

2014-15

# ENERGY AUDIT REPORT

Prepared for

**M/s Yeshwant Mahavidyalaya**

Nanded  
Maharashtra state, India

Prepared by

**MITCON CONSULTANCY & ENGINEERING  
SERVICES LTD**

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## ABBREVIATIONS

Abbreviations	Full Form
°C	Degree Centigrade
A	Ampere
AC	Alternating Current
AHU	Air Handling Unit
APFC	Automatic Power Factor Controller
Avg.	Average
CHW.	Chilled Water
cm.	Centimeter
COP	Co-Efficient Of Performance
Cr.	Crores
CT	Cooling Tower
CW	Cooling Water
DBT	Dry Bulb Temperature
DC	Direct Current
DG	Diesel Generating
Dia.	Diameter
DSCR	Debt Service Coverage Ratio
Effn.	Efficiency
ETP	Effluent Treatment Plant
Ft. or ft	Feet
gm.	Gram
hr.	Hour
HVAC	Heating Ventilation and Air Conditioning
Ins.	Insulated
IRR	Internal Rate of Return
Kcal	Kilo Calories
Kg.	Kilogram
KL	Kilo Liter
KV	Kilo Volt
kVA	Kilo Volt Ampere
kVA <sub>r</sub>	Kilo Volt Ampere Reactive
kW	Kilo Watts
kWh	Kilo Watt Hour
LPD	Liters Per Day
lit	Liters
lt	Liters
Ltd.	Limited
M or m	Meter
Max.	Maximum
MD	Maximum Demand
Min.	Minimum
MITCON	MITCON Consultancy & Engineering Services Limited
Mm	Millimeter
MSEDCL	Maharashtra State Electricity Distribution Company Ltd.
MT	Metric Ton
MW	Mega Watts
No.	Number
OLTC	Online Tape Changer
p.a.	Per Annum
PF	Power Factor

Abbreviations	Full Form
YMN	Yeshwant Mahavidyalaya, Nanded
REC	Renewable Energy Certificates
RH	Relative Humidity
Rpm	Revolutions per minute
Rs.	Rupees
Sec.	Second
SEC	Specific Energy Consumption
SWH	Solar Water Heater
TPA	Tons per Annum
Temp.	Temperature
TPH	Tones Per Hour
TR	Tons of Refrigeration
V	Voltage
VFD	Variable Frequency Drive
WBT	Wet Bulb Temperature
yr.	Year

## HIGHLIGHTS OF THE REPORT

### A. Important Parameters

#### Important Parameters of the Plant

Yeshwant Mahavidyalaya, Nanded

- A Profile

Location

-Nanded, Maharashtra India

Business Activity

- Education

Facility

- Colleges & Hostels

#### Energy Scene

Major Connected load

- Air Conditioners, Fans, Lighting, DG Sets & Other Equipment's

Annual Energy Bills

- Rs. 22.5 Lacs

Major Energy Sources

- Grid Electricity, Diesel, Water

## B. Key Results for Energy Savings & Estimated Potential along with Broad Cost Benefit

Sr. No.	Energy Saving Areas	Estimated Energy Saving, kWh	Estimated Annual Energy Saving Potential, Rs.	Estimated Investment, Rs.	Simple Payback Period	Action for Implementation
<b>A. Recommendations with Minor// Medium Investment</b>						
1	Install APFC panel for improve PF	0.00	129,224.00	136000	13	Immediate
2	Install New T-5 Lamp	35,398.00	368,489.00	842,800.00	27	After Discussion
<b>B. Recommendations with long-term investment</b>						
3	Install New 5 Star rated ACs	7,392.00	76,950.00	220,000.00	34	Implement at 5 AC's on sample basis & review for all
4	Install New LED Lamp	53,939.00	561,507.00	1,926,400.00	41	After Discussion
5	Install new energy efficient fan	57,540.00	598,991.00	1,767,000.00	35	After Discussion
<b>Total</b>		<b>154,269.00</b>	<b>1,735,161.00</b>	<b>4,892,200.00</b>	<b>34</b>	

## PREFACE

Yeshwant Mahavidyalaya Nanded was established in 1963 by Late. Shri Shankarraoji Chavan.

At present, under guidance of Honorable Mr. Ashok Raoji Chavan –Mentor & Dr. N.A. Kalyankarji -Principal, YMN is one of academic excellence in both teaching and research. YMN are a unique initiative in science, commerce, Arts & Management education in India in which teaching and education will be totally integrated with the state-of-the-art research nurturing both curiosity and creativity in an intellectually vibrant atmosphere of research. YMN are destined to become Science Institutes of the highest caliber and reach the prestigious position in the National setting.

Yeshwant Mahavidyalaya has done exceptionally well in the recent reaccreditation process by NAAC Bangalore shooting up the table with 3.31 CGPA in the 4 point scale for overall excellent quality education. The many alumni of college contributed in national development.

The Institute is associate with the S.R.T.M. University, Nanded, offering 7 under graduate and 16 post graduate programs with flexible group combinations.



## ACKNOWLEDGEMENTS

An energy audit is a joint venture of consultant and Institute to account & contain energy usage without sacrificing the purpose of usage of energy. The contribution of Institute's team is equally important in this venture. We sincerely acknowledge the contribution of the following dignitaries and site engineering personnel because of whom the study could progress smoothly –

- |   |                        |   |                             |
|---|------------------------|---|-----------------------------|
| ➤ | Mr. Ashok Raoji Chavan | - | Hon. President              |
| ➤ | Mr. D. P. Sawant       | - | Secretary                   |
| ➤ | Dr. N.V. Kalyankar     | - | Principal                   |
| ➤ | Mr. Sandeep Patil      | - | Register                    |
| ➤ | Dr. S.S. Bodke         | - | Professor – H.O. Biology    |
| ➤ | Dr. N.A. Pande         | - | Professor- H. O. Mathematic |
| ➤ | Mr. Chandel            | - | Sr. Electrical Engg.        |

We are also thankful to the other staff members who were actively involved while collecting the data and conducting the field studies.

## CHAPTER 1

# INTRODUCTION

## 1.1 PREAMBLE

- The Yeshwant Mahavidyalaya is managed by Shri Sharada Bhavan Education society, has a facility at Nanded. With increasing energy costs, management approached MITCON for the energy audit.
- This energy audit report for YMN,Nanded presents the analysis of the data collected, observations made and field trials undertaken. It is governed by the objectives, scope of work, and methodology discussed in ensuing paragraphs.

## 1.2 OBJECTIVES

- To undertake an energy audit to identify areas for energy saving, both without and with investment.
- To prioritize distinct areas identified for energy savings depending upon saving potential, skills, and time frame for execution, investment cost, paybacks etc.

## 1.3 SCOPE OF WORK

- To correlate monthly data of production with electricity, fuels & water consumption, for a period of 12 months of normal operation.
- To study electrical energy metering, monitoring and control system existing at the plant and to recommend a suitable system for future monitoring.
- To study monthly power factor, maximum demand, working hours, load factor etc. for the reference period along with monthly electricity consumption and establish scope for MD control through possible optimization of load factor and through detailed load management study.
- To undertake a detailed motor load study on major continuously operating motors equal to and above 10 HP with the help of a clamp on multi-meter to identify instantaneous motor parameters like kW, kVA, P.F., A, V, frequency etc.
- Based on above, to evaluate the possibility of replacing major motors with energy efficient motors.
- To study existing requirements of conditioned air provisions at present locations and to identify distinct possibilities of rationalization / savings.
- To study existing maintenance practices for air conditioning system and recommend areas for improvement in energy efficiency / savings.
- To identify, evaluate and prioritize energy saving opportunities into short, mid and long-term time spans depending upon investments, quantum of savings, skills and time required for implementation, etc.

#### 1.4 METHODOLOGY

- MITCON deputed following team of experts for conducting the study and worked in close association with YMN unit personnel.
  - Mr. Deepak Zade, Sr. Vice President
  - Mr. Rajesh Patrikar, Principal Consultant
  - Mr. Arjun Singh Panwar, Project Consultant
  - Mr. Anant Ladukar, Chief Consultant
  - Mr. Pramod Tarmode, Associate Consultant
- MITCON submitted an execution work plan for the assignment for which YMN provided relevant data support
- YMN nominated specific persons from engg. / Maintenance sections along with a coordinator of senior managerial level for this audit.
- MITCON undertook an “Orientation Meeting” with management / engg. / Maintenance personnel prior to start of the audit.
- MITCON’s team conducted all necessary field trials and measurements.
- MITCON provided all the instruments necessary for conducting the field trials.
- Following instruments were used by MITCON’s team.

Table 1: Instrument Used by Audit Team

Sr. No.	Instrument Name	Specification
1.	Demand Analyzer	Suitable for 1 $\phi$ , 3 $\phi$ . 156 electrical parameters like voltage, current, frequency, harmonics, active & reactive power, power factor etc.
2.	Clamp-on Power Meter	0 - 1200 kW 0 - 600 Voltage, AC 0 - 800 Voltage, DC 0 - 2000 A, Current, AC / DC
3.	Power Quality Analyzer	3 Ph 4 Wire Recording Parameters: Voltage, Current, Frequency, Harmonics/ Inter harmonics up to 50 <sup>th</sup> , THD of V, I and KW with K Factor, Transients, Voltage Sag- Swells, All Power Parameters, Inrush current, Load Unbalance, Flicker Recording etc. enabling graphical, vectorial, numerical representation, trending of data, monitoring of events etc.
4.	Lux Meter	0 - 50,000 lux level Non Contact Type
5.	Digital Thermo Anemometer	0 - 45 m / sec. $\pm$ 3%
6.	Relative Humidity and Temperature Indicator	RH – 10% to 95% Temp. – 0 – 100 $^{\circ}$ C Handheld unit
7.	Infrared Thermometers	40 $^{\circ}$ C to 500 $^{\circ}$ C
8.	Portable Temperature Indicator	50 $^{\circ}$ C to 1200 $^{\circ}$ C

Sr. No.	Instrument Name	Specification
9.	Ultrasonic Flow Meter	0 – 15 m/sec 25 – 5000 mm homogeneous liquids without gas bubbles +/- 0.5 %
10.	Stop Watch	--
11.	Demand Analyzer	Suitable for 1 $\phi$ , 3 $\phi$ . 156 electrical parameters like voltage, current, frequency, harmonics, active & reactive power, power factor etc.
12.	Clamp-on Power Meter	0 - 1200 kW 0 - 600 Voltage, AC 0 - 800 Voltage, DC 0 - 2000 A, Current, AC / DC

## CHAPTER 2

# ENERGY SCENE OF THE INSTITUTE

## 2.1 ENERGY SCENE

- Primary energy sources utilized at the institute are electricity, diesel, and water. These sources are consumed electricity- Various Eqpts in labs, offices & lighting, Diesel for DG set & water for laboratories, gardening & domestic usage respectively.
- Electricity bill is largest contributor to total annual energy bill. Hence equipment's consuming electricity was focus during the study along with others.

## 2.2 ENERGY: SOURCES & UTILIZATION

### 2.2.1 Electrical Energy

- The source of electrical power for the plant is from MSEDCL grid at 11 KV. The power received is further stepped down to 433 V and 315 kVA transformer is used to distribute electricity to various electrical panels in the Institute.
- Contract demand for commercial feeder is 150KVA. Average registered maximum demand for industrial feeder is 111 kVA. For Institute peak demand was registered at 128 kVA in the month of May, the below tables indicates average consumption for the reference period.

Table 2: Monthly Electricity Consumption Details

Sr. No.	Month	Contract Demand (KVA)	Billed demand (kVA)	Actual Demand (KVA)	Units Consumed (kWh)	Power Factor	Energy Charges (Rs.)	Demand Charge	TOD Traffic	FAC	Total Bill (Rs.)
1	Apr-15	150	75	113	22436	0.979	209185	21470	-3425	2003.3	229233
2	May-15	150	75	110	24436	0.953	228832	20900	-4103	8231	253860
3	Jun-14	150	75	104	24520	0.957	220561	19760	-2376	3691.6	241637
4	Jul-14	150	75	104	27272	0.948	242430	19760	1422	2912	266524
5	Aug-14	150	75	128	27494	0.96	227807	24382	3143	5592.6	260925
6	Sep-15	150	75	119	24662	0.97	222441	22560	1390	13048	259439
7	Oct-15	150	75	128	24662	0.934	192173	24320	3143	6928	226564
8	Nov-15	150	75	98	19621	0.926	230264	18620	1515	14693	265092
9	Dec-14	150	75	98	24158	0.898	230054	18630	-4515	14692	258861
	<b>Total</b>				<b>2,19,261</b>		<b>20,03,747</b>	<b>1,90,402</b>	<b>-3806</b>	<b>71,791</b>	<b>22,62,134</b>
	<b>Avg.</b>			<b>111</b>	<b>24362</b>	<b>0.947</b>	<b>222639</b>	<b>21156</b>			<b>250409</b>
	<b>Min.</b>			<b>98</b>	<b>19621</b>	<b>0.898</b>	<b>192173</b>	<b>18620</b>			<b>226564</b>
	<b>Max.</b>			<b>128</b>	<b>27494</b>	<b>0.979</b>	<b>242430</b>	<b>24382</b>			<b>266524</b>

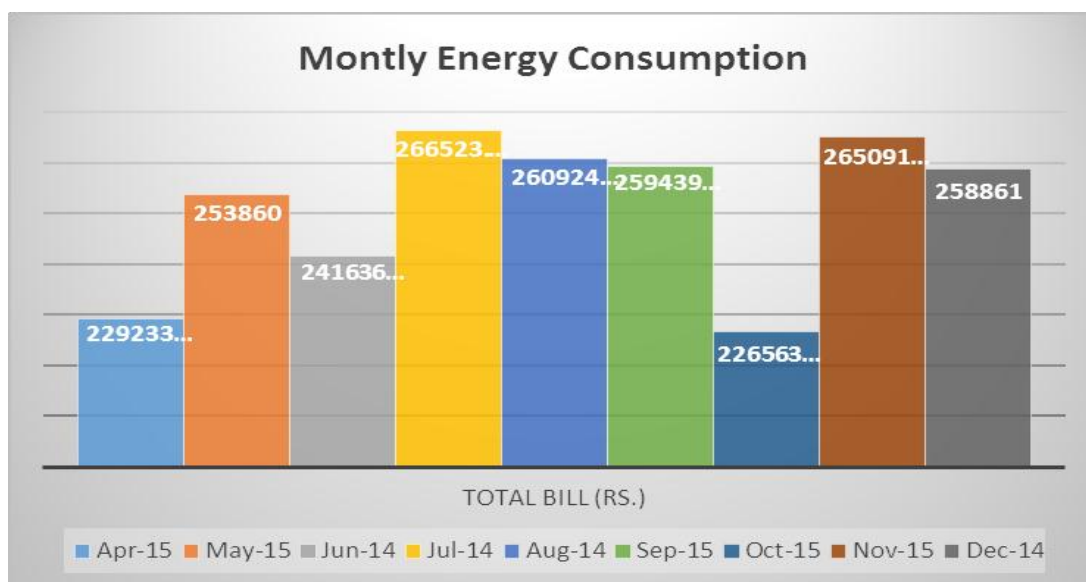
- Average monthly YMN unit's consumption is 24,362 kWh and avg. monthly bill is Rs. 2,50,409.
- Average of last 12 months per elect. unit cost is Rs. 10.41/Kw.

Table 3: Monthly incentive/ penalty received against Power factor Details

Sr. No.	Month	Power Factor	Total Bill (Rs.)	Discount received	P.F Incentive (Rs.) If At unity	Loss Of Incentive for not maint. PF at Unity
1	Apr-15	0.979	229233	11461	16046	4585
2	May-15	0.953	253860	7511	17770	10259
3	Jun-14	0.957	241637	0	16915	16915
4	Jul-14	0.948	266524	2468	18657	16189
5	Aug-14	0.96	260925	0	18265	18265
6	Sep-15	0.97	259439	2383	18161	15778
7	Oct-15	0.934	226564	5282	15859	10577
8	Nov-15	0.926	265092	0	18556	18556
9	Dec-14	0.898	258861	0	18120	18120
	<b>Total</b>		<b>22,62,134</b>	<b>29,105</b>	<b>1,58,349</b>	<b>1,29,244</b>
	<b>Avg.</b>	<b>0.947</b>	<b>250409</b>		<b>17529</b>	<b>14360</b>
	<b>Min.</b>	<b>0.898</b>	<b>226564</b>		<b>15859</b>	<b>4585</b>
	<b>Max.</b>	<b>0.979</b>	<b>266524</b>		<b>18657</b>	<b>18556</b>

- As MSEDCL regulation commercial customer will be avail incentive of 7% of the total bill amount if maintained power factor (PF) at unity or 1.
- The PF maintained at YMN is very poor. The average PF maintained was .947 Min- .898 (Dec-14) & Max- .979 (March-14)
- From table no. -4 it clearly noted that total loss of incentive from Mar-14 to Jan-15 was 1,29,244 Rs.
- Figure below presents monthly electricity consumption trend at the Institute. It can be noted, the energy consumption increases during academic session started and is lowest during holidays. The electric consumption was low in the month of March, June & Oct-14 and increases in remaining months.

Figure 1: Monthly Electricity Consumption Trend





### 2.2.2 Diesel

- Diesel is used to run DG sets during grid outages to ensure uninterrupted power supply to the Institute. The average monthly diesel consumption for the last 12 months reference period record is not maintained.

## 2.3 ENERGY METERING, MONITORING & CONTROL SYSTEM - EXISTING STATUS

### 2.3.1 Electricity

- Electrical energy consumption at the facility is measured on the main tri vector meter on monthly basis.
- Adequate instrumentation was not observed for voltage, current, power & power factor etc.

## 2.4 LEVEL OF AWARENESS

- The level of awareness for energy conservation in top & middle management is excellent. It is however felt necessary to make serious efforts to percolate the same up to the individual personnel level.
- Safety parameters maintained by the facility found in good condition.
- Good housekeeping and maintenance noted at all working areas.
- Trainings on energy conservation are not found on records. It should be ensured that every operator / supervisor knows the operating energy conservation parameters & control / monitor energy consumption, continuously.

## CHAPTER – 3

# **ENERGY CONSERVATION OPPORTUNITIES**

(Observations, Field Trials, Analysis and Key Result Areas)

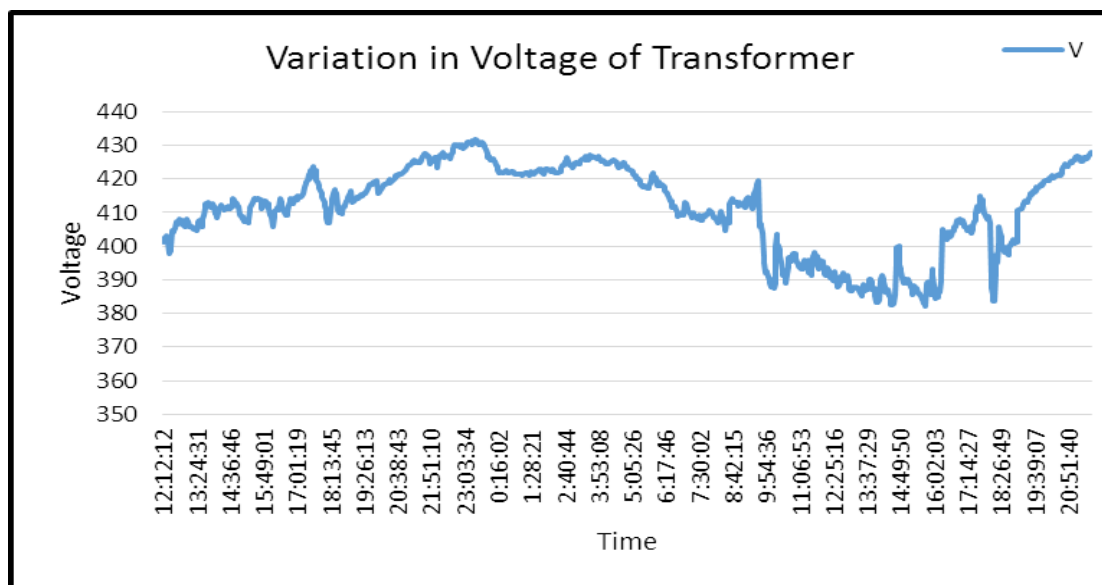
### 3.1 INTRODUCTION

- The study of institute energy consumption, data collection, observations, field trials and analysis of various areas was undertaken, keeping in view the energy scene at the institute, focus areas elaborated in the previous chapter and with a view to identify energy conservation opportunities in the same. The basis for this is the orientation visit, discussions with the various dept. & section personnel and the agreed plan for data collection and field trials. All these trials were undertaken at normal working conditions.

### 3.2 ELECTRICAL ENERGY

#### 3.2.1 Transformer

- The Institute has installed one transformers with rated capacity of 315 KVA for all facilities in the premises.
- The loading pattern at transformer was studied for a period of 48 hrs and data logged for every 5 minute for analysis. Below figures present the data recorded on a sample basis.



- As can be noted, voltage rises from 18.30 hrs to 09.00hrs time hours - 431V and falls from 10.30 to 18.30 hrs peak hours at - 382V. The load at the institute falls after 17.30 hrs and rises at 10.30 hrs.
- On transformer, loading distribution is not proper. As seen from figure, current in R phase is more than rest of two phases.
- Maximum load at the feeder is from 10.30 hrs to 17.30 hrs with peak load of 54 KW and a low of 14 KW during early morning. The power factor is seen falling below the desired limits and needs to be corrected.
- As it can be noted that, Current harmonic level is also high 45% during evening after 18hrs

### Recommendation

- Although the institute has installed capacitor bank at transformer level, but having very less capacity, it is proposed to improve power factor at distribution level. This will avoid losses in the distribution system. The AHPFC (automatic harmonic filter cum power factor controller) to be installed for better power quality & PF correction.

### 3.2.2 Air Conditioners

- The plant has split and packaged air conditioners with capacities ranging from 1TR to 3 TR. These air conditioners are installed at various locations like cabins, offices, seminar halls and HOD cabins. At the time of field studies, the ambient temperature was low and most of the air conditioners were not operating.
- The air conditioners were studied for evaluating their performance and specific energy consumption. Air flow across the air cooled condenser, DBT, WBT and temperature difference were measured. Heat dissipation from air cooled condenser side was thus arrived at for performance evaluation. Below table gives the measured values and specific energy consumption for chiller.

Table 4: AC's Operating Performance

Sr. No.	Description	Unit	IT Dept. - HOD Cabin	Jr. Lab. Computer Div.	Smart Lab-1	Chemistry Dept. Room Cabin	Chemistry Dept.- CISC Room ++ star
1	Make		Voltas	Voltas	Voltas	Blue Star	Blue Star
2	Type		Split AC	Split AC	Split AC	Split AC	Split AC
3	Capacity	TR	1.50	1.50	2.00	1.50	1.50
4	Area	M2	0.19	0.19	0.20	0.19	0.19
5	Ave. Velocity	m/sec	3.25	2.93	3.10	3.30	3.55
6	Flow	m <sup>3</sup> /hr.	0.62	0.56	0.61	0.63	0.67
7	Supply Air DB	°C	18.00	17.80	18.10	18.20	17.90
8	Supply Air WB	°C	16.50	16.10	16.30	16.40	16.60
9	Supply Air Enthalpy	KJ/kg	46.30	45.10	45.70	46.00	46.60
10	Return Air DB	°C	21.00	23.00	22.50	22.70	22.20
11	Return Air WB	°C	18.20	18.20	18.80	18.40	18.60
12	Return Air Enthalpy	KJ/kg	51.40	51.30	52.70	52.00	52.70
13	Enthalpy Diff.	KJ/kg	5.10	6.20	7.00	6.00	6.10
14	Specific Volume	M3/Kg	0.82	0.82	0.85	0.82	0.84
15	TR	TR	1.10	1.20	1.44	1.31	1.40
16	Power	KW	2.64	2.09	2.19	1.73	1.92
17	Specific Norms	KW/TR	2.41	1.74	1.53	1.32	1.37

Sr. No.	Description	Unit	Lab CIC	E-Learning Centre	Language Lab	IQAC Room AC no. 1	HOD Micro biology	Principal Room
1	Make		Blue Star	Blue Star	Blue Star	Voltas	Videocon	Blue Star
2	Type		Split AC	Castte	Split AC	Split AC	Split AC	Split AC
3	Capacity	TR	2.00	3.00	1.50	2.00	1.50	1.50
4	Area	M2	0.20	0.15	0.19	0.20	0.19	0.19
5	Ave. Velocity	m/sec	3.90	3.64	3.37	3.21	3.16	3.24
6	Flow	m <sup>3</sup> /hr.	0.77	0.56	0.64	0.63	0.60	0.62
7	Supply Air DB	°C	18.60	24.00	24.00	20.00	18.20	19.00
8	Supply Air WB	°C	16.80	18.60	19.00	18.00	16.80	16.00
9	Supply Air Enthalpy	KJ/kg	47.20	53.10	53.90	50.80	47.10	44.80
10	Return Air DB	°C	23.20	27.00	26.00	23.00	22.40	21.00
11	Return Air WB	°C	18.80	22.00	21.00	21.00	18.80	19.00
12	Return Air Enthalpy	KJ/kg	52.60	64.30	60.70	60.80	53.40	52.40
13	Enthalpy Diff.	KJ/kg	5.40	11.20	6.80	10.00	6.30	7.60
14	Specific Volume	M3/Kg	0.82	0.85	0.82	0.85	0.82	0.84
15	TR	TR	1.44	2.11	1.57	2.13	1.32	1.59
16	Power	KW	1.15	3.15	1.57	2.41	1.59	1.60
17	Specific Norms	KW/TR	1.20	1.49	1.21	1.13	1.37	1.13

- The specific energy consumption is 0.1 to 2.4 kWh/TR. When measurements were carried out, ambient temperatures were low but humidity was on higher side.
- Refrigerant used in installed systems is R-22 which is no longer used. Due to its higher global warming potential and hazards to environment, it is not allowed to use in any new refrigeration system and production of R-22 will also be phased out very soon.

### Recommendation

- Due to phase out of R-22, it will not be possible to use same refrigerant in the air conditioners. Also, due to age, performance of air conditioning system has deteriorated significantly. The hospital can consider replacing the existing air conditioners with new air conditioners. However, this will involve significant capital investment. SEC of new air cooled 5 star air conditioners is around 1.1-1.2 kW/TR.
- It is recommended that the set point of all ACs should be set on 24 to 26 °C at the summer and rainy season.
- It is recommended that the ACs should be switch off in winter season when temperature is low.
- The windows and doors should be closed when ACs are on to maintain temperature.

Table 5: Energy Saving Potential by Replacement of ACs

Sr. No.	Particulars	Value
1	Avg. specific energy consumption for window / split AC's, kW/TR	1.54
2	Total no. of such AC's	10
4	Total tonnage capacity of such AC's, TR	30
5	Actual TR delivered	27
6	Total energy consumption for above AC's, kW	41.58
7	Annual operating hours for split AC's, hours p.a.	6
8	Estimated SEC by retrofitting - kW/TR	1.1
9	Saving potential - kW/TR	0.44
10	Power saving potential, kW	4.4
11	Annual saving potential @ 6 hrs/day and 280 day/yr – kWh	7,392
12	Avg. energy tariff, Rs. /kWh	10.41
13	Annual savings potential, Rs.	76950.72
15	Total cost of new 5 star AC , Rs.	220000
16	Simple payback period, months	34

- Few studies have been conducted to establish saving potential in air conditioners. The underlying theory behind saving energy in air-conditioning systems starts by identifying which aspect of the system consumes the majority of the power used. In a simple AC unit, the fan would consume approx. 5 - 10%, whereas the compressor would use around 90 - 95% of the total power. This leads to an obvious conclusion make the compressor more energy efficient and we can save money. The star rated AC units come with energy efficient compressors and also larger heat transfer area in the condenser coils.
- Principally, when switched on, a typical air conditioning unit will run continuously until the room thermostat senses the desired temperature and turns the system off. As the room warms up, the thermostat switches the air conditioner back on and the cycle repeats. It's either fully ON or OFF. However, in most conditions, the maximum rated output is rarely required because the system is oversized by design, in other words AC units are designed and sized to cope with the worst case scenario. Therefore, the compressor operates with excess capacity most of the time. An air-conditioner comes with thermostat to provide crude control of temperature that result in overshoot or undershoot of set temperature resulting energy wastage. During the failure of the thermostat the AC works continuously and it is difficult to recognize the failure and take corrective action also resulting in energy wastage.

### 3.2.3 Water Pumping System

- In order meet water requirement of the Institute, two water pumps of 3 HP & 5 HP respectively are installed at the Institute.
- Water from raw water tank is treated and collected in main tank. From this tank, water is supplied to various consumption centers in Institute.
- Selection of pump plays very important role in overall operating efficiency of pumping system. Deviation in operating parameters from name plate parameter in terms of head and flow will result in reduced efficiency of the pumping system.

- It is a normal practice to select pump based on flow neglecting head. If rated head is more than actual operating head of the pump, then pump will deliver more flow than rated but will also draw more power. This leads to failure of pump.

### Recommendation

- As pump is operate only for few hrs daily, It is recommended, at time of replacement, select energy efficient star rated pumps. The star rated pump consumed 20% less energy as compare to standard efficiency pump.

### 3.2.4 Lighting Systems

- The Institute has mostly T-5/T-8 lighting fixtures in the campus. These fixtures are with electronic/magnetic ballast. Institute also uses different wattages of CFL and PL lights in the campus. Table below presents the lighting load details and lux survey undertaken.

### Recommendation

- It is recommended that institute should install new energy efficient lighting system , which is given below-

Table 6: Lighting Calculation by installation of T 5 Lamp

Sr. No.	Particulars	Values
1	Total Tube Light Wattage (52 W X 1204 fixtures) (kW)	62.6
2	Total Annual operating Time (5*280) (hrs)	1400
3	Wattage of 28 W + choke-3W FTL (31 W X 1204nos.)	37.3
5	Total Saving Possible by installing FTL 28 W	25.3
6	Total Saving Potential (kWh)	35398
7	Total Saving Potential @ Rs. 10.41 /kWh (Rs.)	368489
8	Installation Cost Rs. 700 / FTL	842800
9	Simple Payback Period (Months)	27

Table 7: Lighting Calculation by installation of LED Lamp

Sr. No.	Particulars	Values
1	Total Tube Light Wattage (52 W X 1204 fixtures) (kW)	62.6
2	Total Annual operating Time (5*280) (hrs)	1400
3	Wattage of LED lighting (20 W *1204 nos.)	24.08
5	Total Saving Possible by installing LED 20 W	38.528
6	Total Saving Potential (kWh)	53939.2
7	Total Saving Potential @ Rs. 10.4./kWh (Rs.)	561507.072
8	Installation Cost Rs. 1600 / LED Lamp	1926400
9	Simple Payback Period (Months)	41

- It is observed that the most of the lights in Mahavidyalaya classrooms and offices are on when it is empty. It is recommended that the lights should switch off before leave the rooms.

## Energy Audit Report

- It is observed that the switches for lighting operation are common for one room. It is recommended that the lighting switches should be separate for different lights.
- The day light available in most of the class rooms but the lightning fixtures are on. It is recommended that separate lighting switch should provide for near windows light and other area where day light is not sufficient.
- Windows should be open in day time when temperature is normal it will save lighting power as well as fan power.
- It is recommended that new LED with motion sensor should be install for Mahavidyalaya classrooms and office area.

### 3.2.5 Adoption of High Energy Efficient Fans

- Ceiling fans are also one of major load at YMN. The premise has around 2030 ceiling fans each of 75 Watts. Most of the fans are operated around 8 hours per day. Fans installed in the wards are operated continuously throughout the day during summers.
- Fans equipped with Brush Less DC (BLDC) motors consumes around 30 Watts which is 40% of present power consumption. Table below shows saving potential by adopting to fans with BLDC motors.

Table 8: Saving Potential in Fans

Sr. No.	Particulars	Value
1.	Number of ceiling fans	589
2.	Power consumption of each fan, Watts	112
3.	Total connected load for fans, kW	65.96
4.	Average operating hours per year, hrs.	5 hr/day and 280 days a year = 1400hrs
5.	Power consumption of BLDC motor fan, Watts	37.0
	Proposed power consumption with 5 star fans, kW	21.79
6.	Reduction in power consumption, kW	44.17
7.	Energy saving per year, kWh	57540.0
8.	Per unit charge, Rs./kWh	10.41
9.	Annual monetary savings, Rs.	598991
10.	Cost of replacing one fans with 5 star fan	3000
	Total cost of replacement, Rs, Lacs	1767000
11.	Simple payback period, months	35

### 3.3 HSD

- HSD is very less contributor to the overall energy bill as Institute having express feeder electric supply.
- 62.5 kVA DG set has been installed for uninterrupted power supply.

#### Recommendation

- At present there no record maintained for diesel consumption, it is recommended that diesel consumption record should be maintained.



- Also it is observed that, D.G. set fuel level indicator is not working at time of energy audit, so exact unit generation per diesel liter is not calculated. It is recommended that level indicator should be installed & unit generation per lit should be recorded.

### 3.4 POWER QUALITY

- Power Quality and Reliability is the key to successful operation of ultra-modern equipment/ electronic gadgets. The institute is well equipped with ultra-modern instruments, digital eqpt. & electronic gadgets in various laboratories in the institute. It is now even more critical to the institute because of increasing application of electronic loads and electronic controllers, which are sensitive to the quality of power supplied. These can have serious economic consequences and cost business millions of rupees each year in revenues loss, process improvements, and discarded products. There is a dire need for all concerned to discuss the business of power quality and the latest technologies for improving power system efficiency and reliability.
- With increased use of electronic equipment and non-linear sensitive loads, it becomes very important to follow correct installation practice and adopt mitigation techniques to improve power quality.
- During the audit, installation was reviewed from power quality and reliability point of view.
- All critical loads were fed through a UPS. An UPS will take care of any deviation in voltage and frequency parameters and will feed constant voltage and frequency to the load. An UPS can correct deviation in voltage but will not take any mitigating actions due to transients generated due to lightning or capacitor switching.
- UPS is also considered as a dedicated source of supply which is isolated from mains supply so that any fault in mains supply is not transferred to loads connected to UPS.
- It was observed that manual by pass switch in the UPS was disabled. It is against good operating practice and can damage the load connected to it.
- It was also observed that system neutral was used in the UPS. Any fault in the neutral on the supply line can have adverse effect on the load connected to UPS or can even damage the load.
- It is recommended to install a Delta – Star or Delta – Delta – Zig Zag transformer at the input of UPS and keep bypass switch functional.
- Earthing is also one of the important aspect in healthy operation of system and safety of the people. It is desirable to keep earth resistance at minimum possible value. Another important aspect is that all earthing points (earth pits) should be at equal potential. This can be achieved by interconnecting all earth pits including UPS earth pits.

## CHAPTER -4

# GENERAL ENERGY CONSERVATION TIPS

## 4 GENERAL ENERGY CONSERVATION TIPS

- Apart from the above-mentioned areas, there are certain tips that plant should examine in future to increase energy efficiency and hence to cut down on energy costs.

### 4.1 CHECKLIST & TIPS FOR ENERGY EFFICIENCY IN ELECTRICAL UTILITIES

#### 4.1.1 Electricity

- Optimise the tariff structure with utility supplier
- Schedule your operations to maintain a high load factor
- Minimise maximum demand by tripping loads through a demand controller
- Stagger start-up times for equipment with large starting currents to minimise load peaking.
- Use standby electric generation equipment for on-peak high load periods.
- Correct power factor to at least 0.95 under rated load conditions.
- Relocate transformers close to main loads.
- Set transformer taps to optimum settings.
- Disconnect primary power to transformers that do not serve any active loads
- Consider on-site electric generation or cogeneration.
- Export power to grid if you have any surplus in your captive generation.
- Check utility electric meter with your own meter.
- Shut off unnecessary computers, printers and copiers at night

#### 4.1.2 Motors

- Properly size to the load for optimum efficiency. (High efficiency motors offer of 4 – 5% & higher efficiency than standard motors)
- Use energy-efficient motors where economical.
- Use synchronous motors to improve power factor.
- Check alignment.
- Provide proper ventilation (For every 10<sup>0</sup>C increase in motor operating temperature over recommended peak, the motor life is estimated to be halved)
- Check for under-voltage and over-voltage conditions.
- Balance the three-phase power supply. (An Imbalanced voltage can reduce 3 – 5% in motor input power)
- Demand efficiency restoration after motor rewinding. (If rewinding is not done properly, the efficiency can be reduced by 5 – 8%)

#### 4.1.3 Drives

- Use variable-speed drives for large variable loads.
- Use high-efficiency gear sets.
- Use precision alignment.
- Check belt tension regularly.
- Eliminate variable-pitch pulleys.
- Use flat belts as alternatives to v-belts.
- Use synthetic lubricants for large gearboxes.
- Eliminate eddy current couplings.
- Shut them off when not needed.

#### 4.1.4 Fans

- Use smooth, well-rounded air inlet cones for fan air intakes.

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- Avoid poor flow distribution at the fan inlet.
- Minimise fan inlet and outlet obstructions.
- Clean screens, filters and fan blades regularly.
- Use aerofoil-shaped fan blades.
- Minimise fan speed.
- Use low-slip or flat belts.
- Check belt tension regularly.
- Eliminate variable pitch pulleys.
- Use variable speed drives for large variable fan loads.
- Use energy-efficient motors for continuous or near-continuous operation
- Eliminate leaks in ductwork.
- Minimise bends in ductwork.
- Turn fans off when not needed

### **4.1.5 Blowers**

- Use smooth, well-rounded air inlet ducts or cones for air intakes.
- Minimise blower inlet and outlet obstructions.
- Clean screens and filters regularly.
- Minimise blower speed.
- Use low-slip or no-slip belts.
- Check belt tension regularly.
- Eliminate variable pitch pulleys.
- Use variable speed drives for large variable blower loads.
- Use energy-efficient motors for continuous or near-continuous operation.
- Eliminate ductwork leaks.
- Turn blowers off when they are not needed.

### **4.1.6 Pumps**

- Operate pumping near best efficiency point.
- Modify pumping to minimise throttling.
- Adapt to side load variation with variable speed drives or sequenced control of smaller units.
- Stop running both pumps – add an auto-start for an on-line spare or add a booster pump in the problem area.
- Use booster pumps for small load as requiring higher pressures.
- Increase fluid temperature differentials to reduce pumping rates.
- Repair seals and packing to minimise water waste.
- Balance the system to minimise flows and reduce pump power requirements.
- Use siphon effect to advantage: don't waste pumping head with a free-fall (gravity) return.

### **4.1.7 Compressors**

- Consider variable speed drive for variable load on positive displacement compressors.
- Use a synthetic lubricant if the compressor manufacturer permits it.
- Be sure lubricating oil temperature is not too high (oil degradation and lowered viscosity) and not too low (Condensation contamination).
- Change the oil filter regularly.
- Periodically inspect compressor intercoolers for proper functioning.
- Use water heat from a very large compressor to power an absorption chiller or preheat process or utility feeds.

- Establish a compressor efficiency-maintenance program. Start with an energy audit and follow-up, then make a compressor efficiency-maintenance program a part of your continuous energy management program.

#### 4.1.8 Compressed Air

- Install a control system to co-ordinate multiple air compressors.
- Study part-load characteristic and cycling costs to determine the most-efficient mode for operating multiple air compressors.
- Avoid over sizing – match the connected load.
- Load up modulation-controlled air compressors. (They use almost as much power at partial load as at full load.)
- Turn off the back-up air compressor until it is needed.
- Reduce air compressor discharge pressure to the lowest acceptable setting. (*Reduction of 1 kg/cm<sup>2</sup> air pressure (8 kg/cm<sup>2</sup> to 7 kg/cm<sup>2</sup>) would result in 9% input power savings. This will also reduce compressed air leakage rates by 10%*)
- Use the highest reasonable dryer dew point settings.
- Turn off refrigerated and heated air dryers when the air compressors are off.
- Use a control system to minimise heatless desiccant dryer purging.
- Minimise purges, leaks, excessive pressure drops and condensation accumulation. (*Compressed air leak from 1 mm hole size at 7 kg/cm<sup>2</sup> pressure would mean power loss equivalent to 0.5 KW*)
- Use drain controls instead of continuous air bleeds through the drains.
- Consider engine-driven or steam-driven air compression to reduce electrical demand charges.
- Replace standard V-belts with high-efficiency flat belts as the old V-belts wear out.
- Use a small air compressor when major production load is off.
- Take air compressor intake air from the coolest (but not air conditioned) location. (*Every 5°C reduction in intake air temperature would result in 1% reduction in compressor power consumption*)
- Use an air-cooled after cooler to heat building makeup air in winter.
- Be sure that heat exchangers are not fouled (eg. – with oil)
- Be sure that air / oil separators are not fouled.
- Monitor pressure drops across suction and discharge filters and clean or replace filters promptly upon alarm.
- Use a properly sized compressed air storage receiver.
- Minimise disposal costs by using lubricant that is fully demulsible and an effective oil-water separator.
- Consider alternatives to compressed air such as blowers for cooling, hydraulic rather than air cylinders, electric rather than air actuators and electronic rather than pneumatic controls.
- Use nozzles or venturi - type devices instead of blowing with open compressed air lines.
- Check for leaking drain valves on compressed air filter / regular sets. Certain rubber-type valves may leak continuously after they age and crack.
- Industry environments, control packaging lines with high-intensity photocell units instead of standard units with continuous air purging of lenses and reflectors.
- Establish a compressed air efficiency-maintenance program. Start with an energy audit and follow-up, then make a compressed air efficiency-maintenance program a part of your continuous energy management program.

#### 4.1.9 Chillers

- Increase the chilled water temperature set point if possible.

- Use the lowest temperature condenser water available that the chiller can handle. *(Reducing condensing temperature by 5.5°C, results in a 20 – 25% decrease in compressor power consumption)*
- Increase the evaporator temperature *(5.5°C increase in evaporator temperature reduces compressor power consumption by 20 – 25%)*
- Clean heat exchangers when fouled. *(1 mm scale build-up on condenser tubes can increase energy consumption by 40%)*
- Replace old chillers or compressors with new higher-efficiency models.
- Use water-cooled rather than air-cooled chiller condensers.
- Use energy-efficient motors for continuous or near-continuous operation.
- Specify appropriate fouling factors for condensers.
- Do not overcharge oil.
- Install a control system to co-ordinate multiple chillers.
- Study part-load characteristics and cycling costs to determine the most-efficient mode for operating multiple chillers.
- Run the chillers with the lowest operating costs to near base load.
- Avoid over sizing – match the connected load.
- Isolate off-line chillers and cooling towers.
- Establish a chiller efficiency-maintenance program. Start with an energy audit and follow-up, then make a chiller efficiency-maintenance program a part of your continuous energy management program.

#### 4.1.10 HVAC (Heating / Ventilation / Air Conditioning)

- Tune up the HVAC control system.
- Consider installing a building automation system (BAS) or energy management system (EMS) or restoring an out-of-service one.
- Balance the system to minimise flows and reduce blower / fan / pump power requirements.
- Eliminate or reduce reheat whenever possible.
- Use appropriate HVAC thermostat setback.
- Use morning pre-cooling in summer and pre-heating in winter (i.e. – before electrical peak hours).
- Use building thermal lag to minimise HVAC equipment operating time.
- In winter during unoccupied periods, allow temperature to fall as low as possible without damaging stored materials.
- Improve control and utilisation of outside air.
- Use air-to-air heat exchangers to reduce energy requirements for heating and cooling of outside air.
- Reduce HVAC system operating hours (e.g. – night, weekend).
- Optimise ventilation.
- Ventilate only when necessary. To allow some areas to be shut down when unoccupied, install dedicated HVAC systems on continuous loads (e.g. – computer rooms).
- Provide dedicated outside air supply to cleaning rooms, combustion equipment, etc. to avoid excessive exhausting of conditioned air.
- Use evaporative cooling in dry climates.
- Reduce humidification or dehumidification during unoccupied periods.
- Use atomization rather than steam for humidification where possible.
- Clean HVAC unit coils periodically and comb mashed fins.
- Upgrade filter banks to reduce pressure drop and thus lower fan power requirements.
- Check HVAC filters on a schedule (at least monthly) and clean / change if appropriate.
- Check pneumatic controls air compressors for proper operation, cycling, and maintenance.

- Isolate air conditioned loading dock areas and cool storage areas using high-speed doors or clear PVC strip curtains.
- Install ceiling fans to minimise thermal stratification in high-bay areas.
- Relocate air diffusers to optimum heights in areas with high ceilings.
- Consider reducing ceiling heights.
- Eliminate obstructions in front of radiators, baseboard heaters, etc.
- Check reflectors on infrared heaters for cleanliness and proper beam direction.
- Use professionally-designed industrial ventilation hoods for dust and vapour control.
- Use local infrared heat for personnel rather than heating the entire area.
- Use spot cooling and heating (e.g. – use ceiling fans for personnel rather than cooling the entire area).
- Purchase only high-efficiency models for HVAC window units.
- Put HVAC window units on timer control.
- Don't oversize cooling unit. (Oversized units will "short cycle" which results in poor humidity control.)
- Install multi-fuelling capability and run with the cheapest fuel available at the time.
- Consider dedicated make-up air for exhaust hoods. (Why exhaust the air conditioning or heat if you don't need to?)
- Minimise HVAC fan speeds.
- Consider desiccant drying of outside air to reduce cooling requirements in humid climates.
- Consider ground source heat pumps.
- Seal leaky HVAC ductwork.
- Seal all leaks around coils.
- Repair loose or damaged flexible connections (including those under air handling units).
- Eliminate simultaneous heating and cooling during seasonal transition periods.
- Zone HVAC air and water systems to minimise energy use.
- Inspect, clean, lubricate and adjust damper blades and linkages.
- Establish and HVAC efficiency-maintenance program. Start with an energy audit and follow-up, then make an HVAC efficiency-maintenance program a part of your continuous energy management program.

#### 4.1.11 Refrigeration

- Use water-cooled condensers rather than air-cooled condensers.
- Challenge the need for refrigeration, particularly for old batch processes.
- Avoid over sizing – match the connected load.
- Consider gas-powered refrigeration equipment minimise electrical demand charges.
- Use "free cooling" to allow chiller shutdown in cold weather.
- Use refrigerated water loads in series if possible.
- Convert firewater or other tanks to thermal storage.
- Don't assume that the old way is still the best – particularly for energy-intensive low temperature systems.
- Correct inappropriate brine or glycol concentration that adversely affects heat transfer and / or pumping energy. If it sweats, insulate it, but if it is corroding, replace it first.
- Make adjustments to minimise hot gas bypass operation.
- Inspect moisture / liquid indicators.
- Consider change of refrigerant type if it will improve efficiency.
- Check for correct refrigerant charge level.
- Inspect the purge for air and water leaks.

- Establish a refrigeration efficiency-maintenance program. Start with an energy audit and follow-up, then make a refrigeration efficiency-maintenance program part of your continuous energy management program.

#### 4.1.12 Cooling Towers

- Control cooling tower fans based on leaving water temperatures.
- Control to the optimum water temperature as determined from cooling tower and chiller performance data.
- Use two-speed or variable-speed drives for cooling tower fan control if the fans are few. Stage the cooling tower fans with on-off control if there are many.
- Turn off unnecessary cooling tower fans when loads are reduced.
- Cover hot water basins (to minimise algae growth that contributes to fouling).
- Balance flow to cooling tower hot water basins.
- Periodically clean plugged cooling tower water distribution nozzles.
- Install new nozzles to obtain a more-uniform water pattern.
- Replace splash bars with self-extinguishing PVC cellular-film fill.
- An old counter flow cooling towers, replace old spray-type nozzles with new square-spray ABS practically-non-clogging nozzles.
- Replace slat-type drift eliminators with high-efficiency, low-pressure-drop, self-extinguishing, PVC cellular units.
- If possible, follow manufacturer's recommended clearances around cooling towers and relocate or modify structures, signs, fences, dumpsters, etc. that interfere with air intake or exhaust.
- Optimise cooling tower fan blade angle on a seasonal and / or load basis.
- Correct excessive and / or uneven fan blade tip clearance and poor fan balance.
- Use a velocity pressure recovery fan ring.
- Divert clean air-conditioned building exhaust to the cooling tower during hot weather.
- Re-line leaking cooling tower cold water basins.
- Check water overflow pipes for proper operating level.
- Optimise chemical use.
- Consider side stream water treatment.
- Restrict flows through large loads to design values.
- Shut off loads that are not in service.
- Take blowdown water from the return water header.
- Optimise blowdown water from the return water header.
- Automate blowdown to minimise it.
- Send blowdown to other uses (Remembers, the blowdown does not have to be removed at the cooling tower. It can be removed anywhere in the piping system.)
- Implement a cooling tower winterisation plan to minimise ice build-up.
- Install interlocks to prevent fan operation when there is no water flow.
- Establish a cooling tower efficiency-maintenance program. Start with an energy audit and follow-up, then make a cooling tower efficiency-maintenance program a part of your continuous energy management program.

#### 4.1.13 Lighting

- Reduce excessive illumination levels to standard levels using switching, delamping, etc. (Know the electrical effects before doing delamping.)
- Aggressively control lighting with clock timers, delay timers, photocells, and / or occupancy sensors.
- Install efficient alternatives to incandescent lighting, mercury vapour lighting, etc. as follows: low pressure sodium, high pressure sodium, metal halide, fluorescent, mercury vapour, incandescent.



- Select ballasts and lamps carefully with high power factor and long-term efficiency in mind.
- Upgrade obsolete fluorescent systems to compact fluorescents and electronic ballasts.
- Consider lowering the fixtures to enable using less of them.
- Consider day lighting, skylights, etc.
- Consider painting the walls a lighter colour and using less lighting fixtures or lower wattages.
- Use task lighting and reduce background illumination.
- Re-evaluate exterior lighting strategy, type and control. Control it aggressively.
- Change exit signs from incandescent to LED.

#### 4.1.14 DG Sets

- Optimise loading.
- Use waste heat to generate steam / hot water / power an absorption chiller or preheat process or utility feeds.
- Use jacket and head cooling water for process needs.
- Clean air filters regularly.
- Insulate exhaust pipes to reduce DG set room temperatures.
- Use cheaper heavy fuel oil for capacities more than 1MW.

#### 4.1.15 Buildings

- Seal exterior cracks / openings / gaps with caulk, gasketing, weather-stripping etc.
- Consider new thermal doors, thermal window, roofing insulation, etc.
- Install windbreaks near exterior doors.
- Replace single-pane glass with insulating glass.
- Consider covering some window and skylight areas with insulated wall panels inside the building.
- If visibility is not required but light is required, consider replacing exterior windows with insulated glass block.
- Consider tinted glass, reflective glass, coatings, awnings, overhangs, draperies, blinds and shades for sunlit exterior windows.
- Use landscaping to advantage.
- Add vestibules or revolving doors to primary exterior personnel doors.
- Consider automatic doors, air curtains, strip doors, etc. at high-traffic passages between conditioned and non-conditioned spaces. Use self-closing doors if possible.
- Use intermediate doors in stairways and vertical passages to minimise building stack effect.
- Use dock seals at shipping and receiving doors.
- Bring cleaning personnel in during the working day or as soon after as possible to minimise lighting and HVAC costs.

#### 4.1.16 Waste & Waste Water

- Recycle water, particularly for uses with less-critical quality requirements.
- Recycle water, especially if sewer costs are based on water consumption.
- Balance closed systems to minimise flows and reduce pump power requirements.
- Eliminate once-through cooling with water.
- Use the least expensive type of water that will satisfy the requirement.
- Fix water leaks.
- Test for underground water leaks. (It's easy to do over a holiday shutdown.)
- Check water overflow pipes for proper operating level.
- Automate blowdown to minimise it.

- Provide proper tools for wash down – especially self-closing nozzles.
- Install efficient irrigation.
- Reduce flows at water sampling stations.
- Eliminate continuous overflow at water tanks.
- Promptly repair leaking toilets and faucets.
- Use water restrictors on faucets, showers, etc.
- Use self-closing type faucets in restrooms.
- Use the lowest possible hot water temperature.
- Do not use a heating system hot water boiler to provide service hot water during the cooling season – install a smaller, more-efficient system for the cooling season service hot water.
- If water must be heated electrically, consider accumulation in a large insulated storage tank to minimise heating at on-peak electric rates.
- Use multiple, distributed, small water heaters to minimise thermal losses in large piping systems.
- Use freeze protection valves rather than manual bleeding of lines.
- Consider leased and mobile water treatment systems, especially for deionised water.
- Seal sumps to prevent seepage inward from necessitating extra sump pump operation.
- Install pre-treatment to reduce TOC and BOD surcharges.
- Verify the water meter readings.

#### 4.1.17 Miscellaneous

- Meter any unmetered utilities. Know what normal efficient use is. Track down causes of deviations.
- Shut down spare, idling or unneeded equipment.
- Make sure that all of the utilities to redundant areas are turned off – including utilities like compressed air and cooling water.
- Install automatic control to efficiently co-ordinate multiple air compressors, chillers, cooling tower cells, boilers, etc.
- Renegotiate utilities contracts to reflect current loads and variations.
- Consider buying utilities from neighbours, particularly to handle peaks.
- Leased space often has low-bid inefficient equipment. Consider upgrades if your lease will continue for several more years.
- Adjust fluid temperature within acceptable limits to minimise undesirable heat transfer in long pipelines.
- Minimise use of flow bypasses and minimise bypass flow rates.
- Provide restriction orifices in purges (nitrogen, steam, etc.).
- Eliminate unnecessary flow measurement orifices.
- Consider alternatives to high pressure drops across valves.
- Turn off winter heat tracing that is on in summer.

## **ANNEXURE**

**Annexure - I****Power Survey at 315 kVA Transformer**

Date	Time	V	A	PF	kW	KVA	Hz	Thd V fnd	Thd A fnd
2/10/2015	12:12:12	401	89.4	0.949	58.9	62.1	50.0	1.5	7.5
2/10/2015	12:14:13	402	93.9	0.951	62.2	65.4	50.0	1.5	7.5
2/10/2015	12:16:13	401	85.6	0.938	55.9	59.5	50.0	1.5	8.7
2/10/2015	12:18:13	403	92.6	0.926	59.9	64.7	49.9	1.5	8.9
2/10/2015	12:20:14	403	97.8	0.950	64.8	68.2	49.9	1.5	7.3
2/10/2015	12:22:14	401	90.8	0.946	59.7	63.1	49.9	1.5	8.1
2/10/2015	12:24:14	398	87.5	0.947	57.1	60.2	50.0	1.5	8.0
2/10/2015	12:26:15	400	92.7	0.947	60.7	64.2	50.0	1.5	9.1
2/10/2015	12:28:16	399	103.1	0.944	67.2	71.2	50.0	1.4	7.8
2/10/2015	12:30:17	400	91.8	0.947	60.2	63.5	50.0	1.4	7.7
2/10/2015	12:32:19	404	87.4	0.931	57.1	61.3	50.0	1.4	8.4
2/10/2015	12:34:19	404	91.3	0.937	59.9	64.0	50.0	1.4	8.6
2/10/2015	12:36:20	405	89.3	0.940	58.9	62.6	50.0	1.4	8.4
2/10/2015	12:38:21	405	91.7	0.943	60.7	64.4	50.0	1.4	7.9
2/10/2015	12:40:22	407	94.0	0.942	62.5	66.3	50.1	1.5	8.2
2/10/2015	12:42:23	407	88.4	0.936	58.3	62.3	50.1	1.5	8.8
2/10/2015	12:44:24	407	84.9	0.930	55.6	59.8	50.2	1.4	9.2
2/10/2015	12:46:25	407	90.5	0.937	59.8	63.8	50.1	1.4	8.8
2/10/2015	12:48:26	408	85.9	0.935	56.8	60.8	50.1	1.4	9.2
2/10/2015	12:50:27	407	96.5	0.932	63.5	68.1	50.0	1.4	9.2
2/10/2015	12:52:28	408	86.8	0.931	57.1	61.4	50.0	1.4	9.0
2/10/2015	12:54:28	407	95.0	0.930	62.2	66.9	50.0	1.4	9.2
2/10/2015	12:56:28	406	93.1	0.931	61.0	65.6	49.9	1.4	9.2
2/10/2015	12:58:28	406	87.3	0.937	57.6	61.4	49.9	1.4	8.1
2/10/2015	13:00:28	406	86.0	0.934	56.5	60.5	49.9	1.4	8.2
2/10/2015	13:02:29	407	90.5	0.925	59.1	63.9	49.9	1.3	8.2
2/10/2015	13:04:29	408	78.9	0.925	51.6	55.8	50.0	1.3	8.6
2/10/2015	13:06:29	407	92.5	0.931	60.8	65.3	49.9	1.3	8.2
2/10/2015	13:08:29	406	81.6	0.932	53.5	57.4	49.9	1.4	8.5
2/10/2015	13:10:29	406	94.4	0.937	62.3	66.5	50.0	1.4	7.2
2/10/2015	13:12:29	406	94.9	0.933	62.2	66.7	50.0	1.3	7.6
2/10/2015	13:14:29	406	97.5	0.916	62.8	68.5	49.9	1.4	7.2
2/10/2015	13:16:29	405	90.4	0.918	58.3	63.5	49.9	1.4	8.5
2/10/2015	13:18:30	405	90.2	0.919	58.2	63.3	49.9	1.4	8.7
2/10/2015	13:20:30	405	87.9	0.917	56.6	61.8	49.8	1.4	8.7
2/10/2015	13:22:30	405	92.4	0.906	58.9	64.9	49.8	1.4	8.1
2/10/2015	13:24:31	405	101.3	0.917	65.1	71.0	49.8	1.4	8.6
2/10/2015	13:26:31	406	96.9	0.914	62.3	68.1	49.8	1.4	7.4
2/10/2015	13:28:32	407	98.2	0.915	63.4	69.3	49.8	1.3	8.1
2/10/2015	13:30:32	408	91.2	0.921	59.4	64.4	49.8	1.3	7.1

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2/10/2015	13:32:33	407	99.8	0.902	63.4	70.3	49.8	1.3	7.0
2/10/2015	13:34:33	407	92.7	0.918	59.9	65.3	49.9	1.4	7.2
2/10/2015	13:36:33	406	97.2	0.929	63.5	68.3	49.9	1.4	6.3
2/10/2015	13:38:34	408	102.6	0.926	67.2	72.5	49.9	1.3	5.6
2/10/2015	13:40:34	409	90.0	0.917	58.5	63.8	49.9	1.4	7.5
2/10/2015	13:42:34	412	87.7	0.907	56.7	62.6	50.1	1.4	8.0
2/10/2015	13:44:35	413	90.3	0.911	58.8	64.6	50.1	1.5	7.5
2/10/2015	13:46:36	413	106.1	0.921	69.8	75.9	50.1	1.4	6.6
2/10/2015	13:48:37	413	101.3	0.924	67.0	72.5	50.1	1.4	6.2
2/10/2015	13:50:38	413	90.2	0.919	59.3	64.5	50.0	1.4	7.5
2/10/2015	13:52:38	412	93.0	0.918	60.9	66.3	49.9	1.4	7.4
2/10/2015	13:54:38	412	94.1	0.924	62.0	67.1	50.0	1.3	7.4
2/10/2015	13:56:38	412	88.2	0.937	59.0	63.0	49.9	1.4	7.3
2/10/2015	13:58:39	413	85.5	0.930	56.9	61.2	49.8	1.4	7.8
2/10/2015	14:00:39	412	90.8	0.936	60.7	64.9	49.8	1.3	7.3
2/10/2015	14:02:40	411	86.0	0.927	56.9	61.3	49.8	1.4	7.7
2/10/2015	14:04:40	410	85.8	0.929	56.6	60.9	49.8	1.4	7.7
2/10/2015	14:06:40	409	88.2	0.936	58.5	62.5	49.8	1.5	7.4
2/10/2015	14:08:41	408	87.1	0.938	57.8	61.6	49.8	1.4	7.2
2/10/2015	14:10:41	410	84.4	0.931	55.8	60.0	49.8	1.5	8.2
2/10/2015	14:12:42	411	86.6	0.923	56.9	61.7	49.8	1.5	7.7
2/10/2015	14:14:42	412	84.5	0.923	55.6	60.3	49.9	1.4	7.9
2/10/2015	14:16:42	412	86.8	0.930	57.7	62.0	49.9	1.4	8.0
2/10/2015	14:18:43	412	90.5	0.934	60.2	64.5	49.9	1.5	7.7
2/10/2015	14:20:43	412	89.9	0.933	59.9	64.2	49.9	1.5	7.8
2/10/2015	14:22:43	412	84.8	0.927	56.1	60.5	49.8	1.4	7.5
2/10/2015	14:24:44	411	87.2	0.930	57.8	62.1	49.8	1.5	8.0
2/10/2015	14:26:44	412	89.4	0.937	59.7	63.8	49.9	1.5	7.7
2/10/2015	14:28:45	412	81.5	0.935	54.3	58.1	49.9	1.4	7.6
2/10/2015	14:30:45	411	83.4	0.935	55.6	59.4	49.8	1.5	7.5
2/10/2015	14:32:45	412	82.5	0.931	54.8	58.9	49.9	1.5	8.0
2/10/2015	14:34:46	411	79.7	0.928	52.7	56.8	49.9	1.5	7.8
2/10/2015	14:36:46	411	87.8	0.938	58.7	62.5	49.9	1.6	7.9
2/10/2015	14:38:46	411	85.7	0.937	57.2	61.1	49.9	1.5	8.0
2/10/2015	14:40:46	412	86.9	0.938	58.2	62.0	49.9	1.5	8.3
2/10/2015	14:42:47	414	88.5	0.932	59.2	63.5	49.9	1.5	7.9
2/10/2015	14:44:47	414	88.4	0.937	59.3	63.3	50.0	1.6	7.8
2/10/2015	14:46:48	414	85.5	0.938	57.5	61.3	50.0	1.5	8.2
2/10/2015	14:48:49	413	88.8	0.942	59.9	63.6	50.0	1.5	8.5
2/10/2015	14:50:49	413	93.1	0.941	62.6	66.6	49.9	1.6	8.9
2/10/2015	14:52:50	412	89.8	0.937	60.0	64.1	49.9	1.6	8.5
2/10/2015	14:54:50	412	92.5	0.938	61.9	66.0	49.8	1.6	8.8
2/10/2015	14:56:50	409	94.6	0.944	63.3	67.1	49.8	1.6	9.0
2/10/2015	14:58:51	410	97.9	0.941	65.3	69.4	49.8	1.5	6.6
2/10/2015	15:00:51	409	98.8	0.941	65.9	70.0	49.8	1.5	7.0

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2/10/2015	15:02:52	408	101.4	0.929	66.5	71.6	49.8	1.5	5.9
2/10/2015	15:04:52	409	102.8	0.930	67.7	72.8	49.8	1.4	5.5
2/10/2015	15:06:53	408	106.5	0.939	70.5	75.1	49.8	1.4	5.7
2/10/2015	15:08:53	407	99.6	0.936	65.8	70.3	49.8	1.4	5.9
2/10/2015	15:10:54	408	98.9	0.937	65.5	69.8	49.9	1.4	6.3
2/10/2015	15:12:54	408	97.1	0.930	63.8	68.6	49.9	1.3	6.1
2/10/2015	15:14:54	407	97.8	0.923	63.7	68.9	49.9	1.5	6.7
2/10/2015	15:16:54	408	101.8	0.912	65.6	71.9	49.9	1.4	6.6
2/10/2015	15:18:55	411	106.8	0.914	69.5	76.0	49.9	1.4	6.6
2/10/2015	15:20:55	412	100.4	0.916	65.6	71.6	49.9	1.5	6.7
2/10/2015	15:22:55	412	105.4	0.908	68.3	75.3	49.8	1.3	6.6
2/10/2015	15:24:56	413	92.2	0.911	60.2	66.0	49.8	1.5	7.8
2/10/2015	15:26:56	413	94.0	0.916	61.6	67.3	49.8	1.3	7.5
2/10/2015	15:28:56	414	88.6	0.911	57.9	63.5	49.8	1.4	7.3
2/10/2015	15:30:57	414	92.9	0.915	61.0	66.7	49.9	1.4	7.5
2/10/2015	15:32:57	414	101.8	0.910	66.4	73.0	49.9	1.3	7.1
2/10/2015	15:34:57	414	87.8	0.908	57.2	63.0	49.9	1.5	7.4
2/10/2015	15:36:58	414	91.7	0.923	60.7	65.8	49.9	1.4	8.0
2/10/2015	15:38:58	414	89.3	0.922	59.1	64.1	49.9	1.4	7.9
2/10/2015	15:40:58	414	99.6	0.916	65.4	71.4	50.0	1.4	7.4
2/10/2015	15:42:58	414	101.6	0.915	66.7	72.9	50.0	1.4	7.4
2/10/2015	15:44:59	411	100.2	0.919	65.6	71.4	50.1	1.5	7.3
2/10/2015	15:47:00	412	100.7	0.923	66.3	71.9	50.1	1.4	7.3
2/10/2015	15:49:01	413	101.3	0.921	66.8	72.5	50.0	1.3	7.8
2/10/2015	15:51:02	414	93.0	0.923	61.5	66.7	50.0	1.3	6.3
2/10/2015	15:53:02	413	81.6	0.915	53.5	58.5	50.0	1.3	7.1
2/10/2015	15:55:02	413	84.3	0.914	55.1	60.3	50.0	1.3	7.2
2/10/2015	15:57:02	412	84.5	0.921	55.6	60.4	49.9	1.2	7.2
2/10/2015	15:59:02	413	82.2	0.917	53.9	58.8	49.9	1.3	7.3
2/10/2015	16:01:03	411	83.9	0.917	54.8	59.8	49.9	1.4	7.2
2/10/2015	16:03:03	409	92.1	0.909	59.4	65.3	49.9	1.2	7.1
2/10/2015	16:05:03	409	89.9	0.903	57.6	63.8	49.9	1.3	6.8
2/10/2015	16:07:04	408	95.7	0.915	62.0	67.7	49.9	1.2	6.6
2/10/2015	16:09:05	406	96.2	0.915	61.9	67.6	50.1	1.3	6.7
2/10/2015	16:11:06	409	87.4	0.918	56.8	61.9	50.1	1.2	6.5
2/10/2015	16:13:07	410	86.3	0.917	56.3	61.3	50.0	1.2	8.0
2/10/2015	16:15:08	411	90.5	0.902	58.1	64.4	50.0	1.3	7.0
2/10/2015	16:17:09	411	78.5	0.910	50.9	55.9	50.0	1.3	7.1
2/10/2015	16:19:10	411	83.2	0.913	54.1	59.3	50.1	1.2	7.2
2/10/2015	16:21:11	411	85.2	0.917	55.6	60.6	50.1	1.3	8.4
2/10/2015	16:23:12	411	80.6	0.904	51.9	57.5	50.0	1.2	8.0
2/10/2015	16:25:12	414	84.1	0.905	54.6	60.4	50.0	1.3	7.9
2/10/2015	16:27:12	413	83.3	0.909	54.2	59.6	50.0	1.3	7.9
2/10/2015	16:29:13	412	82.6	0.912	53.8	59.0	49.9	1.2	8.2
2/10/2015	16:31:13	411	86.4	0.916	56.4	61.5	49.9	1.3	8.0

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2/10/2015	16:33:13	410	82.5	0.908	53.2	58.6	49.8	1.3	7.9
2/10/2015	16:35:14	410	87.2	0.896	55.6	62.0	49.9	1.2	7.5
2/10/2015	16:37:14	409	80.5	0.900	51.4	57.1	49.9	1.2	7.7
2/10/2015	16:39:14	409	82.1	0.901	52.4	58.2	49.9	1.2	7.8
2/10/2015	16:41:14	410	77.9	0.895	49.6	55.4	49.9	1.3	7.6
2/10/2015	16:43:14	412	82.3	0.900	52.9	58.7	50.1	1.2	8.1
2/10/2015	16:45:15	413	78.7	0.897	50.6	56.4	50.1	1.2	7.7
2/10/2015	16:47:16	414	79.7	0.897	51.3	57.2	50.2	1.2	8.1
2/10/2015	16:49:17	413	78.6	0.897	50.5	56.3	50.1	1.2	8.1
2/10/2015	16:51:18	413	79.0	0.899	50.8	56.5	50.0	1.2	8.0
2/10/2015	16:53:18	414	76.3	0.888	48.6	54.8	49.9	1.3	8.3
2/10/2015	16:55:18	414	76.0	0.889	48.4	54.4	49.9	1.2	8.2
2/10/2015	16:57:19	414	78.8	0.893	50.5	56.5	49.9	1.2	7.1
2/10/2015	16:59:19	415	74.7	0.887	47.6	53.7	49.9	1.2	7.4
2/10/2015	17:01:19	414	81.4	0.882	51.6	58.4	49.9	1.2	9.1
2/10/2015	17:03:20	415	75.9	0.885	48.3	54.6	49.8	1.1	9.2
2/10/2015	17:05:20	415	81.1	0.879	51.3	58.3	49.8	1.3	9.0
2/10/2015	17:07:20	415	70.5	0.884	44.8	50.7	49.9	1.2	9.1
2/10/2015	17:09:21	414	86.0	0.885	54.7	61.8	49.9	1.3	9.3
2/10/2015	17:11:21	415	72.3	0.885	46.0	52.0	50.0	1.3	9.7
2/10/2015	17:13:22	416	71.0	0.878	45.0	51.2	50.0	1.2	9.3
2/10/2015	17:15:23	416	70.1	0.910	46.0	50.5	50.1	1.3	9.3
2/10/2015	17:17:24	418	65.2	0.899	42.4	47.2	50.0	1.3	9.9
2/10/2015	17:19:25	419	58.1	0.906	38.2	42.2	50.0	1.3	11.4
2/10/2015	17:21:26	419	56.5	0.898	36.9	41.1	50.0	1.3	11.5
2/10/2015	17:23:26	420	56.3	0.898	36.8	40.9	50.0	1.3	11.5
2/10/2015	17:25:27	421	55.7	0.896	36.4	40.7	50.1	1.3	11.8
2/10/2015	17:27:28	420	61.6	0.904	40.5	44.8	50.1	1.2	8.6
2/10/2015	17:29:29	420	63.3	0.909	41.8	46.1	50.2	1.2	8.6
2/10/2015	17:31:30	422	59.8	0.906	39.6	43.8	50.2	1.3	8.8
2/10/2015	17:33:31	423	58.4	0.905	38.7	42.7	50.1	1.3	8.9
2/10/2015	17:35:32	424	58.1	0.905	38.6	42.7	50.0	1.3	8.6
2/10/2015	17:37:32	423	56.0	0.894	36.7	41.0	50.0	1.2	8.9
2/10/2015	17:39:32	422	56.9	0.902	37.5	41.6	50.0	1.4	9.8
2/10/2015	17:41:33	423	62.7	0.875	40.1	45.9	50.1	1.3	9.7
2/10/2015	17:43:34	419	68.7	0.898	44.9	49.9	50.1	1.4	12.5
2/10/2015	17:45:35	419	64.8	0.898	42.2	47.0	50.2	1.3	12.6
2/10/2015	17:47:36	418	59.1	0.883	37.8	42.7	50.1	1.3	11.5
2/10/2015	17:49:37	417	58.9	0.878	37.4	42.6	50.0	1.3	11.4
2/10/2015	17:51:37	417	59.4	0.879	37.7	42.9	49.9	1.3	11.2
2/10/2015	17:53:37	416	59.8	0.880	37.9	43.1	49.8	1.3	11.5
2/10/2015	17:55:38	414	60.0	0.878	37.8	43.1	49.8	1.3	11.2
2/10/2015	17:57:38	414	61.0	0.884	38.6	43.7	50.0	1.3	11.1
2/10/2015	17:59:39	413	60.2	0.883	38.0	43.0	50.1	1.3	11.2
2/10/2015	18:01:40	412	64.8	0.869	40.2	46.2	50.1	1.3	10.5

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2/10/2015	18:03:41	411	62.4	0.876	38.9	44.4	50.1	1.3	10.4
2/10/2015	18:05:42	408	74.0	0.874	45.7	52.2	50.1	1.3	8.2
2/10/2015	18:07:43	407	73.5	0.862	44.7	51.8	50.0	1.3	8.1
2/10/2015	18:09:43	408	63.5	0.879	39.4	44.8	49.9	1.3	10.7
2/10/2015	18:11:44	407	64.6	0.871	39.6	45.5	50.0	1.4	10.7
2/10/2015	18:13:45	410	64.5	0.874	40.0	45.8	50.0	1.3	10.8
2/10/2015	18:15:45	413	64.0	0.869	39.8	45.8	49.9	1.3	10.5
2/10/2015	18:17:45	414	60.5	0.892	38.7	43.4	49.9	1.3	9.3
2/10/2015	18:19:45	416	60.7	0.890	38.9	43.7	49.9	1.4	8.9
2/10/2015	18:21:45	417	55.4	0.885	35.4	40.0	50.0	1.4	11.6
2/10/2015	18:23:46	417	55.5	0.886	35.5	40.0	50.0	1.4	11.4
2/10/2015	18:25:47	416	54.9	0.883	34.9	39.6	50.0	1.4	11.0
2/10/2015	18:27:47	412	55.1	0.888	34.9	39.3	49.9	1.4	11.2
2/10/2015	18:29:47	411	60.7	0.891	38.5	43.2	49.9	1.5	10.8
2/10/2015	18:31:47	410	58.1	0.894	36.9	41.3	50.0	1.5	10.1
2/10/2015	18:33:47	410	52.4	0.883	32.9	37.2	50.0	1.4	11.1
2/10/2015	18:35:47	411	53.2	0.908	34.4	37.9	50.0	1.5	11.3
2/10/2015	18:37:48	410	55.9	0.909	36.0	39.6	50.0	1.5	11.4
2/10/2015	18:39:49	410	52.5	0.897	33.5	37.3	50.1	1.5	14.0
2/10/2015	18:41:50	412	44.2	0.927	29.2	31.5	50.0	1.6	17.0
2/10/2015	18:43:51	412	42.5	0.924	28.0	30.3	50.1	1.5	15.9
2/10/2015	18:45:52	412	42.0	0.927	27.8	30.0	50.1	1.5	16.2
2/10/2015	18:47:53	413	41.7	0.930	27.8	29.9	50.1	1.5	17.1
2/10/2015	18:49:54	414	40.3	0.929	26.8	28.9	50.1	1.5	18.4
2/10/2015	18:51:55	415	40.3	0.928	26.9	28.9	50.1	1.6	18.2
2/10/2015	18:53:56	415	40.2	0.928	26.9	28.9	50.1	1.5	18.6
2/10/2015	18:55:57	416	40.5	0.928	27.1	29.2	50.0	1.4	18.0
2/10/2015	18:57:59	416	41.4	0.927	27.7	29.9	50.0	1.5	17.5
2/10/2015	19:00:00	413	41.0	0.927	27.1	29.3	50.1	1.5	17.9
2/10/2015	19:02:01	414	40.8	0.926	27.1	29.3	50.0	1.5	17.2
2/10/2015	19:04:02	413	41.9	0.917	27.5	30.0	50.1	1.6	17.8
2/10/2015	19:06:03	414	41.7	0.919	27.4	29.9	50.1	1.5	17.5
2/10/2015	19:08:04	414	43.3	0.921	28.6	31.1	50.1	1.6	16.5
2/10/2015	19:10:05	415	41.5	0.922	27.5	29.8	50.1	1.6	17.0
2/10/2015	19:12:06	415	41.7	0.923	27.6	29.9	50.1	1.6	16.7
2/10/2015	19:14:07	414	48.4	0.926	32.1	34.7	50.0	1.6	11.0
2/10/2015	19:16:08	415	41.9	0.921	27.7	30.1	50.0	1.6	17.7
2/10/2015	19:18:09	415	42.5	0.918	28.1	30.6	50.0	1.6	17.4
2/10/2015	19:20:10	415	42.5	0.923	28.3	30.6	50.1	1.6	17.5
2/10/2015	19:22:11	415	42.2	0.922	28.0	30.4	50.1	1.5	17.0
2/10/2015	19:24:12	416	41.7	0.924	27.7	30.0	50.2	1.6	17.6
2/10/2015	19:26:13	416	41.5	0.922	27.6	29.9	50.1	1.6	17.1
2/10/2015	19:28:14	416	41.5	0.922	27.5	29.9	50.0	1.7	17.6
2/10/2015	19:30:15	416	40.8	0.923	27.1	29.4	50.0	1.6	18.0
2/10/2015	19:32:15	417	39.6	0.923	26.4	28.6	50.0	1.7	18.6



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2/10/2015	19:34:15	417	37.0	0.913	24.4	26.8	50.0	1.7	20.2
2/10/2015	19:36:15	418	37.4	0.911	24.7	27.1	50.0	1.7	19.2
2/10/2015	19:38:17	418	37.4	0.909	24.6	27.1	50.1	1.7	19.4
2/10/2015	19:40:17	418	37.4	0.911	24.7	27.1	50.1	1.7	18.6
2/10/2015	19:42:18	419	37.4	0.911	24.7	27.1	50.1	1.6	19.6
2/10/2015	19:44:19	419	36.9	0.910	24.4	26.8	50.1	1.6	20.7
2/10/2015	19:46:20	419	38.7	0.908	25.5	28.1	50.0	1.7	21.3
2/10/2015	19:48:20	419	37.2	0.907	24.5	27.0	50.0	1.6	20.8
2/10/2015	19:50:21	419	37.0	0.907	24.4	26.9	49.9	1.7	19.9
2/10/2015	19:52:21	419	36.8	0.907	24.2	26.7	49.9	1.7	21.3
2/10/2015	19:54:21	419	36.7	0.906	24.2	26.7	50.0	1.7	21.7
2/10/2015	19:56:22	416	36.7	0.909	24.1	26.5	50.1	2.0	19.3
2/10/2015	19:58:23	416	36.8	0.906	24.0	26.5	50.1	1.9	21.0
2/10/2015	20:00:24	417	37.0	0.905	24.2	26.7	50.1	1.9	19.3
2/10/2015	20:02:25	417	37.4	0.908	24.6	27.0	50.1	1.9	19.6
2/10/2015	20:04:26	418	37.3	0.908	24.5	27.0	50.1	1.9	20.0
2/10/2015	20:06:27	418	37.0	0.906	24.2	26.8	50.1	1.9	21.2
2/10/2015	20:08:28	418	36.9	0.908	24.3	26.8	50.1	1.9	21.2
2/10/2015	20:10:29	418	35.8	0.913	23.7	26.0	50.1	1.8	20.7
2/10/2015	20:12:30	419	35.8	0.913	23.7	26.0	50.1	1.9	19.7
2/10/2015	20:14:31	419	35.6	0.912	23.6	25.8	50.0	1.9	20.1
2/10/2015	20:16:32	419	35.4	0.912	23.4	25.7	50.0	1.9	20.9
2/10/2015	20:18:33	419	35.5	0.913	23.5	25.7	50.1	1.9	20.8
2/10/2015	20:20:34	420	35.5	0.913	23.5	25.8	50.1	1.9	20.5
2/10/2015	20:22:35	419	35.7	0.910	23.6	25.9	50.1	2.0	21.2
2/10/2015	20:24:36	419	36.9	0.912	24.5	26.8	50.1	1.9	20.8
2/10/2015	20:26:37	419	38.1	0.917	25.4	27.7	50.1	2.0	19.0
2/10/2015	20:28:38	420	35.3	0.911	23.4	25.7	50.1	2.0	20.5
2/10/2015	20:30:39	420	35.1	0.913	23.3	25.5	50.0	2.0	20.2
2/10/2015	20:32:39	420	34.7	0.915	23.1	25.3	50.0	1.7	21.8
2/10/2015	20:34:40	421	34.8	0.915	23.2	25.4	50.0	1.8	21.0
2/10/2015	20:36:41	421	34.8	0.915	23.2	25.4	50.0	1.9	20.5
2/10/2015	20:38:43	421	35.1	0.910	23.3	25.6	50.0	1.7	21.9
2/10/2015	20:40:44	422	35.3	0.909	23.4	25.8	50.1	1.7	21.8
2/10/2015	20:42:45	421	35.4	0.908	23.5	25.9	50.1	1.7	21.8
2/10/2015	20:44:46	422	35.8	0.909	23.8	26.2	50.1	1.8	20.5
2/10/2015	20:46:47	422	35.3	0.907	23.4	25.8	50.0	1.8	21.2
2/10/2015	20:48:47	422	35.6	0.905	23.5	26.0	49.9	1.8	21.2
2/10/2015	20:50:47	422	35.1	0.909	23.3	25.7	49.9	1.9	22.5
2/10/2015	20:52:47	422	34.5	0.904	22.8	25.2	50.0	1.8	22.7
2/10/2015	20:54:47	423	34.6	0.904	22.9	25.3	50.1	1.9	21.0
2/10/2015	20:56:48	423	41.0	0.910	27.3	30.0	50.1	1.8	11.1
2/10/2015	20:58:49	423	34.4	0.908	22.9	25.3	50.0	1.8	20.8
2/10/2015	21:00:51	424	41.2	0.910	27.5	30.2	50.0	1.9	11.6
2/10/2015	21:02:52	424	34.6	0.905	23.0	25.4	50.0	1.8	20.7

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2/10/2015	21:04:53	424	34.6	0.905	23.0	25.4	50.0	1.8	19.7
2/10/2015	21:06:54	424	34.9	0.906	23.3	25.7	50.1	1.8	19.7
2/10/2015	21:08:55	424	34.6	0.905	23.1	25.5	50.1	1.8	20.3
2/10/2015	21:10:56	425	34.3	0.909	23.0	25.3	50.1	1.7	20.6
2/10/2015	21:12:57	425	34.5	0.908	23.1	25.4	50.1	1.9	20.4
2/10/2015	21:14:58	425	34.1	0.908	22.8	25.1	50.0	1.9	21.2
2/10/2015	21:16:58	425	34.3	0.907	22.9	25.3	49.9	1.9	20.9
2/10/2015	21:18:58	425	33.6	0.908	22.5	24.7	49.9	1.9	20.5
2/10/2015	21:20:58	425	34.1	0.905	22.7	25.1	50.0	1.9	20.7
2/10/2015	21:22:59	425	34.8	0.906	23.2	25.6	50.1	1.9	19.9
2/10/2015	21:25:00	425	34.5	0.905	23.0	25.4	50.1	1.8	20.7
2/10/2015	21:27:01	425	34.9	0.906	23.3	25.7	50.1	1.8	20.7
2/10/2015	21:29:02	425	34.6	0.903	23.0	25.5	50.1	1.8	21.8
2/10/2015	21:31:03	426	34.2	0.905	22.8	25.2	50.1	1.8	20.7
2/10/2015	21:33:04	427	34.6	0.905	23.1	25.6	50.1	1.9	19.7
2/10/2015	21:35:05	427	34.4	0.904	23.0	25.5	50.1	1.8	21.0
2/10/2015	21:37:06	427	34.3	0.905	23.0	25.4	50.2	1.8	20.4
2/10/2015	21:39:07	427	34.5	0.905	23.1	25.6	50.2	1.9	21.1
2/10/2015	21:41:08	427	34.7	0.902	23.2	25.7	50.2	1.9	21.2
2/10/2015	21:43:08	427	34.4	0.901	22.9	25.5	50.1	1.9	21.7
2/10/2015	21:45:09	427	34.3	0.901	22.8	25.3	50.0	1.8	20.7
2/10/2015	21:47:09	425	33.9	0.904	22.6	25.0	49.9	1.8	21.3
2/10/2015	21:49:10	424	33.9	0.904	22.5	24.9	49.9	1.8	21.5
2/10/2015	21:51:10	425	35.8	0.904	23.9	26.4	49.9	1.9	20.9
2/10/2015	21:53:10	425	33.9	0.906	22.7	25.0	49.9	2.0	19.7
2/10/2015	21:55:11	425	34.2	0.908	22.9	25.2	49.9	2.0	19.4
2/10/2015	21:57:11	426	33.5	0.910	22.5	24.7	49.9	1.9	20.4
2/10/2015	21:59:11	426	33.5	0.913	22.6	24.8	50.0	1.9	19.2
2/10/2015	22:01:11	426	33.6	0.909	22.5	24.8	50.0	1.7	20.2
2/10/2015	22:03:11	426	33.1	0.907	22.2	24.4	50.0	1.8	21.1
2/10/2015	22:05:11	423	165.3	0.890	107.4	120.7	49.9	1.9	1.7
2/10/2015	22:07:11	426	32.3	0.919	21.9	23.8	50.0	1.9	20.0
2/10/2015	22:09:12	426	32.0	0.916	21.7	23.7	50.0	1.8	20.3
2/10/2015	22:11:14	427	32.1	0.916	21.8	23.8	50.0	1.9	21.4
2/10/2015	22:13:15	427	32.8	0.909	22.1	24.3	50.0	1.8	21.1
2/10/2015	22:15:15	428	31.6	0.914	21.4	23.5	50.0	1.9	21.5
2/10/2015	22:17:15	427	30.7	0.932	21.1	22.7	49.9	1.9	20.4
2/10/2015	22:19:15	426	30.4	0.934	21.0	22.5	49.9	1.9	21.9
2/10/2015	22:21:15	427	31.0	0.930	21.3	22.9	50.0	1.9	20.0
2/10/2015	22:23:15	427	31.5	0.911	21.3	23.3	50.0	2.0	22.2
2/10/2015	22:25:16	427	32.4	0.906	21.7	24.0	50.0	2.0	21.1
2/10/2015	22:27:17	427	32.3	0.905	21.6	23.9	50.0	2.0	22.0
2/10/2015	22:29:17	427	32.4	0.907	21.7	24.0	50.0	2.0	21.1
2/10/2015	22:31:18	427	32.8	0.902	21.8	24.2	50.0	2.0	21.0
2/10/2015	22:33:18	426	32.3	0.906	21.6	23.8	50.0	1.9	21.7

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2/10/2015	22:35:19	428	32.3	0.906	21.7	24.0	50.0	1.9	21.6
2/10/2015	22:37:20	428	33.7	0.908	22.7	25.0	50.1	1.8	20.8
2/10/2015	22:39:21	429	32.1	0.906	21.6	23.9	50.1	1.8	20.9
2/10/2015	22:41:22	430	32.1	0.905	21.6	23.9	50.1	1.8	21.3
2/10/2015	22:43:23	430	32.2	0.907	21.8	24.0	50.0	1.9	21.8
2/10/2015	22:45:24	430	31.9	0.900	21.4	23.8	50.0	1.8	22.7
2/10/2015	22:47:25	430	31.5	0.898	21.1	23.5	50.1	1.8	22.8
2/10/2015	22:49:26	430	31.7	0.899	21.2	23.6	50.1	1.7	22.9
2/10/2015	22:51:27	430	31.7	0.895	21.1	23.6	50.0	1.8	22.4
2/10/2015	22:53:28	429	31.2	0.901	20.9	23.2	50.0	1.8	22.0
2/10/2015	22:55:29	430	31.2	0.901	21.0	23.3	50.1	1.7	21.7
2/10/2015	22:57:30	430	31.1	0.900	20.9	23.2	50.0	1.8	21.8
2/10/2015	22:59:32	429	31.0	0.902	20.8	23.0	50.0	1.7	22.9
2/10/2015	23:01:33	430	31.2	0.900	20.9	23.2	50.0	1.8	22.0
2/10/2015	23:03:34	429	31.5	0.898	21.1	23.5	50.1	1.9	22.4
2/10/2015	23:05:35	430	33.9	0.895	22.6	25.3	50.1	1.8	22.1
2/10/2015	23:07:36	430	31.9	0.893	21.3	23.8	50.1	1.8	21.7
2/10/2015	23:09:37	431	32.2	0.894	21.5	24.0	50.1	1.9	22.7
2/10/2015	23:11:38	431	31.7	0.892	21.1	23.7	50.1	1.8	23.2
2/10/2015	23:13:38	431	31.3	0.896	21.0	23.4	50.1	1.8	21.7
2/10/2015	23:15:40	431	31.2	0.896	20.8	23.3	50.0	1.8	24.2
2/10/2015	23:17:40	431	31.4	0.895	21.0	23.5	50.0	1.8	24.0
2/10/2015	23:19:41	430	31.3	0.897	20.9	23.4	50.0	1.7	22.2
2/10/2015	23:21:42	431	31.3	0.896	20.9	23.4	50.1	1.6	23.7
2/10/2015	23:23:43	431	32.0	0.894	21.4	23.9	50.1	1.7	23.7
2/10/2015	23:25:44	432	31.2	0.896	20.9	23.4	50.1	1.6	23.4
2/10/2015	23:27:45	432	31.6	0.898	21.2	23.6	50.1	1.5	22.4
2/10/2015	23:29:46	431	31.2	0.897	20.9	23.3	50.1	1.4	22.9
2/10/2015	23:31:47	431	31.5	0.897	21.1	23.5	50.1	1.4	23.6
2/10/2015	23:33:47	430	31.0	0.904	20.9	23.1	50.2	1.4	23.6
2/10/2015	23:35:48	430	31.2	0.903	21.0	23.3	50.2	1.4	22.0
2/10/2015	23:37:49	430	31.0	0.907	21.0	23.1	50.2	1.3	21.2
2/10/2015	23:39:50	431	31.0	0.907	21.0	23.1	50.2	1.3	21.1
2/10/2015	23:41:50	431	30.8	0.907	20.9	23.0	50.2	1.2	22.4
2/10/2015	23:43:51	430	31.2	0.904	21.0	23.3	50.2	1.1	21.9
2/10/2015	23:45:52	430	31.2	0.904	21.0	23.3	50.1	1.2	22.4
2/10/2015	23:47:53	429	31.1	0.904	20.9	23.1	50.0	1.2	22.0
2/10/2015	23:49:54	429	31.3	0.904	21.0	23.2	50.0	1.2	21.6
2/10/2015	23:51:54	427	30.9	0.903	20.6	22.9	50.0	1.2	22.7
2/10/2015	23:53:54	426	31.0	0.904	20.7	22.9	50.0	1.2	22.1
2/10/2015	23:55:54	427	30.9	0.905	20.7	22.9	50.0	1.2	22.8
2/10/2015	23:57:55	426	30.8	0.906	20.6	22.7	50.0	1.2	22.6
2/10/2015	23:59:56	426	30.7	0.907	20.5	22.6	50.0	1.1	23.5
2/11/2015	0:01:58	426	30.6	0.905	20.4	22.6	50.0	1.1	22.2
2/11/2015	0:03:59	426	30.7	0.901	20.4	22.7	50.0	1.1	23.1

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2/11/2015	0:06:00	426	30.8	0.902	20.5	22.7	50.0	1.1	24.2
2/11/2015	0:08:00	425	31.0	0.901	20.5	22.8	50.0	1.2	23.6
2/11/2015	0:10:00	424	31.2	0.900	20.6	22.9	50.0	1.1	21.8
2/11/2015	0:12:01	424	31.5	0.900	20.8	23.1	50.0	1.1	21.9
2/11/2015	0:14:02	424	31.0	0.902	20.6	22.8	50.0	1.1	24.7
2/11/2015	0:16:02	422	30.3	0.907	20.1	22.2	49.9	1.0	23.9
2/11/2015	0:18:02	422	30.5	0.906	20.2	22.3	50.0	1.2	23.7
2/11/2015	0:20:02	422	30.5	0.906	20.2	22.3	50.0	1.1	23.4
2/11/2015	0:22:02	422	30.6	0.908	20.3	22.4	50.0	1.0	24.6
2/11/2015	0:24:04	422	30.7	0.906	20.3	22.4	50.0	1.1	22.9
2/11/2015	0:26:05	422	30.9	0.905	20.4	22.6	50.0	1.1	22.8
2/11/2015	0:28:06	422	30.9	0.903	20.4	22.6	50.0	1.0	21.9
2/11/2015	0:30:06	422	31.6	0.903	20.9	23.1	50.0	1.1	21.9
2/11/2015	0:32:06	423	32.5	0.903	21.5	23.8	49.9	1.0	23.1
2/11/2015	0:34:06	422	31.1	0.910	20.7	22.8	50.0	0.9	22.2
2/11/2015	0:36:06	422	30.3	0.914	20.2	22.2	50.0	1.0	22.7
2/11/2015	0:38:07	422	30.3	0.914	20.2	22.1	50.0	0.9	22.4
2/11/2015	0:40:08	422	30.3	0.915	20.2	22.1	50.1	0.9	22.8
2/11/2015	0:42:09	422	30.1	0.914	20.2	22.1	50.1	0.9	23.4
2/11/2015	0:44:10	422	30.5	0.910	20.3	22.3	50.1	0.9	24.0
2/11/2015	0:46:11	422	31.0	0.906	20.6	22.7	50.1	0.9	22.7
2/11/2015	0:48:12	422	31.2	0.910	20.8	22.8	50.0	1.0	22.4
2/11/2015	0:50:13	422	31.1	0.906	20.6	22.7	50.0	0.9	23.5
2/11/2015	0:52:15	422	31.3	0.906	20.7	22.9	50.0	1.0	22.5
2/11/2015	0:54:16	421	31.2	0.908	20.7	22.7	50.0	0.9	23.8
2/11/2015	0:56:17	421	30.5	0.909	20.3	22.3	50.0	0.9	23.4
2/11/2015	0:58:17	421	30.4	0.908	20.1	22.2	50.0	1.0	24.5
2/11/2015	1:00:17	422	30.7	0.912	20.4	22.4	50.0	0.9	23.3
2/11/2015	1:02:17	421	31.8	0.910	21.2	23.3	50.0	0.9	23.8
2/11/2015	1:04:17	421	30.5	0.907	20.2	22.3	49.9	1.0	24.8
2/11/2015	1:06:17	421	30.7	0.905	20.3	22.4	49.9	1.0	23.9
2/11/2015	1:08:17	421	31.0	0.906	20.5	22.6	50.0	1.0	22.3
2/11/2015	1:10:18	421	31.1	0.904	20.5	22.7	50.0	1.0	22.8
2/11/2015	1:12:18	422	30.8	0.904	20.3	22.5	50.0	1.0	24.2
2/11/2015	1:14:18	422	31.1	0.904	20.6	22.8	49.9	0.9	22.7
2/11/2015	1:16:18	422	30.8	0.902	20.3	22.5	49.9	0.9	22.6
2/11/2015	1:18:18	422	30.4	0.906	20.1	22.2	49.9	1.0	22.7
2/11/2015	1:20:18	421	30.5	0.907	20.2	22.3	49.9	1.1	23.0
2/11/2015	1:22:18	421	30.5	0.906	20.2	22.3	49.9	0.9	22.5
2/11/2015	1:24:18	421	30.7	0.908	20.3	22.4	50.0	1.0	22.9
2/11/2015	1:26:20	422	30.6	0.905	20.3	22.4	50.0	1.0	23.5
2/11/2015	1:28:21	422	30.8	0.904	20.3	22.5	50.0	1.0	23.8
2/11/2015	1:30:22	422	30.8	0.903	20.3	22.5	50.0	1.0	22.7
2/11/2015	1:32:23	422	31.0	0.901	20.4	22.6	50.0	0.9	23.7
2/11/2015	1:34:24	422	31.1	0.899	20.4	22.7	50.0	1.1	22.4



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2/11/2015	1:36:25	422	31.4	0.902	20.7	23.0	50.1	1.0	22.3
2/11/2015	1:38:26	422	31.1	0.904	20.5	22.7	50.1	1.0	23.2
2/11/2015	1:40:27	423	31.1	0.903	20.5	22.7	50.0	1.1	23.3
2/11/2015	1:42:28	422	30.9	0.903	20.4	22.6	50.1	1.0	23.3
2/11/2015	1:44:29	423	31.0	0.902	20.5	22.7	50.1	1.0	23.6
2/11/2015	1:46:30	422	31.3	0.900	20.6	22.9	50.0	1.0	23.5
2/11/2015	1:48:32	423	31.4	0.899	20.6	23.0	50.0	0.9	24.5
2/11/2015	1:50:32	422	31.3	0.898	20.5	22.9	49.9	1.0	24.5
2/11/2015	1:52:32	422	30.9	0.902	20.3	22.6	49.9	0.9	24.3
2/11/2015	1:54:32	422	30.9	0.903	20.4	22.5	50.0	0.9	24.6
2/11/2015	1:56:32	422	30.5	0.903	20.2	22.4	50.0	1.0	22.6
2/11/2015	1:58:33	423	30.7	0.907	20.4	22.5	50.0	0.9	22.6
2/11/2015	2:00:33	423	30.2	0.907	20.1	22.1	50.0	0.9	24.0
2/11/2015	2:02:33	423	30.4	0.904	20.2	22.3	50.0	1.1	23.2
2/11/2015	2:04:33	423	30.3	0.905	20.1	22.2	49.9	1.3	24.2
2/11/2015	2:06:34	422	30.6	0.905	20.3	22.4	49.9	1.2	22.4
2/11/2015	2:08:34	423	30.9	0.902	20.4	22.6	50.0	1.2	22.3
2/11/2015	2:10:35	422	30.8	0.904	20.4	22.5	50.0	1.1	22.7
2/11/2015	2:12:36	423	30.9	0.902	20.4	22.7	50.0	1.1	22.9
2/11/2015	2:14:36	423	30.8	0.902	20.3	22.6	50.0	1.2	22.5
2/11/2015	2:16:36	422	30.8	0.901	20.3	22.5	49.9	1.1	23.0
2/11/2015	2:18:36	422	30.3	0.906	20.1	22.1	49.9	1.1	22.9
2/11/2015	2:20:36	422	31.1	0.905	20.6	22.7	49.9	1.0	22.6
2/11/2015	2:22:37	422	31.5	0.906	20.8	23.0	49.9	1.0	23.2
2/11/2015	2:24:37	422	31.1	0.902	20.5	22.7	49.9	1.1	21.7
2/11/2015	2:26:37	422	30.8	0.904	20.3	22.5	50.0	1.0	23.3
2/11/2015	2:28:38	422	31.5	0.904	20.8	23.0	50.0	1.1	23.5
2/11/2015	2:30:39	422	31.2	0.900	20.5	22.8	50.0	1.1	23.3
2/11/2015	2:32:40	423	31.5	0.897	20.8	23.1	50.0	1.3	23.3
2/11/2015	2:34:42	424	31.3	0.897	20.7	23.0	50.0	1.2	23.7
2/11/2015	2:36:43	424	31.1	0.898	20.6	22.9	50.0	1.2	23.6
2/11/2015	2:38:43	424	31.4	0.900	20.7	23.0	50.0	1.2	22.7
2/11/2015	2:40:44	425	30.5	0.904	20.3	22.5	50.1	1.2	22.9
2/11/2015	2:42:45	425	30.7	0.906	20.5	22.6	50.1	1.1	22.5
2/11/2015	2:44:46	426	30.4	0.906	20.3	22.5	50.2	1.1	23.8
2/11/2015	2:46:47	425	30.4	0.906	20.3	22.4	50.1	1.2	24.4
2/11/2015	2:48:48	424	30.9	0.902	20.5	22.7	50.0	1.1	24.5
2/11/2015	2:50:49	424	30.6	0.902	20.3	22.5	50.0	1.1	24.1
2/11/2015	2:52:49	424	30.5	0.902	20.2	22.5	50.0	1.1	23.5
2/11/2015	2:54:49	424	31.1	0.901	20.6	22.8	49.9	1.1	23.5
2/11/2015	2:56:49	423	31.1	0.900	20.6	22.8	49.9	1.1	21.8
2/11/2015	2:58:50	424	30.8	0.904	20.5	22.6	49.9	1.1	22.0
2/11/2015	3:00:50	424	30.6	0.905	20.4	22.5	50.0	1.1	23.0
2/11/2015	3:02:50	425	30.5	0.905	20.3	22.4	50.0	1.0	24.1
2/11/2015	3:04:50	425	30.6	0.905	20.4	22.5	50.0	1.1	23.1

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2/11/2015	3:06:50	425	30.9	0.904	20.6	22.7	50.0	1.1	22.6
2/11/2015	3:08:51	424	31.7	0.903	21.0	23.3	50.0	1.1	21.1
2/11/2015	3:10:52	424	31.5	0.898	20.8	23.2	50.1	1.1	22.5
2/11/2015	3:12:53	425	31.8	0.898	21.1	23.5	50.1	1.1	21.3
2/11/2015	3:14:54	426	31.5	0.897	20.8	23.3	50.1	1.1	22.8
2/11/2015	3:16:55	426	31.5	0.897	20.9	23.3	50.1	1.0	24.3
2/11/2015	3:18:56	426	31.2	0.899	20.7	23.0	50.1	1.0	22.4
2/11/2015	3:20:57	426	31.1	0.899	20.7	23.0	50.0	1.0	22.4
2/11/2015	3:22:57	426	30.7	0.898	20.3	22.6	50.0	1.0	23.7
2/11/2015	3:24:57	427	31.1	0.897	20.6	23.0	50.0	1.0	22.4
2/11/2015	3:26:57	426	30.6	0.903	20.4	22.6	50.0	1.1	22.3
2/11/2015	3:28:57	426	30.7	0.904	20.5	22.7	50.0	1.0	24.1
2/11/2015	3:30:57	426	30.7	0.903	20.4	22.6	50.0	1.0	23.1
2/11/2015	3:32:57	427	30.6	0.902	20.4	22.6	50.0	1.1	24.3
2/11/2015	3:34:59	427	30.7	0.906	20.6	22.7	50.0	1.0	22.5
2/11/2015	3:37:00	427	30.6	0.903	20.4	22.6	50.0	1.1	23.4
2/11/2015	3:39:01	427	30.3	0.910	20.4	22.4	50.0	1.0	23.0
2/11/2015	3:41:02	427	30.3	0.908	20.3	22.4	50.1	1.0	23.0
2/11/2015	3:43:03	426	30.0	0.910	20.2	22.2	50.1	1.0	23.8
2/11/2015	3:45:04	426	30.1	0.910	20.2	22.2	50.1	1.0	24.6
2/11/2015	3:47:05	427	30.4	0.908	20.4	22.5	50.1	1.0	23.2
2/11/2015	3:49:06	426	30.7	0.905	20.5	22.7	50.1	1.1	22.7
2/11/2015	3:51:07	426	30.9	0.904	20.6	22.8	50.1	1.0	23.5
2/11/2015	3:53:08	427	30.7	0.904	20.5	22.7	50.0	1.0	22.3
2/11/2015	3:55:09	426	31.2	0.903	20.8	23.0	50.0	1.0	22.1
2/11/2015	3:57:09	425	30.9	0.905	20.6	22.8	50.0	1.1	22.8
2/11/2015	3:59:09	425	30.9	0.905	20.6	22.8	50.0	0.9	22.8
2/11/2015	4:01:10	426	31.2	0.900	20.7	23.0	50.0	1.1	22.5
2/11/2015	4:03:11	425	31.3	0.898	20.7	23.0	50.0	1.0	22.8
2/11/2015	4:05:13	425	33.6	0.905	22.4	24.7	50.0	0.9	22.4
2/11/2015	4:07:13	425	31.2	0.899	20.6	23.0	50.0	1.0	25.2
2/11/2015	4:09:13	425	31.9	0.898	21.1	23.5	50.0	1.0	22.9
2/11/2015	4:11:13	425	31.7	0.896	20.9	23.3	50.0	1.0	23.5
2/11/2015	4:13:13	424	31.3	0.896	20.6	23.0	50.0	1.1	24.2
2/11/2015	4:15:13	425	31.3	0.896	20.6	23.0	50.0	1.0	24.8
2/11/2015	4:17:13	425	32.3	0.900	21.4	23.8	50.0	1.0	25.5
2/11/2015	4:19:13	425	30.9	0.902	20.5	22.7	50.0	1.0	25.1
2/11/2015	4:21:13	425	30.6	0.903	20.4	22.5	50.0	1.0	25.1
2/11/2015	4:23:13	426	30.5	0.903	20.3	22.5	50.0	1.1	24.9
2/11/2015	4:25:14	425	30.6	0.903	20.3	22.5	50.0	0.9	24.1
2/11/2015	4:27:15	425	31.2	0.899	20.6	23.0	50.0	1.0	23.1
2/11/2015	4:29:16	425	31.6	0.898	20.9	23.3	50.0	1.0	23.7
2/11/2015	4:31:16	425	31.3	0.898	20.7	23.1	49.9	1.0	25.5
2/11/2015	4:33:17	424	31.0	0.900	20.5	22.8	49.9	1.0	24.3
2/11/2015	4:35:17	423	31.4	0.899	20.7	23.0	49.9	1.0	23.5

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2/11/2015	4:37:17	424	30.7	0.904	20.4	22.6	50.0	0.9	24.3
2/11/2015	4:39:17	424	31.3	0.906	20.8	22.9	50.0	1.0	21.7
2/11/2015	4:41:18	424	30.9	0.903	20.5	22.7	50.1	0.9	23.0
2/11/2015	4:43:19	424	31.3	0.906	20.9	23.0	50.1	1.0	23.1
2/11/2015	4:45:20	425	30.9	0.905	20.6	22.8	50.2	1.0	23.6
2/11/2015	4:47:21	425	31.5	0.898	20.8	23.2	50.1	0.9	24.3
2/11/2015	4:49:22	424	31.4	0.897	20.7	23.1	50.1	0.9	24.6
2/11/2015	4:51:23	424	31.5	0.897	20.7	23.1	50.1	1.0	24.1
2/11/2015	4:53:24	424	31.5	0.895	20.7	23.1	50.0	1.0	23.6
2/11/2015	4:55:24	423	31.2	0.898	20.5	22.8	50.0	1.0	23.8
2/11/2015	4:57:24	423	31.3	0.900	20.6	22.9	50.0	0.9	22.6
2/11/2015	4:59:24	423	31.5	0.905	20.9	23.1	50.0	0.9	23.2
2/11/2015	5:01:25	423	31.2	0.901	20.6	22.9	50.0	0.9	23.3
2/11/2015	5:03:25	422	30.5	0.905	20.2	22.3	50.0	1.0	24.5
2/11/2015	5:05:26	422	30.6	0.904	20.2	22.3	50.0	1.0	25.0
2/11/2015	5:07:26	421	30.4	0.905	20.1	22.2	50.0	0.9	23.5
2/11/2015	5:09:26	421	30.8	0.909	20.4	22.5	50.0	1.0	23.1
2/11/2015	5:11:27	421	30.6	0.908	20.2	22.3	50.0	0.9	24.3
2/11/2015	5:13:28	420	31.0	0.909	20.5	22.6	50.1	0.9	22.5
2/11/2015	5:15:29	420	30.9	0.912	20.5	22.5	50.1	0.9	24.1
2/11/2015	5:17:30	420	30.1	0.912	20.0	21.9	50.1	0.9	25.8
2/11/2015	5:19:31	420	30.2	0.911	20.0	22.0	50.0	0.9	25.7
2/11/2015	5:21:31	420	30.0	0.911	19.9	21.8	49.9	0.8	24.5
2/11/2015	5:23:31	418	30.0	0.912	19.8	21.7	49.9	1.0	24.4
2/11/2015	5:25:31	418	30.5	0.908	20.1	22.1	49.9	1.0	23.9
2/11/2015	5:27:32	418	30.5	0.908	20.0	22.0	49.9	0.9	24.7
2/11/2015	5:29:32	418	30.8	0.907	20.3	22.3	50.0	0.9	22.0
2/11/2015	5:31:33	418	31.1	0.904	20.4	22.5	50.0	0.9	20.5
2/11/2015	5:33:34	417	31.0	0.904	20.3	22.4	50.0	0.9	21.8
2/11/2015	5:35:34	418	30.5	0.908	20.0	22.1	49.9	0.9	22.5
2/11/2015	5:37:34	417	31.1	0.900	20.2	22.5	49.9	0.9	22.5
2/11/2015	5:39:35	417	31.4	0.901	20.5	22.7	49.9	0.9	20.4
2/11/2015	5:41:36	418	31.2	0.901	20.3	22.6	50.1	0.9	21.9
2/11/2015	5:43:37	419	31.5	0.903	20.6	22.8	50.3	0.9	21.4
2/11/2015	5:45:37	420	31.8	0.898	20.8	23.1	50.3	0.9	21.2
2/11/2015	5:47:38	421	31.7	0.896	20.7	23.1	50.1	0.9	23.1
2/11/2015	5:49:39	422	31.9	0.893	20.8	23.3	50.0	0.9	21.8
2/11/2015	5:51:39	421	31.9	0.892	20.8	23.3	49.9	0.8	21.9
2/11/2015	5:53:39	421	31.7	0.893	20.6	23.1	49.9	0.9	22.9
2/11/2015	5:55:39	420	29.3	0.902	19.3	21.4	49.9	0.9	22.7
2/11/2015	5:57:39	419	29.4	0.909	19.4	21.4	50.0	0.9	22.8
2/11/2015	5:59:40	418	28.6	0.909	18.8	20.7	50.1	0.8	24.2
2/11/2015	6:01:41	419	28.4	0.904	18.6	20.6	50.1	0.8	24.0
2/11/2015	6:03:43	419	27.6	0.907	18.2	20.0	50.0	0.9	24.3
2/11/2015	6:05:43	418	26.9	0.908	17.7	19.5	50.0	0.8	24.4

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2/11/2015	6:07:43	418	25.3	0.919	16.9	18.3	49.9	0.8	24.4
2/11/2015	6:09:43	418	23.7	0.939	16.1	17.2	50.0	0.9	22.3
2/11/2015	6:11:43	418	23.2	0.935	15.6	16.7	50.0	0.8	24.4
2/11/2015	6:13:44	417	22.2	0.943	15.1	16.0	50.0	0.9	22.8
2/11/2015	6:15:45	416	20.7	0.936	13.9	14.9	50.0	0.9	25.8
2/11/2015	6:17:46	416	21.1	0.939	14.3	15.2	50.0	0.9	23.2
2/11/2015	6:19:46	416	20.6	0.937	13.9	14.8	49.9	0.8	26.0
2/11/2015	6:21:47	415	20.7	0.937	13.9	14.9	49.9	0.8	25.2
2/11/2015	6:23:47	414	21.2	0.931	14.1	15.2	49.9	0.8	25.7
2/11/2015	6:25:47	415	21.4	0.926	14.2	15.4	49.9	0.8	27.0
2/11/2015	6:27:47	413	21.7	0.929	14.5	15.5	50.1	0.8	25.1
2/11/2015	6:29:48	413	22.1	0.927	14.7	15.9	50.1	0.7	25.1
2/11/2015	6:31:49	412	22.5	0.929	14.9	16.0	50.1	0.8	24.5
2/11/2015	6:33:50	412	25.4	0.959	17.4	18.1	50.0	0.9	19.0
2/11/2015	6:35:50	412	25.2	0.961	17.3	18.0	50.0	0.8	19.7
2/11/2015	6:37:51	412	25.3	0.962	17.3	18.0	49.9	0.8	19.8
2/11/2015	6:39:51	411	25.3	0.963	17.3	18.0	50.0	0.7	19.3
2/11/2015	6:41:52	410	25.3	0.963	17.3	17.9	50.1	0.9	18.8
2/11/2015	6:43:53	409	25.5	0.966	17.5	18.1	50.2	0.8	19.2
2/11/2015	6:45:54	410	25.0	0.963	17.1	17.8	50.2	0.8	20.6
2/11/2015	6:47:54	409	26.3	0.958	17.9	18.7	50.2	0.9	18.9
2/11/2015	6:49:55	409	27.0	0.949	18.2	19.1	50.2	0.9	19.5
2/11/2015	6:51:56	410	27.3	0.947	18.4	19.4	50.1	0.8	18.9
2/11/2015	6:53:57	410	27.2	0.952	18.4	19.3	50.0	0.9	19.5
2/11/2015	6:55:57	409	27.0	0.956	18.3	19.1	49.9	1.0	19.4
2/11/2015	6:57:57	413	28.3	0.950	19.2	20.2	50.0	0.9	18.0
2/11/2015	6:59:57	413	29.4	0.951	20.0	21.0	49.9	0.9	17.9
2/11/2015	7:01:57	413	31.3	0.949	21.2	22.4	49.9	0.9	15.0
2/11/2015	7:03:58	411	32.9	0.957	22.5	23.5	49.9	0.9	17.4
2/11/2015	7:05:58	411	33.2	0.958	22.7	23.7	50.0	1.0	17.9
2/11/2015	7:07:58	410	36.4	0.961	24.9	25.9	50.0	1.0	17.6
2/11/2015	7:09:58	410	33.7	0.957	22.9	23.9	50.0	1.0	15.4
2/11/2015	7:11:58	410	35.9	0.961	24.5	25.5	49.9	1.0	14.5
2/11/2015	7:13:58	409	37.6	0.958	25.5	26.6	49.9	0.9	13.6
2/11/2015	7:15:59	410	37.7	0.953	25.5	26.7	49.8	0.9	13.1
2/11/2015	7:17:59	410	39.3	0.951	26.5	27.9	49.8	0.9	13.9
2/11/2015	7:20:00	409	38.0	0.954	25.7	26.9	49.8	0.9	13.3
2/11/2015	7:22:00	409	38.5	0.953	26.0	27.3	49.8	0.9	13.4
2/11/2015	7:24:01	408	38.0	0.952	25.6	26.9	49.8	0.9	13.4
2/11/2015	7:26:01	408	38.2	0.952	25.7	27.0	49.9	0.9	13.5
2/11/2015	7:28:02	409	38.0	0.952	25.7	27.0	49.9	0.9	13.8
2/11/2015	7:30:02	409	38.3	0.953	25.8	27.1	49.9	0.9	12.7
2/11/2015	7:32:02	408	37.7	0.954	25.4	26.7	49.9	1.0	13.3
2/11/2015	7:34:02	408	38.5	0.957	26.1	27.2	49.9	0.9	12.9
2/11/2015	7:36:03	408	38.6	0.957	26.1	27.3	49.9	0.9	13.0



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2/11/2015	7:38:03	409	38.5	0.955	26.1	27.3	49.9	0.9	13.4
2/11/2015	7:40:03	409	39.2	0.954	26.5	27.8	49.9	1.0	13.7
2/11/2015	7:42:03	409	39.4	0.953	26.6	27.9	49.9	0.9	13.3
2/11/2015	7:44:03	410	39.5	0.953	26.7	28.0	49.9	1.0	13.1
2/11/2015	7:46:04	409	40.0	0.954	27.1	28.4	49.9	0.9	13.5
2/11/2015	7:48:04	410	36.8	0.952	24.8	26.1	49.9	1.0	12.1
2/11/2015	7:50:04	411	47.6	0.936	31.7	33.9	49.9	0.8	9.4
2/11/2015	7:52:04	410	45.1	0.931	29.9	32.1	49.9	0.8	9.7
2/11/2015	7:54:05	410	45.6	0.928	30.1	32.4	49.9	0.9	10.1
2/11/2015	7:56:05	410	48.3	0.926	31.7	34.3	49.9	0.8	9.4
2/11/2015	7:58:05	410	46.0	0.915	29.8	32.6	49.9	0.8	9.8
2/11/2015	8:00:05	409	47.5	0.913	30.7	33.7	49.9	0.8	9.5
2/11/2015	8:02:06	408	48.1	0.912	31.0	34.0	49.9	0.9	9.2
2/11/2015	8:04:06	409	47.0	0.904	30.0	33.2	49.8	0.9	10.3
2/11/2015	8:06:07	408	47.1	0.905	30.1	33.3	49.8	0.9	10.3
2/11/2015	8:08:07	408	47.0	0.906	30.1	33.2	49.8	0.9	10.2
2/11/2015	8:10:07	407	46.4	0.910	29.8	32.7	49.8	0.9	10.2
2/11/2015	8:12:08	408	46.9	0.911	30.2	33.2	49.9	0.9	10.1
2/11/2015	8:14:08	409	52.3	0.928	34.3	37.0	49.9	0.9	9.7
2/11/2015	8:16:08	410	52.9	0.927	34.8	37.6	49.9	0.8	9.3
2/11/2015	8:18:08	409	52.3	0.924	34.2	37.0	49.9	0.9	9.7
2/11/2015	8:20:09	409	54.4	0.927	35.7	38.5	49.8	0.9	9.1
2/11/2015	8:22:09	407	50.1	0.925	32.7	35.3	49.8	0.9	8.2
2/11/2015	8:24:10	406	51.2	0.924	33.2	36.0	49.8	0.9	8.5
2/11/2015	8:26:10	405	50.4	0.926	32.7	35.3	49.8	0.9	8.8
2/11/2015	8:28:11	407	49.9	0.926	32.5	35.2	49.8	0.9	8.6
2/11/2015	8:30:11	408	48.4	0.929	31.8	34.2	49.9	1.0	8.8
2/11/2015	8:32:11	408	47.9	0.930	31.5	33.8	49.9	1.0	8.6
2/11/2015	8:34:11	407	48.5	0.934	31.9	34.2	50.0	1.0	8.8
2/11/2015	8:36:13	413	49.5	0.934	33.0	35.3	50.0	1.0	8.8
2/11/2015	8:38:14	413	50.2	0.931	33.4	35.9	50.0	1.0	8.7
2/11/2015	8:40:14	414	49.0	0.926	32.6	35.2	50.0	1.0	9.5
2/11/2015	8:42:15	414	49.4	0.922	32.7	35.4	50.1	0.9	9.1
2/11/2015	8:44:16	413	49.4	0.924	32.6	35.3	50.1	1.0	8.9
2/11/2015	8:46:17	413	50.2	0.926	33.2	35.9	50.0	1.0	9.0
2/11/2015	8:48:18	413	53.5	0.938	35.8	38.2	50.0	1.0	7.7
2/11/2015	8:50:18	413	51.8	0.928	34.4	37.1	49.9	1.1	9.3
2/11/2015	8:52:18	413	50.4	0.919	33.1	36.0	49.9	1.1	9.8
2/11/2015	8:54:18	412	50.4	0.918	33.0	35.9	50.0	1.1	9.7
2/11/2015	8:56:20	413	52.3	0.914	34.2	37.4	50.0	1.1	9.0
2/11/2015	8:58:20	412	52.1	0.915	34.0	37.2	49.9	1.1	9.0
2/11/2015	9:00:20	413	51.6	0.913	33.6	36.8	49.9	1.0	9.0
2/11/2015	9:02:20	412	51.8	0.915	33.8	37.0	49.8	1.1	8.8
2/11/2015	9:04:21	412	51.6	0.914	33.7	36.8	49.9	0.9	9.2
2/11/2015	9:06:21	412	51.6	0.919	33.8	36.8	50.0	1.2	8.9

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2/11/2015	9:08:21	412	51.2	0.918	33.5	36.5	50.0	1.0	9.1
2/11/2015	9:10:21	413	45.7	0.928	30.3	32.6	50.0	1.2	9.6
2/11/2015	9:12:21	414	46.2	0.927	30.7	33.1	50.0	1.1	9.4
2/11/2015	9:14:21	414	43.2	0.907	28.1	30.9	49.9	1.0	10.9
2/11/2015	9:16:21	414	42.1	0.908	27.5	30.2	49.9	1.1	10.9
2/11/2015	9:18:22	414	42.2	0.904	27.3	30.2	49.9	1.1	10.5
2/11/2015	9:20:22	413	42.0	0.906	27.2	30.1	50.0	1.1	10.8
2/11/2015	9:22:23	412	47.0	0.920	30.9	33.5	50.1	1.1	10.2
2/11/2015	9:24:24	411	45.2	0.921	29.6	32.1	50.1	1.1	10.8
2/11/2015	9:26:25	412	44.1	0.923	29.0	31.5	50.1	1.2	11.6
2/11/2015	9:28:26	416	45.2	0.923	30.0	32.5	50.1	1.2	12.0
2/11/2015	9:30:27	416	49.7	0.896	32.1	35.8	50.1	1.1	13.3
2/11/2015	9:32:28	418	51.4	0.902	33.6	37.2	50.1	1.1	13.2
2/11/2015	9:34:29	418	50.5	0.900	32.9	36.6	50.1	1.1	13.2
2/11/2015	9:36:30	419	50.7	0.895	33.0	36.8	50.0	1.2	13.8
2/11/2015	9:38:31	406	50.1	0.906	31.9	35.2	50.1	1.4	13.5
2/11/2015	9:40:32	407	51.0	0.903	32.4	35.9	50.1	1.5	13.7
2/11/2015	9:42:33	406	51.0	0.903	32.4	35.9	50.1	1.3	13.5
2/11/2015	9:44:34	406	51.2	0.904	32.5	36.0	50.1	1.4	12.9
2/11/2015	9:46:35	404	51.6	0.912	32.9	36.1	50.1	1.3	13.6
2/11/2015	9:48:36	397	51.0	0.916	32.1	35.0	50.0	1.2	13.8
2/11/2015	9:50:36	395	51.2	0.919	32.2	35.0	50.0	1.2	14.0
2/11/2015	9:52:36	392	69.4	0.902	42.5	47.1	50.0	1.3	9.9
2/11/2015	9:54:36	392	71.7	0.904	44.0	48.7	50.0	1.2	10.1
2/11/2015	9:56:36	392	72.1	0.904	44.3	49.0	50.0	1.2	9.8
2/11/2015	9:58:38	391	72.8	0.910	44.8	49.2	50.0	1.2	10.1
2/11/2015	10:00:38	390	72.3	0.909	44.3	48.8	50.0	1.3	10.9
2/11/2015	10:02:38	389	69.4	0.924	43.2	46.7	49.9	1.3	9.8
2/11/2015	10:04:38	388	72.5	0.934	45.5	48.7	50.0	1.3	9.0
2/11/2015	10:06:39	390	69.4	0.926	43.4	46.9	50.0	1.4	9.7
2/11/2015	10:08:40	389	69.2	0.927	43.2	46.6	50.0	1.3	9.7
2/11/2015	10:10:40	388	73.2	0.935	46.0	49.1	50.0	1.4	10.5
2/11/2015	10:12:40	389	73.0	0.931	45.8	49.2	50.0	1.3	9.8
2/11/2015	10:14:40	400	75.5	0.921	48.2	52.3	50.0	1.4	9.6
2/11/2015	10:16:41	404	76.4	0.918	49.0	53.4	49.9	1.5	9.3
2/11/2015	10:18:41	401	76.3	0.920	48.7	52.9	50.0	1.6	9.4
2/11/2015	10:20:42	400	85.4	0.916	54.2	59.2	50.0	1.6	9.5
2/11/2015	10:22:43	399	83.8	0.915	53.0	57.9	50.0	1.5	9.1
2/11/2015	10:24:44	397	83.9	0.923	53.3	57.7	50.0	1.5	9.0
2/11/2015	10:26:45	395	84.1	0.925	53.2	57.6	50.0	1.5	9.0
2/11/2015	10:28:45	393	85.3	0.928	53.9	58.0	50.0	1.5	8.8
2/11/2015	10:30:45	391	83.8	0.930	52.9	56.8	50.0	1.5	8.5
2/11/2015	10:32:45	393	81.1	0.925	51.0	55.2	50.0	1.5	8.6
2/11/2015	10:34:45	391	83.3	0.930	52.4	56.4	50.0	1.5	8.9
2/11/2015	10:36:45	389	92.8	0.918	57.4	62.6	50.0	1.4	7.4

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2/11/2015	10:38:47	392	81.1	0.925	50.9	55.1	50.1	1.3	10.4
2/11/2015	10:40:48	394	81.8	0.918	51.2	55.8	50.1	1.3	10.7
2/11/2015	10:42:49	397	78.3	0.911	49.0	53.8	50.1	1.1	7.6
2/11/2015	10:44:50	397	78.9	0.920	49.8	54.2	50.1	1.3	10.3
2/11/2015	10:46:51	396	86.2	0.929	54.9	59.1	50.1	1.3	8.6
2/11/2015	10:48:52	396	79.8	0.929	50.8	54.7	50.0	1.4	9.1
2/11/2015	10:50:52	398	78.1	0.922	49.5	53.8	49.9	1.3	8.9
2/11/2015	10:52:52	398	81.3	0.922	51.6	56.0	49.9	1.3	8.8
2/11/2015	10:54:52	398	81.1	0.925	51.7	55.9	49.9	1.3	8.9
2/11/2015	10:56:52	398	81.5	0.925	51.9	56.1	49.9	1.2	9.3
2/11/2015	10:58:53	396	84.8	0.929	54.1	58.2	49.9	1.3	9.6
2/11/2015	11:00:53	395	81.7	0.922	51.6	55.9	49.9	1.4	10.0
2/11/2015	11:02:53	394	78.9	0.917	49.5	53.9	49.9	1.3	10.1
2/11/2015	11:04:53	394	87.8	0.938	56.1	59.9	50.0	1.4	9.1
2/11/2015	11:06:53	394	89.2	0.939	57.1	60.8	50.0	1.5	9.2
2/11/2015	11:08:54	393	86.5	0.937	55.2	58.9	50.0	1.4	9.3
2/11/2015	11:10:56	395	82.1	0.926	52.0	56.1	50.0	1.4	10.2
2/11/2015	11:12:56	393	82.0	0.924	51.6	55.9	50.0	1.5	9.9
2/11/2015	11:14:56	394	79.2	0.920	49.7	54.0	49.9	1.4	11.2
2/11/2015	11:20:56	396	55.5	0.927	35.2	38.0	50.0	1.8	13.3
2/11/2015	11:22:57	394	57.5	0.935	36.7	39.2	50.1	1.5	12.8
2/11/2015	11:24:58	395	58.1	0.949	37.7	39.7	50.1	1.4	13.8
2/11/2015	11:26:59	394	52.6	0.939	33.7	35.9	50.1	1.4	11.7
2/11/2015	11:31:01	396	30.2	0.909	18.8	20.7	50.1	1.2	19.2
2/11/2015	11:33:02	392	64.0	0.913	39.7	43.5	50.1	1.2	9.4
2/11/2015	11:35:03	394	38.3	0.928	24.3	26.2	50.0	1.1	13.8
2/11/2015	11:37:04	391	41.3	0.937	26.2	28.0	50.0	1.1	14.3
2/11/2015	11:39:05	394	41.4	0.935	26.4	28.2	50.1	1.1	13.6
2/11/2015	11:41:06	397	37.4	0.914	23.5	25.7	50.1	1.1	13.4
2/11/2015	11:43:07	398	37.1	0.916	23.4	25.6	50.1	1.3	13.9
2/11/2015	11:45:08	398	41.6	0.935	26.8	28.7	50.1	1.2	14.1
2/11/2015	11:47:09	397	39.1	0.931	25.0	26.9	50.0	1.1	13.9
2/11/2015	11:49:09	397	39.0	0.930	25.0	26.8	50.0	1.2	13.8
2/11/2015	11:51:10	394	40.2	0.926	25.4	27.5	49.9	1.2	14.0
2/11/2015	11:53:10	393	40.3	0.926	25.4	27.5	49.9	1.2	14.9
2/11/2015	11:55:10	396	39.1	0.926	24.9	26.8	49.9	1.1	14.3
2/11/2015	11:57:11	395	39.9	0.928	25.3	27.3	49.8	1.2	14.2
2/11/2015	11:59:11	394	42.9	0.938	27.5	29.3	49.8	1.2	14.6
2/11/2015	12:01:11	396	38.2	0.914	23.9	26.2	49.9	1.2	13.9
2/11/2015	12:03:12	395	38.9	0.918	24.4	26.6	49.9	1.2	13.8
2/11/2015	12:05:12	393	45.7	0.936	29.1	31.1	49.9	1.1	14.3
2/11/2015	12:07:12	392	47.7	0.940	30.5	32.4	49.9	1.2	13.8
2/11/2015	12:09:12	391	47.2	0.941	30.1	32.0	50.0	1.2	11.2
2/11/2015	12:11:13	394	45.3	0.928	28.7	30.9	50.0	1.2	11.7
2/11/2015	12:13:14	394	48.2	0.936	30.8	32.9	50.1	1.2	11.6



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2/11/2015	12:15:15	393	75.9	0.941	48.6	51.7	50.0	1.2	10.1
2/11/2015	12:17:15	392	72.6	0.938	46.2	49.2	49.9	1.2	10.5
2/11/2015	12:19:16	391	77.5	0.946	49.6	52.4	49.9	1.1	9.6
2/11/2015	12:21:16	391	87.3	0.932	55.0	59.1	49.9	1.1	8.0
2/11/2015	12:23:16	390	68.8	0.923	42.9	46.5	49.9	1.2	11.6
2/11/2015	12:25:16	391	75.5	0.943	48.2	51.1	49.9	1.2	10.3
2/11/2015	12:27:16	392	84.8	0.938	54.0	57.6	50.0	1.3	10.3
2/11/2015	12:29:17	390	82.2	0.938	52.1	55.5	49.9	1.3	10.6
2/11/2015	12:31:17	389	81.2	0.934	51.2	54.7	49.9	1.3	10.7
2/11/2015	12:33:17	388	76.0	0.933	47.7	51.1	49.9	1.3	10.9
2/11/2015	12:35:17	388	80.8	0.943	51.2	54.3	49.9	1.2	10.6
2/11/2015	12:37:18	388	75.8	0.932	47.5	51.0	49.9	1.1	7.7
2/11/2015	12:39:18	390	84.1	0.931	52.8	56.7	50.0	1.3	8.5
2/11/2015	12:41:19	391	69.9	0.938	44.4	47.3	50.1	1.5	11.3
2/11/2015	12:43:20	390	74.2	0.943	47.3	50.2	50.1	1.3	11.5
2/11/2015	12:45:20	392	72.9	0.937	46.4	49.5	50.2	1.4	10.9
2/11/2015	12:47:21	392	73.0	0.941	46.6	49.5	50.1	1.3	10.6
2/11/2015	12:49:22	390	83.6	0.939	53.0	56.5	50.1	1.3	9.0
2/11/2015	12:51:23	391	93.8	0.925	58.7	63.5	50.0	1.2	7.1
2/11/2015	12:53:23	390	86.7	0.928	54.3	58.5	49.9	1.2	8.2
2/11/2015	12:55:24	391	72.9	0.938	46.4	49.4	49.9	1.3	11.4
2/11/2015	12:57:24	389	73.6	0.941	46.7	49.6	50.0	1.2	11.9
2/11/2015	12:59:24	387	75.2	0.941	47.5	50.4	50.0	1.2	12.0
2/11/2015	13:01:24	387	73.2	0.942	46.2	49.0	50.0	1.3	12.1
2/11/2015	13:03:24	387	73.1	0.947	46.4	49.0	50.0	1.3	11.0
2/11/2015	13:05:24	387	75.3	0.951	48.0	50.4	50.0	1.3	11.5
2/11/2015	13:07:25	388	77.5	0.953	49.6	52.0	50.0	1.3	11.5
2/11/2015	13:09:26	388	75.8	0.949	48.3	50.9	50.1	1.3	12.1
2/11/2015	13:11:27	387	71.0	0.959	45.7	47.6	50.1	1.3	11.3
2/11/2015	13:13:28	388	70.7	0.960	45.6	47.5	50.0	1.4	11.2
2/11/2015	13:15:28	388	75.2	0.964	48.7	50.5	50.0	1.3	11.3
2/11/2015	13:17:28	387	67.9	0.958	43.7	45.6	49.9	1.3	10.6
2/11/2015	13:19:28	387	69.2	0.959	44.5	46.4	49.9	1.3	10.7
2/11/2015	13:21:29	387	67.7	0.956	43.3	45.3	49.9	1.3	10.8
2/11/2015	13:23:29	386	83.1	0.965	53.6	55.6	50.0	1.2	10.0
2/11/2015	13:25:29	385	76.7	0.970	49.6	51.2	50.0	1.4	9.6
2/11/2015	13:27:29	385	77.6	0.969	50.2	51.8	50.0	1.3	9.2
2/11/2015	13:29:29	389	75.7	0.963	49.1	50.9	50.0	1.4	9.3
2/11/2015	13:31:29	388	82.2	0.967	53.4	55.2	49.9	1.4	8.6
2/11/2015	13:33:29	387	80.6	0.970	52.3	53.9	50.0	1.3	8.4
2/11/2015	13:35:29	388	78.6	0.969	51.1	52.7	50.0	1.3	8.6
2/11/2015	13:37:29	388	78.4	0.971	51.1	52.6	50.0	1.4	7.3
2/11/2015	13:39:30	387	79.0	0.969	51.3	52.9	50.1	1.2	6.9
2/11/2015	13:41:31	389	84.6	0.956	54.5	57.0	50.1	1.3	8.3
2/11/2015	13:43:32	390	81.5	0.962	52.9	55.0	50.1	1.3	8.1

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2/11/2015	13:45:33	390	81.2	0.961	52.7	54.9	50.1	1.3	8.1
2/11/2015	13:47:34	390	81.9	0.962	53.1	55.2	50.0	1.3	8.3
2/11/2015	13:49:34	387	76.1	0.955	48.7	51.0	49.9	1.3	9.2
2/11/2015	13:51:34	388	76.8	0.955	49.3	51.6	49.9	1.3	9.0
2/11/2015	13:53:35	388	76.5	0.967	49.7	51.4	49.8	1.4	8.3
2/11/2015	13:55:35	385	76.9	0.969	49.7	51.3	49.8	1.4	8.9
2/11/2015	13:57:36	383	75.2	0.969	48.4	49.9	49.9	1.4	8.4
2/11/2015	13:59:36	384	75.3	0.967	48.4	50.0	50.0	1.4	8.0
2/11/2015	14:01:37	383	73.2	0.966	47.0	48.6	50.0	1.4	7.6
2/11/2015	14:03:38	384	71.6	0.967	46.1	47.6	50.0	1.4	8.9
2/11/2015	14:05:39	390	71.7	0.966	46.8	48.5	50.0	1.4	8.6
2/11/2015	14:07:40	390	71.4	0.963	46.5	48.3	50.0	1.3	8.6
2/11/2015	14:09:40	391	68.5	0.956	44.4	46.4	50.0	1.3	9.1
2/11/2015	14:11:41	390	68.9	0.959	44.7	46.5	49.9	1.5	8.9
2/11/2015	14:13:41	389	71.4	0.963	46.4	48.2	49.9	1.4	8.4
2/11/2015	14:15:41	388	71.5	0.965	46.4	48.0	49.9	1.4	8.4
2/11/2015	14:17:41	387	70.5	0.965	45.6	47.2	49.9	1.4	8.5
2/11/2015	14:19:42	386	68.9	0.960	44.2	46.1	49.9	1.4	8.0
2/11/2015	14:21:42	386	68.6	0.960	44.0	45.8	49.8	1.4	8.5
2/11/2015	14:23:42	387	70.0	0.964	45.2	46.9	49.8	1.4	8.0
2/11/2015	14:25:43	385	70.4	0.966	45.4	47.0	49.8	1.4	8.3
2/11/2015	14:27:43	385	70.9	0.967	45.7	47.2	49.8	1.4	8.5
2/11/2015	14:29:44	383	70.4	0.954	44.5	46.7	49.7	1.4	9.8
2/11/2015	14:31:45	382	74.5	0.941	46.4	49.3	49.7	1.3	8.6
2/11/2015	14:33:45	384	60.1	0.961	38.4	39.9	49.8	1.5	12.8
2/11/2015	14:35:46	383	63.6	0.962	40.6	42.2	49.8	1.4	12.5
2/11/2015	14:37:46	386	61.0	0.959	39.1	40.8	49.9	1.4	18.2
2/11/2015	14:39:46	395	64.4	0.944	41.6	44.0	49.9	1.4	11.3
2/11/2015	14:41:47	400	68.8	0.938	44.7	47.6	49.9	1.4	8.4
2/11/2015	14:43:47	400	57.7	0.957	38.2	40.0	50.0	1.6	11.7
2/11/2015	14:45:48	400	58.1	0.957	38.5	40.3	50.1	1.5	11.5
2/11/2015	14:47:49	394	56.8	0.957	37.1	38.8	50.1	1.6	11.3
2/11/2015	14:49:50	393	54.5	0.950	35.3	37.1	50.0	1.6	11.6
2/11/2015	14:51:51	393	54.7	0.952	35.4	37.2	49.9	1.4	11.2
2/11/2015	14:53:51	390	56.1	0.958	36.3	37.9	49.9	1.5	11.8
2/11/2015	14:55:52	389	58.3	0.962	37.8	39.3	49.9	1.4	9.6
2/11/2015	14:57:52	390	66.5	0.946	42.5	44.9	49.9	1.4	7.4
2/11/2015	14:59:52	390	60.8	0.951	39.1	41.1	49.9	1.4	7.9
2/11/2015	15:01:52	390	60.4	0.950	38.7	40.8	49.9	1.4	7.9
2/11/2015	15:03:52	389	62.7	0.956	40.4	42.2	49.8	1.3	7.6
2/11/2015	15:05:53	390	62.1	0.956	40.1	41.9	49.9	1.4	7.9
2/11/2015	15:07:53	389	62.0	0.957	40.0	41.7	49.9	1.5	8.2
2/11/2015	15:09:53	389	58.6	0.946	37.3	39.5	49.9	1.4	8.8
2/11/2015	15:11:54	388	58.5	0.945	37.1	39.3	49.9	1.4	8.7
2/11/2015	15:13:54	387	61.6	0.954	39.4	41.3	49.9	1.4	8.6

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2/11/2015	15:15:54	386	64.9	0.959	41.6	43.3	49.9	1.3	7.7
2/11/2015	15:17:54	388	61.9	0.952	39.7	41.7	49.9	1.4	8.6
2/11/2015	15:19:55	388	59.7	0.951	38.2	40.1	49.8	1.4	8.9
2/11/2015	15:21:55	387	59.3	0.956	38.0	39.8	49.9	1.4	8.0
2/11/2015	15:23:55	388	60.3	0.961	38.9	40.5	49.9	1.4	8.8
2/11/2015	15:25:56	388	59.0	0.956	37.9	39.6	49.8	1.4	8.6
2/11/2015	15:27:56	386	58.3	0.952	37.1	38.9	49.9	1.3	9.2
2/11/2015	15:29:56	386	58.3	0.952	37.1	38.9	49.8	1.4	10.6
2/11/2015	15:31:57	385	59.0	0.951	37.4	39.4	49.9	1.4	9.0
2/11/2015	15:33:57	385	66.0	0.941	41.5	44.1	49.9	1.3	8.8
2/11/2015	15:35:57	384	61.7	0.960	39.4	41.0	49.9	1.3	8.2
2/11/2015	15:37:58	384	60.5	0.958	38.5	40.2	49.9	1.3	9.1
2/11/2015	15:39:58	383	59.6	0.954	37.7	39.5	50.0	1.3	9.2
2/11/2015	15:41:58	383	59.3	0.957	37.6	39.3	50.0	1.3	8.1
2/11/2015	15:43:59	382	62.8	0.959	39.9	41.6	50.1	1.4	10.3
2/11/2015	15:46:00	389	62.8	0.958	40.6	42.3	50.1	1.3	9.7
2/11/2015	15:48:01	390	61.5	0.958	39.8	41.5	50.1	1.2	8.6
2/11/2015	15:50:01	389	57.0	0.949	36.4	38.4	50.1	1.3	9.1
2/11/2015	15:52:02	387	58.7	0.944	37.1	39.3	49.9	1.2	7.6
2/11/2015	15:54:02	387	58.3	0.952	37.2	39.1	49.9	1.2	9.7
2/11/2015	15:56:02	386	59.1	0.953	37.6	39.5	49.9	1.2	10.0
2/11/2015	15:58:03	393	64.1	0.935	40.8	43.7	49.8	1.1	8.0
2/11/2015	16:00:03	391	60.8	0.932	38.4	41.2	49.9	1.1	8.3
2/11/2015	16:02:03	388	52.9	0.937	33.4	35.6	49.9	1.2	11.3
2/11/2015	16:04:03	386	55.2	0.960	35.4	36.9	49.9	1.2	11.1
2/11/2015	16:06:03	384	54.5	0.962	34.9	36.3	50.0	1.2	11.9
2/11/2015	16:08:05	385	55.2	0.966	35.5	36.8	50.0	1.2	11.3
2/11/2015	16:10:06	385	63.7	0.942	40.0	42.4	50.0	1.2	9.2
2/11/2015	16:12:06	387	51.5	0.958	33.1	34.5	50.0	1.2	12.6
2/11/2015	16:14:06	386	53.6	0.959	34.4	35.9	50.0	1.2	12.1
2/11/2015	16:16:06	390	52.9	0.956	34.1	35.7	50.0	1.3	11.2
2/11/2015	16:18:06	392	52.8	0.954	34.2	35.8	50.0	1.3	12.0
2/11/2015	16:20:06	405	49.4	0.943	32.7	34.7	50.0	1.4	12.5
2/11/2015	16:22:06	404	66.8	0.936	43.7	46.7	49.9	1.3	9.5
2/11/2015	16:24:06	404	57.0	0.943	37.6	39.9	50.0	1.4	10.5
2/11/2015	16:26:06	404	56.4	0.945	37.3	39.5	50.0	1.4	10.9
2/11/2015	16:28:07	403	55.1	0.943	36.3	38.5	50.1	1.5	10.7
2/11/2015	16:30:08	402	57.2	0.944	37.6	39.8	50.1	1.3	11.0
2/11/2015	16:32:09	404	56.7	0.942	37.4	39.7	50.1	1.6	10.7
2/11/2015	16:34:10	403	63.4	0.931	41.2	44.3	50.1	1.4	15.0
2/11/2015	16:36:11	403	55.7	0.938	36.4	38.9	50.1	1.5	14.2
2/11/2015	16:38:12	403	58.1	0.945	38.3	40.5	50.1	1.5	14.3
2/11/2015	16:40:13	403	58.7	0.946	38.8	41.0	50.0	1.4	13.9
2/11/2015	16:42:15	405	58.8	0.945	39.0	41.2	50.0	1.5	13.5
2/11/2015	16:44:16	405	58.9	0.947	39.1	41.3	50.1	1.5	14.3

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2/11/2015	16:46:16	406	49.3	0.948	32.9	34.6	50.1	1.5	14.3
2/11/2015	16:48:17	406	49.6	0.945	32.9	34.8	50.1	1.4	14.6
2/11/2015	16:50:19	408	47.4	0.943	31.6	33.5	50.1	1.5	16.0
2/11/2015	16:52:20	407	46.9	0.945	31.2	33.0	50.1	1.4	15.3
2/11/2015	16:54:21	408	46.5	0.942	31.0	32.9	50.1	1.4	16.1
2/11/2015	16:56:22	408	45.7	0.942	30.4	32.3	50.1	1.5	15.6
2/11/2015	16:58:23	407	45.7	0.943	30.4	32.2	50.0	1.4	16.6
2/11/2015	17:00:24	407	39.5	0.946	26.3	27.8	50.1	1.5	19.0
2/11/2015	17:02:25	408	39.4	0.944	26.2	27.8	50.0	1.5	18.8
2/11/2015	17:04:26	408	38.8	0.940	25.8	27.4	50.0	1.4	19.3
2/11/2015	17:06:26	406	38.5	0.939	25.4	27.1	49.9	1.5	20.0
2/11/2015	17:08:26	406	39.4	0.941	26.1	27.7	49.9	1.4	20.5
2/11/2015	17:10:27	406	38.6	0.941	25.5	27.1	49.9	1.5	19.8
2/11/2015	17:12:27	405	37.8	0.941	24.9	26.5	49.9	1.6	19.9
2/11/2015	17:14:27	405	37.7	0.940	24.8	26.4	50.1	1.5	19.8
2/11/2015	17:16:28	405	38.1	0.937	25.0	26.7	50.1	1.6	19.5
2/11/2015	17:18:29	406	37.8	0.935	24.8	26.6	50.0	1.5	19.9
2/11/2015	17:20:29	405	40.6	0.943	26.8	28.5	50.0	1.5	20.8
2/11/2015	17:22:29	404	47.8	0.905	30.3	33.4	50.0	1.4	12.0
2/11/2015	17:24:29	405	35.5	0.932	23.2	24.9	50.0	1.6	22.1
2/11/2015	17:26:29	406	35.8	0.929	23.4	25.2	50.0	1.5	22.7
2/11/2015	17:28:30	407	35.0	0.933	23.1	24.7	50.0	1.5	22.7
2/11/2015	17:30:30	408	45.6	0.914	29.4	32.2	50.0	1.5	12.1
2/11/2015	17:32:32	410	33.8	0.936	22.4	24.0	50.0	1.6	23.2
2/11/2015	17:34:33	412	33.7	0.931	22.4	24.0	50.0	1.6	22.2
2/11/2015	17:36:34	410	33.7	0.934	22.4	24.0	50.1	1.7	22.7
2/11/2015	17:38:35	410	32.2	0.935	21.4	22.8	50.0	1.6	22.5
2/11/2015	17:40:36	413	32.1	0.925	21.3	23.0	50.0	1.7	22.9
2/11/2015	17:42:37	415	31.8	0.922	21.1	22.9	50.2	1.7	20.9
2/11/2015	17:44:38	413	31.2	0.927	20.7	22.3	50.3	1.5	22.8
2/11/2015	17:46:38	414	30.7	0.918	20.2	22.0	50.2	1.5	23.2
2/11/2015	17:48:39	412	27.4	0.909	17.8	19.5	50.1	1.5	23.1
2/11/2015	17:50:40	410	39.1	0.884	24.5	27.7	50.0	1.4	12.3
2/11/2015	17:52:41	409	27.9	0.902	17.8	19.8	49.8	1.5	22.0
2/11/2015	17:54:41	409	29.3	0.914	19.0	20.8	49.8	1.6	23.7
2/11/2015	17:56:41	408	30.0	0.893	19.0	21.2	49.9	1.6	26.5
2/11/2015	17:58:41	409	27.7	0.881	17.3	19.6	50.1	1.6	25.2
2/11/2015	18:00:42	408	30.5	0.918	19.8	21.6	50.1	1.5	17.3
2/11/2015	18:02:43	407	26.5	0.904	16.9	18.7	50.0	1.5	18.9
2/11/2015	18:04:43	390	25.8	0.912	15.9	17.4	50.0	1.5	19.5
2/11/2015	18:06:44	388	25.7	0.912	15.7	17.3	49.9	1.5	19.2
2/11/2015	18:08:44	386	26.0	0.918	15.9	17.3	49.8	1.6	19.6
2/11/2015	18:10:44	384	25.4	0.917	15.4	16.8	49.9	1.6	18.8
2/11/2015	18:12:44	384	25.8	0.918	15.7	17.1	50.1	1.5	17.0
2/11/2015	18:14:45	392	30.7	0.898	18.7	20.9	50.1	1.7	17.1

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2/11/2015	18:16:46	397	31.0	0.896	19.1	21.4	50.1	1.8	17.6
2/11/2015	18:18:47	395	30.9	0.898	19.0	21.1	50.0	1.7	17.7
2/11/2015	18:20:48	401	32.2	0.878	19.6	22.4	49.9	2.0	17.4
2/11/2015	18:22:48	406	31.8	0.884	19.7	22.3	49.9	2.0	19.2
2/11/2015	18:24:48	404	28.6	0.916	18.3	20.0	49.8	1.8	17.5
2/11/2015	18:26:49	403	29.0	0.920	18.6	20.2	49.8	2.0	16.9
2/11/2015	18:28:49	400	29.4	0.922	18.8	20.4	49.8	1.8	16.7
2/11/2015	18:30:50	399	30.5	0.923	19.4	21.1	49.8	1.8	15.6
2/11/2015	18:32:50	400	30.1	0.929	19.3	20.8	49.8	1.8	14.7
2/11/2015	18:34:51	398	29.8	0.932	19.2	20.6	49.9	1.7	15.5
2/11/2015	18:36:51	398	29.6	0.933	19.1	20.4	49.8	1.7	14.5
2/11/2015	18:38:52	398	29.5	0.931	19.0	20.4	49.8	1.7	15.5
2/11/2015	18:40:52	398	29.7	0.933	19.1	20.4	49.9	1.6	15.0
2/11/2015	18:42:52	398	29.5	0.934	19.0	20.3	50.0	1.5	15.8
2/11/2015	18:44:52	400	30.3	0.932	19.5	21.0	49.9	1.6	15.2
2/11/2015	18:46:53	400	31.0	0.932	20.0	21.5	49.8	1.6	15.4
2/11/2015	18:48:53	401	31.7	0.936	20.6	22.0	49.9	1.6	15.4
2/11/2015	18:50:53	401	29.4	0.937	19.1	20.4	50.0	1.6	15.5
2/11/2015	18:52:54	402	28.6	0.936	18.6	19.9	50.0	1.6	15.3
2/11/2015	18:54:56	401	31.3	0.934	20.3	21.8	50.0	1.6	15.1
2/11/2015	18:56:56	401	29.1	0.933	18.8	20.2	50.0	1.5	15.8
2/11/2015	18:58:56	402	28.9	0.931	18.7	20.1	50.0	1.6	15.6
2/11/2015	19:00:56	401	28.3	0.932	18.4	19.7	49.9	1.6	16.1
2/11/2015	19:02:56	411	27.3	0.919	17.8	19.4	50.0	1.5	15.7
2/11/2015	19:04:56	411	28.1	0.923	18.4	19.9	49.9	1.5	17.1
2/11/2015	19:06:56	411	26.8	0.917	17.4	19.0	50.0	1.5	16.6
2/11/2015	19:08:57	411	26.8	0.914	17.4	19.1	50.0	1.5	15.4
2/11/2015	19:10:58	411	26.2	0.919	17.1	18.6	50.1	1.5	16.6
2/11/2015	19:12:59	412	26.5	0.912	17.2	18.9	50.1	1.6	16.4
2/11/2015	19:15:00	413	26.6	0.910	17.3	19.0	50.0	1.5	16.0
2/11/2015	19:17:01	413	27.7	0.910	18.0	19.8	50.0	1.5	15.8
2/11/2015	19:19:01	413	28.2	0.910	18.3	20.1	49.9	1.5	16.1
2/11/2015	19:21:01	413	33.3	0.907	21.6	23.8	49.9	1.6	13.9
2/11/2015	19:23:01	413	33.2	0.907	21.5	23.7	50.0	1.5	13.4
2/11/2015	19:25:02	414	33.2	0.908	21.6	23.7	50.0	1.5	14.0
2/11/2015	19:27:03	414	33.1	0.909	21.6	23.7	50.1	1.5	14.0
2/11/2015	19:29:04	415	32.9	0.911	21.5	23.6	50.1	1.6	13.4
2/11/2015	19:31:05	416	33.5	0.902	21.8	24.1	50.0	1.5	13.8
2/11/2015	19:33:05	415	33.5	0.901	21.7	24.1	49.9	1.5	14.6
2/11/2015	19:35:05	416	33.7	0.901	21.9	24.3	50.0	1.5	14.0
2/11/2015	19:37:05	416	33.8	0.906	22.1	24.4	50.0	1.6	14.1
2/11/2015	19:39:07	416	34.5	0.899	22.3	24.9	50.1	1.5	13.6
2/11/2015	19:41:08	416	34.1	0.898	22.1	24.6	50.1	1.5	14.4
2/11/2015	19:43:09	417	34.1	0.898	22.1	24.6	50.1	1.5	14.3
2/11/2015	19:45:09	417	34.4	0.899	22.4	24.9	50.1	1.5	14.1

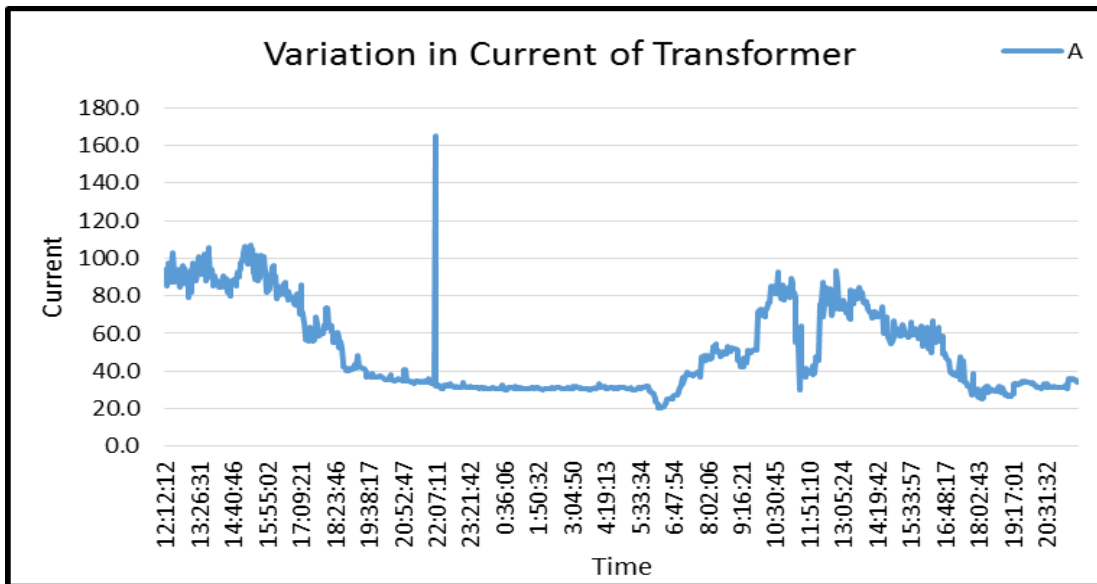
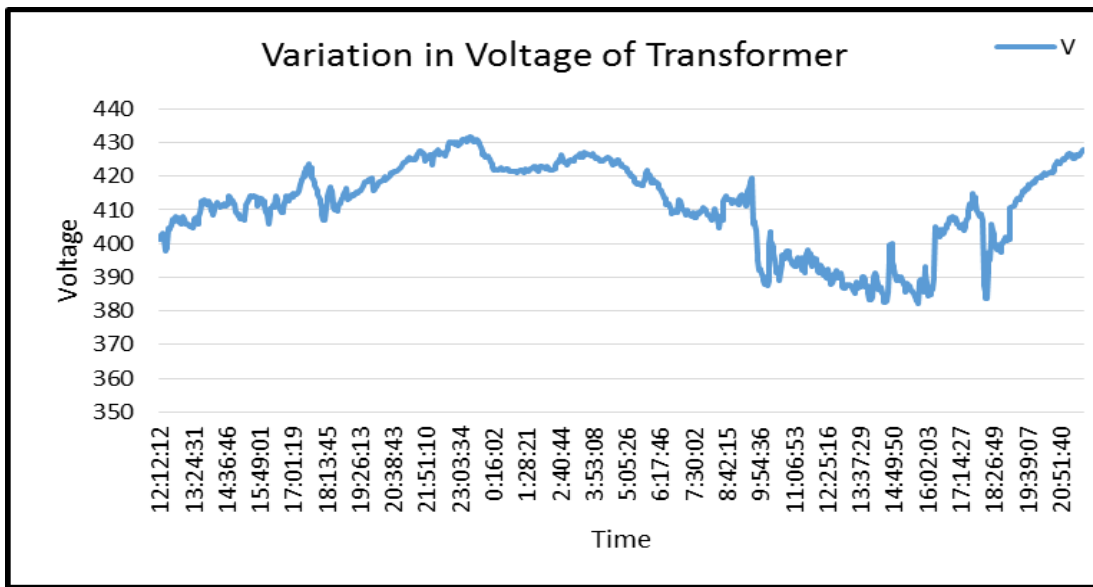


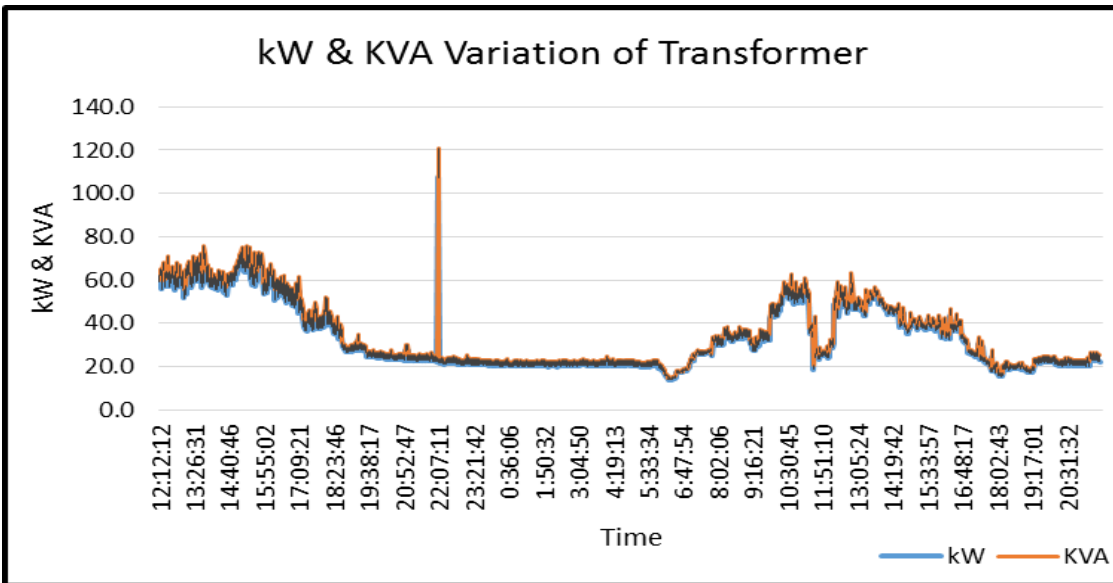
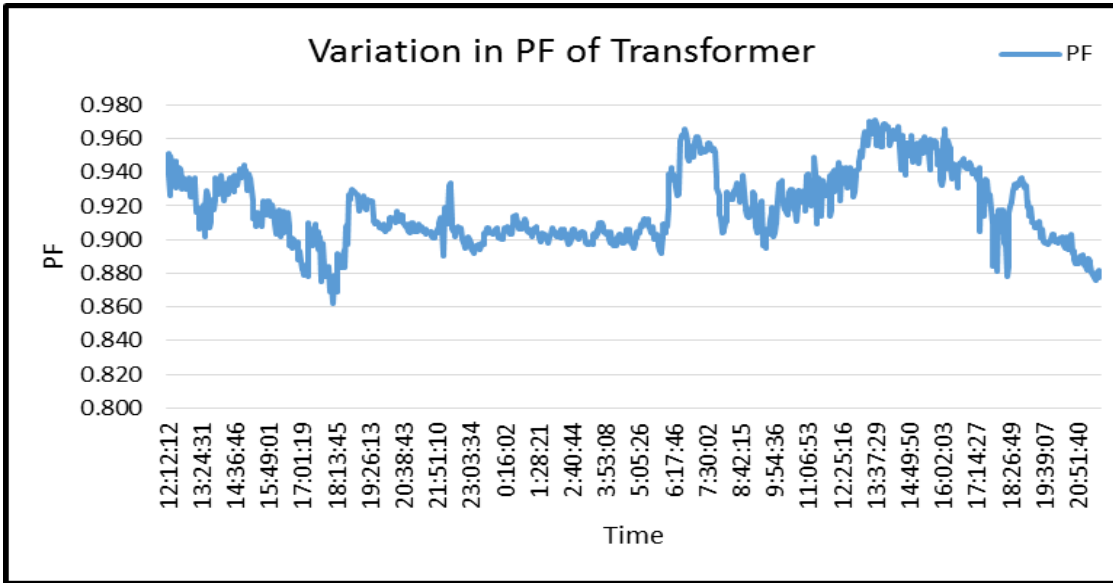
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2/11/2015	19:47:10	417	34.0	0.898	22.0	24.6	50.1	1.6	14.3
2/11/2015	19:49:11	418	33.9	0.897	22.0	24.5	50.1	1.5	14.3
2/11/2015	19:51:12	418	34.3	0.899	22.3	24.8	50.1	1.5	13.7
2/11/2015	19:53:13	418	33.9	0.900	22.1	24.5	50.1	1.5	13.9
2/11/2015	19:55:14	418	33.8	0.900	22.0	24.5	50.1	1.5	14.2
2/11/2015	19:57:15	419	33.5	0.903	21.9	24.3	50.1	1.5	13.8
2/11/2015	19:59:16	419	33.7	0.903	22.1	24.5	50.1	1.6	14.5
2/11/2015	20:01:17	419	34.0	0.900	22.2	24.7	50.1	1.5	14.3
2/11/2015	20:03:18	419	34.0	0.899	22.2	24.7	50.1	1.5	14.0
2/11/2015	20:05:19	420	32.4	0.899	21.2	23.6	50.1	1.5	14.2
2/11/2015	20:07:20	420	32.6	0.900	21.3	23.6	50.0	1.6	13.9
2/11/2015	20:09:21	419	31.7	0.898	20.7	23.0	50.1	1.6	14.6
2/11/2015	20:11:22	420	31.3	0.899	20.4	22.7	50.1	1.5	14.5
2/11/2015	20:13:23	420	31.2	0.901	20.5	22.7	50.0	1.6	14.0
2/11/2015	20:15:25	421	31.2	0.900	20.4	22.7	50.0	1.6	14.0
2/11/2015	20:17:26	420	31.3	0.901	20.5	22.7	50.0	1.6	14.4
2/11/2015	20:19:27	420	30.9	0.902	20.3	22.5	50.1	1.6	14.4
2/11/2015	20:21:28	421	31.4	0.897	20.5	22.8	50.1	1.6	13.7
2/11/2015	20:23:29	421	31.5	0.896	20.5	22.9	50.1	1.5	14.2
2/11/2015	20:25:30	421	31.8	0.895	20.8	23.2	50.1	1.6	14.2
2/11/2015	20:27:31	421	33.2	0.902	21.8	24.2	50.0	1.5	14.5
2/11/2015	20:29:32	421	31.2	0.895	20.4	22.8	50.0	1.5	14.7
2/11/2015	20:31:32	421	31.3	0.894	20.4	22.8	50.0	1.5	14.6
2/11/2015	20:33:33	421	33.2	0.901	21.8	24.2	50.1	1.5	14.5
2/11/2015	20:35:34	421	31.2	0.899	20.4	22.7	50.1	1.6	14.4
2/11/2015	20:37:35	422	32.0	0.899	21.0	23.4	50.2	1.6	13.9
2/11/2015	20:39:36	423	32.3	0.903	21.3	23.6	50.3	1.6	14.5
2/11/2015	20:41:37	424	31.1	0.892	20.4	22.8	50.3	1.5	13.8
2/11/2015	20:43:37	424	31.4	0.893	20.6	23.0	50.3	1.5	13.9
2/11/2015	20:45:38	424	31.5	0.888	20.6	23.2	50.2	1.5	14.4
2/11/2015	20:47:39	424	31.5	0.886	20.5	23.1	50.1	1.5	14.8
2/11/2015	20:49:40	424	31.8	0.887	20.7	23.3	50.0	1.6	13.7
2/11/2015	20:51:40	424	31.6	0.886	20.5	23.2	50.0	1.6	14.0
2/11/2015	20:53:41	424	31.6	0.886	20.6	23.2	50.0	1.6	14.1
2/11/2015	20:55:42	425	31.3	0.890	20.5	23.0	50.1	1.6	14.6
2/11/2015	20:57:43	425	31.3	0.889	20.5	23.1	50.1	1.6	14.0
2/11/2015	20:59:44	425	31.1	0.890	20.4	22.9	50.1	1.6	14.6
2/11/2015	21:01:45	425	31.4	0.891	20.6	23.1	50.1	1.6	13.9
2/11/2015	21:03:46	426	31.2	0.889	20.4	23.0	50.1	1.6	13.8
2/11/2015	21:05:47	426	31.5	0.886	20.6	23.2	50.1	1.6	13.5
2/11/2015	21:07:48	426	31.4	0.885	20.5	23.2	50.1	1.6	14.2
2/11/2015	21:09:49	427	31.4	0.884	20.5	23.2	50.1	1.5	14.1
2/11/2015	21:11:50	427	31.1	0.882	20.3	23.0	50.0	1.6	14.5
2/11/2015	21:13:51	426	33.0	0.889	21.6	24.4	50.0	1.6	14.3
2/11/2015	21:15:52	426	32.9	0.889	21.6	24.3	50.0	1.5	14.4

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2/11/2015	21:17:53	427	30.8	0.887	20.2	22.7	50.1	1.6	14.4
2/11/2015	21:19:54	425	36.2	0.885	23.6	26.7	50.0	1.7	12.6
2/11/2015	21:21:55	425	36.3	0.880	23.5	26.7	50.1	1.7	13.3
2/11/2015	21:23:56	426	35.4	0.879	22.9	26.1	50.1	1.6	12.8
2/11/2015	21:25:57	426	36.1	0.879	23.4	26.6	50.1	1.7	12.5
2/11/2015	21:27:58	426	35.5	0.877	23.0	26.2	50.1	1.7	12.4
2/11/2015	21:29:59	426	35.6	0.876	23.0	26.3	50.0	1.7	11.8
2/11/2015	21:32:00	426	36.0	0.880	23.3	26.5	50.0	1.7	12.3
2/11/2015	21:34:01	426	35.5	0.877	23.0	26.2	50.1	1.7	12.3
2/11/2015	21:36:02	427	35.2	0.877	22.8	26.0	50.1	1.9	12.4
2/11/2015	21:38:03	427	34.8	0.882	22.7	25.7	50.2	1.9	12.5
2/11/2015	21:40:04	428	34.3	0.879	22.4	25.4	50.3	1.8	13.3





**Annexure - II****Lighting Survey at Mahavidyalaya**

Sr. No.	Location	Present Fitting	Type Of Lamp	Total consumption annual (Kwh)	Proposed Fitting T-5 (28Watt -each)	Saving Expected (Kwh) From T-5	Proposed Fitting LED(15W att-each)	Saving Expected (Kwh) From LED	Unit Per Kw (Rs)	Saving in Rs. (T-5)	Saving in Rs. (LED)
1	Porch	16.00	FTL	116.5	69.4	47.0	35.8	80.6	10.4	489.7	839.46
2	Ground parking	2.00	FTL	14.6	8.7	5.9	4.5	10.1	10.4	61.2	104.93
3	Exam section	2.00	FTL	14.6	8.7	5.9	4.5	10.1	10.4	61.2	104.93
4	Genies batch unit	13.00	FTL	94.6	56.4	38.2	29.1	65.5	10.4	397.9	682.06
5	CET-study section	7.00	FTL	51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
6	Hall no.103	7.00	FTL	51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
7	Hall no.104	7.00	FTL	51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
8	Hall no.105	7.00	FTL	51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
9	Ground porch	7.00	FTL	51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
10	Hall no_201	6.00	FTL	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.80
11	Hall no_202	7.00	FTL	51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
12	Hall no_203	7.00	FTL	51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
13	Hall no_204	7.00	FTL	51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
14	Hall no_205	7.00	FTL	51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
15	1 st floor	10.00	FTL	72.8	43.4	29.4	22.4	50.4	10.4	306.1	524.66
16	MHT-CET	6.00	FTL	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.80
17	MRDA(lab)	6.00	FTL	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.80
18	Hall no_208	3.00	FTL	21.8	13.0	8.8	6.7	15.1	10.4	91.8	157.40
19	Hall no_209	6.00	FTL	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.80
20	Hall no_210	6.00	FTL	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.80
21	Hall no_211	7.00	FTL	51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
22	Porch	7.00	FTL	51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
23	Hall no_213	4.00	FTL	29.1	17.4	11.8	9.0	20.2	10.4	122.4	209.87
24	Hall no_214	4.00	FTL	29.1	17.4	11.8	9.0	20.2	10.4	122.4	209.87
25	Hall no_301	7.00	FTL	51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
26	Hall no_302	7.00	FTL	51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
27	Hall no_303	7.00	FTL	51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
28	Hall no_304	7.00	FTL	51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
29	Hall no_305	7.00	FTL	51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
30	porch	10.00	FTL	72.8	43.4	29.4	22.4	50.4	10.4	306.1	524.66
31	Hall no_307	8.00	FTL	58.2	34.7	23.5	17.9	40.3	10.4	244.8	419.73
32	Hall no_308	8.00	FTL	58.2	34.7	23.5	17.9	40.3	10.4	244.8	419.73
33	Hall no_309	5.00	FTL	36.4	21.7	14.7	11.2	25.2	10.4	153.0	262.33
34	Hall no_312	10.00	FTL	72.8	43.4	29.4	22.4	50.4	10.4	306.1	524.66
35	Porch	5.00	FTL	36.4	21.7	14.7	11.2	25.2	10.4	153.0	262.33

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36	Biology lab	13.00	FTL	94.6	56.4	38.2	29.1	65.5	10.4	397.9	682.06
37	Hall no _402	12.00	FTL	87.4	52.1	35.3	26.9	60.5	10.4	367.3	629.60
38	Hall no _403	5.00	FTL	36.4	21.7	14.7	11.2	25.2	10.4	153.0	262.33
39	Hall no _404	5.00	FTL	36.4	21.7	14.7	11.2	25.2	10.4	153.0	262.33
40	Hall no _405	5.00	FTL	36.4	21.7	14.7	11.2	25.2	10.4	153.0	262.33
41	Hall no _406	7.00	FTL	51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
42	Hall no _408	10.00	FTL	72.8	43.4	29.4	22.4	50.4	10.4	306.1	524.66
43	Porch	10.00	FTL	72.8	43.4	29.4	22.4	50.4	10.4	306.1	524.66
44	Electronic lab	6.00	FTL	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.80
45	Chemistry lab	12.00	FTL	87.4	52.1	35.3	26.9	60.5	10.4	367.3	629.60
46	Hall no _412	6.00	FTL	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.80
47	Chemistry lab	6.00	FTL	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.80
48	Jr. chemistry store	2.00	FTL	14.6	8.7	5.9	4.5	10.1	10.4	61.2	104.93
49	Staff room	4.00	FTL	29.1	17.4	11.8	9.0	20.2	10.4	122.4	209.87
50	Porch	8.00	FTL	58.2	34.7	23.5	17.9	40.3	10.4	244.8	419.73
51	Computer lab	32.00	FTL	233.0	138.9	94.1	71.7	161.3	10.4	979.4	1678.92
52	Soft warelab	24.00	FTL	174.7	104.2	70.6	53.8	121.0	10.4	734.5	1259.19
53	Music room	3.00	FTL	21.8	13.0	8.8	6.7	15.1	10.4	91.8	157.40
54	Step one side	4.00	FTL	29.1	17.4	11.8	9.0	20.2	10.4	122.4	209.87
55	Step two side	4.00	FTL	29.1	17.4	11.8	9.0	20.2	10.4	122.4	209.87
56	Yashwant society	6.00	FTL	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.80
57	Guest house	2.00	FTL	14.6	8.7	5.9	4.5	10.1	10.4	61.2	104.93
58	Building outside light	6.00	FTL	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.80
59	Muft university	2.00	FTL	14.6	8.7	5.9	4.5	10.1	10.4	61.2	104.93
60	<b>Sangeet HOD</b>	1.00	FTL	7.3	4.3	2.9	2.2	5.0	10.4	30.6	52.47
61	Musical Lab	2.00	FTL	14.6	8.7	5.9	4.5	10.1	10.4	61.2	104.93
62	Lecture Hall	3.00	FTL	21.8	13.0	8.8	6.7	15.1	10.4	91.8	157.40
63	Entrance	1.00	FTL	7.3	4.3	2.9	2.2	5.0	10.4	30.6	52.47
64	Stair Case	1.00	FTL	7.3	4.3	2.9	2.2	5.0	10.4	30.6	52.47
65	<b>Micro Dept.</b>										0.00
66	Toilet	4.00	T 5	17.4	17.4	0.0	9.0	15.1	10.4	0.0	157.40
67	Store Room	3.00	T 5	13.0	13.0	0.0	6.7	13.0	10.4	0.0	135.54
68	HOD & Staff	6.00	T 5	26.0	26.0	0.0	13.4	17.1	10.4	0.0	177.80
69	Micro Lab-1	7.00	T 5	30.4	30.4	0.0	15.7	23.7	10.4	0.0	246.30

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70	Micro Lab-2	7.00	T 5	30.4	30.4	0.0	15.7	16.9	10.4	0.0	176.35
71	Micro Research	7.00	T 5	30.4	30.4	0.0	15.7	14.7	10.4	0.0	153.03
72	Lobby	4.00	T 5	17.4	17.4	0.0	9.0	1.7	10.4	0.0	17.49
73	<b>Enviromental</b>										0.00
74	HOD & Staff	2.00	FTL	14.6	8.7	5.9	4.5	10.1	10.4	61.2	104.93
75	Enviromental lab (UG)	7.00	FTL	51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
76	Enviromental lab (PG)	9.00	FTL	65.5	39.1	26.5	20.2	45.4	10.4	275.4	472.20
77	<b>Biotech Lecture Hall</b>	6.00	FTL	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.80
78	Biotech Lab	8.00	FTL	58.2	34.7	23.5	17.9	40.3	10.4	244.8	419.73
79	Lobby	7.00	FTL	51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
80	Biotech HOD	8.00	T 5	58.2	34.7	23.5	17.9	40.3	10.4	244.8	419.73
81	Biotech (PG)	8.00	T 5	58.2	34.7	23.5	17.9	40.3	10.4	244.8	419.73
82	Biotech (UG)	8.00	T 5	58.2	34.7	23.5	17.9	40.3	10.4	244.8	419.73
83	Biotech Research-1	8.00	T 5	58.2	34.7	23.5	17.9	40.3	10.4	244.8	419.73
84	Biotech Research-2	8.00	T 5	58.2	34.7	23.5	17.9	40.3	10.4	244.8	419.73
85	Toilet	4.00	T 5	29.1	17.4	11.8	9.0	20.2	10.4	122.4	209.87
86	Hall No.-501 (Micro) Working -1 hr daily	8.00	T 5	58.2	34.7	23.5	17.9	40.3	10.4	244.8	419.73
87	Hall No.-502	8.00	T 5	58.2	34.7	23.5	17.9	40.3	10.4	244.8	419.73
88	Hall No.-503	8.00	T 5	58.2	34.7	23.5	17.9	40.3	10.4	244.8	419.73
89	Hall No.-504	8.00	T 5	58.2	34.7	23.5	17.9	40.3	10.4	244.8	419.73
90	Hall No.-505	6.00	T 5	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.80
91	Hall No.-506	6.00	T 5	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.80
92	Sport Dept.	7.00		51.0	30.4	20.6	15.7	35.3	10.4	214.2	367.26
93	Micro Dept. Outside Working -8hrs daily during night	1.00	T 5	7.3	4.3	2.9	2.2	5.0	10.4	30.6	52.47
94	Micro Bio- Out side Small tubes Working -8hrs daily during night	6.00	FTL	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.80
95	<b>Librery</b>										0.00

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96	Tube -40 W - only 20% working for 8 hrs	162.00	FTL	377.4	225.0	152.4	362.9	14.5	10.4	1586.6	151.10
97	CFL -15W- only 20% working for 8hrs	50.00	CFL	116.5	69.4	47.0	112.0	4.5	10.4	489.7	46.64
98	<b>Office Area</b>										0.00
99	Registrar Office	1.00	FTL	7.3	4.3	2.9	2.2	5.0	10.4	30.6	52.47
100	Registrar Office & Lobby	2.00	T 5	8.7	8.7	0.0	4.5	4.2	10.4	0.0	43.72
101	Principal Cabin	8.00	FTL	58.2	34.7	23.5	17.9	40.3	10.4	244.8	419.73
102	Admin. Office	12.00	FTL	87.4	52.1	35.3	26.9	60.5	10.4	367.3	629.60
103	Salary Section	3.00	FTL	21.8	13.0	8.8	6.7	15.1	10.4	91.8	157.40
104	Accountant Cabin	2.00	FTL	14.6	8.7	5.9	4.5	10.1	10.4	61.2	104.93
105	Cash Room	2.00	FTL	14.6	8.7	5.9	4.5	10.1	10.4	61.2	104.93
106	Cash Section non grant	4.00	FTL	29.1	17.4	11.8	9.0	20.2	10.4	122.4	209.87
107	Office Store	3.00	FTL	21.8	13.0	8.8	6.7	15.1	10.4	91.8	157.40
108	Main Bldg		FTL	0.0	0.0	0.0	0.0	0.0	10.4	0.0	0.00
109	Toilet	1.00	FTL	7.3	4.3	2.9	2.2	5.0	10.4	30.6	52.47
110	X-Rox Room	1.00	FTL	7.3	4.3	2.9	2.2	5.0	10.4	30.6	52.47
111	NCC Room	3.00	FTL	21.8	13.0	8.8	6.7	15.1	10.4	91.8	157.40
112	Dept.- Marathi, Hindi, Urdu, Public Admin. Etc.	6.00	FTL	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.80
113	HOD History	6.00	FTL	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.80
114	Dept. Commerce & Mgm. Science	4.00	FTL	29.1	17.4	11.8	9.0	20.2	10.4	122.4	209.87
115	<b>Language Dept.</b>										0.00
116	E-learning -CFL	40.00	CFL								
117	Language lab - CFL	15.00	CFL								
118	HOD Cabin -CFL	6.00	CFL								
119	Lobby -CFL	12.00	CFL								
120	Language Dept. -Tube	3.00	FTL	21.8	13.0	8.8	6.7	15.1	10.4	91.8	157.4
121	<b>Class Room -1</b>	3.00	FTL	21.8	13.0	8.8	6.7	15.1	10.4	91.8	157.4
122	Class Room -2	6.00	FTL	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.8
123	Class Room -3	5.00	FTL	36.4	21.7	14.7	11.2	25.2	10.4	153.0	262.3
124	Class Room -4	5.00	FTL	36.4	21.7	14.7	11.2	25.2	10.4	153.0	262.3
125	Class Room -5	4.00	FTL	29.1	17.4	11.8	9.0	20.2	10.4	122.4	209.9
126	Class Room -6	2.00	FTL	14.6	8.7	5.9	4.5	10.1	10.4	61.2	104.9

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127	Class Room -7	2.00	FTL	14.6	8.7	5.9	4.5	10.1	10.4	61.2	104.9
128	Class Room -8	3.00	FTL	21.8	13.0	8.8	6.7	15.1	10.4	91.8	157.4
129	Class Room -9	3.00	FTL	21.8	13.0	8.8	6.7	15.1	10.4	91.8	157.4
130	Class Room -10	2.00	FTL	14.6	8.7	5.9	4.5	10.1	10.4	61.2	104.9
131	Class Room -11	4.00	FTL	29.1	17.4	11.8	9.0	20.2	10.4	122.4	209.9
132	Class Room -12	4.00	FTL	29.1	17.4	11.8	9.0	20.2	10.4	122.4	209.9
133	Class Room -13	3.00	FTL	21.8	13.0	8.8	6.7	15.1	10.4	91.8	157.4
134	Class Room -14	5.00	FTL	36.4	21.7	14.7	11.2	25.2	10.4	153.0	262.3
135	Class Room -15	1.00	FTL	7.3	4.3	2.9	2.2	5.0	10.4	30.6	52.5
136	Class Room -16	2.00	FTL	14.6	8.7	5.9	4.5	10.1	10.4	61.2	104.9
137	Class Room -17	4.00	FTL	29.1	17.4	11.8	9.0	20.2	10.4	122.4	209.9
138	Class Room -18	3.00	FTL	21.8	13.0	8.8	6.7	15.1	10.4	91.8	157.4
139	Class Room -19	3.00	FTL	21.8	13.0	8.8	6.7	15.1	10.4	91.8	157.4
140	Class Room -20	6.00	FTL	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.8
141	Class Room -21	6.00	FTL	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.8
142	Class Room -22	5.00	FTL	36.4	21.7	14.7	11.2	25.2	10.4	153.0	262.3
143	Class Room -23	5.00	FTL	36.4	21.7	14.7	11.2	25.2	10.4	153.0	262.3
144	Class Room -24	5.00	FTL	36.4	21.7	14.7	11.2	25.2	10.4	153.0	262.3
145	Old Room-13	4.00	FTL	29.1	17.4	11.8	9.0	20.2	10.4	122.4	209.9
146	Dept. Sociology	1.00	FTL	7.3	4.3	2.9	2.2	5.0	10.4	30.6	52.5
147	Dept. Of Fashion	3.00	FTL	21.8	13.0	8.8	6.7	15.1	10.4	91.8	157.4
148	Dept. Economic	2.00	FTL	14.6	8.7	5.9	4.5	10.1	10.4	61.2	104.9
149	NAAC Office	3.00	FTL	21.8	13.0	8.8	6.7	15.1	10.4	91.8	157.4
150	Internal Examination	3.00	FTL	21.8	13.0	8.8	6.7	15.1	10.4	91.8	157.4
151	Porch	6.00	FTL	43.7	26.0	17.6	13.4	30.2	10.4	183.6	314.8
152	Store Room	3.00	FTL	21.8	13.0	8.8	6.7	15.1	10.4	91.8	157.4
153	Indoor Stadium - LED	24.00	LED								
				New Bldg							
154	Passage Ground LED	8.00	LED								
				New Bldg							
155	Incoming Entry gate main	6.00	CFL								
				New Bldg							
156	Room No.1 FTL	5.00	FTL								
				New Bldg							
157	Room No.1 inside side CFL	3.00	CFL								
				New Bldg							
158	Room No.2 FTL	5.00	FTL								
				New Bldg							
159	Room No.3		FTL								
				New Bldg							
160	Room No.4		FTL								
				New Bldg							
161	Room No.5		FTL								
				New Bldg							
162	Entry Gate -1	18.00	CFL								
				New Bldg							
163	Room Near Hall	3.00	FTL								
				New Bldg							
164	First floor Toilet	3.00	FTL								
				New Bldg							
165	Hall No-1	24.00	Lamp								
				New Bldg							
166	Hall No-2	12.00	Lamp								
				New Bldg							



## Energy Audit Report



167	Tennis Ground	12.00	LED	New Bldg
168	Micro Bio Bldg Outside	4.00	SV	New Bldg
169	Near Tennis Ground	1.00	SV	New Bldg
170	Science Wing Gate	1.00	SV	New Bldg
171	Science Wing out side	4.00	SV	New Bldg
172	Office Area Front side	4.00	SV	New Bldg
173	Near Basket Ball Ground	1.00	MV	New Bldg
174	Office premises Front side	2.00	CFL	New Bldg
175	Office premises Front side	1.00	SV	New Bldg

Sr. No	Location	Type of Light	watts	Qty.	No. of Fan	Measured Lux	Total watt	Day Light
1	Science wing Ground floor							
2	Director academy of architecture	FTL	40	2	2	40,29,50	80	Partially available
3	Class room 1	FTL	40	6	3	28,38,40	240	Partially available
4	Laboratory	FTL	40	6	3	15,20	240	Partially available
5	Passage	FTL	40	3		78,80,95	120	Available
6	Science wing 1st floor							
7	Library architecture	FTL	40	2	2	36,35,30	80	Partially available
8	Lecture hall 29	FTL	40	6	3	28,30,25	240	Partially available
9	Lecture hall 30	FTL	40	6	3	85,70,50	240	Partially available
10	Passage	FTL	40	5			200	Available
11	Lecture hall 27	FTL	40	8	4		320	Partially available
12	Lecture hall 26	FTL	40	6	3		240	Partially available
13	2nd floor							
14	Lecture hall 32	FTL	40	2	2		80	Partially available
15	Lecture hall 31	FTL	40	14	5		560	Available
16	Small Hall	FTL	40	4	1		160	Partially available
17	Hall no. 33	FTL	40	6	3		240	Partially available
18	Hall no. 34	FTL	40	6	2		240	Partially available
19	Passage	FTL	40	3			120	Available
	Computer Dept. 2nd floor							
21	Lecture hall 35	FTL	40	1	1		40	Available
22	Smart lab 2	CFL	18	32			576	Partially available
23	Smart Lab 1	CFL	18	32			576	Partially available
24	Lecture hall no. 36	FTL	40	2	3		80	Partially available
25	PL Lab 2	FTL	40	9	7		360	Not Available

## Energy Audit Report



26	Passage	FTL	40	3			120	Available
27	Lecture Hall 37	FTL	40	2	2		80	Partially available
28	Power room	FTL	40	1			40	Partially available
29	Graphic Lab UG	FTL	40	10			400	Not Available
30	Computer science lab	FTL	40	14			560	Not Available
31	Computer science Lab PP	FTL	40	10	2		400	Not Available
32	Passage physics dept.	FTL	40	4			160	Partially available
33	Networking unit	FTL	40	2	1		80	Not Available
34	Physics HOD	FTL	40	4	2		160	Partially available
35	Physics Lab	FTL	40	6	4		240	Partially available
36	Electronics research lab	FTL	40	2	2		80	Partially available
37	Lecture Hall 38	FTL	40	6	2		240	Partially available
38	Math's dept. HOD	FTL	40	6	2		240	Partially available
39	Zoology Dept.							
40	Passage	FTL	36	5			180	Available
41	Staff room	FTL	36	6	4		216	Partially available
42	HOD Zoology	FTL	36	6	2		216	Partially available
43	Lecture hall 1st year	FTL	36	8	6		288	Partially available
44	Zoology staff room	T 5	28	4	1		112	Partially available
45	Chemistry Dept.							
46	Chemistry research lab	T 5	28	5			140	Partially available
47	Passage	T 5	28	12			336	Available
48	Chemistry Lab UG 3	T 5	28	8			224	Partially available
49	staff room	T 5	28	3	2		84	Partially available
50	Chemistry lab UG 1	T 5	28	9			252	Partially available
51	Chemistry lab UG 2	T 5	28	6			168	Partially available
	Dept. of Botany							
53	Botany lab UG 2	T 5	28	10	5		280	Partially available
54	Botanical museum	T 5	28	6	1		168	Partially available
55	Passage	T 5	28	5			140	Available
56	Botany Lab 2	T 5	28	6	2		168	Partially available
57	Botany HOD	T 5	28	6	3		168	Partially available
58	Botany lecturer staff room	T 5	28	6	2		168	Partially available
59	Botany research lab	T 5	28	6	2		168	Partially available
60	Store room	T 5	28	2	1		56	Partially available
61	Outer	T 5	28	6			168	Partially available
62	Ladies staff room	T 5	28	2	1		56	Partially available
63	Vice principal	T 5	28	2	1		56	Not Available
64	History dept.							
65	Lecture hall 22	FTL	40	4	4		160	Partially available
66	Lecture hall 23	FTL	40	4	4		160	Partially available
67	Lecture hall 24	FTL	40	4	4		160	Partially available
68	HOD sociology	FTL	40	1	2		40	Partially available
69	Passage	FTL	40	3			120	Available
70	1st floor Lecture hall 21	FTL	40	5	4		200	Partially available

71	2nd floor Lecture hall 20	FTL	40	5	4		200	Partially available
72	Fashion designing carrier courses	FTL	40	3	3		120	Partially available
73	HOD Economics	FTL	40	3	3		120	Partially available
74	Girls Hostel							
75	Security cabin	FTL	36	2	1		72	Partially available
76	Passage	FTL	36	3	1		108	Available
77	Office	FTL	36	3	2		108	Partially available
78	Room no. 1 Store room	FTL	36	2	2		72	Partially available
79	Room no. 2 to 11	FTL	36	20	20		720	Partially available
80	Room no. 12 to 28	FTL	40	34	34		1360	Partially available
81	Hall 1st floor	FTL	36	4	3		144	Available
82	Passage at 1st floor	FTL	36	4			144	Available
83	Room no. 29 to 44	FTL	36	32	32		1152	Partially available
84	Room no. 45	FTL	36	3	3		108	Partially available
85	Hall 2nd floor	FTL	36	5			180	Available
86	Passage at 2nd floor	FTL	36	9			324	Available
87	Stair 1	FTL	36	3			108	Available
88	Stair 2	FTL	36	3			108	Available
89	Passage ground floor	FTL	36	8			288	Available
90	Dining hall	CFL	28	4	3		112	Partially available
91	Dining hall kitchen	CFL	28	1	1		28	Partially available
92	Store room	FTL	36	1	1		36	Partially available
93	Outer ground light	FTL	18	4			72	Available
94	Madam room	FTL	36	3	3		108	Available
95	Street light	FTL	18	8			144	Available
96	Street light	MV	250	1			250	Available

**Fan survey of Mahavidyalaya**

Location	No. Fan	Present Fan (w)	Present Total consumption Annually (Kw)	Expected Fan- five star rating running on 4 & 5 speed Annually (Kw)	Saving Expected running on 1 to 3 speed Fan Annually (Kw)	Total Saving in (Kw)	Unit Per Kw (Rs)	Saving in Annual (Rs)	Saving in Monthly (Rs)
Office	1	75	157	84	21	105	10.41	1093	91
Office	7	75	1098	588	147	735	10.41	7651	638
Ground parking	3	75	470	252	63	315	10.41	3279	273
Exam section	1	75	157	84	21	105	10.41	1093	91
Genus batch unit	4	75	627	336	84	420	10.41	4372	364
<b>CET-study</b>	<b>5</b>	<b>75</b>	<b>784</b>	<b>420</b>	<b>105</b>	<b>525</b>	<b>10.41</b>	<b>5465</b>	<b>455</b>
Hall-103	5	75	784	420	105	525	10.41	5465	455
Hall-104	5	75	784	420	105	525	10.41	5465	455
Hall-105	5	75	784	420	105	525	10.41	5465	455
Hall no_201	5	75	784	420	105	525	10.41	5465	455

# Energy Audit Report



Location	No. Fan	Present Fan (w)	Present Total consumption Annually (Kw)	Expected Fan- five star rating running on 4 & 5 speed Annually (Kw)	Saving Expected running on 1 to 3 speed Fan Annually (Kw)	Total Saving in (Kw)	Unit Per Kw (Rs)	Saving in Annual (Rs)	Saving in Monthly (Rs)
Hall no_202	5	75	784	420	105	525	10.41	5465	455
Hall no_203	5	75	784	420	105	525	10.41	5465	455
Hall no_204	5	75	784	420	105	525	10.41	5465	455
Hall no_205	2	75	314	168	42	210	10.41	2186	182
Hall no_206	4	75	627	336	84	420	10.41	4372	364
Hall no_207	4	75	627	336	84	420	10.41	4372	364
Hall no_208	4	75	627	336	84	420	10.41	4372	364
Hall no_210	4	75	627	336	84	420	10.41	4372	364
Hall no_211	4	75	627	336	84	420	10.41	4372	364
Hall no_213	2	75	314	168	42	210	10.41	2186	182
Hall no_214	2	75	314	168	42	210	10.41	2186	182
Hall no_301	5	75	784	420	105	525	10.41	5465	455
Hall no_302	5	75	784	420	105	525	10.41	5465	455
Hall no_303	5	75	784	420	105	525	10.41	5465	455
Hall no_304	5	75	784	420	105	525	10.41	5465	455
Hall no_305	5	75	784	420	105	525	10.41	5465	455
Hall no_306	6	75	941	504	126	630	10.41	6558	547
Hall no_307	5	75	784	420	105	525	10.41	5465	455
Hall no_308	6	75	941	504	126	630	10.41	6558	547
Hall no_309	5	75	784	420	105	525	10.41	5465	455
Hall no_401	5	75	784	420	105	525	10.41	5465	455
Hall no_402	5	75	784	420	105	525	10.41	5465	455
Hall no_403	1	75	157	84	21	105	10.41	1093	91
Hall no_404	1	75	157	84	21	105	10.41	1093	91
Hall no 406	4	75	627	336	84	420	10.41	4372	364
Hall no 407	2	75	314	168	42	210	10.41	2186	182
Hall no 408	5	75	784	420	105	525	10.41	5465	455
Electronic lab	6	75	941	504	126	630	10.41	6558	547
Jr. chemistry	2	75	314	168	42	210	10.41	2186	182
Staff room	4	75	627	336	84	420	10.41	4372	364
Hall-1computer lab	7	75	1098	588	147	735	10.41	7651	638
Software lab	6	75	941	504	126	630	10.41	6558	547
Music room	3	75	470	252	63	315	10.41	3279	273
Yashwant society	11	75	1725	924	231	1155	10.41	12024	1002
Mukt university	5	75	784	420	105	525	10.41	5465	455
		75	0	0	0	0	10.41	0	0
Sangeet HOD	2	75	314	168	42	210	10.41	2186	182
Musical lab	2	75	314	168	42	210	10.41	2186	182

Location	No. Fan	Present Fan (w)	Present Total consumption Annually (Kw)	Expected Fan- five star rating running on 4 & 5 speed Annually (Kw)	Saving Expected running on 1 to 3 speed Fan Annually (Kw)	Total Saving in (Kw)	Unit Per Kw (Rs)	Saving in Annual (Rs)	Saving in Monthly (Rs)
Lecture Hall	2	75	314	168	42	210	10.41	2186	182
Micro Dept.		75	0	0	0	0	10.41	0	0
Store Room	1	75	157	84	21	105	10.41	1093	91
HOD & Staff	4	75	627	336	84	420	10.41	4372	364
Micro Lab-1	6	75	941	504	126	630	10.41	6558	547
Micro Lab-2	6	75	941	504	126	630	10.41	6558	547
Micro Research	6	75	941	504	126	630	10.41	6558	547
Lobby	1	75	157	84	21	105	10.41	1093	91
Environmental		75	0	0	0	0	10.41	0	0
HOD & Staff	2	75	314	168	42	210	10.41	2186	182
Environmental lab (UG)	2	75	314	168	42	210	10.41	2186	182
Environmental lab (PG)	3	75	470	252	63	315	10.41	3279	273
Biotech Lecture Hall	2	75	314	168	42	210	10.41	2186	182
Biotech Lab	2	75	314	168	42	210	10.41	2186	182
Biotech HOD	6	75	941	504	126	630	10.41	6558	547
Biotech (PG)	6	75	941	504	126	630	10.41	6558	547
Biotech (UG)	6	75	941	504	126	630	10.41	6558	547
Biotech Research-1	6	75	941	504	126	630	10.41	6558	547
Biotech Research-2	6	75	941	504	126	630	10.41	6558	547
Toilet	2	75	314	168	42	210	10.41	2186	182
Hall No.-501 (Micro) Working - 1 hr daily	6	75	941	504	126	630	10.41	6558	547
Hall No.-502	6	75	941	504	126	630	10.41	6558	547
Hall No.-503	6	75	941	504	126	630	10.41	6558	547
Hall No.-504	6	75	941	504	126	630	10.41	6558	547
Hall No.-505	4	75	627	336	84	420	10.41	4372	364
Hall No.-506	4	75	627	336	84	420	10.41	4372	364
Sport Dept.	2	75	314	168	42	210	10.41	2186	182
Library - 20% fan working for 8hrs daily	100	75	15680	8400	2100	10500	10.41	109305	9109
Registrar Office	2	75	314	168	42	210	10.41	2186	182

Location	No. Fan	Present Fan (w)	Present Total consumption Annually (Kw)	Expected Fan- five star rating running on 4 & 5 speed Annually (Kw)	Saving Expected running on 1 to 3 speed Fan Annually (Kw)	Total Saving in (Kw)	Unit Per Kw (Rs)	Saving in Annual (Rs)	Saving in Monthly (Rs)
Registrar Office & Lobby	1	75	157	84	21	105	10.41	1093	91
Principal Cabin	1	75	157	84	21	105	10.41	1093	91
Admin. Office	6	75	941	504	126	630	10.41	6558	547
Salary Section	1	75	157	84	21	105	10.41	1093	91
Accountant Cabin	1	75	157	84	21	105	10.41	1093	91
Cash Room	1	75	157	84	21	105	10.41	1093	91
Cash Section non grant	1	75	157	84	21	105	10.41	1093	91
Office Store	2	75	314	168	42	210	10.41	2186	182
Dept.- Marathi, Hindi, Urdu, Public Admin. Etc.	5	75	784	420	105	525	10.41	5465	455
HOD History	2	75	314	168	42	210	10.41	2186	182
Dept. Commerce & Mgm. Science	4	75	627	336	84	420	10.41	4372	364
Language Dept. staff	6	75	941	504	126	630	10.41	6558	547
E-learning	0	75	0	0	0	0	10.41	0	0
Language lab	6	75	941	504	126	630	10.41	6558	547
HOD Cabin	1	75	157	84	21	105	10.41	1093	91
Class Room -1	2	75	314	168	42	210	10.41	2186	182
Class Room -2	4	75	627	336	84	420	10.41	4372	364
Class Room -3	4	75	627	336	84	420	10.41	4372	364
Class Room -4	4	75	627	336	84	420	10.41	4372	364
Class Room -5	4	75	627	336	84	420	10.41	4372	364
Class Room -6	0	75	0	0	0	0	10.41	0	0
Class Room -7	3	75	470	252	63	315	10.41	3279	273
Class Room -8	5	75	784	420	105	525	10.41	5465	455
Class Room -9	4	75	627	336	84	420	10.41	4372	364
Class Room -10	4	75	627	336	84	420	10.41	4372	364
Class Room -11	4	75	627	336	84	420	10.41	4372	364
Class Room -12	4	75	627	336	84	420	10.41	4372	364
Class Room -13	4	75	627	336	84	420	10.41	4372	364
Class Room -14	5	75	784	420	105	525	10.41	5465	455
Class Room -15	1	75	157	84	21	105	10.41	1093	91
Class Room -16	2	75	314	168	42	210	10.41	2186	182
Class Room -17	4	75	627	336	84	420	10.41	4372	364
Class Room -18	3	75	470	252	63	315	10.41	3279	273

Location	No. Fan	Present Fan (w)	Present Total consumption Annually (Kw)	Expected Fan- five star rating running on 4 & 5 speed Annually (Kw)	Saving Expected running on 1 to 3 speed Fan Annually (Kw)	Total Saving in (Kw)	Unit Per Kw (Rs)	Saving in Annual (Rs)	Saving in Monthly (Rs)
Class Room -19	3	75	470	252	63	315	10.41	3279	273
Class Room -20	6	75	941	504	126	630	10.41	6558	547
Class Room -21	6	75	941	504	126	630	10.41	6558	547
Class Room -22	5	75	784	420	105	525	10.41	5465	455
Class Room -23	5	75	784	420	105	525	10.41	5465	455
Class Room -24	5	75	784	420	105	525	10.41	5465	455
Old Room-13	2	75	314	168	42	210	10.41	2186	182
Dept. Sociology	2	75	314	168	42	210	10.41	2186	182
Dept. Of Fashion	3	75	470	252	63	315	10.41	3279	273
Dept. Economic	2	75	314	168	42	210	10.41	2186	182
NAAC Office	2	75	314	168	42	210	10.41	2186	182
Internal Examination	2	75	314	168	42	210	10.41	2186	182
Store Room	1	75	157	84	21	105	10.41	1093	91
Indoor Stadium	11	750							
Room 1	2	75							
Room 2	2	75							
Room 3	2	75							
Room 4	2	75							
Room 5	2	75							
Entry Gate -1	6	75							
Room Near Hall	1	75							
First floor Toilet	1	75							
Hall No-1	6	75							
Hall No-2	6	75							

**VENDOR'S LIST**

### List of Equipment / Services Vendors

Sr. No.	Product / Equipment	Contact Details
1	Lighting Energy Saver	Prithvi Technologies Pvt Ltd Mr. Ravi Amdekar Mobile: 09869059501
2	Super Fans	Versa Drives Pvt Ltd., 351B/2A, Uzhaipalar Street, GN Mills Post Coimbatore – 641029 India
3	Refurbishment of Air conditioners:	Mr. Rajesh Deshpande - Energetic Consulting Phone: 022-32437023
4	Solar System	Standard Engineering Company, 131/7B, Hadapsar Industrial Estate, Pune- 411013 Tel: 020-26870237, Fax: 020-26870414 Email: solar@sunbeam.net
		Siddhakala Renewable Energy Systems Pvt. Ltd., 4-A Building, Shree VenkateshPuram, 33/11/1, Phale Nagar, ambega, Pune-411 046 Te:020-65290699, Mob:09689920201 E-mail: srespl.vishal@gmail.com
		Racold Thermo Ltd., No 265/374-376, Kharabwadi, Chakan-Telegaon Road, Taluka: Khed, Pune -410501 Tel : 02135-253593-97, Fax : 02135-254025 / 252966 E-mail:marketing@racold.com Avinash.Sarode@racold.com
		Kaushal Solar Equipments Ltd. 767/7, Deccan Gymkhana, Pune- 411004 Tel : 020-5670472 / 5676379, Fax : 020-5677789 E-mail : kaushalsolar@vsnl.com
		Savemax Solar Systems Pvt. Ltd. Narhe Industrial Zone, Survey No. 48/14-A/2, Plot B Near Sinhagad Medical College, Narhe Pune 411041 Telefax : 020-24358613 / 24358781 E-mail : savemax1@gmail.com
		Sunrise Engitech Pvt. Ltd. Office No. 02, B Wing, 1st Floor, MangalMurti Complex, Above Bank of Maharashtra, Sinhgad Road, Pune- 411030 Tel fax: 020-24250004 Email:totalhotwatersolutions@gmail.com
		Sudarshan Saur Shakti Pvt. Ltd. # 5, Tarak Colony, Opp. Ramakrishna, Mission Ashrama, Beed bypass, Aurangabad- 431005 (Maharashtra) Tel: 0240-6510677, Fax: 0240-6606556 Email:office@sudarshansaur.com vishwash@sudarshansaur.com

Note: The suppliers mentioned above are not the only one of the best in the market. The Management may contact other suppliers for competitive rates specifications.