CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Fuel switch project at Surya Roshni Limited, India
Version: 1.0
Date: 30/06/2007

A.2. Description of the small-scale project activity:

The project activity is proposed by Surya Roshni Limited (Surya) in its Lighting plant (Lighting & Component divisions) at Malanpur in Madhya Pradesh & in Steel plant at Bahadurgarh in Haryana. The plant at Malanpur manufactures lighting products FTL (Fluorescent Tube Lamps), GLS (General Lighting System) and CFLs (Compact Fluorescent Lamps) and the plant at Bahadurgarh produces ERW (Electric Resistance Welded) steel pipes and cold rolled strips. The unit operations at these two plants require fossil fuels (FO, HSD & LDO) combustion in plant operations and in power generation. Surya proposes to switch from the current use of FO, HSD & LDO to that of Natural Gas in the plant operations and power generation. Natural gas is a cleaner fuel (15.3 tC/ TJ) as compared to FO (21.1tC/ TJ), HSD and LDO (20.2 tC/ TJ) and so project activity results in lower emissions.

Lighting Plant:
Operations at Lighting plant require use of FO in glass furnaces and cap unit & HSD/LDO in Thermopac and DG sets. Surya replaced FO and HSD/LDO with cleaner natural gas. The displacement of these fuels results into emission reduction in power generation and other unit operations at the unit.

Steel Plant:
At steel plant, Surya use a mix of grid power and DG based captive power, which is partly replaced with natural gas in the project activity.

Following are the areas in the units of Surya where fuel switching is undertaken –

Lighting Plant (Lighting & Component divisions) at Malanpur	**Pre-project fuel used**	**Fuel used in project activity**
Thermopac	HSD/ LDO	Waste heat of flue gases from gas engine
Glass Furnaces	FO	Natural Gas
Cap Plant	FO/ LDO/HSD	Natural Gas
Power generation	LDO	Natural Gas

Steel Plant at Bahadurgarh	**Pre-project fuel used**	**Fuel used in project activity**
Power generation	LDO	Natural Gas

The project activity faces many hurdles against its implementation and Surya foresee overcoming these hurdles with CDM backed revenue generation.

The project activity is a small scale project activity and has following sustainable development aspects:

1. The project activity uses cleaner fuel i.e. natural gas and helps in improved environmental conditions inside the plant and overall improvement in region's environment thanks to lower emissions.
2. The project activity helps in reduction of GHGs and accomplishes mitigating ill effects of climate change
3. It helps in generation of employment during erection & commissioning and later on its operation.
4. Project activity would help spread awareness among the industries and promote its speedy implementation among industrial sectors.
5. Efforts will be renewed in the field of Research & Development of gas based technologies for different application areas.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) Project participants (*) (as applicable)	Kindly indicate if the party involved wishes to be considered as project participant (yes/no)
Government of India (Host)	Surya Roshni Limited (Private Entity)	No

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

Country: India

A.4.1.2. Region/State/Province etc.:

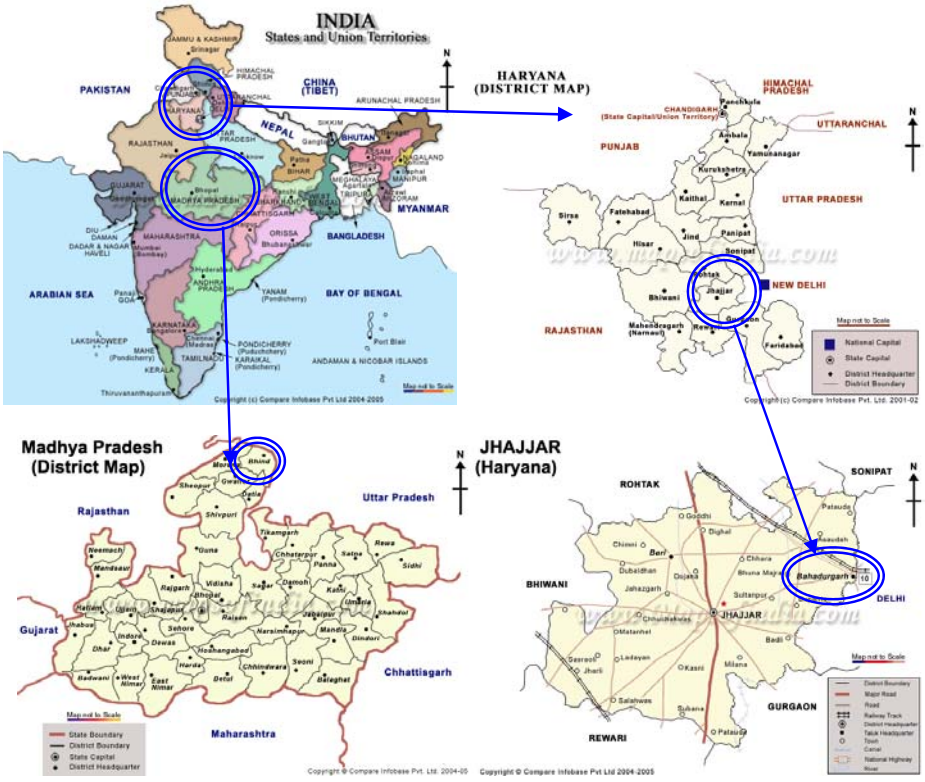
State: Haryana & Madhya Pradesh

A.4.1.3. City/Town/Community etc:

Boundary	Lighting Division	Steel Division
Located At	Malanpur	Bahadurgarh
District	Bhind	Jhajjar
State	Madhya Pradesh	Haryana

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

The lighting plant (lighting & component divisions) of Surya Roshni Limited at Malanpur, District Bhind (M.P) is about 300 km from Delhi and 25 km from Gwalior. The steel division at Bahadurgah is about 42 km from Delhi on NH-10.



A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

The project is a small scale CDM project activity and is based on Appendix B of the simplified modalities and procedures for small-scale CDM project activities. The project activity conforms to the following category -

Project Type: III– Other project activities

Project Category: IIIB. Switching Fossil Fuels; Sectoral Scope: 1

Technology in the project activity:

Lighting Plant at Malanpur:

Glass Furnace Area:
Surya in the project activity has retrofitted existing glass furnaces at its Lighting Division in Malanpur. The retrofit measures allowed use of natural gas in the furnaces. Retrofit measures comprised of laying of natural gas piping to the furnace area, gas feeding arrangement, gas metering and control systems.

Cap unit:
In the cap manufacturing plant, thermal demand is met through combustion of FO, propane and LDO/HSD. FO is the dominant fuel in this unit. Project activity would replace use of these fuels with natural gas and achieve emission reductions.

Thermopac:
In the project activity, Surya avoided use of HSD/LDO in heat generation in existing Thermopacs. Instead, waste heat from gas engines is used to meet the thermal demand load in drying operations at FTL plant. For the purpose, waste heat recovery units have been installed to recover waste heat of flue gases.

Gas engines:
To meet the in-house power demand of the plant, Surya use a mix of grid power and DG based captive power. Project activity helped in displacing power mix in the baseline. Surya has installed 02 nos. of gas engines at Malanpur unit.

Technical specifications of installed gas engines (Malanpur):

Parameter	**Engine 1**	**Engine 2**
Manufacturer – Engine	GE Jenbacher	GE Jenbacher
Engine Type	J 320 GS – C05	J 612 GS E 12
Working Principal	4 Stroke	4 Stroke
Energy input	2607 kW	4318 kW
Gas Volume rate	274 Nm^3/ h	437 Nm^3/ h
Mechanical O/P	1095 kWh	1871 kWh
Electrical O/P	1064 kWh	1815 kWh

Steel plant at Bahadurgarh:
Similar activity has been carried out at the Bahadurgah based steel unit. 05 nos. of gas engines have been installed.

Technical Specifications of Installed Gas Engines (Bahadurgarh):

Parameter	**Engine 1**	**Engine 2**	**Engine 3**	**Engine 4**	**Engine 5**
Manufacturer – Engine	Cummins	Cummins	Wartsila	Wartsila	Wartsila
Model	GTA-3067	GTA-3067	W175S4G	W175S4G	W175S4G
Capacity	625 kVA	625 kVA	1250 kVA	1250 kVA	1250 kVA
RPM	1500	1500	1500	1500	1500

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

Years	Estimation of annual emission reductions in tonnes of CO2 e
2007-08	16549
2008-09	16549
2009-10	16549
2010-11	16549
2011-12	16549
2012-13	16549
2013-14	16549
2014-15	16549
2015-16	16549
2016-17	16549
Total estimated reductions (tonnes of CO2 e**)**	165490
Total number of crediting years	10 years Fixed
Annual average of the estimated reductions over the crediting period (tonnes of CO2e**)**	16549

A.4.4. Public funding of the small-scale project activity:

No public funding from Annex 1/ Non- Annex 1 countries is involved for the project activity.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

As per Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities– *"A proposed small-scale project activity shall be deemed to be a de-bundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:*

- *With the same project participants;*
- *In the same project category and technology/measure; and*
- *Registered within the previous 2 years; and*
- *Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point"*

The project activity is not a de-bundled component of a large project activity as –

There is no small scale CDM project activity registered or an application for the purpose of the same by Surya, in the same project category in the last two years within 1 km of the project boundary of the proposed small-scale project activity.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

The project is a small scale CDM project activity and is based on Appendix B of the simplified modalities and procedures for small-scale CDM project activities. The project activity conforms to the following category -

Project Type: III– Other project activities

Project Category: IIIB. Switching Fossil Fuels

Version 10, Scope 1; dated 23 December 2006

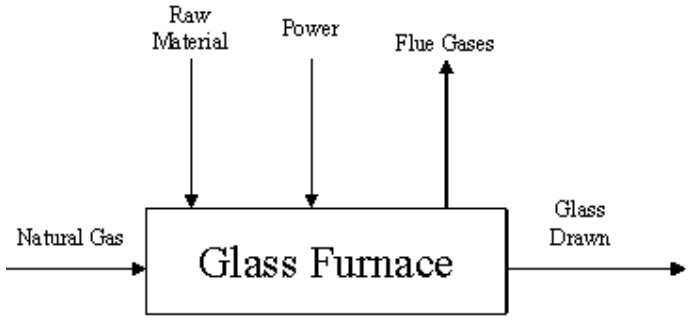
B.2 Justification of the choice of the project category:

Category	Applicability Criteria	Project Status
IIIB: Switching fossil fuels	This category comprises fossil fuel switching in existing industrial, residential, commercial, institutional or electricity generation applications. Fuel switching may change efficiency as well. If the project activity primarily aims at reducing emissions through fuel switching, it falls into this category. If fuel switching is part of a project activity focussed primarily on energy efficiency, the project activity falls in category II.D or II.E.	The project is primarily one of switching of fossil fuel in existing industrial and electricity generation applications.
	Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.	Implementation of project activity results in emissions reduction less than 60 kt CO_2e annually.

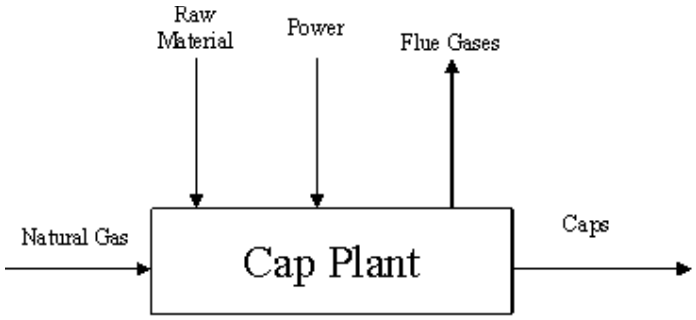
B.3. Description of the project boundary:

The project boundary is the physical, geographical site(s) where the fuel combustion affected by the fuel-switching measure occurs.

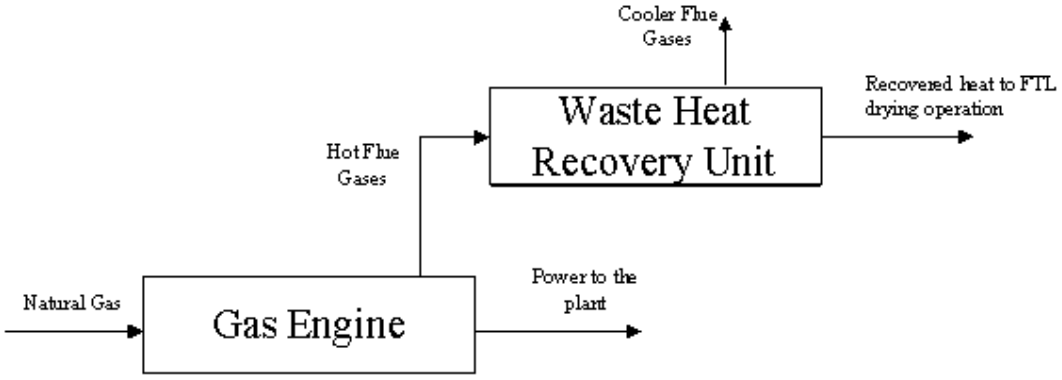
Glass Furnace Area



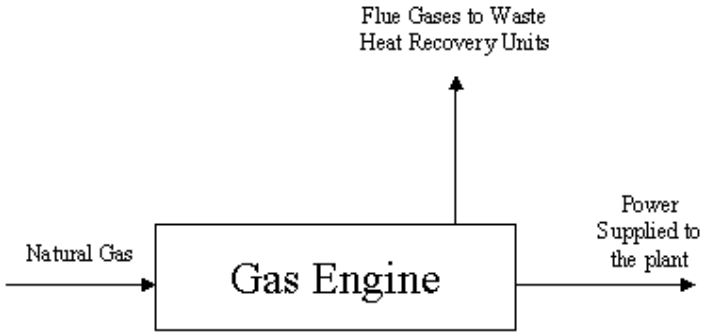
Cap Plant



Waste Heat Recovery Units



Gas Engines



B.4. Description of baseline and its development:

Baseline emission factor for unit operations & power generation has been estimated based on past performance. The method adopted is explained in following sections.

Lighting Plant at Malanpur

A. Baseline Emission Factor for Glass Furnaces:

Baseline emission factor is estimated for per tonne of glass drawn from glass furnaces in the existing system based on plant operation data and fuel consumptions for recent 3 years.

Following methodology has been adopted for estimating baseline emissions prior the project activity:

1. Emissions associated with FO consumption in glass furnace are calculated for each year.
2. Ratio of total emissions to total production in a year gives emissions for per tonne of glass drawn for respective year.
3. Weighted average of emissions for last 3 years has been taken as baseline emission factor for per tonne of glass drawn from glass furnace.

Parameter	Unit	2003-04	2004-05	2005-06
Glass Drawn	MT/ annum	40530	41002	43235
Cumulative Baseline Emissions	tCO_2e/ annum	16000	16209	16791
Sp. Baseline Emissions	tCO_2e/ t of glass drawn	0.39	0.40	0.39
Baseline Emissions Factor	tCO_2e/ t of glass drawn	0.39		

B. Baseline Emission Factor for Cap Unit:

Baseline emission factor is estimated for per '000 units of cap manufactured in the existing system based on plant operation data and fuel consumptions for recent 3 years.

Following methodology has been adopted for estimating baseline emissions prior the project activity:

1. Emissions associated with FO/LDO/ Propane consumption in cap unit are calculated for each year.
2. Ratio of total emissions to total production in a year gives emissions for per '000 units of caps for respective year.
3. Weighted average of emissions for last 3 years has been taken as baseline emission factor for per '000 units of caps from the cap unit.

Parameter	Unit	2003-04	2004-05	2005-06
Caps produced	'000/ annum	157155	153715	171627
Cumulative Baseline Emissions	tCO_2e/ annum	2092	2127	2094
Sp. Baseline Emissions	tCO_2e/ '000 of caps	0.0133	0.0138	0.0122
Baseline Emissions Factor	tCO_2e/ '000 of caps	0.0131		

C. Baseline Emission Factor for Thermopac:

In the production of FTL, heating is required of FTL with hot air. Hot air is generated by circulation of hot oil from Thermopac. Baseline emission factor is estimated for per unit of FTL produced in the existing system based on plant operation data and fuel consumptions for recent 3 years.

Following methodology has been adopted for estimating baseline emission prior the project activity:

1. Emissions associated with HSD/LDO consumption in operation are calculated for each year.
2. Ratio of total emissions to total production in a year gives emissions for per thousand units of FTL.
3. Weighted average of emissions for last 3 years has been taken as baseline emission factor for per thousand units of FTL produced.

Parameter	Unit	2003-04	2004-05	2005-06
FTL produced	Units/ annum	12522945	13425756	17616251
Cumulative Baseline Emissions	tCO_2e/ annum	675	739	917
Sp. Baseline Emissions	tCO_2e/ '000 FTL	0.05	0.06	0.05
Baseline Emissions Factor	tCO_2e/ '000 FTL	0.05		

D. Baseline Emission Factor for DG set:

Baseline emission factor is estimated for per unit of power generation in DG sets. Following methodology has been adopted for estimating baseline emission prior to the project activity:

1. Emissions associated with HSD/LDO consumption in DG sets are calculated for each year.
2. Ratio of total emissions to total production in a year gives emissions for per unit of power generation for respective year.
3. Weighted average of emissions for last 3 years has been taken as baseline emission factor for per unit power generation.

Lighting Division DG:

Parameter	Unit	2003-04	2004-05	2005-06
Net power generation	MWh/ annum	1459.244	969.286	598.828
Sp. Baseline Emissions	tCO_2e/ MWh	0.648	0.672	0.726
Baseline Emissions Factor	tCO_2e/ MWh	0.671		

Component Division DG:

Parameter	Unit	2003-04	2004-05	2005-06
Net power generation	MWh/ annum	1019.984	854.600	283.824
Sp. Baseline Emissions	tCO_2e/ MWh	0.729	0.725	0.677
Baseline Emissions Factor	tCO_2e/ MWh	0.721		

E. Grid emission factor:

Grid emission factors for the Western Region Grid and Northern Region Grid is taken as suggested in "**CO_2 Baseline Database for the Indian Power Sector"** by Central Electricity Authority (CEA), Ministry of Power, Government of India.

The lighting division of Surya is located in Western Region (WR) grid and the Steel division is located in Northern Region (NR) grid.

The value for Combined Margin for Western Grid (grid in the project activity) is given as 0.81 tCO_2e/ MWh and the value for Combined Margin for Northern Grid (grid in the project activity) is given as 0.80 tCO_2e/ MWh.

Steel Plant at Bahadurgarh

F. Baseline Emission Factor for DG set:

Baseline emission factor is estimated for per unit of power generation in DG sets. Following methodology has been adopted for estimating baseline emission prior the project activity:

1. Emissions associated with HSD/LDO consumption in DG sets are calculated for each year.
2. Ratio of total emissions to total production in a year gives emissions for per unit of power generation for respective year.
3. Weighted average of emissions for last 3 years has been taken as baseline emission factor for per unit power generation.

Parameter	Unit	2003-04	2004-05	2005-06

Net power generation	MWh/ annum	2431214	3874494	2716338
Sp. Baseline Emissions	tCO_2e/ MWh	0.85	0.86	0.86
Emissions Factor for DG set	tCO_2e/ MWh	0.86		

Weighted average emission factor of baseline power generation mix has been taken as baseline emission factor for the calculations, for both the plants.

Developed by:
Surya Roshni Limited (also a project participant)
Dated: 30/05/2007

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

Surya have taken up the project activity despite many hurdles to its implementation. To prove additionality of the project activity, barrier analysis has been carried out as per Attachment A of the Appendix B of the simplified modalities and procedures for small scale CDM projects.

Investment barrier:
The investment in the project activity incurred by Surya is ~Rs. 98 million at its Malanpur plant for converting existing furnaces into gas fired ones and in the purchase, installation and commissioning of gas engines including waste heat recovery units. Similarly, investment to the tune of Rs. 64.4 million is made at its Bahadurgarh plant. Apart from the investments made in plant and machinery, Surya had to make security deposit of Rs. 10.35 lakhs and to submit a bank guarantee for Rs. 31.05 lakhs for obtaining gas from GAIL in Lighting Plant at Malanpur. Similar deposits were required for obtaining gas at Bahadurgarh plant. No such deposits were however required in the baseline case apart of zero investment requirements in plant & machinery. On the amount of security deposit GAIL has though agreed to pay interest but that is only a simple interest at the rate of RBI interest rates minus 1 percent per annum. This interest rate is much lower as compared to the expected return on equity (14-16% per year) which may have been realised in the baseline on the same amount.

The investments by Surya in the project activity are substantial considering the risks involved. These risks are due to the unstable natural gas market, monopoly of supplier, uncertain price regime including operational issues involved. These have been discussed in the sections to follow -

Technology barrier:
Surya had to make extra efforts for managing the alterations in the whole system. Management had to devote efforts for better understanding and administration for successful and efficient running of the gas engine in Bahadurgarh and Malanpur plants. New recruitments and training programme are proposed to be conducted for the purpose. These efforts would not, however have been required in baseline scenario i.e. running fuel oil based DG sets. It is a common and established practice in the industry including in-house capabilities developed by Surya over the years for their operation and maintenance.

Stable and reliable combustion of natural gas in furnaces is problematic at times due to its variable calorific value; moisture in natural gas and fluctuation in natural gas pressure. For successful operation, Surya has roped in external agencies for Annual Maintenance of the engines, which was not the case with DG operation in the baseline.

The control on the quality of gas is beyond the control of Surya and they have no option but to use it to run the plant continuously. Though the Gas sales agreement between Surya and the GAIL specifies the water content of the gas ranging between 112 to 144 kg/ million SCM and the GCV of the same has to be not less than 8500 kcal/SCM, but the variations in the gas quality parameters may occur and if the gas supplied does not meet the specification and Surya agrees to take it, the GAIL will not have any further liabilities and the prices to be paid will be at the prevailing rates.

Barriers due to prevailing practice:

Natural Gas Prices:
The market for NG in India is a budding market.There are a number of aspects that influence the price of natural gas. These are upside availability, location (transaction cost), quality, demand- supply gaps etc. Gas prices face ups-and-downs and are volatile and dynamic in nature. Apart from that, the market of natural gas is not uniform: different sectors face different cost structure for natural gas. The Ministry of Petroleum and Natural gas revised the price of natural gas in June 2006. The industrial customers have to pay Rs. 8,675 per tcm (an increase of 23 % from the previous one). Natural gas in India is primarily used in two sectors i.e. power and fertilizers. These priority sectors had been kept out of this price hike. [(1)] The project activity, it may be noted does not fall under "Priority Sectors".

The prices on LNG are fixed only up to 31st December, 2008. Revision of prices will be done thereafter. However, if at any time, change in Government laws/regulations/policy pertaining to the pricing of natural gas may lead to the revision of market prices of LNG. Spot LNG prices of private players are already quite high.

Reliability of supply
Natural gas supply in India is still a new market and natural gas supply is strictly monitored and controlled by government regulations. There exists a demand supply gap of gas in India of about 90 mmscm/d.[2]. Non availability of gas has had its impacts on green field and captive power generation in India. Availability of R-LNG is affected by the re-gasification capacity constraints too. Other than this gas storage is not practically possible at the project site and daily supplies are dependent on supplies upstream, which is not the case with fuel oils where fuel can be stored for constrained situations.

Any change in policy or regulation may affect the availability of natural gas to the project activity. In past industries in the region have faced such a situation when the gas supplies were abruptly stopped due to its requirement for other "priority sectors" In 2002, gas supplies were abruptly stopped due to gas requirements for transport sector for the state of neighboring Delhi state (Supreme Court Order). Any such move in future can seriously hamper the project activity. Unlike fuel oil, natural gas supplies are strictly monopolized in the country. In the region of project activity, GAIL is the only supplier of natural gas. And dependence on a single entity has its own risks/ disadvantages.

Summary
A discussed in the sections above it can be said that usage of natural gas in plant operations definitely lead to better environmental conditions but there are a number of factors that may impact the project activity negatively and in normal course, this is considered a risky proposition unlike the baseline

(1) *CRIS Research, July 2006. Impact of June 2006 Natural Gas Price Hike*

(2) *Gas In Power, Power Line June 2007. P 66.*

scenario where investment requirement is nill and it would have been a continuation of ongoing practice at the facilities.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Baseline Emissions:

Glass Furnace:

$BE_{y,1} = Q_{glass,y} \times EF_{BSL,1}$

Where;
$BE_{y,1}$ = Emissions in the baseline in year y, tCO_2
$Q_{glass,y}$ = Quantity of glass drawn from furnace in year y, tonne
$EF_{BSL,1}$ = Baseline emission factor for glass drawn in furnace, tCO_2/ tonne of glass drawn

Thermopac:

$BE_{y,2} = Q_{FTL,y} \times EF_{BSL,2}$

Where;
$BE_{y,2}$ = Emissions in the baseline in year y, tCO_2
$Q_{FTL,y}$ = No of FTL produced in year y, number
$EF_{BSL,2}$ = Baseline emission factor for FTL production, tCO2/ '000 FTL

Gas Engine:

$BE_{y,3} = NET_y \times EF_{BSL,3}$

Where;
$BE_{y,3}$ = Emissions in the baseline in year y, tCO2
NET_y = Net power generation in gas engine in year y, MWh
$EF_{BSL,3}$ = Baseline emission factor for power generation, tCO_2/MWh

&

$EF_{BSL,3} = wt\%_{grid} \times GEF + wt\%_{DG} \times EF_{DG}$

Where;
$wt\%_{grid}$ = Grid power mix in total power consumed in the baseline, %
GEF = Grid emission factor of connected grid, tCO2/ MWh
$wt\%_{DG}$ = Captive power mix in total power consumed in the baseline, %
EF_{DG} = Emission factor for captive power generation in baseline, tCO2/ MWh

Cap Unit:

$BE_{y,4} = Q_{caps,y} \times EF_{BSL,4}$

Where;

$BE_{y,4}$ = Emissions in the baseline in year y, tCO_2
$Q_{cap,y}$ = Caps produced in year y, '000 caps
$EF_{BSL,4}$ = Baseline emission factor for cap production, tCO_2/ '000 of caps

Project Emissions:

Glass Furnace:
$PE_{y,1} = Q_{glass,y} \times EF_{y,1}$

Where;
$PE_{y,1}$ = Emissions in the year y, tCO_2
$Q_{glass,y}$ = Quantity of glass drawn from furnace in year y, tonne
$EF_{y,1}$ = Emission factor in project activity for glass drawn in furnace, tCO_2/ tonne of glass drawn

Thermopac:
$PE_{y,2} = Q_{FTL,y} \times EF_{y,2}^{*}$

Where;
$PE_{y,2}$ = Emissions in the project activity in year y, tCO_2
Q_{FTLy} = No of FTL produced in year y, number
$EF_{y,2}$ = Emission factor in project activity for FTL production, tCO_2/ '000 FTL

*Emission from the project activity is nill as it would run on waste heat from the gas engines.

Gas engine:
$BE_{y,3} = NET_y \times EF_{y,3}$

Where;
$BE_{y,3}$ = Emissions in the baseline in year y, tCO_2
NET_y = Net power generation in gas engine in year y, MWh
$EF_{y,3}$ = Emission factor in project activity for power generation, tCO_2/MWh

Cap Unit:
$PE_{y,4} = Q_{caps,y} \times EF_{y,4}$

Where;
$PE_{y,4}$ = Emissions in the project activity in year y, tCO_2
$Q_{cap,y}$ = Caps produced in year y, '000 caps
$EF_{y,4}$ = Emission factor in project activity for cap production, tCO_2/ '000 of caps

Emission Reduction:

$ER_y = BE_y - PE_y$

B.6.2. Data and parameters that are available at validation:

(Copy this table for each data and parameter)

Data / Parameter:	**EF_{grid}**
Data unit:	tCO_2/MWh
Description:	Grid emission factor
Source of data used:	"CO2 Baseline Database for the Indian Power Sector"; Central Electricity Authority (CEA), India
Value applied:	0.81 tCO_2/ MWh – WR Grid & 0.80 tCO_2/MWh – NR Grid
Justification of the choice of data or description of measurement methods and procedures actually applied :	CEA has established the grid emission factors for all the regional grids in India and is based on ACM0002.
Any comment:	

Data / Parameter:	**$EF_{BSL,1}$**
Data unit:	tCO_2/ tonne of glass drawn from furnace
Description:	Baseline Emission factor for glass drawn from glass furnace
Source of data used:	Past years plant data
Value applied:	0.39
Justification of the choice of data or description of measurement methods and procedures actually applied :	Average emission factor for furnace operation based on 3 year performance
Any comment:	

Data / Parameter:	**$EF_{BSL,2}$**
Data unit:	tCO_2/ '000 FTL produced
Description:	Baseline emission factor for per '000 units of FTL produced
Source of data used:	On-site measurements
Value applied:	0.05
Justification of the choice of data or description of measurement methods and procedures actually applied :	Average emission factor for Thermopac operation based on 3 year performance
Any comment:	

Data / Parameter:	**$EF_{BSL,3}$**
Data unit:	tCO_2/ MWh

Description:	Baseline emission factor for power generation
Source of data used:	On-site measurements
Value applied:	0.788 for Lighting Division power, 0.800 for Component Division power at Malanpur; 0.805 for Steel plant at Bahadurgarh
Justification of the choice of data or description of measurement methods and procedures actually applied :	Average emission factor for power generation based on past performance
Any comment:	

Data / Parameter:	**$EF_{BSL,4}$**
Data unit:	tCO_2/'000 units of caps
Description:	Baseline emission factor for caps production
Source of data used:	On-site measurements
Value applied:	0.0131
Justification of the choice of data or description of measurement methods and procedures actually applied :	Average emission factor based on 3 year performance
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

Glass Furnaces:
Production from Glass Furnace = 45000 TPA
Baseline emission factor = 0.39 tCO_2/T production
Baseline emissions = 45000 x 0.39 = 17673 tCO_2/annum
Project emission factor = 0.28 tCO_2/ T production
Project emissions = 45000 x 0.28 = 12818
Emission reduction = 17673-12818 = 4855 tCO_2/annum

Cap Unit:
Production from Cap unit = 200000 '000 nos.
Baseline emission factor = 0.0131 tCO_2/'000 units of cap
Baseline emissions = 200000 x 0.0131 = 2617 tCO_2/annum
Project emission factor = 0.0106 tCO_2/ T production
Project emissions = 200000 x 0.0106 = 2120 tCO2/annum
Emission reduction = 2617-2120 = 497 tCO_2/annum

Thermopac:
Production from FTL = 20,000 '000 FTL/annum
Baseline emission factor = 0.05 tCO_2/'000 FTL

Baseline emissions = 20000 x 0.05 = 1073 tCO_2/annum
Project emission factor = 0.00 tCO_2/ T production
Project emissions = 20000 x 0.00 = 0.00
Emission reduction = 1073- 0 = 1073 tCO_2/annum

Power Generation at Malanpur:

Lighting Division
Net power generation = 1815 x (330x24) x 90% x (1-3%)/1000 = 12549 MWh/annum
Baseline emission factor = 0.788 tCO_2/MWh
Project emission factor = 0.59 tCO_2/MWh
Emission reduction = 12549 x (0.788-0.59) = 2523 tCO_2/annum

Component Division
Net power generation = 1064 x (330x24) x 90% x (1-3%)/1000 = 7356 MWh/annum
Baseline emission factor = 0.800 tCO_2/MWh
Project emission factor = 0.59 tCO_2/MWh
Emission reduction = 7356 x (0.800-0.59) = 1564 tCO_2/annum

Power Gen at Bahadurgarh:
Net power generation = 4000 x (330x24) x 90% x (1-3%)/1000 = 27657 MWh/annum
Baseline emission factor = 0.805 tCO_2/MWh
Project emission factor = 0.59 tCO_2/MWh
Emission reduction = 27657 x (0.805-0.59) = 6037 tCO_2/annum

B.6.4 Summary of the ex-ante estimation of emission reductions:

Lighting Plant at Malanpur:

Glass Furnaces			
Year	**Baseline Emissions**	**Project Emissions**	**Emission Reductions**
2007-08	17673	12818	4855
2008-09	17673	12818	4855
2009-10	17673	12818	4855
2010-11	17673	12818	4855
2011-12	17673	12818	4855
2012-13	17673	12818	4855
2013-14	17673	12818	4855
2014-15	17673	12818	4855
2015-16	17673	12818	4855
2016-17	17673	12818	4855
Total	176730	128180	48550

Cap Unit			
Year	**Baseline Emissions**	**Project Emissions**	**Emission Reductions**
2007-08	2617	2120	497
2008-09	2617	2120	497
2009-10	2617	2120	497
2010-11	2617	2120	497
2011-12	2617	2120	497
2012-13	2617	2120	497
2013-14	2617	2120	497
2014-15	2617	2120	497
2015-16	2617	2120	497
2016-17	2617	2120	497
Total	26170	21200	4970

Thermopac			
Year	**Baseline Emissions**	**Project Emissions**	**Emission Reductions**
2007-08	1073	0	1073
2008-09	1073	0	1073
2009-10	1073	0	1073
2010-11	1073	0	1073
2011-12	1073	0	1073
2012-13	1073	0	1073
2013-14	1073	0	1073
2014-15	1073	0	1073
2015-16	1073	0	1073
2016-17	1073	0	1073
Total	10730	0	10730

Power Generation in Lighting Division			
Year	**Baseline Emissions**	**Project Emissions**	**Emission Reductions**
2007-08	9891	7368	2523
2008-09	9891	7368	2523
2009-10	9891	7368	2523
2010-11	9891	7368	2523
2011-12	9891	7368	2523
2012-13	9891	7368	2523
2013-14	9891	7368	2523
2014-15	9891	7368	2523

2015-16	9891	7368	2523
2016-17	9891	7368	2523
Total	98910	73680	25230

Power Generation in Component Division			
Year	**Baseline Emissions**	**Project Emissions**	**Emission Reductions**
2007-08	5884	4319	1564
2008-09	5884	4319	1564
2009-10	5884	4319	1564
2010-11	5884	4319	1564
2011-12	5884	4319	1564
2012-13	5884	4319	1564
2013-14	5884	4319	1564
2014-15	5884	4319	1564
2015-16	5884	4319	1564
2016-17	5884	4319	1564
Total	58840	43190	15640

Steel Plant at Bahadurgarh:

Power Generation in Steel plant			
Year	**Baseline Emissions**	**Project Emissions**	**Emission Reductions**
2007-08	22276	16239	6037
2008-09	22276	16239	6037
2009-10	22276	16239	6037
2010-11	22276	16239	6037
2011-12	22276	16239	6037
2012-13	22276	16239	6037
2013-14	22276	16239	6037
2014-15	22276	16239	6037
2015-16	22276	16239	6037
2016-17	22276	16239	6037
Total	222760	162390	60370

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)	
Data / Parameter:	**$EF_{y,1}$**
Data unit:	tCO2/ tonne of glass drawn from furnace
Description:	Emission factor for glass drawn from glass furnace in year y
Source of data to be used:	Calculated
Value of data	0.39
Description of measurement methods and procedures to be applied:	Calculated based on quantity of glass drawn and fuel consumption in furnaces
QA/QC procedures to be applied:	-
Any comment:	

Data / Parameter:	**$EF_{y,3}$**
Data unit:	tCO2/ MWh
Description:	Emission factor for power generation in gas engine
Source of data to be used:	On-site measurements
Value of data	0.59
Description of measurement methods and procedures to be applied:	Calculated based on net power generation and fuel consumption in gas engine
QA/QC procedures to be applied:	-
Any comment:	

Data / Parameter:	**$EF_{y,4}$**
Data unit:	tCO2/'000 cap units
Description:	Emission factor for cap production
Source of data to be used:	On-site measurements
Value of data	0.0106
Description of measurement methods and procedures to be applied:	Calculated based on cap production and fuel consumption in year y
QA/QC procedures to be applied:	-
Any comment:	

Data / Parameter:	**$Q_{glass,y}$**
Data unit:	tonne
Description:	Quantity of glass drawn from glass furnace

Source of data to be used:	On-site measurements
Value of data	45000
Description of measurement methods and procedures to be applied:	Direct measurement at project site
QA/QC procedures to be applied:	Meter calibrated regularly
Any comment:	

Data / Parameter:	**$Q_{cap,y}$**
Data unit:	'000 caps
Description:	No of caps produced
Source of data to be used:	On-site counting
Value of data	200,000
Description of measurement methods and procedures to be applied:	Counting of caps
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	**$Q_{FTL,y}$**
Data unit:	'000 units
Description:	Number of FTL units produced in year y
Source of data to be used:	On-site measurements
Value of data	20000
Description of measurement methods and procedures to be applied:	Direct counting at project site. Cross checked with outgoing material receipts
QA/QC procedures to be applied:	-
Any comment:	

Data / Parameter:	**NET_y**
Data unit:	MWh
Description:	Net power supplied from the gas engine
Source of data to be used:	On-site measurements
Value of data	27657 at Bahadurgarh and 19906 at Malanpur
Description of measurement methods	In-line energy meters at the site are used.

and procedures to be applied:	
QA/QC procedures to be applied:	Meters are calibrated regularly.
Any comment:	

B.7.2 Description of the monitoring plan:

Surya proposes following procedures to assure the completeness and correctness of the data needed to be monitored for CDM project. Procedures shall be followed at both the locations.

Day to day data collection and record keeping:
Plant data shall be collected on operation under the supervision of the respective Shift-in-charge and record would be kept in daily logs.

Frequency of monitoring-
The frequency for data monitoring shall be as per the monitoring details in Section B.7.1 of this document.

Archiving of data-
The data is kept for two years after crediting period (total 12 years)

Checking data for its correctness and completeness:
Power plant in-charge would have the overall responsibility of checking data for its completeness and correctness. The data collected from daily logs is forwarded to the in-charge after verification.

Calibration of monitoring equipments/ instruments:
Surya will have the energy meter calibrated regularly. A log of calibration records will be maintained. Instrumentation department in the company is responsible for the upkeep of instruments in the plant.

Maintenance of instruments and equipments used in data monitoring:
The operation department shall be responsible for the proper functioning of the equipments/ instruments and shall inform the concerned department for corrective action if found not operating as required. The concerned department shall take corrective action and a report on corrective action taken shall be maintained as done time to time along with the details of problems rectified.

Emergency preparedness:
The project activity does not result in any unidentified activity that can result in substantial emissions from the project activity. No need for emergency preparedness in data monitoring is visualized.

Report generation on monitoring:
After verification of the data and due diligence on correctness an annual report on monitoring and estimations shall be maintained by the CDM team and record to this effect shall be maintained for future verification.

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

Surya Roshni Limited (also a project participant)
Lighting Plant
Mr. Bijay Kumar Behera (Sr. General Manager – HR)
J-7 to 11, Industrial Area
Malanpur, Distt Bhind (MP)
Phone: 07539 – 283551/52/53/54
Fax: 07539-283483
Dated: 13/04/2007
Email: srlmlpr@sancharnet.in

Steel Plant
Mr. Satish Gupta (Asst. General Manager – Electrical)
Prakash Nagar
Delhi-Rohtak Road
Bahadurgarh – 124 507
Haryana
Phone: 01276 – 241540, 241296/97
Fax: 01276 - 241886
Email: tosatishgupta@gmail.com

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

01/03/2005

C.1.2. Expected operational lifetime of the project activity:

20 years

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

NA

C.2.1.2. Length of the first crediting period:

NA

CDM – Executive Board

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/10/2007

C.2.2.2. Length:

10 years

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

Environment Impact Assessment study is not required for the project activity as per the regulations defined by Central Pollution Control Board in India (EIA notification S.O. S.O. 1533 2006). The project activity has only positive impacts due to the use of cleaner fuel as compared to baseline scenario.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The project activity is a fuel switch project. Cleaner fuel natural gas replaces use of high carbon intensive fuels such as LDO/ HSD & FO. The switch is an environmentally positive project and has only good impact on environment.

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

Following stakeholders are identified for the project activity –
-Local community
-Local authorities
-State pollution control board

Surya invited views of stakeholders in the following manner –

-Advertisements published in Times of India and *Dainik Bhaskar* informing people at large about the project activity and inviting their views
-Letters sent to gram panchayat and district authorities
-Conducting general meeting at the project sites
-Letter sent to state pollution control board informing about the fuel switch in plant operations

E.2. Summary of the comments received:

The meeting at Malanpur was held at the company premises on March 15, 2006. Meeting was held with local people of Malanpur. Sarpanch- Gram Panchayat was also present. They were told about the project activity and its impact on people and their environment. The meeting was presided over by Mr. Surendra Sharma – Sarpanch, Malanpur village and conducted by Mr. B K Behera-General Manager (HRD). He explained to the meeting about the project activity, its positive impact on the environment and employment opportunities due to the project. He told that Surya has come into contract with GAIL for supplying natural gas to the plant, which would effect in less emission of greenhouse gases.

People in general commended the work done by Surya. Sarpanch also applauded the project and expressed that this would help in environment improvement and development of the area.

For steel plant at Bahadurgarh, an advertisement was published in Times of India inviting views of common people on the project activity. A meeting was also called on April 14 for consultation with people of the area. Meeting was called at village Sakhola in the presence of village Sarpanch. Mr. Satish Gupta (AGM, Electrical) conducted it. He explained people about greenhouse gases and its impact on climate globally and about the steps taken by UNFCCC to curb the emission of these gases.

E.3. Report on how due account was taken of any comments received:

All the stakeholders appreciated the efforts from Surya. No negative comments are received on the project activity.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Surya Roshni Limited
Street/P.O.Box:	J-7 to 11, Industrial Area
Building:	
City:	Malanpur, District Bhind
State/Region:	Madhya Pradesh
Postfix/ZIP:	477116
Country:	India
Telephone:	91-07539-283551, 52, 53
FAX:	91-07539-283483
E-Mail:	srlmlpr@sancharnet.in
URL:	
Represented by:	
Title:	Sr. General Manager
Salutation:	Mr.
Last Name:	Behera
Middle Name:	Kumar
First Name:	Bijay
Department:	HR
Mobile:	98931 15600
Direct FAX:	91-07539-283483
Direct tel:	91-07539-283551, 52, 53
Personal E-Mail:	

Organization:	Surya Roshni Limited
Street/P.O.Box:	Delhi-Rohtak Road
Building:	Prakash Nagar
City:	Bahadurgarh
State/Region:	Haryana
Postfix/ZIP:	124 507
Country:	India
Telephone:	01276 – 241540, 241296/97
FAX:	01276 - 241886
E-Mail:	
URL:	
Represented by:	
Title:	Asst General Manager
Salutation:	Mr.
Last Name:	Gupta
Middle Name:	
First Name:	Satish
Department:	Electrical
Mobile:	93158 25002

Direct FAX:	01276 - 241886
Direct tel:	01276 – 241540, 241296/97
Personal E-Mail:	tosatishgupta@gmail.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No ODA funding or funding from annex 1 country for the project activity.

Annex 3

BASELINE INFORMATION

Fuel Consumption & Glass Draw in Lighting Division				
2003-04	**F.O**	**Glass Draw**	**Emissions**	**Sp. emissions**
	[KL]	**(in MT)**	**[tCO2e]**	**[tCO2e/ MT]**
April ' 03	448.1	3195	1246	0.39
May	456.3	3210	1269	0.40
June	445.7	3207	1240	0.39
July	458.9	3107	1277	0.41
August	456.2	3200	1269	0.40
September	476.3	3530	1325	0.38
October	497.9	3552	1385	0.39
November	493.2	3504	1372	0.39
December	518.1	3630	1441	0.40
January	523.2	3562	1455	0.41
February	473.0	3208	1316	0.41
March ' 04	504.6	3625	1404	0.39
Total	**5751.5**	**40530**	**16000**	**0.39**

2004-05	**F.O**	**Glass Draw**	**Emissions**	**Sp. emissions**
	[KL]	**(in MT)**	**[tCO2e]**	**[tCO2e/ MT]**
April ' 04	390.95	2302	1088	0.47
May	484.91	3505	1349	0.38
June	489.40	3480	1361	0.39
July	493.30	3614	1372	0.38
August	486.55	3558	1353	0.38
September	475.41	3415	1322	0.39
October	500.39	3415	1392	0.41
November	495.79	3457	1379	0.40
December	507.39	3640	1411	0.39
January	521.51	3698	1451	0.39
February	470.81	3228	1310	0.41
March ' 05	510.48	3690	1420	0.38
Total	**5826.88**	**41002**	**16209**	**0.40**

2005-06	**F.O**	**Glass Draw**	**Emissions**	**Sp. emissions**
	[KL]	**(in MT)**	**[tCO2e]**	**[tCO2e/ MT]**
April ' 05	490.00	3567	1363	0.38
May	494.61	3645	1376	0.38
June	482.59	3504	1342	0.38
July	491.72	3701	1368	0.37
August	502.10	3659	1397	0.38
September	488.17	3585	1358	0.38
October	516.77	3741	1438	0.38
November	502.60	3627	1398	0.39

December	531.13	3748	1478	0.39
January	538.82	3681	1499	0.41
February	487.89	3367	1357	0.40
March ' 06	509.50	3410	1417	0.42
Total	**6035.9**	**43235**	**16791**	**0.39**

Fuel consumption and cap production in Cap Unit			
2003-04	**Alum Cap prod**	**Emissions**	**Sp. Emissions**
	[Nos]	**[tCO2]**	**[tCO2/ '000 caps]**
April	13102500	174	0.0133
May	10788000	178	0.0165
June	13081525	154	0.0117
July	13074000	168	0.0129
August	13035000	171	0.0131
September	12238700	175	0.0143
October	13513500	175	0.0129
November	13161155	170	0.0129
December	12750000	185	0.0145
January	14331000	192	0.0134
February	13502000	171	0.0127
March ' 04	14578550	179	0.0123
TOTAL	**157155930**	**2092**	**0.0133**

2004-05	**Alum Cap prod**	**Emissions**	**Sp. Emissions**
	[Nos]	**[tCO2]**	**[tCO2/ '000 caps]**
April ' 04	12153500	170	0.0140
May	12093065	185	0.0153
June	12089500	174	0.0144
July	11580250	178	0.0154
August	12270000	172	0.0140
September	11656650	172	0.0148
October	12640500	170	0.0135
November	12849000	172	0.0134
December	13704010	198	0.0145
January	14005500	191	0.0137
February	14728500	168	0.0114
March ' 05	13945500	175	0.0125
TOTAL	**153715975**	**2127**	**0.0138**

2005-06	**Alum Cap prod**	**Emissions**	**Sp. Emissions**
	[Nos]	**[tCO2]**	**[tCO2/ '000 caps]**
April ' 05	12595500	167	0.0133
May	13024500	166	0.0127

June	13338000	161	0.0121
July	13989000	156	0.0112
August	12964650	175	0.0135
September	13132000	171	0.0130
October	16032000	185	0.0115
November	15547500	180	0.0116
December	16828500	186	0.0110
January	15675000	186	0.0119
February	12913600	171	0.0132
March ' 06	15687000	191	0.0121
TOTAL	**171627250**	**2094**	**0.0122**

Emissions in Thermopac in FTL production				
2003-04	**FTL Lamp production**	**Emissions**	**Sp. fuel consumption**	**Sp. Emissions**
	[Nos.]	**[tCO2]**	**[L/ FTL]**	**[per '000 FTLs]**
April ' 03	1053057	57	0.019	0.05
May	1091521	55	0.018	0.05
June	1001467	50	0.018	0.05
July	1019019	52	0.018	0.05
August	887887	45	0.018	0.05
September	926023	51	0.020	0.05
October	957321	51	0.019	0.05
November	1081631	58	0.019	0.05
December	1164447	65	0.020	0.06
January	1120887	67	0.021	0.06
February	1087131	62	0.020	0.06
March ' 04	1132554	62	0.020	0.05
TOTAL	**12522945**	**675**	**0.019**	**0.05**

2004-05	**FTL Lamp production**	**Emissions**	**Sp. fuel consumption**	**Sp. Emissions**
	[Nos.]	**[tCO2]**	**[L/ FTL]**	**[per '000 FTLs]**
April ' 04	1148879	59	0.018	0.05
May	1078725	51	0.017	0.05
June	1083763	52	0.017	0.05
July	1129138	56	0.018	0.05
August	1045297	56	0.019	0.05
September	1122731	59	0.019	0.05
October	1109205	60	0.020	0.05
November	1057040	59	0.020	0.06
December	1233493	75	0.022	0.06
January	1166597	73	0.023	0.06

February	1104520	71	0.023	0.06
March ' 05	1146368	70	0.022	0.06
TOTAL	**13425756**	**739**	**0.020**	**0.06**

2005-06	**FTL Lamp production**	**Emissions**	**Sp. fuel consumption**	**Sp. Emissions**
	[Nos.]	**[tCO2]**	**[L/ FTL]**	**[per '000 FTLs]**
April ' 05	1125494	66	0.021	0.06
May	1208320	68	0.020	0.06
June	1179909	64	0.020	0.05
July	1566465	85	0.020	0.05
August	1469420	68	0.017	0.05
September	1501346	70	0.017	0.05
October	1555541	77	0.018	0.05
November	1507743	79	0.019	0.05
December	1630064	87	0.019	0.05
January	1618191	90	0.020	0.06
February	1588376	81	0.018	0.05
March ' 06	1665382	81	0.018	0.05
TOTAL	**17616251**	**917**	**0.019**	**0.05**

Lighting Division - DG operation	**Power Generation in DG set**	**Fuel Consumption**	**Emission**	**Sp. Emission factor**
Year	**kWh**	**KL**	**tCO2**	**tCO2/MWh**
2003-04	1459244	362	946	0.648
2004-05	969286	249	651	0.672
2005-06	598828	166	434	0.726

Component Division - DG operation	**Power Generation in DG set**	**Fuel Consumption**	**Emission**	**Sp. Emission factor**
Year	**kWh**	**KL**	**tCO2**	**tCO2/MWh**
2003-04	1019984	284	743	0.729
2004-05	854600	237	619	0.725
2005-06	283824	73	192	0.677

Grid Emission Factor	**NR Grid**	**WR Grid**
OM	0.99	0.99
BM	0.60	0.63
CM	0.80	0.81

Steel Division -DG operation	**Power Generation in DG set**	**Fuel Consumption**	**Sp. Emission factor**
Year	**kWh**	**KL**	**tCO2/MWh**
2003-04	2431214	787	0.84
2004-05	3874494	1281	0.86
2005-06	2716338	893	0.85

Annex 4

MONITORING INFORMATION

Please refer section B.7.2 for detailed monitoring plan.

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