



PIXON GREEN ENERGY PRIVATE LIMITED

R.S. No. 157/1, 158/1, 158/2, 165/1 166 of Khijadiya Nana, R.S. No. 15/1 of Depaliya, Rajkot - Jamnagar Highway, Padadhari, Rajkot - 360110, Gujarat, India

Document Format No. : PGEPL/TC/ST/FM/06
Issue No./Date :
Rev. No./Date :

Gate Pass Outward Cum Delivery Challan

OGP No. : 000004	Exp Date of Return : 01-05-2021
OGP Date : 01-05-2020	Department : FG
Plant : Module	Transport Name : Shree krishna roadlines
Storage Location : FG01	
Designation Point :	LR No. & Date : 293 & 01-05-2021
Vendor Name : Marwadi university	Vehicle No : GJ03BV3678
Address: Rajkot, Gujarat 360003	Vehicle Type : Eicher
	Driver's Name : Rajubhai
	Licence No : 88148
	No. of Packages : 10
Invoice No. & Date :	Contact Person :
Challan No. & Date :	Contact No : -7229035102
GSTIN :	Weight Bridge Slip : 6882 Kg

S	Description	UOM	HSN/SAC No	GST%	GST Value	Quantity	Value
	Solar Module	Nos	8541	5	7443	310	2307330
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
Total						310	2307330

Total :-
 CGST :- 57683.25
 SGST :- 57683.25
 Round off :- -0.2
 Total Value :- 2422696.3

Total In Words :

Remarks :

Purpose :

HARENDRA HINSU Prepared By	Arnab Dasgupta Authorised By	HARENDRA HINSU Store Incharge	Security Officer	Reieved By

Handwritten notes:
 Date: 01/05/2021
 Time: 4:00 PM
 IH T/499

	PIXON GREEN ENERGY PRIVATE LIMITED	Document Format No.	PGEPL/TC/ST/FM/06
	R.S. No. 157/1, 158/1, 158/2, 165/1 166 of Khijadiya Nana, R.S. No. 15/1 of Depaliya, Rajkot -Jamnagar Highway, Padadhari, Rajkot - 360110, Gujarat, India	Issue No./Date	
		Rev. No./Date	

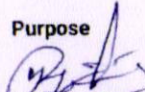
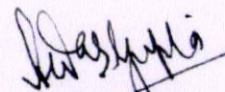

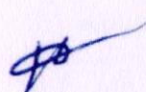
Gate Pass Outward Cum Delivery Challan

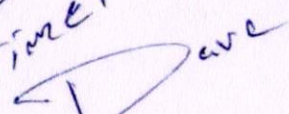
OGP No. : 000005 OGP Date : 01-05-2020 Plant : Module Storage Location : FG01 Designation Point : Vendor Name : Marwadi university Address : Rajkot, Gujarat 360003 Invoice No. & Date : Challan No. & Date : GSTIN :	Exp Date of Return : 02.05.2021 Department : FG Transport Name : Shree krishna roadlines LR No. & Date : 293 & 01-05-2021 Vehicle No : GJ03BW9244 Vehicle Type : Eicher Driver's Name : Raju Licence No : 4031 No. of Packages : 10 Contact Person : - Contact No : -7229035102 Weight Bridge Slip : 6882 Kg
--	---

Sr	Description	UOM	HSN/SAC No	GST%	GST Value	Quantity	Value
1	Solar Module	Nos	8541	5	7443	310	2307330
Total						310	2307330

Total :-
CGST :- 57683.25
SGST :- 57683.25
Round off :- -0.2
Total Value :- 2422696.3

Total In Words :

Remarks :	
Purpose :  JIFENDRA HINSU Prepared By	 Arnab Dasgupta Authorised By
	 JIFENDRA HINSU Store Incharge
	 Security Officer Relieved By

T/501
 Date:- 17/5/2021
 Time:- 4:00 PM


	PIXON GREEN ENERGY PRIVATE LIMITED	Document Format No.	PGEPL/TC/ST/FM/06
	R.S. No. 157/1, 158/1, 158/2, 165/1 166 of Khijadiya Nana, R.S. No. 15/1 of Depaliya, Rajkot -Jamnagar Highway, Padadhari, Rajkot - 360110, Gujarat, India	Issue No./Date	
		Rev. No./Date	

Gate Pass Outward Cum Delivery Challan

OGP No. : 000006	Exp Date of Return : 02.05.2021
OGP Date : 01-05-2020	Department : FG
Plant : Module	Transport Name : Shree krishna roadlines
Storage Location : FG01	
Designation Point :	LR No. & Date : 293 & 01-05-2021
Vendor Name : Marwadi university	Vehicle No : GJ03BV9840
Address: Rajkot, Gujarat 360003	Vehicle Type : Eicher
	Driver's Name : Jiwanbhai
	Licence No : 45292
	No. of Packages : 10
Invoice No. & Date :	Contact Person : -
Challan No. & Date :	Contact No : -7229035102
GSTIN :	Weight Bridge Slip : 6882 Kg

Sl.	Description	UOM	HSN/SAC No	GST%	GST Value	Quantity	Value
1	Solar Module	Nos	8541	5	7443	310	2307330
Total						310	2307330

Total :-
 CGST :- 57683.25
 SGST :- 57683.25
 Round off :- -0.2
 Total Value :- 2422696.3

Total In Words :

Remarks :	
Purpose :	
 JITENDRA HINSU Prepared By	 Arneeb Daasgupta Authorised By
 JITENDRA HINSU Store Incharge	 Security Officer
	 Relieved By

121
 T/500
 Date: 1/5/2021
 Time: 4:00 PM
 Date

	PIXON GREEN ENERGY PRIVATE LIMITED	Document Format No.	PGEPL/TC/ST/FM/06
	R.S. No. 157/1, 158/1, 158/2, 165/1 166 of Khijadiya Nana, R.S. No. 15/1 of Depaliya, Rajkot - Jamnagar Highway, Padadhari, Rajkot - 360110, Gujarat, India	Issue No./Date	
		Rev. No./Date	

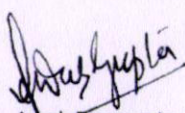
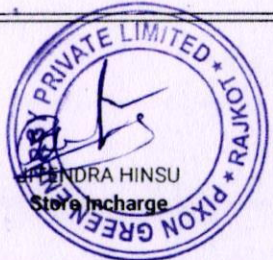
Gate Pass Outward Cum Delivery Challan

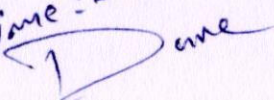
OGP No. : 000006 OGP Date : 02-05-2021 Plant : Module Storage Location : FG01 Designation Point : Vendor Name : Marwadi university Address: Rajkot, Gujarat 360003 Invoice No. & Date : Challan No. & Date : GSTIN :	Department : FG Transport Name : Shree krishna roadlines LR No. & Date : 295 & 02-05-2021 Vehicle No : GJ03BW9244 Vehicle Type : Eicher Driver's Name : Raju Licence No : 4031 No. of Packages : 9 Contact Person : - Contact No : -7229035102 Weight Bridge Slip : 6882 Kg
---	---

S. No.	Description	UOM	HSN/SAC No	GST%	GST Value	Quantity	Value
1	Solar Module	Nos	8541	5	7443	279	2076597
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
			-	-	-	-	-
Total						279	2076597

Total :-
 CGST :- 51914.925
 SGST :- 51914.925
 Round off :- -0.2
Total Value :- 2180426.65

Total in Words :

Remarks :				
Purpose :				
Prepared By :	Arhab Daasgupta Authorised By	HINDRA HINSU Store incharge	Security Officer	 Relieved By

IN
 T/503
 Date :- 21/5/2021
 Time :- 2:15 PM


 PIXON	PIXON GREEN ENERGY PRIVATE LIMITED	Document Format No.	PGEPL/TC/ST/FM/06
	R.S. No. 157/1, 158/1, 158/2, 165/1 166 of Khijadiya Nana, R.S. No. 15/1 of Depaliya, Rajkot -Jamnagar Highway, Padadhari, Rajkot - 360110, Gujarat, India	Issue No./Date	
		Rev. No./Date	

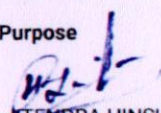
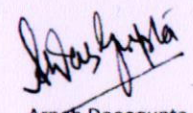
Gate Pass Outward Cum Delivery Challan


OGP No. : 000005 OGP Date : 02-05-2020 Plant : Module Storage Location : FG01 Designation Point : Vendor Name : Marwadi university Address: Rajkot, Gujarat 360003 Invoice No. & Date : Challan No. & Date : GSTIN :	Department : FG Transport Name : Shree krishna roadlines LR No. & Date : 293 & 01-05-2021 Vehicle No : GJ03BV9840 Vehicle Type : Eicher Driver's Name : Jiwanbhai Licence No : 45292 No. of Packages : 10 Contact Person : - Contact No : -7229035102 Weight Bridge Slip : 6882 Kg
---	---

Sr	Description	UOM	HSN/SAC No	GST%	GST Value	Quantity	Value
1	Solar Module	Nos	8541	5	7443	310	2307330
total						310	2307330

Total :-
CGST :- 57683.25
SGST :- 57683.25
Round off :- -0.2
Total Value :- 2422696.3

Total In Words :

Remarks :	
Purpose :  JITENDRA HINSU Prepared By	 Ansh Daasgupta Authorized By
	 JITENDRA HINSU Store Incharge
	Security Officer
	 Relieved By

14
T/502
Date :- 2/5/2021
Time :- 12:35 PM


A Proposal

**To Establish Kitchen Waste
based Biogas Plant**

Submitted to

Gujarat Energy Development Agency
4th floor, Block No. 11 & 12
Udyog Bhavan
Sector -11
Gandhinagar-382 017, Gujarat

Submitted by

Chintan Pathak, Ph.D.
Debananda Roy, Ph.D.
Rajendrasinh Jadeja, Ph.D.

to be establish at:

MARWADI FOUNDATIONS' GROUP OF INSTITUTIONS
Rajkot-Morbi Road, At & PO: Gauridad
Rajkot 360 003. Gujarat

2014

Title: “Energy Recovery from Kitchen Waste using Biogas Plant”

PI Name, Designation & Address:

- [1] **Chintan Pathak, Ph.D.**
Asst. Professor
Dept. of Environmental Science and Engineering,
Faculty of Engineering,
Marwadi Education Foundations’ Group of Institutions (MEFGI), At & Po.
Gauridad, Rajkot – 360003
e-mail address: chintan.pathak@marwadieducation.edu.in
Contact: +919428422179

Co-PI Name, Designation & Address:

- [1] **Debananda Roy, Ph.D.**
Asst. Professor
Dept. of Environmental Science and Engineering,
Faculty of Engineering,
Marwadi Education Foundations’ Group of Institutions’ (MEFGI), At & Po.
Gauridad, Rajkot – 360003
e-mail address: debananda.roy@marwadieducation.edu.in
Contact: +919374282321
- [2] **Rajendrasinh Jadeja, Ph.D.**
Professor and Dean
Dept. of Electrical Engineering,
Faculty of Engineering,
Marwadi Education Foundations’ Group of Institutions’ (MEFGI), At & Po.
Gauridad, Rajkot – 360003
e-mail address: rajendrasinh.jadeja@marwadieducation.edu.in
Contact: +919727724686

Summary: With interest and investment in waste to energy systems increasing by the month, organic “waste” can and should be treated as a commodity i.e. a product with monetary value on the market and an increasingly valuable one. At present, our institute incurs significant operating costs in having its organic wastes hauled to external sites that are finding environmentally beneficial and profitable uses for it. Given the opportunity presented by our large campus community here in MEFGI, the authors of this proposal suggest that the institute should design its own kitchen waste based combined waste to energy generation power plant at campus.

Authors demonstrates how installing and operating an anaerobic digester that feeds the campus cogeneration plant with refined biogas to produce energy, would be a viable investment. Despite significant capital and operating costs, a digester system producing biogas, electricity, recoverable heat and marketable compost would be a cost effective and profitable method of disposing the kitchen's organic waste as well as generating alternative energy.

Introduction

The disposal and alternate uses of organic "waste" have recently resurfaced as hot topics within the environmental sustainability arena. With interest in alternate uses having been piqued across the nation in recent years, investment decisions for such projects are often dependent on the ability to secure consistent streams of feedstock for the long term. Organic "waste" can thus be treated as a commodity i.e. a product with monetary value on the market and an increasingly valuable one at that.

Despite the increasing consideration of organic waste as a valuable resource, the institute has yet to develop a program for its beneficial reuse on campus. Instead, at the present time, the institute pays to haul its dining hall food waste (500 kgs/day) to proper disposal quite away at far distance to an external composting site and does not reuse organic waste. To that end, the analysis in this proposal suggests that the operation of an anaerobic digester that offsets a portion of the campus cogeneration plant's natural gas consumption with refined biogas would achieve both environmental and economic benefits for the Institute.

Brief Background

Presently, the campus uses LPG gas as its main source of fuel. Anaerobic digestion or the degradation of organic matter in the absence of oxygen - produces a biogas rich in methane (~75% by volume) which could then be purified and used in place of energy source. In addition, given an appropriately long digestion time (> 20 days) and high temperature (>120°F), residual materials from the digester can be directly combined with a bulking agent such as wood chips and sold as compost or fertilizer additive (Eftoda, 2004).

BIOGAS is produced by bacteria through the bio-degradation of organic material under anaerobic conditions. Natural generation of biogas is an important part of bio-geochemical carbon cycle.

Composition of biogas

Component	Concentration (by volume)
Methane (CH ₄)	55-60 %
Carbon dioxide (CO ₂)	35-40 %
Water (H ₂ O)	2-7 %
Hydrogen sulphide (H ₂ S)	20-20,000 ppm (2%)
Ammonia (NH ₃)	0-0.05 %
Nitrogen (N)	0-2 %
Oxygen (O ₂)	0-2 %
Hydrogen (H)	0-1 %

Many factors affecting the fermentation process of organic substances under anaerobic condition are,

- The quantity and nature of organic matter
- The temperature
- Acidity and alkalinity (pH value) of substrate
- The flow and dilution of material

GENERAL FEATURES OF BIOGAS

Energy Content	6-6.5 kWh/m ³
Fuel Equivalent	0.6-0.65 l oil/m ³ biogas
Explosion Limits	6-12 % biogas in air
Ignition Temperature	650-750 °C
Critical Pressure	75-89 bar
Critical temperature	-82.5 °C
Normal Density	1.2 kg/m ³
Smell	Bad eggs

A typical biogas system consists of the following components:

- (1) Manure collection
- (2) Anaerobic digester
- (3) Effluent storage
- (4) Gas handling
- (5) Gas use

Principal of Biogas

Organic substances exist in wide variety from living beings to dead organisms . Organic matters are composed of Carbon (C), combined with elements such as Hydrogen (H), Oxygen (O), Nitrogen (N), Sulphur (S) to form variety of organic compounds such as carbohydrates, proteins & lipids. In nature MOs (microorganisms), through digestion process breaks the complex carbon into smaller substances. There are 2 types of digestion process : Aerobic digestion and Anaerobic digestion. The digestion process occurring in *presence of Oxygen* is called **Aerobic digestion** and produces mixtures of gases having carbon dioxide (CO₂), one of the main “Green House” responsible for global warming. The digestion process occurring *without (absence) oxygen* is called **Anaerobic digestion** which generates mixtures of gases. The gas produced which is mainly methane produces 5200-5800 KJ/m³ which when burned at normal room temperature and presents a viable environmentally friendly energy source to replace fossil fuels (non-renewable).

Considerations

The construction steps and operation of biogas plant, which include:

- a.** Planning the biogas plant layout and designing the digesters, where the rules of thumb for planning the layout of a commercial biogas plant are elucidated and a methodology for specifying the dimensions of both digester(s) and residue storage tank(s) is illustrated, and they are: internal and external diameters of the tanks, wall thickness of the tank, height ...etc.
- b.** Undertaking the project, i.e. carrying out the excavation (digging) works, preparation of the bottom plate of the digester, integrating the heating tubes, building the fermenter, installing the insulation, and technology installation.
- c.** Running the biogas plant including the mechanization of the biogas plant such as: solids feeder, gas processing unit, mixing technology ...etc.
- d.** System control, i.e. how the individual facility components are monitored by computer technology even from afar as well as on-site using a computer system.

The components of a biogas unit are:

1. Reception tank
2. Digester or fermenter
3. Gas holder
4. Overflow tank

Food Waste to Energy Process

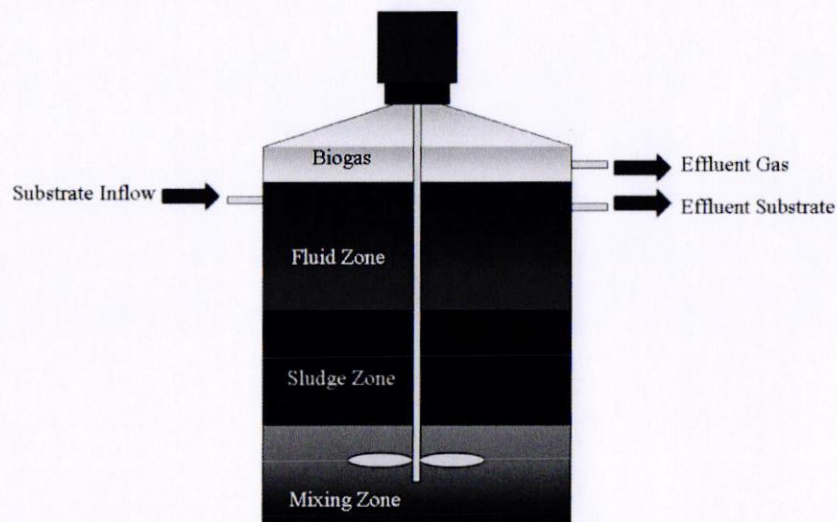
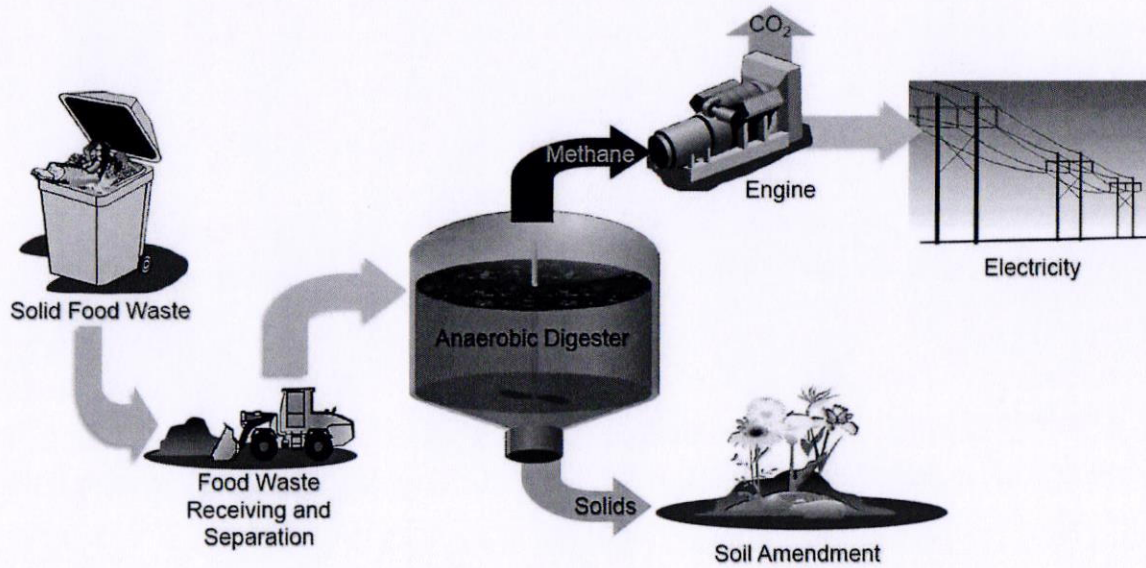
The size of a biogas unit depends on several factors, which are:

1. The amount and type of organic waste to be disposed in the digester
2. The objective of treating the organic waste (the production of energy)
3. Demand of natural gas and consumption pattern
4. On-site nature of the soil and the level of ground water
5. Air temperature in the region and wind direction throughout the different seasons
6. The amount of manure fed into a digester each day has an important effect on its operation

The amount of manure fed into a digester each day is measured by volume added in relation to the volume of the digester, but the actual quantity fed to the digester also depends on the temperature at which the digester is maintained. In order to determine the unit size of a biogas unit, the following mathematical equation must be achieved:

$$\text{Digester size (m}^3\text{)} = \text{Daily feed-in (m}^3 \text{ day}^{-1}\text{)} \times \text{Retention time (day)}$$

The digester size can be defined as the total size of the biogas unit, which includes the effective size of any volume occupied by the fermented material and the volume of gas storage. Size of the daily feed-in is the size of a mixture of waste with water added to the digester once daily or several times and the average concentration of total solids of 10%, where mixing the organic wastes with water depends on its water content. In order to plan a biogas plant and to design a digester, several design parameters must be determined which are: ratio of gathered waste from canals to total waste, quantity of daily liquid organic matter deposition into the digester, hydraulic retention time, density and quantity of daily dry organic matter deposition into the digester and digester load. The aforementioned design parameters are used to determine the total volume of the materials that are intended to be stored in the tank and are equal to the internal volume of the tank. Additionally, the designer should take into consideration that a part of the tank (about 10%) is empty and the substrates should not fill it, because it is the place where the gas will accumulate. Even in case of designing other storage tanks (e.g. liquid organic matter tank) it is required to leave 10% of the tank volume empty.



Here two syntax tanks will be used, one of 1000 lit from digester and other of 750 lit for gas collector. Here also different parameter will be checked like...

- Total solid – increasing the feeding rate from 100 gm to 5 kg and to check effect on gas production and effluent quality.
- PH – to check change in PH and control of PH
- Temperature effect

Parameters

Maximum food waste that can be accommodated	500 kg/d
Gas production capacity	750 gm LPG equivalent per day
Standard size to be installed	4000 l
Water required	30-40 l/d
Processing time	8 d
Methane	70-75 %
Calorific value of Biogas	6 kWh/m ³

Calculations:

According to campus and dining facilities, the amount of organic waste generated amount is approximately 450 kgs per day. We assume that approximately 500 kgs of organic waste can be collected from the aforementioned entities on campus. Compost production, biogas production and methane content of biogas after thermophilic digestion (120° F) of food waste for 28 days were based on the widely cited paper from UC Berkeley (Zhang et al 2007). The heating value of the methane was then obtained and energy and power produced was then calculated based on the 50% efficiency of a reciprocating engine. An American Society of Heating and Refrigeration and Air-Conditioning Engineers publication (ASHRAE, 2004) was then used as reference to determine the amount of waste heat recoverable from the engine of which 30% is used for heating the digester itself. Maintenance costs were assumed to start at Rs.1000/ton and increases by 2% every year; this is inclusive of annual labor, maintenance, materials, testing and insurance costs. The revenue generated by the system stems from the biogas that offsets natural gas, compost and waste heat that are produced. Since it directly substitutes for natural gas consumption, the rupees value of methane produced in the biogas is equivalent to the cost of natural gas used at the central plants – Rs.50/therm. The value of the waste heat captured from the engine is also priced at this level. The economic analysis for the project was done using a Minimum Attractive Rate of Return (MARR) of 8%, assuming a useful life of 25 years for the digester, Rs.0/- Salvage Value and a 2% increase in maintenance costs per year.

Sr. No.	Detail	Value	Unit
1	Total Mass / Day	0.5	tons/day (at peak)
2	Total Volume / Day	0.416319734	m ³ /day
3	Digester Mass with residence time of 28 days (M)	14	tons
4	Digester Volume with residence time of 28 days (V)	12.82264779	m ³
5	Volatile Solids (Vs) of Total Waste (TW)	136.077	kg/day
		122.4693	kg VS/day
7	Value of compost grade residual solids	9385.08	rs./yr
			value/ton (400 Rs.) * tons produced/yr
9	Peak ft ³ of CH ₄ produced	1411.02	CH ₄ /day (at peak)
10	Energy Generation	1446294.32	BTU/day
11	(30 % of waste heat from turbine is used for digester heating - not gas produced from the digester)	211.9423097	kWh/day (at peak)
12	Value of CH ₄ produced	5648.502472	
13	Power Generation	8.83092957	kW (at peak)
14	Value of Heat produced	3128.85981	Rs.

Energy Savings and GHG Reduction from a Food Waste to Energy Project

Avg. annual energy savings (kWh/yr)	Annual GHG reduction (MT CO ₂ e/yr)	Lifetime GHG reduction (MT CO ₂ e/yr)
***	810	16,200

Regulatory Environment for Biomass Projects

Needless to say, any future decisions will also be influenced by the regulatory environment for alternative energy within the State. On this count, the Ministry of Renewable Energy Incentive

Program is fully supportive of cost-effective growth of biomass to energy technology. It affirms that “energy from waste is an attractive option” and calls for the policy makers and administrators to “consider opportunities to support further use of biomass as an energy source and consider innovative mechanisms for the development of new plants that can make use of a variety of biomass types to produce electricity as well as fuels”.

Procedure

Kitchen waste mass has been determined daily and composition has been noted weekly. The waste is broken down using a commercial shredder. After shredding, the waste is fed into acetogenic organisms chamber, which will degrade the food waste forming organic acids. The acids will serve as substrate to methanogenic organisms in second stage producing biogas. Treated effluent will be pumped into an effluent tank where it will be stored until later use. Daily inspections (1 hr/d) will be necessary to ensure that all mechanical equipment functions properly. Overall operation of the digestion should require less than 8 days after start-up is completed.

Analysis: Chemical analysis of influent and effluent waste streams in addition to the mass streams will provide the basis of energy and economic analysis of the system. Biogas flow and composition will be determined using online measurements while mass flows and composition of the liquid/solid streams will need to be determined manually. Weekly COD, TS and VS tests will be completed to characterize the input material. Every two weeks major nutrients (Nitrogen, Phosphorous, Potassium) will be determined in the liquid streams in order to assess the fertilizer value of the effluent. To characterize the total solids for the food waste, Standard Method for the Examination of Water & Wastewater should be applied. The following equation determines the total solids of the material by measuring the amount of water that is lost.

$$\text{Total Solids} = \text{Weight}_{\text{post-105}^\circ\text{C}} - \text{Weight}_{\text{initial}}$$

To characterize the total volatile solids for the food waste,

$$\text{Total Volatile Solids} = \text{Weight}_{\text{post-105}^\circ\text{C}} - \text{Weight}_{\text{post-550}^\circ\text{C}} - \text{Weight}_{\text{initial}}$$

While the COD is a direct measure of the latent energy content of a particular waste the removal of volatile solids have been often used to characterize digester performance.

Summary of Advantages and Disadvantages

Adding a food waste receiving system would allow taking advantage of excess digester capacity to generate renewable energy. Below is a summary of advantages and disadvantages of adding food waste.

Advantages:

- Additional biogas production to produce “GHG-free” energy.
- Optimized use of excess digester capacity.
- Reduced truck traffic to nearby landfills.
- Diverts food waste from landfills and sewer systems.
- Potential to create local food waste collection jobs.

Disadvantages:

- Increased loading on digesters.
- Increase in O&M costs.
- High capital expenditures.
- Potential odor concerns.
- Potential operational impact from haulers if receiving station not designed correctly.
- Requires on-going set-up and oversight of a project.

Conclusions

The authors of this proposal can understand the concerns the Institute has for an anaerobic digestion system - high capital costs, fluctuating waste streams, technology risks, siting concerns and operational challenges from odor and transportation being chief among them. These are undoubtedly some issues beyond the scope of this proposal. However, the Department of Environment Science and Engineering, Faculty of Engineering, MEFGI does offer a feasibility study incentive that would partially offset the cost of doing a comprehensive go or no-go evaluation. The feasibility study for an expected system between .5 and 1 MW would qualify for the lesser of Rs.5,00,000 or 50% of the cost of the study.

Throughout the country, there are only a handful of organizations that own and operate an anaerobic digester. It is our hope that the recent leadership of the MEFGI serves as

reassurance that an organization can cope with a seasonal fluctuation of organic waste and still operate successfully. Given the institution's progressive stance on recycling, the installation of kitchen waste based anaerobic digester could have significant potential to further improve our waste management as well as alternative energy production.

“In light of the fact that the tonnage of food waste generated per year in India is greater than the combined tonnage of old newspapers, glass containers and aluminum cans (three of the most commonly recognized recyclable materials), food waste recycling represents a great opportunity for achieving recycling gains in this state” – Solid Waste Management Plan Update.

References

- 1) ASHRAE, Assessing value of CHP systems, ASHRAE Journal, June 2004
- 2) California EPA, Current Anaerobic Digestion Technologies Used for Treatment of Municipal Organic Solid Waste, California Integrated Waste Management Board, March 2008.
- 3) Ebunilo, P. O., and D. O. Otiede. "Design and Testing of a Mini-Plant for Conversion of Organic Waste to Biogas." *Advanced Materials Research*.
- 4) Eftoda, Grant, and Daryl McCartney. "Determining the Critical Bulking Agent Requirement for Municipal Biosolids Composting." *Compost Science and Utilization* 12 (2004): 208-18.
- 5) "Energy Calculators." EIA Energy Kids. United States Energy Information Administration.
- 6) Web.
<[://www.eia.gov/kids/energy.cfm?page=about_energy_conversion_calculator-basics](http://www.eia.gov/kids/energy.cfm?page=about_energy_conversion_calculator-basics)>.
- 7) "Feeding Animals : The Business Solution to Food Scraps Success Story." EPA.
- 8) Environmental Protection Agency, Oct. 2009. Web.
<<http://www.epa.gov/osw/conserva/materials/organics/food/success/rutgers.htm>>.
- 9) "How the Institution's Kitchen Facilities Work." Telephone interview.
- 10) NJ DEP, New Jersey Department of Environmental Protection – Bureau of Recycling and Planning.
- 11) "Reciprocating Engines." Web.
<http://njchp.rutgers.edu/files/Reciprocating_Engines.pdf>.
- 12) Zhang, Ruihong, Hamed M. El-Mashad, Karl Hartman, Fengyu Wang, Guangqing Liu, Chirs Choate, and Paul Gamble. "Characterization of Food Waste as Feedstock for Anaerobic Digestion." *Bioresource Technology* 98.4 (2007): 929-35.
- 13) Bartali, E. (1999). Characteristics and Performances of Construction Materials, In: CIGR Handbook of Agricultural Engineering: Animal Production and Aquacultural Engineering, E. Bartali, A. Jongebreur, and D. Moffitt, (eds.), 3-29, ASAE, ISBN 0-929355-98-9, St. Joseph, Michigan, USA.
- 14) Blumensaat, F. & Keller J. (2005). Modelling of Two-Stage Anaerobic Digestion Using the IWA Anaerobic Digestion Model No. 1 (ADM1). *Water Research*, Vol. 39, No. 1, pp. 171-183, ISSN 0043-1354.
- 15) BIOGAS PLANT DESIGN. <http://bio-gas-plant.blogspot.com/>

- 16) BIOGAS NORD GmbH, Werningshof 2-4, 33719 Bielefeld, Germany.
<http://www.biogasnord.com/>
- 17) Chandrasekar, A. (2006). Demonstration of Hydrogen Production from Dairy Manure Derived Biogas, Proceedings of 2006 ASABE Annual International Meeting, Paper Number: 067065, Portland, Oregon, USA, July 9-12, 2006.
- 18) Environmental Power Corp., 120 White Plains Rd, Tarrytown, NY 10591, USA.
www.environmentalpower.com
- 19) Florentino, H. (2003). Mathematical Tool to Size Rural Digesters. *Scientia Agricola*, Vol. 60, No. 1, pp. 185-190, ISSN 0103-9016.
- 20) Ghafoori, E. & Flynn P. C. (2007). Optimizing the Size of Anaerobic Digesters. *Transactions of the ASABE*, Vol. 50, No. 3, pp. 1029-1036, ISSN 2151-0032.
- 21) Godbout, S.; Marquis, A.; Fafard, M. & Picard, A. (2003). Analytical Determination of Internal Forces in a Cylindrical Tank Wall from Soil, Liquid, and Vehicle Loads. *Canadian Biosystems Engineering*, Vol. 45, pp. 5.7-5.14, ISSN: 1492-9058.
- 22) Gronauer, A. G. & Naser S. (2003). Concepts and Techniques for Sustainable Slurry Management on Farms, Proceedings of Ninth International Symposium on Animal, Agricultural and Food Processing Wastes, Paper Number: 701P1203, North Carolina, USA, October 12-15, 2003.
- 23) Lindley, J. A. & Whitaker, J. H. (1996). *Agricultural Buildings and Structures*, ASAE, ISBN 0-929355-73-3, St. Joseph, Michigan, USA.
- 24) MT-ENERGIE GmbH & Co. KG, Vor dem Seemoor 1, 27404 Rockstedt, Germany.
<http://www.mt-energie.com/>
- 25) Samer, M. (2011). How to Construct Manure Storages and Handling Systems? *IST Transactions of Biosystems and Agricultural Engineering*, Vol. 1, No. 1, pp. 1-7, ISSN 1913-8741.
- 26) Samer, M. (2010). A Software Program for Planning and Designing Biogas Plants. *Transactions of the ASABE*, Vol. 53, No. 4, pp. 1277-1285, ISSN 2151-0032.



To

Date: 26th April, 2016

The Account Section,
Marwadi education Foundation Group of Institution,
Rajkot, Gujarat.

Sub: Payment of the amount Rs. 80, 000/- to "M/S Shiva Biogas Agency" for Biogas Plant project.

Respected sir,

Please find the financial statement of Biogas Plant:

- A. Total cost of the plant as per sanction letter provided by GEDA dated 02.03.2015 = 10,08,112 (Rs.).
- B. Subsidy Provided by Govt. = 75% of the total cost = $1008112 \times 75/100$ (Rs.) = 7,56,084 (Rs.)
- C. Discount allowed by the contractor = 50, 000 (Rs.)
- D. Total Amount to be paid by the Organization (MEFGI) = Rs. [10,08,112 - (7,56,084 + 50,000)]
- = Rs. 2, 02, 028
- E. First installment to be pay(40%) = $202028 \times 40/100$ = Rs. 80, 800/-
- F. Second installment to be pay (40%)= Rs. 80, 800/-
- G. Third installment to be pay (20%)= Rs. 20, 200/-

It's a kind request to pay amount Rs. 80,800 in the favor of "M/S Shiva Biogas Agency", Wankaner, Rajkot to complete the project.

Thanking you,

Dr. Debananda Roy
Assistant Professor,
Dept. of Environmental Science and Engg.,
MEFGI, Rajkot.

Rajendra Singh Jadeja, Ph.D.

Professor and Dean (Faculty of
Engineering), MEFGI, Rajkot.



To

Date: 03/03/16

The Dean of faculty of Engineering,
Marwadi education Foundation Group of Institution,
Rajkot, Gujarat.

Sub: Approval for the manufacture amount (Rs. 2, 02,028) for Biogas Plant.

Respected sir,

Please find the financial statement of Biogas Plant:

- A. Total cost of the plant as per sanction letter provided by GEDA dated 02.03.2015 = 10,08,112 (Rs.).
- B. Subsidy Provided by Govt. = 75% of the total cost = $1008112 \times 75/100$ (Rs.) = 7,56,084 (Rs.)
- C. Discount allowed by the contractor = 50, 000 (Rs.)
- D. Amount to be paid by the Organization (MEFGI) = Rs. $[10,08,112 - (7,56,084 + 50,000)]$
= Rs. 2, 02, 028

It's a kind request to approve amount Rs. 2, 02, 028 in the favor of "M/S Shiva Biogas Agency", Wankaner, Rajkot to complete the project.

Thanking you,

Yours Faithfully,

Debananda Roy

Dr. Debananda Roy
Assistant Professor,
Dept. of Environmental Science and Engg.,
MEFGI, Rajkot.

9/3/16

[Signature]

[Signature]

[Signature]



GEDA

ગુજરાત ઊર્જા વિકાસ એજન્સી
GUJARAT ENERGY DEVELOPMENT AGENCY
A Government of Gujarat Organisation

GEDA/BIO/2015/03/OW/ 5533

02/03/2015

To,
Marwadi Education Foundation's Group Of Institutions,,
Rajkot-Morbi Road,,
At & PO. Gauridad
360003,
Ta,Rajkot Dist Rajkot

Kind Attn: Dr.Rajendrasinh Jadeja(Dean)

Subject: Sanction for Installation and commissioning of 1*45 m³/day capacity Institutional Biogas Plant (IBP) at your campus.

Ref. : Your letter dated 12-11-2014

With reference to your detailed proposal(consisting of land ownership , kitchen waste, gas generation potential available , undertakings submitted about basic infrastructural facilities (i.e. land, water , electricity and manpower availability for plant construction and its operation and maintenance on day to day basis) I am directed to convey you the sanction for undertaking of installation & commissioning of 1*45 m³/day capacity mixed waste based biogas plant in your campus under 50% subsidy scheme through GEDA's approved manufacturer namely M/s Shiva Biogas Agency, Wankaner (who have been selected by you for getting the plant installed as per GEDA designs) under market mode approach-2014-15. In case ,any details provided by you is found incorrect/false, the applicable subsidy for the sanctioned project will be withheld/cancelled .

The completion period for installation & commissioning of plant is considered up to Aug'2015. It is to draw your kind attention that as the said subsidy is applicable only for the current financial year, it is desirable that project is completed & commissioned before March'2015 to avail the total applicable subsidy amount during current financial year.

In case, the plant is not completed & commissioned by March'2015, the subsidy component applicable for respective stage may not be admissible in next financial year. So, utmost care is to be taken up to get the plant completed & commissioned in current financial year only with the following details:

- | | | |
|----|------------------------------|-----------------------------|
| a) | Plant capacity | : 1* 45 m ³ /day |
| b) | Cost of biogas plant (GGS) | : Rs. 8,97,433/- |
| c) | Cost Gas Distribution System | : Rs. 1,10,679/- |
| d) | Total Cost of plant (b+c) | : Rs. 10,08,112/- |
| e) | Subsidy Amount (@ 50% of d) | : Rs. 5,04,056/ |

sanctions-2014-15



To

Date: 03/03/16

The Dean of faculty of Engineering,
Marwadi education Foundation Group of Institution,
Rajkot, Gujarat.

Sub: Approval for the manufacture amount (Rs. 2, 02,028) for Biogas Plant.

Respected sir,

Please find the financial statement of Biogas Plant:

- A. Total cost of the plant as per sanction letter provided by GEDA dated 02.03.2015 = 10,08,112 (Rs.).
- B. Subsidy Provided by Govt. = 75% of the total cost = $1008112 \times 75/100$ (Rs.) = 7,56,084 (Rs.)
- C. Discount allowed by the contractor = 50,000 (Rs.)
- D. Amount to be paid by the Organization (MEFGI) = Rs. $[10,08,112 - (7,56,084 + 50,000)]$
= Rs. 2, 02, 028

It's a kind request to approve amount Rs. 2, 02, 028 in the favor of "M/S Shiva Biogas Agency", Wankaner, Rajkot to complete the project.

Thanking you,

Yours Faithfully,

Debananda Roy

Dr. Debananda Roy
Assistant Professor,
Dept. of Environmental Science and Engg.,
MEFGI, Rajkot.

9/13/1

[Signature]

[Signature]

[Signature]



GEDA

ગુજરાત ઊર્જા વિકાસ એજન્સી
GUJARAT ENERGY DEVELOPMENT AGENCY
A Government of Gujarat Organisation

GEDA/BIO/2015/03/OW/ 5533

02/03/2015

To,
Marwadi Education Foundation's Group Of Institutions,,
Rajkot-Morbi Road,,
At & PO. Gauridad
360003,
Ta. Rajkot Dist Rajkot

Kind Attn: Dr. Rajendrasinh Jadeja (Dean)

Subject: Sanction for Installation and commissioning of 1*45 m3/day capacity Institutional Biogas Plant (IBP) at your campus.

Ref. : Your letter dated 12-11-2014

With reference to your detailed proposal (consisting of land ownership, kitchen waste, gas generation potential available, undertakings submitted about basic infrastructural facilities (i.e. land, water, electricity and manpower availability for plant construction and its operation and maintenance on day to day basis) I am directed to convey you the sanction for undertaking of installation & commissioning of 1*45 m3/day capacity mixed waste based biogas plant in your campus under 50% subsidy scheme through GEDA's approved manufacturer namely M/s Shiva Biogas Agency, Wankaner (who have been selected by you for getting the plant installed as per GEDA designs) under market mode approach-2014-15. In case, any details provided by you is found incorrect/false, the applicable subsidy for the sanctioned project will be withheld/cancelled.

The completion period for installation & commissioning of plant is considered up to Aug'2015. It is to draw your kind attention that as the said subsidy is applicable only for the current financial year, it is desirable that project is completed & commissioned before March'2015 to avail the total applicable subsidy amount during current financial year.

In case, the plant is not completed & commissioned by March'2015, the subsidy component applicable for respective stage may not be admissible in next financial year. So, utmost care is to be taken up to get the plant completed & commissioned in current financial year only with the following details:

a)	Plant capacity	: 1* 45 m3/day
b)	Cost of biogas plant (GGS)	: Rs. 8,97,433/-
c)	Cost Gas Distribution System	: Rs. 1,10,679/-
d)	Total Cost of plant (b+c)	: Rs. 10,08,112/-
e)	Subsidy Amount (@ 50% of (d))	: Rs. 5,04,056/-

→ → →

sanctions-2014-15



ELECTRONIC CLEARING SERVICE (CREDIT CLEARING) /REAL TIME GROSS SETTLEMENT (RTGS) FACILITY FOR RECEIVING PAYMENTS

A. DETAIL OF ACCOUNT HOLDER:-

NAME OF ACCOUNT HOLDER	SHIVA BIO GAS AGENCY
COMPLETE CONTACT ADDRESS	L.S-2/527,SECTOR-F, JANKIPURAM,LUCKNOW
TELEPHONE NUMBER/FAX/EMAIL	0522-2732989,shivabiogas@gmail.com

B. BANK ACCOUNT DETAILS:-

BANK NAME	STATE BANK OF INDIA
BRANCH NAME WITH COMPLETE ADDRESS	ENGINEERING COLLEGE CHAURAHA,JANKIPURAM,LUCKNOW
WHETHER THE BRANCH IS COMPUTERISED?	YES
WHETHER THE BRANCH IS RTGS ENABLED? IF YES, THEN WHAT IS THE BRANCH'S IFSC CODE	<u>SBIN0015116</u>
IS THE BRANCH ALSO NEFT ENABLED?	YES
TYPE OF BANK ACCOUNT (SB/CURRENT/CASH CREDITS)	CURRENT
COMPLETE BANK ACCOUNT NUMBER (LATEST)	<u>31705892943</u>
MICR CODE OF BANK	226002083 : 000098 : 29

DATE OF EFFECT

I hereby declare that the particulars given above are correct and complete. If the transaction is delayed or not effected at all for reasons of incomplete or incorrect information I would not hold the user Institution responsible. I have read the option invitation letter and agree to discharge responsibility expected of me as a participant under the Scheme.

For Shiva Bio Gas Agency

Perforator

Signature of Customer

Date: 18/11/2013

Certified that the particulars furnished above are correct as per our records.

For Shiva Bio Gas Agency

Signature of Customer

(Bank's Signature & Stamp)

Date: 18/11/2013

1. Please attach a photocopy of cheque along with the verification obtained from the Bank.
2. In case your Bank Branch is presently not "RTGS enabled", then upon its up gradation to "RTGS Enabled" Branch, please submit the information again in the above Performa to the Department at earliest.



Marwadi
University

Valid From 01- 04-1996

Phone : 0522- 2363989

Mob. : 0941505834

Guj. : 9428164157

M/s SHIVA BIO GAS AGENCY

Specialist & Manufactures : Janta Model K.V. I.C. Model Bio Gas Plant of Different Types & Size
Suppliers Of. : Bio Gas Equipments Parts & Water Heater System
Coantractor NEDA Irrigation U.P. GOVT. GEDA Guj. GOVT.

Office : L-S-2/527, Sector 'F' Jankipuram, Lucknow.

Sheri No. 10 Ni Same, Juna Chandrapur Road, Jinpara , Wankaner - 363621, Di. Rajkot

Surendra Prasad Singh
(Proprietor)

Ref. No.

Date :

Date: 26th April 2016

To,
The Dean
Faculty of Engineering
MEFGI, Rajkot

Sub: Request to pay the amount of Rs. 2,02,028/- to "M/S Shiva Biogas Agency" for Biogas Plant project (Account No.- 31705892943).

Respected sir,

We are glad to inform you that, we have completed 40% of civil work as well as fabrication of Gas holder. It's a kind request to pay total amount Rs. 2,02,028/- in the favor of "M/S Shiva Biogas Agency", Wankaner, Rajkot to complete the total project work. Account details has been given below-

Name of Bank:	State Bank Of India
Branch Name with Address:	Engineering College, Chauraha, Jankipuram, Lucknow
IFC code:	SBIN0015116
Account No. -	31705892943
Type of Account:	Current
Bank code:	226002083:000098:29

Thanking you,

Project Officer

M/S Shiva Bio Gas Agency,
L-S-2/527, Sector 'F' Jankipuram, Lucknow

Shiva Bio Gas Agency
Sheri No. 10 Ni Same,
Juna Chandrapur Road,
Jinpara, Wankaner-363621, Rajkot



RajendrasinhJadeja, Ph.D.
Professor and Dean

Dept. of Electrical Engineering,
Faculty of Engineering,
Marwadi Education Foundations'
Group of Institutions,
At & Po. Gauridad,
Rajkot-360003 (Gujarat)

Date: 17th Nov. 2014

To,
The Senior Project Executive
Gujarat Energy Development Agency
Udhyog Bhavan, 4th Floor,
Block No.11-12, Sector-11,
Gandhinagar (Gujarat) - 382017

Subject: Regarding 40% completion of civil work of **Institutional Biogas Plant (IBP)** Project at our Campus.

Dear Sir,

With reference to your letter dated 15th Oct. 2014, GEDA/BIO/10/2014/4217, construction of Biogas Plant has been successfully started under the guidance of your esteemed organization. We would like to inform you that 40% of civil work has been completed by M/s Shiva biogas Agency till date.

Thanking you in anticipation.

Sincerely,

Debamanda Roy

RajendrasinhJadeja
(Dr. RajendrasinhJadeja)
Dean
MEFGI





BANK OF INDIA

Panchnath Branch, Rajkot.

Application For RTGS/NEFT

REMITTER

DEBIT A/C. No.:

3	1	0	3	2	0	1	1	0	0	0	0	2	5	7
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Name Of A/C. Holder : Marwadi Education Foundation

Cheque No.: 020068 Transaction Amount : 80,800=00

Date : 26-04-2016

(Rupees Eighty Thousand Eight Hundred Only)

Plus Charges Rs. 50.00

RECEIVER INSTITUTE'S DETAILS

IFSC Code (11 Digit) :

S	B	I	N	0	0	1	5	1	1	6
---	---	---	---	---	---	---	---	---	---	---

BANK NAME : STATE BANK OF INDIA, JANKIPURAM, LUCKNOW

ORDERING INSTITUTION

BANK / BRANCH CODE : ISO :

BANK OF INDIA

BENEFICIARY'S ACCOUNT NO.:

3	1	7	0	5	8	9	2	9	4	3				
---	---	---	---	---	---	---	---	---	---	---	--	--	--	--

BENEFICIARY'S NAME : SHIVA BIO GAS AGENCY

BENEFICIARY'S ADDRESS : LUCKNOW.

Amrased
Marwadi Education Foundation
J.A. Handmani
(Signature of Customer)
Authorized Signatory

For Bank's Use

Transaction id : _____

UTR NO.: BK2DM16126228241

Entered by : _____

Authorised by : _____
DR
27/04/16



BANK OF INDIA

Panchnath Branch, Rajkot.

Application For RTGS/NEFT

REMITTER

DEBIT A/C. No.:

3	1	0	3	2	0	1	1	0	0	0	0	2	5	7
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Name Of A/C. Holder : Marwadi Education Foundation

Cheque No.: 020138 Transaction Amount : 80,800=00

Date : 03-06-2016

(Rupees Eighty Thousand Eight Hundred Only)

Plus Charges Rs. 50.00

RECEIVER INSTITUTE'S DETAILS

IFSC Code (11 Digit) :

S	B	I	N
---	---	---	---

0	0	1	5	1	1	6
---	---	---	---	---	---	---

BANK NAME : STATE BANK OF INDIA, JANKIPURAM, LUCKNOW

ORDERING INSTITUTION

BANK / BRANCH CODE : ISO :

BANK OF INDIA

BENEFICIARY'S ACCOUNT NO.:

3	1	7	0	5	8	9	2	9	4	3				
---	---	---	---	---	---	---	---	---	---	---	--	--	--	--

BENEFICIARY'S NAME : SHIVA BIO GAS AGENCY Marwadi Education Foundation

BENEFICIARY'S ADDRESS : LUCKNOW.

J. A. Khattar
Authorized Signatory

(Signature of Customer)

For Bank's Use

Transaction id : _____

UTR NO.: BRIDN16159444837

Entered by : _____

Authorised by : _____



Date:18/05/2016

To

The Account Section,
Marwadi education Foundation Group of Institution,
Rajkot, Gujarat.

Sub: Payment of the amount Rs. 80, 800/- to "M/S Shiva Biogas Agency" for Biogas Plant project.

Respected sir,

Please find the financial statement of Biogas Plant:

- A. Total cost of the plant as per sanction letter provided by GEDA dated 02.03.2015 = 10,08,112 (Rs.).
- B. Subsidy Provided by Govt. = 75% of the total cost = $1008112 \times 75/100$ (Rs.) = 7,56,084 (Rs.)
- C. Discount allowed by the contractor = 50, 000 (Rs.)
- D. Total Amount to be paid by the Organization (MEFGI) = $[10,08,112 - (7,56,084 + 50,000)]$ (Rs.)
- = Rs. 2, 02, 028
- E. First installment to be pay(40%) = $202028 \times 40/100$ = Rs. 80, 800/-
- ✓ F. Second installment to be pay (40%)= Rs. 80, 800/-
- G. Third installment to be pay (20%)= Rs. 20, 200/-

It's a kind request to pay amount Rs. 80,800 in the favor of "M/S Shiva Biogas Agency", Wankaner, Rajkot to complete the project.

Thanking you,

Dr. Debananda Roy
Assistant Professor,
Dept. of Environmental Science and Engg.,
MEFGI, Rajkot.

Rajendrasinh Jadeja, Ph.D.
Professor and Dean (Faculty of
Engineering), MEFGI, Rajkot.



Date: 29th April, 2016

To,
The Senior Project Executive
Gujarat Energy Development Agency
Udhyog Bhavan, 4th Floor,
Block No. 11-12, Sector-11,
Gandhinagar (Gujarat) - 382017

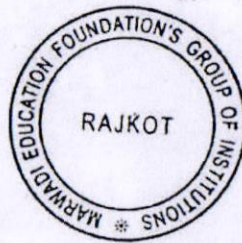
Subject: Regarding 40% completion of Gasholder Fabrication work of Institutional Biogas Plant (IBP) Project at our Campus.

Dear Sir,

With reference to your letter dated 15th Oct. 2014, GEDA/BIO/10/2014/4217, construction of Biogas Plant has been successfully started under the guidance of your esteemed organization. We would like to inform you that 40% of Gasholder Fabrication work has been completed by M/s Shiva Biogas Agency till date.

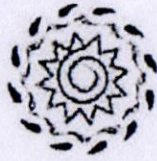
Thanking you for your cooperation.

Sincerely,



[Signature]
(Dr. Rajendrasinh Jadeja)
Dean (Faculty of
Engineering)
MEFGI





GEDA

ગુજરાત ઊર્જા વિકાસ એજન્સી
GUJARAT ENERGY DEVELOPMENT AGENCY
A Government of Gujarat Organisation

GEDA/BIO/2015/03/OW/ 5533

02/03/2015

To,
Marwadi Education Foundation's Group Of Institutions,,
Rajkot-Morbi Road,,
At & PO. Gauridad
360003,
Ta,Rajkot Dist Rajkot

Kind Attn: Dr.Rajendrasinh Jadeja(Dean)

Subject: Sanction for Installation and commissioning of 1*45 m3/day capacity Institutional Biogas Plant (IBP) at your campus.

Ref : Your letter dated 12-11-2014

With reference to your detailed proposal (consisting of land ownership, kitchen waste, gas generation potential available, undertakings submitted about basic infrastructural facilities (i.e. land, water, electricity and manpower availability for plant construction and its operation and maintenance on day to day basis) I am directed to convey you the sanction for undertaking of installation & commissioning of 1*45 m3/day capacity mixed waste based biogas plant in your campus under 50% subsidy scheme through GEDA's approved manufacturer namely M/s Shiva Biogas Agency, Wankaner (who have been selected by you for getting the plant installed as per GEDA designs) under market mode approach-2014-15. In case, any details provided by you is found incorrect/false, the applicable subsidy for the sanctioned project will be withheld/cancelled.

The completion period for installation & commissioning of plant is considered up to Aug'2015. It is to draw your kind attention that as the said subsidy is applicable only for the current financial year, it is desirable that project is completed & commissioned before March'2015 to avail the total applicable subsidy amount during current financial year.

In case, the plant is not completed & commissioned by March'2015, the subsidy component applicable for respective stage may not be admissible in next financial year. So, utmost care is to be taken up to get the plant completed & commissioned in current financial year only with the following details:

- | | | |
|----|------------------------------|-------------------|
| a) | Plant capacity | : 1* 45 m3/day |
| b) | Cost of biogas plant (GGS) | : Rs. 8,97,433/- |
| c) | Cost Gas Distribution System | : Rs. 1,10,679/- |
| d) | Total Cost of plant (b+c) | : Rs. 10,08,112/- |
| e) | Subsidy Amount (@ 50% of td) | : Rs. 5,04,056/ |

→ → Gaurid

sanctions-2014-15



Valid From 01- 04-1996

Phone : 0522- 2363989
Mob. : 0941505834
Guj. : 9428164157

M/s SHIVA BIO GAS AGENCY

Specialist & Manufactures : Janta Model K.V. I.C. Model Bio Gas Plant of Different Types & Size
Suppliers Of. : Bio Gas Equipments Parts & Water Heater System
Coantractor NEDA Irrigation U.P. GOVT. GEDA Guj. GOVT.

Office : L-S-2/527, Sector 'F' Jankipuram, Lucknow.
Sheri No. 10 Ni Same, Juna Chandrapur Road, Jinpara , Wankaner - 363621, Di. Rajkot

Surendra Prasad Singh
(Proprietor)

Ref. No.

Date :

To,
The Dean
Faculty of Engineering
MEFGI, Rajkot

Date: 26th April 2016


Sub: Request to pay the amount of Rs. 2,02,028/- to "M/S Shiva Biogas Agency" for Biogas Plant project (Account No.- 31705892943).

Respected sir,

We are glad to inform you that. we have completed 40% of civil work as well as fabrication of Gas holder. It's a kind request to pay total amount Rs. 2,02,028/- in the favor of "M/S Shiva Biogas Agency", Wankaner, Rajkot to complete the total project work. Account details has been given below-

Name of Bank:	State Bank Of India
Branch Name with Address:	Engineering College, Chauraha, Jankipuram, Lucknow
IFC code:	SBIN0015116
Account No. -	31705892943
Type of Account:	Current
Bank code:	226002083:000098:29

Thanking you,


Project Officer

M/S Shiva Bio Gas Agency,
L-S-2/527, Sector 'F' Jankipuram, Lucknow

Shiva Bio Gas Agency
Sheri No. 10 Ni Same,
Juna Chandrapur Road,
Jinpara, Wankaner-363621, Rajkot

Rajendrasinh Jadeja, Ph.D.
Professor and Dean

Dept. of Electrical Engineering,
Faculty of Engineering,
Marwadi Education Foundations'
Group of Institutions,
At & Po. Gauridad,
Rajkot-360003 (Gujarat)

Date: 25th Sept. 2014

To,
The Senior Project Executive
Gujarat Energy Development Agency
Udhyog Bhavan, 4th Floor,
Block No.11-12, Sector-11,
Gandhinagar (Gujarat) - 382017

Subject: To avail subsidy for establishment of **Kitchen Waste based Biogas Plant** at our Campus.

Dear Sir,

With interest and speculation in waste to energy systems, organic “waste” can and should be treated as a commodity i.e. a product with monetary value on the market and an increasingly valuable one. At present, our institute incurs significant operating costs in having its organic wastes hauled to external sites that are finding environmentally beneficial and profitable uses for it. Given the opportunity presented by our large campus community here in MEFGI, we would like to establish Kitchen Waste based Biogas Plant at our campus. It is therefore, our request to avail subsidy for setting-up Biogas Plant under the guidance of your esteemed organization.

I, hereby express my curiosity for the same please. I would be pleased if you kindly consider my request with a favorable weightage and kindly give us an opportunity to work in collaboration with you. Please, find herewith the proposal for the same please.

Thanking you in anticipation.

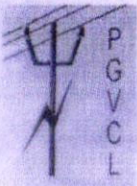
Sincerely,

(Dr. Rajendrasinh Jadeja)



Annexure-22.1

- Contract Demand as per electricity billing of July-2021: 1300 kW.
- Total Capacity of Solar Power Plant as per NOC attached: 612 kWp.
- Installed onsite renewable energy system is around 47% of contract demand of the project.



Paschim Gujarat Vij Company Ltd.

Reg. Off. Paschim Gujarat Vij Seva Sadan Off. Nana Mava Main Road, Laxminagar, Rajkot ? 360004
CIN:U40102GJ2003SGC042908 GSTIN:24AADCP1453C1ZZ PAN NO. AADCP1453C Website: http://www.pgvcl.com

HT BILL FOR THE MONTH OF :JUL-2021

By RPAD/Hand Delivery No.

M/S MARWADI EDUCATION FOUNDATION

Opp. Mahadev Vadi, Rajkot-Morbi Highway, Between Bedi & Gauridad, Dis.- Rajkot. RAJKOT

OFFICE OF EXEC. ENGINEER

PGVCL Division Office

Date: 22-07-2021 *9885*

Division Office Email id:

Phone No:

Cons. GSTIN:

Consumer No:	Tariff	Contract Demand	85% Contract Demand	Actual Max. Demand	Billing Demand	Excess Cont. DMD	SD Cash	Bank Guarantee
26437	HTF-I	1300	1105	872	1105		3768027	0.00
Supp Voltage	KWH	KVAH	KVARH	Avg PF	MF	Actual Max DMD during day	PP Indicator	
11	274095	274088	149999993	1	15			
Meter No:	Make	CTPT Make	CTPT Srno	CT Ratio	PT Ratio	Meter Constant	MC/MF/CD/TF	Meter Status
GHB00142	SECURE		15				MC	Normal
	KWH	KVAH	KVARH	AMD	PEAK HR	NIGHT HR	AMD DAY	AMD NIGHT
Current R	5518	5525	10		1850	1735		
Previous R	19	26	10		0	0		
Difference	5499	5499	0		1850	1735		
Diff*MF	82485	82485	0		27750	26025		
Old Met Cons.	191610	191602.8	149999992.3		64410.	49185		
Enhanced Unit								

CONSUMPTION DETAILS

A.Total Units	B.Night Units	C.TOU	D.1/3 Of Units in A	E.Night Concession Units	F.Connection Date	G.Consumer Type
274095	75210	92160	91365	75210	05-03-2010	
H.Recoverable SD	I.Seasonal Status	J.ED Exemption Upto	K.Details of Adjustments	CHQ DISHONOUR DT		

CALCULATION OF CHARGES

Demand Charges	DMD in KVA	Rate per KVA	Amount Rs	Electricity Duty	KWH	Consumption Charges	ED Rate	Amount
1st 500 KVA	500	150	75000					
2nd 500 KVA	500	260	130000		274095	1916660.72	.075	143749.55
Next	105	475	49875					
Excess DMD	0	0	0					
Tot Demand	1105		254875					
SET OFF DETAILS								
	KWH	Rate	Amount	Total->	Wind Energy	CPP	Open Access	
Energy Charges	274095	4.2	1151199.00	Units	0			
Night Rebate	75210	.43	32340.3	Amount				
				Adj (Credit)	0			
Fuel charge	274095	1.80	493371.00	Adj (Debit)				
PF Rebate	1151199	-2.50%	-28779.98					
EHV Rebate	1151199.00	0.00	0.00	AMG Charges				
TOU	92160	0.85	78336.00	CGST:			SGST:	
Tot Consumption Charge			1916660.72					

SUMMARY OF CHARGES

Demand Charge	Energy Charge	Fuel Surcharge	PF Adj/Rebate	Night Rebate	EHV Rebate	Time Of Use Charges	Tot Consumption Charge		
254875.00	1151199.00	493371.00	-28779.98	32340.30	0.00	78336.00	1916660.72		
Electricity Duty	Meter Charges	Cross Subsidy	Wheeling Charges	Parallel Operation Charges	Current Month's Bill	Outstanding Arrears			
143749.55	0.00				2060410.27	0.00			
Delayed Payment Charges	Adv. Payment / Adjust.	Net Payable	TCS	Total Payable	PREV. BILL TCS Cr	Reading Date	Bill Date	Due Date	Freeze Amount
0.00	0.00	2060410.27		2060410.27		16-07-2021	22-07-2021	02-08-2021	0.00

Amount in Words: Twenty Lakhs Sixty Thousand Four Hundred And Ten And Twenty Seven Paise Only

Msg:U/S 194Q OF IT ACT, TDS @0.1% IS APPLICABLE

EXECUTIVE ENGINEER
RAJKOT RURAL

MC-Meter Change MF-Multiplication Factor CD-Contract Demand TF-Tariff Change

FOR IMPORTANT NOTE PLEASE SEE OVERLEAF

*To Dept
Jms*

OFFICE OF THE CHIEF ELECTRICAL INSPECTOR

Office of the Chief Electrical Inspector Udyog Bhavan, 6th Floor, Block No.18, Sector-11, Gandhinagar.

No/CEI/Gan/Certi/49455/2021

E-mail :
cei-epd@gujarat.gov.in

ph no : (079) 23256642 to 44

Date : 27/6/2021

fax no : (079) 232 566 51

To
M/S MARWADI EDUCATION FOUNDATION
OPP MAHADEV VADI RAJKOT - MORBI HIGHWAY
BETWEEN BEDI GAURIDAD
Vi.Gavaridad
Ta.Rajkot
Dist.Rajkot, 360003

Subject Initial inspection for the electrical installation of 612.0 KW Grid Connected Solar Power Plant along with associated equipments at M/S MARWADI EDUCATION FOUNDATION, OPP MAHADEV VADI RAJKOT - MORBI HIGHWAY, BETWEEN BEDI GAURIDAD, Vi.Gavaridad, Ta.Rajkot, Dist.Rajkot, Gujarat, 360003 (Consumer No. 26437).

Sir,

Initial Inspection of the Electrical Installation of 612.0 KW Grid Connected Solar Power Plant at OPP MAHADEV VADI RAJKOT - MORBI HIGHWAY, BETWEEN BEDI GAURIDAD, Vi.Gavaridad, Rajkot, Rajkot, Gujarat, 360003 for M/S MARWADI EDUCATION FOUNDATION has been carried out by EI, Rajkot on 22/06/2021 and the same is found in order in accordance with the drawing approved vide this office letter No: No/CEI/Gan/Plan/35709/2020, Date: 21/09/2020. The details of the same are as following.

Details of Installation

No.	Particular	Solar PV Cells (Modules)
1	Make	PIXON
2	Capacity (Wp)	400
3	Total No. of Modules	1530
4	Total Capacity (KWp)	612.0
Total (KWp)		612.0
No.	Particular	Inverters
1	Make	SOLAREEDGE,SOLAREEDGE,SOLAREEDGE,SOLAREEDGE,SOLAREEDGE,SOLAREEDGE,SOLAREEDGE,SOLAREEDGE,SOLIS
2	Capacity in KW/KVA	82.8KW,82.8KW,82.8KW,82.8KW,55KW,82.8KW,55KW,17KW
3	No. Of Inverters	1,1,1,1,1,1,1,1
4	Output Voltage in AC(V)	400,400,400,400,400,400,400,400
5	Sr.No.	SJ2720-07E0A9296-BO,SJ1520-07E093C92-55,SJ2220-07E0A1F2B-D2,SJ2720-07E0A93A5-C0,SJ1120-07E08DA50-B0,SJ1520-07E093C9B-5E,SJ1120-07E08DA56-B6,1107D2203190009

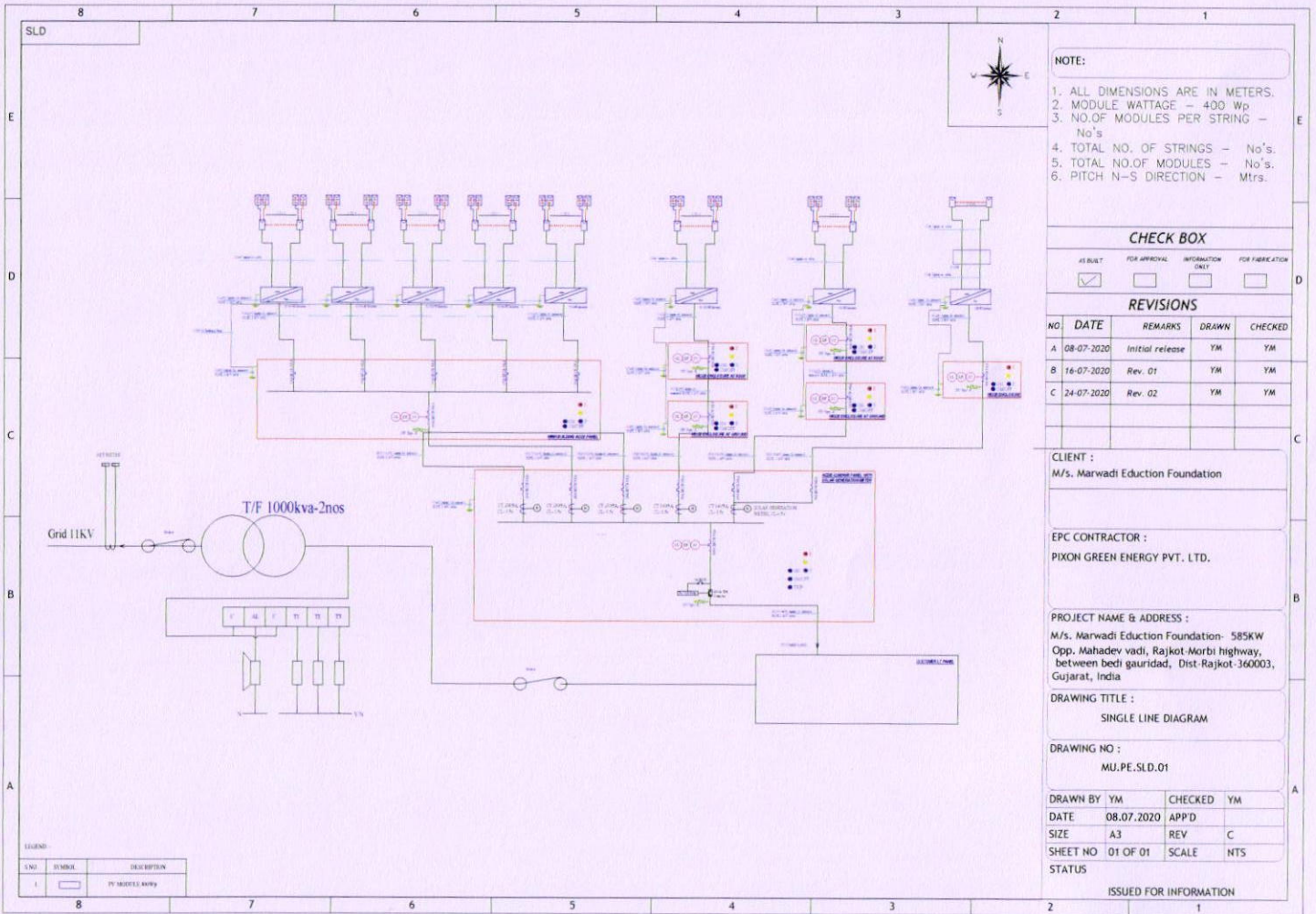
As provided under the Regulation 32 of the Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulation, 2010 permission is hereby granted to energize the above installation along with the associated equipments.

Your's Faithfully

H H Khoja
CHIEF ELECTRICAL INSPECTOR
Gandhinagar

Copy forwarded to:

Applicant
Deputy Chief Electrical Inspector, West Zone - Rajkot
Electrical Inspector, Rajkot
Assistant Electrical Inspector, Rajkot
Executive Engineer (PGVCL)



NOTE:

1. ALL DIMENSIONS ARE IN METERS.
2. MODULE WATTAGE - 400 Wp
3. NO.OF MODULES PER STRING - No's
4. TOTAL NO. OF STRINGS - No's.
5. TOTAL NO.OF MODULES - No's.
6. PITCH N-S DIRECTION - Mtrs.

CHECK BOX

AS BUILT	FOR APPROVAL	INFORMATION ONLY	FOR FABRICATION
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

REVISIONS

NO.	DATE	REMARKS	DRAWN	CHECKED
A	08-07-2020	Initial release	YM	YM
B	16-07-2020	Rev. 01	YM	YM
C	24-07-2020	Rev. 02	YM	YM

CLIENT :
M/s. Marwadi Education Foundation

EPC CONTRACTOR :
PIXON GREEN ENERGY PVT. LTD.

PROJECT NAME & ADDRESS :
M/s. Marwadi Education Foundation- 585KW
Opp. Mahadev vadi, Rajkot-Morbi highway,
between bedi gauridad, Dist-Rajkot-360003,
Gujarat, India

DRAWING TITLE :
SINGLE LINE DIAGRAM

DRAWING NO :
MU.PE.SLD.01

DRAWN BY	YM	CHECKED	YM
DATE	08.07.2020	APP'D	
SIZE	A3	REV	C
SHEET NO	01 OF 01	SCALE	NTS

STATUS
ISSUED FOR INFORMATION

LEGEND:

NO.	SYMBOL	DESCRIPTION
1		PV MODULE ARRAY

Annexure-22.1

- Contract Demand as per electricity billing of July-2021: 1300 kW.
- Total Capacity of Solar Power Plant as per NOC attached: 612 kWp.
- Installed onsite renewable energy system is around 47% of contract demand of the project.



Paschim Gujarat Vij Company Ltd.

Reg. Off. Paschim Gujarat Vij Seva Sadan Off. Nana Mava Main Road, Laxminagar, Rajkot ? 360004
CIN:U40102GJ2003SGC042908 GSTIN:24AADCP1453C1ZZ PAN NO: AADCP1453C Website:http://www.pgvcl.com

HT BILL FOR THE MONTH OF :JUL-2021

By RPAD/Hand Delivery No.

M/S MARWADI EDUCATION FOUNDATION
Opp. Mahadev Vadi, Rajkot-Morbi Highway, Between Bedi & Gauridad, Dis.- Rajkot.
RAJKOT

OFFICE OF EXEC. ENGINEER

PGVCL Division Office

Date: 22-07-2021 *9/8/21*

Division Office Email id:

Phone No:

Cons. GSTIN:

Consumer No:	Tarrif	Contract Demand	85% Contract Demand	Actual Max. Demand	Billing Demand	Excess Cont. DMD	SD Cash	Bank Guarantee
26437	HTP-I	1300	1105	872	1105		3768027	0.00
Supp Voltage	KWH	KVAH	KVARH	Avg PF	MF	Actual Max DMD during day	PP Indicator	
11	274095	274088	149999993	1	15			
Meter No:	Make	CTPT Make	CTPT Srno	CT Ratio	PT Ratio	Meter Constant	MC/MF/CD/TF	Meter Status
GHB00142	SECURE		15				MC	Normal
	KWH	KVAH	KVARH	AMD	PEAK HR	NIGHT HR	AMD DAY	AMD NIGHT
Current R	5518	5525	10		1850	1735		
Previous R	19	26	10		0	0		
Difference	5499	5499	0		1850	1735		
Diff*MF	82485	82485	0		27750	26025		
Old Met Cons.	191610	191602.5	149999992.5		64410.	49185		
Enhanced Unit								

CONSUMPTION DETAILS

A.Total Units	B.Night Units	C.TOU	D.1/3 Of Units in A	E.Night Concession Units	F.Connection Date	G.Consumer Type
274095	75210	92160	91365	75210	05-03-2010	
H.Recoverable SD	I.Seasonal Status	J.ED Exemption Upto	K.Details of Adjustments			CHQ DISHONOUR DT

CALCULATION OF CHARGES

Demand Charges	DMD in KVA	Rate per KVA	Amount Rs	Electricity Duty	KWH	Consumption Charges	ED Rate	Amount
1st 500 KVA	500	150	75000					
2nd 500 KVA	500	260	130000		274095	1916660.72	.075	143749.55
Next	105	475	49875					
Excess DMD	0	0	0					
Tot Demand	1105		254875					
SET OFF DETAILS								
	KWH	Rate	Amount	Total->	Wind Energy	CPP	Open Access	
Energy Charges	274095	4.2	1151199.00	Units	0			
Night Rebate	75210	.43	32340.3	Amount				
				Adj (Credit)	0			
Fuel charge	274095	1.80	493371.00	Adj (Debit)				
PF Rebate	1151199	-2.50%	-28779.98					
EHV Rebate	1151199.00	0.00	0.00	AMG Charges				
TOU	92160	0.85	78336.00	CGST:			SGST:	
Tot Consumption Charge			1916660.72					

SUMMARY OF CHARGES

Demand Charge	Energy Charge	Fuel Surcharge	PF Adj/Rebate	Night Rebate	EHV Rebate	Time Of Use Charges	Tot Consumption Charge		
254875.00	1151199.00	493371.00	-28779.98	32340.30	0.00	78336.00	1916660.72		
Electricity Duty	Meter Charges	Cross Subsidy	Wheeling Charges		Parallel Operation Charges	Current Month's Bill	Outstanding Arrears		
143749.55	0.00					2060410.27	0.00		
Delayed Payment Charges	Adv.Payment / Adjust.	Net Payable	TCS	Total Payable	PREV. BILL TCS Cr	Reading Date	Bill Date	Due Date	Freeze Amount
0.00	0.00	2060410.27		2060410.27		16-07-2021	22-07-2021	02-08-2021	0.00

Amount in Words: Twenty Lakhs Sixty Thousand Four Hundred And Ten And Twenty Seven Paise Only

Msg:U/S 194Q OF IT ACT, TDS @0.1% IS APPLICABLE

EXECUTIVE ENGINEER
RAJKOT RURAL

MC-Meter Change MF-Multiplication Factor CD-Contract Demand TF-Tariff Change

FOR IMPORTANT NOTE PLEASE SEE OVERLEAF

*To Dept
Inch*

OFFICE OF THE CHIEF ELECTRICAL INSPECTOR

Office of the Chief Electrical Inspector Udyog Bhavan, 6th Floor, Block No.18, Sector-11, Gandhinagar.

No/CEI/Gan/Certi/49455/2021

E-mail :
cei-epd@gujarat.gov.in

ph no : (079) 23256642 to 44

Date : 27/6/2021

fax no : (079) 232 566 51

To
M/S MARWADI EDUCATION FOUNDATION
OPP MAHADEV VADI RAJKOT - MORBI HIGHWAY
BETWEEN BEDI GAURIDAD
Vi.Gavaridad
Ta.Rajkot
Dist.Rajkot, 360003

Subject Initial inspection for the electrical installation of 612.0 KW Grid Connected Solar Power Plant along with associated equipments at M/S MARWADI EDUCATION FOUNDATION, OPP MAHADEV VADI RAJKOT - MORBI HIGHWAY, BETWEEN BEDI GAURIDAD, Vi.Gavaridad, Ta.Rajkot, Dist.Rajkot, Gujarat, 360003 (Consumer No. 26437).

Sir,

Initial Inspection of the Electrical Installation of 612.0 KW Grid Connected Solar Power Plant at OPP MAHADEV VADI RAJKOT - MORBI HIGHWAY, BETWEEN BEDI GAURIDAD, Vi.Gavaridad, Rajkot, Rajkot, Gujarat, 360003 for M/S MARWADI EDUCATION FOUNDATION has been carried out by EI, Rajkot on 22/06/2021 and the same is found in order in accordance with the drawing approved vide this office letter No: No/CEI/Gan/Plan/35709/2020, Date: 21/09/2020. The details of the same are as following.

Details of Installation

No.	Particular	Solar PV Cells (Modules)
1	Make	PIXON
2	Capacity (Wp)	400
3	Total No. of Modules	1530
4	Total Capacity (KWp)	612.0
Total (KWp)		612.0
No.	Particular	Inverters
1	Make	SOLAREEDGE, SOLAREEDGE, SOLAREEDGE, SOLAREEDGE, SOLAREEDGE, SOLAREEDGE, SOLAREEDGE, SOLAREEDGE, SOLIS
2	Capacity in KW/KVA	82.8KW, 82.8KW, 82.8KW, 82.8KW, 55KW, 82.8KW, 55KW, 17KW
3	No. Of Inverters	1, 1, 1, 1, 1, 1, 1, 1
4	Output Voltage in AC(V)	400, 400, 400, 400, 400, 400, 400, 400
5	Sr.No.	SJ2720-07E0A9296-B0, SJ1520-07E093C92-55, SJ2220-07E0A1F2B-D2, SJ2720-07E0A93A5-C0, SJ1120-07E08DA50-B0, SJ1520-07E093C9B-5E, SJ1120-07E08DA56-B6, 1107D2203190009

As provided under the Regulation 32 of the Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulation, 2010 permission is hereby granted to energize the above installation along with the associated equipments.

Your's Faithfully

H H Khoja
CHIEF ELECTRICAL INSPECTOR
Gandhinagar

Copy forwarded to:

Applicant
Deputy Chief Electrical Inspector, West Zone - Rajkot
Electrical Inspector, Rajkot
Assistant Electrical Inspector, Rajkot
Executive Engineer (PGVCL)

7.1.2 - Sensor-Based Energy Conservation

The Institute has implemented sensor-based energy conservation plan. Below mentioned light fixtures operates on sensor and saves energy. Total 25.62 KW load is on Sensor Based Technology

Timer Operated lighting details						
Sr.No.	Light fitting details	Light fitting watt rating	Qty	Total watt (Watt rating x total Qty)	Location	Remark
1	High mast lighting Tower-01 (7200 watt)	800 watt	8 nos	6400 watt	PG Building back side	Mercury Lamp
		400 watt	3 nos	1200 watt		
2	High mast lighting Tower-02 (6400 watt)	800 watt	8 nos	6400 watt	Opposite Hostel B	Mercury Lamp
3	70 watt Street light fitting	70 watt	75 nos	5250 watt	Mefgi campus	Mercury Lamp
4	40 watt Street light fitting	40 watt	06 nos	240 watt	Mefgi campus	LED Lamp
5	800 watt Light fitting	800 watt	03 nos	2400 watt	Main building terrace	Mercury Lamp
6	800 watt Light fitting	800 watt	01 nos	800 watt	Hostel D	Mercury Lamp
7	150Watt Light fitting	150 watt	04 nos	600 watt	Security main gate	LED
8	150Watt Light fitting	150 watt	01 nos	150 watt	Between Hostel A & B	LED
9	150Watt Light fitting	150 watt	01 nos	150 watt	Vadi area, Near Inter.canteen	LED
10	150Watt Light fitting	150 watt	01 nos	150 watt	Near Amphitheater	LED
11	150Watt Light fitting	150 watt	01 nos	150 watt	Near STP plant	LED
12	150Watt Light fitting	150 watt	01 nos	150 watt	Main building back side	LED
13	150Watt Light fitting	150 watt	01 nos	150 watt	Main building Reception	LED
14	400 watt light fitting	400 watt	02 nos	800 watt	International canteen	Mercury Lamp
	150 watt light fitting	150 watt	01 nos	150 watt		Mercury Lamp
	40 watt LED light fitting	40 watt	12 nos	480 watt		LED
Total				25620 watt (25.62 KW)		