:00:00	154:06:00	0:00:00	74:15:00	0:00:00	25189	0	6318	0	31507	19264	47380	0	0	84050	18875.50	94760.00	18952.00	216637.50	6.88	11.25

viii. August 2012

Date	Engine Hrs				Sync Hrs				Generated units kWh				Total kWh Gen/day	Exported units kWh	Total biomass used	Diesel Used (Liters)	Diesel Cost	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for gen.	Cost/kWh for Export
	GG 1	GG2	GG3	DG4	GG1	GG2	GG3	DG4	GG1	GG2	GG3	DG4												
1-Aug													0				0	2123.39	555.18	0.00	0.00	2678.56	-	-
2-Aug													0				0	2123.39	557.68	0.00	0.00	2681.06	-	-
3-Aug													0				0	2123.39	375.18	0.00	0.00	2498.56	-	-
4-Aug													0				0	2123.39	455.18	0.00	0.00	2578.56	-	-
5-Aug													0				0	2123.39	172.68	0.00	0.00	2296.06	-	-
6-Aug													0				0	2123.39	590.18	0.00	0.00	2713.56	-	-
7-Aug													0				0	2123.39	432.68	0.00	0.00	2556.06	-	-
8-Aug													0				0	2123.39	432.68	0.00	0.00	2556.06	-	-
9-Aug													0				0	2123.39	500.18	0.00	0.00	2623.56	-	-
10-Aug													0				0	2123.39	387.68	0.00	0.00	2511.06	-	-
11-Aug													0				0	2123.39	477.68	0.00	0.00	2601.06	-	-
12-Aug													0				0	2123.39	162.68	0.00	0.00	2286.06	-	-
13-Aug													0				0	2123.39	567.68	0.00	0.00	2691.06	-	-
14-Aug	1:20:00	0:30:00			1:10:00	0:20:00			178	32			210	104	1170		0	2123.39	955.18	2340.00	468.00	5886.56	28.03	56.60

15-Aug	0:17:00	1:06:00			0:00:00	0:51:00			0	81			81	56	270		0	2123.39	162.68	540.00	108.00	2934.06	36.22	52.39
16-Aug		8:15:00				8:00:00				722			722	352	900		0	2123.39	522.68	1800.00	360.00	4806.06	6.66	13.65
17-Aug		13:55:00				12:25:00				1210			1210	648	1350		0	2123.39	762.68	2700.00	540.00	6126.06	5.06	9.45
18-Aug		24:00:00				22:57:00				2136			2136	1216	2250		0	2123.39	627.68	4500.00	900.00	8151.06	3.82	6.70
19-Aug		24:00:00				23:30:00				2100			2100	1128	2250		0	2123.39	605.18	4500.00	900.00	8128.56	3.87	7.21
20-Aug		10:45:00				10:40:00				895			895	496	1080		0	2123.39	477.68	2160.00	432.00	5193.06	5.80	10.47
21-Aug	5:10:00				4:41:00				764				764	480	1620		0	2123.39	660.18	3240.00	648.00	6671.56	8.73	13.90
22-Aug	1:10:00				0:58:00				388				388	112	450		0	2123.39	702.68	900.00	180.00	3906.06	10.07	34.88
23-Aug																	0	2123.39	522.68	0.00	0.00	2646.06	-	-
24-Aug	0:15:00				0:00:00				0				0	0	180		0	2123.39	567.68	360.00	72.00	3123.06	-	-
25-Aug																	0	2123.39	500.18	0.00	0.00	2623.56	-	-
26-Aug																	0	2123.39	162.68	0.00	0.00	2286.06	-	-
27-Aug	11:10:00				10:50:00				2097				2097	1424	3510		0	2123.39	612.68	7020.00	1404.00	11160.06	5.32	7.84
28-Aug	19:45:00				19:03:00				3329				3329	2128	5400		0	2123.39	479.18	10800.00	2160.00	15562.56	4.67	7.31
29-Aug	5:10:00	2:00:00			4:45:00	1:58:00			744	136			880	560	1890		0	2123.39	687.68	3780.00	756.00	7347.06	8.35	13.12
30-Aug		24:00:00				22:30:00				2128			2128	1120	2250		0	2123.39	620.18	4500.00	900.00	8143.56	3.83	7.27
31-Aug		22:40:00				21:40:00				1602			1602	1040	2250		0	2123.39	575.18	4500.00	900.00	8098.56	5.06	7.79
TOTAL	44:17:00	131:11:00	0:00:00	0:00:00	41:27:00	124:51:00	0:00:00	0:00:00	7500	11042	0	0	18542	10864	26820	0	0	65825	15872.00	53640.00	10728.00	146065.00	7.88	13.44

ix. September 2012

Date	Engine Hrs				Sync Hrs				kWh Generated				Total kWh Gen/day	Export	Total biomass used	Diesel Used (Liters)	Diesel Cost	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for gen.	Cost/kWh for Export
	GG1	GG2	GG3	DG4	GG1	GG2	GG3	DG4	GG1	GG2	GG3	DG4												
1-Sep		24:00:00				24:00:00			0	2216	0	0	2216	1152	2160		0	1795.00	415.83	4320.00	864.00	7394.83	-	-
2-Sep		24:00:00				24:00:00			0	2214	0	0	2214	1168	2160		0	1795.00	280.83	4320.00	864.00	7259.83	-	-
3-Sep		24:00:00				22:00:00			0	2038	0	0	2038	968	2160		0	1795.00	503.33	4320.00	864.00	7482.33	-	-
4-Sep		24:00:00				22:17:00			0	2004	0	0	2004	1032	2160		0	1795.00	365.83	4320.00	864.00	7344.83	-	-
5-Sep		24:00:00				22:25:00			0	1912	0	0	1912	952	2160		0	1795.00	235.83	4320.00	864.00	7214.83	-	-
6-Sep		24:00:00				22:00:00			0	1958	0	0	1958	1008	2160		0	1795.00	460.83	4320.00	864.00	7439.83	-	-
7-Sep		23:00:00				22:25:00			0	1873	0	0	1873	920	2160		0	1795.00	490.83	4320.00	864.00	7469.83	-	-
8-Sep		21:55:00				11:45:00			0	1337	0	0	1337	488	1980		0	1795.00	460.83	3960.00	792.00	7007.83	-	-
9-Sep		24:00:00				11:15:00			0	2001	0	0	2001	1056	2160		0	1795.00	258.33	4320.00	864.00	7237.33	-	-

10-Sep		24:00:00				24:00:00			0	2067	0	0	2067	1104	2160		0	1795.00	468.33	4320.00	864.00	7447.33	-	-
11-Sep		24:00:00				21:34:00			0	1920	0	0	1920	968	2160		0	1795.00	438.33	4320.00	864.00	7417.33	-	-
12-Sep		24:00:00				20:48:00			0	1802	0	0	1802	880	2160		0	1795.00	438.33	4320.00	864.00	7417.33	-	-
13-Sep		17:15:00				15:25:00			0	1353	0	0	1353	704	1710		0	1795.00	335.83	3420.00	684.00	6234.83	-	-
14-Sep		24:00:00				21:49:00			0	1930	0	0	1930	976	2160		0	1795.00	368.33	4320.00	864.00	7347.33	3.81	7.53
15-Sep		24:00:00				20:27:00			0	1767	0	0	1767	840	2160		0	1795.00	370.83	4320.00	864.00	7349.83	4.16	8.75
16-Sep		4:15:00				4:15:00			0	294	0	0	294	128	810		0	1795.00	370.83	1620.00	324.00	4109.83	13.98	32.11
17-Sep		22:00:00				18:47:00			0	1646	0	0	1646	800	1980		0	1795.00	390.83	3960.00	792.00	6937.83	4.21	8.67
18-Sep		24:00:00				22:46:00			0	1672	0	0	1672	736	2160		0	1795.00	370.83	4320.00	864.00	7349.83	4.40	9.99
19-Sep		8:15:00				8:15:00			0	685	0	0	685	368	720		0	1795.00	73.33	1440.00	288.00	3596.33	5.25	9.77
20-Sep		3:05:00				3:00:00			0	196	0	0	196	0	450		0	1795.00	248.33	900.00	180.00	3123.33	15.94	-
21-Sep		0:00:00				0:00:00			0		0	0	0		0		0	1795.00	293.33	0.00	0.00	2088.33	-	-
22-Sep		0:00:00				0:00:00			0		0	0	0		0		0	1795.00	313.33	0.00	0.00	2108.33	-	-
23-Sep		0:00:00				0:00:00			0		0	0	0		0		0	1795.00	63.33	0.00	0.00	1858.33	-	-
24-Sep		0:00:00				0:00:00			0		0	0	0		0		0	1795.00	335.83	0.00	0.00	2130.83	-	-
25-Sep		1:25:00				0:00:00			0		0	0			180		0	1795.00	360.83	360.00	72.00	2587.83	-	-
26-Sep		0:00:00				0:00:00			0		0	0					0	1795.00	223.33	0.00	0.00	2018.33	-	-
27-Sep		0:00:00				0:00:00			0		0	0	0				0	1795.00	200.83	0.00	0.00	1995.83	-	-
28-Sep		0:00:00				0:00:00			0		0	0	0				0	1795.00	248.33	0.00	0.00	2043.33	-	-
29-Sep		0:00:00				0:00:00			0		0	0	0				0	1795.00	63.33	0.00	0.00	1858.33	-	-
30-Sep		0:00:00				0:00:00			0		0	0	0				0	1795.00	63.33	0.00	0.00	1858.33	-	-
TOTAL		413:10:00				363:13:00			0	32885	0	0	32885	16248	**38070**	0	0	53850.00	9512.50	76140.00	15228.00	154730.50	4.71	9.52

x. October 2012

Date	Engine Hrs				Sync Hrs				kWh Generated				Total kWh Gen/day	Export	Total biomass used	Diesel Used (Liters)	Diesel Cost	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for gen.	Cost/kWh for Export
	GG 1	GG2	GG3	DG4	GG1	GG2	GG3	DG4	GG1	GG2	GG3	DG4												
1-Oct		5:15:00				5:15:00				557			557	312	900		0	1482.26	520.00	1800.00	360.00	4162.26	-	-
2-Oct		8:30:00				4:30:00				300			300	200	990		0	1482.26	415.00	1980.00	396.00	4273.26	-	-
3-Oct		0:00:00				0:00:00				0			0	0	0		0	1482.26	282.00	0.00	0.00	1764.26	-	-
4-Oct		0:00:00				0:00:00				0			0	0	0		0	1482.26	355.00	0.00	0.00	1837.26	-	-

5-Oct		0:00:00				0:00:00				0			0	0	0		0	1482.26	340.00	0.00	0.00	1822.26	-	-
6-Oct		0:00:00				0:00:00				0			0	0	0		0	1482.26	565.00	0.00	0.00	2047.26	-	-
7-Oct		0:35:00				0:00:00				0			0	0	0		0	1482.26	595.00	0.00	0.00	2077.26	-	-
8-Oct		0:00:00				0:00:00				0			0	0	0		0	1482.26	495.00	0.00	0.00	1977.26	-	-
9-Oct		3:25:00				0:00:00				0			0	0	0		0	1482.26	562.00	0.00	0.00	2044.26	-	-
10-Oct		13:20:00				12:20:00				1000			1000	816	1350		0	1482.26	547.00	2700.00	540.00	5269.26	-	-
11-Oct		20:00:00				19:05:00				1570			1570	752	2160		0	1482.26	522.00	4320.00	864.00	7188.26	-	-
12-Oct		24:00:00				23:10:00				1863			1863	904	2160		0	1482.26	405.00	4320.00	864.00	7071.26	-	-
13-Oct		11:57:00				8:30:00				825			825	376	1080		0	1482.26	385.00	2160.00	432.00	4459.26	-	-
14-Oct		0:00:00				0:00:00				0			0	0	0		0	1482.26	167.00	0.00	0.00	1649.26	-	-
15-Oct		0:00:00				0:00:00				0			0	0	0		0	1482.26	167.00	0.00	0.00	1649.26	-	-
16-Oct		0:00:00				0:00:00				0			0	0	0		0	1482.26	445.00	0.00	0.00	1927.26	-	-
17-Oct		0:00:00				0:00:00				0			0	0	0		0	1482.26	465.00	0.00	0.00	1947.26	-	-
18-Oct		0:00:00				0:00:00				0			0	0	0		0	1482.26	475.00	0.00	0.00	1957.26	-	-
19-Oct		0:00:00				0:00:00				0			0	0	0		0	1482.26	407.00	0.00	0.00	1889.26	-	-
20-Oct		0:00:00				0:00:00				0			0	0	0		0	1482.26	312.00	0.00	0.00	1794.26	-	-
21-Oct		0:00:00				0:00:00				6			6	0	0		0	1482.26	322.00	0.00	0.00	1804.26	300.71	-
22-Oct		11:15:00				10:25:00				789			789	360	1350		0	1482.26	415.00	2700.00	540.00	5137.26	6.51	14.27
23-Oct		13:00:00				12:12:00				961			961	961	1260		0	1482.26	170.00	2520.00	504.00	4676.26	-	-
24-Oct		0:00:00				0:00:00				0			0	0	0		0	1482.26	175.00	0.00	0.00	1657.26	-	-
25-Oct		7:55:00				6:00:00				463			463	216	1080		0	1482.26	495.00	2160.00	432.00	4569.26	-	-
26-Oct		24:00:00				22:23:00				1997			1997	992	2160		0	1482.26	420.00	4320.00	864.00	7086.26	-	-
27-Oct		17:15:00				16:10:00				1336			1336	656	1710		0	1482.26	405.00	3420.00	684.00	5991.26	4.48	9.13
28-Oct		0:00:00				0:00:00				0			0	0	0		0	1482.26	167.00	0.00	0.00	1649.26	-	-
29-Oct		0:00:00				0:00:00				0			0	0	0		0	1482.26	340.00	0.00	0.00	1822.26	-	-
30-Oct		0:00:00				0:00:00				0			0	0	0		0	1482.26	332.00	0.00	0.00	1814.26	-	-
31-Oct		6:00:00				5:14:00				502			502	224	900		0	1482.26	448.00	1800.00	360.00	4090.26	8.15	18.26
TOTAL	0:00:00	166:27:00	0:00:00	0:00:00	0:00:00	145:14:00	0:00:00	0:00:00	0	12169	0	0	12169	6769	**17100**	0	0	45950	12115.00	34200.00	6840.00	99105.06	8.14	14.64

xi. November 2012

Date	Engine Hrs				Sync Hrs				kWh Generated				Total kWh Gen/day	Export	Total biomass used	Diesel Used (Liters)	Diesel Cost	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for gen.	Cost/ kWh for Export
	GG 1	GG2	GG 3	DG 4	GG 1	GG2	GG 3	DG 4	GG 1	GG2	GG 3	DG 4												
1-Nov		12:55:00				9:36:00			0	964	0	0	964	258	1620		0	1603.94	424.08	3240.00	648.00	5916.02	-	-
2-Nov		21:55:00				20:58:00			0	2003	0	0	2003	1120	1980		0	1603.94	444.08	3960.00	792.00	6800.02	-	-
3-Nov		24:00:00				23:45:00			0	2186	0	0	2186	1176	2160		0	1603.94	491.58	4320.00	864.00	7279.52	-	-
4-Nov		21:45:00				18:10:00			0	1649	0	0	1649	824	2070		0	1603.94	531.58	4140.00	828.00	7103.52	-	-
5-Nov		22:45:00				22:45:00			0	1806	0	0	1806	864	2070		0	1603.94	511.58	4140.00	828.00	7083.52	-	-
6-Nov		12:05:00				12:05:00			0	729	0	0	729	128	1350		0	1603.94	491.58	2700.00	540.00	5335.52	-	-
7-Nov		7:20:00				5:15:00			0	1267	0	0	1267	392	1080		0	1603.94	499.08	2160.00	432.00	4695.02	-	-
8-Nov		21:35:00				19:20:00			0	1306	0	0	1306	496	1980		0	1603.94	381.58	3960.00	792.00	6737.52	-	-
9-Nov		14:35:00				14:35:00			0	1035	0	0	1035	434	1440		0	1603.94	429.08	2880.00	576.00	5489.02	-	-
10-Nov		24:00:00				19:45:00			0	1804	0	0	1804	872	2160		0	1603.94	496.58	4320.00	864.00	7284.52	-	-
11-Nov		23:15:00				23:15:00			0	1931	0	0	1931	1024	2160		0	1603.94	491.58	4320.00	864.00	7279.52	-	-
12-Nov		24:00:00				23:30:00			0	1754	0	0	1754	840	2160		0	1603.94	436.58	4320.00	864.00	7224.52	-	-
13-Nov		24:00:00				18:45:00			0	1472	0	0	1472	760	2160		0	1603.94	501.58	4320.00	864.00	7289.52	-	-
14-Nov		24:00:00				23:30:00			0	1928	0	0	1928	816	2160		0	1603.94	469.08	4320.00	864.00	7257.02	3.76	8.89
15-Nov		24:00:00				21:35:00			0	1842	0	0	1842	1080	2160		0	1603.94	416.58	4320.00	864.00	7204.52	3.91	6.67
16-Nov		13:00:00				13:00:00			0	1761	0	0	1761	320	1170		0	1603.94	401.58	2340.00	468.00	4813.52	2.73	15.04
17-Nov		0:00:00				0:00:00			0	0	0	0	0	0	0		0	1603.94	141.58	0.00	0.00	1745.52	-	-
18-Nov		5:35:00				5:35:00			0	1510	0	0	1510	240	720		0	1603.94	446.58	1440.00	288.00	3778.52	2.50	15.74
19-Nov		23:20:00				10:50:00			0	1403	0	0	1403	784	2160		0	1603.94	691.58	4320.00	864.00	7479.52	5.33	9.54
TOTAL		**344:05:00**				**306:14:00**			**0**	**28350**	**0**	**0**	**28350**	**12428**	**32760**	**0**	**0**	**30474.86**	**8697.52**	**65520.00**	**13104.00**	**117796.38**	**4.16**	**9.48**

xii. December 2012

Date	Engine Hrs				Sync Hrs				kWh Generated				Total kWh Gen/day	Export	Total biomass used	Diesel Used (Liters)	Diesel Cost	Labour cost	Maint, Cost	Biomass cost	Cutting cost	Total cost	Cost /kWh for gen.	Cost/kWh for Export
	GG 1	GG2	GG3	DG4	GG1	GG2	GG3	DG4	GG1	GG2	GG3	DG4												
1-Dec	0:00:00	10:30:00	0:00:00	0:00:00	0:00:00	10:20:00	0:00:00	0:00:00	0	1054	0	0	1054	400	1350	0	0	1777.42	400.88	2700	540.00	5418.30	5.14	13.55
2-Dec	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0	0	0	0	0	0	0	0	0	1777.42	198.38	0	0.00	1975.80	-	-
3-Dec	0:00:00	3:50:00	0:00:00	0:00:00	0:00:00	2:00:00	0:00:00	0:00:00	0	93	0	0	93	32	450	0	0	1777.42	378.38	900	180.00	3235.80	34.79	101.12
4-Dec	0:00:00	23:00:00	0:00:00	0:00:00	0:00:00	22:20:00	0:00:00	0:00:00	0	1408	0	0	1408	320	2160	0	0	1777.42	688.38	4320	864.00	7649.80	5.43	23.91
5-Dec	0:00:00	23:10:00	0:00:00	0:00:00	0:00:00	22:20:00	0:00:00	0:00:00	0	1939	0	0	1939	1776	2160	0	0	1777.42	378.38	4320	864.00	7339.80	3.79	4.13
6-Dec	0:00:00	24:00:00	0:00:00	0:00:00	0:00:00	21:50:00	0:00:00	0:00:00	0	1279	0	0	1279	856	2160	0	0	1777.42	378.38	4320	864.00	7339.80	5.74	8.57
7-Dec	0:00:00	21:05:00	0:00:00	0:00:00	0:00:00	19:23:00	0:00:00	0:00:00	0	1649	0	0	1649	728	2070	0	0	1777.42	343.38	4140	828.00	7088.80	4.30	9.74
8-Dec	0:00:00	23:32:00	0:00:00	0:00:00	0:00:00	19:07:00	0:00:00	0:00:00	0	1710	0	0	1710	768	2160	0	0	1777.42	268.38	4320	864.00	7229.80	4.23	9.41
9-Dec	0:00:00	21:00:00	0:00:00	0:00:00	0:00:00	21:10:00	0:00:00	0:00:00	0	1709	0	0	1709	848	2070	0	0	1777.42	420.88	4140	828.00	7166.30	4.19	8.45
10-Dec	0:00:00	14:35:00	0:00:00	0:00:00	0:00:00	13:00:00	0:00:00	0:00:00	0	1223	0	0	1223	448	1620	0	0	1777.42	340.88	3240	648.00	6006.30	4.91	13.41
11-Dec	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0	0	0	0	0	0	0	0	0	1777.42	288.38	0	0.00	2065.80	-	-
12-Dec	0:00:00	7:55:00	0:00:00	0:00:00	0:00:00	4:30:00	0:00:00	0:00:00	0	573	0	0	573	384	1080	0	0	1777.42	468.38	2160	432.00	4837.80	8.44	12.60
13-Dec	0:00:00	15:35:00	0:00:00	0:00:00	0:00:00	15:10:00	0:00:00	0:00:00	0	1209	0	0	1209	616	1800	0	0	1777.42	433.38	3600	720.00	6530.80	5.40	10.60
14-Dec	0:00:00	13:03:00	0:00:00	0:00:00	0:00:00	11:53:00	0:00:00	0:00:00	0	984	0	0	984	464	1440	0	0	1777.42	400.88	2880	576.00	5634.30	5.73	12.14
15-Dec	0:00:00	16:10:00	0:00:00	0:00:00	0:00:00	16:05:00	0:00:00	0:00:00	0	1336	0	0	1336	672	1620	0	0	1777.42	310.88	3240	648.00	5976.30	4.47	8.89
16-Dec	0:00:00	9:10:00	0:00:00	0:00:00	0:00:00	7:50:00	0:00:00	0:00:00	0	739	0	0	739	360	1440	0	0	1777.42	400.88	2880	576.00	5634.30	7.62	15.65
17-Dec	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0	0	0	0	0	0	0	0	0	1777.42	378.38	0	0.00	2155.80	-	-
18-Dec	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0	0	0	0	0	0	0	0	0	1777.42	355.88	0	0.00	2133.30	-	-
19-Dec	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0	0	0	0	0	0	0	0	0	1777.42	288.38	0	0.00	2065.80	-	-
20-Dec	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0	0	0	0	0	0	0	0	0	1777.42	223.38	0	0.00	2000.80	-	-
21-Dec	0:00:00	12:20:00	0:00:00	0:00:00	0:00:00	12:13:00	0:00:00	0:00:00	0	23	0	0	23	8	1080	0	0	1777.42	378.38	2160	432.00	4747.80	206.43	593.48
22-Dec	0:00:00	20:20:00	0:00:00	0:00:00	0:00:00	12:48:00	0:00:00	0:00:00	0	476	0	0	476	104	2160	0	0	1777.42	263.38	4320	864.00	7224.80	15.18	69.47
23-Dec	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0	0	0	0	0	0	0	0	0	1777.42	365.88	0	0.00	2143.30	-	-
24-Dec	0:00:00	14:10:00	0:00:00	0:00:00	0:00:00	14:00:00	0:00:00	0:00:00	0	876	0	0	876	512	1440	0	0	1777.42	468.38	2880	576.00	5701.80	6.51	11.14
25-Dec	0:00:00	3:20:00	0:00:00	0:00:00	0:00:00	2:20:00	0:00:00	0:00:00	0	224	0	0	224	88	0	0	0	1777.42	345.88	0	0.00	2123.30	9.48	24.13
26-Dec	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0	0	0	0	0	0	0	0	0	1777.42	313.38	0	0.00	2090.80	-	-
27-Dec	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0	0	0	0	0	0	0	0	0	1777.42	388.38	0	0.00	2165.80	-	-

28-Dec	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0	0	0	0	0	0	0	0	0	1777.42	288.38	0	0.00	2065.80	-	-
29-Dec	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0	0	0	0	0	0	0	0	0	1777.42	320.88	0	0.00	2098.30	-	-
30-Dec	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0	0	0	0	0	0	0	0	0	1777.42	48.38	0	0.00	1825.80	-	-
31-Dec	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00		0	0	0	0	0	0	0		1777.42	378.38	0	0.00	2155.80	-	-
TOTAL	**0:00:00**	**276:45:00**	**0:00:00**	**0:00:00**	**0:00:00**	**248:19:00**	**0:00:00**	**0:00:00**	**0**	**18504**	**0**	**0**	**18504**	**9384**	**28260**	**0**	**0**	**55100.02**	**10904.78**	**56520**	**11304.00**	**131673.00**	**7.12**	**14.03**

ANNEX III

PLANT PERSONNEL

THE CURRENT FULL TIME STAFF AT KABBIGERE PLANT

SL NO	STAFF NAME	DESIGNATION
1	Sri MANSOOR AHMED	PROJECT SUPERVISOR
2	Sri GANGARAJU.K.V	PLANT OPERATOR
3	Sri RAMALINGAIAH.B.V	SHIFT TECHNICIAN

THE CURRENT SECURITY STAFF AT KABBIGERE PLANT

1	Sri THIMMANNA	SECURITY
2	Sri LINGARAJU	SECURITY

THE CURRENT SECURITY STAFF AT BOREGUNTE PLANT

1	Sri RANGANATHAPPA	SECURITY
2	Sri RANGAPPA	SECURITY

THE CURRENT SECURITY STAFF AT SEEBINAYAPALYA PLANT

1	Sri RAMANJINAPPA	SECURITY
2	Sri HANUMATHARAYAPPA	SECURITY

THE CURRENT DAILY WAGES STAFF AT KABBIGERE

1	Sri RANGARAJU	Trainee / shift operator

2	Sri.RANGANTHA.B.M	Trainee / shift operator
3	Sri MALLIKARJUNA	Trainee / shift operator
4	Sri RANGANTHA.B.M.(RANGA.B.M)	Trainee / shift operator
5	Sri KAMARAJU	Trainee / shift operator
6	Sri SANNA MALLAPPA	Trainee / shift operator
7	Sri RAVI KUMAR	Trainee / shift operator
8	Sri RAMACHANDRAPPA	Trainee / shift operator
9	SMT.YASHODAMMA	Biomass cutting/handling
10	MS.BHAGYAMMA	Biomass cutting/handling
11	MS.KARIYAMMA	Biomass cutting/handling
12	SMT.BORAKKA	Biomass cutting/handling
13	SMT.GANGAMMA	Biomass cutting/handling
14	SMT.PUTTAMMA	Biomass cutting/handling

ANNEX IV:

PROJECT PLANNING MATRIX

NARRATIVE SUMMARY	OBJECTIVITY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	CRITICAL ASSUMPTIONS
I. Development Objective (Impacts)			
To reduce CO_2 emissions through the promotion of bioenergy as a viable and sustainable option to meet the rural energy service needs in India.	Extent of energy needs met by bio-energy Reduction in use of non-renewable energy sources	Adoption of bioenergy packages in other parts of rural India	Globally, bioenergy package will continue to be one of the key climate-mitigation options and the government is committed towards the reduction in GHG emissions. Provision of good quality bioenergy services will improve the quality of life, and thereby lead to it replication in other parts of rural India. Large scale use of bioenergy will lead to reduction in GHG emissions.
II. Immediate Objective (Outcomes) / Purposes:			
Immediate Objective 1: To provide a decentralized bioenergy technology package for the provision of good quality rural energy services for lighting, drinking water supply, cooking gas, irrigation water supply and milling.	% of households having access to bioenergy services % Functional bioenergy systems meeting the % energy requirements	Per capita bioenergy consumed	The findings of survey undertaken as part of PDF activities hold good
Activity 1: Technology Package Standardization			
Output 1: Development; adaptation; and resulting availability of gas engines—which are available; locally – to use the renewable feedstock proposed under the project	No. of systems installed	Evaluation of performance of gas engines	Introduction of gas engines will improve the efficiency and use of 100% renewable resources and lead to reduction in costs of services.
Output 2: Detailed technical specifications will be drawn for the proposed bioenergy package in selected areas	Report on recommended specifications	Evaluation report of technical specifications	The technological components are well known and trouble free and could be adopted and modified and put together to suit local conditions without a large effort in R & D. The industry will favour high quality standards and adhere to the standards while producing these equipments.
Output 3: Draft standards for bioenergy technologies for use in Activity 2 to test their suitability for wider applications	Established technical standards	Findings of the proposed monitoring activities	Standards will enhance the reliability and confidence level of the customers
Activity 2: Technology Demonstration and proof of Concept (response to the technical barriers)			

Output 1: 1.2 MW biomass gasifier (60 units of 20 kw capacity) based power plants with a generating potential of 4800 MWh of bioelectricity annually.	Number of installed bioenergy systems having the recommended specifications / standards Capacity utilization of installed systems	% increase in area under bioenergy irrigation and corresponding outputs Quantity of fossil fuel substituted	Increase in incomes lead to demand for good quality energy services There will not be any conflicts arising out of sharing of irrigation water.
Output 2: 120kW (3-10 kW each) Community biogas cum bio-fertilizer systems generating 346 MWh for base loads	No. of households connected to biogas	% of household having access to lighting services	Rural communities aspire for better quality of life
Output 3: 24 Biogas cum bio-fertilizer systems in 24 village settlements with a total capacity of 4000m3/day (range 25 to 100m3/day) for cooking gas and bio-fertilizer production	No. of households connected to biogas electricity	Reduction in fuelwood consumption and fertilizer sales	The targeted beneficiaries of the project will prefer bioenergy services than conventional forms of use of energy
Output 4: Establish 452 ha of short rotation forest plantations, 371 ha of agro-forestry systems, 271 ha of community forestry 471 ha of orchards and 113 ha of high input forestry	Area covered under forests	Overall increase in forest area	There will not be major land tenure issues and the stakeholders' cooperation is guaranteed. The communities will participate in the sustainable forestry activities
Output 5: Lessons in different modes of providing the rural energy service package to rural villages, including experience in gaining full cost recovery.	Case studies documented	Review of project implementation results	Bioenergy services would not become financially less attractive due to pricing ploicies of competing energy service utilities. People will actually pay fee for services utilized.
Activity 3: Enabling activities (response to the market barriers)			
Output 1: A solid rationale and framework justifying the fee-for-service approach of rural energy provisions.	Framework for fee for services established	Framework for fee for services adopted	Relevant government and private stakeholders' actively participate in developing appropriate policies.
Output 2: Policy papers to address the issue of *level playing field* for bioenergy package such as policy analysis for rational pricing of energy	Policy papers published	Changes in relevant policies	Relevant government and private stakeholders' actively participate in developing appropriate policies
Output 3: Case studies to highlight successful policy implementation experiences	Case studies documented	Case studies disseminated	The project will be closely monitored and regular feedback will be provided
Output 4: Workshops to involve stakeholders especially policy makers to exchange the experiences, study tours and policy research activities	Extent of participation and recommendations	Extent of recommendations accepted	The recommendations will provide key basis to some of the intended policy changes – such as level playing field for bioenergy services

Output 5: Documentation of lessons learnt and sharing of experiences;	No. of cases documented		
Output 6: Monitoring and evaluation of the proposed project approach and activities	Quarterly reports Annual reports	Progress made in the implementation of the project	All stakeholders will provide inputs to the monitoring team in addition to their direct feedback to the implementing agency.
Activity 4: Information dissemination (response to the information barriers)			
Output 1: Information system on bioenergy technologies, manufacturers, technology suppliers, financial mechanisms, technical performance, R & D facilities and technical experts			Awareness modules will reach the targeted beneficiaries/users
Output 2: Methods for project formulation including financial analysis, implementation, monitoring, etc for potential replicability			
Output 3: Promotional modules using audio-visual print and other media.	Case studies, video films, Software packages developed	Extensive use of promotional modules	
Activity 5: Removal of Financial Barriers and Creation of Investment Risk Fund (response to the financial barriers)			
Output 1: Provision of venture capital for franchisers and franchisees as start-up capital;	Number of entrepreneurs financed	Enterprises / Rural Energy Service Company (RESCO) operating successfully	There will be sustained demand for good quality bioenergy services
Output 2: Creation of revolving fund to offset perceived investment risks;	Loan recovery rate Private investments leveraged	Revolving Fund mechanisms in place	
Output 3: Formulation of a approach involving bidding for concessions to operate future bioenergy systems in areas targeted for replications	Replicable approaches formulated	Replicable approaches adopted	Other areas would be receptive to the recommended approaches
Output 4: Demonstration of economic and financial viability through creation of cost recovery mechanisms	Private investments by the enterprises	Institutional networks for funding in place	Other financing institutions provide loans for bioenergy technologies and services
Output 5: Demonstration of willingness and capacity of rural households to pay for good quality energy services	Loan recovery rate Increase in demand for good quality energy services	Agencies providing credit to households for bioenergy services	Other financing agencies, NGO's etc., to provide credit for bioenergy technologies and services