# Metric No: 7.1.2

## DVV Comment:

Provide Geo tagged photographs of the (Solar energy Bio gas plant Wheeling to the Grid Sensor-based energy conservation Use of LED bulbs/ power efficient equipment). Provide Bills for the purchase of equipment's for the (Solar energy Bio gas plant Wheeling to the Grid Sensor-based energy conservation Use of LED bulbs/ power efficient equipment ) created under this metric for the year 2019-20.

## HEI Response

Geo tagged photographs of the

1. Solar energy
2. Bio gas plant
3. Wheeling to the Grid
4. Sensor-based energy conservation
5. Use of LED bulbs / power efficient equipment and also the bills are provided as a single copy:

| s.no | Name | Page Nos |
|---|---|---|
| 1 | Geo tagged photographs of the<br>1. Solar energy<br>2. Bio gas plant<br>3. Wheeling to the Grid Sensor-based energy conservation<br>4. Use of LED bulbs / power efficient equipment | 01 to 32 |
| 2 | Bills for the purchase of equipment | 33 to 43 |

# Geo tagged photographs of the

1. Solar energy
2. Bio gas plant
3. Wheeling to the Grid Sensor-based energy conservation
4. Use of LED bulbs / power efficient equipment

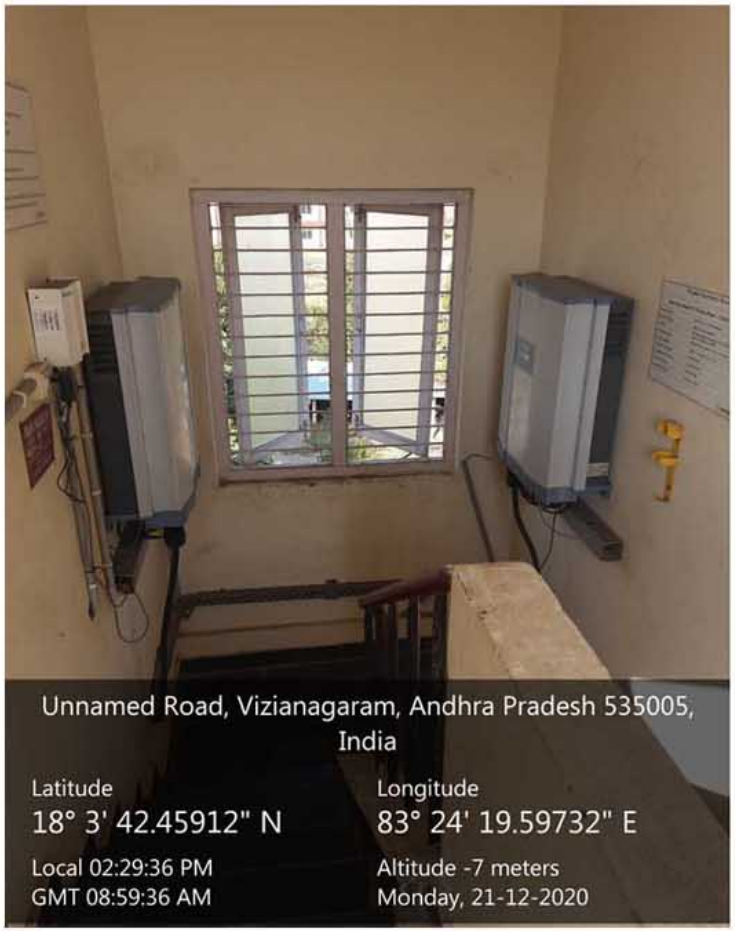
# Solar Power Plant

India has tremendous scope of generating solar energy. The geographical location of the country stands to its benefit for generating solar energy. The reason being India is a tropical country and it receives solar radiation almost throughout the year, which amounts to 3,000 hours of sunshine. This is equal to more than 5,000 trillion kWh. Almost all parts of India receive 4-7 kWh of solar radiation per sq metres. This is equivalent to 2,300–3,200 sunshine hours per year. States like Andhra Pradesh, Bihar, Gujarat, Haryana, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, and West Bengal have great potential for tapping solar energy due to their location.

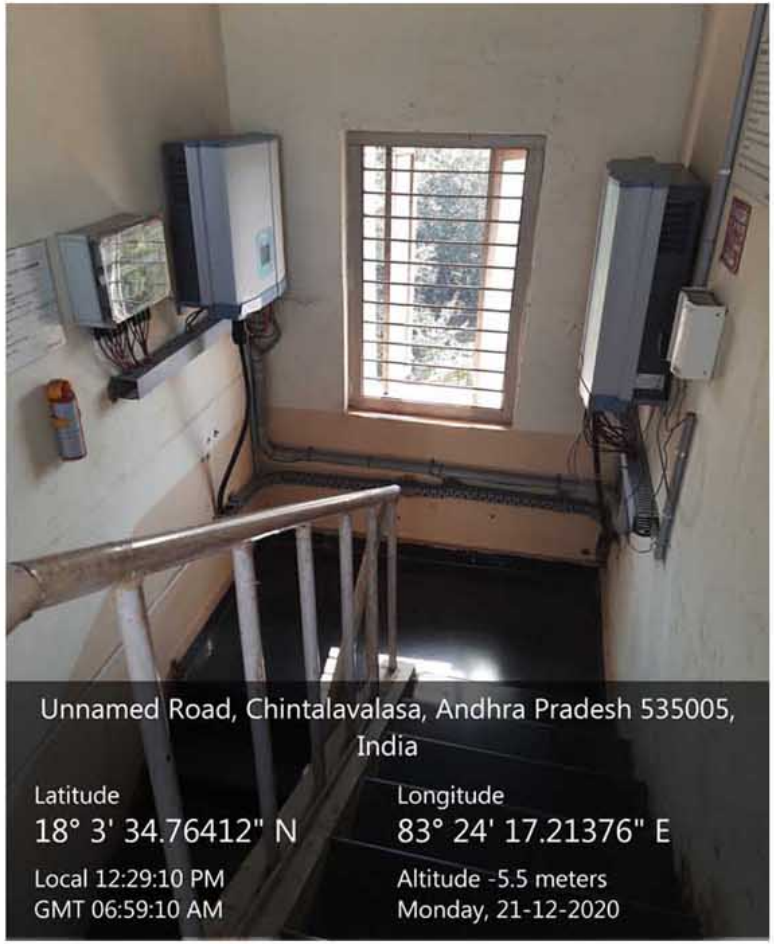
400kwP rooftop solar power plant was installed in December 2016 and was commissioned to operation from 1st January 2017. A total of 17,68,985 units of energy is generated through the solar plant till date and reducing the Carbon Di Oxide footprint by 1415.18Ton (Assuming 0.8kg / kWh).

Out of total solar generation, 6, 66, 625 units of energy has been exported to grid via net metering system. The rest of units has been consumed by the college.

| S.No | Year | No of Units generated |
|---|---|---|
| 1 | 2017 | 497254 |
| 2 | 2018 | 476391 |
| 3 | 2019 | 450830 |
| 4 | 2020 | 344510 |


**100Kwp Plant located on rooftop of civil department and associated Inverters**


**75Kwp Plant located on rooftop of CSE department and associated Inverters**



**75Kwp Plant located on rooftop of ECE department and associated Inverters**



**55Kwp Plant located on rooftop of EEE department and associated Inverter**



**95Kwp Plant located on rooftop of MECH department and associated Inverters**

# Bio Gas Plant

## Design and development of anaerobic biodigester for generating biogas from kitchen waste

The biogas plant at MVGR college of Engineering was an anaerobic digester which has a capacity of 3 tons. The digester works under anaerobic conditions. The feed of the digester was Kitchen waste, food waste and cow dung. The daily feed of the digester was 150 kg and the retention time is 15-20 days. The salient features of the digester are its bubble gun technology (generating gas bubbles) for mixing the slurry of the digester. Another important feature of the digester is it works under constant operating temperature of $35^0$C. The feed (kitchen waste/food waste) is crushed into small fine pieces and fed into the digester through Peristaltic Pump. Part of the gas produced from the digester was used to generate bubbles with bubble gun. Solar water heating was used for the hot water circulation inside column of the digester to keep temperature of the digester constant. The biogas produced from the digester was taken by the water ring compressor and sent to the water gas separator where the moisture in the biogas was removed and the dry biogas was sent to the storage balloon.

FIG: Biogas Plat at MVGR College of Engineering

# BIOGAS PLANT

# OPERATING MANUAL

**MVGR COLLEGE OF ENGINEERING (AUTONOMOUS)**

Approved by AICTE, Accredited by NBA and NAAC with ‘A ’Grade

Vijayaram nagar campus, Chitalavalasa,

Vizianagaram-535005, AP.

# Contents

## Introduction to biogas Technology

Biogas technology is about capturing the gas that results from the anaerobic fermentation of biomass. The plant uses the natural processes of anaerobic digestion to produce biogas from animal waste or Kitchen waste. Biogas is a mixture of gas produced by methanogenic bacteria while acting upon biodegradable materials in an anaerobic condition. Biogas is mainly composed of 50-70% methane, 25-35% carbon dioxide and trace gases such as hydrogen sulphide, water vapour, nitrogen and hydrogen.

Biogas is about 20% lighter than air and has ignition temperature in the range of $650^0$ to $750^0$ C. It is odourless and colourless gas that burns with clear blue flame like that of LPG gas. Its calorific value is 20000 kJ/$m^3$ and burns with 60% efficiency in a conventional biogas stove.

**Biogas feedstock**

Biogas feedstock can be sourced from any biodegradable materials such as kitchen waste, municipal waste and animal waste such as cows. The gas production varies from one feedstock to the other as well as the speed of digestion.

**Biodigester**

A biodigester is a container that receives a daily input of farm waste, and within which the manure mixed with water will be fermented, producing methane-rich biogas, as well as a natural and ecological fertilizer

**Biogas**

The biogas is a mixture of different gases (Methane, carbon dioxide, oxygen, sulphur etc..) produced by bacteria in an anaerobic environment and can be used as a source of renewable energy.

# Biogas plant components and their functions

1. **Peristaltic pump**: A peristaltic pump is a type of positive displacement pump used for pumping a variety of fluids, they are also commonly known as roller pumps. The fluid is contained within a flexible tube fitted inside a circular pump casing (though linear peristaltic pumps have been made). A rotor with several "rollers", "shoes", "wipers", or "lobes" attached to the external circumference of the rotor compresses the flexible tube. As the rotor turns, the part of the tube under compression is pinched closed thus forcing the fluid to be pumped to move through the tube.


2. **Mixing Tank:** Preparation and introduction of feed stock into the digester. In this tank the feed stock is mixed with water before it is sent to the digester chamber
3. **Anaerobic Digester:** An anaerobic digester is a tank or vessel which excludes oxygen and in which a sludge (cow dung/kitchen waste) or a liquid effluent is modified by the action of anaerobic bacteria.
4. **Vacuum pump**: A vacuum pump is a device that removes gas molecules from a sealed volume in order to leave behind a partial vacuum.

5. **Water gas separator**: it removes moisture in the gas collected from the top of the digester and sent to the bubble gun/storage balloon.

6. **Bubble gun**: it is the device used for mixing the digester slurry with help of biogas

7. **Water trap**: Due to temperature changes, the moisture-saturated biogas will form inevitably condensation water in the piping system. The gas after passing through water trap it may send to gas storage balloon.

8. **Biogas flow meter**: It is used to measure the flow rate of biogas generated in Litres or $m^3$

9. **RTD sensors**: These are used to measure temperature of the slurry inside the digester.

10. **Pressure gauge**: it is used to measure the pressure of gas sent to the bubble gun

11. **Pressure relief valve**: used to release the gas inside the digester when the pressure exceeds 1.5 bar

12. **Crusher**: it is used to crush the kitchen waste, food waste and other biomass waste before send to the mixing tank.

13. **Gas piping system**: The biogas is transported to the kitchen through a piping system. At the plant, a valve is installed to help isolate the plant whenever need arises. This valve should always be closed to ensure that the gas does not flow out through some leakages in the piping when the gas is not being used. The piping system must be reliably gas-tight during the life-span of the biogas unit. Faulty piping systems were the most frequent reason for gas losses in biogas units. Galvanized steel water supply pipes are used most frequently, because the entire piping system (gas pipe, valves and accessories). The necessary pipe diameter depends on the required flow-rate of biogas through the pipe and the distance between biogas digester and gas appliances. Long distances lead to a decrease of the gas pressure. Bends and fittings increase the pressure losses. Pipe diameter of 3/4" is suitable for the total piping system of small biogas plants.
14. **Valves**: To the extent possible, ball valves or cock valves suitable for gas installations should be used as shutoff and isolating elements. The most reliable valves are chrome-plated ball valves. They must be greased regularly. Test the digester and the piping system separately for their gas-tightness.

15. **Biogas stove**: It is the device used for burning the biogas and used for cooking

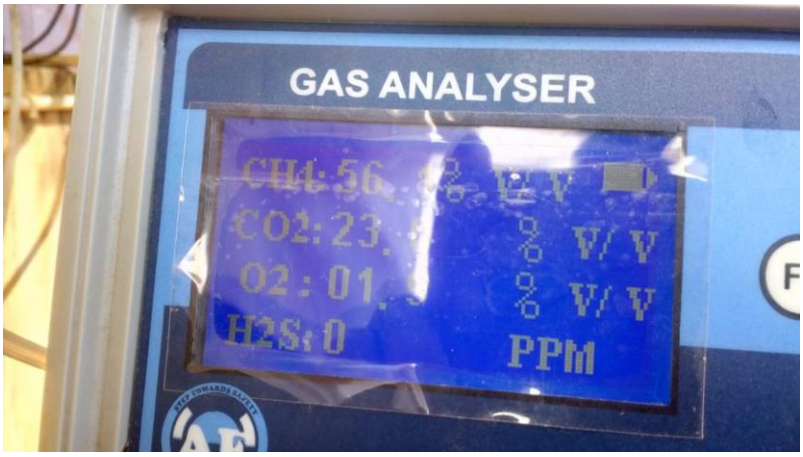
16. **Slurry handling structure**: It removes the digested slurry from the digester and used as fertilizer for the plants.

17. **Gas balloon**: it is used to store the gas generated from the digester. The gas from the storage balloon is supplied to the biogas stove for usage.

18. **pH Meter**: A pH meter is a scientific instrument that measures the hydrogen-ion activity in water-based solutions, indicating its acidity or alkalinity expressed as pH. The pH meter

measures the difference in electrical potential between a pH electrode and a reference electrode. The difference in electrical potential relates to the acidity or pH of the solution.

19. **Biogas Analyser**: The Biogas Analyser measures gas composition with repeatable accuracy. It shows the composition of biogas ($CH_4$,$CO_2$,$O_2$,$H_2S$)




20. **Junkers Gas Calorimeter**: it is used to measure the calorific value of the biogas. It is generally in the range of 19-25 $MJ/m^3$

Fig.1 Layout of BENAKA-MVGR Biogas Plant

## Plant Start up Procedure

1. The biogas digester is filled with water and check for any leakage in the digester and in the water pipelines.
2. Operate the bubble gun and ensure proper mixing is happening inside the digester.
3. Remove the water from the digester completely
4. When feeding the digester for the first time, add up to half of the initial load with Inoculum from a nearby working digester.
5. Use cow fresh manure for the initial load.
6. The manure should be free of other material, especially glass, wires, or plastic.
7. Add water to the cow manure in 1:2
8. Adjust the daily feeding rates to amounts that are easy to measure in buckets (kgs)
9. To protect the reactor and to have the best agitation results, ONLY agitate the system when it is not completely full of gas. It is good to agitate the system for 2-3 minutes per day right before the daily feeding.
10. Measure the PH of the feed and ensure it is in the range of 6.5-8.2

## Operation and maintenance of a biogas plant

1. The digester is fed on daily basis based on its capacity
2. The very first gas produced should be vented unused from the water drain valve.
3. Ensure that the plant is filled as per its capacity
4. Bio-slurry should overflow from the biogas digester through the slurry canal
5. Ensure that gas is produced consistently.
6. keep the area around the biogas system clean.
7. Measure the temperature and pH of the slurry in the digester daily
8. Maintain the pH of the slurry is in the range of 7.5-8.2
9. Ensure the temperature of the digester is constant ($30^0$C for mesophilic and $55^0$C for thermophilic conditions)
10. Mix the slurry every day 2-3 minutes by help of bubble gun

## Troubleshooting of Biogas Plant

**Feeding the biogas plant:** To ensure that biogas system operation is uninterrupted, it is advisable to ensure the bio digester is fed regularly by the appropriate feedstock. There is no standard approach for feeding the biodigester; however, there are minimum standards that must be fulfilled to ensure gas production is optimal and sustainable. The volume of waste that was used to decide on the size of the biogas plant should always be maintained to ensure that the biogas produced is as per the volume intended. The feedstock should be mixed thoroughly with water on a ratio of 1:2 before it is fed to the bio digester.

**Sanitizing the environment around the biogas system:** Care should be taken to ensure that the area around the biogas system is clean always and does not pose a potential threat because of poor management.

**The following are areas where problems could arise and result to reduced gas production:**

i. The digester could be having cracks that are causing biogas to escape

ii. The pipes could be leaking particularly in the joint areas.

iii. The feedstock may be inadequate, not of the right quality.

iv. The digester may have developed excess toxicity.

**Summary of possible problems of biogas plants and their solutions**

| Problems | Possible reasons | Solutions |
|---|---|---|
| Insufficient gas pressure | • Gas leakage along the pipeline<br>• Under feeding of the plant<br>• Too much water inside the digester<br>• Existence of toxic substances inside the digester<br>• Presence of water in the piping system | • Check for any gas leakage by pouring soapy water on the suspected leakage point; bubbles indicate gas leakage. |
| Gas production has declined and is less than before | • Under feeding of the plant<br>• Dung/water mixture not at the right proportion to the one incorporated in the digester design<br>• Possible gas leakages along the gas pipeline<br>• Scum formation inside the digester<br>• Accumulation of inorganic solids inside the digester<br>• pH is low (< 7) | • Ensure the feeding instruction is followed and daily feeding is done for a constant gas production<br>• Check for gas leakages along the pipeline<br>• Scum should be removed<br>• plant requires to be emptied due to too much scum and inorganic solids |
| Bio-slurry smelling at the digester outlet | • Overfeeding the digester | • Follow feeding instructions to ensure a good consistency of the mixture |

| | | |
|---|---|---|
| Gas stove not burning well | • Blocked flame holes<br>• Incorrect gas/air mixing ratio<br>• Presence of water in the pipe line<br>• The first gas coming from the plant may not burn | • Clean all the air ducts and burner holes regularly in order to prevent blockages<br>• Open the valves and allow the gas to flow out once or twice. It will start burning. |
| There is plenty of gas inside the balloon but won't come in the stove | • Main valve is closed<br>• Gas tap or gas jet may be blocked | • Open the main gas valve<br>• Clean the gas tap and gas jet |
| Flame is very weak and red | • There may be impurities in the gas tap and stove<br>• Less gas inside the plant | • Clean the gas tap and stove weekly<br>• Close the main gas valve and collect the gas |
| The feeding materials are not entering the digester | • Blocked inlet pipe | • Poke through the inlet pipe or replace the inlet pipe |
| Bio-slurry entering the gas pipe line | • Overflow pipe blocked | • Check slurry overflow point and remove any blocking materials |
| | | |

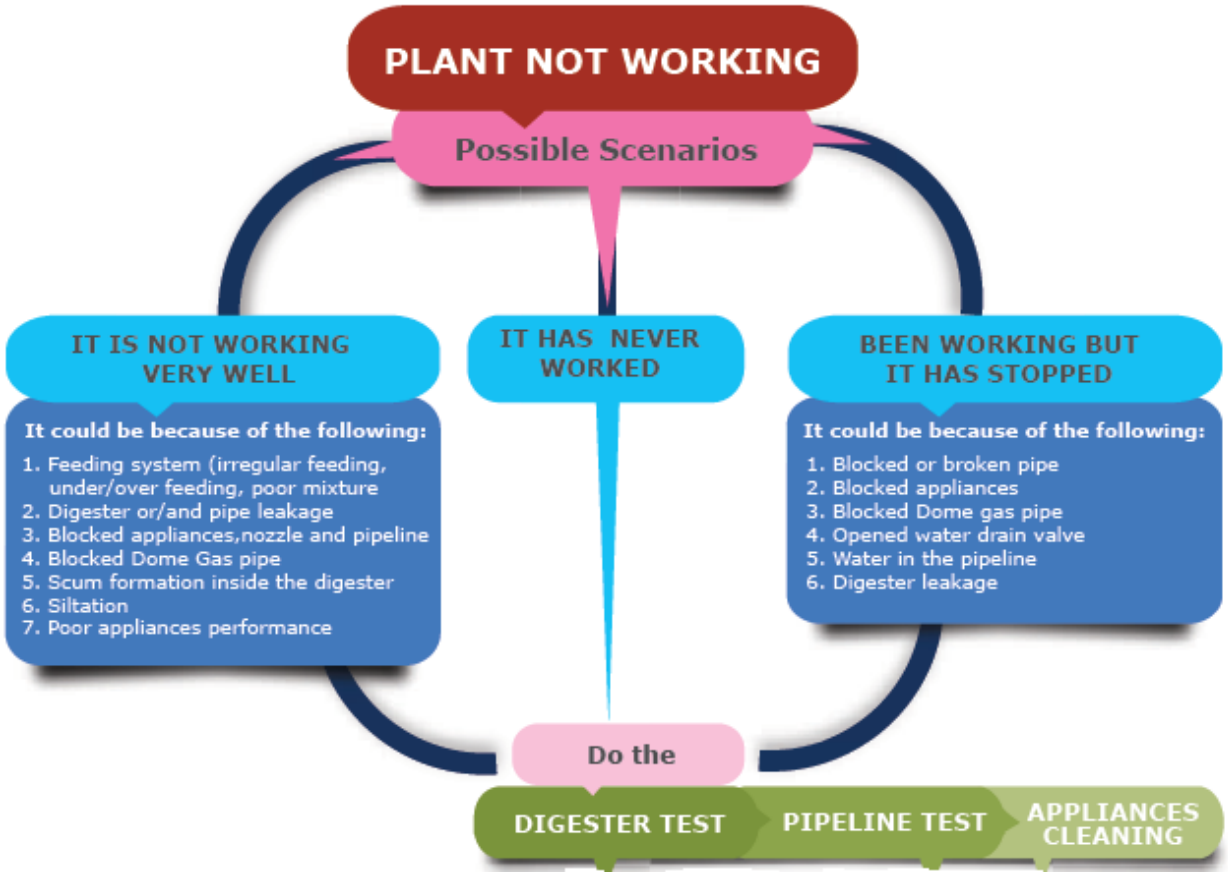



**Fig:2 Trouble shooting of general problems**

**References:**


1. Operation and maintenance of biogas plants, bio-slurry management and use, Biogas Solutions Ltd.
2. User manual biodigester's use & maintenance, www.Sistema.bio
3. End User Biogas Manual, IT Power Eastern Africa.

# 3. Wheeling to the Grid Sensor-based energy conservation
# 4. Use of LED bulbs / power efficient equipment



**CAD LAB** Fitted with LED Lamps in CIVIL Department.



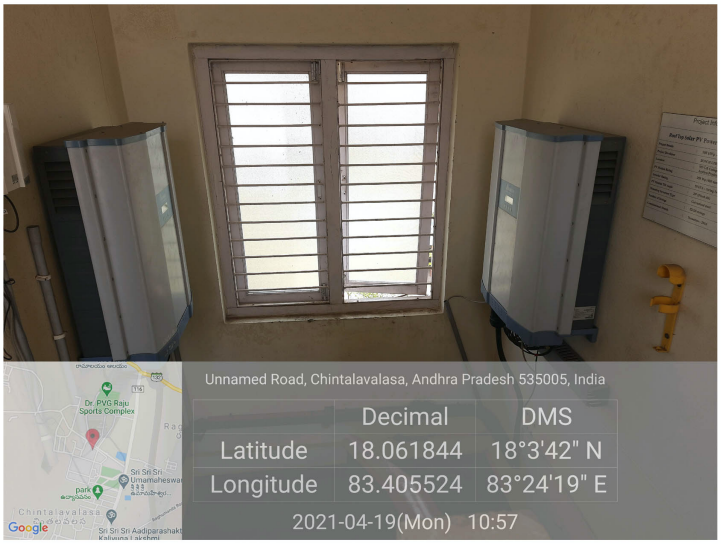
**Digital Library** Fitted with LED Lamps in Central Library.



**Ritchie Lab F**itted with LED Lamps in IT Department.



**Electrical Simulation Lab F**itted with LED Lamps in EEE Department.


## Solar Inverters On Grid generating Energy


# Net meter cubicle located in main switch yard.

# Bills for the Purchase of Equipment

BOSCH

Our ref.
ST-IIN/2017/L005

Sheet
Date. 10.02.2017

To,
M/s. MAHARAJ VIJAYARAM GAJAPATHI RAJ COLLEGE OF ENGINEERING
Vijayaram Nagar campus,
Chintalavalasa,
VIZIANAGARAM - 535005

Sub. Regarding SECI subsidy.

Dear Sir,

With reference to the Purchase order No. MVGR/PO/COL/EQU/2016-17/005 & MVGR/SO/COL/EQU/2016-17/005 Dated. 30.07.2016 for the Supply & Installation of 400kWp Solar PV Project, please refer the below consolidated table with the details of SECI Subsidy.

| Sl no | Invoice Number | Invoice Description | Total Invoice Value | SECI Subsidy Amount | Net Amount Payable by MVGR |
|---|---|---|---|---|---|
| 1 | BEBSIN/16-17/BS/2192 | Supply of 3 phase inverters | 2,310,948 | 6,180,000 | 14,420,000 |
| 2 | BEBSIN/16-17/BS/2192 | Supply of 3 phase inverters | 363,948 | | |
| 3 | BEBSIN/16-17/BS/2198 | Supply of 250 Wp rated solar panels | 6,762,552 | | |
| 4 | BEBSIN/16-17/BS/2206 | Supply of 250 Wp rated solar panels | 6,762,552 | | |
| 5 | BEBSIN/16-17/BS/2226 | Supply of Balance of System components | 3,872,500 | | |
| 6 | BEBSIN/16-17/BS/2239 | Supply of Balance of System components | 527,500 | | |
| 7 | BEBSIN/16-17/SI/6545 | Installation & Commissioning of 400 kWp Solar PV Plant | 5,000,000 | 1,500,000 | 3,500,000 |
| | | **Total** | **25,600,000** | **7,680,000** | **17,920,000** |

Kindly acknowledge the same & release the payment at the earliest.

Yours sincerely
For BOSCH Ltd

V. T. Rangarajan

Bosch Limited

4007 02 0000

# INVOICE

M.V.G.R. COLLEGE OF ENGG.(A) VIZIANAGARAM B-2 31/12

BOSCH

Bosch Limited
Adugodi, Hosur Road
Bangalore 560030
India
www.boschindia.com

Tel : +91 80 222-20088
Fax : +91 80 222-72728

**CUSTOMER :**

**M/s. MAHARAJ VIJAYARAM GAJAPATHI RAJ COLLEGE OF**
**Vijayaram Nagar campus,**
**Chintalavalasa,**
**VIZIANAGARAM - 535005**
**ANDRA PRADESH [INDIA]**

| | |
|---|---|
| INV No.: | BEBSIN/16-17/SI/6545 |
| Date: | 27-Dec-16 |

| | |
|---|---|
| Work Order No: | MVGR/SO/COL/EQU/2016-17/005, |
| Date: | 30.07.2016 |
| Customer Code : | 17023671 |
| Customer PAN No. | AAATM3365Q |
| LC No. | Y34IOUU162440001, |

Your ref/date | Our Ref | Date :

| | |
|---|---|
| **Our Reference** | Our ServiceTax Reg No : AAACM 9840PST001 |
| Project No : | Our PAN : AAACM 9840 P |
| Project Name: 400Kw MVGR | CIN : L85110KA1951PLC000761 |

| Sl.No. | Particulars | Currency | Total Price |
|---|---|---|---|
| | **Category : Installation and Commissioning** | | |
| 1 | Installation & Commissioning of 400 kWp Solar PV Plant | INR | 4,347,826 |
| | TOTAL | | 4,347,826 |
| | Service Tax @ 14.00% | INR | 608,696 |
| | Swachh Bharat Cess @ 0.5% | INR | 21,739 |
| | Krishi Kalyan Cess @ 0.5% | INR | 21,739 |
| | | | 5,000,000 |
| | **Amount in Words:** RUPEES FIFTY LAKH ONLY | | |

Payment should be made as per the agreed terms, otherwise Interest will be charged as applicable. All disputes arising out of this Service are subject to the jurisdiction of the courts in Bangalore or elsewhere according to Bosch's option.

**for Bosch Limited**

Bosch Limited Bosch Limited

**Authorised Signatory**

# BILL OF SALE

BOSCH



| | | |
|---|---|---|
| **Bosch Limited**<br>Plot No 263,<br>Bommasandra-Jigani Link Road, Industrial Area,<br>Rajapura Village, Jigani Hobli,<br>Anekal Tq, Bangalore - 562106 India. | CUSTMER CODE: 17023671<br>Your Order Ref:MVGR/PO/COL/EQU/2016-17/005, Dated. 30.07.2016<br>YOUR CST & TIN No. / YOUR PAN No. AAATM3365Q<br>LC No. Y34IOUU162440001, Dated. 06.09.2016 | INVOICE NO: BEBSIN/16-17/BS/2192<br>DATE: 26-Oct-16<br>DELIVERY TERMS:<br>DAP-Delivered at place<br>PAYMENTS TERMS: 20% Advance Along with Purchase Order, 80% Payment Through LC |

| CUSTOMER | DISPATCH TO |
|---|---|
| **M/s. MAHARAJ VIJAYARAM GAJAPATHI RAJ COLLEGE OF ENGINEERING**<br>Vijayaram Nagar campus,<br>Chintalavalasa,<br>**VIZIANAGARAM - 535005**<br>**ANDRA PRADESH [INDIA]** | **M/s. MAHARAJ VIJAYARAM GAJAPATHI RAJ COLLEGE OF ENGINEERING**<br>Vijayaram Nagar campus,<br>Chintalavalasa,<br>**VIZIANAGARAM - 535005**<br>**ANDRA PRADESH [INDIA]** |

| CARRIER | NO.OF PACKAGES | VEHICLE NO | G.R/LR NO. & DATE | WEIGHT IN KG |
|---|---|---|---|---|
| | | | | |

| SL.NO. | Description | QUANTITY (Nos) | UNIT VALUE (Rs.) | TOTAL VALUE (Rs.) |
|---|---|---|---|---|
| 1 | Supply of 3 phase inverters of 50 kVA rating for 400 kWp Solar Power Plant | 7 | 330135.43 | 2,310,948 |
| 2 | Supply of 3 phase inverters of 20 kVA rating for 400 kWp Solar Power Plant | 2 | 181974.00 | 363,948 |

Certified that the particulars given above are true and correct and the amounts indicated represent the price actually charged and that there is no flow of additional consideration directly or indirectly from the buyer.

| | |
|---|---|
| Value of Goods | 2,674,896 |
| CST NIL (VAT/CST is exempted vide notification No.FD 71 CSL 2015 dated 01.08.2015) | - |
| **TOTAL VALUE** | **2,674,896** |

Our TIN No. 29140139615
PAN No.: AAACM9840P
CIN: L85110KA1951PLC000761

**VALUE IN WORDS.** RUPEES TWENTY SIX LAKH SEVENTY FOUR THOUSAND EIGHT HUNDRED AND NINETY SIX ONLY.

Payment should be made as per the terms stipulated otherwise interest will be charged as applicable. Sales Tax declaration form covering this supply should be sent immediately on receipt of this invoice, otherwise sales Tax will be charged as applicable, Rejections, if any, should be advised to us giving full particulars for our further action within 8 days from the date of receipt of goods by you. All disputes arising out of this sale are subject to the jurisdiction of the courts in Bangalore or elsewhere according to BOSCH Ltd. option. These terms of sale are supplementary to the BOSCH Ltd. General Terms of Delivery

Bankers: State Bank Of India, Canara Bank, Citi Bank, Deutsche Bank AG

**for Bosch Limited.**

V. T. Rangavalla.

Bosch Limited * Bosch Limited

# BILL OF SALE

BOSCH



| | | |
|---|---|---|
| **Bosch Limited**<br>Plot No 263,<br>Bommasandra-Jigani Link Road, Industrial Area,<br>Rajapura Village, Jigani Hobli,<br>Anekal Tq, Bangalore - 562106 India. | CUSTMER CODE: 17023671<br>Your Order Ref:MVGR/PO/COL/EQU/2016-17/005, Dated. 30.07.2016<br>YOUR CST & TIN No. / YOUR PAN No. AAATM3365Q<br>LC No. Y34IOUU162440001, Dated. 06.09.2016 | INVOICE NO: BEBSIN/16-17/BS/2206<br>DATE: 9-Nov-16<br>DELIVERY TERMS:<br>DAP-Delivered at place<br>PAYMENTS TERMS: 20% Advance Along with Purchase Order, 80% Payment Through LC |

| CUSTOMER | DISPATCH TO |
|---|---|
| **M/s. MAHARAJ VIJAYARAM GAJAPATHI RAJ COLLEGE OF ENGINEERING**<br>Vijayaram Nagar campus,<br>Chintalavalasa,<br>**VIZIANAGARAM - 535005**<br>**ANDRA PRADESH [INDIA]** | **M/s. MAHARAJ VIJAYARAM GAJAPATHI RAJ COLLEGE OF ENGINEERING**<br>Vijayaram Nagar campus,<br>Chintalavalasa,<br>**VIZIANAGARAM - 535005**<br>**ANDRA PRADESH [INDIA]** |

| CARRIER | NO.OF PACKAGES | VEHICLE NO | G.R/LR NO. & DATE | WEIGHT IN KG |
|---|---|---|---|---|
| | | | | |

| SL.NO. | Description | QUANTITY (Nos) | UNIT VALUE (Rs.) | TOTAL VALUE (Rs.) |
|---|---|---|---|---|
| 1 | Supply of 250 Wp rated solar panels for 400 kWp Solar Power Plant | 800 | 8453.19 | 6,762,552 |

Certified that the particulars given above are true and correct and the amounts indicated represent the price actually charged and that there is no flow of additional consideration directly or indirectly from the buyer.

| | |
|---|---|
| Value of Goods | 6,762,552 |
| CST NIL<br>(VAT/CST is exempted vide notification No.FD 71 CSL 2015 dated 01.08.2015) | - |
| **TOTAL VALUE** | **6,762,552** |

Our TIN No. 29140139615
PAN No.: AAACM9840P
CIN: L85110KA1951PLC000761

**VALUE IN WORDS.** RUPEES SIXTY SEVEN LAKH SIXTY TWO THOUSAND FIVE HUNDRED AND FIFTY TWO ONLY.

Payment should be made as per the terms stipulated otherwise interest will be charged as applicable. Sales Tax declaration form covering this supply should be sent immediately on receipt of this invoice, otherwise sales Tax will be charged as applicable, Rejections, if any, should be advised to us giving full particulars for our further action within 8 days from the date of receipt of goods by you. All disputes arising out of this sale are subject to the jurisdiction of the courts in Bangalore or elsewhere according to BOSCH Ltd. option. These terms of sale are supplementary to the BOSCH Ltd. General Terms of Delivery

Bankers: State Bank Of India, Canara Bank, Citi Bank, Deutsche Bank AG

for Bosch Limited.

V.T. Rangavalla

Bosch Limited

# BILL OF SALE

BOSCH



| | | |
|---|---|---|
| **Bosch Limited**<br>Plot No 263,<br>Bommasandra-Jigani Link Road, Industrial Area,<br>Rajapura Village, Jigani Hobli,<br>Anekal Tq, Bangalore - 562106 India. | CUSTMER CODE: 17023671<br>Your Order Ref:MVGR/PO/COL/EQU/2016-17/005, Dated. 30.07.2016<br>YOUR CST & TIN No. / YOUR PAN No. AAATM3365Q<br>LC No. Y34IOUU162440001, Dated. 06.09.2016 | INVOICE NO: BEBSIN/16-17/BS/2198<br>DATE: 30-Oct-16<br>DELIVERY TERMS:<br>DAP-Delivered at place<br>PAYMENTS TERMS: 20% Advance Along with Purchase Order, 80% Payment Through LC |

| CUSTOMER | DISPATCH TO |
|---|---|
| **M/s. MAHARAJ VIJAYARAM GAJAPATHI RAJ COLLEGE OF ENGINEERING**<br>Vijayaram Nagar campus,<br>Chintalavalasa,<br>**VIZIANAGARAM - 535005**<br>**ANDRA PRADESH [INDIA]** | **M/s. MAHARAJ VIJAYARAM GAJAPATHI RAJ COLLEGE OF ENGINEERING**<br>Vijayaram Nagar campus,<br>Chintalavalasa,<br>**VIZIANAGARAM - 535005**<br>**ANDRA PRADESH [INDIA]** |

| CARRIER | NO.OF PACKAGES | VEHICLE NO | G.R/LR NO. & DATE | WEIGHT IN KG |
|---|---|---|---|---|
| | | | | |

| SL.NO. | Description | QUANTITY (Nos) | UNIT VALUE (Rs.) | TOTAL VALUE (Rs.) |
|---|---|---|---|---|
| 1 | Supply of 250 Wp rated solar panels for 400 kWp Solar Power Plant | 800 | 8453.19 | 6,762,552 |

Certified that the particulars given above are true and correct and the amounts indicated represent the price actually charged and that there is no flow of additional consideration directly or indirectly from the buyer.

| | |
|---|---|
| Value of Goods | 6,762,552 |
| CST NIL (VAT/CST is exempted vide notification No.FD 71 CSL 2015 dated 01.08.2015) | - |
| **TOTAL VALUE** | **6,762,552** |

Our TIN No. 29140139615
PAN No.: AAACM9840P
CIN: L85110KA1951PLC000761

**VALUE IN WORDS.** RUPEES SIXTY SEVEN LAKH SIXTY TWO THOUSAND FIVE HUNDRED AND FIFTY TWO ONLY.

Payment should be made as per the terms stipulated otherwise interest will be charged as applicable. Sales Tax declaration form covering this supply should be sent immediately on receipt of this invoice, otherwise sales Tax will be charged as applicable, Rejections, if any, should be advised to us giving full particulars for our further action within 8 days from the date of receipt of goods by you. All disputes arising out of this sale are subject to the jurisdiction of the courts in Bangalore or elsewhere according to BOSCH Ltd. option. These terms of sale are supplementary to the BOSCH Ltd. General Terms of Delivery

Bankers: State Bank Of India, Canara Bank, Citi Bank, Deutsche Bank AG

for Bosch Limited

V. T. Ranganatha

Bosch Limited

# BILL OF SALE

BOSCH



| | | |
|---|---|---|
| **Bosch Limited**<br>Plot No 263,<br>Bommasandra-Jigani Link Road, Industrial Area,<br>Rajapura Village, Jigani Hobli,<br>Anekal Tq, Bangalore - 562106 India. | CUSTMER CODE: 17023671<br>Your Order Ref:MVGR/PO/COL/EQU/2016-17/005, Dated. 30.07.2016<br>YOUR CST & TIN No. / YOUR PAN No. AAATM3365Q<br>LC No. Y34IOUU162440001, Dated. 06.09.2016 | INVOICE NO: BEBSIN/16-17/BS/2226<br>DATE: 30-Nov-16<br>DELIVERY TERMS:<br>DAP-Delivered at place<br>PAYMENTS TERMS: 20% Advance Along with Purchase Order, 80% Payment Through LC |

**CUSTOMER**

**M/s. MAHARAJ VIJAYARAM GAJAPATHI RAJ COLLEGE OF ENGINEERING**
Vijayaram Nagar campus,
Chintalavalasa,
**VIZIANAGARAM - 535005**
**ANDRA PRADESH [INDIA]**

**DISPATCH TO**

**M/s. MAHARAJ VIJAYARAM GAJAPATHI RAJ COLLEGE OF ENGINEERING**
Vijayaram Nagar campus,
Chintalavalasa,
**VIZIANAGARAM - 535005**
**ANDRA PRADESH [INDIA]**

| CARRIER | NO.OF PACKAGES | VEHICLE NO | G.R/LR NO. & DATE | WEIGHT IN KG |
|---|---|---|---|---|
| | | | - | |

| SL.NO. | Description | QUANTITY (Lot) | UNIT VALUE (Rs.) | TOTAL VALUE (Rs.) |
|---|---|---|---|---|
| 1 | Supply of Balance of System components for 400 kWp solar power plant | 1 | 3,670,616 | 3,670,616 |

Certified that the particulars given above are true and correct and the amounts indicated represent the price actually charged and that there is no flow of additional consideration directly or indirectly from the buyer.

| | |
|---|---|
| Value of Goods | 3,670,616 |
| CST @5.5% | 201,884 |
| **TOTAL VALUE** | **3,872,500** |

Our TIN No. 29140139615
PAN No.: AAACM9840P
CIN: L85110KA1951PLC000761

**VALUE IN WORDS.** RUPEES THIRTY EIGHT LAKH SEVENTY TWO THOUSAND FIVE HUNDRED ONLY.

Payment should be made as per the terms stipulated otherwise interest will be charged as applicable. Sales Tax declaration form covering this supply should be sent immediately on receipt of this invoice, otherwise sales Tax will be charged as applicable, Rejections, if any, should be advised to us giving full particulars for our further action within 8 days from the date of receipt of goods by you. All disputes arising out of this sale are subject to the jurisdiction of the courts in Bangalore or elsewhere according to BOSCH Ltd. option. These terms of sale are supplementary to the BOSCH Ltd. General Terms of Delivery

Bankers: State Bank Of India, Canara Bank, Citi Bank, Deutsche Bank AG

**for Bosch Limited.**

V. T. Rangavatha

Bosch Limited

# BILL OF SALE

BOSCH



| | | |
|---|---|---|
| **Bosch Limited**<br>Plot No 263,<br>Bommasandra-Jigani Link Road, Industrial Area,<br>Rajapura Village, Jigani Hobli,<br>Anekal Tq, Bangalore - 562106 India. | CUSTMER CODE: 17023671<br>Your Order Ref:MVGR/PO/COL/EQU/2016-17/005, Dated. 30.07.2016<br>YOUR CST & TIN No. / YOUR PAN No.<br>AAATM3365Q<br>LC No. Y34IOUU162440001, Dated. 06.09.2016 | INVOICE NO: BEBSIN/16-17/BS/2239<br>DATE: 14-Dec-16<br>DELIVERY TERMS:<br>DAP-Delivered at place<br>PAYMENTS TERMS: 20% Advance Along with Purchase Order,<br>80% Payment Through LC |

| CUSTOMER | DISPATCH TO |
|---|---|
| **M/s. MAHARAJ VIJAYARAM GAJAPATHI RAJ COLLEGE OF ENGINEERING**<br>Vijayaram Nagar campus,<br>Chintalavalasa,<br>**VIZIANAGARAM - 535005**<br>**ANDRA PRADESH [INDIA]** | **M/s. MAHARAJ VIJAYARAM GAJAPATHI RAJ COLLEGE OF ENGINEERING**<br>Vijayaram Nagar campus,<br>Chintalavalasa,<br>**VIZIANAGARAM - 535005**<br>**ANDRA PRADESH [INDIA]** |

| CARRIER | NO.OF PACKAGES | VEHICLE NO | G.R/LR NO. & DATE | WEIGHT IN KG |
|---|---|---|---|---|
| | | | | |

| SL.NO. | Description | QUANTITY (Lot) | UNIT VALUE (Rs.) | TOTAL VALUE (Rs.) |
|---|---|---|---|---|
| 1 | Supply of Balance of System components for 400 kWp solar power plant | 1 | 500,000 | 500,000 |

Certified that the particulars given above are true and correct and the amounts indicated represent the price actually charged and that there is no flow of additional consideration directly or indirectly from the buyer.

| | |
|---|---|
| Value of Goods | 500,000 |
| CST @5.5% | 27,500 |
| **TOTAL VALUE** | **527,500** |

Our TIN No. 29140139615
PAN No.: AAACM9840P
CIN: L85110KA1951PLC000761

**VALUE IN WORDS.** RUPEES FIVE LAKH TWENTY SEVEN THOUSAND FIVE HUNDRED ONLY.

Payment should be made as per the terms stipulated otherwise interest will be charged as applicable. Sales Tax declaration form covering this supply should be sent immediately on receipt of this invoice, otherwise sales Tax will be charged as applicable, Rejections, if any, should be advised to us giving full particulars for our further action within 8 days from the date of receipt of goods by you. All disputes arising out of this sale are subject to the jurisdiction of the courts in Bangalore or elsewhere according to BOSCH Ltd. option. These terms of sale are supplementary to the BOSCH Ltd. General Terms of Delivery

Bankers: State Bank Of India, Canara Bank, Citi Bank, Deutsche Bank AG

for Bosch Limited

# TAX INVOICE

| | |
|---|---|
| **M/S Delta Power Solutions India Private Limited**<br>C/O CFC Logistics Pvt. Ltd, 2485/2486/2487, AECS Layout, A-Block, 14th Main, Singasandra, Bangalore 560068 Karnataka India<br>TIN NO. : 29070877969V PAN NO. : | **Tax Invoice No. : KA/100592/2016-17**<br>Date : 04/10/2016 |

| | |
|---|---|
| **Bill To:**<br>BOSCH LIMITED<br>PLOT NO. 263, BOMMASANDRA-JIGANI LINK ROAD INDUSTRIAL AREA, JIGANI HOBLI ANEKAL TQ BANGALORE DIST. 562106 Karnataka India<br>CST NO. :<br>TIN NO. : 29140139615<br>PAN NO. : AAACM9840P | **Ship To:**<br>Maharaj Vijayaram Gajapathi Raj College of Engineering.<br>Vijayaram Nagar Campus, Chintalavalasa, Vizianagaram Vizianagaram, 535005 Andra Pradesh India<br>CST NO. :<br>TIN NO. :<br>PAN NO. : AAATM3365Q |
| PO. NO : 2016BEBSIN375<br>PO Date : 03/10/2016<br>WCD :<br>SAP No. : 9431001303<br>Payment Term : 0N30<br>Incoterms : CIF<br>No. : 5141000882 DO No. : 8141332609 | Shipment by : TRUCK<br>Shipment Date : 04/10/2016<br>Vehicle No. :<br>LR No :<br>Transporter Name : |

| SR.NO. | PARTICULARS | PRICE/UNIT | QTY | Total Price ( INR ) |
|---|---|---|---|---|
| | SOLAR ENERGY DEVICES-INVERTER & EQUIPMENTS | | | |
| 1. | RPI503M221000-PVI 50KW I=1000VDC O=230V(DELTA)WB | 268500.00 | 7.000 PCE | 1,879,500.00 |
| 2. | RPI203FA0E0200-PVI 20KW I=1000VDC O=230V MINI(DELTA)WB | 148000.00 | 2.000 PCE | 296,000.00 |

| | | | |
|---|---|---|---|
| | Total Taxable Amount (INR). | | 2,175,500.00 |
| VAT and CST is Nill against "Karnataka Government Notification No:FD 71 CSL 2015 Date:1.08.2015, Under Karnataka Value Added Tax Act,2003 (Karnataka Act 32 of 2004)" | CST/LST | 0.00% | 0.00 |
| | Grand Total | | 2,175,500.00 |

**Grand Total(Words): TWENTY ONE LAKH SEVENTY FIVE THOUSAND FIVE HUNDRED Rupees**

For M/S Delta Power Solutions India Private Limited

Authorised Signatory

Benificiary Name : Delta Power Solutions India Pvt. Ltd., Account Number: 09065-110423-001-97, Bank Name : BNP Paribas Bank, Branch : New Delhi, IFSC Code : BNPA0009065, Address: East Towers 8th & 9th Floor, 25, Barakhamba Road, New Delhi-110001

# M.V.G.R COLLEGE OF ENGINEERING -16-17

## F.A. Solar Power Plant

Ledger Account

1-Apr-2016 to 31-Mar-2017



| Date | | Particulars | Vch Type | Vch No./Excise Inv.No. | Debit | Credit |
|---|---|---|---|---|---|---|
| 14-10-2016 | Cr | **Tds on Professional Charges A/c**<br>*CH NO 005546 PAID TOWARDS FIRST INSTALLMENT TOWARDS - CONSULTANCY CHARGES FOR PROCESSING OF SOLAR ELECTRIC PEC BILL TO M/S P R CLEAN ENERGY PVT LTD* | Payment | 1206 | 2,87,500.00 | |
| 23-12-2016 | Cr | **M/S Bosch Limited**<br>*being work completed as per thier certificate on 23.12.2016* | Journal | 232 | 1,79,20,000.00 | |
| 30-12-2016 | Cr | **Canara Bank (Miscellaneous Fee C.A 5002 )**<br>*CH NO 006245 PAID TOWARDS SOLAR NET PROCESSING CHARGES TO APEPDC V NO 372* | Payment | 1811 | 23,140.00 | |
| 31-12-2016 | Cr | **VAT Payable**<br>*ch no 5958 PAID TOWARDS THE INSTALLATION OF SPARE FEEDERS TO M/S SAI DURGA ELECTRICALS* | Payment | 1822 | 87,150.00 | |
| 31-1-2017 | Cr | **Canara Bank (Miscellaneous Fee C.A 5002 )**<br>*CH NO 006616 PAID TOWARDS FINAL PAYMENT ON SOLAR NET PROCESSING CHARGES* | Payment | 2064 | 75,932.00 | |
| 27-3-2017 | Cr | **VAT Payable**<br>*CH NO 006746 PAID TOWARDS L&T SFU ENCLOSER WORKS TO M/S SAI DURGA ELECTRICALS* | Payment | 2559 | 55,650.00 | |
| 28-3-2017 | Cr | **M/s P R Clean Energy Private Ltd**<br>*travelling exp by pr clena*<br>*being travelling expenses cliamed as per thier debited note 22/02.2017* | Journal | 336 | 71,344.00 | |
| 31-3-2017 | Dr | **Depreciation A/c**<br>*depreciation accounted* | Journal | 389 | | 74,08,286.00 |
| | Dr | **Closing Balance** | | | 1,85,20,716.00 | 74,08,286.00<br>1,11,12,430.00 |
| | | | | | **1,85,20,716.00** | **1,85,20,716.00** |

M.V.G.R College of Engg (A) VIZIANAGARAM

PRINCIPAL
MVGR College of Engineering (A)
VIZIANAGARAM-535005

# M.V.G.R COLLEGE OF ENGINEERING -17-18

## F.A. Solar Power Plant

Ledger Account

1-Apr-2017 to 31-Mar-2018



| Date | | Particulars | Vch Type | Vch No./Excise Inv.No. | Debit | Credit |
|---|---|---|---|---|---|---|
| 1-4-2017 | Cr | **Opening Balance** | | | **1,11,12,430.00** | |
| 6-4-2017 | Cr | **Canara Bank (Tuition Fee - C.A 5001)** *CH NO 006782 PAID TOWARDS THE L&T SFU ENCLOUSER WORKS TO M/S SAI DURGA ELECTRICALS* | **Payment** | 120 | 54,325.00 | |
| 10-4-2017 | Cr | **Tds on Professional Charges A/c** *CH NO 006791 PAID TOWARDS FINAL PAYMENT ON CONSULTANCY CHARGES AND PROCESSING FEE OF SOLAR ELECTRIC PEC TO P R CLEAN ENERGY PVT LTD* | **Payment** | 140 | 5,75,000.00 | |
| 27-6-2017 | Dr | **Canara Bank (Tuition Fee - C.A 5001)** *CH NO 006746 PAID TOWARDS L & T SFU ENCLOSER WORKS TO M/S SAI DURGA ELECTRICALS NOT ENCASHED* | **Receipt** | 229 | | 54,325.00 |
| 31-3-2018 | Dr | **Depreciation A/c** *Being Depreciation provided for the year 2017-18* | **Journal** | 490 | | 93,49,944.00 |
| | Dr | **Closing Balance** | | | 1,17,41,755.00 | 94,04,269.00 |
| | | | | | | 23,37,486.00 |
| | | | | | **1,17,41,755.00** | **1,17,41,755.00** |

M.V.G.R. College of Engg (A) VIZIANAGARAM

PRINCIPAL
MVGR College of Engineering (A)
VIZIANAGARAM-535005