

# Carbon emissions in tCO<sub>2</sub> at IIT (BHU) Varanasi



Greenhouse Gas Protocol (GHG Protocol)

Solar Power and recycle battery

### **Estimation of saving of CO<sub>2</sub> emissions using solar power in May 2023:**

The CO<sub>2</sub> emissions associated with electricity consumption in India can vary based on the energy mix and the carbon intensity of electricity generation in different regions. As ref [1], the average carbon intensity for electricity generation in India was around 0.82 kilograms of CO<sub>2</sub> per kilowatt-hour (kgCO<sub>2</sub>/kWh).

To calculate the CO<sub>2</sub> emissions from electricity consumption in India, we have used the formula mentioned earlier:

$$\text{CO}_2 \text{ emissions (kg)} = \text{Electricity consumption (kWh)} \times \text{Carbon intensity (kgCO}_2\text{/kWh)}$$

As shown in Table 1 illustrates the generated solar power in kWh for May 2023 at IIT (BHU Varanasi), is 1,61,980 kWh.

The CO<sub>2</sub> emissions (kg) is therefore = 1,61,980 kWh x 0.82 kgCO<sub>2</sub>/kWh CO<sub>2</sub> emissions (kg) = 1,32,823.6 kg in May 2023

$$\text{Average annual CO}_2 \text{ emissions (in tCO}_2\text{e)} = 132.82 \times 12 \text{ tCO}_2\text{e} = \mathbf{1593.84 \text{ tCO}_2\text{e}}$$

Ref [1]: CO<sub>2</sub> *Baseline Database for the Indian Power Sector*, [https://cea.nic.in/wp-content/uploads/baseline/2023/01/Approved\\_report\\_emission\\_2021\\_22.pdf](https://cea.nic.in/wp-content/uploads/baseline/2023/01/Approved_report_emission_2021_22.pdf), access on July 2023.

### **Estimation of saving of CO2 emissions using recycle of old batteries 2023:**

Estimating the exact saving of CO2 emissions through the recycling of old batteries requires specific data on the recycling process, the type and quantity of batteries recycled, and the carbon footprint associated with both recycling and manufacturing new batteries.

To calculate the saving of CO2 emissions using recycle of old batteries 2023 at IIT (BHU) Varanasi, using the following

- The carbon footprint of batteries: According to Ref.[1], each kWh of batteries produced would generate the equivalent of 150 to 200 kilograms of CO2.
- According to Ref.[2], recycling can save 50% to 98% of CO2 emission.

Based on [1] and [2], the saving of CO2 emissions using recycle of old batteries 2023 as follows:

= No.of batteries x carbon footprint generated by new batteries x reduce the CO2 emission by recycle

=600 (Table 2 and ref [3]) x 175 (average of 150 and 200) x .75 (average of 50% to 98%)  
=78,75,000 kilograms CO2 = **7,875 tCO2e**

[1] <https://greenly.earth/en-us/blog/ecology-news/carbon-footprint-battery>, accessed on July 2023.

[2]

<https://8billiontrees.com/carbon-offsets-credits/carbon-footprint-recycling/#:~:text=How%20Much%20Does%20Recycling%20Reduce,61%20kg%20of%20emissions%20monthly>, accessed on July 2023.

[3]

[https://www.iitbhu.ac.in/contents/institute/2023/tender/tender\\_website\\_battery\\_procurement.pdf](https://www.iitbhu.ac.in/contents/institute/2023/tender/tender_website_battery_procurement.pdf), Gem tender, July 2023.

**Table 1:** illustrates the generated solar power in kW

Clean Max Enviro Energy Solutions Pvt. Ltd.



Client Name	Indian Institute of Technology Hindu University
Client Address	Indian Institute of Technology Banaras Hindu University, IWD, IIT - Banaras Hindu University, Varanasi Uttar Pradesh 221005
Solar plant total capacity	1518.3 kWp
Bill date	14 Jun 2023
Bill Supplier	31-May-2023

Location/Building	Capacity (kWp)	Reading Type	Current reading (A)	Previous reading (A)	Initials units (C= A-B)	Billable units (C= A-B) including Decmet & Inverter	Rate per kWh (D)	Comment
IIT BHU Electrical New Bldg	88.20	Energy Meter	20645.81	19002.222	11,643.59	11,643.59	6.15	
IIT BHU Electrical Old Bldg	126.00	Energy Meter	880120.13	874893.813	14,126.32	14,126.32	6.15	
IIT BHU Civil Old Bldg	81.80	Energy Meter	140323.77	131752.359	8,571.41	8,571.41	6.15	
IIT BHU Civil New Bldg	63.00	Energy Meter	139630.68	130224.890	9,605.79	9,605.79	6.15	
IIT BHU Electronic Bldg	119.70	Energy Meter	822077.94	810082.813	11,995.13	11,995.13	6.15	
IIT BHU Chemistry Building	37.80	Energy Meter	314302.72	308744.76	4,557.97	4,557.97	6.15	
IIT BHU Mechanical Building	113.40	Energy Meter	749014.5	740489	8,525.50	8,525.50	6.15	
IIT BHU PHARMA (Y) Bldg	151.20	Energy Meter	988700.25	974694.76	13,705.50	13,705.50	6.15	
IIT BHU Ceramic	88.20	Energy Meter	688962.38	68474.125	10,488.26	10,488.26	6.15	
IIT BHU Mining	214.20	Energy Meter	780286	774213	6,667.00	6,667.00	6.15	
IIT BHU Ayazibama	220.50	Energy Meter	476207	469735	16,472.00	16,472.00	6.15	
IIT BHU Vayasaray a Hostel	88.20	Energy Meter	872303.44	85610.375	12,753.06	12,753.06	6.15	
IIT BHU N BOSE Hostel	63.00	Energy Meter	698906.88	684954.125	13,852.76	13,852.76	6.15	
IIT BHU Library	63.00	Energy Meter	425160.5	417845.813	7,604.69	7,604.69	6.15	
Total	1,518.30		142057.88	135091.094	6,966.79	6,966.79	6.15	
			82,39,692.00	80,67,711.00	4,444.35	4,444.35	6.15	
					1,61,980.00	1,61,980.00		



Registered & Head Office Address : 4<sup>th</sup> floor, The International, 16 Maharshi Karve Road, New Marine Lines Cross Road No. 1, Churchgate, Mumbai - 400020 | +91 22 6252 0000 | www.cleanmax.com

India | UAE | Thailand

CIN No.: U93090MH2010PTC208425



Table 2: Batteries for recycle

<u>Technical Specifications</u>	
Requirement Units:	
1. Each of the 20 KVA UPS(Model: Luminous ) has bank of 20 No. 100 AH batteries. So in total for the 2 UPS units 40 units of 12V, 100 AH SMF VRLA batteries are required.	
2. Each of the 3 KVA UPS(Model: Luminous ) has bank of 12 No. 26 AH batteries. So in total for the 12 UPS units 312 units of 12V, 26 AH SMF VRLA batteries are required.	