LIHIR GOLD LIMITED

LIHIR GEOTHERMAL POWER PROJECT
UNFCCC Reference Number 0279

MONITORING REPORT
3rd Reporting Period

Project Site:	Lihir Island, New Ireland Province, Papua New Guinea
Monitoring Period:	1st October 2007 – 31st August 2008
Prepared By:	Lihir Gold Limited (LGL)
Submission:	3rd Monitoring Report v1 submitted 15th October 2008

The New Lihir Gold

People Results Growth

Certified Environmental Management

EXECUTIVE SUMMARY

This document reports on the emission reductions generated by the Lihir Geothermal Power Plant (LGPP), CDM Registration Reference No. 0279 for the third monitoring period beginning 1st October 2007 through to 31st August 2008.

Emission reductions documented in this report contain data for the full energy producing capacity of 55MW for the LGPP.

This project has reduced emissions by displacing electricity that was generated through the combustion of heavy fuel oil (HFO) at the LGL Diesel Power Station.

Project activity emissions are calculated from reductions on burning of fossil fuels compared to baseline years 2002-2004, as well as the drilling of new wells to source additional steam for the LGPP.

The net power production for this reporting period was 318,974MWhrs resulting in 216,264t CO_2-e emissions reduced from the grid. However, five new wells were drilled to source additional steam for the LGPP resulting in project activity emissions of 15,889t CO_2-e produced.

Based on the emissions reduced from the grid of 216,264t CO_2-e minus the project emissions generated, the total emission reductions for this reporting period are 200,376t CO_2 -e.

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APPENDICES

ABBREVIATIONS AND GLOSSARY OF TERMS

LGPP	Lihir Geothermal Power Plant
LGL	Lihir Gold Limited
MW	Megawatt
HFO	Heavy Fuel Oil
PDD	Project Design Document
CER's	Certified Emission Reductions
SOP	Standard Operating Procedure
NCG's	Non-Condensable Gases
IGNS	Institute of Geological and Nuclear Sciences
$C0_2$	Carbon Dioxide
CH_4	Methane
E6	Ellipse 6
TFT	Tracer Flow Testing
GHG	Greenhouse Gas
PI	Process Information
CDM	Clean Development Mechanism
t CO_2 -e	tonnes carbon dioxide equivalent
GW	Geothermal Well

1 INTRODUCTION

This document reports on the emission reductions generated by the Lihir Geothermal Power Plant (LGPP), CDM Registration Reference No. 0279 for its third monitoring period. The power plant remains under the ownership of Lihir Gold Limited (LGL).

The LGPP uses geothermal steam produced from mine depressurization operations to create an ultimate nominal power producing capacity of 55MW (50MW net capacity).

This project has reduced emissions by displacing electricity that was generated through the combustion of heavy fuel oil (HFO) at the LGL Diesel Power Station.

Approved consolidated monitoring methodology ACM0002 “Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources” is used for this project as stated in the Project Design Document (PDD).

The PDD was revised in June 2008 to correct the description of the calculated grid emission factor used to calculate emissions reduced from the grid. The revised monitoring plan was approved by the CDM Executive Board on the 17th August, 2008.

2 IMPLEMENTATION AND CURRENT STATUS

Emission reductions documented in this report contain data for the 55MW geothermal power project only.

A total plant shutdown was carried out during this reporting period. The 33MW plant was shutdown from the 14th February to the 22nd February while the 22MW plant was shutdown from the 16th to 17th February, for service and maintenance of equipment.

Nine geothermal wells were supplying steam to the LGPP commencing this reporting period. In March 2008, GW49, GW1306 & GW1307 were commissioned and put online. In May 2008, GW51 & GW53 were commissioned and tied-in to the steam

supply system and in late June, GW56 was placed on-line also. GW17 was decommissioned in late August, bringing the total number of production wells to 14 at the end of this reporting period.

3 MONITORING PERIOD

The monitoring period for this report is from the 1st October, 2007 to the 31st August, 2008.

4 MONITORING PROCEDURES

4.1 Calibration and Maintenance of Monitoring Equipment and Instruments

4.1.1 Sampling Equipment and Instruments

Geothermal steam sampling is conducted on-site and monitored by the Mine Technical Department, Geothermal and Dewatering Section. Weber separators used to separate the two-phase steam/water mixture are calibrated and maintained on-site. Calibration is conducted quarterly after sampling, in preparation for the next quarterly sampling. Other pressure measuring instruments are calibrated by the Process Plant Maintenance, Instrumentation Section. Refer to Appendix 2 for the calibration certificate for this monitoring period.

4.1.2 Laboratory Equipment and Instruments

The Institute of Geological and Nuclear Sciences (IGNS) in Auckland, New Zealand conducts analyses on gas samples collected. The laboratory is accredited by International Accreditation New Zealand and the tests conducted are performed in accordance with its terms of accreditation.

4.1.3 Steam Flow and Electricity Monitoring Equipment and Instruments

For this reporting period, steam flow into the 33MW section of the LGPP was measured by steam flow meter, tag # PGS: S100_FTn_011_TOTn. Steam flow meter tag # PGS: S400_FTn_011_TOTn measures steam flow into the 22MW section of the LGPP. Other pressure measuring instruments, e.g. Gauges and annubars are calibrated by the Process Plant Maintenance Department, Instrumentation Section (refer to Section 4.2.3).

Energy meters are used for electricity monitoring and have been manufactured under an ISO9001 registered system and conform to IEC 947-1, IEC 1010-1. Energy meters for the 20MW phase were calibrated in September, 2006 and flow meters were calibrated in May, 2006. Calibration/test results for the steam flow and energy meters have already been provided in previous monitoring reports. No new meters were installed during this monitoring period. Original test result certificates are kept by the LGPP Department.

4.2 Gathering of Data from Steam Wells and Power Generation

4.2.1 Gas Sampling

Gas sampling is conducted using the ASTM E1675-83: Standard Practice for Sampling Two-Phase Geothermal Fluid for the Purposes of Chemical Analysis on a quarterly basis. Standard Operating Procedure (SOP) # 2500-006 Geothermal Steam and Water Sampling describes the gas sampling process undertaken. No changes to this procedure have occurred since the last reporting period. Refer to Appendix 1 for further detail. Gas sampling is conducted by experienced and trained personnel from Century Drilling and Engineering Services (NZ) Limited and LGL. Sampling points are at the 33MW scrubber, the 22MW scrubber and at individual steam wellheads. See Figure 4.2.1 for well locations and Table 4.2.1 showing well steam supply to the LGPP.

Table 4.2.1 Geothermal Wells Supplying Steam to the LGPP

ITEM	WELL NO.	SUPPLYING	ONLINE	OFFLINE
1	24	33MW	01 June'05	08 Jan'07
2	26	33MW	01 June'05	08 Jan'07
3	27	33MW	31 Oct '07	
4	28	33MW	01 Jun'05	
5	37	22MW	17 Oct'06	
6	38	22MW	17 Oct'06	
7	39	22MW	17 Oct'06	
8	40	22MW	17 Oct'06	
9	43	22MW	30 Jul '07	
10	48	22MW	03 Jun '07	
11	17	22MW	01 Sept'07	28 Aug '08
12	18	22MW	01 Sept'07	
13	49	33MW	18 Mar '08	
14	1306	33MW	07 Mar '08	
15	1307	33MW	07 Mar '08	
16	53	33MW	07 May '08	
17	56	33MW	25 Jul '08	

18	1312	6MW		
19	1313	6MW		
20	1314	6MW		
21	1084	6MW		
22	41	6MW		
23	36	6MW		
24	51	6MW		

Average steam amounts passing into the LGPP via the scrubbers for a 24 hour period are calculated and recorded daily. Steam released from discharge wells are also monitored and samples taken. Refer to Appendix 3 for discharge well results.

Non-condensable gases (NCG's) in the samples are analysed by the IGNS. IGNS uses the method Geothermal Gas Analysis by Gas Chromatography for analyses of the gas samples taken. Refer to Appendix 1 for further detail on this method.

Carbon dioxide (CO_2) and methane (CH_4) content in the produced steam are monitored along with other NCG's. For this reporting period, CO_2 and CH_4 content average values are 1.66%w/w and 0.003 %w/w respectively. In effect, a total of 54,158 tonnes of CO_2 and 67 tonnes of CH_4 were in the steam used to generate energy. CO_2 and CH_4 content is also measured in discharge well samples. Results are supplied by the Geothermal and Dewatering Section. For this reporting period, a total of 38t of CO_2 and 21kg of CH_4 were released. Refer to discharge well results in Appendix 3.

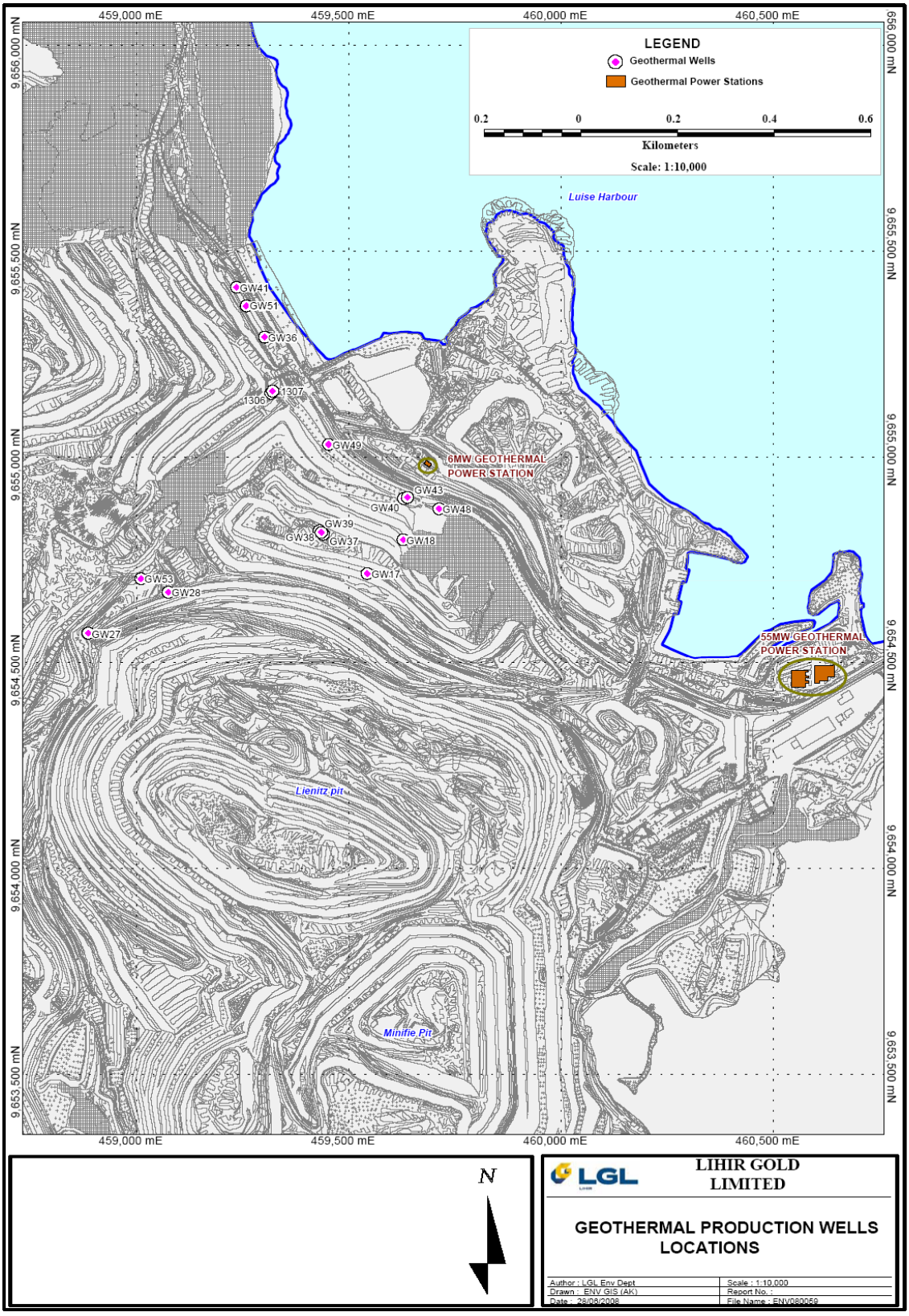

Figure 4.2.1 Geothermal Power Production Wells

4.2.2 Electricity Generation

Electricity generation is monitored in the LGPP control room. Energy production figures for a 24 hour period are taken at midnight and entered into the E6 database.

Total gross and net power production for this reporting period was 342,405 MWhrs & 318,974 MWhrs respectively. Table 4.2.1 and Figure 4.2.1 shows the monthly power generation figures. Refer to Appendix 5 for daily power generation and usage data.

Table 4.2.2 Monthly Power Generation Figures

Month	Gross Power Production	Total Usage	Net Power Production
	MWhrs	MWhrs	MWhrs
Oct-07	30,544	2,385	28,159
Nov-07	35,323	2,346	32,977
Dec-07	30,163	2,157	28,006
Jan-08	30,035	1,946	28,089
Feb-08	16,649	1,298	15,351
Mar-08	29,530	1,889	27,641
Apr-08	35,483	2,331	33,152
May-08	36,425	2,345	34,080
Jun-08	33,573	2,232	31,341
Jul-08	32,560	2,199	30,361
Aug-08	32,120	2,303	29,817
Total	**342,405**	**23,431**	**318,974**

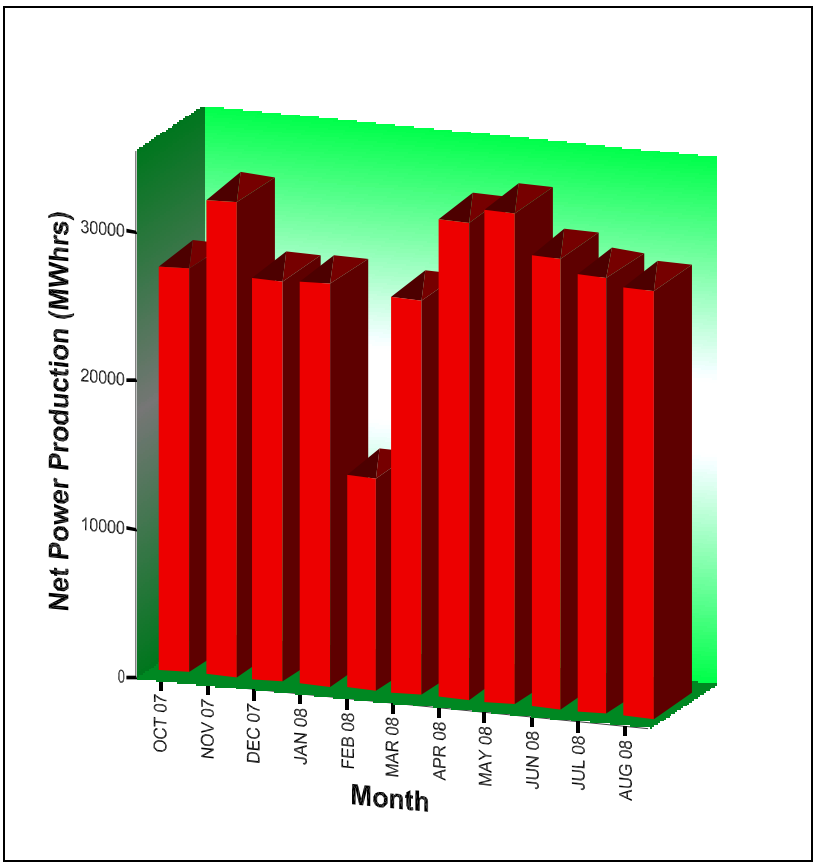

Fig. 4.2.1 Monthly Net Power Generation Figures

The LGPP has a back-up Cummins 350 KVA diesel generator that is used only during power failures. Run hours for this reporting period stands at 58.4hrs which have accumulated due to routine testing of the generator.

4.2.3 Steam Flow

LGL uses a PI database system which allocates tag numbers to all meters used throughout process plant operations. Flow meter tag # PGS: S100_FTn_011_TOTn was installed at the 33MW scrubber and is used to monitor the total steam flow into the 33MW section of the LGPP. Tag # 'PGS: S400_FTn_011_TOTn, installed at the 22MW scrubber, was used to monitor steam flowing to the 22MW phase. To reunite, total steam flow is calculated by adding the steam flow from the 33MW and 22MW phases. Data collected from the flow meters are documented in this report.

Problems occur with the measurement of steam flow either (1) when the PI server fails and readings are given as 'No Good Data for Calculation'; (2) if there is a data communication problem from the meter to the SCADA screen in the control room or (3) if the flow meter is reading incorrectly due to damage from vibrations, clogging of

flow meters or other various reasons. Problems 1 and 2 are solved when the system is restarted and takes measurements again. Problem 3 is overcome when the meters are replaced during shutdown periods.

The steam flow meter for the 33MW section failed towards the end of March and will be replaced with an orifice plate. This will require a three day shutdown and thus cannot be installed until August 2009.

Table 4.4.2 Steam Flow from Scrubbers Vs Wellheads

Month	Total Steam Flow from Scrubbers (tonnes)	Total Steam Flow from Wellheads (tonnes)
Oct-07	330,473	345,456
Nov-07	349,119	377,880
Dec-07	318,277	410,280
Jan-08	307,573	411,480
Feb-08	183,862	303,144
Mar-08	257,730	383,400
Total	**1,747,034**	**2,231,640**

The Tracer Flow Test (TFT) method is used to measure steam flow rates from each well. TFT discharge measurements are done for a single tracer injection and sampling period which takes less than 1 hour for each well. This is conducted by the Mine Technical, Geothermal and Geotechnical Section.

To verify steam flow readings taken from the two flow meters at the LGPP, the figure 11t of steam produces 1MWhr of energy is used. This is derived from a model produced using the software program Engineering Equation Solver designed specifically for the LGPP.

From October 2007 to March 2008, whilst the 33MW steam flow meter was operating, a total of 1,747,034 t of steam (see Table 4.2.2) was used for energy production. Verification of this figure by comparing with steam flow directly from wellheads is favourable (78%). The difference (484,606) is additional steam in excess of LGPP requirements and is released en route from the wells to the LGPP.

Due to the favourable comparison, total steam usage values from April 2008 to August 2008 are derived from steam flow directly from wellheads. Thus a total of 2,078,832 t of steam was supplied to the LGPP. 1,621 489t (78% of 2,078,832 t supplied) was used to generate energy. Verification using the Engineering Equation Solver model shows that 1,621,489 t of steam is estimated to produce 147,408 MWhrs of energy. Energy produced from April to August 2008 was 158,751 MWhrs which compares favourably (93%).

4.3 Calculation of GHG Emission Reductions

4.3.1 Project Activity Emissions

Project activity emissions are calculated from reductions in burning of fossil fuels compared to baseline years 2002-2004 and steam additions resulting from the drilling of additional wells to source additional steam for the LGPP.

In this reporting period, there have been nil project emissions from the combustion of fossil fuels as zero fossil fuels are used by the LGPP.

Fifteen geothermal wells in total were used for most of this reporting period. Five wells (GW48, GW49, GW51, GW53 & GW56) were drilled specifically to source additional steam for LGPP requirements. Emissions for these wells are considered as project emissions. GW48, GW51 & GW53 produced 11,176 tCO_2-e (See Table 4.3.1). GW49 has a wet discharge and all steam samples collected are diluted with brine making the results inaccurate and unreliable. GW56 has a problem with accessing the cellar of the well which is flooded due to clogged drains within the well. This problem is currently being addressed. (Source: Geothermal & Geotechnical, Mine Technical Dept.). Estimates for project emissions from GW49 and GW56 are based on time-averaged steam flow data from the other three wells (GW48, GW51 & GW53). An estimated 3,534 tCO_2-e was released from GW49 and 1,178 tCO_2-e released from GW56. Thus a total of 15,889 tCO_2-e project emissions were calculated for this reporting period. Refer to Appendix 5 for daily project emission data.

Table 4.3.1 – Project Activity Emissions

Month	GW48	GW49	GW51	GW53	GW56
	t CO_2-e	t CO_2-e	t CO_2-e	t CO_2-e	t CO_2-e
Oct-07	605	n/a	n/a	n/a	n/a
Nov-07	584	n/a	n/a	n/a	n/a
Dec-07	544	n/a	n/a	n/a	n/a
Jan-08	623	n/a	n/a	n/a	n/a
Feb-08	494	n/a	n/a	n/a	n/a
Mar-08	520	589	n/a	n/a	n/a
Apr-08	570	589	n/a	n/a	n/a
May-08	585	589	543	678	n/a
Jun-08	566	589	369	813	n/a
Jul-08	598	589	477	831	589
Aug-08	615	589	298	863	589
Total	**6304**	**3534**	**1687**	**3185**	**1178**

n/a - data not available

4.3.2 Emissions Offset from the Grid

The emissions offset from the grid associated with the project activity are 15,889 tCO_2 –e based on detail provided in Section 4.3.1.

4.3.3 Emission Reductions

Total emission reductions for this reporting period are 200,376 tCO_2 -e. Monthly emission reduction data is given in Table 4.3.2 and Figure 4.3.1. Refer to Appendix 6 for daily emission reduction data.

Table 4.3.2 Monthly Emission Reductions produced for this reporting period

Month	Net Power Production	CO2 Emission Factor	Emissions Reductions from Grid	Project Emissions	Emission Reductions
	MWhrs		t CO_2-e	t CO_2	t CO_2-e
Oct-07	28,159	0.678	19092	605	18486
Nov-07	32,977	0.678	22358	584	21774
Dec-07	28006	0.678	18988	544	18444
Jan-08	28089	0.678	19044	623	18421
Feb-08	15351	0.678	10408	494	9914
Mar-08	27641	0.678	18741	1109	17632
Apr-08	33152	0.678	22477	1159	21318
May-08	34080	0.678	23106	2395	20712
Jun-08	31341	0.678	21249	2338	18912
Jul-08	30361	0.678	20585	3085	17500
Aug-08	29817	0.678	20216	2954	17262
Total	**318,974**		**216,264**	**15,889**	**200,376**

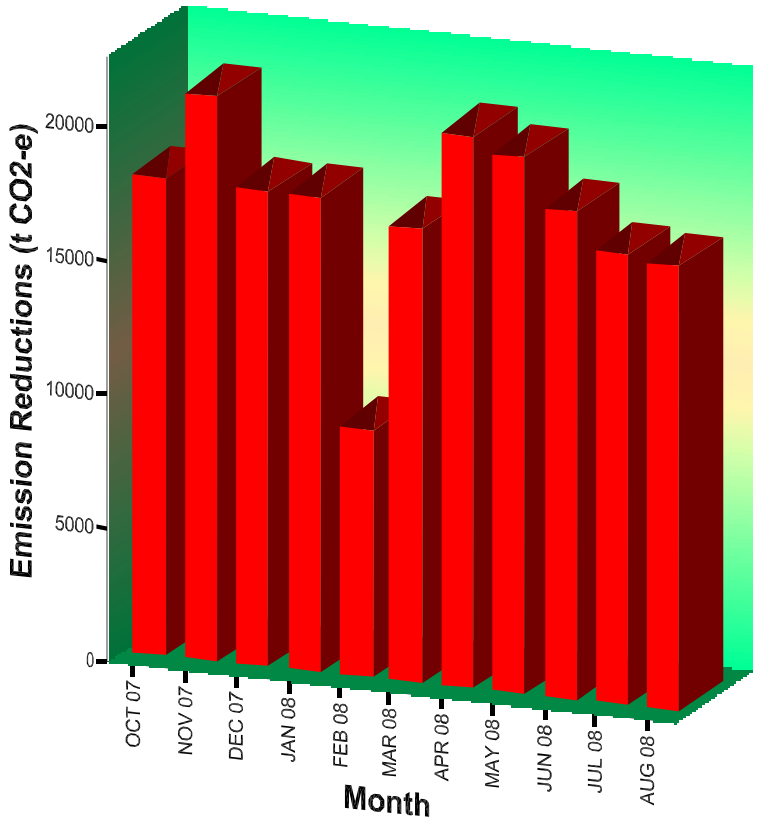

Fig 4.3.1 Graph showing Emission Reductions produced for this reporting period

Total emissions for 2008, estimated from baseline information, are 287 $ktCO_2$ equivalent emission reductions (see Table 4.3.3).

Table 4.3.3 Total Estimated Emissions for the 10 Year Crediting Period

Total Estimated Emissions				
Year	**Installed Capacity**	**Annual Operating Hours**	**GWhr**	**$KtCO_2$/Year**
2006	**31.7**	**5333**	**169**	**163**
2007	**52.8**	**8000**	**422**	**200**
2008	**52.8**	**8000**	**422**	**287**
2009	**52.8**	**8000**	**422**	**287**
2010	**52.8**	**8000**	**422**	**287**
2011	**52.8**	**8000**	**422**	**287**
2012	**52.8**	**8000**	**422**	**287**
2013	**52.8**	**8000**	**422**	**287**
2014	**52.8**	**8000**	**422**	**287**
2015	**52.8**	**8000**	**422**	**287**
2016	**52.8**	**2667**	**141**	**96**

(*Source: CDM-PDD Version 02 pg39*)

4.4 Management and Storage of Data

Data for this monitoring period is collected daily as specified in the PDD and entered into a spreadsheet and stored on the company's common drive. As previously stated, LGL uses a tag database system known as PI for all monitoring meters used in process plant operations. Steam flow data is obtained via PI and entered into the spreadsheet. Power generation figures are entered into E6 by LGPP personnel and later extracted and entered in the CDM spreadsheet by the CDM monitoring officer. All data is summarised at the end of month and results submitted in the end-of-month report.

4.5 Supervision of the Quality of the Monitoring Process

End of month figures for CDM are submitted to the Environment Superintendent for review and stored on the Department common drive. Regular communication between the CDM monitoring officer and LGPP staff ensure changes in operating conditions are picked up and reported.

4.6 Issuance of Reports for Internal and External Verification

This report is issued to LGL's General Manager Business Risk, the Chief Financial Officer, and External Auditors. The results are summarised in LGL's Annual Environment Report.

5 CONCLUSION

A large amount of monitoring data covering a spectrum of parameters associated with the generation of power from geothermal steam is presented in this report and is discussed frequently in light of previously reported data.

Data presented in this report provide evidence on the emission reductions generated by the Lihir Geothermal Power Plant.

6 REFERENCES

LGL 2006. CDM Monitoring Report. September 2006
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