

## Comprehensive Solar installations in IIT Roorkee Campus

IIT Roorkee faculty and students have led initiatives to save significant electricity by conducting an energy audit, developing policy for reducing electricity consumption and energy conservation and using solar energy for reducing carbon footprint. It has installed following solar energy system during the year 2013 – 15.

- Solar PV (1.81 MW) for electricity generation (about 25 lacs units annual), Commissioned in April 2014 with 25 years contract of maintenance at the cost of Rs. 15.90 crores with the subsidy from MNRE of Rs. 12.84 crores.
- Water heating (4.4 Lac liters per day) covering entire campus. Commissioned in Dec 2014 with 20 years contract of maintenance at the cost of Rs. 11.93 crores with the subsidy from MNRE of Rs. 2.85 crores for 3.5 lacs lpd.
- Solar steam for cooking (students hostels 9 nos. equivalent to 5,000 cylinders of 14.2 kg LPG annually) Commissioned during July 2014 to Oct 2015 with 20 years contract of operation and maintenance at the cost of Rs. 2.59 crores for five years with the subsidy from MNRE of Rs. 1.05 crores.

All the systems have SCADA for monitoring and generation of data for further research. For the system technology were adopted as follows:

- A. Polycrystalline Photovoltaic Cells for Solar Electricity Generation (27 units of 1.81 MW)
- B. Evacuated Tube Thermosyphon System (3.4 lacs lpd) and flat plate bed (0.9 lac lpd) for Solar Water Heating
- C. Scheffler Concentrator (16 nos.) for Solar Steam Cooking Systems.

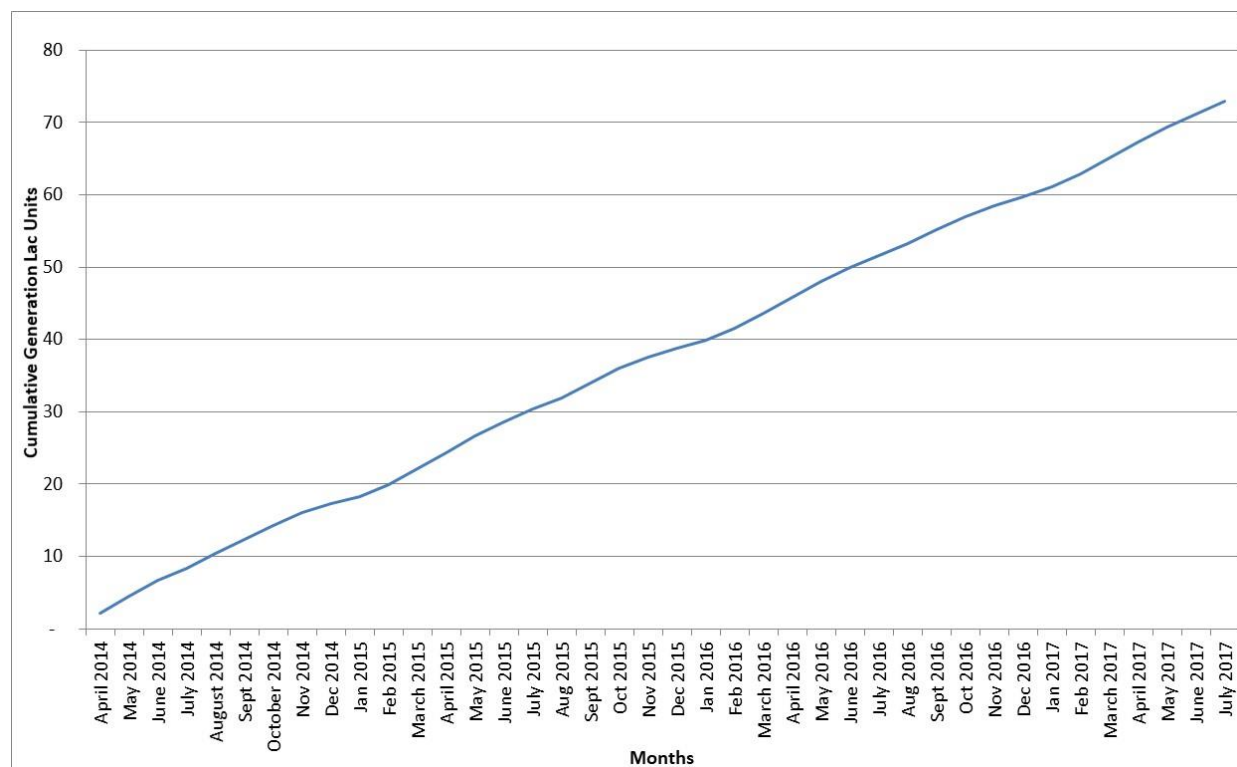
### A. SOLAR PHOTOVOLTAIC SYSTEM:

In IIT Roorkee 1.812 MW capacity of solar photovoltaic system has been installed in all the 27 no. of departments/units as follows.

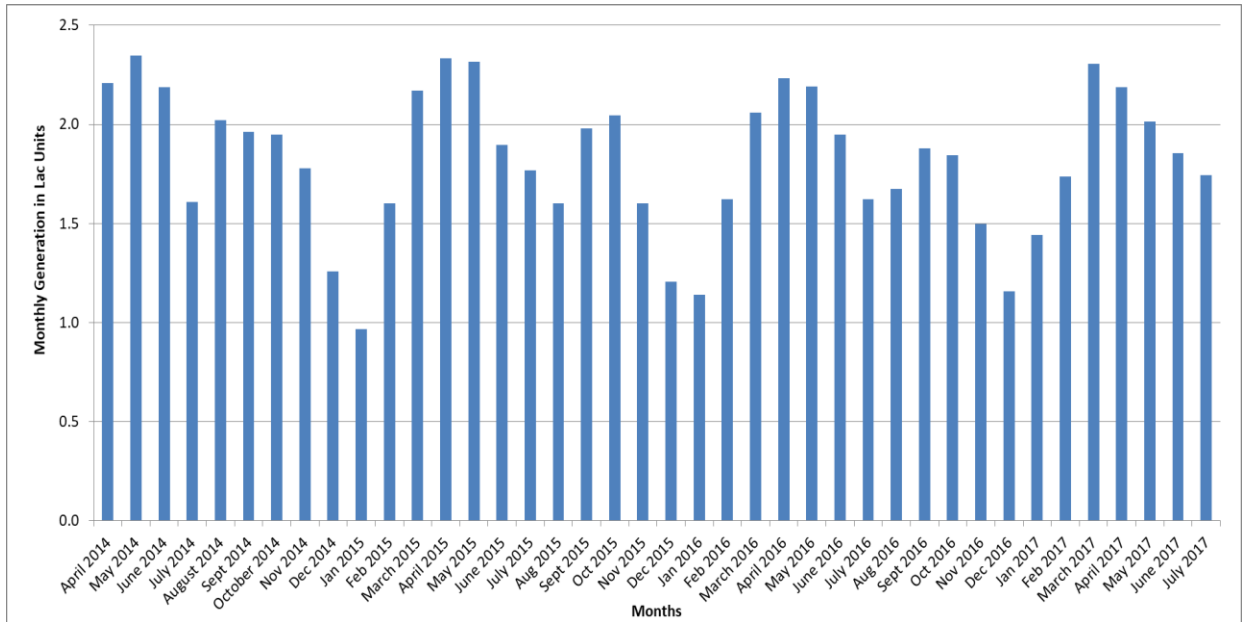
S. No.	Site (Departments / Centers)	Roof Area (sq.m.)	Peak Power Output (kWp)
1.	Alternate Hydro Energy Center	658.6	42
2.	Dept of Architecture & Planning	1050.6	66
3.	Geomatics engg	767.6	60
4.	Dept of Civil Engineering	2734.7	200
5.	Department of Chemistry	1263.9	61
6.	Dept of Chemical Engg	2069.5	119
7.	Dept of Management Studies	1166.2	40
8.	Dept of Earthquake Engg	1540.7	66
9.	Dept of Earth Science	535.1	50
10.	Institute Computer Center	615.6	32
11.	Water Resource Development & Mgnt	786.3	43
12.	Dept of Electronics and Computer Engg	2180.3	114
13.	Dept of Electrical Engg	3273.1	170
14.	Dept of Humanities and Sciences	659.3	35
15.	Dept of Hydrology	577.2	26

S. No.	Site (Departments / Centers)	Roof Area (sq.m.)	Peak Power Output (kWp)
16.	Dept of Maths& Physics	1372	60
17.	Dept of Metallurgy	3237.7	159
18.	MCA block	1050.6	15
19.	Institute Instrumentation Center	317.4	22
20.	Dept of Mechanical Engineering	1596.6	100
21.	Mahatma Gandhi Central Library	941	42
22.	Lecture Hall-1,-2	134.9	30
23.	Lecture Hall Complex	1575.6	84
24.	Hafiz Mohd Ibrahim Building	999	61
25.	Industrial Block	932.5	48
26.	OP Jain Auditorium	454.8	21
27.	RS wing	787.1	46
<b>Total</b>		<b>33277.9</b>	<b>1812</b>
<b>Cumulative Generation from April 2014 – Sept 2016</b>			<b>5,517,293 units</b>

Thus a saving of CO<sub>2</sub> 7208 ton has been achieved till July 2017.



Cumulative Generation upto Sept 2016 (5.5 MU)



Monthly Generation

PV systems have been connected to micro grid power of the campus and are without any battery.

Further at IITR extension centre at Greater Noida in 10 acre area, a 47 kW solar photovoltaic system is being installed for which MNRE sanction has been received in July 2015.





Civil Department



Mechanical Department

## B. SOLAR WATER HEATING SYSTEM:

In IIT Roorkee campus, solar water heaters systems with various capacities (100 LPD, 200 LPD, 300 LPD, 500 LPD, 750 LPD, 1000 LPD, 1500 LPD, 2000 LPD, 2500 LPD, 3000 LPD) has been installed for all possible installations in Bhawans (hostels), faculty residences and guest houses. There are 12 hostels, 2 guest houses and 14 residential areas covering all staff, students. A total of 4.35 lacs litre per day of installed capacity systems have been installed.

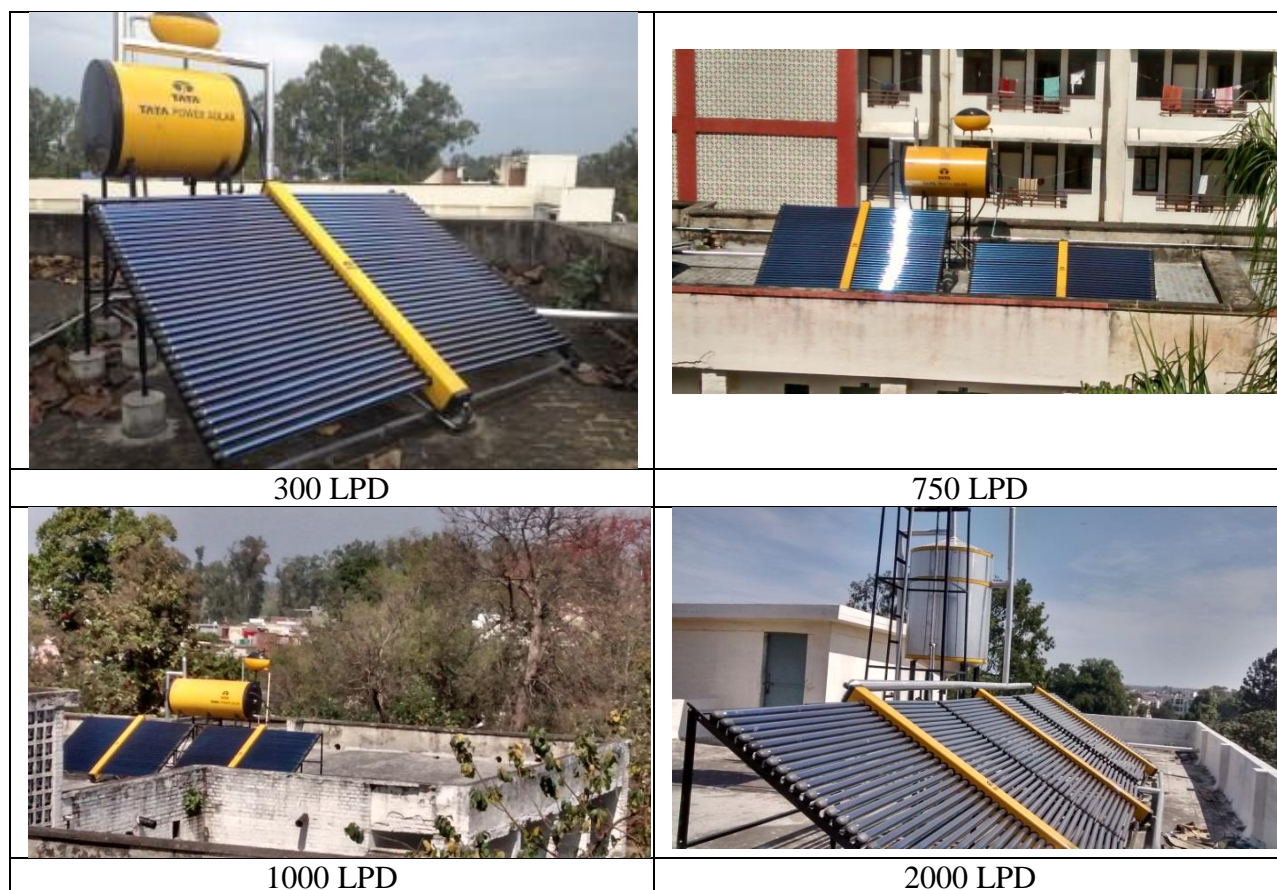
Existing geysers have also connected to the solar water heating systems for use during periods of low and poor heating/sunshine due to fog or clouds. Further an additional capacity of 25000 liter per day is being planned for the balance/recently built hostels.



100 LPD



200 LPD



**Installations:**Following installations has been done in the Campus

LPD of units	No. of system	Total LPD
<b>During 2011-12 (Flat plate system)</b>		
at 6 places of different capacities		96000
<b>During 2014-15 (Evacuated vacuum tubes)</b>		
100	20	2,000
200	1058	211,600
300	12	3,600
500	12	6,000
600	25	15,000
750	8	6,000
1,000	19	19,000
1,500	29	43,500
2,000	11	22,000
2,500	2	5,000
3,000	2	6,000
Sub Total	<b>1,198</b>	<b>339,700</b>
		<b>435,700</b>

Considering full capacity use of SWS for about only 150 days in a year, 4 kWh per day saving is expected for a 100 lpd system, thus a total annual saving of electricity is estimated as 26 lacs units which has saved 2132 ton of CO<sub>2</sub>.

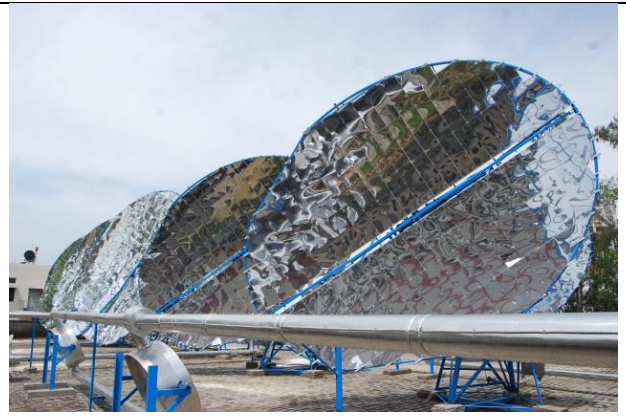
### C. SOLAR STEAM COOKING SYSTEM

61 collectors providing an area of 976 sq. m using Dish type parabolic solar concentrator have been installed in 9 students messes. These messes are as follows:

S. No.	Student Messes	No. of Students	Approximate No. of Concentrators (16m <sup>2</sup> Dishes with single axis tracking)
1	Ganga Bhawan Mess	567	7
2	CautleyBhawan Mess	907	9
3	RajendraBhawan Mess	800	8
4	Azad Bhawan Mess	499	6
5	RavindraBhawan Mess	509	6
6	GovindBhawan Mess	606	7
7	JawaharBhawan Mess	642	7
8	SarojiniBhawan Mess	251	3
9	Radhakrishnan Mess	624	8
<b>Total</b>		<b>5,405</b>	<b>61</b>



Azad Bhawan Mess



Ganga Bhawan Mess



RajendraBhawan Mess



GovindBhawan Mess



Sarojini Bhawan Mess



Jawahar Bhawan Mess

For details

Prof Arun Kumar, AHEC IIT Roorkee  
[akumafah@iitr.ac.in](mailto:akumafah@iitr.ac.in), [aheciitr.ak@gmail.com](mailto:aheciitr.ak@gmail.com)