ENERGY AUDIT REPORT

FOR

BHARTIYA JAIN SANGHTANA

Wagholi Education and Rehabilitation Center,
Wagholi, Pune

By

SAS Powertech Pvt Ltd.

101, Gera's Regent Manor, Survey No. 33, Area No. 39/570,
Behind Opulent Car Care Center Baner, Pune 411045

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ACKNOWLEDGEMENT

We are thankful to the management of **BHARTIYA JAIN SANGHTANA. Wagholi, Pune.** For giving us an opportunity to conduct power quality analysis at their premises.

We are also thankful to **Mr. Shantilal Muttha** For making available documentation and information about entire setup and co-operation during Energy Audit.

We do hope you will find our recommendations useful in helping you to improve the power quality of your electrical system

We wish the management success in their Endeavour to improve power quality.

For **SAS Powertech, Pune**

Abhijit Katre
Authorized Signatory

Executive Summary

1) Power factor is not maintained at unity and institution is paying around Rs.11000 per month as penalty. Installation of capacitors would bring in 7% incentive on energy charges and gross benefit per month would be around Rs. 22000. Capacitors of rating 45KVAR / 460volts are required to be installed with suitable MCCBS across the main panels. The investment would be around Rs. 30000.00

2) Electrical consumption savings as detailed in report in the range of Rs. 50000 per month to Rs.100000 per month are possible with around 5 year's payback. Institution can arrive at suitable decision for funding these investments. Single phase voltage is always more than 250volts. On top priority, installation of servo stabilizer will bring in immediate savings on tube lights and fans. (We do not recommend tap changing from MSEDCL side to reduce the voltage as it may give problems under low voltage situations.) This will also help in reducing maintenance and replacement costs.

3) Major consumption is in hostels, so we recommend suitable active majors as detailed in the report either through disciplinary policies or forced actions for specific time period. This will prevent energy wastage.

4) STP plant should be made functional and effective use of purified water should be brought into practice. This will save around 30% expenses on water purchase say around Rs. 3000 per day. A ward of caution here is that even if you use this water for flushing application, maintain monthly "Water Quality" reports obtained from any approved laboratory as records.

5) Cooking activity consumes lot of Diesel and LPG. Solar steam generation and Solar cookers can replace majority of these fuels. We advise you to involve any reputed agency in this field to quantify the gains and take suitable actions.

6) We have recommended DM water plant and use of solar water heating at residential quarters to reduce electrical consumption. The details are available in the report.

7) Electrical installation throughout the institution appears to be not receiving due attention and the same is unsafe at various stages. Details are included in the report along with required actions.

8) In nutshell this report recommends various actions for saving at least Rs. 8 Lacs annually on electrical consumption with maximum payback period of about 5 years on various investments.

----------END OF SUMMARY----------

Wagholi Education and Rehabilitation Centre.

1) Description of the facility:

- Day School and Day College 5th standard to Graduation.
- Provision for 800 Nos residential students with facility for hostel and Mess.
- 220 self contained rooms, accommodating 4 students each.
- Totally there are about 3000 students (including residential and non residential)
- Main buildings are Hostel, Mess and Admin building, School building and College building.
- Apart from this there are 3 staff quarter buildings accommodating 36 tenements.
- **Above setup consumes about 30000 electrical units per month.**
- Solar hot water system for hostel is installed but the same is not working at present due to hard water issue. Presently hot water is generated using wood fired boilers; this uses about 35Kg of wood per day.
- The facility has a small bore well to meet partial need of water, but majority of the need is fulfilled using water bought through water tankers. About 12 tankers of 9000 ltrs each are required per day.
- Mess has dining facility and food is cooked every day. The energy consumption for this is as follows

  1200 Ltrs of Diesel per month and 60 LPG cylinders per month.
- **The setup has 125 KVA standby DG set which works for around 60 hrs per month and consumes 18 Ltrs Diesel per hour.**

Average cost of energy consumed per month:

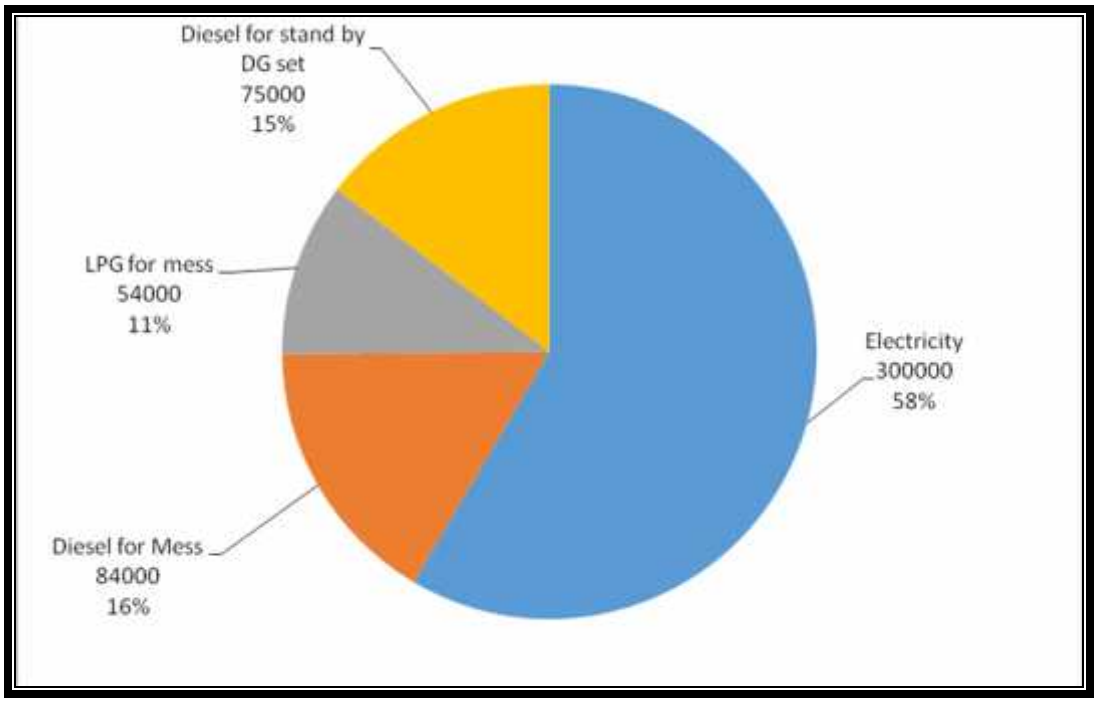
Electricity	= Rs. 3,00,000.
Diesel for Mess	= Rs. 84,000.
LPG for mess	= Rs. 54,000.
Diesel for stand by DG set	= Rs. 75,000.
Total	**= Rs. 5,13,000**

About Rs. 12000.00 per day are spent on water tankers.

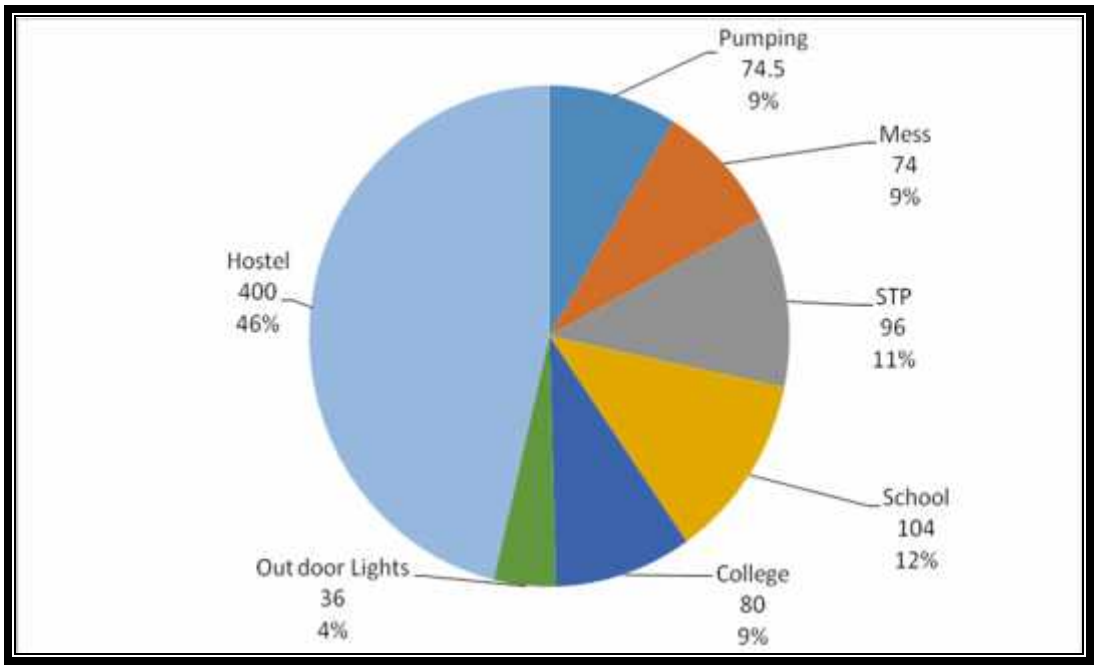
You have an STP installed within the premises. You may engage an external agency to improve performance of this plant, and use this water at least as “FLUSH water” in hostel. Even if you save 30% water due to this, you will save water worth Rs. 3000 per day. Even if you are required to invest up to Rs. 10Lacs for this (STP up gradation and separate plumbing), the payback would be less than a year. (Basis for these calculations is information given to us regarding number of tankers bought every day).

2) Pie Charts Showing % energy Expenses and % Kwh under various loads

Energy expenses



Pie chart showing % daily consumption in Kwh of electricity under various heads



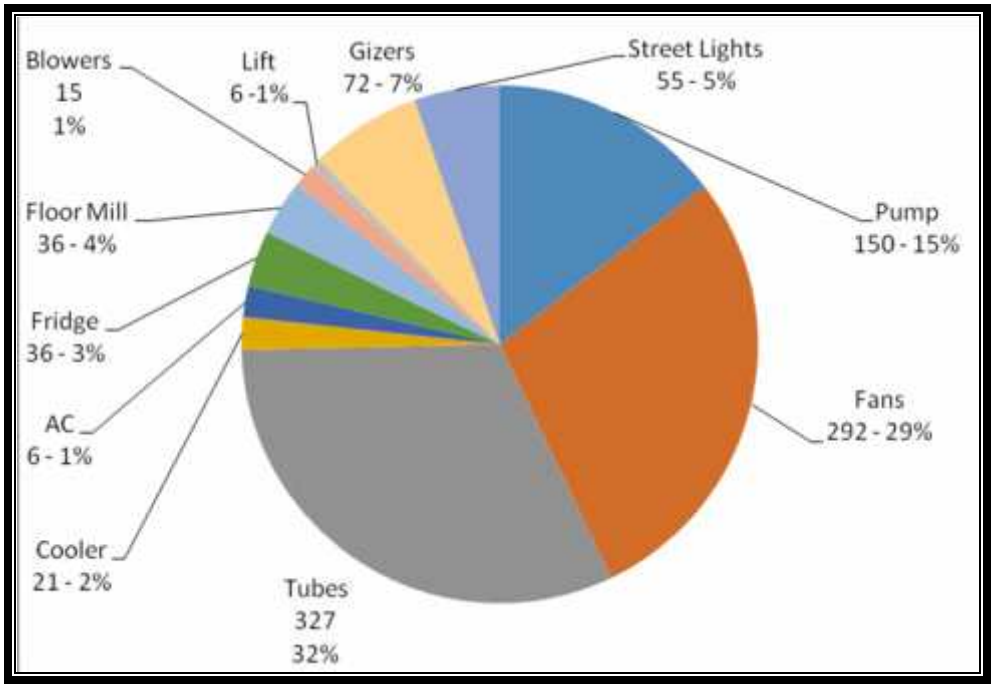
3) Table showing electrical energy consumption pattern based on list of connected load.

This table assumes diversity and running hours based on our experience, locates significant use and recommends energy saving majors which are implementable.

Facility wise and equipment wise electrical load in KW as per Load list given												
Facility	Pump	Fan	Tubes	Cooler	AC	Fridge	Mill Motor	Blowers	Lift	Gizers	Steet Lights	Total
Hostel	18.75	40.72	33.08									92.55
ETP	11.25											11.25
Admin Bldg		5.28	3.88	0.8	5							14.96
Mess		5.2	8.24			1.5	7.5	3	1.5			26.94
Water Cooler				0.8								0.8
School		4.88	11.84	0.8								17.52
Toilets		2.25	2.04									4.29
College		8.4	18.48	0.8		1.5						29.18
A,B,C Quarters		5.6	4							52		61.6
Substation		0.6	0.36									0.96
Street Lights											6.15	6.15
Total	30	72.93	81.92	3.2	5	3	7.5	3	1.5	52	6.15	266.2
Diversity	0.5	0.5	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.7	0.9	
Running Load	15	36.465	32.768	1.28	2.5	1.5	4.5	1.8	0.9	36.4	5.535	138.65
Running Hours	10	8	10	16	8	24	8	8	6	2	10	
Kwh / Day	150	291.72	327.68	20.48	20	36	36	14.4	5.4	72.8	55.35	1029.8
Possible Kwh saving	50	70	150							50	40	360

We have prepared this chart to know equipment wise consumption and also to know possible savings. We have assumed realistic diversity factors and working hours for these equipments based on our experience and also based on information gathered during discussions with operating staff.

Following Pie chart shows daily – equipment wise consumption in Kwh.



4) Significant use of electrical energy and associated energy saving majors.

It is clear from above that following are significant uses of electricity. There is possibility of reduction in the same.

Tubes: 327 units per day or 32% of total consumption
Gizers: 72 units or 7% of total consumption.
Street lights: 55 units or 5% of total consumption.
Pumps: 150 units or 15% of total consumption.
Fans: 292 units or 29% of total consumption.

- Use of tube lights is substantial as demanded by application. We recommend use of LED fixtures to save energy on this front. The effect will be visible only if all the fixtures are replaced simultaneously.
- The gizers at residential quarters can be replaced by solar water heating system.
- The single phase voltage available throughout the day is more than 250Volts. This can be brought down to 215Volts using servo stabilizer. This will help in reducing energy consumption associated with tubes and fans by at least 20%.
- As regards pumps, we have recommended some changes in water storage etc. Once decisions regarding this are taken, then actual savings can be predicted.

Table showing possible savings, required budgetary investments and paybacks.

Equipment	Present Kwh Per day	Saving in KWh per day	Saving in Rs. Per Day	Saving Achieved due to	Investment Required Rs.
Pump	150	50	500	Scheduling and TOD benefit, Overhead Tank on Hostel	500000
Fans	292	70	700	Installing servo stabilizer to reduce voltage to 215V.	350000
Tubes	327	150	1500	Replacing by LED fittings 22 Watts	3500000
Cooler	21				
AC	20				
Fridge	36				
Floor Mill	36				
Blowers	15				
Lift	6				
Gizers	72	50	500	Installation of Solar water heating system 5000Ltrs	500000
Street Lights	55	40	400	Replacing by LED fittings 48 watts	600000
Total	1030	360	3600		5450000
Saving possible in 5 years		657000	6570000	Payback Period	5 years

Above chart shows various majors, which can lead to energy savings on electrical front. The payback period calculated is about 5 years. Even if 50% of this is assumed to be achievable. this would bring in savings of around Rs.50000 per month. (We have assumed average per Kwh rate to be Rs. 10 for 5 years, which in fact you are paying at the moment). **Kindly note that your organization being a charitable institute, these calculations may change if you get some extraordinary tariff concessions at a later date.**

5) Other Comments regarding energy conservation:

1) Power factor is not maintained at unity and on an average you are paying penalty instead on getting incentive**. In the process you are losing almost Rs.22000.00** per month. About Rs.30000 worth capacitors should be fixed across both the panels in transformer room to avail this incentive and avoid penalty. **The payback for this investment would be less than 2 months.**

2) Predominant electrical energy use appears to be in Hostel. This is about 46% of total energy use in a day. **Active controls like No power for predetermined timings** may help in reducing this consumption.

3) You may check occasional use of electrical water heaters in the room by students. As per institutional policy you may allow or disallow use of such heaters.

4) IF use of STP is a statutory requirement in your area, You can improve STP performance and think about using this water as flush water in hostel, to reduce water quantity purchased every day and associated cost.

5) **Solar water Heating** with DM water plant will avoid burning of wood.

6) **Concentric Solar Steam generators** may be introduced in Mess Kitchen, so that cooking can done with the help of steam. **Major expenses on Diesel could be reduced if this is adopted. It is advised that you can locate a expert in this area and quantify the savings and investments required.**

6) Comments regarding DG set arrangements:

1) It should be noted that **DG set diesel consumption does not vary substantially depending upon electrical load on DG set**. (The engine being typical internal combustion engine)

2) We understand that Hostel+Mess, School, College and staff Residential quarters are independent energy consumption heads and institute would like to get correct monthly energy consumption figures for all these heads. These energy consumption figures for direct electrical energy and DG set electrical energy should be available independently. This can be achieved easily by installing "Dual Energy Meters" at respective feeders and logging this energy either manually or using computer network. **It is not necessary that for this reason these establishments should have different MSEDCL meters and Different DG sets.**

3) We also understand that **Hostel and Mess are critical areas** and should always have availability of electrical power continuously. Dependency on one DG set may prove to be critical for this area in case of longer backup periods. The connected load of this area is 125 KW. We are of the opinion that this will work at 60% diversity.

4) **You may install one 75 KVA / 100KVA standby DG set only for this load** with a suitable changeover panel. The main source for this area would be MSEDCL, alternative 1 would be existing 125 KVA DG set and alternative 2 would be new 100 KVA DG set. The lower ratings from this should be selected if you opt for LED light fittings in this area.

5) It is also advised that the existing DG set may be overhauled from a reputed source and full load trail may be conducted for a day to confirm it's reliability.

7) Other comments on electrical installation

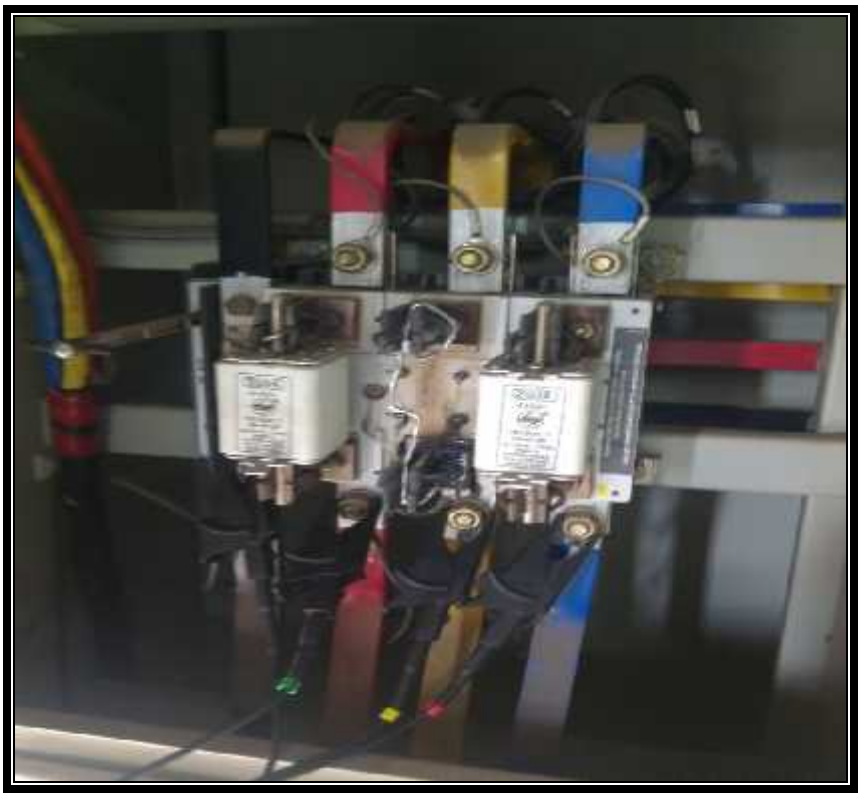
- Electrical installation appears to be neglected at all location and there is no preventive maintenance.
- Main LT panel room windows do not have proper glass covering. Main shutter lock does not operate properly.
- Main distribution panel does not have covers from all the sides.
- Lot of vegetation has grown in transformer yard.
- School, College, Mess panel rooms were full of other junk or unrelated material. This is not safe from electrical safety point of view.
- Main switches have “Jumpers” instead of proper rating fuses. This will not protect the circuit under any emergency.
- In ETP pump control panel a dead squirrel was found.

Panel in LT Room without cover

Panel room windows do not have glasses

Transformer yard with vegetation

Main switch with jumper without fuse

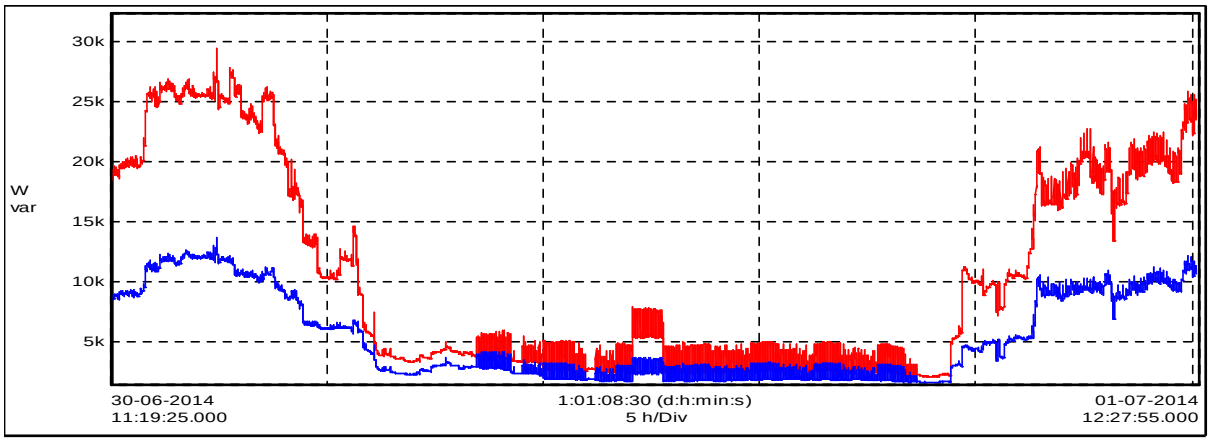


We request you to note the fact that this is a public institution and large number of students and other lay persons use the premises every day. Electrical installation spread over vast area need to be maintained in good working condition along with all statutory safety provisions. One person from internal staff or any responsible external agency should be made responsible for this entire setup and he should take all necessary precautions and can also be made responsible for energy conservation.

---------- **END OF REPORT** ----------

8) Recorded data for electrical consumption

College / School Load



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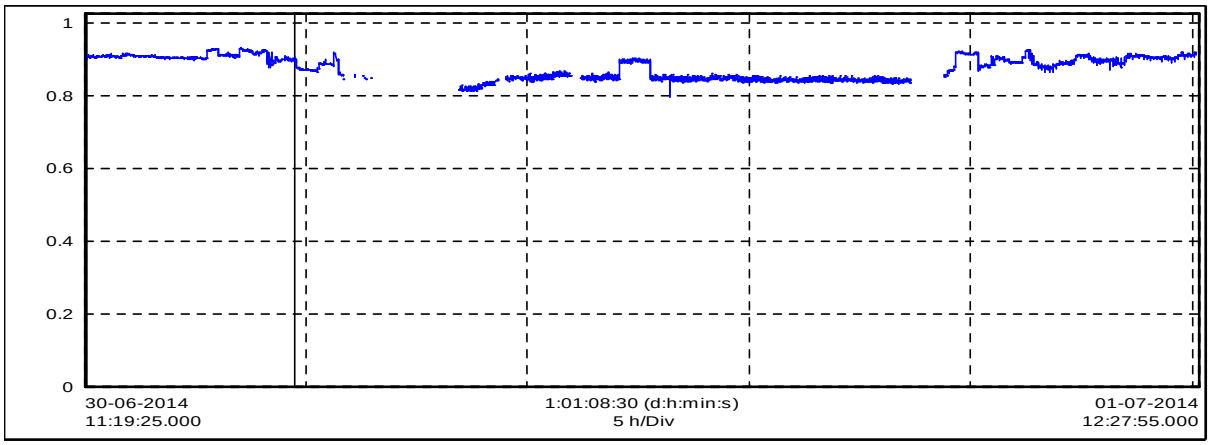
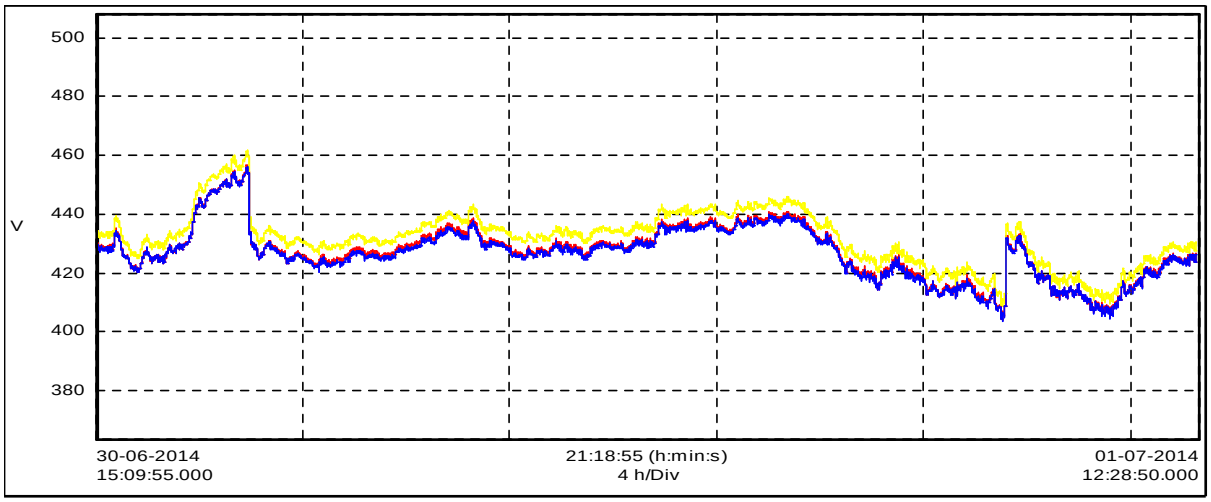
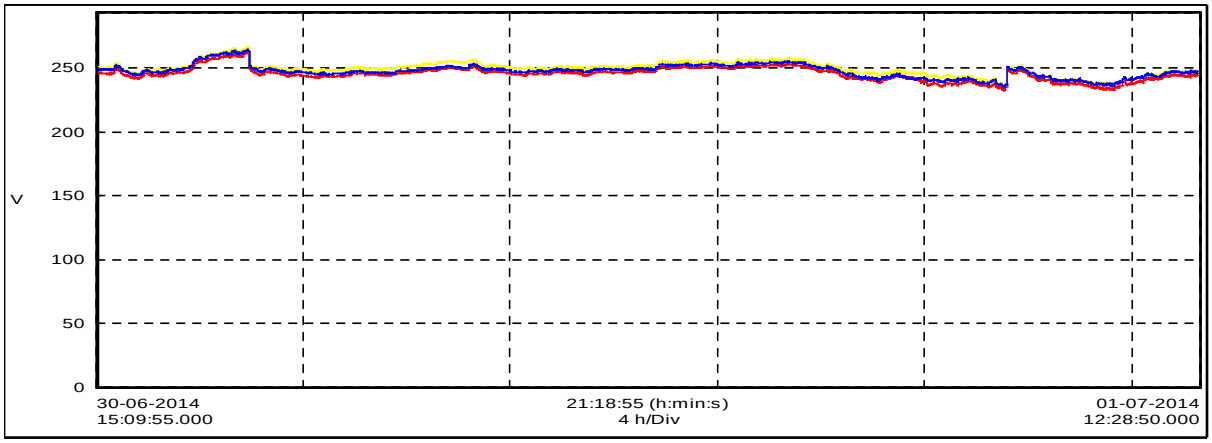


Hostel , Mess and Residential Staff quarters

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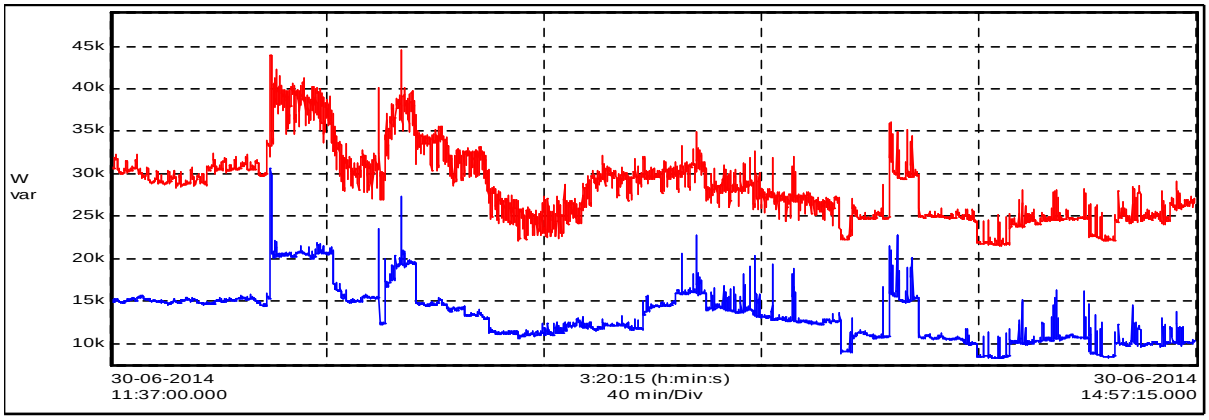
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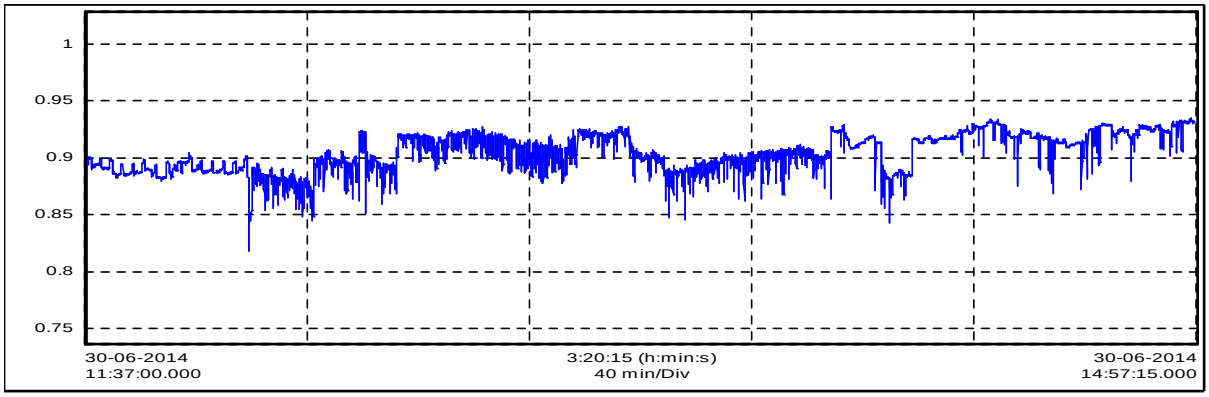
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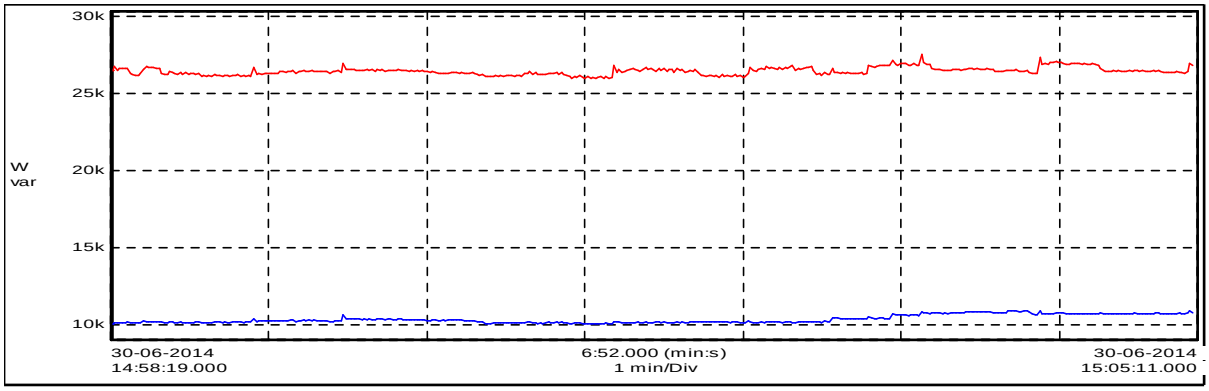
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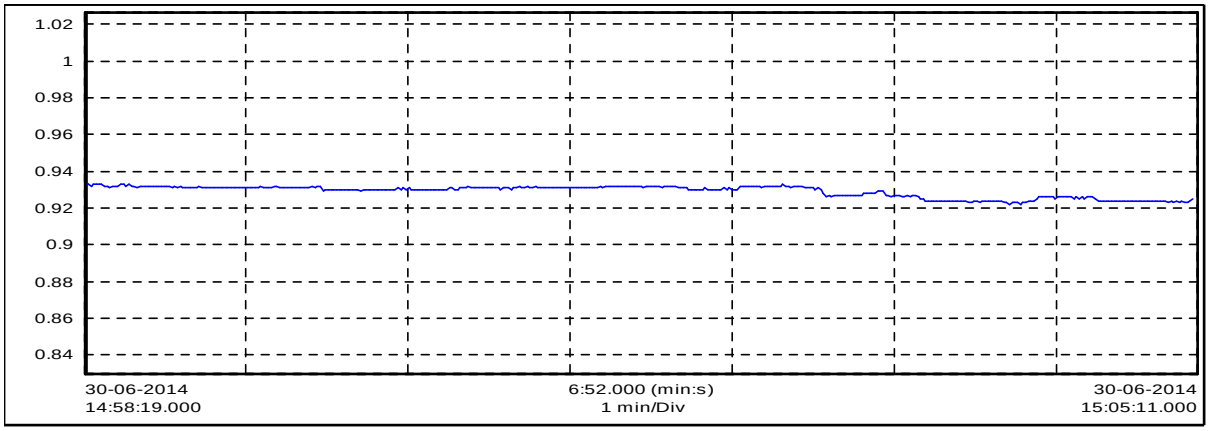
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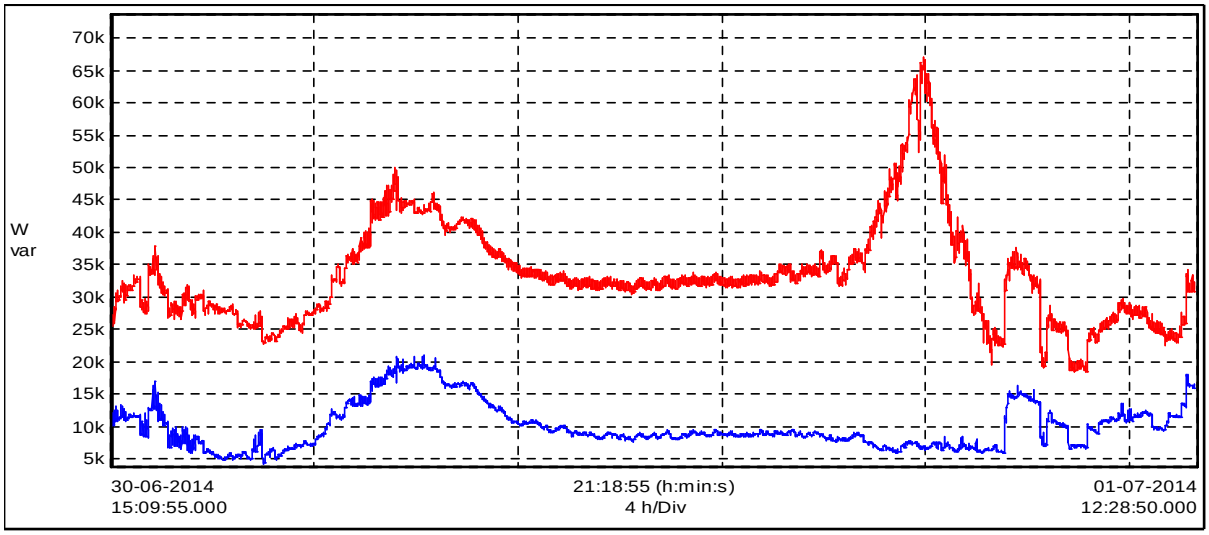
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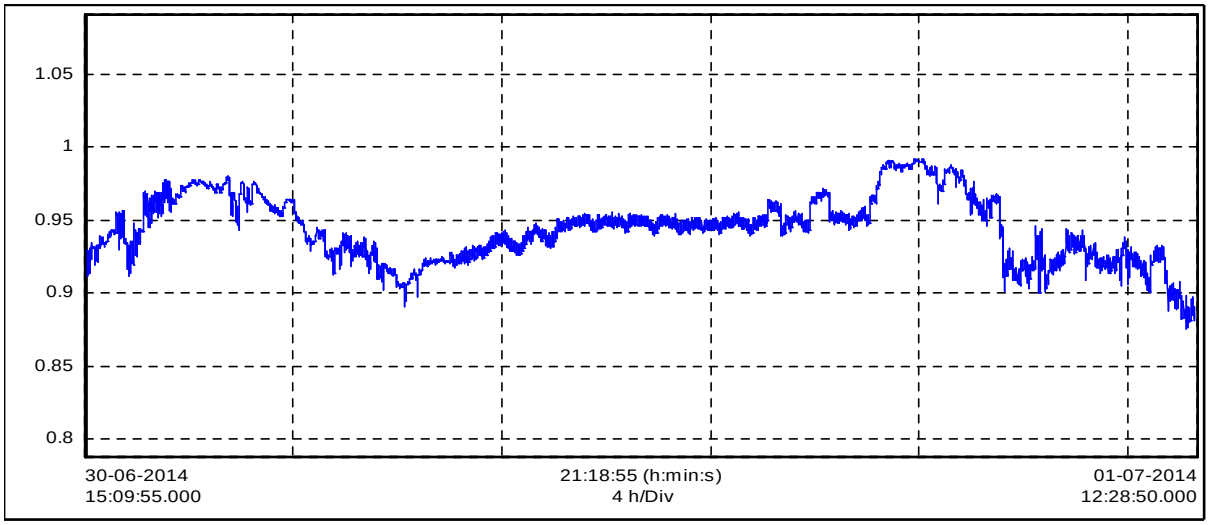
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