Azim & Son (Pvt.) Ltd. (Unit-2)

368, Gacha Road, Gacha, NU, Gazipur-1704, Bangladesh

Greenhouse Gas Emission Inventory/ Carbon Foot Print Analysis

January, 2024 to December, 2024

Ref: EES/2025/GHG/668; Date: 16/04/2025

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1.0 Overview

This GHG inventory estimates the GHG emission such as CO_2 emitted by "**AZIM & SON (PVT.) LTD. (UNIT-2)**" for its utility purpose and prepared to quantify their annual CO_2 emission which will helps them to incorporate carbon cost in decision making as well as to identify cost saving opportunities. It is situated at **368, Gacha Road, Gacha, NU, Gazipur-1704, Bangladesh.**

Yearly Energy Consumption of the factory is given below:

Electricity Consumption:

Electricity Consumption	
Month	**Energy Consumption**
Unit	**kWh**
Jan-2024	146957
Feb-2024	148962
Mar-2024	169335
Apr-2024	116418
May-2024	172245
Jun-2024	120417
Jul-2024	127974
Aug-2024	74349
Sep-2024	140230
Oct-2024	151581
Nov-2024	151079
Dec-2024	126207
Average	**137146.1667**
Total	**1645754**

Diesel Consumption:

Diesel Consumption	
Month	Diesel Consumption
Unit	**L**
Jan-2024	7768.40
Feb-2024	7934.20
Mar-2024	8609.30
Apr-2024	15700.40
May-2024	24323.95
Jun-2024	19247.50
Jul-2024	16722.20
Aug-2024	12474.26
Sep-2024	19678.50
Oct-2024	13089.00
Nov-2024	9033.50
Dec-2024	8869.00
Average	**13620.85083**
Total	**163450.21**

Gas Consumption:

Gas Consumption	
Month	Gas Consumption
Unit	**m^3**
Jan-2024	48953.58
Feb-2024	60949.09
Mar-2024	46754.74
Apr-2024	28723.60
May-2024	54396.06
Jun-2024	28166.76
Jul-2024	26077.86
Aug-2024	15056.53
Sep-2024	40006.00
Oct-2024	79819.00
Nov-2024	82720.00
Dec-2024	81613.00
Average	**49436.35167**
Total	**593236.22**

2.0 Scope & Boundaries

The annual GHG emission is estimated in following scopes:

- *Scope 1:* The Direct emission from Stationary combustion sources is considered here. Stationary Combustion sources are given below:

Name of Unit	Types of Fuel used
Generator	Diesel
Boiler	Gas

- ***Scope 2:*** **Indirect Emission from purchased electricity.**
- ***Scope 3:*** **Corporate Value Chain (If any)**

Organizational Boundary: Total CO_2 emission is considered for the utility sector of the factory identifies that utility is the main and major source of their GHG Emission. In this inventory Scope 3 is not considered as no data has been obtained from the supply chain of the factory.

In this inventory 3 Greenhouse gases emission are considered and these are CO_2, CH_4 & N_2O. The total GHG emission is considered for total Natural Gas & Diesel combustion in the factory and total electricity used in this factory. Fuel properties data (Net Calorific Value, Density) are unavailable at the factory, so some assumptions are done to estimate fuel properties.

3.0 Reporting Period

The annual GHG Inventory is prepared for a year of (**Jan, 2024 to Dec, 2024).**

4.0 Methodology

The GHG Inventory has prepared in accordance with "***2006 IPCC Guidelines for National Greenhouse Gas Inventories*** **for Stationary Combustion (Volume 2_Energy_Chapter 2)".** The emission of Greenhouse gases is calculated by applying **Tier 1 approach** and following equation 2.1 of IPCC 2006 guidelines.

5.0 Data Management

Energy Consumption Data of **Jan, 2024 to Dec, 2024**

Serial	Month	Diesel Consumption (L)	Electricity Consumption (kWh)	Gas Consumption (m^3)
1	**Jan-2024**	7768.40	146957	48953.58
2	**Feb-2024**	7934.20	148962	60949.09
3	**Mar-2024**	8609.30	169335	46754.74
4	**Apr-2024**	15700.40	116418	28723.60
5	**May-2024**	24323.95	172245	54396.06
6	**Jun-2024**	19247.50	120417	28166.76
7	**Jul-2024**	16722.20	127974	26077.86
8	**Aug-2024**	12474.26	74349	15056.53
9	**Sep-2024**	19678.50	140230	40006.00
10	**Oct-2024**	13089.00	151581	79819.00
11	**Nov-2024**	9033.50	151079	82720.00
12	**Dec-2024**	8869.00	126207	81613.00
Total		**163450.21**	**1645754**	**593236.22**

6.0 Result:

Direct Emission:

In case of Gas

CO_2 Emission	For Gas Consumption of 593236.22 **m^3/year** CO_2 Emission is ≈ 1140.591076 **ton/year** *[Reference 1, 2 & 6]* *(Note: Diesel density is estimated to be 840 kg/m^3, NCV of Gas as per IPCC 2006 V2, table 1.2 is 43 TJ/ Gg which is equivalent to 43 MJ/ kg)*
CH_4 Emission	CH_4 Emission is 20.33139173 **kg CH_4/year** Now CH_4 Emission in Equivalent Carbon-dioxide (CO_2e) using GWP 21is ≈ 0.426959226 **ton CO_2/year** *[Reference 1 & 3]*
N_2O Emission	N_2O Emission is 2.033139173 **kg N_2O /year** Now N_2O Emission in Equivalent Carbon-dioxide(CO_2e) using GWP 310is e ≈ 0.630273144 **ton CO_2/year** *[Reference 1 & 3]*
Total CO_2e Emission	**1141.648309 ton CO_2/year**

Direct Emission:

In case of Diesel

CO_2 Emission	For Diesel Consumption of 163450.21 **liter/year** CO_2 Emission is ≈ 437.4731794 **ton/year** *[Reference 1, 2 & 6]* *(Note: Diesel density is estimated to be 840 kg/m^3, NCV of Diesel as per IPCC 2006 V2, table 1.2 is 43 TJ/ Gg which is equivalent to 43 MJ/ kg)*
CH_4 Emission	CH_4 Emission is 17.71146476 **kg CH_4/year** Now CH_4 Emission in Equivalent Carbon-dioxide (CO_2e) using GWP 21is ≈ 0.371940761 **ton CO_2/year** *[Reference 1 & 3]*
N_2O Emission	N_2O Emission is 3.542292951 **kg N_2O /year** Now N_2O Emission in Equivalent Carbon-dioxide(CO_2e) using GWP 310is e ≈ 1.098110815 **ton CO_2/year** *[Reference 1 & 3]*
Total CO_2e Emission	**438.943231 ton CO_2/year**

Indirect Emission:

From Electricity Consumption

For Electricity Consumption of 1645754 **kWh/year**

Total CO_2e Emission = (1645.754 mWh /year) X (**0.67** ton CO2/mWh) [4]

= 1102.65518 **ton CO_2/year**

TOTAL GHG EMISSION = CO_2e emission from (Gas + Diesel + Electricity consumption)

= (1141.648309 + 438.943231 + 1102.65518) **ton CO_2/year**

= 1084.194279 **ton CO_2/year**

Where,	
Emission from Scope 1	1580.59154 **ton CO_2/year**
Emission from Scope 2	1102.65518 **ton CO_2/year**

Graphical Representation of Results:

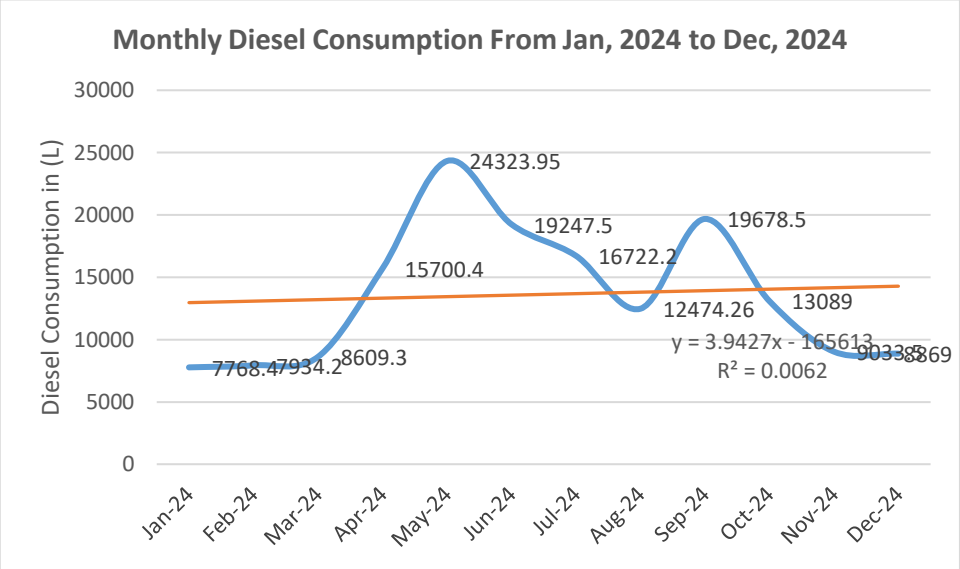

Figure 6.1: Monthly Diesel Consumption of the factory.

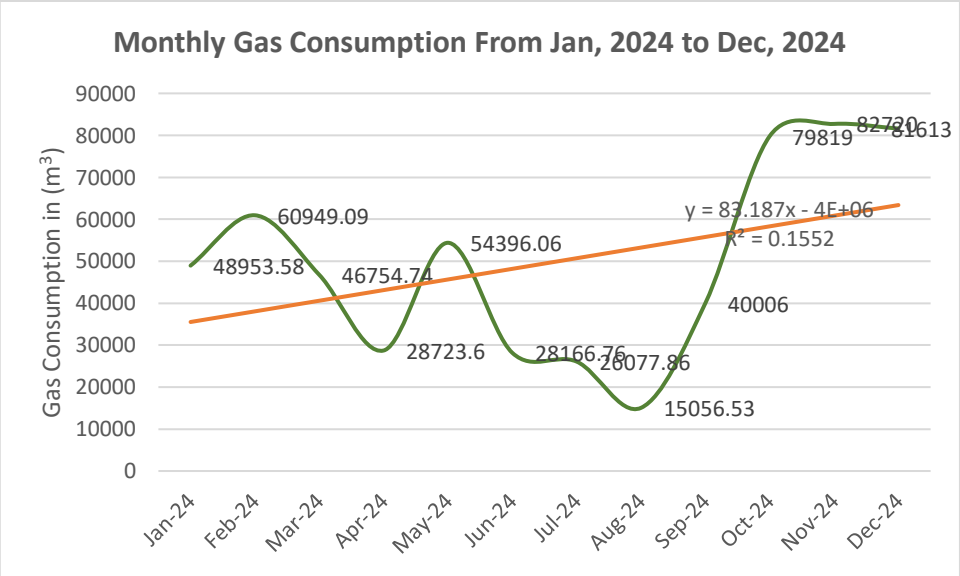

Figure 6.2: Monthly Gas Consumption of the factory.

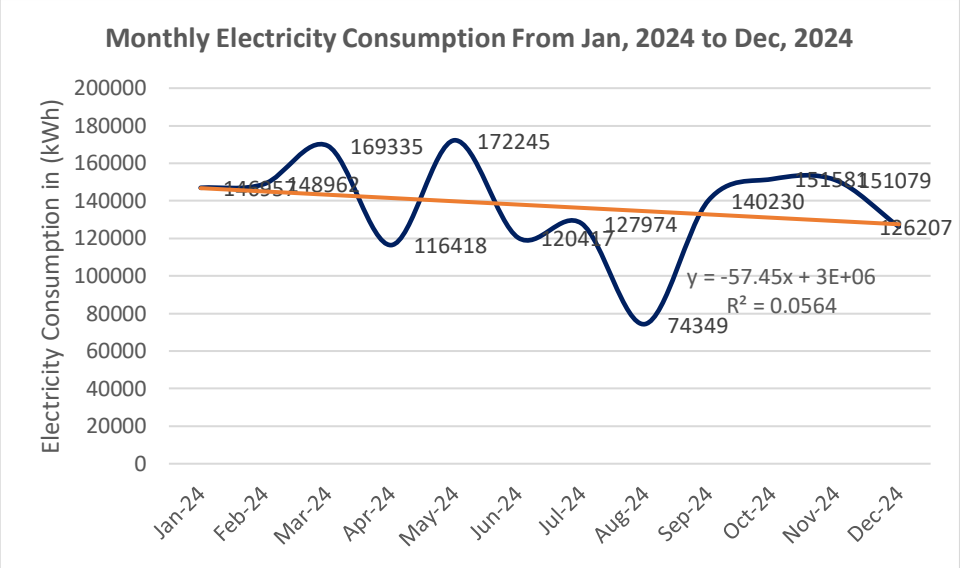

Figure 6.3: Monthly Electricity Consumption of the factory.

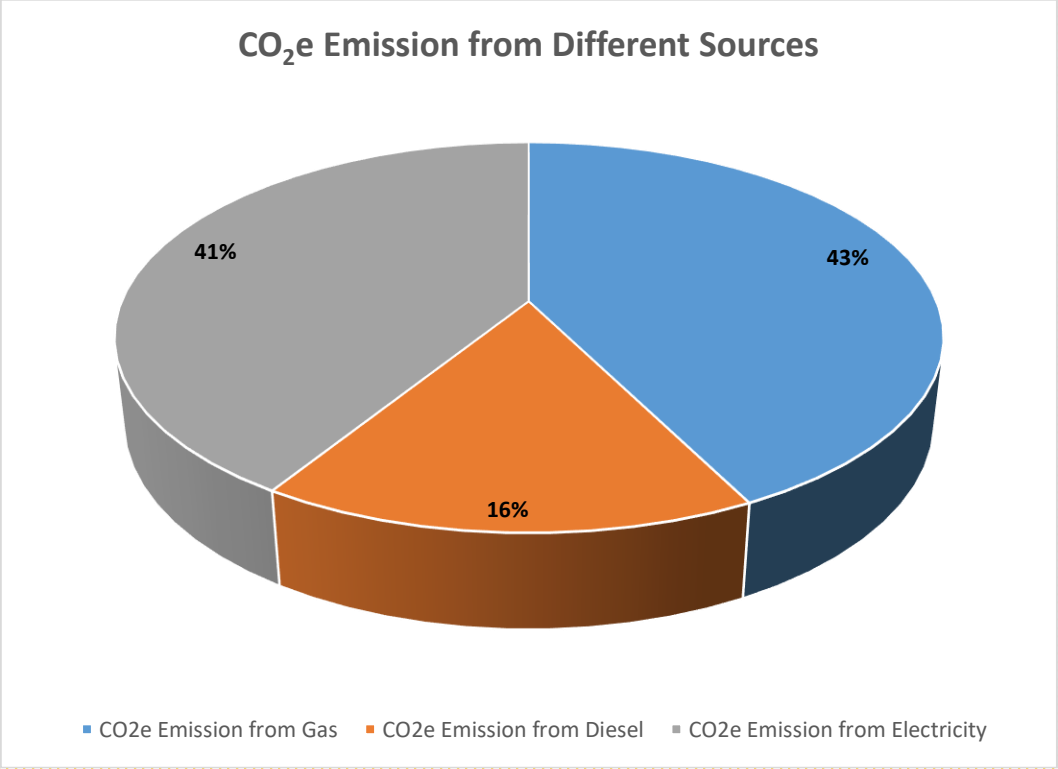

Figure 6.4: Annual GHG Emission in Percentage.

Comment:

From the GHG Inventory, it has been observed that near about 41% of CO_2e is emitted from scope 2 or indirect emissions **i.e.** from purchased Electricity, Diesel is near about 16% and Gas is near about 43%. It is also found that the emission of CH_4 & N_2O is negligible compared with CO_2 emission.

Carbon Management Plan

1.0 Introduction

This Greenhouse Gas Emissions Reduction Plan (GHG Plan) was prepared as a requirement of factory proponent according to fulfillment of their buyer's requirements. Mitigation Measure was developed during environmental review of Cleanup Plan, Offsite Properties within the Exide Preliminary Investigation Area (referred to as the Cleanup Plan or Project). The purpose and origins of the measure are described in DTSC's Final Environmental Impact Report (EIR) for the Project (State Clearinghouse No. 2016061032). The purpose of the GHG Plan is to monitor and track greenhouse gas emissions as well as to mitigate such emissions if needed to ensure the Project has less than significant impacts on the environment.

1.1 Mitigation Measure

1. Planting of new drought-tolerant and native trees of appropriate size and type for the property that would result in a net sequestration of CO_2 emissions (up to a maximum of two new trees per residential property with property owner permission and based on available funding).
2. Conduct a building energy efficiency audit in accordance with industry standard methods to identify nonstructural retrofits to existing buildings to improve the energy performance. Based on the results of the energy efficiency audit, retrofits may include, but are not limited to, weatherization (e.g., upgraded building insulation, upgraded energy-efficient glazing, reduction of air leakage from window and door seals), installation of smart thermostats, energy efficient lighting upgrades, water efficient faucet and showerhead upgrades, heating, ventilation, and air conditioning (HVAC) system maintenance, or other nonstructural energy efficiency improvements in accordance with state and local permitting standards.
3. Coordinating with property owners, for the installation of "cool roofs", i.e. a roofing system that delivers higher solar reflectance and higher thermal emittance than standard roofing products, with the goal of meeting Title 24 (2016) cool roof performance standards.
4. Coordinating with property owners for the installation of rooftop solar photovoltaic panels or solar water heating in accordance with state and local permitting standards on existing buildings at properties under cleanup. This measure only applies to existing buildings that do not require structural load-bearing improvements to accommodate the solar panels or water heaters and related electrical wiring, inverters, conduits, service panels, metering equipment or other necessary equipment. Solar panels may only be installed on rooftops with areas that meet the solar zone requirements in Section 110.10 of the Title 24 (2016) mandatory requirements. This measure does not provide for on-going maintenance. Post-installation maintenance and costs shall be borne by the property owner.
5. Reviewing, at least once a year, commercial availability of alternatives to diesel powered on-road and off-road equipment. If commercially available in the region, contractors shall be

required to use equipment capable of performing the cleanup activities in a comparable manner (with respect to time, safety, etc.) which results in appreciable GHG reductions.

6. Purchasing carbon credits from a reputable carbon market. The plan shall devise mitigation with a priority on fiscal considerations in order to reserve Project funds, to the extent feasible, for actual cleanups. The plan may also include provisions to seek grant funding or other mechanisms to leverage other existing programs that address energy reduction or urban forestation.

1.2 Plan Overview

The GHG Plan is designed to describe a program for ensuring compliance with Mitigation Measure GHG-1, including assurance that the Project GHG emissions will be monitored appropriately for the purpose of reducing GHG emissions impacts to a less than significant level. The organization of the GHG Plan includes:

- Introduction of Role, Responsibility, and Process for Implementation
- Summary of Projected GHG Emissions and Thresholds of Significance
- Process for Tracking and Monitoring GHG Emissions
- Analysis of GHG Reduction Measures to Select and Implement as Necessary

1.3 Project Management Team

- **GHG Mitigation Manager (GHGMM)** – An experienced compliance and GHG assessment specialist will have primary responsibility for ensuring compliance with the requirements of this GHG Plan, and for training and directing GHGMM Delegates. The GHGMM will be employed by the contractor executing the Cleanup Plan.
- **GHGMM Delegate(s)** – The GHGMM Delegate(s) will be employed by the factory and will have responsibility for assisting the GHGMM and will represent the GHGMM when the GHGMM is not present at the site.
- **Workers** – Workers at the work site, including management personnel and will be trained by the GHGMM and GHGMM Delegates to conduct all activities in accordance with the requirements of this GHG Plan, including providing information and resources as necessary to appropriately keep records and monitor GHG emissions. The management personnel will work with the GHGMM to facilitate this training, which will be conducted as necessary throughout the facility.

1.4 GHG Plan Implementation Approach

In order to meet the required measures to reduce GHG emissions during and after remediation, the GHG Plan has been designed with the following provisions:

- The GHGMM and his/her representatives will be at the cleanup site(s) during work hours at least once per week of the Project period to ensure that proper records are being kept and collect the fuel logs (and any other data as necessary).
- The GHGMM or a GHGMM Delegate will annually review the commercial availability of alternatives to diesel powered on-road and off-road equipment. If commercially available in the region, the GHGMM or a GHGMM Delegate will evaluate whether alternative equipment can perform the cleanup activities in a comparable manner (with respect to time, safety,

and effectiveness). If the alternative equipment is determined to meet those standards, the GHGMM or a GHGMM Delegate will ensure the use of that equipment by contractors.

- The GHGMM or GHGMM Delegate(s) will have full access to all areas of the remediation site, and will have the authority to stop any or all Project activities as may be warranted by applicable GHG mitigation conditions.
- The GHGMM or GHGMM Delegate(s) may have other responsibilities in addition to meeting the requirements of this GHG Plan.

2.0 GHG Reduction Measures

This section outlines the specific measures that can be employed as necessary to reduce the Project's annual GHG emissions and describes the measures that can be implemented to ensure and document successful enforcement of these conditions.

2.1 Facility Design Features and Measure to Reduce GHGs during Cleanup

The Project shall comply with the use of low carbon vehicle fuels.

- All off-road diesel equipment greater than 50 horsepower (hp) used for this facility shall meet USEPA Tier 4 off-road emission standards. Documentation of all off-road diesel equipment used for this facility including Tier 4 certification shall be maintained. If Tier 4 equipment is not available, all off-road diesel-powered equipment greater than 50 hp shall meet USEPA Tier 3 emissions standards where available. All equipment shall be outfitted with Best Available Control Technology (BACT) devices including a CARB certified Level 3 Diesel Particulate Filter or equivalent.
- Idling of on- and off-road heavy-duty diesel vehicles for more than five minutes at a time is prohibited. Exemptions to the idling rule include heavy traffic conditions, queuing beyond 100 feet from sensitive land uses, and forced to remain motionless due to weather or safety inspection activities.

2.2 GHG Reduction Measures to Reduce GHG Impacts to A Less Than Significant Level When Necessary

2.2.1 Planting Trees to Sequester carbon:

If GHG Reduction Measures are necessary, the measures may include planting of new drought-tolerant, high-carbon sequestering, and/or native trees of appropriate size and type for the property that would result in a net sequestration of CO2 emissions (up to a maximum of two new trees per residential property with property owner permission).

2.2.2 Building Energy Efficiency Audits and Performance Improvements

If GHG Reduction Measures are necessary than property owners can conduct building energy efficiency audits in accordance with industry standard methods to identify non-structural retrofits to existing buildings to improve the energy performance. Based on the results of the energy efficiency audits, retrofits may include, but are not limited to, weatherization (e.g., upgraded building insulation, upgraded energy-efficient glazing, reduction of air leakage from window and door seals), installation of smart thermostats, energy efficient lighting upgrades, water efficient faucet and showerhead upgrades, heating, ventilation, and air conditioning (HVAC) system maintenance, or other non-structural energy efficiency improvements in accordance with state and

local permitting standards.

2.2.3 Cool Roofing Systems

If GHG Reduction Measures are necessary, the measures may include coordinating with property owners, for the installation of "cool roofs" (i.e., a roofing system that delivers higher solar reflectance and higher thermal emittance than standard roofing products).

2.2.4 Rooftop Solar Photovoltaic Panels or Solar Water Heating

If GHG Reduction Measures are necessary, the measures may include coordinating with property owners for the installation of rooftop solar photovoltaic panels or solar water heating in accordance with state and local permitting standards on existing buildings at properties under cleanup. This measure only applies to existing buildings that do not require structural load-bearing improvements to accommodate the solar panels or water heaters and related electrical wiring, inverters, conduits, service panels, metering equipment or other necessary equipment.

2.2.5 GHG Offset Credits

If GHG Reduction Measures are necessary, the measures may include carbon offset credits certified from a reputable carbon standard including any one of the following:

- American Carbon Registry
- Climate Action Reserve
- Verified Carbon Standard

Other offset credits could be eligible for purchase, if they can be demonstrated to meet the standards of real, additional, quantifiable, permanent, verifiable and enforceable.

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Reference:

[1] 2006 IPCC Guidelines for National Greenhouse Gas Inventories for Stationary Combustion, Volume2: Energy, Chapter 2- "Table 2.3 – Default Emission Factors for Stationary Combustion for Manufacturing Industries and Construction"

[2] *2006 IPCC, Volume 2, Energy, "Table 1.2- Default Net Calorific Values (NCV) and Lower and Upper Limits of the 95 % Confidence Intervals".*

[3] *2.10.2 Direct Global Warming Potentials, IPCC Fourth Assessment Report: Climate Change 2007*

[4] *"New Grid Emission Factor"- http://www.doe.gov.bd/old/gef.html*

[5] "USAID CCEB: Task 2 – Baseline Assessment Report"- *http://www.cleanenergybd.org/index.php/component/jdownloads/viewdownload/4-resource center/13-task-2-1-baseline-assessment-report-final*

[6] "Properties of Liquids"- http://webserver.dmt.upm.es/~isidory o/dat1/eLIQ.pdf

[7] "LPG Basic and Grades" *-www.primove.in/images/LPG-Basics-and-Grades.pdf LPG is considered Butane based gas and the density is estimated at gaseous state.*