**Environmental Consciousness and Sustainability.**

The Institution has facilities for alternate sources of energy and energy conservation measure.

* 1. **Solar Energy**

### Electricity Generation from Grid connected Solar Power Plant of 50 KWp capacity

### C:\Users\Admin\Desktop\Photos Umashankar\DSC_0533.JPG

###

Electromech Devices Mfg. Co. Raipur has installed a Grid Connected Solar Power Plant of Tata Solar having capacity of 50 KWp and handed over to Bhilai Education Trust on 29th March, 2018.

|  |  |
| --- | --- |
| Total Wattage of one Solar Panel | 0.31 Kwp |
| Total Numbers of Panel | 162 |
| Total Wattage | 50 kwp |

The seller can sell energy maximum up to 49%. The supply arrangement of Solar Power Plant is such that it will first meet in-house electricity consumption of college, then after it will supply surplus energy to grid, which will be recorded by Import/Export meter. The serial. number of Secure make import/export meter is X0480882. The shadow free area of college roof is 12,000 sq. meter.

The solar module efficiency will be about 90% after 10 year and about 80% after 25 years of installation. Module efficiency is 16.55%.

A View of Solar Power Plant

The technical details of electrical parameters of Solar panel is mentioned below :-

|  |  |  |  |
| --- | --- | --- | --- |
| Type of Module | Multi | Make & Year | Tata Solar, 2018 |
| Module Efficiency | 16.55% | Voltage & Nos. | 24 V, 162 Nos. |
| PCU Make& Rating | Delta, 50 KW | Tilt angle of module | 21.D |
| No. of series & parallel combinations | Series 18 x5, 18 x4 & parallel 9 |
| AC output & Capacity | 230 V, three phase & 50 KWp |

 

Considering the fact that the Bhilai Mahila Vidya;laya is a non-technical college, there is a significant energy conservation and environmental activity both by faculty and students. The environmental awareness initiatives are substantial. The installation of ongrid solar photo voltaic panels and five star rated equipments are noteworthy. This may lead to the prosperous future in context of Green Campus having energy conservation activities & use of renewable energy and thus sustainable environment and community development.

### Solar Power Plant Generation

|  |  |
| --- | --- |
| **Month** | **Energy Yield in KWH** |
| Jun-18 | 4856 |
| Jul-18 | 3717 |
| Aug-18 | 3773 |
| Sep-18 | 5595 |
| Oct-18 | 6899 |
| Nov-18 | 5867 |
| Dec-18 | 4921 |
| Jan-19 | 5441 |
| Feb-19 | 6338 |
| Mar-19 | 7625 |
| Total Generation | 55032 |
| Total Average Generation permonth | 5503 |

Table 3 : Solar Power Plant Generation during first year of installation

|  |  |
| --- | --- |
| **Month** | **Energy Yield in KWH** |
| Dec-20 | 4871 |
| Jan-21 | 4018 |
| Feb-21 | 4013 |
| Mar-21 | 4973 |
| Apr-21 | 4679 |
| May-21 | 4866 |
| Jun-21 | 4264 |
| Jul-21 | 4023 |
| Aug-21 | 5393 |
| Sep-21 | 4696 |
| Oct-21 | 6278 |
| Total Generation in 11 month | 52074 |
| Total Average Generation per month | 4,734 |

Table 4: Solar Power Plant Generation during first year of installation

|  |  |  |  |
| --- | --- | --- | --- |
| Life Energy Total | **223.94 MWH** | Run Time | 14965 Hours |

Table 5 : Electricity generation & Run time hours since installation

* 1. **Use of LED bulbs/power efficient equipment.**

**Electrical Connected Load :**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Segment** | **Type** | **Wattage** | **Quantity** | **Total Load** |
| **Lighting** | LED 2x2 | 32 | 28 | 896 |
| FTL 40 | 40 | 572 | 22880 |
| LED TL | 22 | 181 | 3982 |
| LED 18 W | 18 | 12 | 216 |
| LED 200 W | 200 | 8 | 1600 |
| LED 12 W | 12 | 20 | 240 |
| CFL 32 W | 32 | 1 | 32 |
| LED 5 W | 5 | 2 | 10 |
| Total | **29856** |
| **HVAC** | Fan | 70 | 655 | 45850 |
| AC 1.5 T | 1700 | 26 | 44200 |
| Big Air Cooler | 600 | 8 | 4800 |
| Air Cooler | 200 | 5 | 1000 |
| Exhaust Medium | 200 | 11 | 2200 |
| Exhaust Small | 70 | 18 | 1260 |
| Total | **99310** |
| **Office** | Computer | 70 | 68 | 4760 |
| Printer/Scanner | 500 | 19 | 9500 |
| Printer | 300 | 11 | 3300 |
| Photocopy machine | 750 | 1 | 750 |
| Total | **18310** |
| **Campus Lighting** | LED 150 W | 150 | 2 | 300 |
| LED 50 W | 50 | 11 | 550 |
| LED 120 W | 120 | 7 | 840 |
| LED 200 W | 200 | 3 | 600 |
| CFL 85 W | 85 | 2 | 170 |
| Total | **2460** |
| **Others** | Water Cooler | 600 | 5 | 3000 |
| Submersible Pump | 750 | 1 | 750 |
| Pump | 750 | 3 | 2250 |
| Heater | 1000 | 1 | 1000 |
| Induction heater | 2000 | 3 | 6000 |
| Refrigerator Big | 900 | 1 | 900 |
| Refrigerator Medium | 700 | 3 | 2100 |
| Refrigerator small | 500 | 6 | 3000 |
| Geyser | 2000 | 5 | 10000 |
| Miscellaneous |  |  | 11000 |
| Total | **40000** |
| **Total Connected Load in watt** | 189936 |
| **Say** | 190 KW |

Table 8: Connected Load of Bhilai Mahila Mahavidyalaya, Bhilai

The total connected load of St. Thomas, Bhilai Campus is about 121 KW. The maximum share of connected load is in HVAC segment, which is 45% and alone air conditioner has about 13% load share among all the electrical equipment.

|  |  |
| --- | --- |
| **Equipment** | **Connected Load in Watt** |
| Lighting | 29856 |
| HVAC | 99310 |
| Office | 18310 |
| Campus Lighting | 2460 |
| Others | 40000 |
| Total | 189936 |

Table 9 : Segment wise Connected Load of of Bhilai Mahila Mahavidyalaya, Bhilai

### Graphical representation of Connected Load



Figure 1 : Graphical representation of connected Load

As per requirement, we have calculated installed load of LED fittings and Conventional light fittings.

|  |  |
| --- | --- |
| **Types of Light Fittings** | **Load in Watt** |
| LED Light Fittings | 9234 |
| Conventional Light Fittings | 23082 |

Table 10 : Connected Load of LED light fittings & Conventional fittings at of Bhilai Mahila Mahavidyalaya, Bhilai

## Percentage of Lighting Power requirement met through LED lights

|  |  |
| --- | --- |
| LED Lighting Load in Watt | 9234 |
| Total Lighting Load in watt | 32316 |
| Percentage of Lighting Power requirement met through LED lights | 28.57 |

Table 11: Percentage of Lighting Power requirement met through LED lights

**Thus, total Percentage of Lighting Power requirement met through LED lights is about 29 %.**

### Graphical representation of Percentage of Lighting Power requirement met through LED lights



Figure 2 : Graphical representation of Percentage of Lighting Power requirement met through LED lights

### Electricity Bill Analysis

We have analyzed the electricity bills of last six years i.e. 2015-16,2016-17,2017-18,2018-19,2019-20 & 2020-21

### 1. 2015-16

|  |  |
| --- | --- |
| **Month** | **Unit Consumption** |
| **Apr-15** | 5000 |
| **May-15** | 25577 |
| **Jun-15** | 5000 |
| **Jul-15** | 15466 |
| **Aug-15** | 5000 |
| **Sep-15** | 23745 |
| **Oct-15** | 5000 |
| **Nov-15** | 19300 |
| **Dec-15** | 5000 |
| **Jan-16** | 13280 |
| **Feb-16** | 5000 |
| **Mar-16** | 18775 |
| Total | 146143 |

Table 12 : Electricity Consumption for the year 2015-16

### 2. 2016-17

|  |  |
| --- | --- |
| **Month** | **Unit Consumption** |
| **Apr-16** | 5000 |
| **May-16** | 23089 |
| **Jun-16** | 5000 |
| **Jul-16** | 18182 |
| **Aug-16** | 5000 |
| **Sep-16** | 28377 |
| **Oct-16** | 5000 |
| **Nov-16** | 22327 |
| **Dec-16** | 5000 |
| **Jan-17** | 18214 |
| **Feb-17** | 5000 |
| **Mar-17** | 15061 |
| **Total** | **155250** |

Table 13 : Electricity Consumption for the year 2016-17

### 3. 2017-18

|  |  |
| --- | --- |
| **Month** | **Unit Consumption** |
| **Apr-17** | 5000 |
| **May-17** | 29881 |
| **Jun-17** | 5000 |
| **Jul-17** | 15161 |
| **Aug-17** | 5000 |
| **Sep-17** | 26387 |
| **Oct-17** | 5000 |
| **Nov-17** | 20528 |
| **Dec-17** | 5000 |
| **Jan-18** | 5000 |
| **Feb-18** | 5000 |
| **Mar-18** | 5000 |
| Total | 131957 |

Table 14 : Electricity Consumption for the year 2017-18

### 4. 2018-19

|  |  |
| --- | --- |
| **Month** | **Unit Consumption** |
| **Apr-18** | 5000 |
| **May-18** | 5000 |
| **Jun-18** | 5000 |
| **Jul-18** | 5000 |
| **Aug-18** | 5000 |
| **Sep-18** | 89084 |
| **Oct-18** | 14400 |

|  |  |
| --- | --- |
| **Nov-18** | 4600 |
| **Dec-18** | 6440 |
| **Jan-19** | 5400 |
| **Feb-19** | 7640 |
| **Mar-19** | 5000 |
| Total | 157564 |

Table 15 : Electricity Consumption for the year 2018-19

### 5. 2019-20

|  |  |
| --- | --- |
| **Month** | **Unit Consumption** |
| **Apr-19** | 16040 |
| **May-19** | 5000 |
| **Jun-19** | 5000 |
| **Jul-19** | 5000 |
| **Aug-19** | 5000 |
| **Sep-19** | 42640 |
| **Oct-19** | 13320 |
| **Nov-19** | 7680 |
| **Dec-19** | 4200 |
| Jan-20 | 5000 |
| Feb-20 | 22680 |
| Mar-20 | 5000 |
| Total | 136560 |

Table 16 : Electricity Consumption for the year 2019-20

### 6. 2020-21

|  |  |
| --- | --- |
| **Month** | **Unit Consumption** |
| Apr-20 | 5000 |
| May-20 | 5000 |
| Jun-20 | 13120 |
| Jul-20 | 6040 |
| Aug-20 | 5000 |
| Sep-20 | 4800 |
| Oct-20 | 6080 |
| Nov-20 | 2960 |
| Dec-20 | 3320 |
| Jan-21 | 3360 |
| Feb-21 | 3480 |
| Mar-21 | 2800 |
| Total | 60960 |

Table 17 : Electricity Consumption for the year 2020-21

The yearly electricity consumption of last six years is summarized below :-

|  |  |  |
| --- | --- | --- |
| **Sl. No.** | **Year** | **Unit Consumption** |
| 1 | 2015-16 | 146143 |
| 2 | 2016-17 | 155250 |
| 3 | 2017-18 | 131957 |
| 4 | 2018-19 | 157564 |
| 5 | 2019-20 | 136560 |
| 6 | 2020-21 | 60960 |

Table 18 : Summary of Electricity Consumption for last six years

### Graphical representation of Unit consumption of last six years



Figure 3: Graphical representation of Unit consumption of last six years.

### Annual Electricity Consumption

On the basis of operational hours, we have calculated annual unit consumption:-

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Segment** | **Type** | **Wattage** | **Quantity** | **No. of Hours** | **Nos. of Days** | **Diversity Factor** | **Total Annual Unit****Consumption** |
| **Lighting** | LED 2x2 | 32 | 28 | 6 | 220 | 0.8 | 946 |
| FTL 40 | 40 | 572 | 6 | 220 | 0.8 | 24161 |
| LED TL | 22 | 181 | 6 | 220 | 0.5 | 2628 |
| LED 18 W | 18 | 12 | 6 | 220 | 1 | 285 |
| LED 200 W | 200 | 8 | 6 | 30 | 0.8 | 230 |
| LED 12 W | 12 | 20 | 6 | 220 | 1 | 316 |
| CFL 32 W | 32 | 1 | 6 | 220 | 1 | 42 |
| LED 5 W | 5 | 2 | 6 | 220 | 1 | 13 |
| Total |  |  |  | 28621 |
| **HVAC** | Fan | 70 | 655 | 6 | 220 | 0.7 | 42365 |
| AC 1.5 T | 1700 | 26 | 6 | 100 | 0.8 | 21216 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Big Air Cooler | 600 | 8 | 6 | 20 | 0.8 | 461 |
| Air Cooler | 200 | 5 | 6 | 180 | 0.5 | 540 |
| ExhaustMedium | 200 | 11 | 6 | 180 | 0.5 | 1188 |
| Exhaust Small | 70 | 18 | 6 | 180 | 0.5 | 680 |
| Total |  |  |  | 66450 |
| **Office** | Computer | 70 | 68 | 6 | 270 | 0.6 | 4627 |
| Printer/Scanner | 500 | 19 | 1 | 270 | 0.4 | 1026 |
| Printer | 300 | 11 | 1 | 270 | 0.4 | 356 |
| Photocopymachine | 750 | 1 | 6 | 270 | 0.7 | 851 |
| Total |  |  |  | 6860 |
| **Campus Lighting** | LED 150 W | 150 | 2 | 11 | 365 | 1 | 1205 |
| LED 50 W | 50 | 11 | 11 | 365 | 1 | 208 |
| LED 120 W | 120 | 7 | 11 | 365 | 1 | 3373 |
| LED 200 W | 200 | 3 | 11 | 365 | 1 | 2409 |
| CFL 85 W | 85 | 2 | 11 | 365 | 1 | 683 |
| Total |  |  |  | 7878 |
|  |  |  |  |  |  |  |  |
| **Water Supply** | SubmersiblePump | 750 | 1 | 5 | 365 | 0.8 | 1095 |
| Pump | 750 | 3 | 5 | 365 | 1 | 4106 |
|  |  |  |  |  |  |  | 5201 |
| **Others** | Water Cooler | 575 | 5 | 8 | 365 | 0.8 | 6716 |
| Heater | 1000 | 1 | 1 | 180 | 1 | 180 |
| Induction heater | 2000 | 3 | 1 | 270 | 0.8 | 1296 |
| Refrigerator Big | 500 |
| Refrigerator Medium | 400 |
| Refrigerator small | 300 |
| Geyser | 2000 | 5 | 3 | 90 | 1 | 2700 |
| Miscellaneous |  | 5000 |
| Total |  |  |  | 17092 |
|  | **Grand Total** | 1,32,102 |

Table 19 : Annual Electricity Consumption

### Segment wise Unit Consumption

|  |  |
| --- | --- |
| Lighting | 28621 |
| HVAC | 66450 |
| Office | 6860 |
| Campus Lighting | 7878 |
| Water Supply | 5201 |
| Others | 17092 |

Table 20 : Segment wise Unit Consumption

### Graphical Representation of Unit Consumption



Figure 4 : Graphical Representation of Unit Consumption

**Thus, we may say that the maximum share of electricity consumption is in HVAC**