Forest, Environment and Climate Change Department, Odisha
OFFICE OF THE DIVISIONAL FOREST OFFICER
JHARSUGUDA FOREST DIVISION
Email - dfo.jharsuguda@odisha.gov.in
Ph - 06645 - 295040

Memo No. 4319 /4F (Misc) Dated. 03/08/2024

To,

The Principal,
Laxmi Narayan College, Jharsuguda

Sub: - Regarding conducting Inspection and Issuance of Green Initiative Certificate for Laxminarayan College, Jharsuguda.

Ref: - (i)Letter No.1177/LNC, dt.11.07.2024 of the Principal, L.N. College, Jharsuguda.
(ii)Memo No.421, dt.29.07.2024 of the Range Officer, Jharsuguda Range.

Sir,

With reference to the letter cited above on the captioned subject, as per your request & report submitted by the Range Officer, Jharsuguda Range, the Green Initiative certificate in favour of Laxmi Narayan College for preparing 3rd cycle of NAAC Accreditation is enclosed herewith for your information and necessary action.

Encl: As above

Yours faithfully,

Divisional Forest Officer,
Jharsuguda Forest Division

Government of Odisha.
Forest Environment & Climate Change Department.

Office of the Divisional Forest Officer, Jharsuguda Forest Division.

CERTIFICATE

This is to certify that

Laxminarayan College, Jharsuguda,

At: Badheimunda, Po: Kalimandir Road, Odisha (India), 768202

Has successfully undergone

'GREEN & ENERGY AUDIT'

by our team members and the energy conservation practices, energy saving measures and sustainability in the campus have been assessed to be excellent and commendable.

It has attempted to achieve energy uses standards for the learning spaces with least impact on environment.

Divisional Forest Officer,
Jharsuguda Forest Division

LAXMINARAYAN COLLEGE JHARSUGUDA

Energy Audit Report

Laxminarayan College, Jharsuguda

Jharsuguda, Odisha-768201

Session 2018-19

Energy Audit Team: -

The energy audit has been conducted by following members:

- Mr. Bharat Bhabesh Pati
  Lecturer in physics
- Mrs. Rashmi Rekha Behera
  Lecturer in physics

Preface

Data collection for energy audit of the L.N. College, campus was carried out by the team during 2018-19. This audit was conducted to observe energy consumption of college and seek opportunities to improve the energy efficiency of the campus

Reduction of energy consumption while maintaining or improving human comfort, health and safety were of primary concern. Beyond simply identifying the energy consumption pattern, this audit sought to identify the most energy efficient appliances. Moreover, some daily practices relating common appliances have been provided which may help reducing the energy consumption.

The report accounts for the energy consumption patterns of the academic area and hostel based on actual survey and detailed analysis during the audit. The report compiles a list of possible actions to conserve and efficiently access the available scarce resources and their saving potential was also identified. We look forward towards optimization that the authorities, students and staff would follow the recommendations in the best possible way.

The report is based on certain generalizations and approximations wherever necessary. The views expressed may not reflect the general opinion. They merely represent the opinion of the team guided by the interviews of consumers.

Acknowledgement

The support and assistance received from Heads of the Departments, Chief Wardens of the Hostel, Key-persons of the Departments/Hostel is sincerely appreciated and acknowledged.

Energy audit team
L.N. College
Jharsuguda

CONTENT

Introduction

Laxminarayan College, **Jharsuguda**, is a full-fledged aided College of the Government of Odisha located in Jharsuguda town. It has thousands of students and hundreds of employees. It imparts teaching in Arts, Science and Commerce both in + 2 and + 3 stage with Honours teaching facilities. The College is one of the oldest colleges in western Odisha being established in August, 1969. Laxminarayan College is a fully aided educational institution of the government of Odisha, having many UGC- scale teachers. The main building of the college is housed in an erstwhile Hostel of the Engineering School of Jharsuguda, later on many new infrastructures along with a sports complex financed by the UGC has been added. The College presently boast of a modern computer Laboratory with 60 computers with LAN connections, a well-equipped modern language laboratory and other facility. The present student strength of the college is about 2000.

There are three floors of the college building with total 90 rooms which includes 11 academic departments, examination and admission sections, offices and supporting infrastructures like +3 and+2 library, different laboratories, computer centre, room for watchman etc.

Objective

The objective of Energy Audit is to promote the idea of Energy Conservation in the Campus of L.N. College. The purpose of the energy audit is to identify, quantify, describe and prioritize cost saving measures relating to energy use in the Hostel, Departments and Institute Central Facilities.

The work eligible for Energy Audit Study should be directed towards:

- Identification of areas of energy wastage and estimation of energy saving potential in Hostel, Departments and Institute Central Facilities.
- Suggesting cost-effective measures to improve the efficiency of energy use.
- Estimation of implementation costs and payback periods for each recommended action.
- Documenting results & vital information generated through these activities.
- Identification of possible usages of co-generation, renewable sources of energy (say Solar Energy) and recommendations for implementation, wherever possible, with cost benefit analysis.

Energy Audit Methodology

The methodology adopted for this audit was a three steps process comprising of:

1. **Data Collection** – In preliminary data collection phase, exhaustive data collection was performed using different tools such as observation, interviewing key persons, and measurements.
2. **Data Analysis** - Detailed analysis of data collected was done. The data analysed was used for producing graphical representations.
3. **Recommendation** – On the basis of results of data analysis and observations, some steps for reducing power consumption without affecting the comfort and satisfaction were recommended along with their cost analysis.

Data Collection

For suggesting any corrective measures to reduce power consumption, it is first necessary to know the power consumption pattern in detail. For this, the exhaustive data collection exercise was performed at all the departments, academic centres, hostel, and other supporting entities such as library, computer centre etc.

Following steps were taken for data collection:

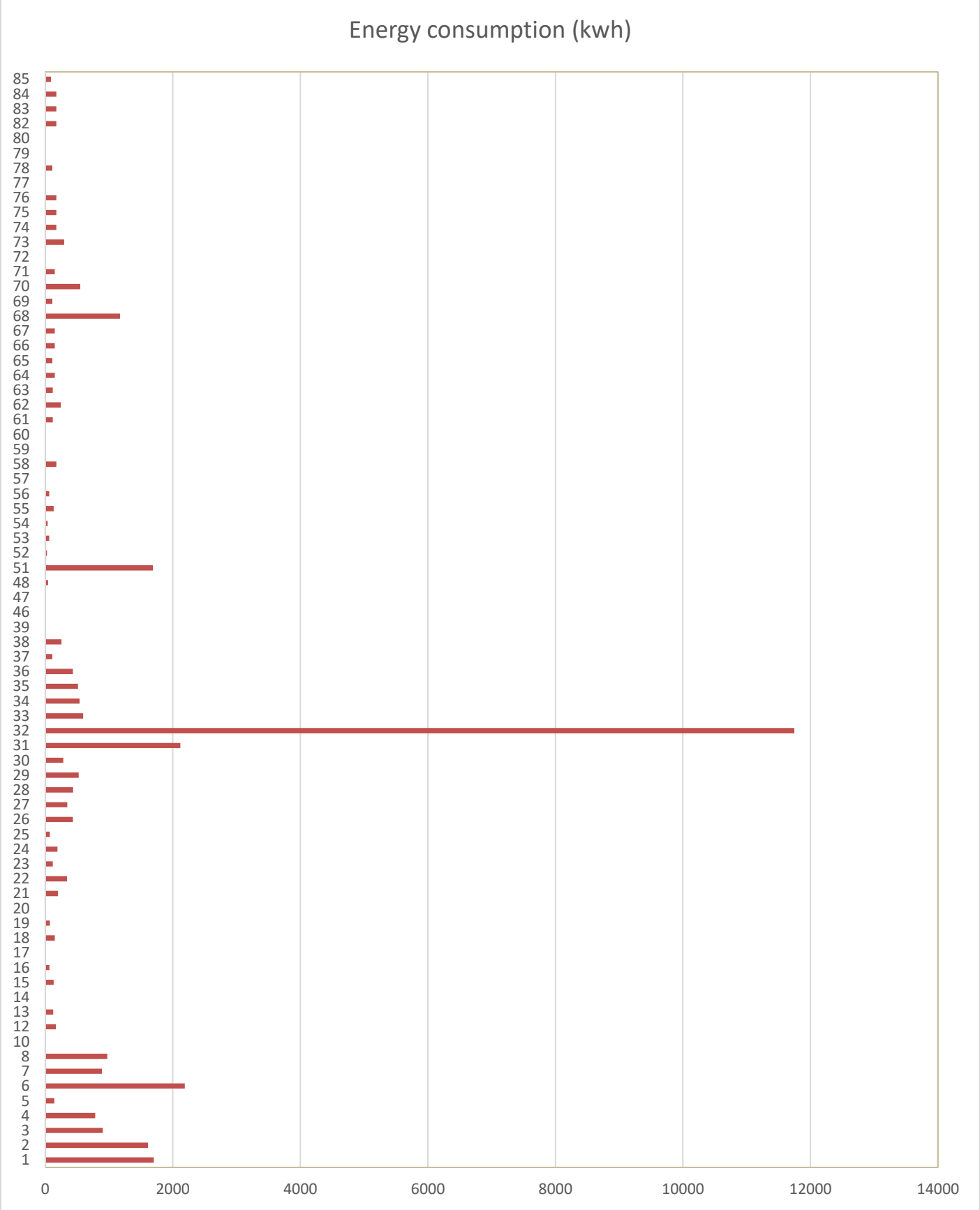
- The team went to each department, centre, hostel etc. to gather information about running hours of appliances in each department
- Information about the general electrical appliances was collected by observation and interviewing.
- The power consumption of appliances was measured (rated power; CFL for example).
- The details of usage of the appliances were collected by interviewing key persons e.g. Warden (in case of hostels), key-person (in case of departments) etc.
- In case of Air Conditioning, insulation was checked by visual inspection.
- Approximations and generalizations were done at places with lack of information.

Data Analysis

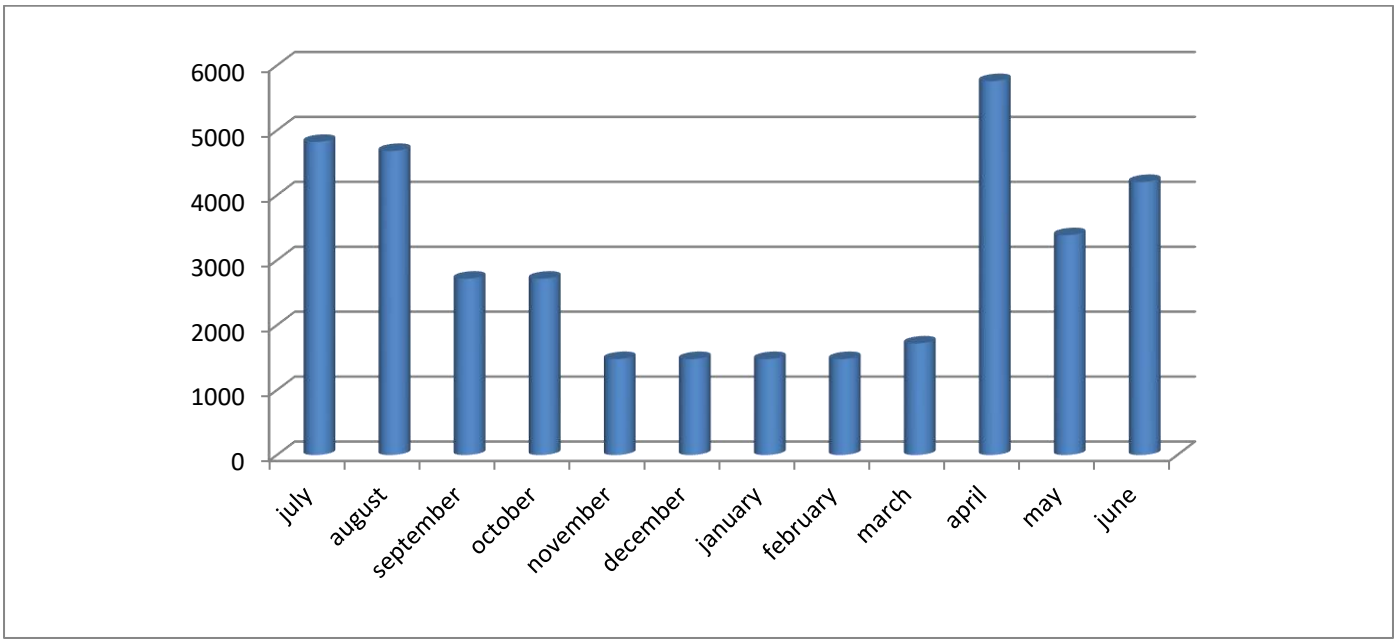
In data analysis, the data collected is processed to draw significant conclusions to pinpoint loopholes and identify the areas to focus upon. Analysis of the power consumption observations obtained was used to obtain the power consumption pattern and also to get the information about the points where electric power is wasted.

The team analysed the data and provided the information in the form of graphs and charts.

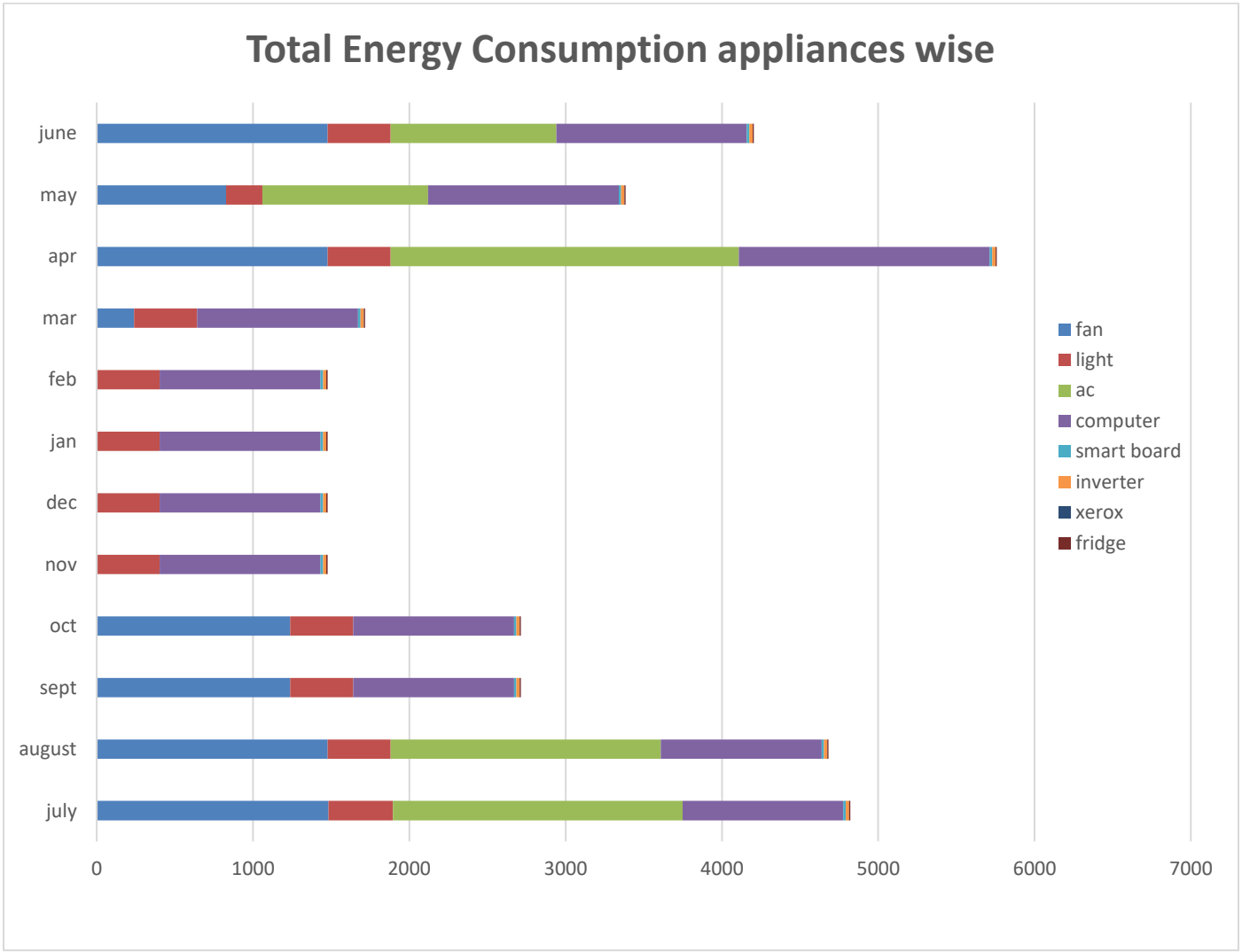
Energy consumption (kwh) by different rooms



Total Energy Consumption (kwh) in different months.



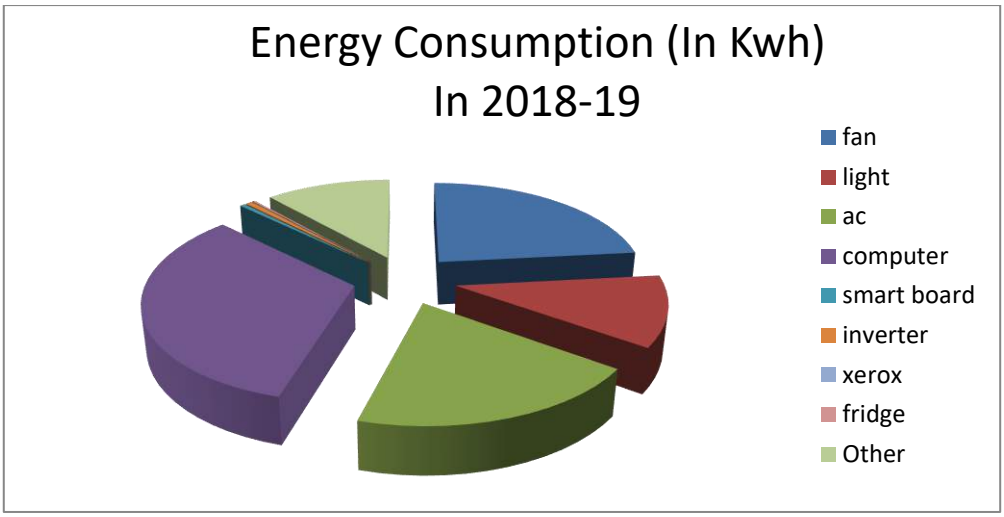
Total Energy Consumption (kwh) by different appliances



Appliances wise energy consumption (kwh)

Name of Appliances	Energy Consumption in 2018-19 (In kwh)	Total Energy Consumption In 2018-19 (In kwh)
Fan	9459.51	40568.29
Light	4670.45	
Ac	7927.2	
Computer	13304.93	
Smart board	192	
Inverter	252	
Xerox	6.6	
Fridge	90	
Other	4665.6	

Other appliances include 2 water purifiers, LED and CFL bulb in the corridor for night lighting, 1 water pump and 6 cctv camera.



For lighting purpose 11.51% of total energy is consumed.

The fans have a contribution of 23.31% in total energy consumption and is maximum over all equipments.

The air conditioners consume 19.54% of total energy consumption and is the second maximum over all equipments.

The computers consume 32.79% of energy out of the total energy consumption.

The other equipment such as water pump, inverter, currency counting machine, lab equipments, xerox machine, fridge etc consumes 12.83% of total energy.

Execution of previous recommendations

In the previous audit it was recommended to replace all CFL bulbs by LED bulbs. Majority of them have been replaced but still in some rooms CFL bulbs are being used.

As per the recommendations in the previous audit the college installed solar panels in the month of October which proposes to supply 81 kwh of energy every month in ideal condition of 10 hours of sunlight. Taking into account all weather conditions it can generate approximately 800 kwh of energy, which is almost 2% percent of the total energy consumption of the year 2018-19.

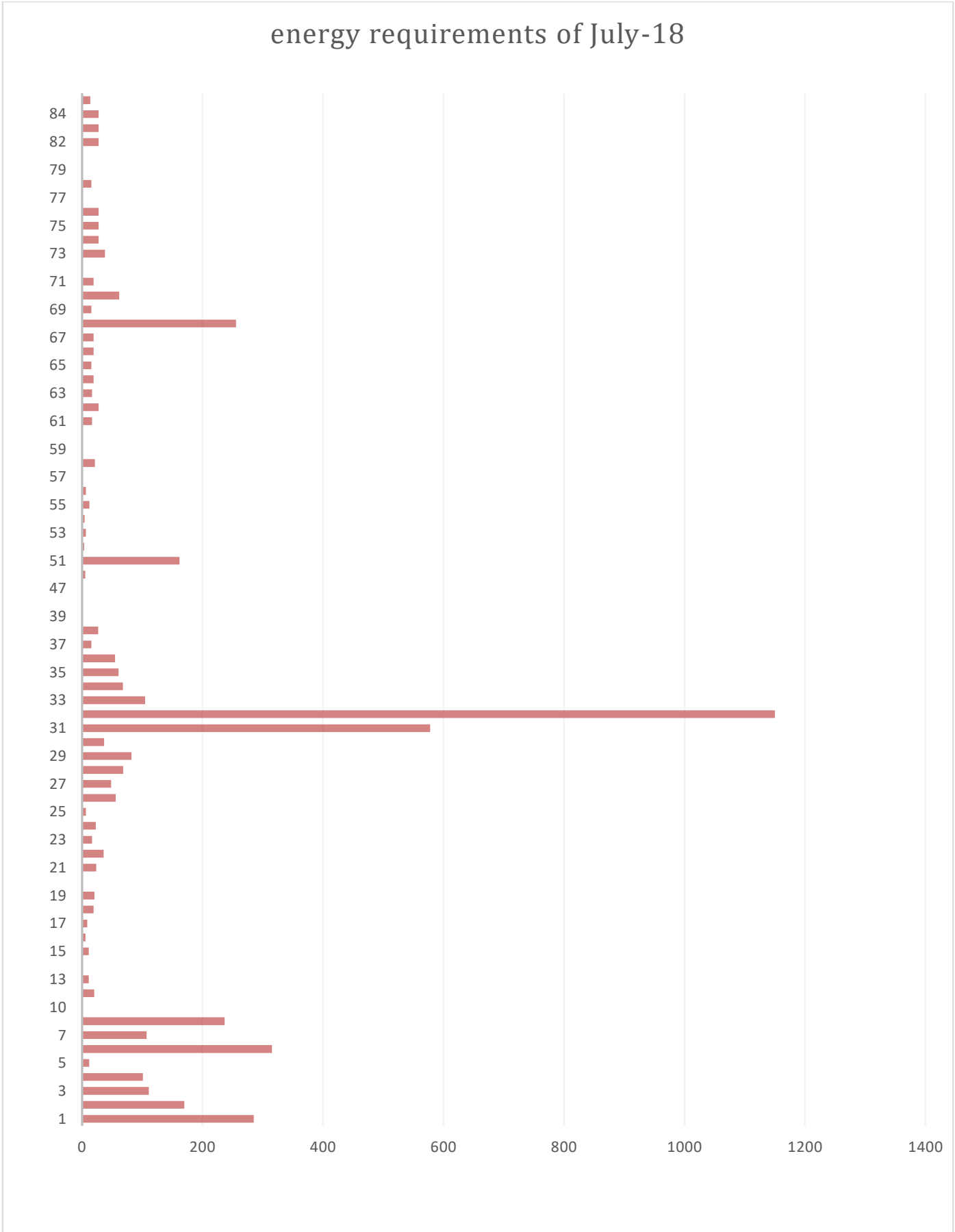
Recommendations

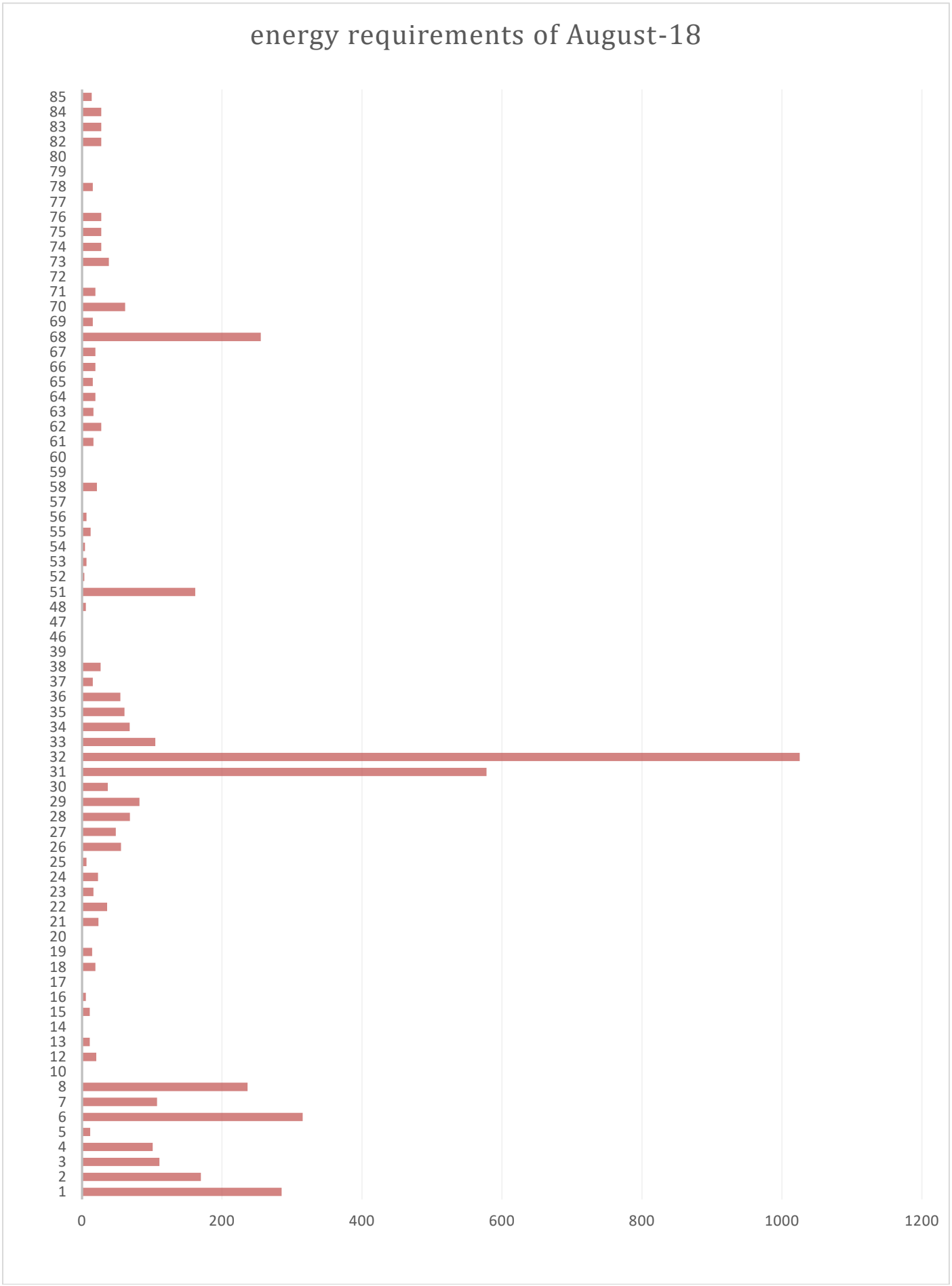
Few steps have been taken to minimise the energy consumption of college. But still there are number of ways in which the present situation may be improved. Following is a list of recommendations that we make that will help make L.N. College an energy efficient system.

- Installation of more solar panel
- Replacing CFL bulbs by LED bulbs
- Replacing LCD computer monitors by LED monitors
- Use of motion sensors on corridors and toilets
- Use of master switch outside each room

Appendix-A

Month wise comparative energy consumption graphs of all departments

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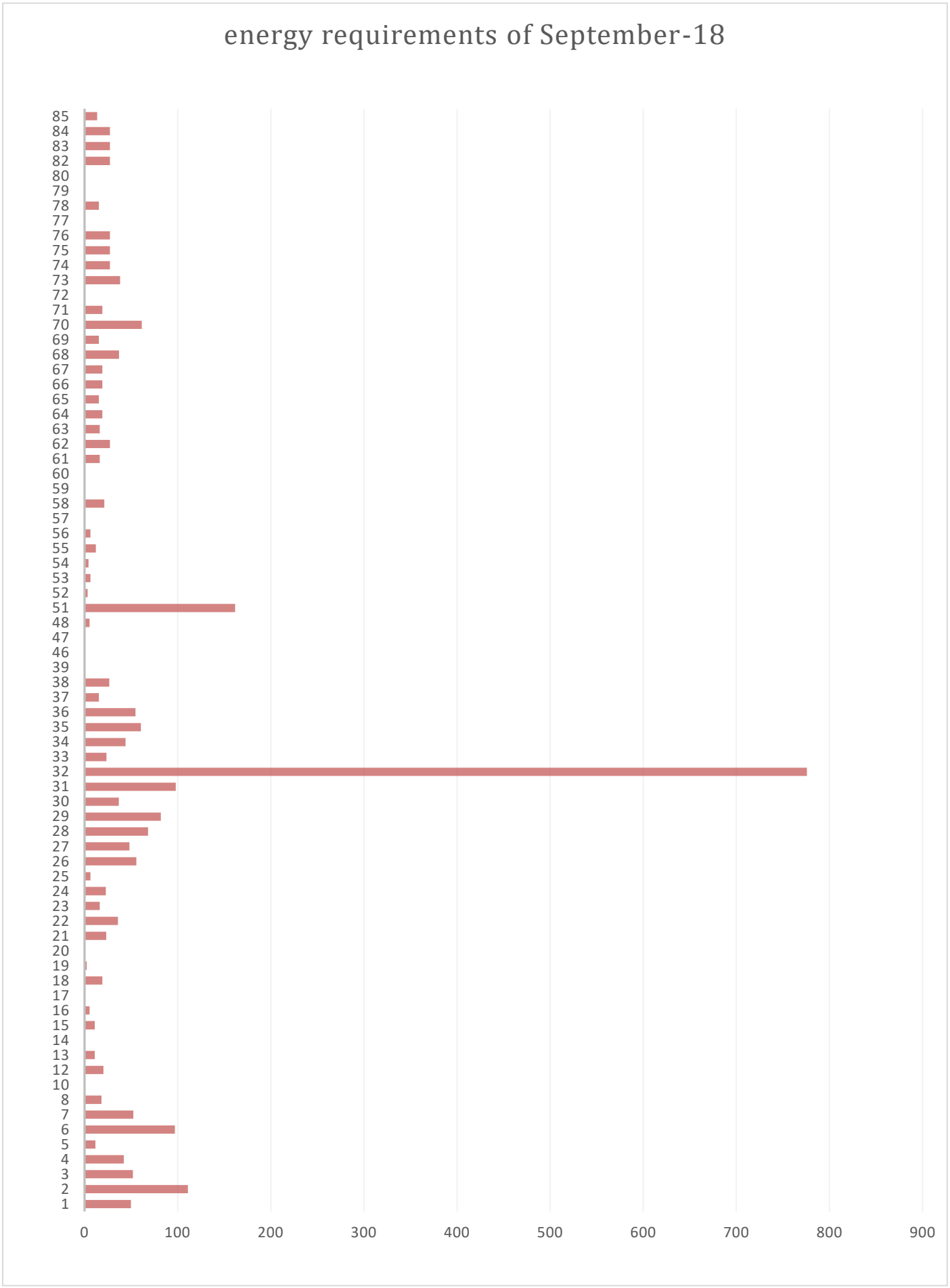
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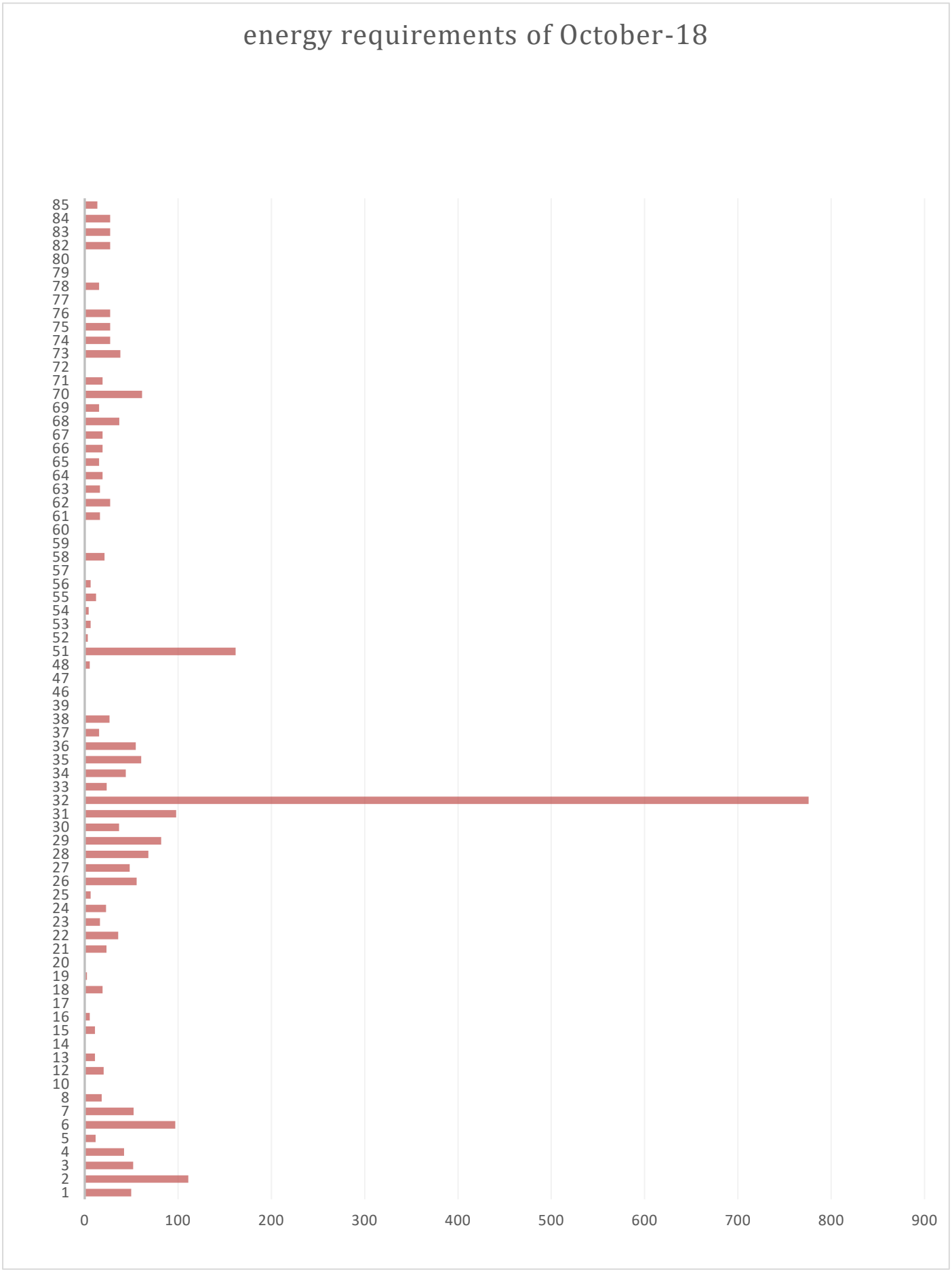
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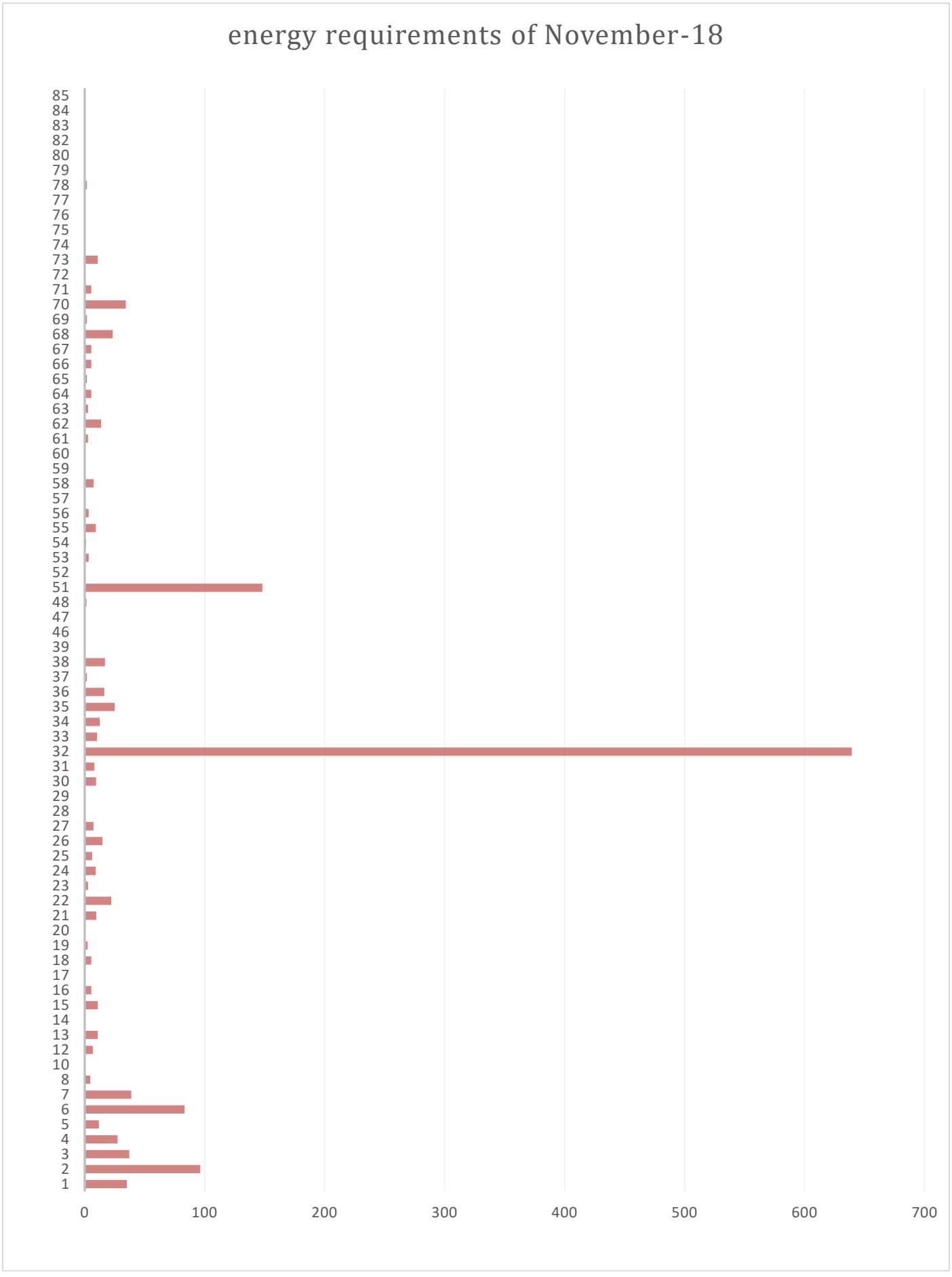
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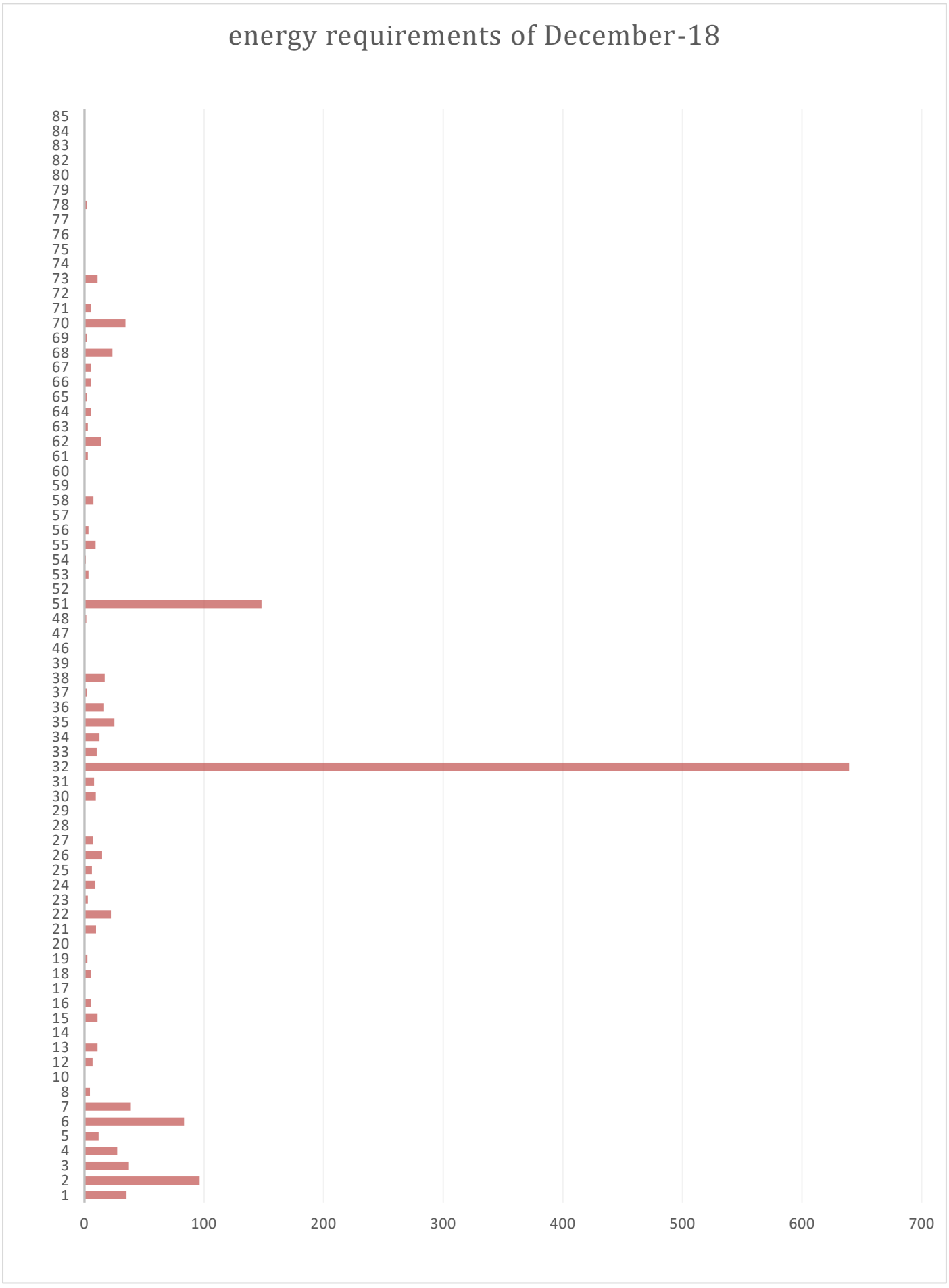
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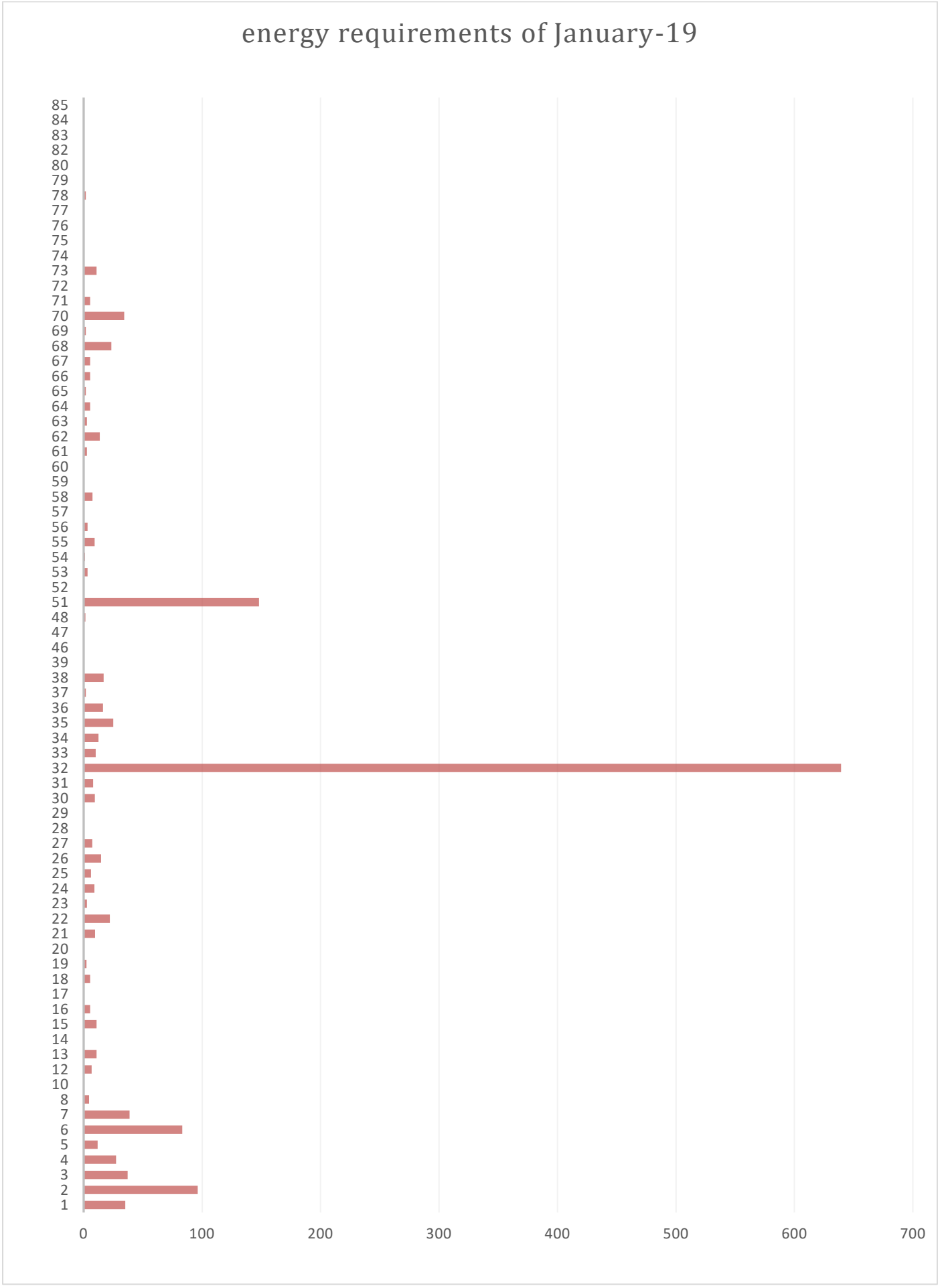
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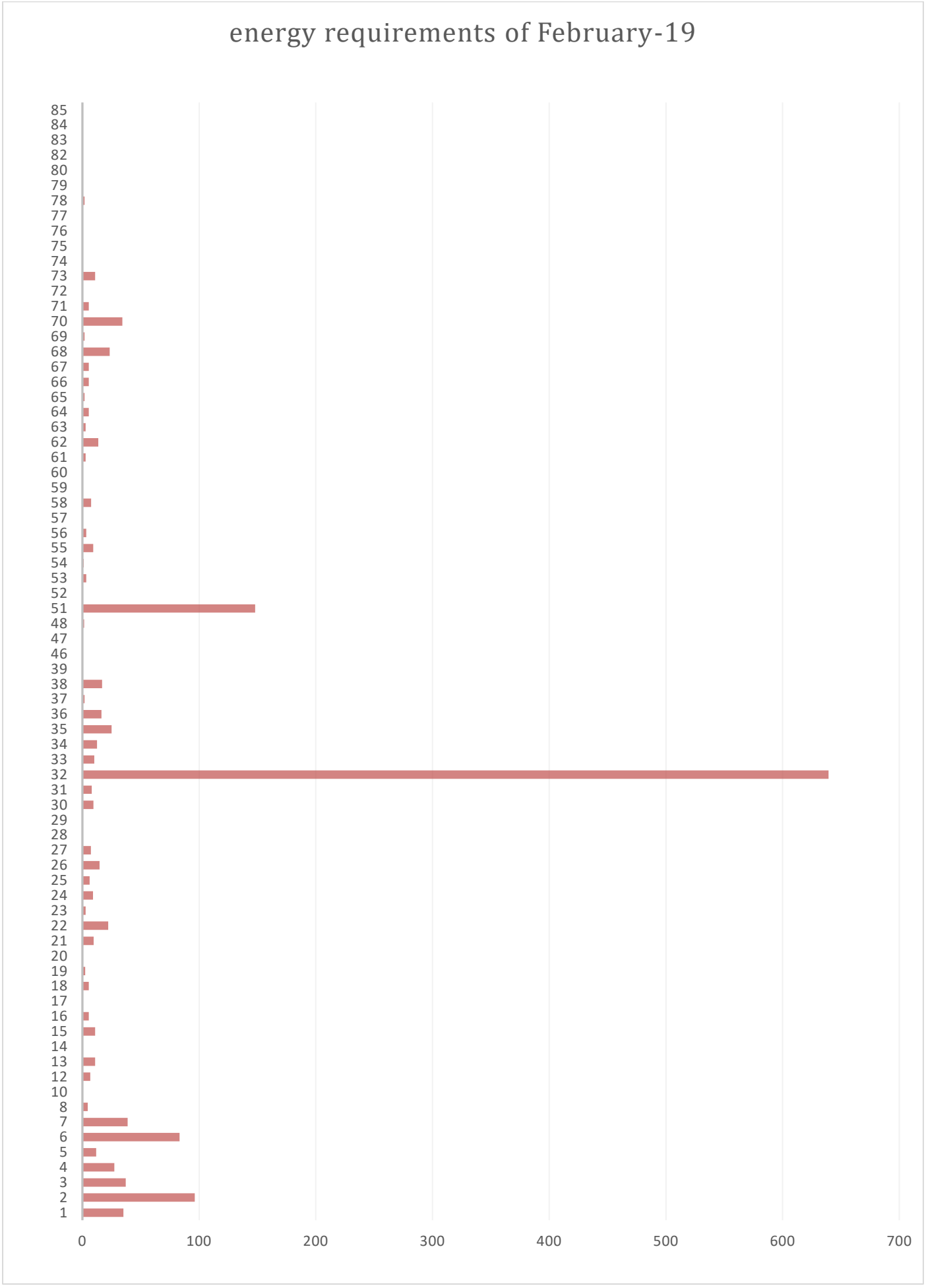
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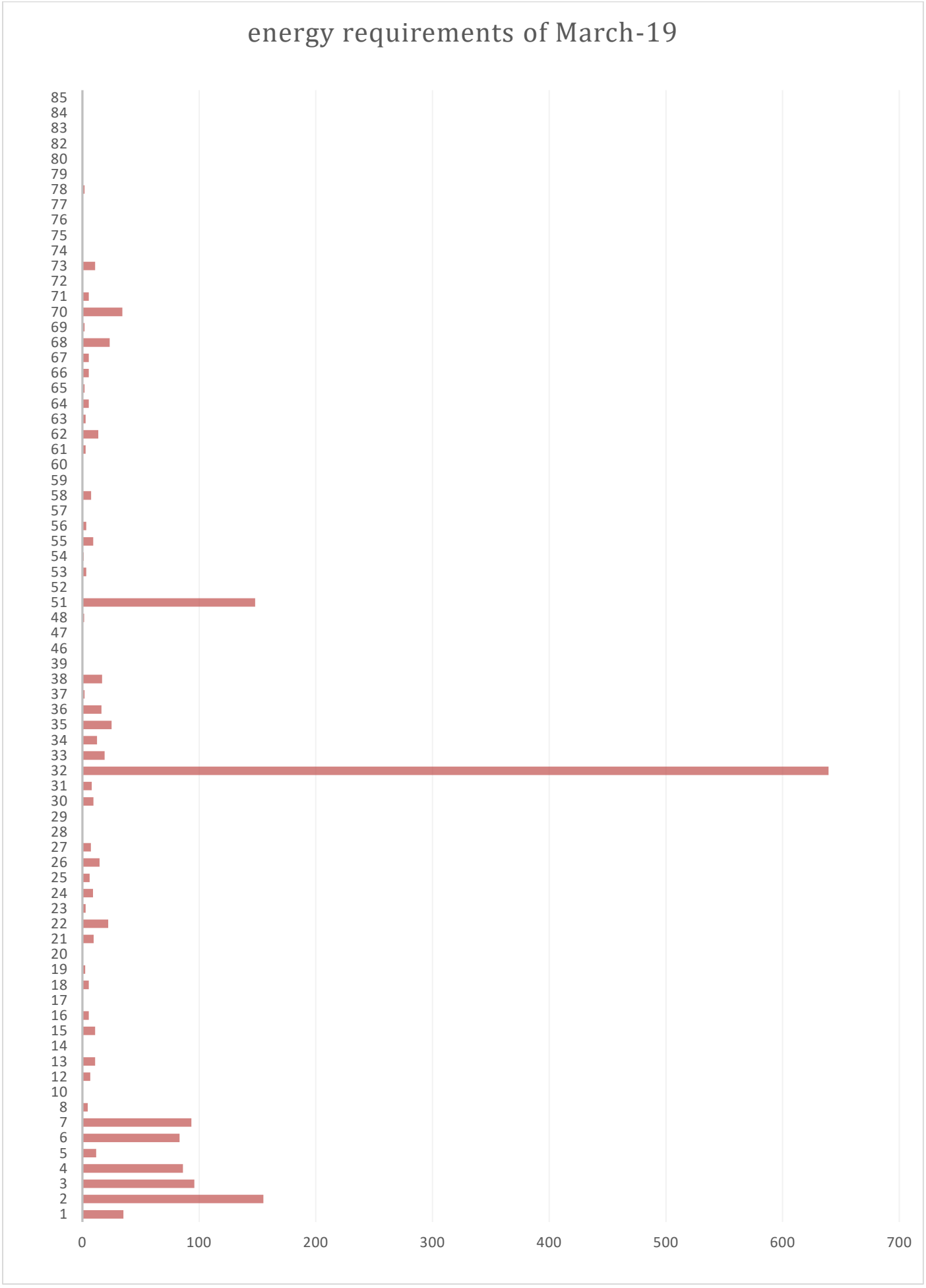
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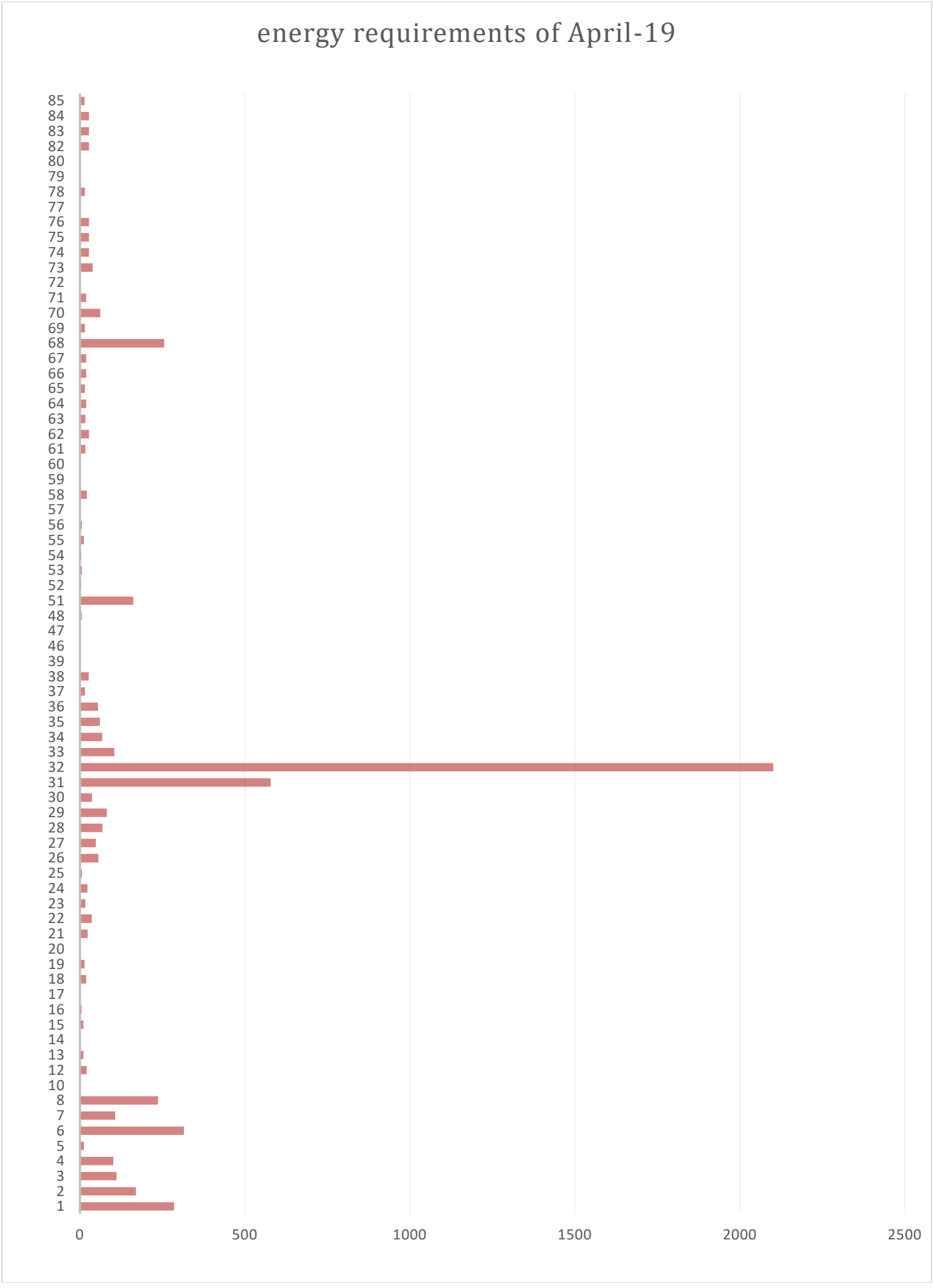
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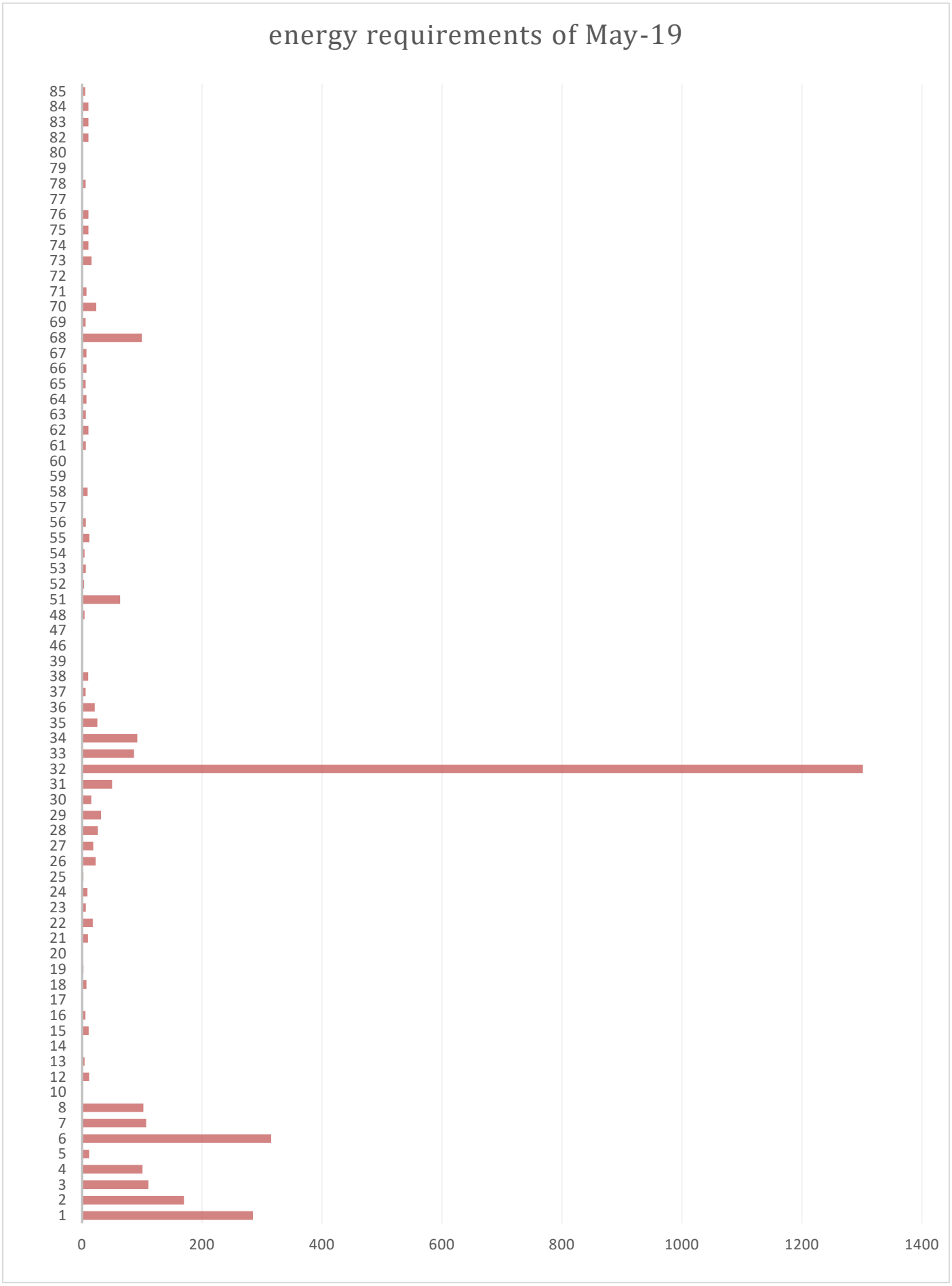
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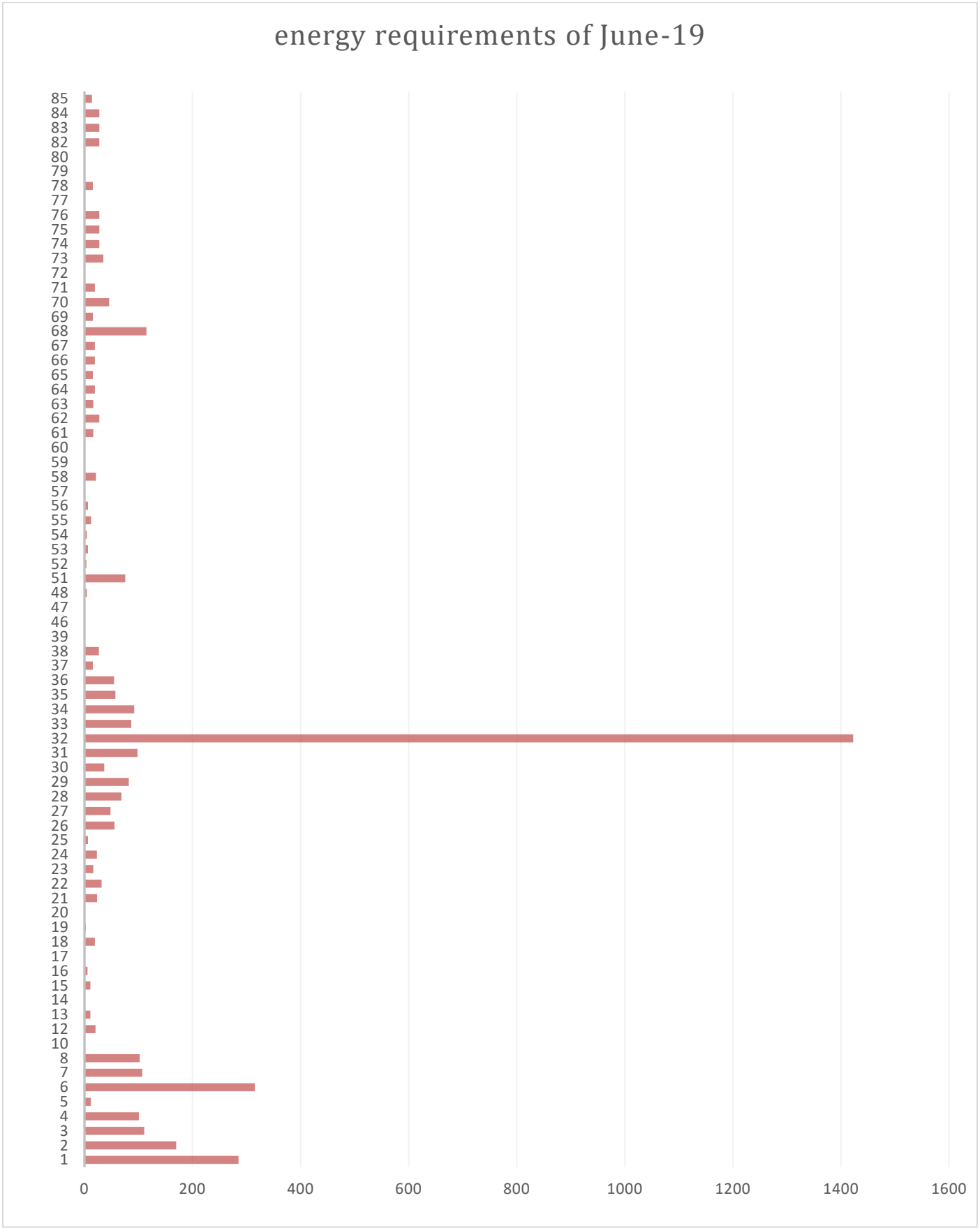
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Appendix-B

Appliances wise energy consumption in hostel

Light

Sl. No	Room No.	Type	No.	Power (In Watt)	Running Hour	Energy (In KWH)	Energy Consumption in 2018-19 (In KWh)
001	01	Nil	0	0	0	0	
002	02	Nil	0	0	0	0	
003	03	Nil	0	0	0	0	
004	04	CFL	2	30	18	1.08	
005	05	CFL	2	30	12	0.72	
006	06	CFL	2	30	12	0.72	
007	07	CFL	2	30	6	0.36	
008	08	CFL	2	30	6	0.36	
009	09	CFL	2	30	6	0.36	
010	10	CFL	2	30	6	0.36	3831.3
011	11	CFL	2	30	6	0.36	
012	12	CFL	2	30	6	0.36	
013	Latrine	CFL	2	30	0	0	
014	Corridor	CFL	4	30	8	0.96	
015	Cycle room	CFL	2	30	0	0	
016	Kitchen	CFL	3	30	5	0.45	
017	Matron room	CFL	1	30	0	0	
018	Bathroom	CFL	3	30	0	0	
019	Office room	CFL	2	30	2	0.12	

020	outside	CFL	8	30	12	2.88	
021	13	CFL	2	30	6	0.36	
022	14	CFL	2	30	6	0.36	
023	15	CFL	2	30	6	0.36	
024	16	CFL	2	30	6	0.36	
025	17	CFL	2	30	6	0.36	
026	Latrine	CFL	1	30	0	0	
027	Corridor	CFL	2	30	0	0	
028	Study room	CFL	3	30	8	0.72	

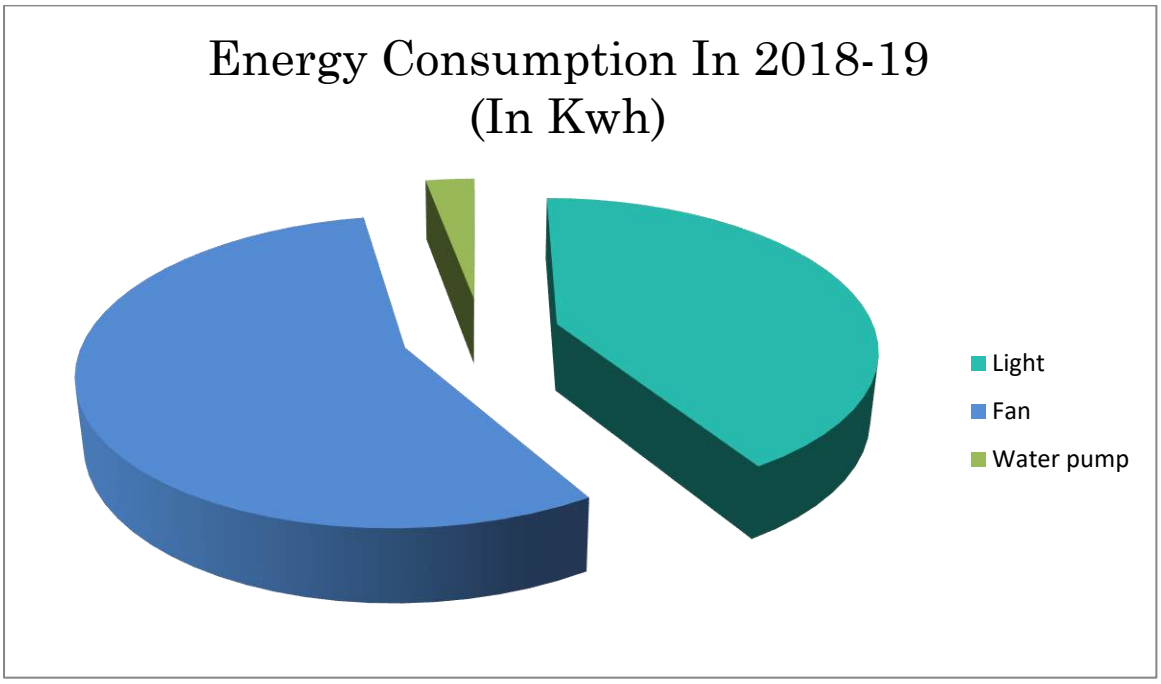
Fan

Sl. No	Room No.	Type	No.	Power (In Watt)	Running Hour	Energy (In KWH)	Energy Consumption in 2018-19 (In KWh)
001	01	Nil	0	0	0	0	
002	02	Nil	0	0	0	0	
003	03	Nil	0	0	0	0	
004	04	ceiling	2	70	10	1.4	
005	05	ceiling	2	70	10	1.4	
006	06	ceiling	2	70	10	1.4	7114.8
007	07	ceiling	2	70	10	1.4	
008	08	ceiling	2	70	10	1.4	
009	09	ceiling	2	70	10	1.4	
010	10	ceiling	2	70	10	1.4	
011	11	ceiling	2	70	10	1.4	

012	12	ceiling	2	70	10	1.4
013	Latrine	ceiling	0	0	0	0
014	Corridor	ceiling	0	0	0	0
015	Cycle room	ceiling	0	0	0	0
016	Kitchen	ceiling	0	0	0	0
017	Matron room	ceiling	0	0	0	0
018	Bathroom	ceiling	0	0	0	0
019	Office room	ceiling	2	70	2	0.28
020	outside	ceiling	0	0	0	0
021	13	ceiling	2	70	10	1.4
022	14	ceiling	2	70	10	1.4
023	15	ceiling	2	70	10	1.4
024	16	ceiling	2	70	10	1.4
025	17	ceiling	2	70	10	1.4
026	Latrine	ceiling	0	0	0	0
027	Corridor	ceiling	0	0	0	0
028	Study room	ceiling	3	70	8	1.68

Appliances wise energy consumption in hostel

Sl. No	Name Of Appliance	Energy Consumption in a day (In KWh)	Energy Consumption In 2018-19 (In KWh)
001	Light	11.61	5204.1
002	Fan	21.56	7047.48
003	Water pump	1.119	369.27



Appendix-C

References

- IIT Kanpur energy audit report, group of environment and energy engineering
- IIT Roorkee energy audit report

Energy Audit Report

Laxminarayan College, Jharsuguda

Jharsuguda, Odisha-768201

Session 2019-20

Energy Audit Team: -

The energy audit has been conducted by following members:

- Mr. Bignan Bhusan Bhanja
  Lecturer in physics
- Mr. Bijendra Jyotish
  Lecturer in physics
- Mr. Bharat Bhabesh Pati
  Lecturer in physics
- Mr. Kailash Kumar Panda
  Demonstrator in chemistry

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The report accounts for the energy consumption patterns of the academic area and hostel based on actual survey and detailed analysis during the audit. The report compiles a list of possible actions to conserve and efficiently access the available scarce resources and their saving potential was also identified. We look forward towards optimization that the authorities, students and staff would follow the recommendations in the best possible way.

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Energy audit team
L.N. College
Jharsuguda

CONTENT

Introduction

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There are three floors of the college building with total 90 rooms which includes 11 academic departments, examination and admission sections, offices and supporting infrastructures like +3 and+2 library, different laboratories, computer centre, room for watchman etc.

Objective

The objective of Energy Audit is to promote the idea of Energy Conservation in the Campus of L.N. College. The purpose of the energy audit is to identify, quantify, describe and prioritize cost saving measures relating to energy use in the Hostel, Departments and Institute Central Facilities.

The work eligible for Energy Audit Study should be directed towards:

- Identification of areas of energy wastage and estimation of energy saving potential in Hostel, Departments and Institute Central Facilities.
- Suggesting cost-effective measures to improve the efficiency of energy use.
- Estimation of implementation costs and payback periods for each recommended action.
- Documenting results & vital information generated through these activities.
- Identification of possible usages of co-generation, renewable sources of energy (say Solar Energy) and recommendations for implementation, wherever possible, with cost benefit analysis.

Energy Audit Methodology

The methodology adopted for this audit was a three steps process comprising of:

1. **Data Collection** – In preliminary data collection phase, exhaustive data collection was performed using different tools such as observation, interviewing key persons, and measurements.
2. **Data Analysis** - Detailed analysis of data collected was done. The data analysed was used for producing graphical representations.
3. **Recommendation** – On the basis of results of data analysis and observations, some steps for reducing power consumption without affecting the comfort and satisfaction were recommended along with their cost analysis.

Data Collection

For suggesting any corrective measures to reduce power consumption, it is first necessary to know the power consumption pattern in detail. For this, the exhaustive data collection exercise was performed at all the departments, academic centres, hostel, and other supporting entities such as library, computer centre etc.

Following steps were taken for data collection:

- The team went to each department, centre, hostel etc. to gather information about running hours of appliances in each department
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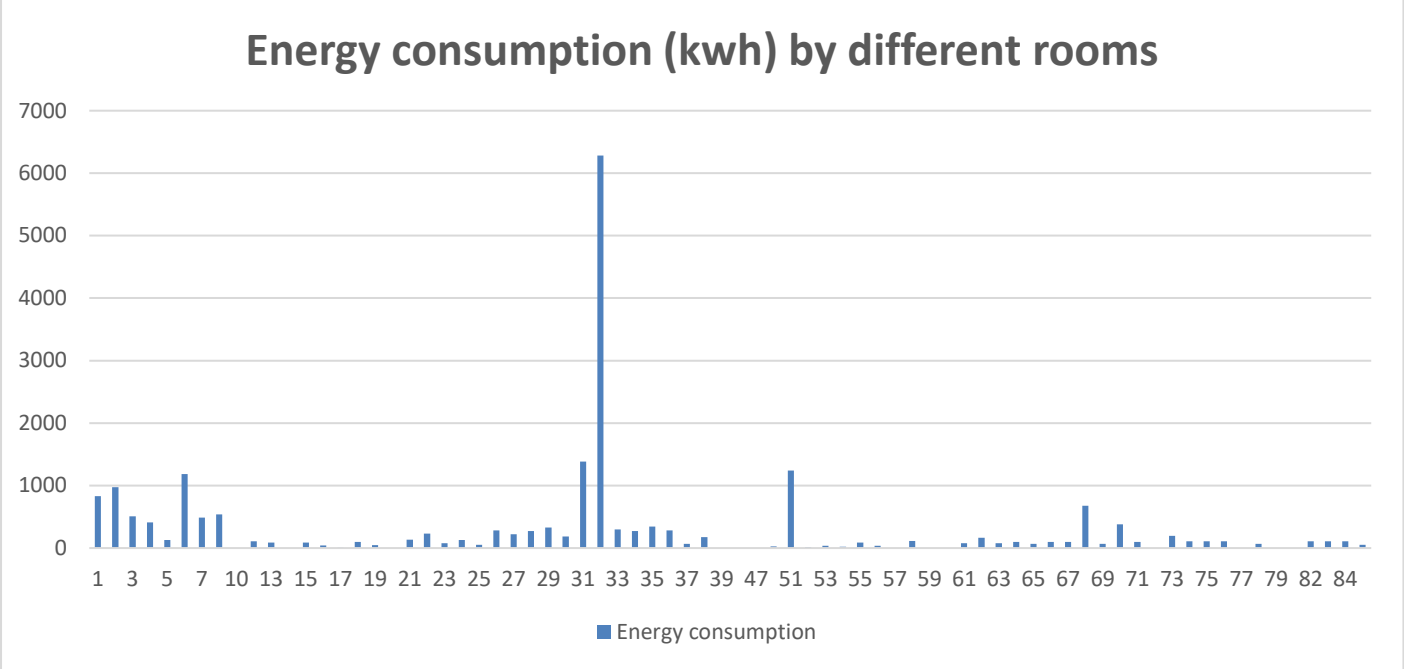
- The power consumption of appliances was measured (rated power; CFL for example).
- The details of usage of the appliances were collected by interviewing key persons e.g. Warden (in case of hostels), key-person (in case of departments) etc.
- In case of Air Conditioning, insulation was checked by visual inspection.
- Approximations and generalizations were done at places with lack of information.

Data Analysis

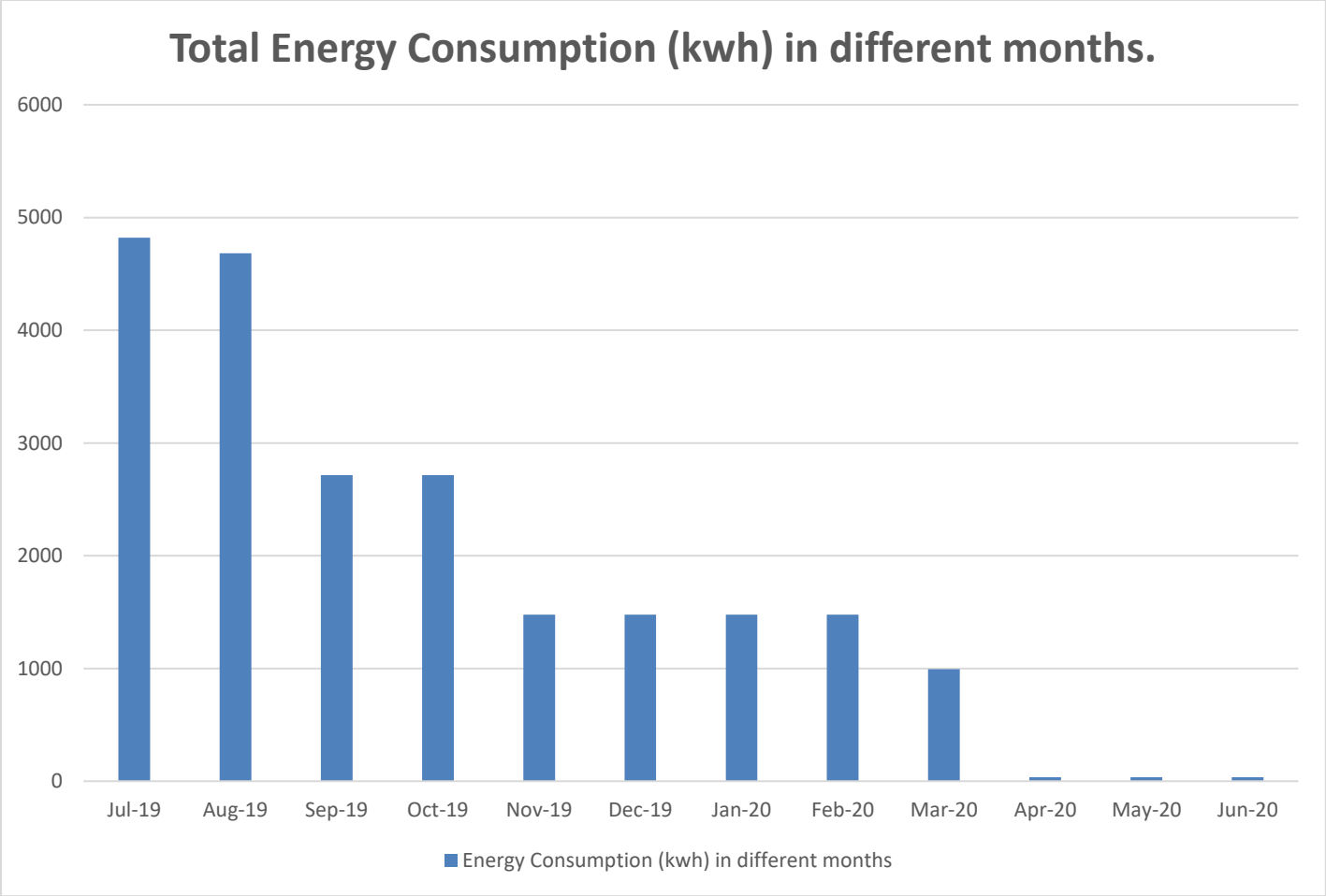
In data analysis, the data collected is processed to draw significant conclusions to pinpoint loopholes and identify the areas to focus upon. Analysis of the power consumption observations obtained was used to obtain the power consumption pattern and also to get the information about the points where electric power is wasted.

The team analysed the data and provided the information in the form of graphs and charts.

Energy consumption (kwh) by different rooms

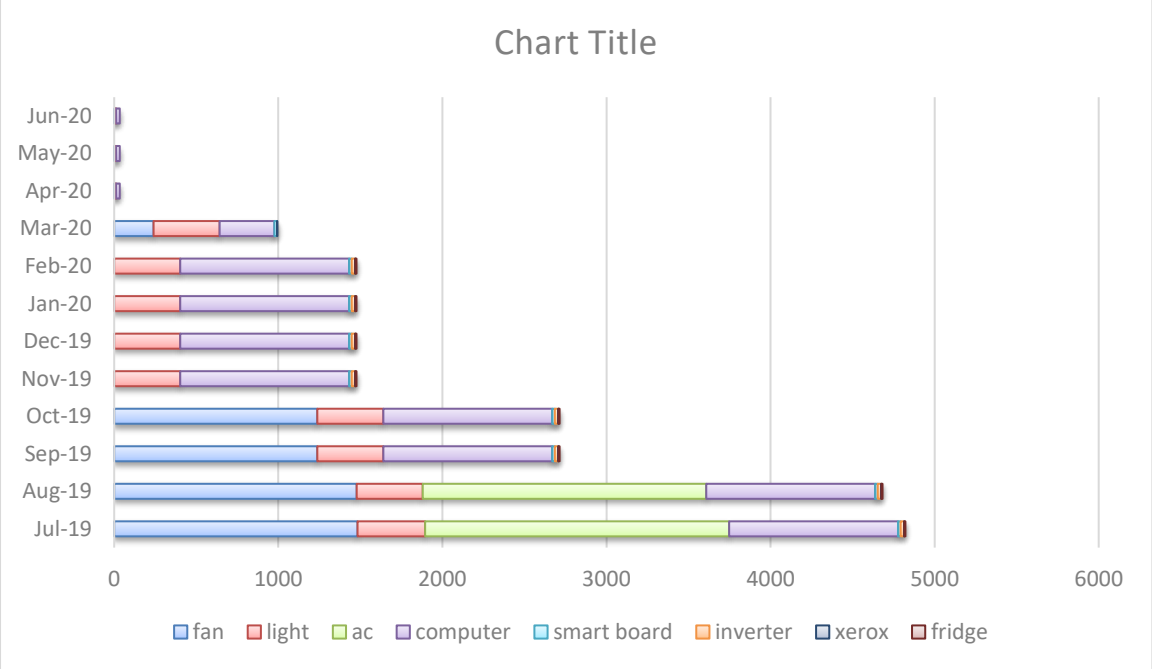


Total Energy Consumption (kwh) in different months.



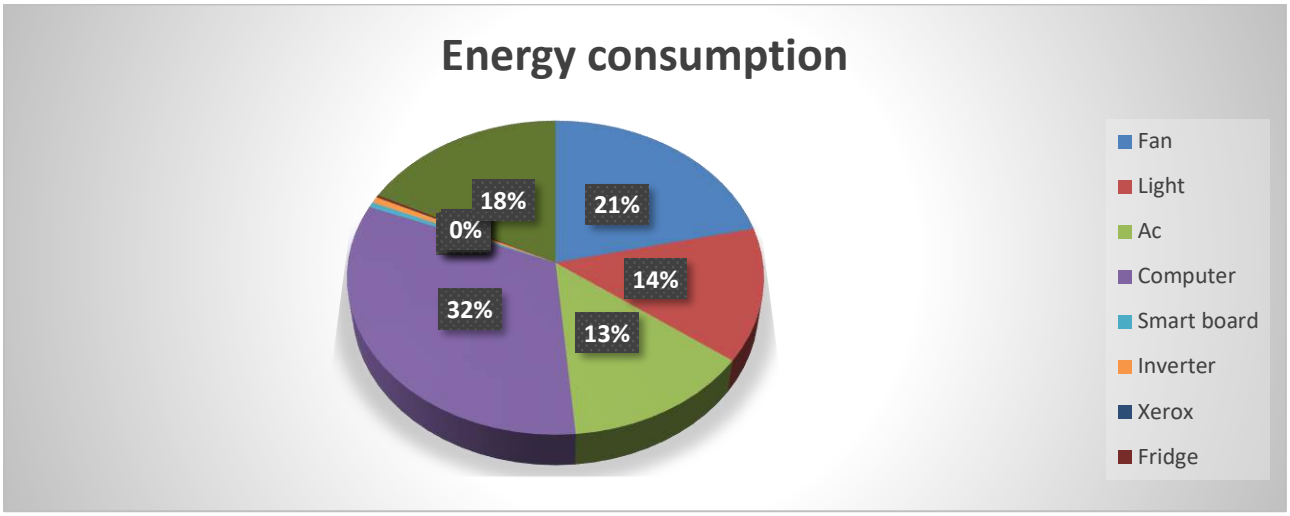
Due to covid-19 pandemic lockdown was declared in the month of march. And as per the Covid-19 guidelines administered by Govt. of Odisha no classes could be held in physical mode. Therefore, a decrease in consumption of energy can be seen from the month of march 2019.

Total Energy Consumption (kwh) by different appliances



Appliances wise energy consumption (kwh)

Name of Appliances	Energy Consumption in 2019-20 (In kwh)	Total Energy Consumption In 2019-20 (In kwh)
Fan	5695.14	21933.98
Light	3649.665	
Ac	3580.8	
Computer	8630.975	
Smart board	144	
Inverter	168	
Xerox	5.4	
Fridge	60	
Other	4665.6	



Other appliances include 2 water purifiers, LED and CFL bulb in the corridor for night lighting, 1 water pump and 6 cctv camera.

For lighting purpose around 14% of total energy is consumed.

The fans have a contribution of around 21% in total energy consumption and is maximum over all equipments.

The air conditioners consume around 13% of total energy consumption and is the second maximum over all equipments.

The computers consume around 32% of energy out of the total energy consumption.

The other equipment such as water pump, inverter, currency counting machine, lab equipments, xerox machine, fridge etc consumes around 18% of total energy.

Execution of previous recommendations

In the previous audit it was recommended to replace all CFL bulbs by LED bulbs. Majority of them have been replaced but still in some rooms CFL bulbs are being used.

As per the recommendations in the previous audit the college has installed solar panels which proposes to supply 81 kwh of energy every month in ideal condition of 10 hours of sunlight. Taking into account all weather conditions it can generate approximately 800 kwh of energy, which is almost 3% percent of the total energy consumption of the year 2019-20.

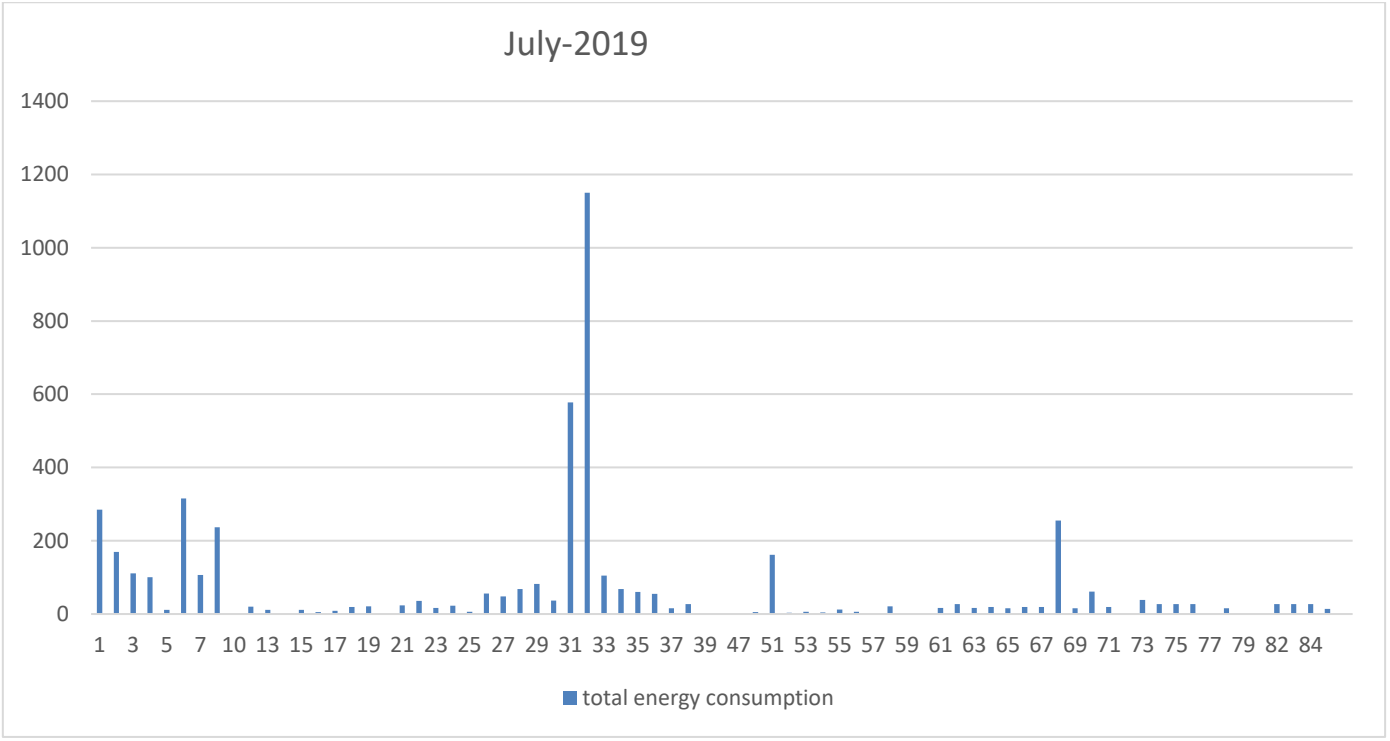
Recommendations

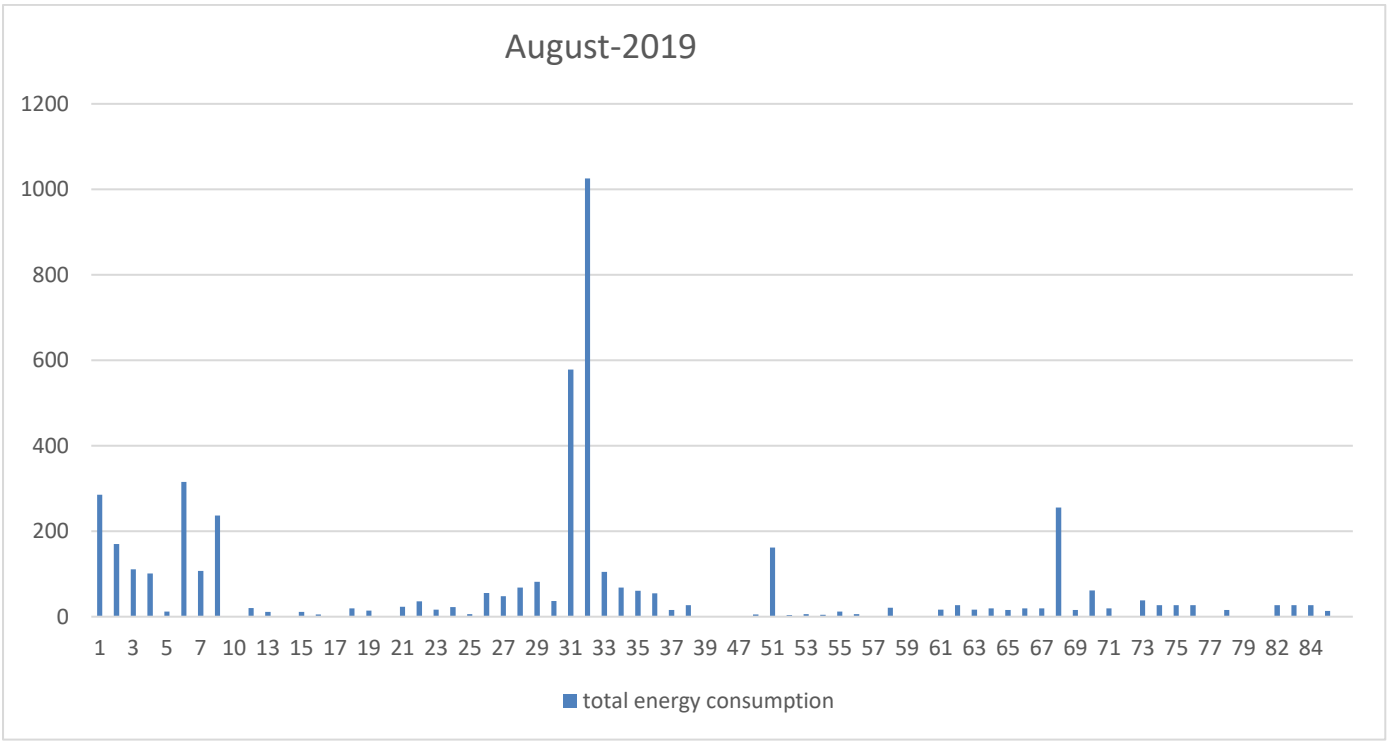
Few steps have been taken to minimise the energy consumption of college. But still there are number of ways in which the present situation may be improved. Following is a list of recommendations that we make that will help make L.N. College an energy efficient system.

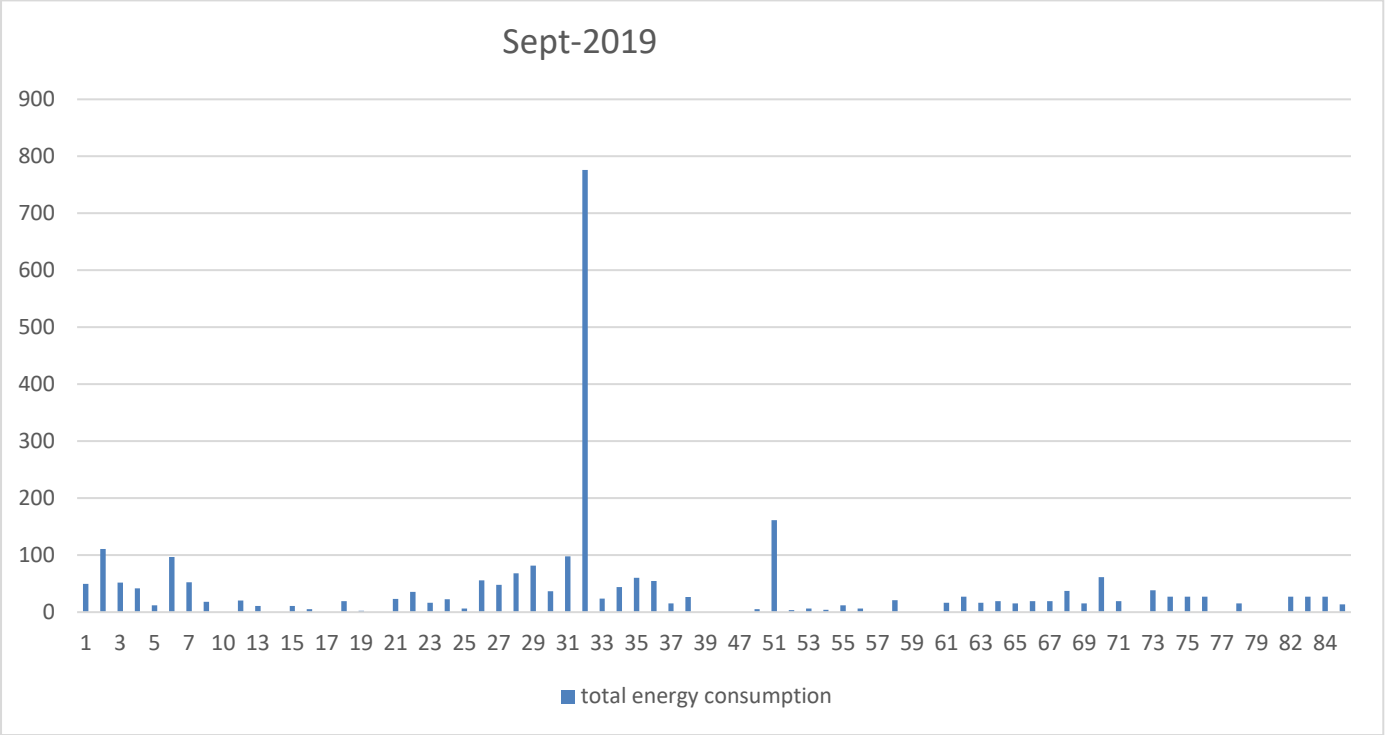
- Installation of more solar panel
- Replacing CFL bulbs by LED bulbs
- Replacing LCD computer monitors by LED monitors
- Use of motion sensors on corridors and toilets
- Use of master switch outside each room

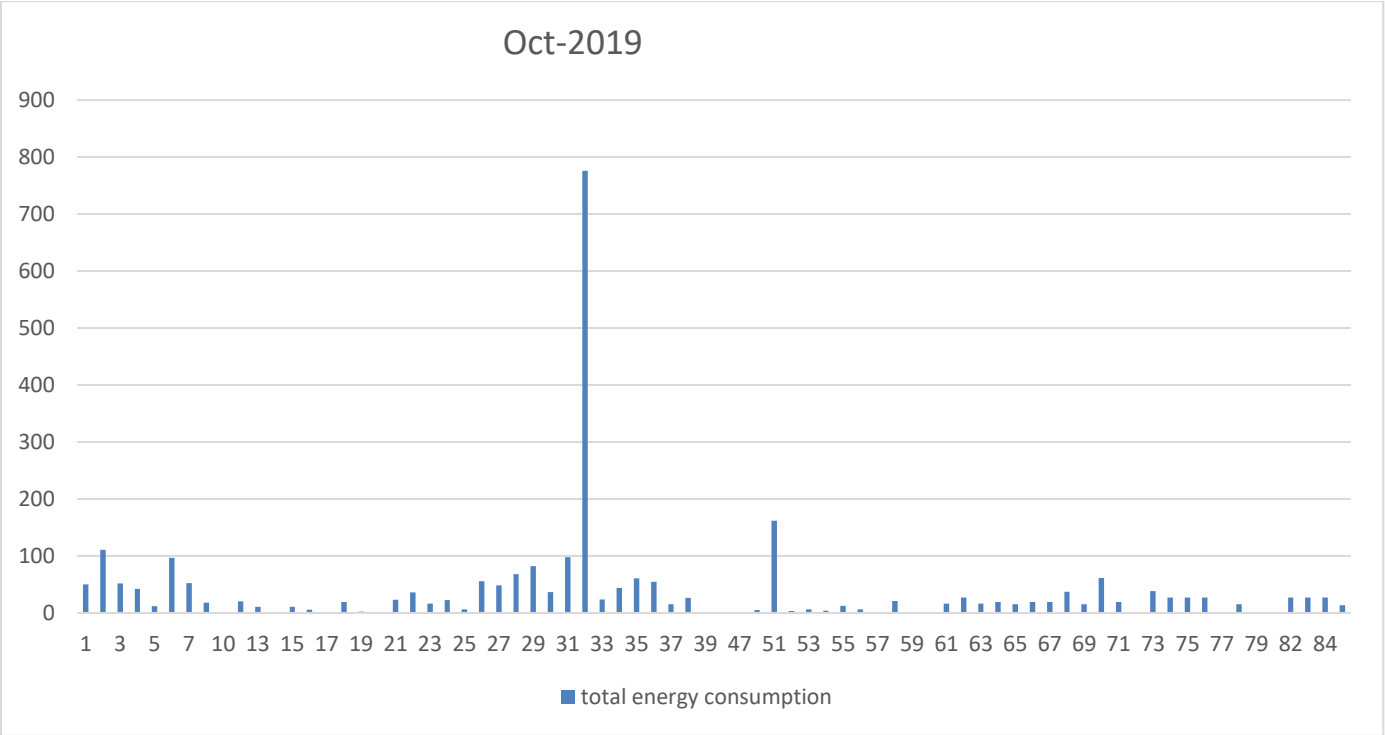
Appendix-A

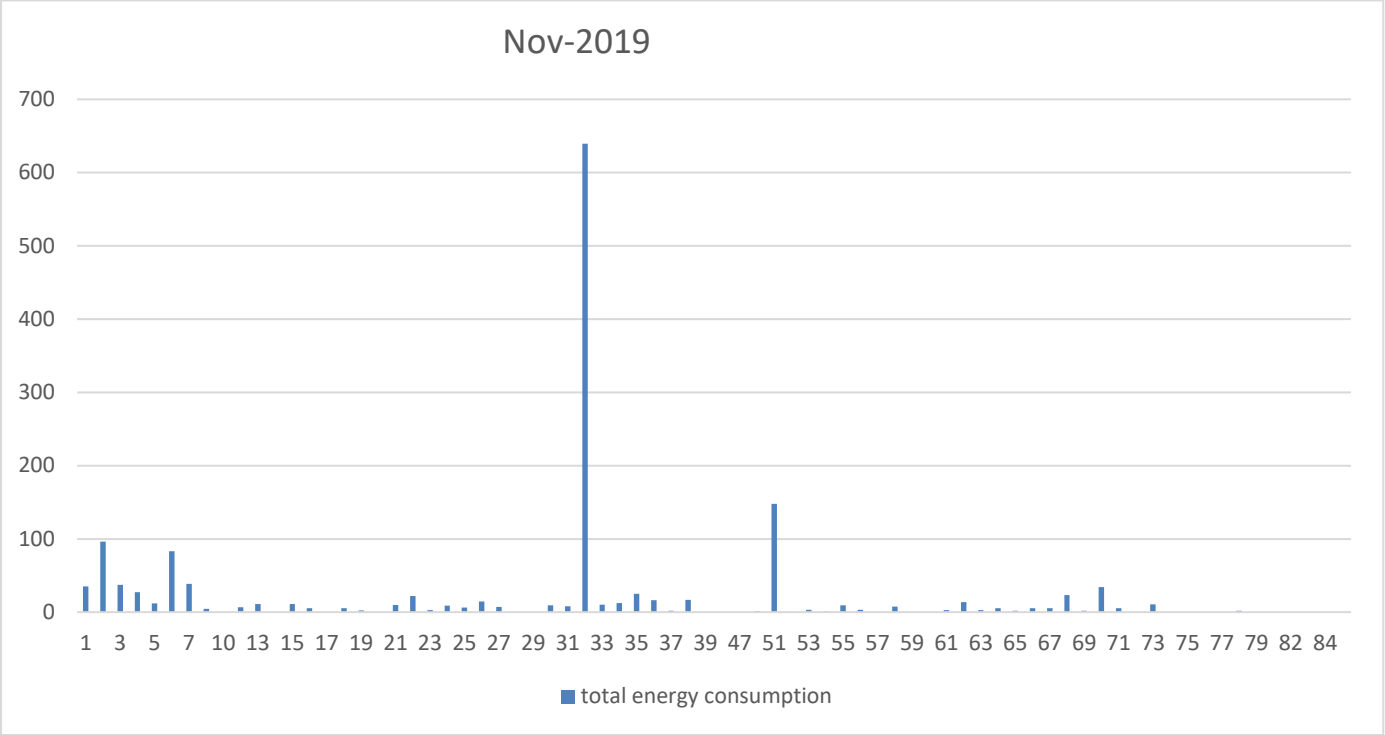
Month wise comparative energy consumption graphs of all departments






Sept-2019
900
800
700
600
500
400
300
200
100
0
1 3 5 7 10 13 15 17 19 21 23 25 27 29 31 33 35 37 39 47 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 82 84
total energy consumption


Oct-2019
900
800
700
600
500
400
300
200
100
0
1 3 5 7 10 13 15 17 19 21 23 25 27 29 31 33 35 37 39 47 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 82 84
total energy consumption


Nov-2019
700
600
500
400
300
200
100
0
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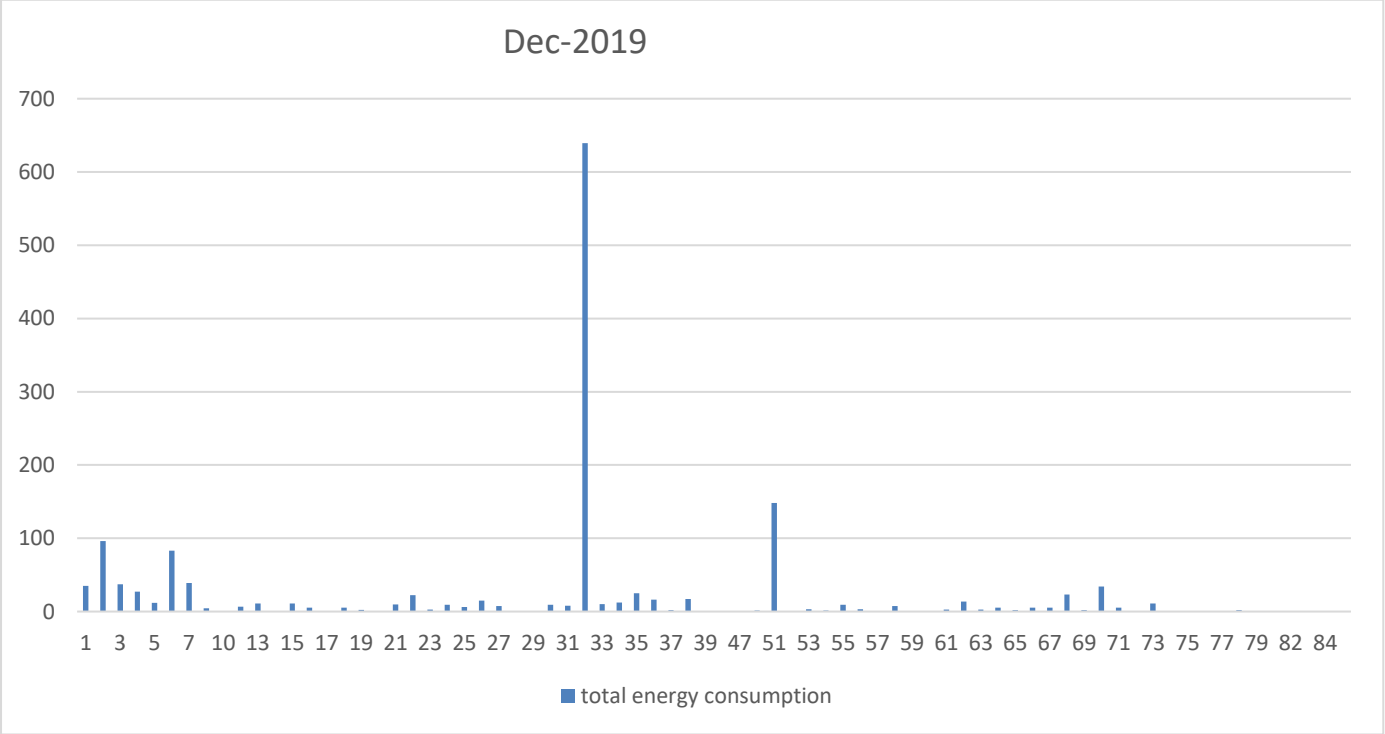
total energy consumption


Dec-2019
700
600
500
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0
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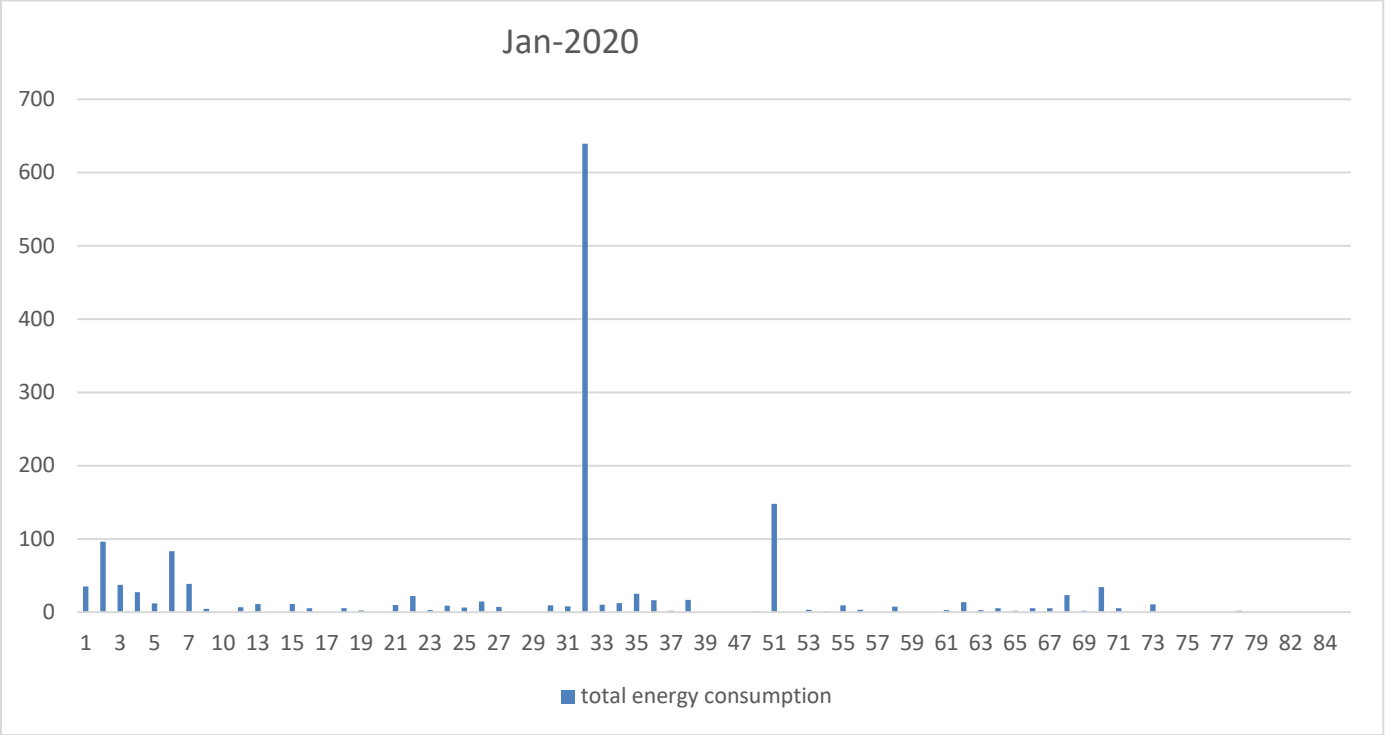
total energy consumption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600
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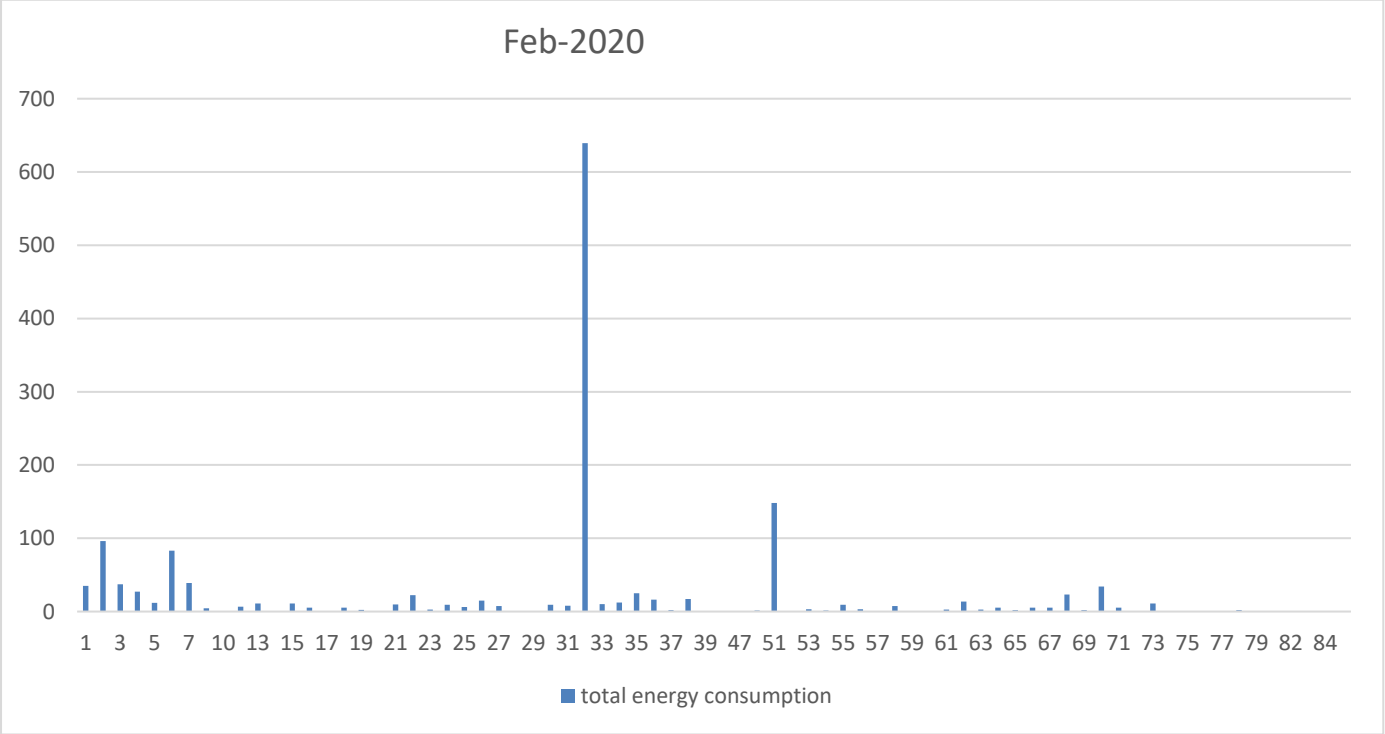
total energy consumption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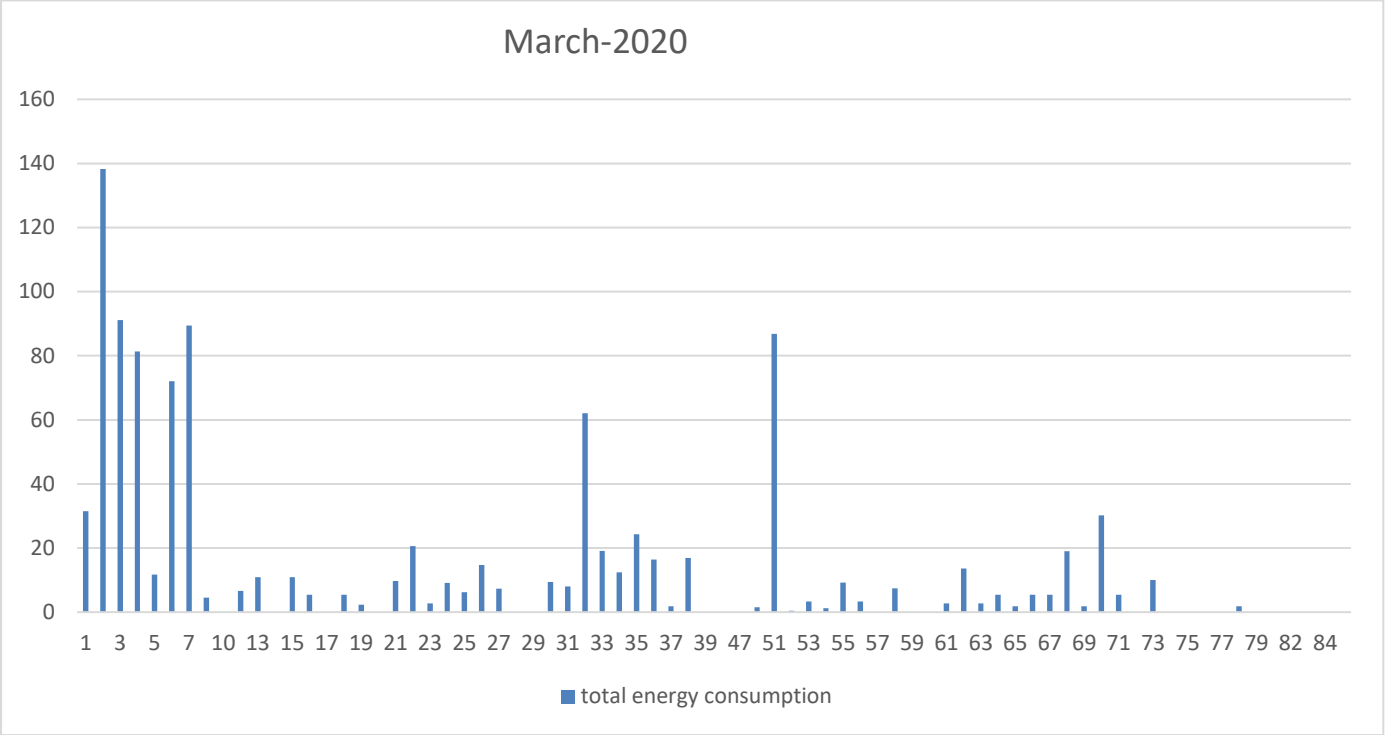
total energy consumption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140
120
100
80
60
40
20
0
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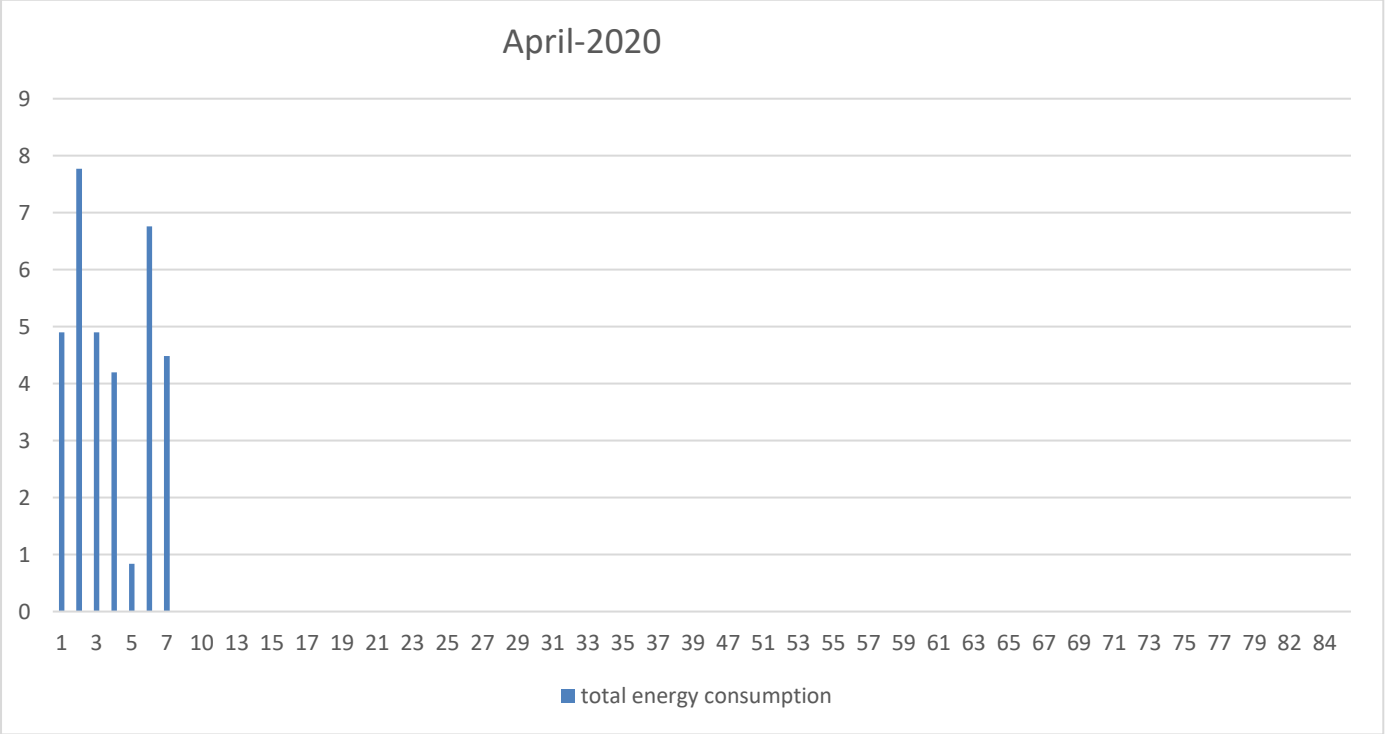
total energy consumption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8
7
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4
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2
1
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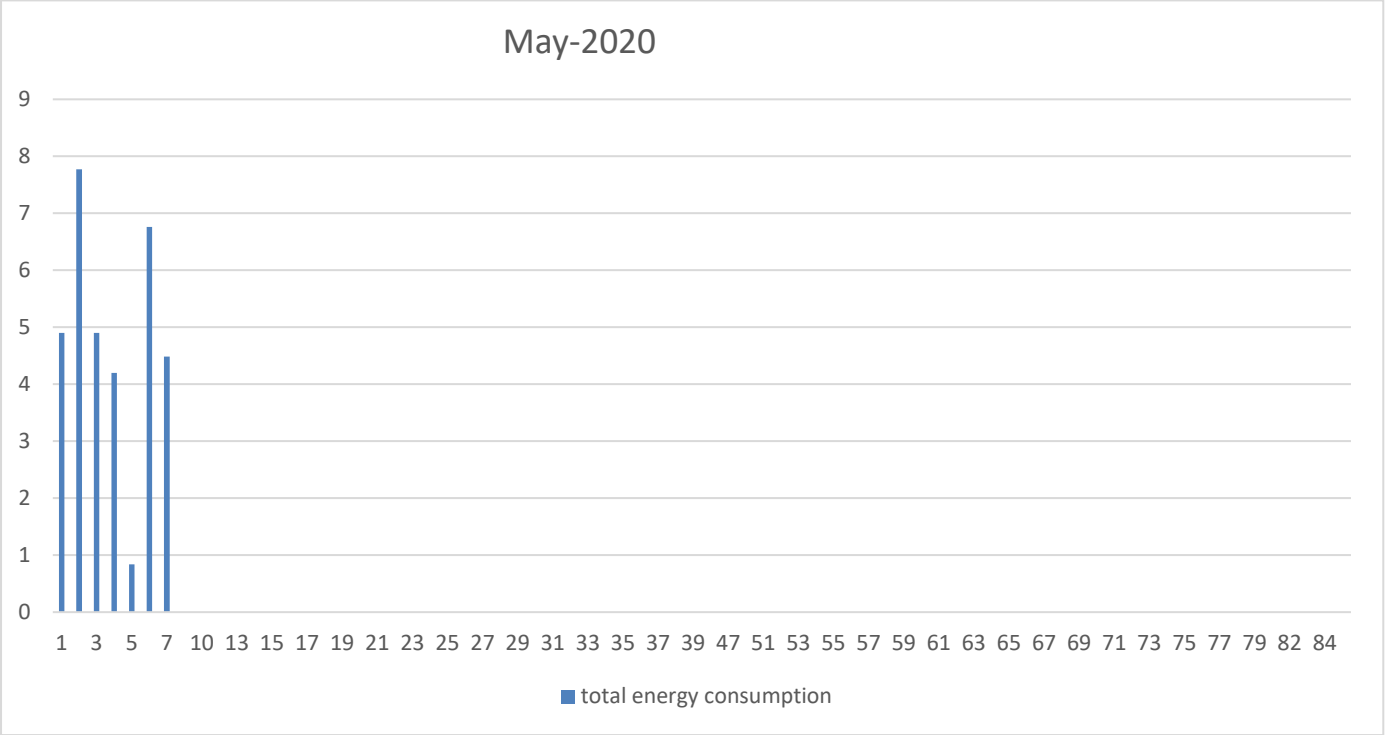
total energy consumption


May-2020
9
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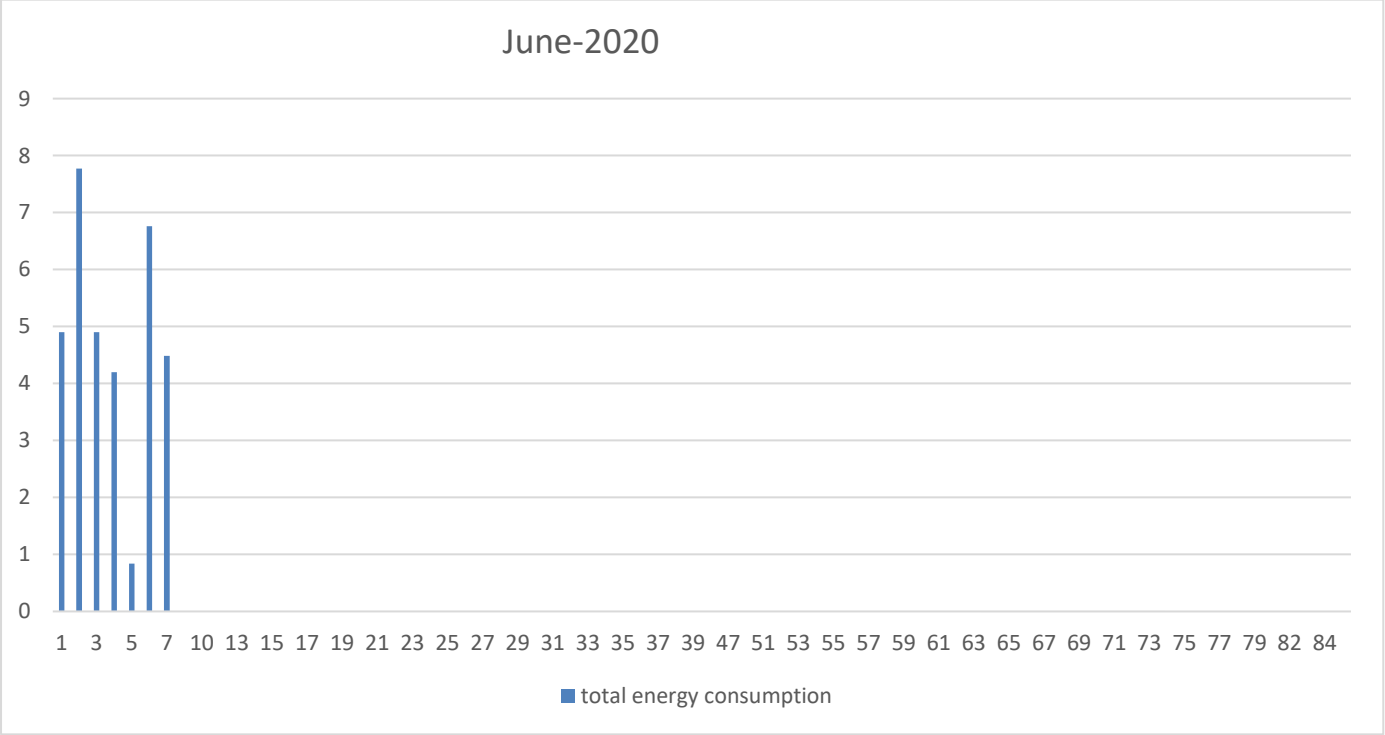
1 3 5 7 10 13 15 17 19 21 23 25 27 29 31 33 35 37 39 47 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 82 84
total energy consumption


June-2020
9
8
7
6
5
4
3
2
1
0
1 3 5 7 10 13 15 17 19 21 23 25 27 29 31 33 35 37 39 47 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 82 84
total energy consumption

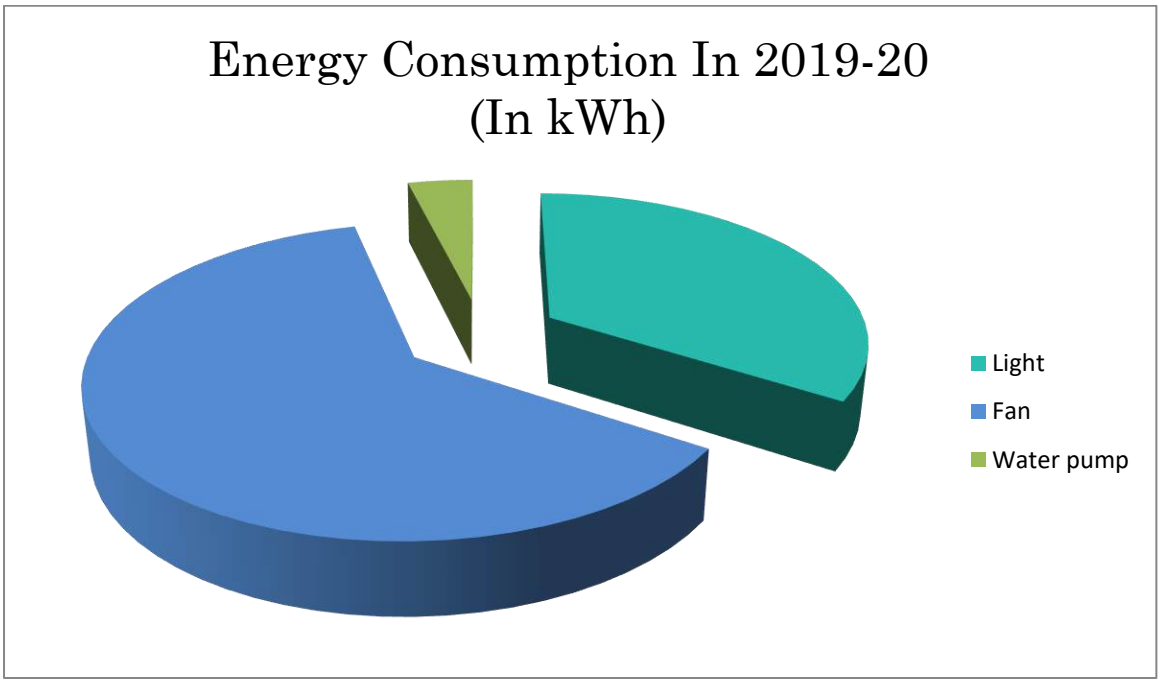
Appendix-B

Energy consumption in hostel

Sl. No	Room No.	Energy consumption due to light bulb (in kWh) in 2019-20	Energy consumption due to fan (in kWh) in 2019-20	Total energy consumption (in kWh) in 2019-20
1	1	0	0	0
2	2	0	0	0
3	3	0	0	0
4	4	291.6	378	669.6
5	5	194.4	378	572.4
6	6	194.4	378	572.4
7	7	97.2	378	475.2
8	8	97.2	378	475.2
9	9	97.2	378	475.2
10	10	97.2	378	475.2
11	11	97.2	378	475.2
12	12	97.2	378	475.2
13	Latrine	97.2	0	97.2
14	Corridor	259.2	0	259.2
15	Cycle room	129.6	0	129.6
16	Kitchen	121.5	0	121.5
17	Matron room	16.2	94.5	110.7
18	Bathroom	97.2	0	97.2
19	Office room	32.4	75.6	108
20	outside	518.4	0	518.4
21	13	97.2	378	475.2
22	14	97.2	378	475.2
23	15	97.2	378	475.2
24	16	97.2	378	475.2
25	17	97.2	378	475.2
26	Latrine	0	0	0
27	Corridor	32.4	0	32.4
28	Study room	194.4	453.6	648

Appliances wise energy consumption in hostel

Sl. No	Name of Appliance	Energy Consumption in 2019-20 (In KWh)
001	Light	3248.1
002	Fan	5915.7
003	Water pump	369.27



Energy Audit Report

Laxminarayan College, Jharsuguda

Jharsuguda, Odisha-768201

Session 2020-21

Energy Audit Team: -

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Reduction of energy consumption while maintaining or improving human comfort, health and safety were of primary concern. Beyond simply identifying the energy consumption pattern, this audit sought to identify the most energy efficient appliances. Moreover, some daily practices relating common appliances have been provided which may help reducing the energy consumption.

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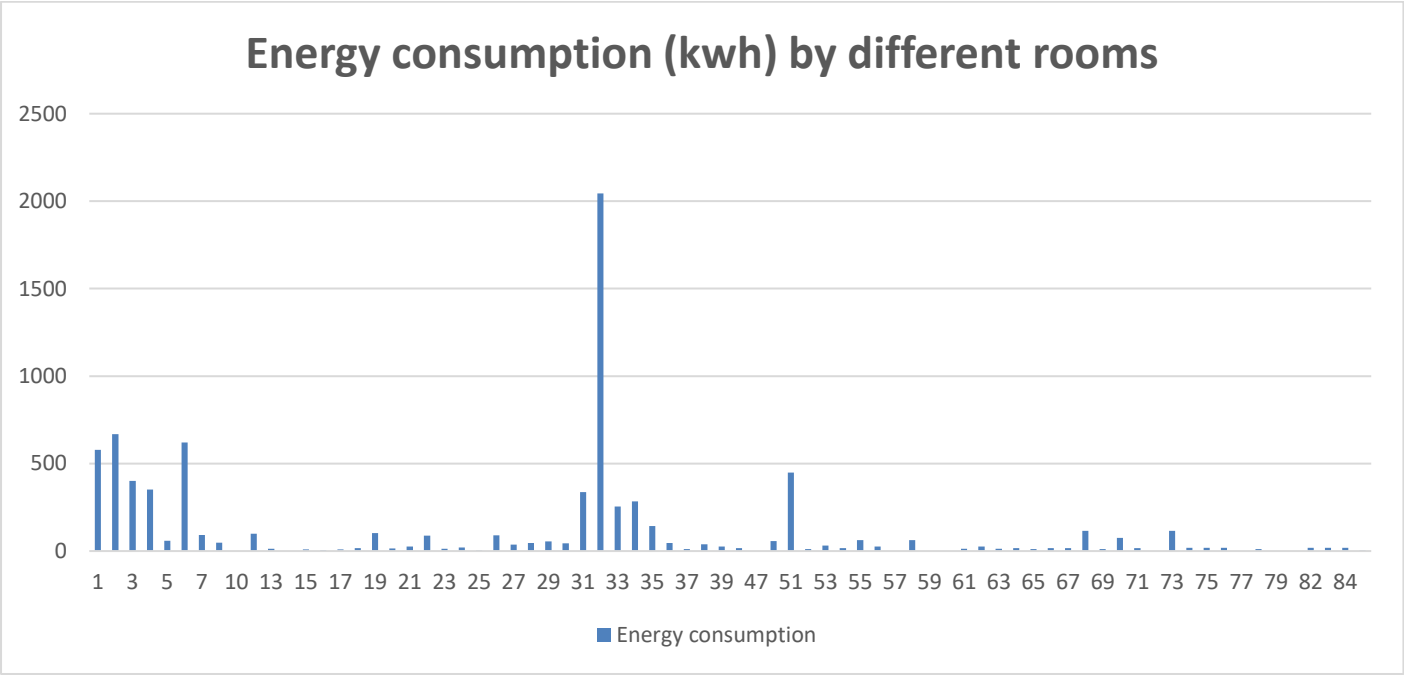
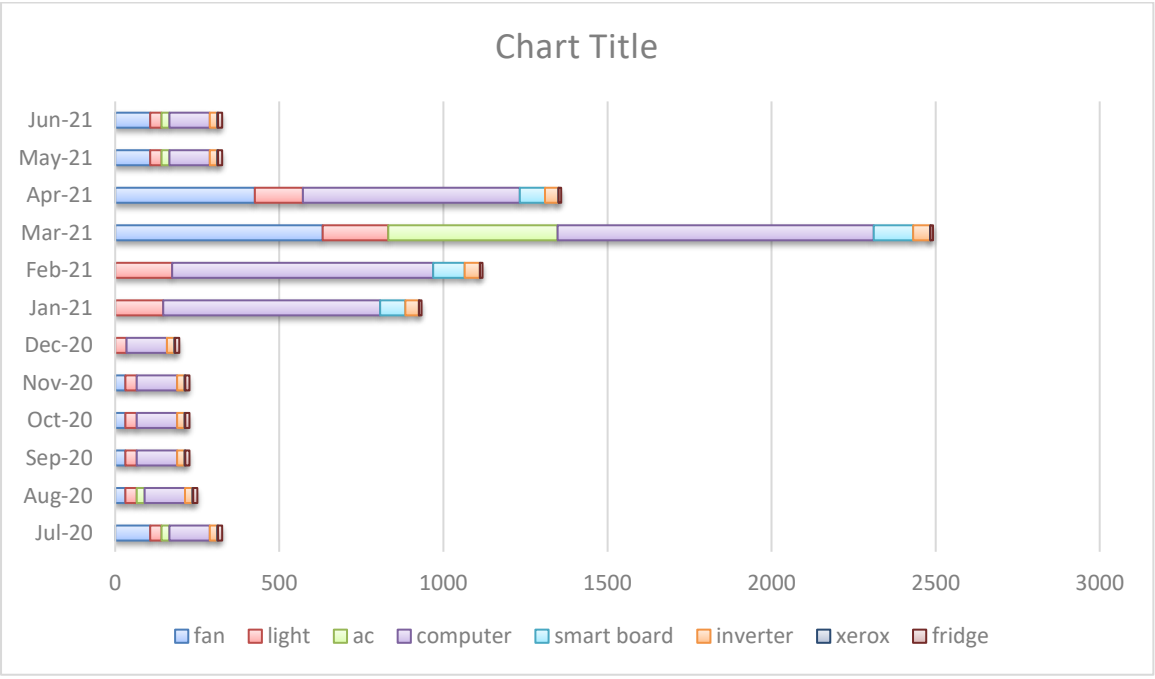
The team analysed the data and provided the information in the form of graphs and charts.

Energy consumption (kwh) by different rooms



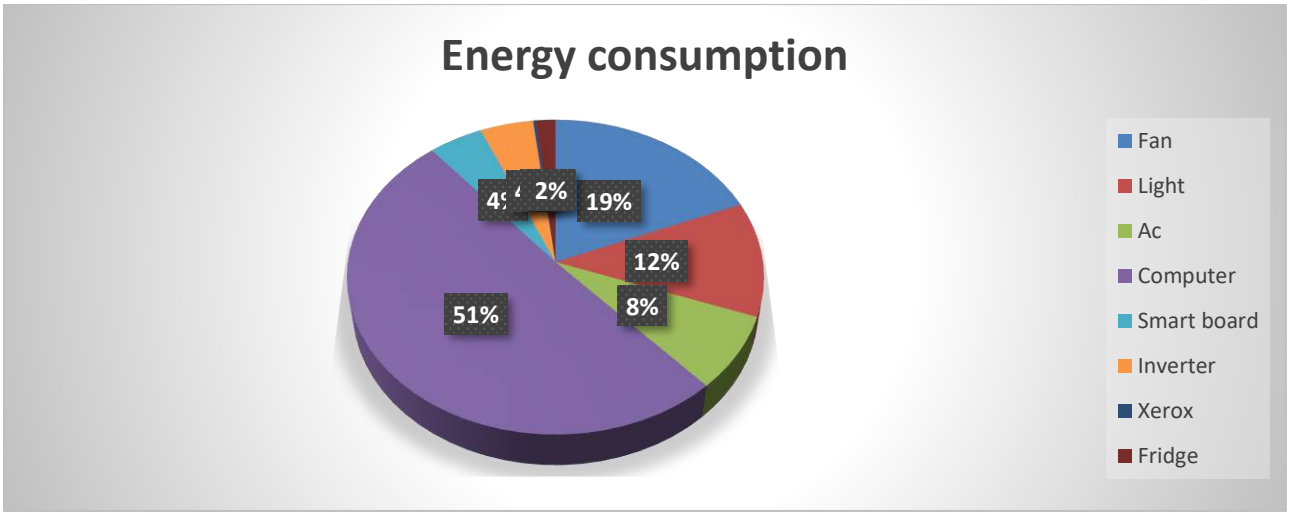
Due to covid-19 pandemic lockdown was declared in the month of march 2019 which continued till January 2021. And as per the Covid-19 guidelines administered by Govt. of Odisha no classes could be held in physical mode. Therefore, a decrease in consumption of energy can be seen from the month of July 2020 in this session.

Total Energy Consumption (kwh) by different appliances



Appliances wise energy consumption (kwh)

Name of Appliances	Energy Consumption in 2020-21 (In kwh)	Total Energy Consumption In 2020-21 (In kwh)
Fan	1501.965	8005.91
Light	943.185	
Ac	612	
Computer	4065.1	
Smart board	369.6	
Inverter	362.46	
Xerox	20.8	
Fridge	130.8	



For lighting purpose around 12% of total energy is consumed and is maximum over all equipments.

The fans have a contribution of around 19% in total energy consumption and is the second maximum over all equipments.

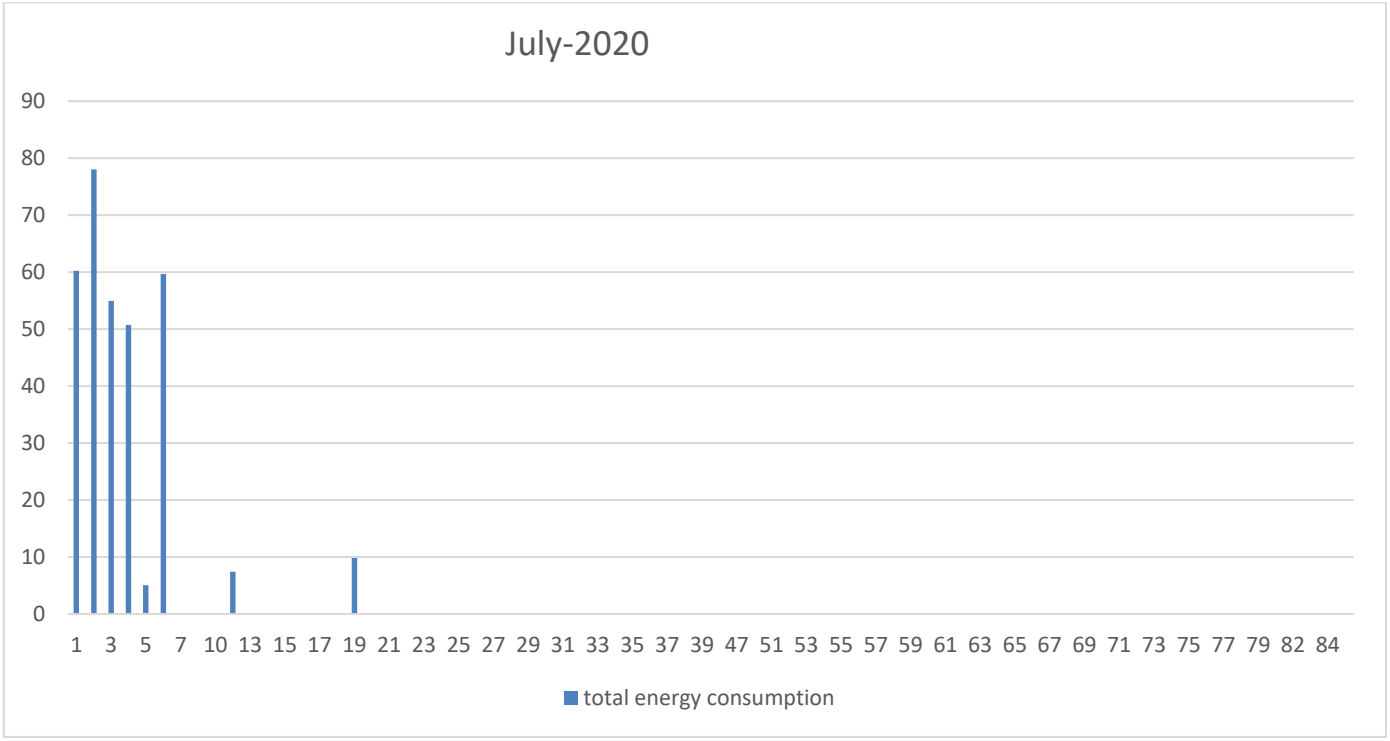
The air conditioners consume 8% of total energy consumption.

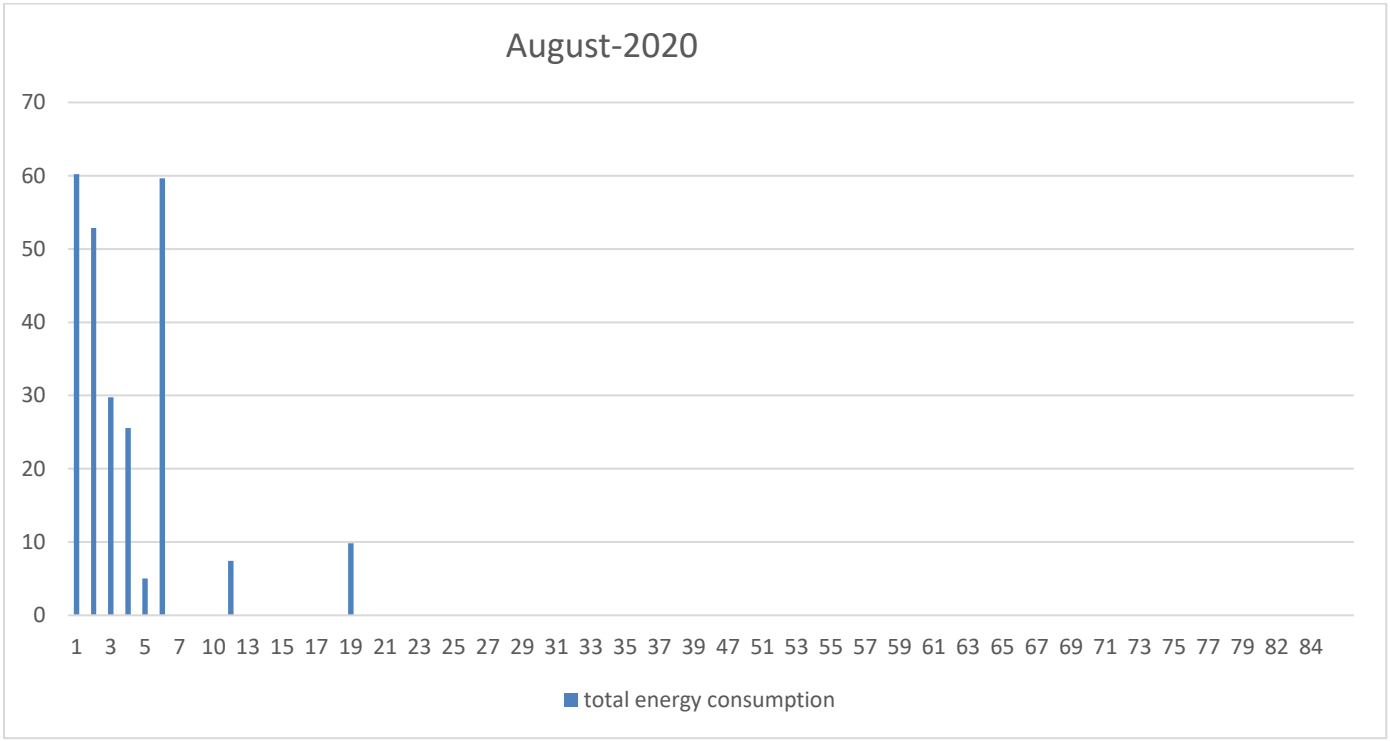
The computers consume around 61% of the total energy consumption.

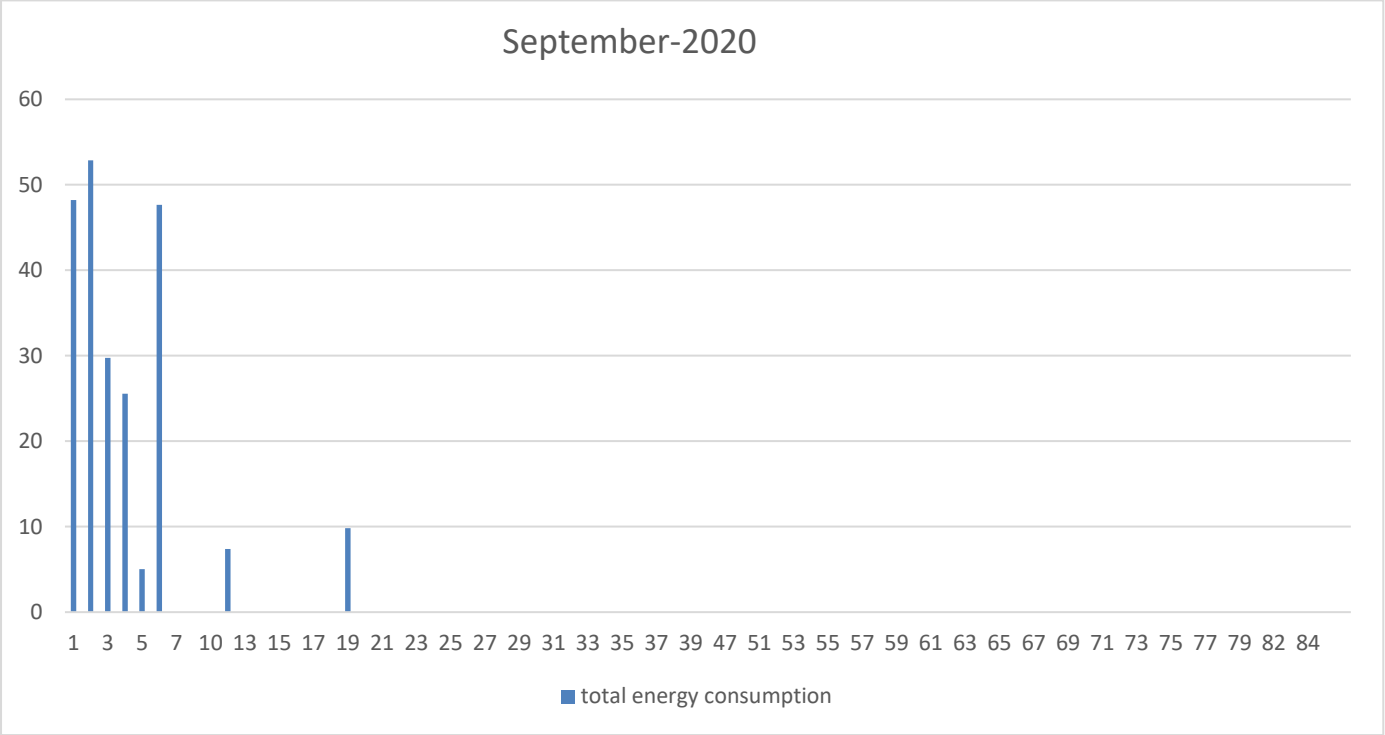
The other equipment such as water pump, inverter, currency counting machine, lab equipments, xerox machine, fridge etc consumes around 7% of total energy.

Appendix-A

Month wise comparative energy consumption graphs of all rooms



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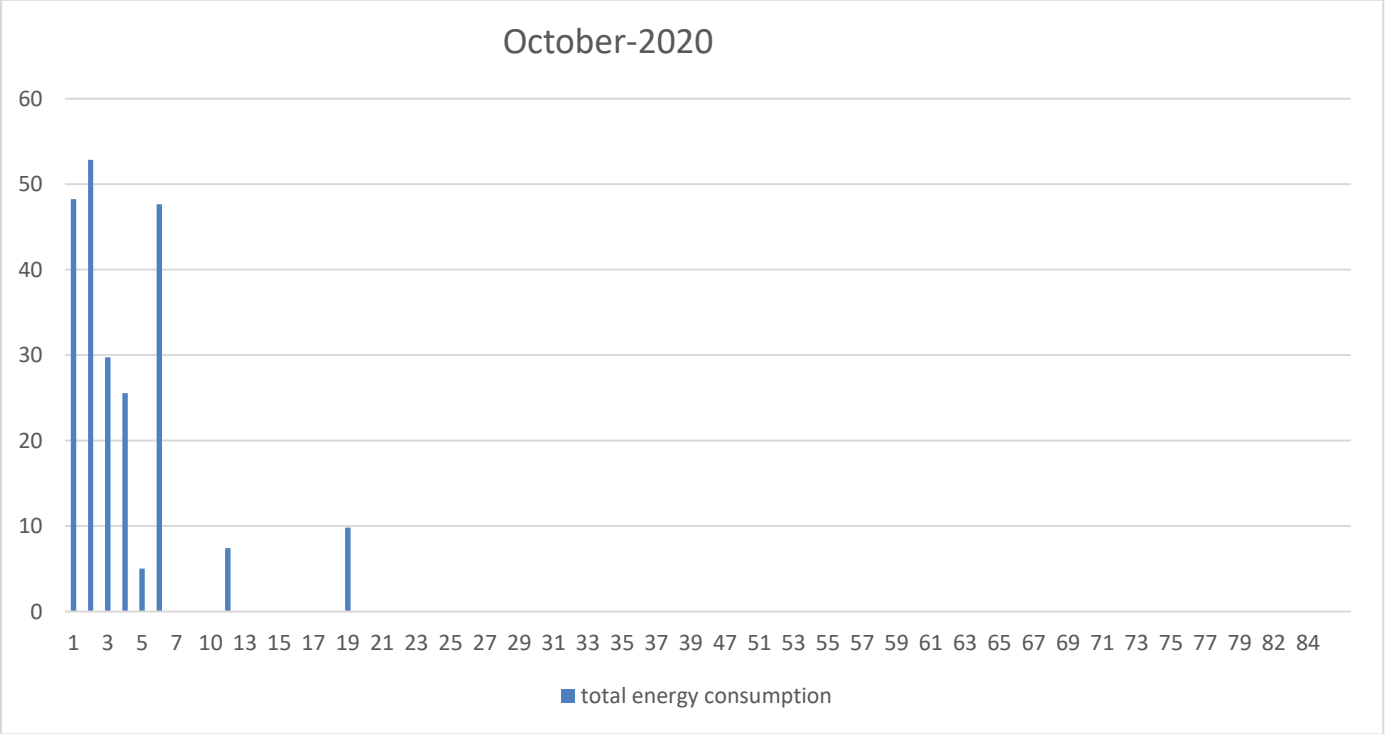
total energy consumption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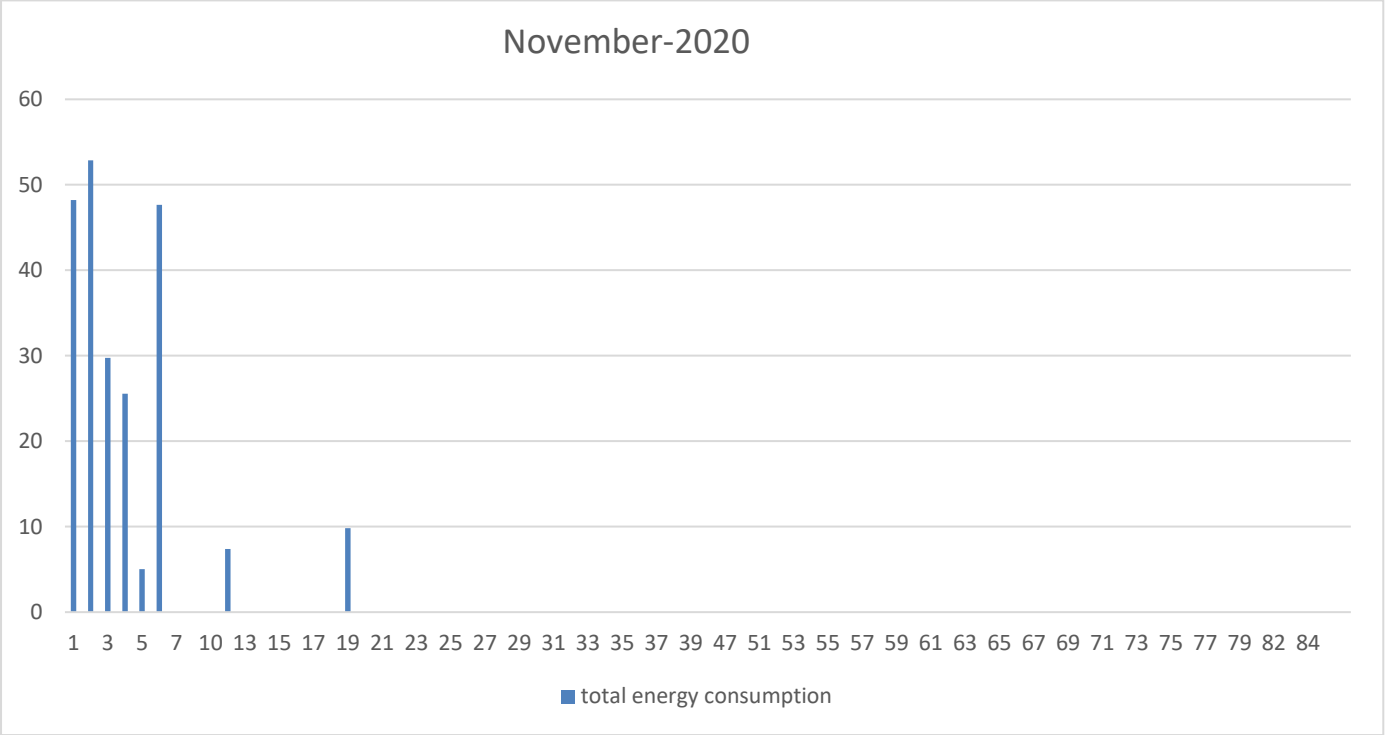
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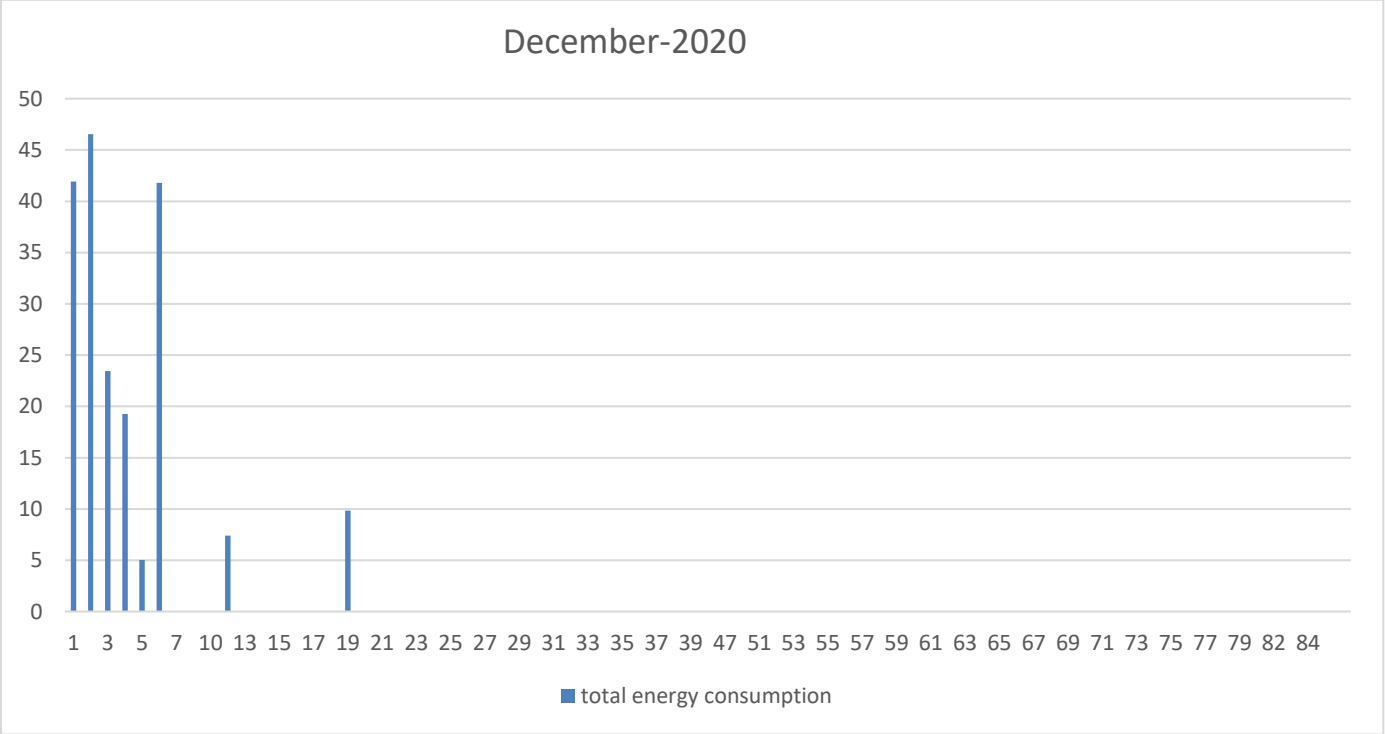
total energy consumption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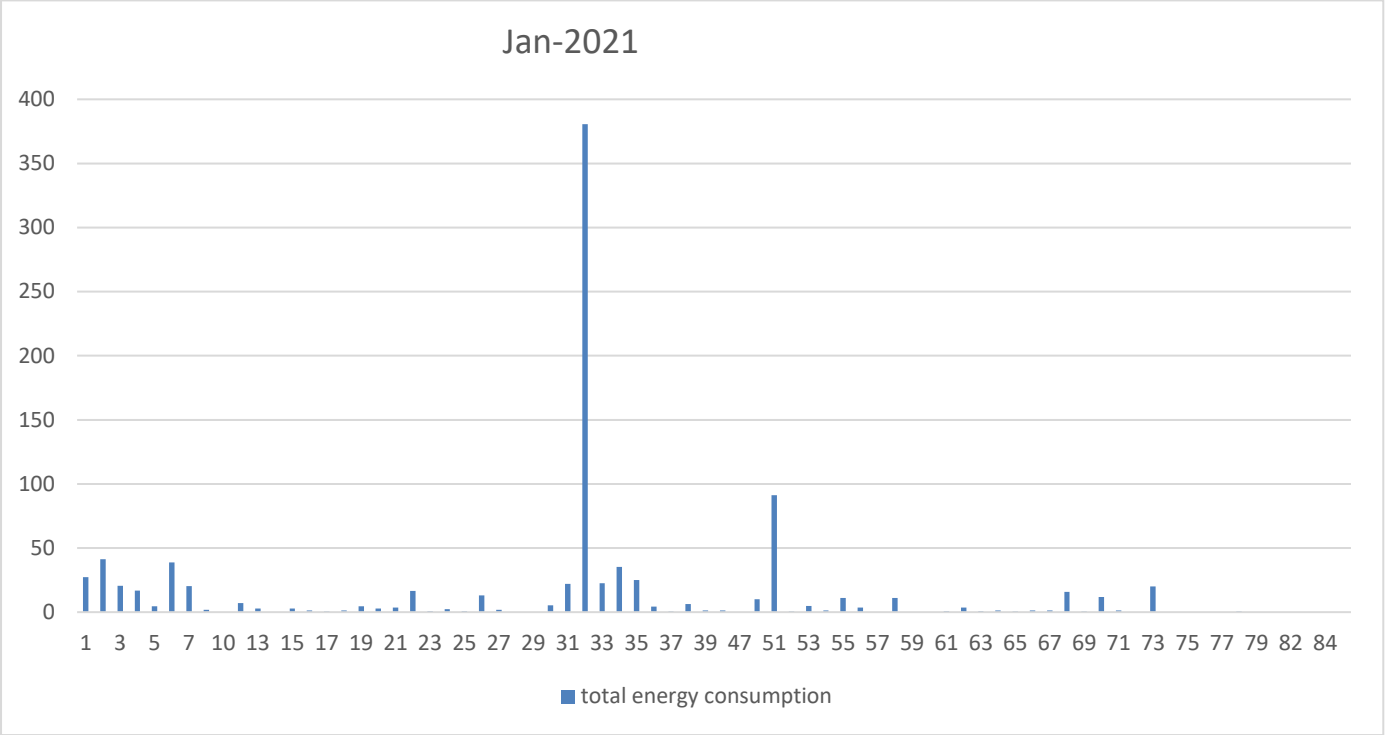
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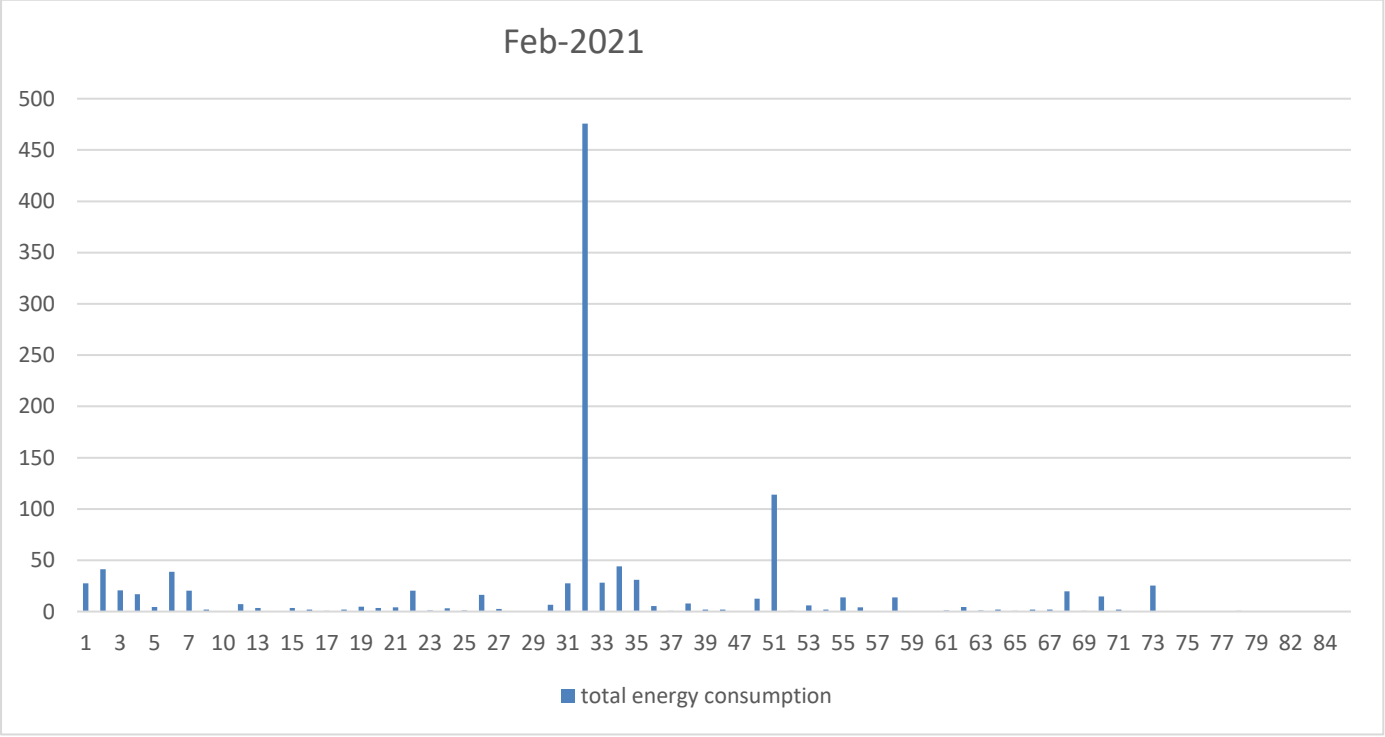
total energy consumption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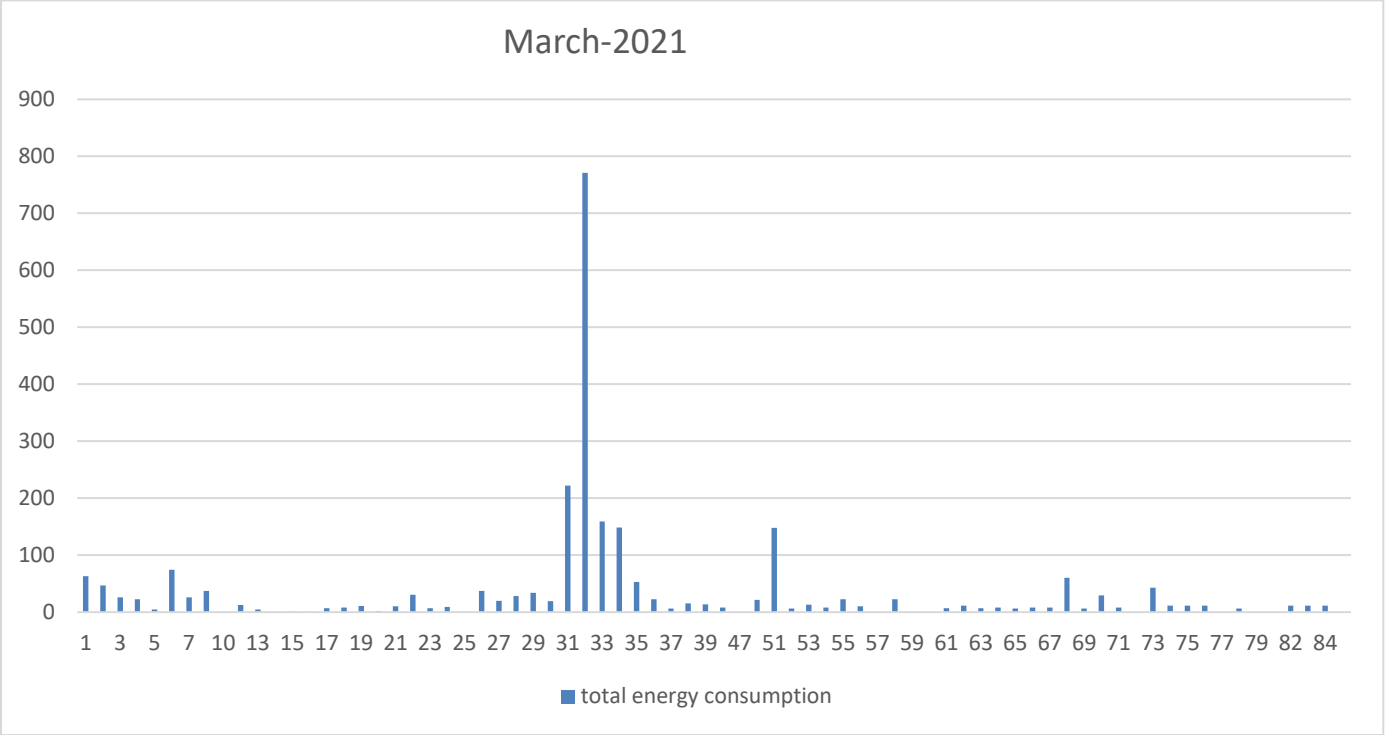
total energy consumption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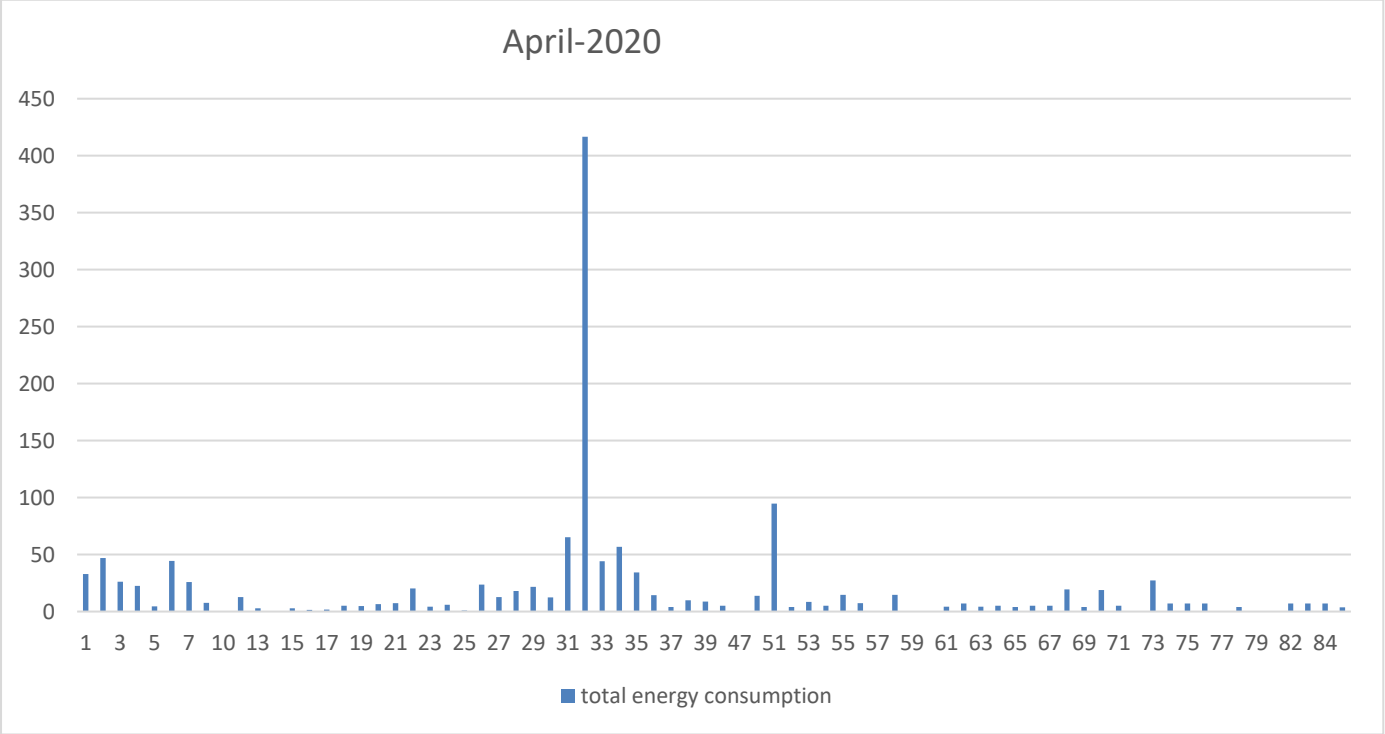
total energy consumption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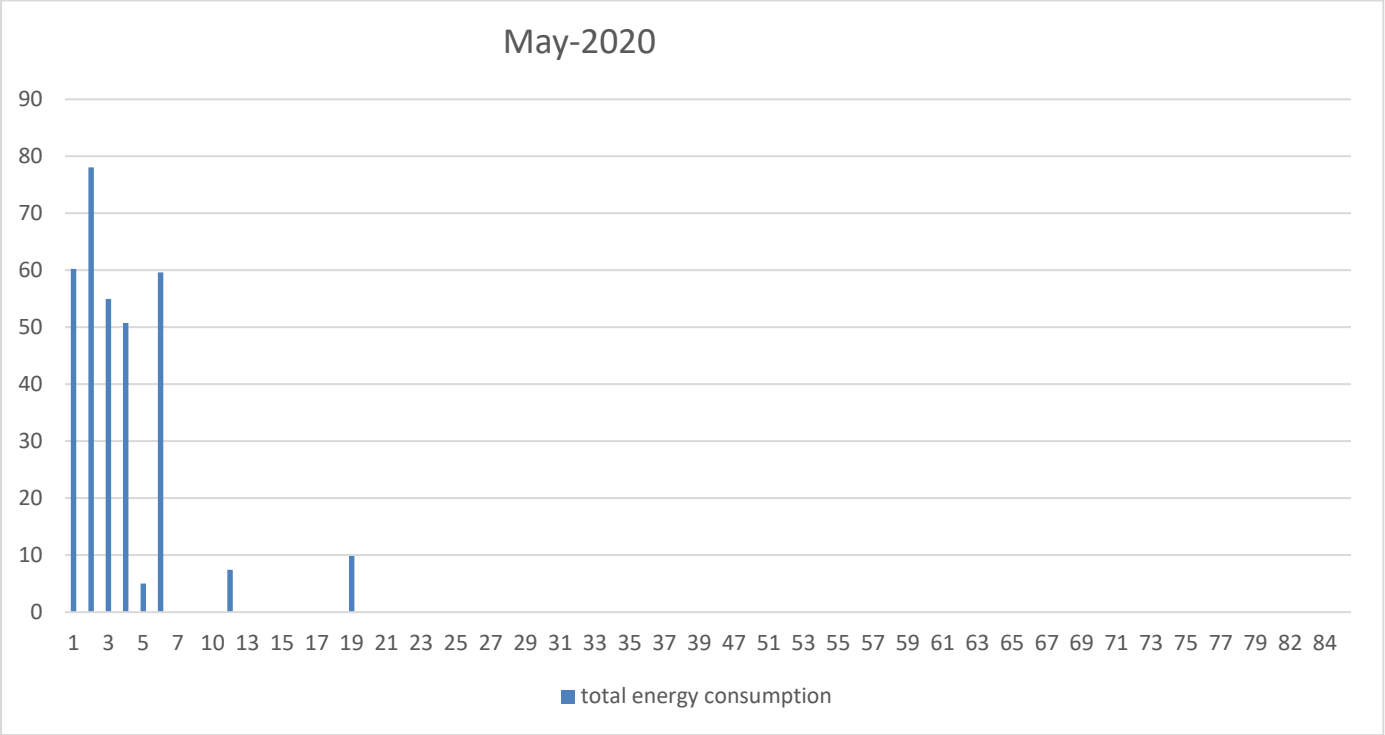
total energy consumption


May-2020
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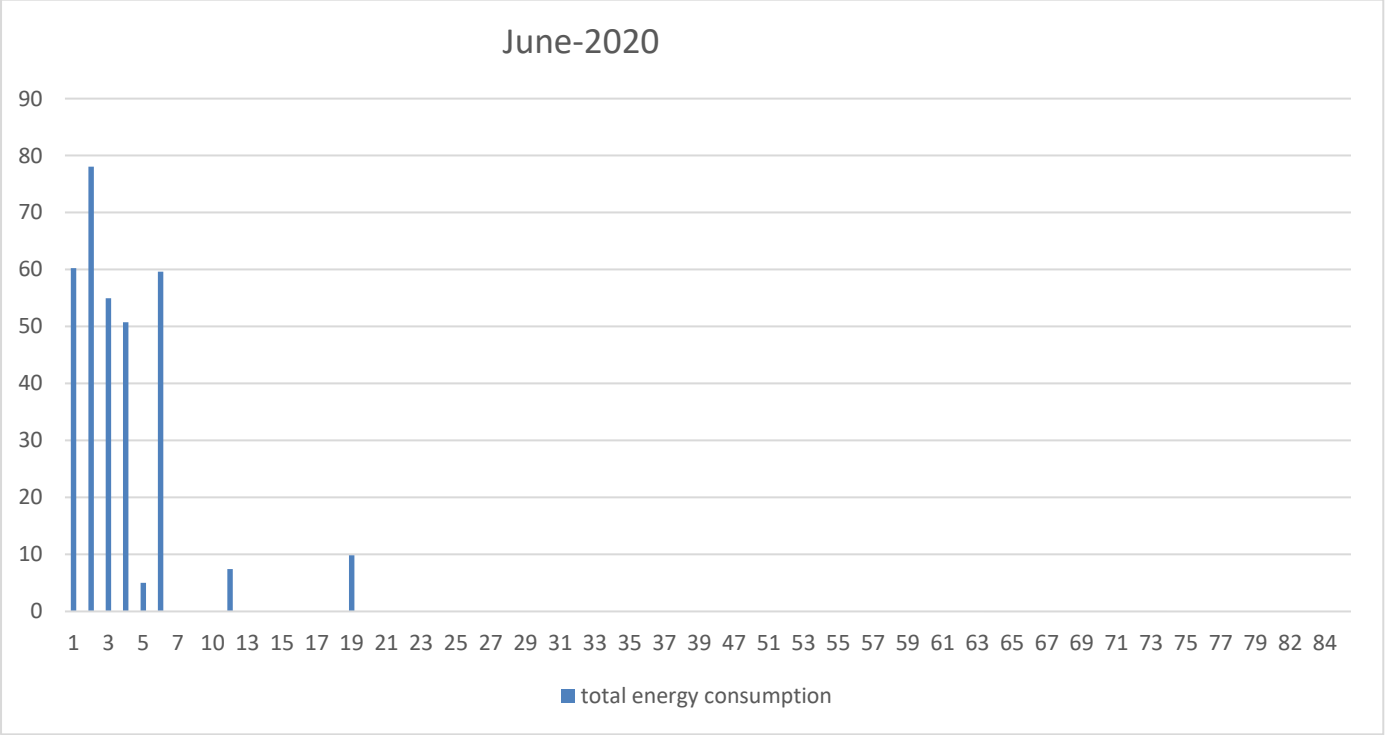
total energy consumption


June-2020
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1 3 5 7 10 13 15 17 19 21 23 25 27 29 31 33 35 37 39 47 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 82 84
total energy consumption

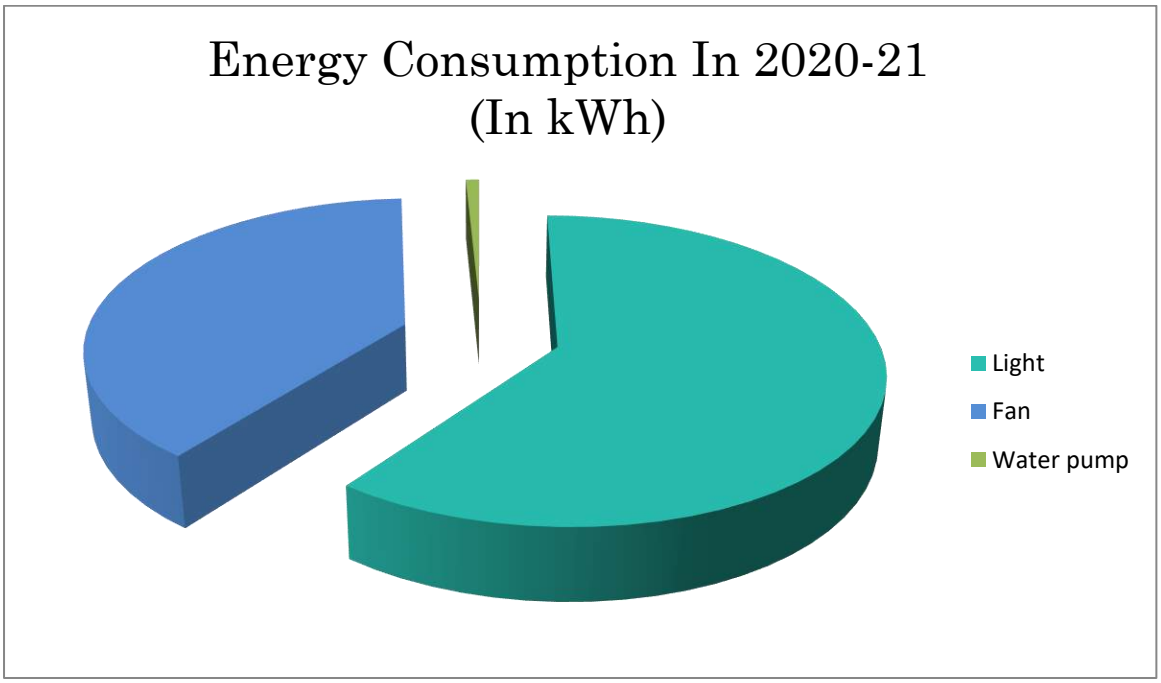
Appendix-B

Energy consumption in hostel

Sl. No	Room No.	Energy consumption due to light bulb (in kWh) in 2020-21	Energy consumption due to fan (in kWh) in 2020-21	Total energy consumption (in kWh) in 2020-21
1	1	0	0	0
2	2	0	0	0
3	3	0	0	0
4	4	1944	840	2784
5	5	1296	840	2136
6	6	1296	840	2136
7	7	648	840	1488
8	8	648	840	1488
9	9	648	840	1488
10	10	648	840	1488
11	11	648	840	1488
12	12	648	840	1488
13	Latrine	648	0	648
14	Corridor	1728	0	1728
15	Cycle room	648	0	648
16	Kitchen	810	0	810
17	Matron room	108	210	318
18	Bathroom	648	0	648
19	Office room	216	168	384
20	outside	2592	0	2592
21	13	648	840	1488
22	14	648	840	1488
23	15	648	840	1488
24	16	648	840	1488
25	17	648	840	1488
26	Latrine	0	0	0
27	Corridor	0	0	0
28	Study room	1296	1008	2304

Appliances wise energy consumption in hostel

Sl. No	Name of Appliance	Energy Consumption in 2020-21 (In KWh)
001	Light	20358
002	Fan	13146
003	Water pump	268.56



Energy Audit Report

Laxminarayan College, Jharsuguda

Jharsuguda, Odisha-768201

Session 2022-23

Energy Audit Team: -

The energy audit has been conducted by following members:

- Mr. Bignan Bhusan Bhanja
  Lecturer in physics
- Mr. Bijendra Jyotish
  Lecturer in physics
- Mr. Bharat Bhabesh Pati
  Lecturer in physics

Preface

Data collection for energy audit of the L.N. College, campus was carried out by the team during 2022-23. This audit was conducted to observe energy consumption of college and seek opportunities to improve the energy efficiency of the campus

Reduction of energy consumption while maintaining or improving human comfort, health and safety were of primary concern. Beyond simply identifying the energy consumption pattern, this audit sought to identify the most energy efficient appliances. Moreover, some daily practices relating common appliances have been provided which may help reducing the energy consumption.

The report accounts for the energy consumption patterns of the academic area and hostel based on actual survey and detailed analysis during the audit. The report compiles a list of possible actions to conserve and efficiently access the available scarce resources and their saving potential was also identified. We look forward towards optimization that the authorities, students and staff would follow the recommendations in the best possible way.

The report is based on certain generalizations and approximations wherever necessary. The views expressed may not reflect the general opinion. They merely represent the opinion of the team guided by the interviews of consumers.

Acknowledgement

The support and assistance received from Heads of the Departments, Chief Wardens of the Hostel, Key-persons of the Departments/Hostel is sincerely appreciated and acknowledged.

Energy audit team
L.N. College
Jharsuguda

CONTENT

Introduction

Laxminarayan College, **Jharsuguda**, is a full-fledged aided College of the Government of Odisha located in Jharsuguda town. It has thousands of students and hundreds of employees. It imparts teaching in Arts, Science and Commerce both in + 2 and + 3 stage with Honours teaching facilities. The College is one of the oldest colleges in western Odisha being established in August, 1969. Laxminarayan College is a fully aided educational institution of the government of Odisha, having many UGC- scale teachers. The main building of the college is housed in an erstwhile Hostel of the Engineering School of Jharsuguda, later on many new infrastructures along with a sports complex financed by the UGC has been added. The College presently boast of a modern computer Laboratory with 60 computers with LAN connections, a well-equipped modern language laboratory and other facility. The present student strength of the college is about 2000.

There are three floors of the college building with total 90 rooms which includes 11 academic departments, examination and admission sections, offices and supporting infrastructures like +3 and+2 library, different laboratories, computer centre, room for watchman etc.

Objective

The objective of Energy Audit is to promote the idea of Energy Conservation in the Campus of L.N. College. The purpose of the energy audit is to identify, quantify, describe and prioritize cost saving measures relating to energy use in the Hostel, Departments and Institute Central Facilities.

The work eligible for Energy Audit Study should be directed towards:

- Identification of areas of energy wastage and estimation of energy saving potential in Hostel, Departments and Institute Central Facilities.
- Suggesting cost-effective measures to improve the efficiency of energy use.
- Estimation of implementation costs and payback periods for each recommended action.
- Documenting results & vital information generated through these activities.
- Identification of possible usages of co-generation, renewable sources of energy (say Solar Energy) and recommendations for implementation, wherever possible, with cost benefit analysis.

Energy Audit Methodology

The methodology adopted for this audit was a three steps process comprising of:

1. **Data Collection** – In preliminary data collection phase, exhaustive data collection was performed using different tools such as observation, interviewing key persons, and measurements.
2. **Data Analysis** - Detailed analysis of data collected was done. The data analysed was used for producing graphical representations.

Data Collection

For suggesting any corrective measures to reduce power consumption, it is first necessary to know the power consumption pattern in detail. For this, the exhaustive data collection exercise was performed at all the departments, academic centres, hostel, and other supporting entities such as library, computer centre etc.

Following steps were taken for data collection:

- The team went to each department, centre, hostel etc. to gather information about running hours of appliances in each department
- Information about the general electrical appliances was collected by observation and interviewing.
- The power consumption of appliances was measured (rated power; CFL for example).
- The details of usage of the appliances were collected by interviewing key persons e.g. Warden (in case of hostels), key-person (in case of departments) etc.
- In case of Air Conditioning, insulation was checked by visual inspection.
- Approximations and generalizations were done at places with lack of information.

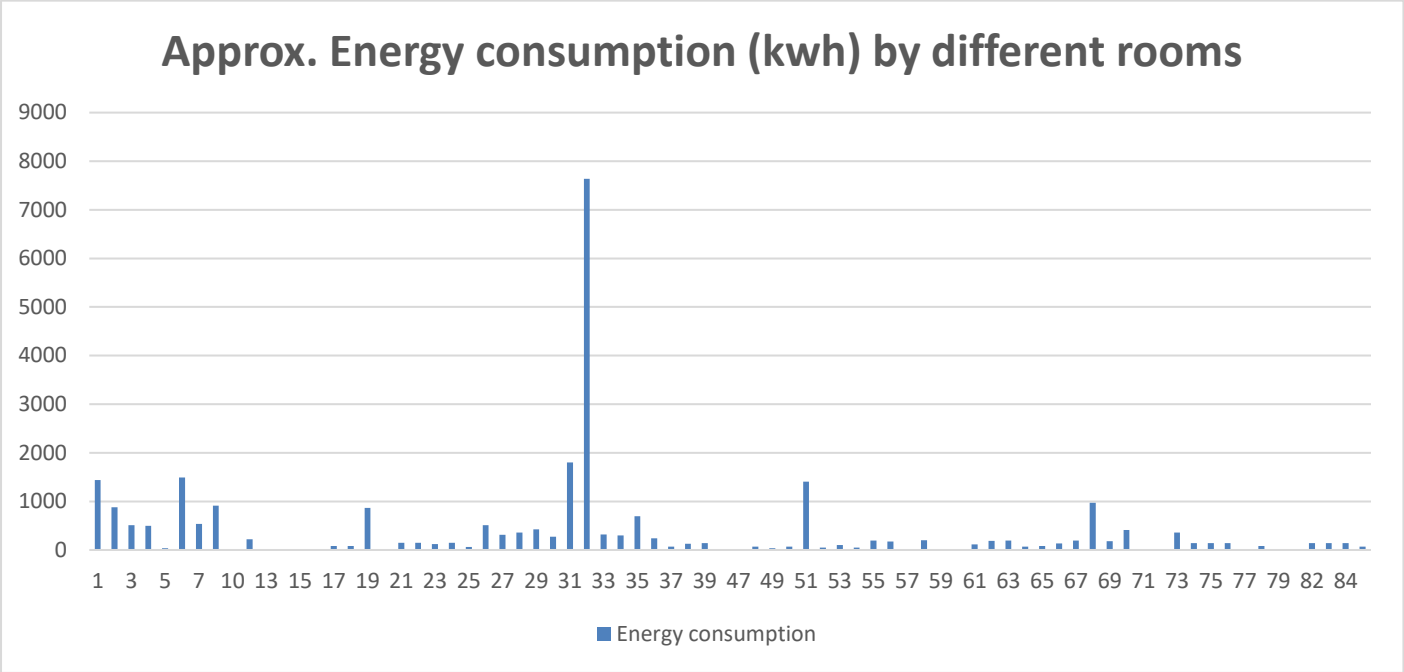
Data Analysis

In data analysis, the data collected is processed to draw significant conclusions to pinpoint loopholes and identify the areas to focus upon. Analysis of the power consumption observations obtained was used to obtain the power consumption pattern and also to get the information about the points where electric power is wasted.

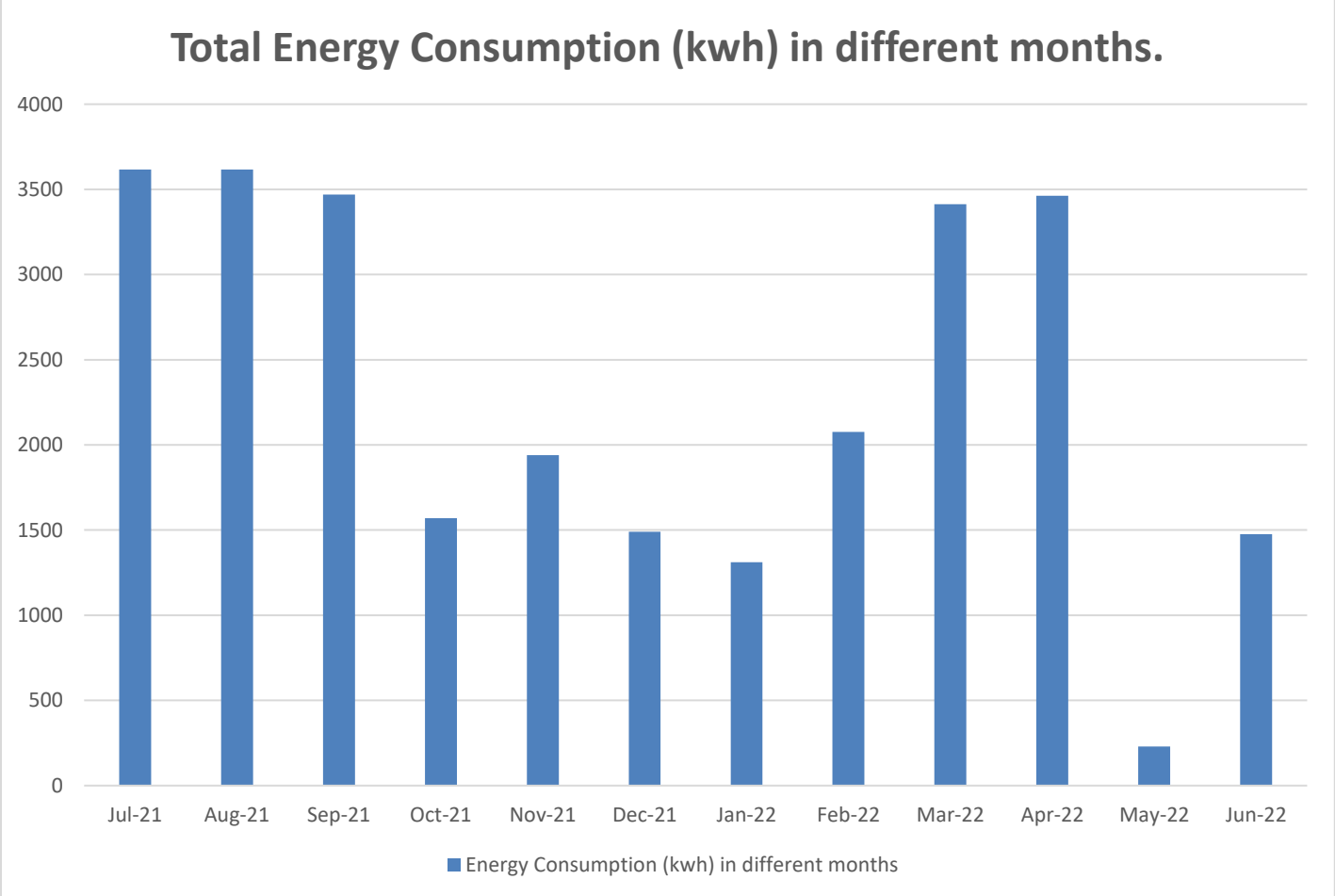
The team analysed the data and provided the information in the form of graphs and charts. As per the common minimum standard issued by Govt. of Odisha for the session 2021-22 the total no. of working days in different months are as follows.

Sl. No.	Month	No. of Working days
1.	Jul-21	24
2.	Aug-21	24
3.	Sep-21	24
4.	Oct-21	17
5.	Nov-21	21
6.	Dec-21	25
7.	Jan-22	22
8.	Feb-22	23
9.	Mar-22	23
10.	Apr-22	23
11.	May-22	01
12.	Jun-22	10

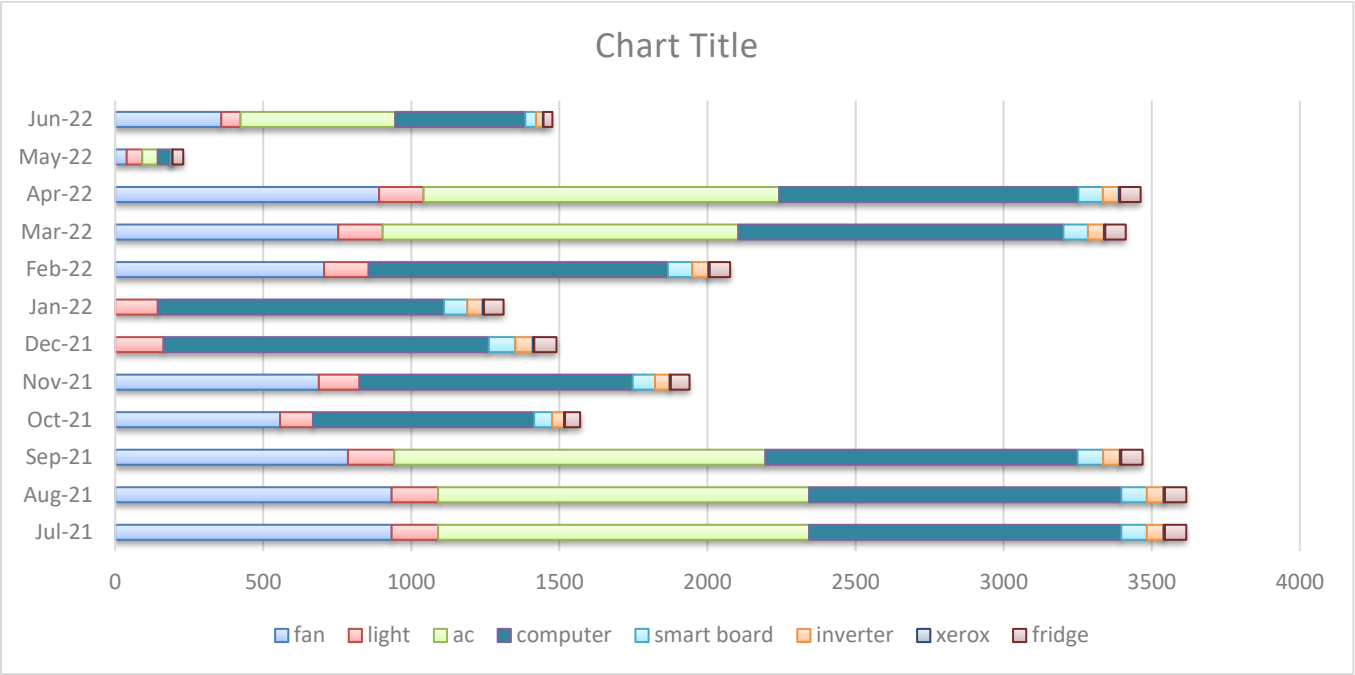
Approximate Energy consumption (kwh) by different rooms



Approximate Total Energy Consumption (kwh) in different months.

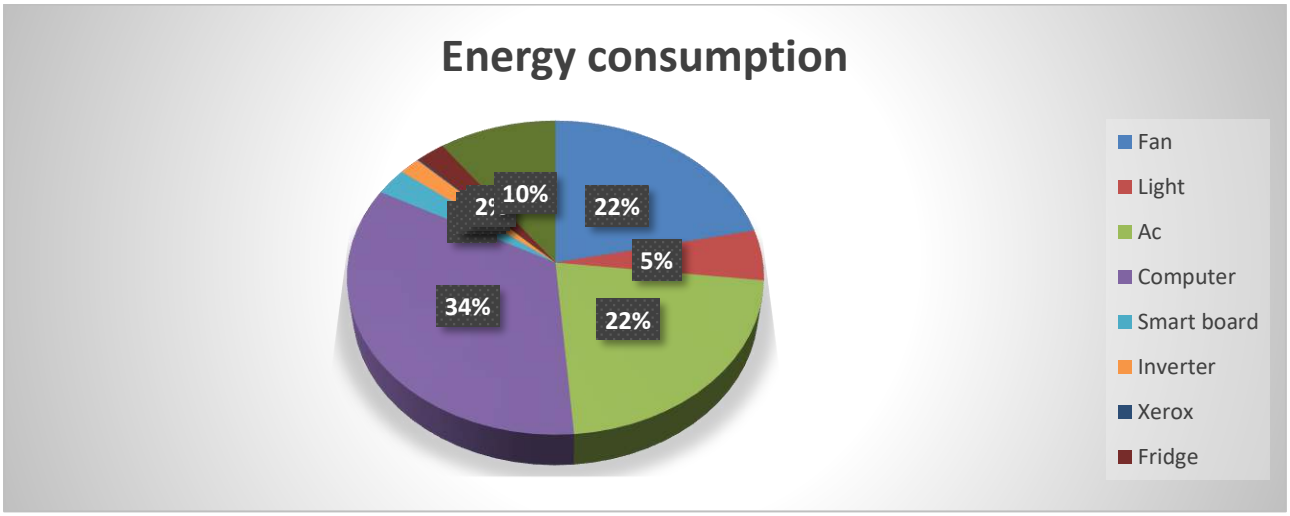


Total Energy Consumption (kwh) by different appliances



Appliances wise energy consumption (kwh)

Name of Appliances	Approximate Energy Consumption in 2022-23 (In kwh)	Approximate Total Energy Consumption In 2022-23 (In kwh)
Fan	6644	30743
Light	1595	
Ac	6734	
Computer	10498	
Smart board	853	
Inverter	556	
Xerox	47	
Fridge	744	
Other	3072	



For lighting purpose around 5% of total energy is consumed.

The fans have a contribution of around 22% in total energy consumption.

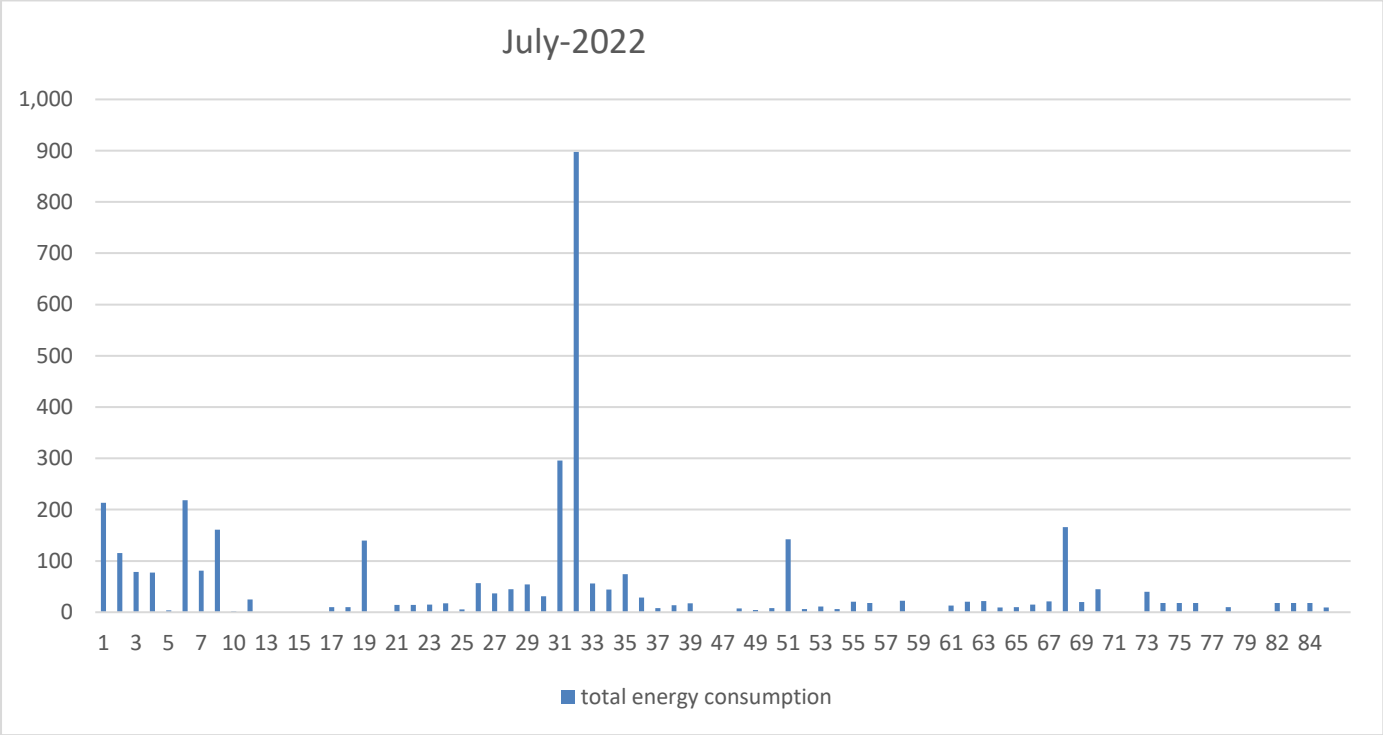
The air conditioners consume around 22% of total energy consumption.

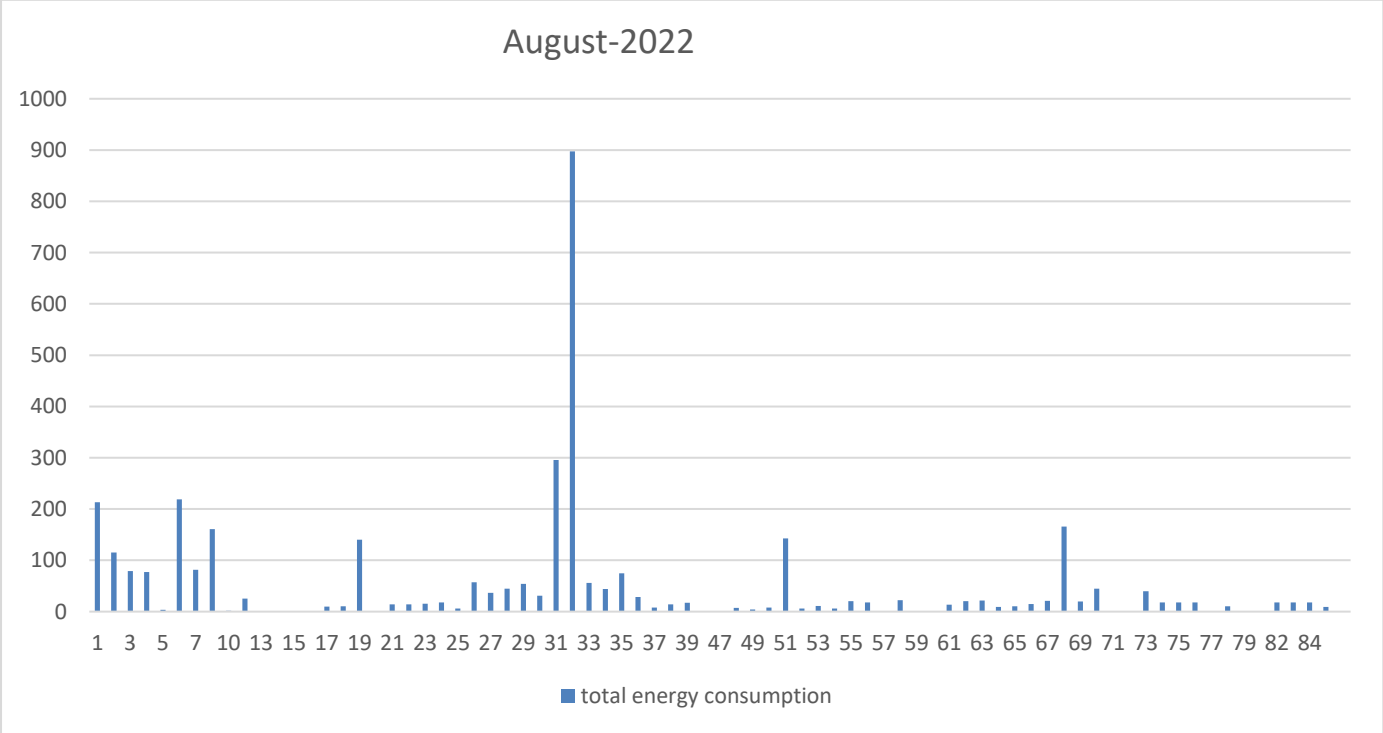
The computers consume around 34% of energy out of the total energy consumption.

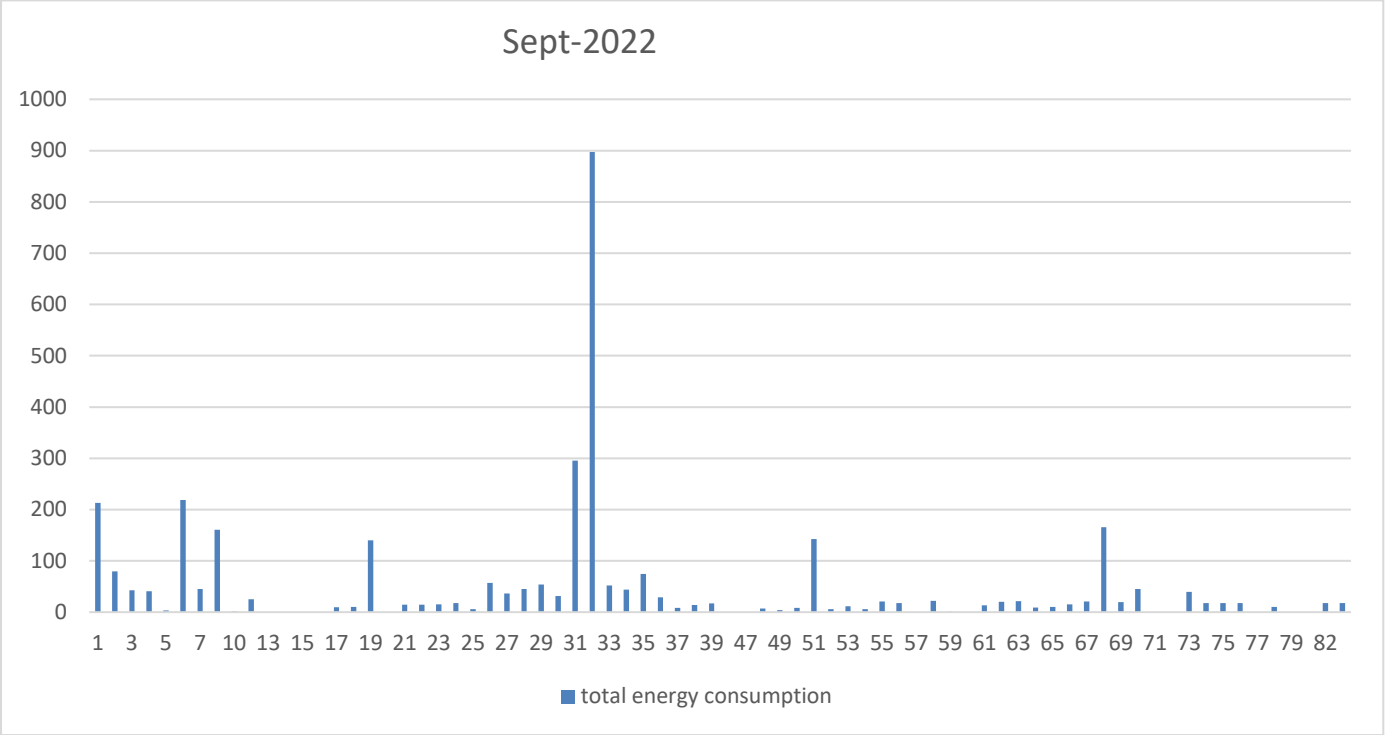
The other equipment such as water pump, inverter, currency counting machine, lab equipment, xerox machine, fridge etc consumes around 17% of total energy.

Appendix-A

Month wise comparative energy consumption graphs of all departments



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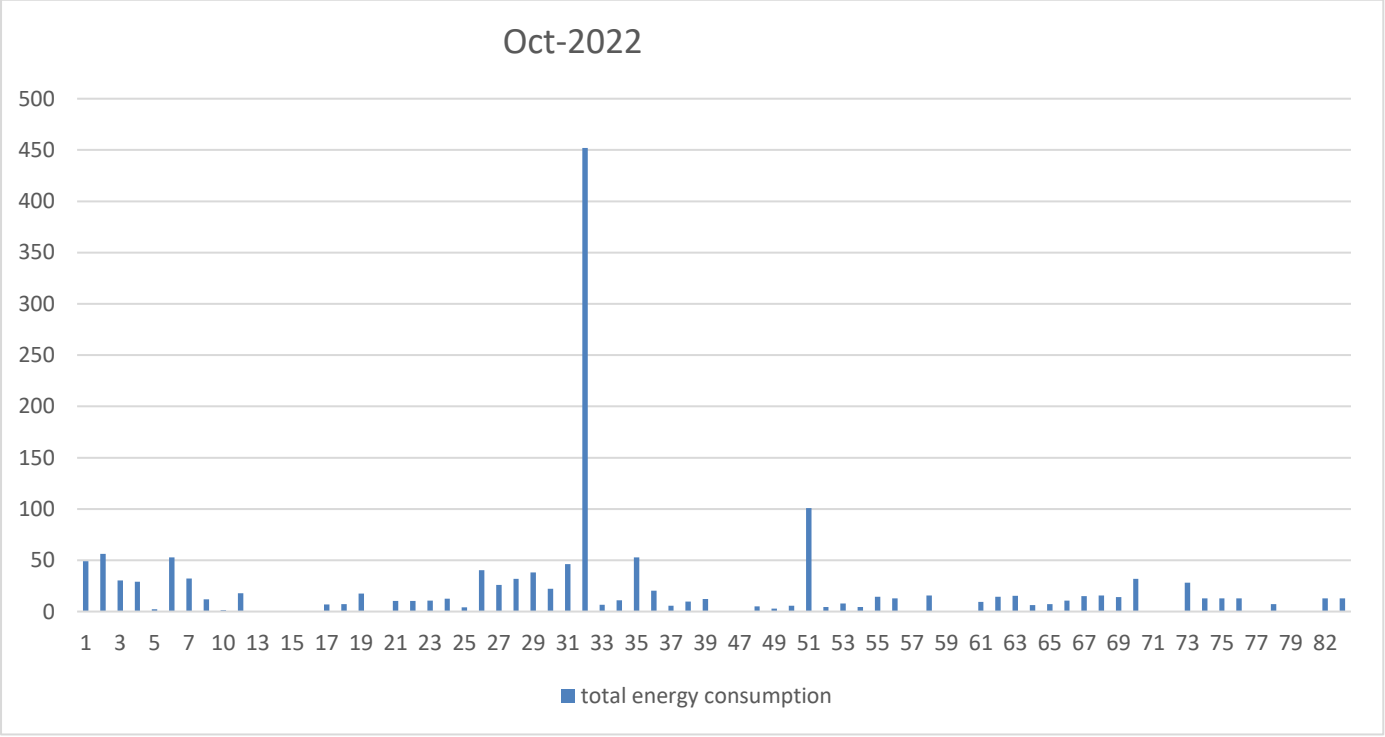
total energy consumption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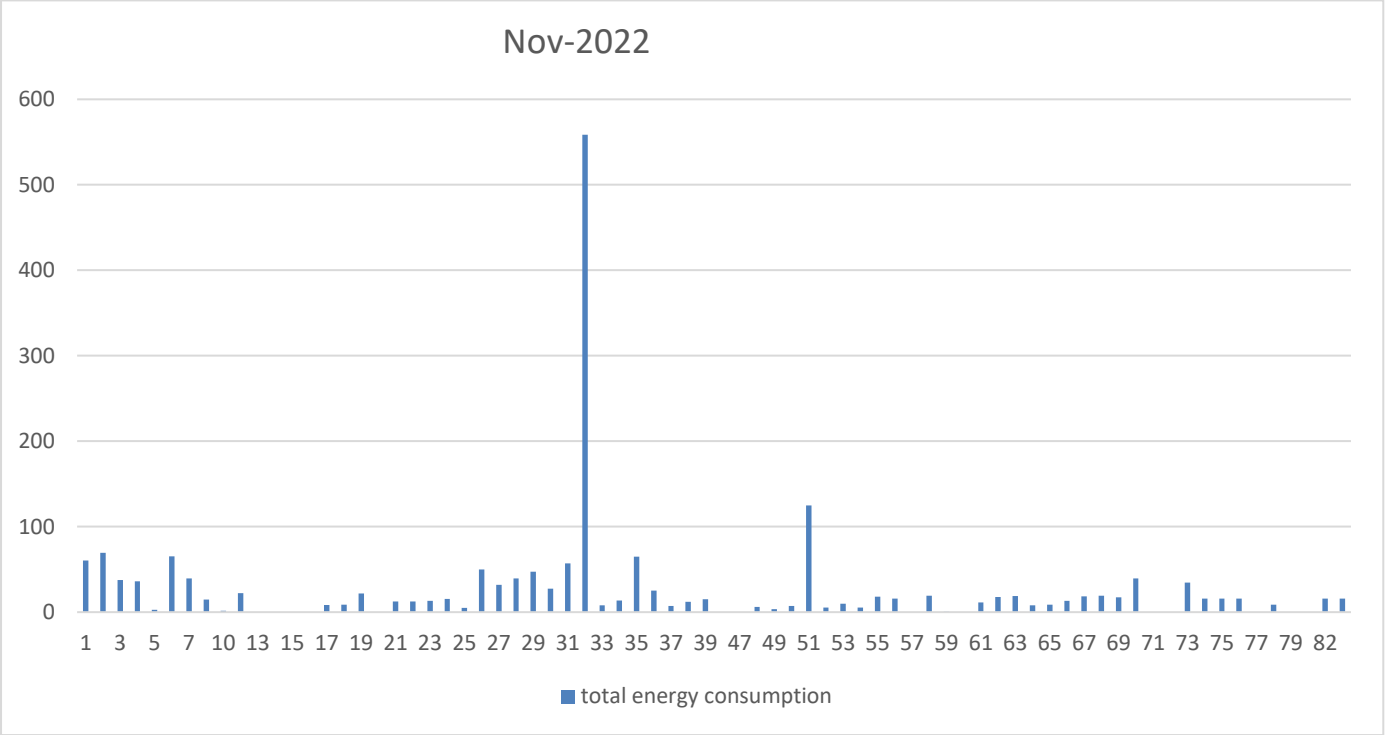
total energy consumption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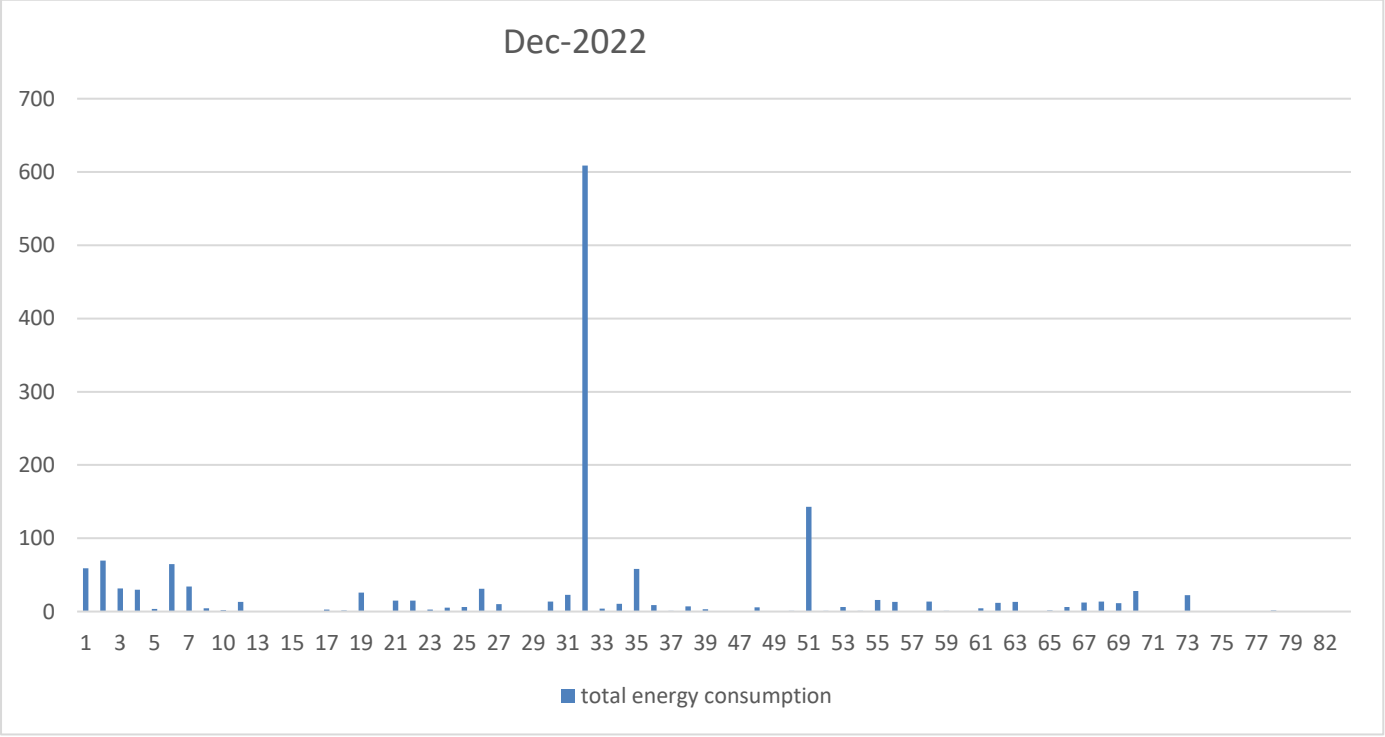
total energy consumption


Dec-2022
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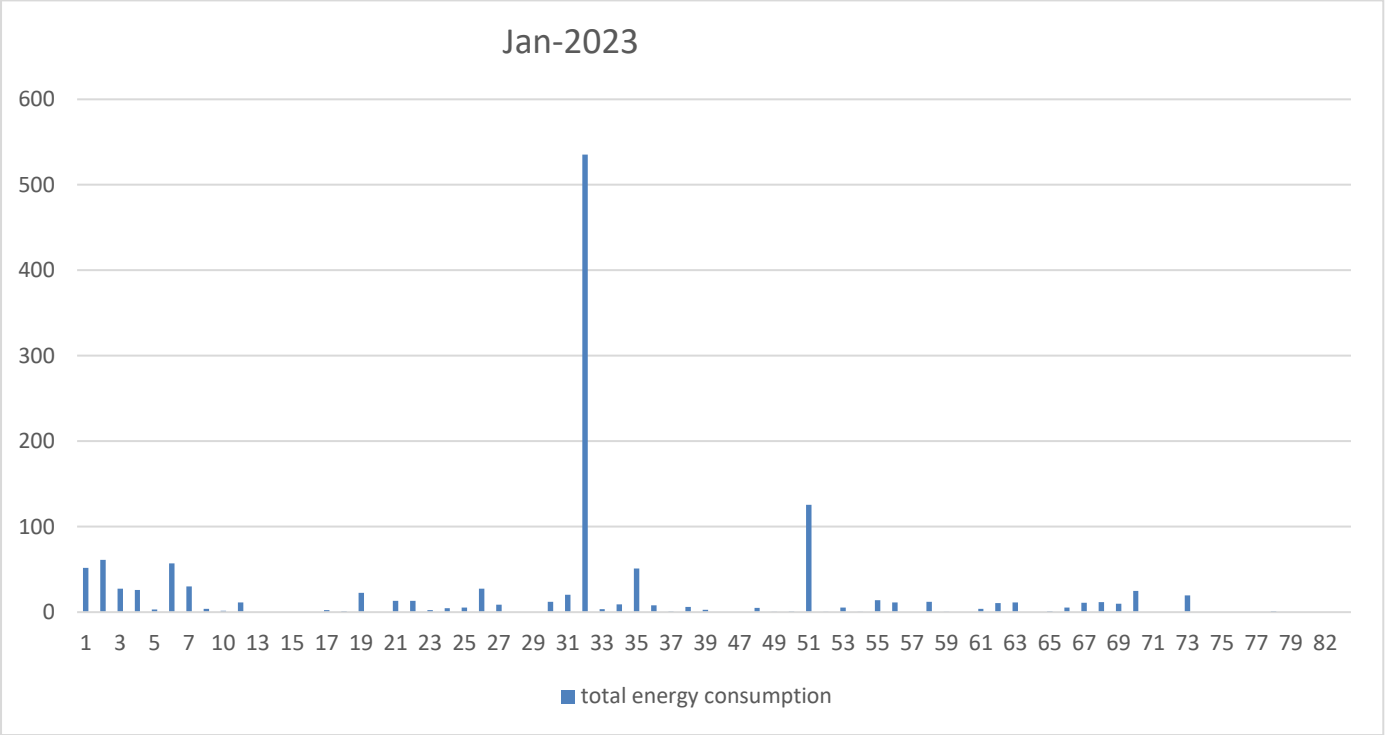
total energy consumption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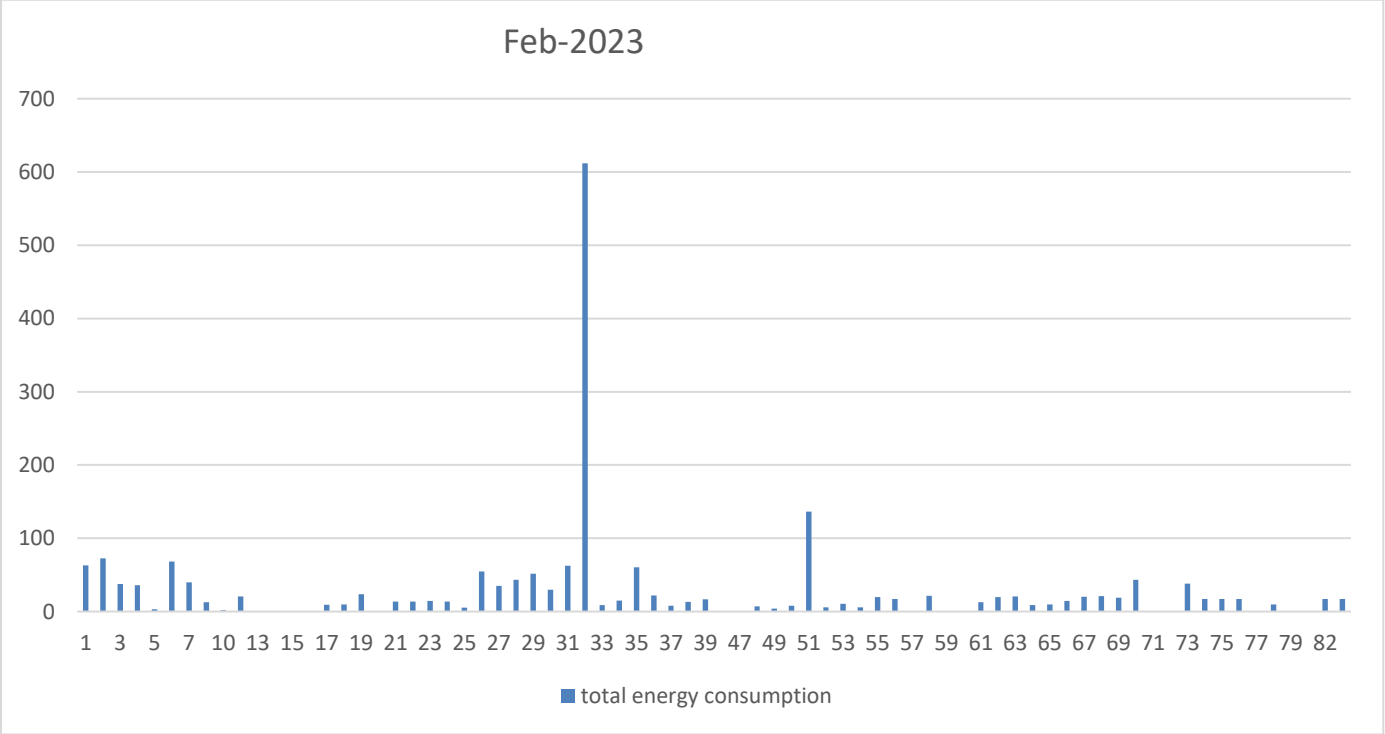
total energy consumption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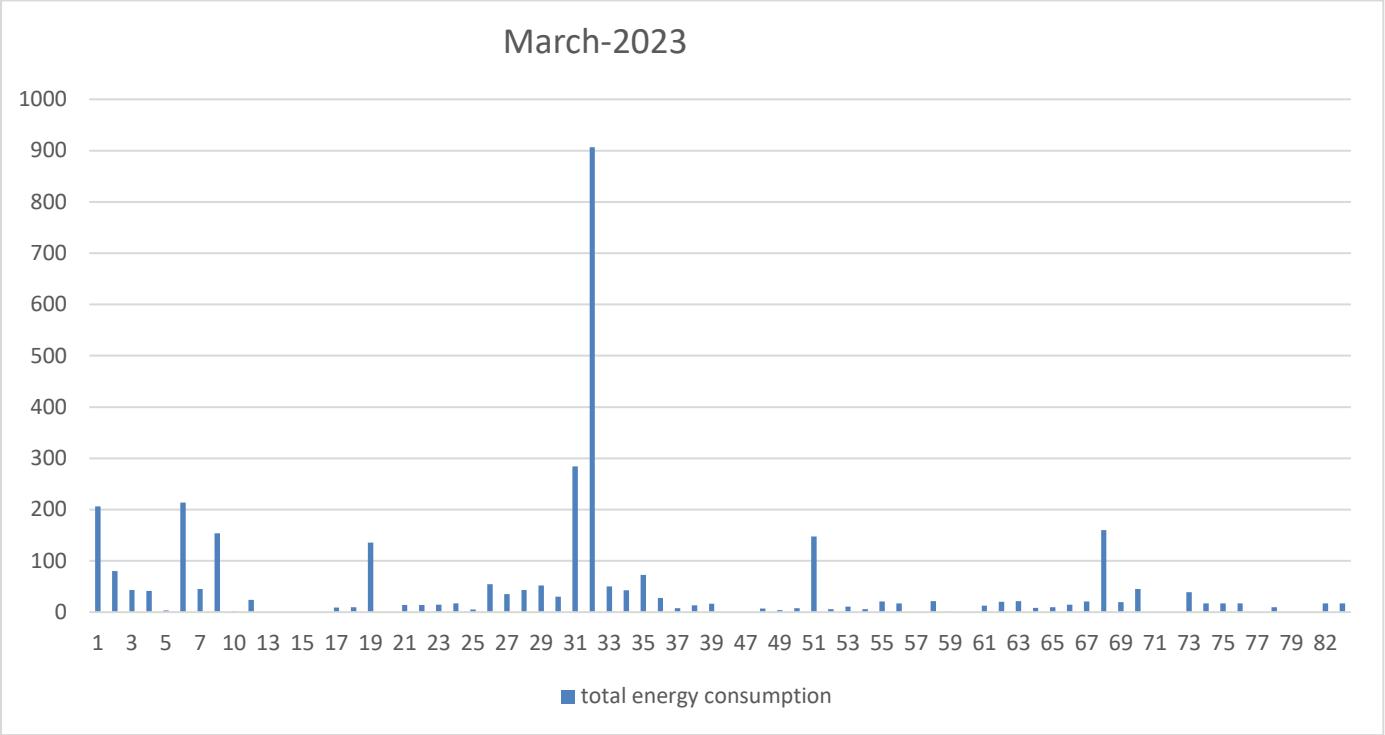
total energy consumption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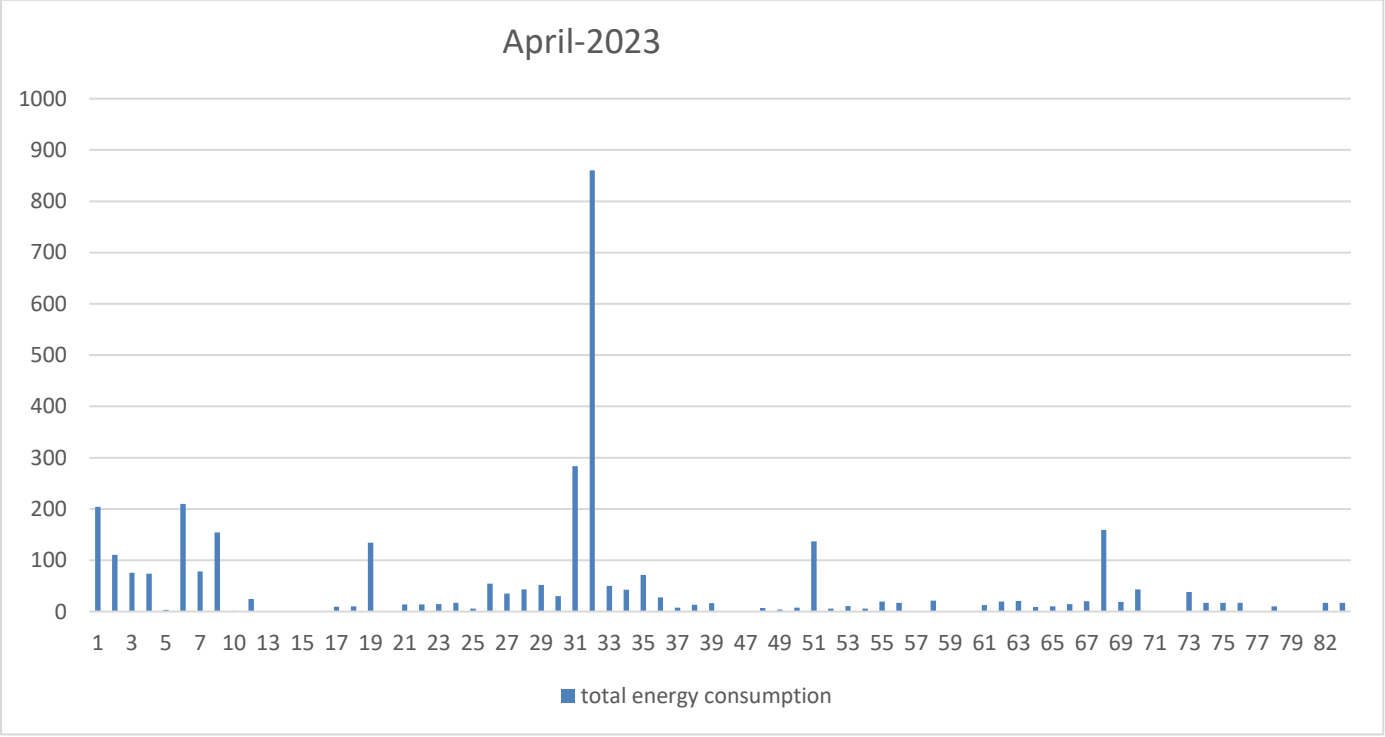
total energy consumption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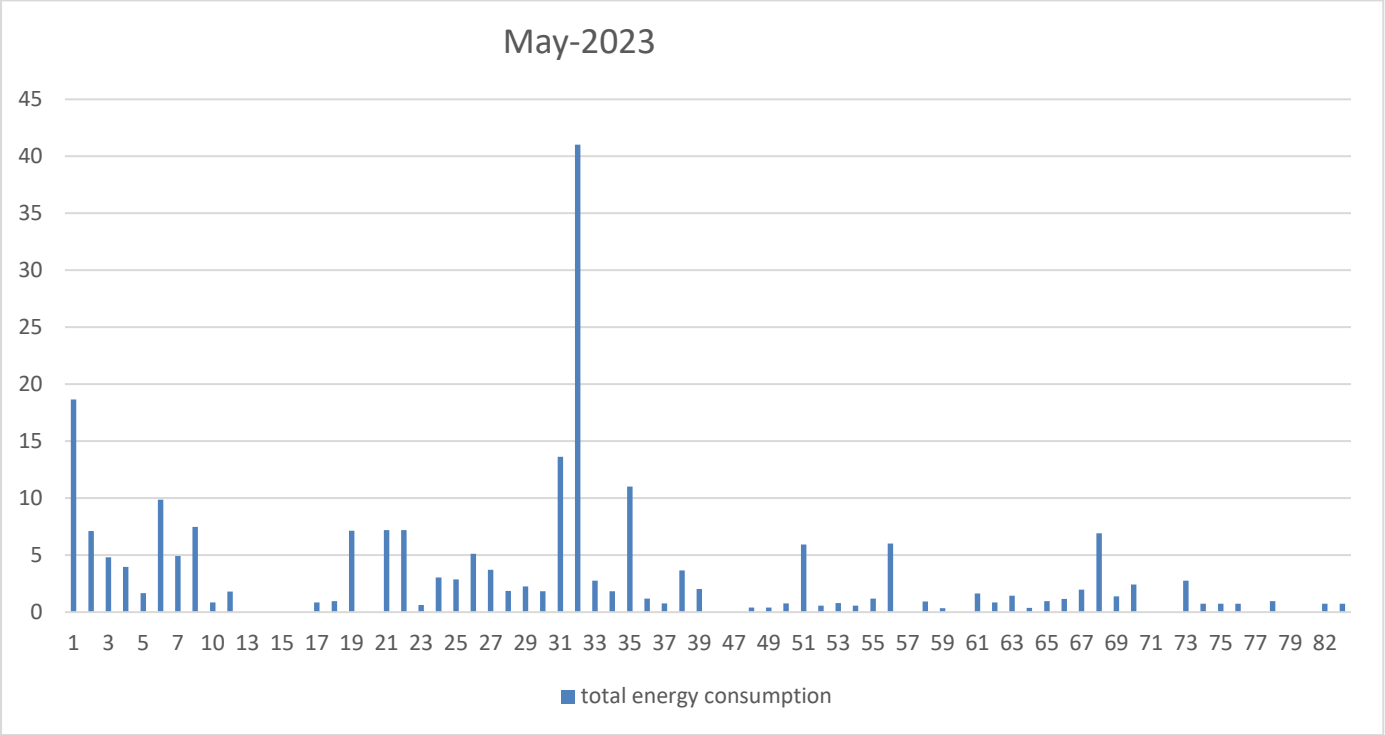
May-2023
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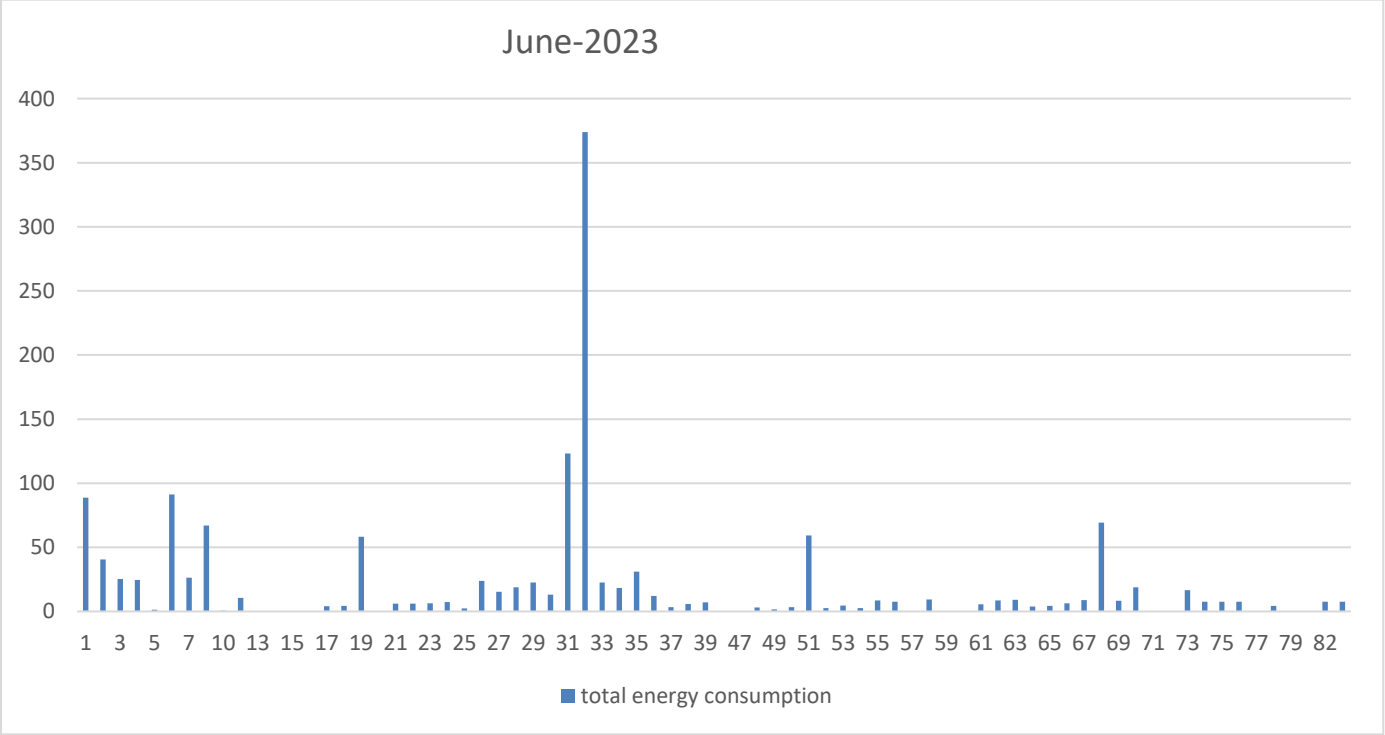
June-2023
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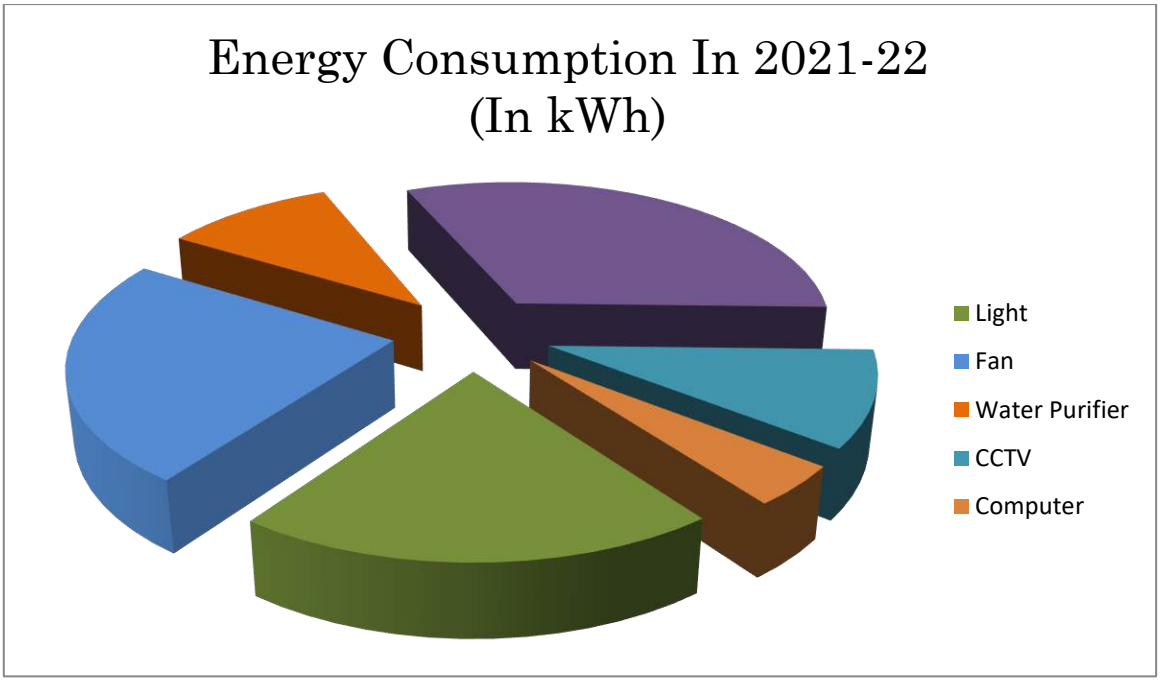
1 3 5 7 10 13 15 17 19 21 23 25 27 29 31 33 35 37 39 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 82
total energy consumption

Appendix-B

Appliances wise energy consumption in hostel

Sl. No	Appliances	Number	Approximate Energy Consumption (in KWh)
1.	Light	61	110
2.	Fan	36	129
3.	Water Purifier	2	55
4.	Water Pump	2	172
5.	CCTV	1	55
6.	Computer	1	23



Energy Audit Report

Laxminarayan College, Jharsuguda

Jharsuguda, Odisha-768201

Session 2022-23

Energy Audit Team: -

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  Lecturer in physics
- Mr. Bijendra Jyotish
  Lecturer in physics
- Mr. Bharat Bhabesh Pati
  Lecturer in physics

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Energy audit team
L.N. College
Jharsuguda

CONTENT

Introduction

Laxminarayan College, **Jharsuguda**, is a full-fledged aided College of the Government of Odisha located in Jharsuguda town. It has thousands of students and hundreds of employees. It imparts teaching in Arts, Science and Commerce both in + 2 and + 3 stage with Honours teaching facilities. The College is one of the oldest colleges in western Odisha being established in August, 1969. Laxminarayan College is a fully aided educational institution of the government of Odisha, having many UGC- scale teachers. The main building of the college is housed in an erstwhile Hostel of the Engineering School of Jharsuguda, later on many new infrastructures along with a sports complex financed by the UGC has been added. The College presently boast of a modern computer Laboratory with 60 computers with LAN connections, a well-equipped modern language laboratory and other facility. The present student strength of the college is about 2000.

There are three floors of the college building with total 90 rooms which includes 11 academic departments, examination and admission sections, offices and supporting infrastructures like +3 and+2 library, different laboratories, computer centre, room for watchman etc.

Objective

The objective of Energy Audit is to promote the idea of Energy Conservation in the Campus of L.N. College. The purpose of the energy audit is to identify, quantify, describe and prioritize cost saving measures relating to energy use in the Hostel, Departments and Institute Central Facilities.

The work eligible for Energy Audit Study should be directed towards:

- Identification of areas of energy wastage and estimation of energy saving potential in Hostel, Departments and Institute Central Facilities.
- Suggesting cost-effective measures to improve the efficiency of energy use.
- Estimation of implementation costs and payback periods for each recommended action.
- Documenting results & vital information generated through these activities.
- Identification of possible usages of co-generation, renewable sources of energy (say Solar Energy) and recommendations for implementation, wherever possible, with cost benefit analysis.

Energy Audit Methodology

The methodology adopted for this audit was a three steps process comprising of:

1. **Data Collection** – In preliminary data collection phase, exhaustive data collection was performed using different tools such as observation, interviewing key persons, and measurements.
2. **Data Analysis** - Detailed analysis of data collected was done. The data analysed was used for producing graphical representations.

Data Collection

For suggesting any corrective measures to reduce power consumption, it is first necessary to know the power consumption pattern in detail. For this, the exhaustive data collection exercise was performed at all the departments, academic centres, hostel, and other supporting entities such as library, computer centre etc.

Following steps were taken for data collection:

- The team went to each department, centre, hostel etc. to gather information about running hours of appliances in each department
- Information about the general electrical appliances was collected by observation and interviewing.
- The power consumption of appliances was measured (rated power; CFL for example).
- The details of usage of the appliances were collected by interviewing key persons e.g. Warden (in case of hostels), key-person (in case of departments) etc.
- In case of Air Conditioning, insulation was checked by visual inspection.
- Approximations and generalizations were done at places with lack of information.

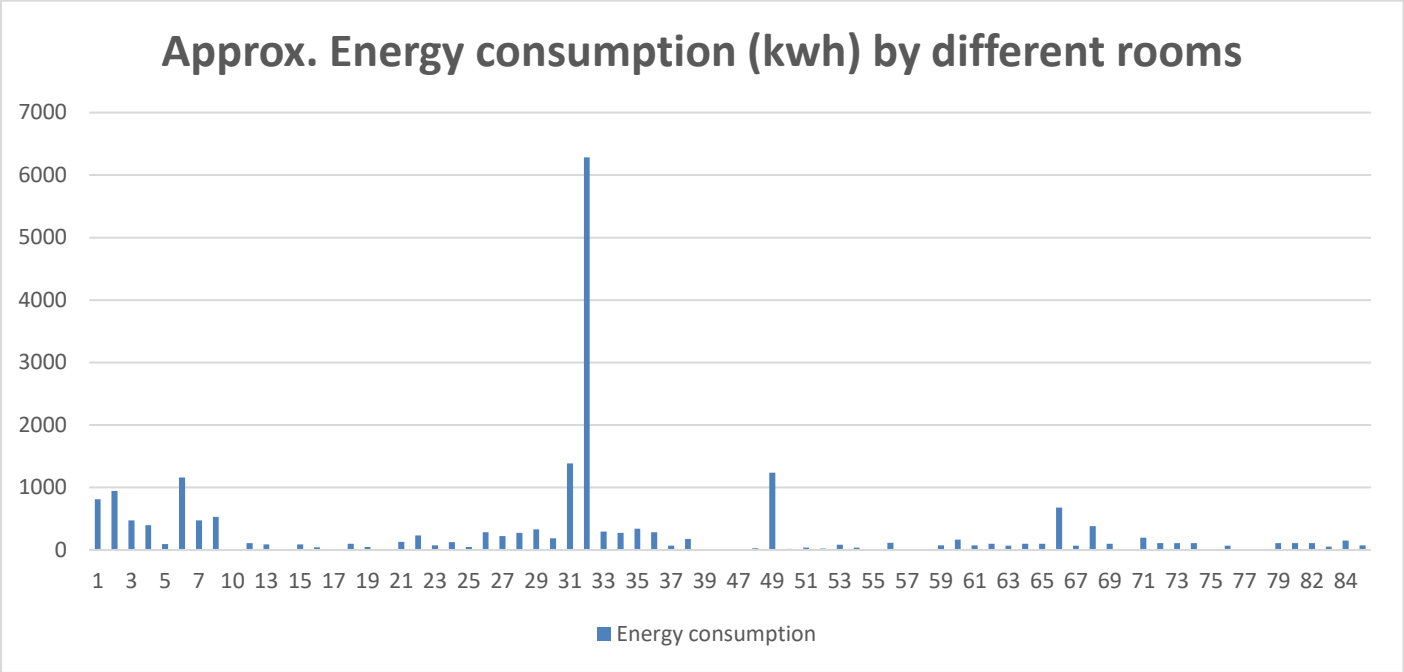
Data Analysis

In data analysis, the data collected is processed to draw significant conclusions to pinpoint loopholes and identify the areas to focus upon. Analysis of the power consumption observations obtained was used to obtain the power consumption pattern and also to get the information about the points where electric power is wasted.

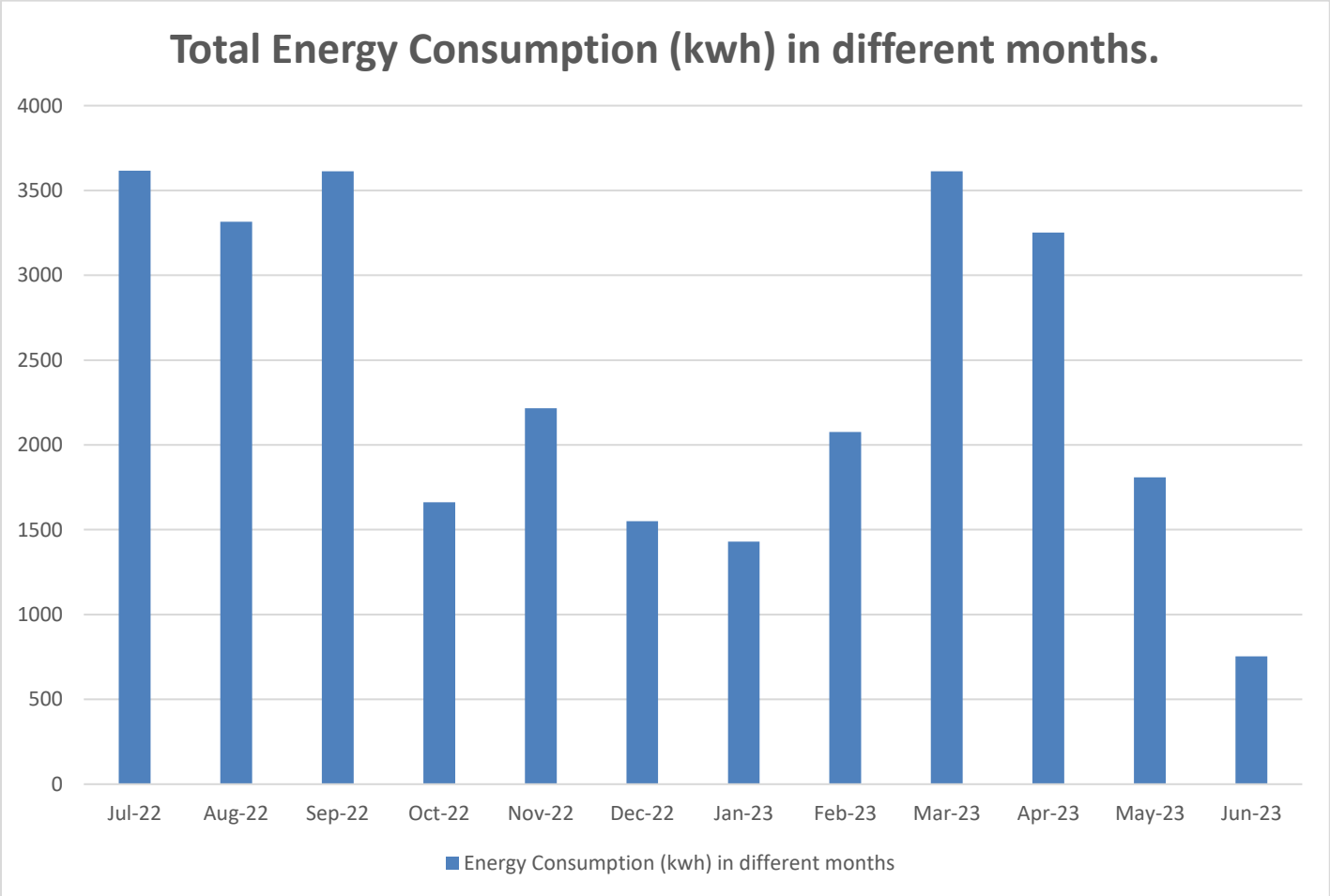
The team analysed the data and provided the information in the form of graphs and charts. As per the common minimum standard issued by Govt. of Odisha the total no. of working days in session 2022-23 in different months are as follows.

Sl. No.	Month	No. of Working days
1.	Jul-22	24
2.	Aug-22	22
3.	Sep-22	25
4.	Oct-22	18
5.	Nov-22	24
6.	Dec-22	26
7.	Jan-23	24
8.	Feb-23	23
9.	Mar-23	25
10.	Apr-23	22
11.	May-23	12
12.	Jun-23	05

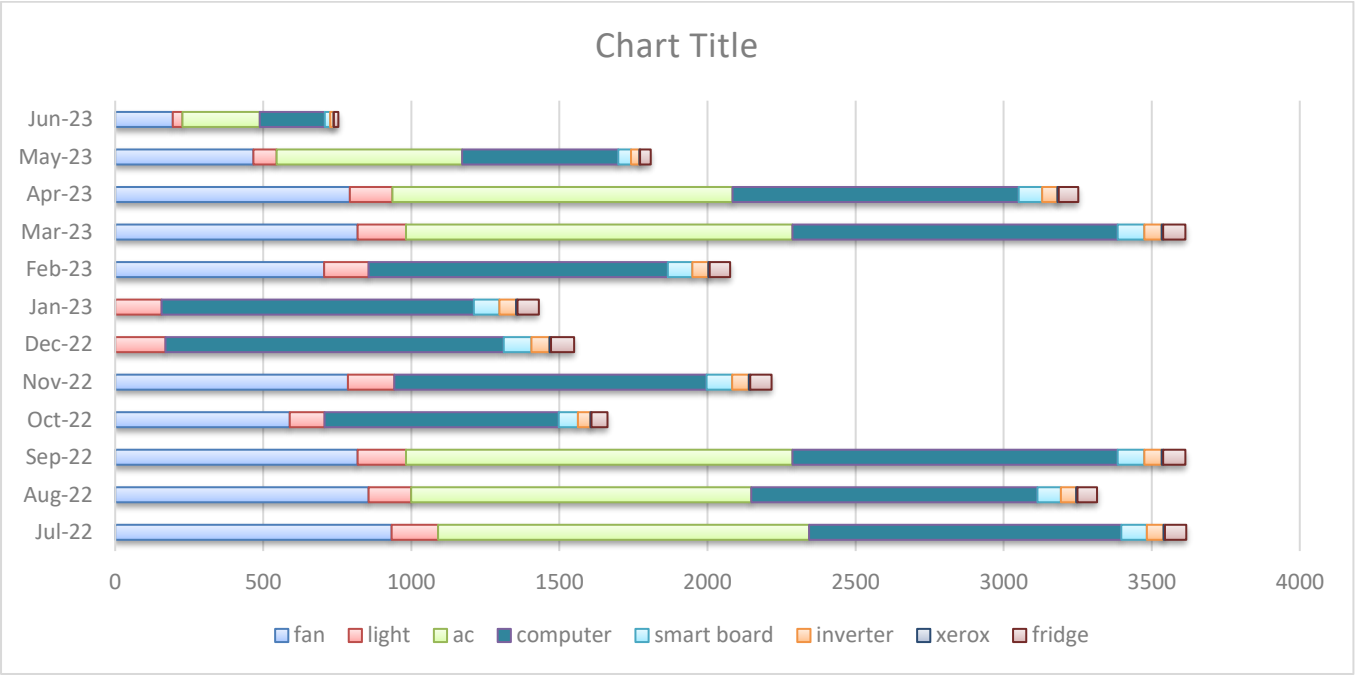
Approximate Energy consumption (kwh) by different rooms



Approximate Total Energy Consumption (kwh) in different months.

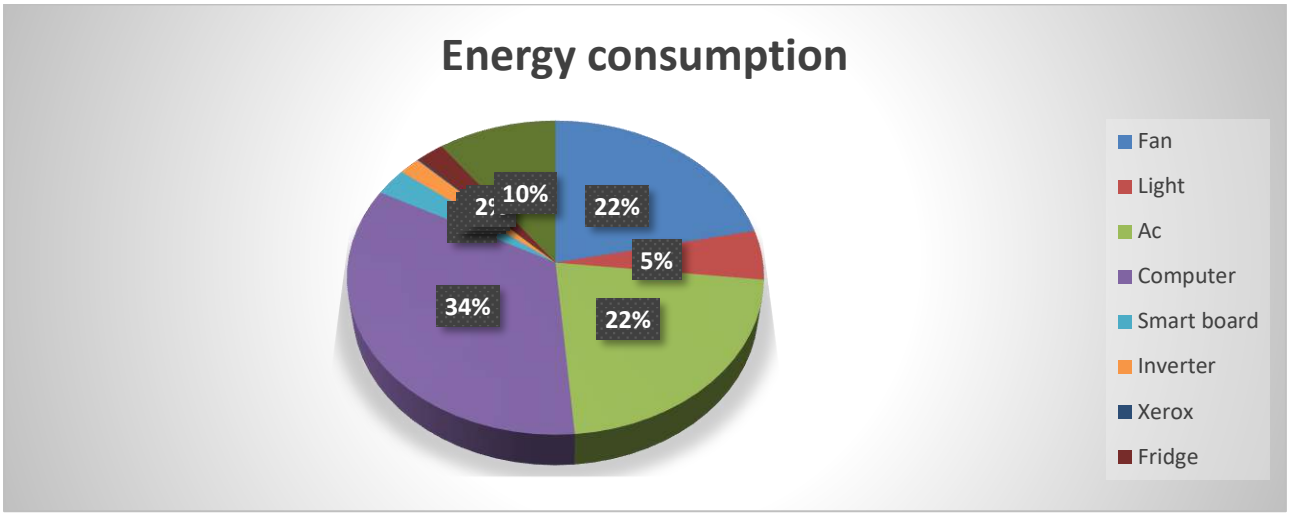


Total Energy Consumption (kwh) by different appliances



Appliances wise energy consumption (kwh)

Name of Appliances	Approximate Energy Consumption in 2022-23 (In kwh)	Approximate Total Energy Consumption In 2022-23 (In kwh)
Fan	6961	28909
Light	1634	
Ac	7047	
Computer	10981	
Smart board	900	
Inverter	586	
Xerox	50	
Fridge	750	
Other	6961	



For lighting purpose around 5% of total energy is consumed.

The fans have a contribution of around 22% in total energy consumption.

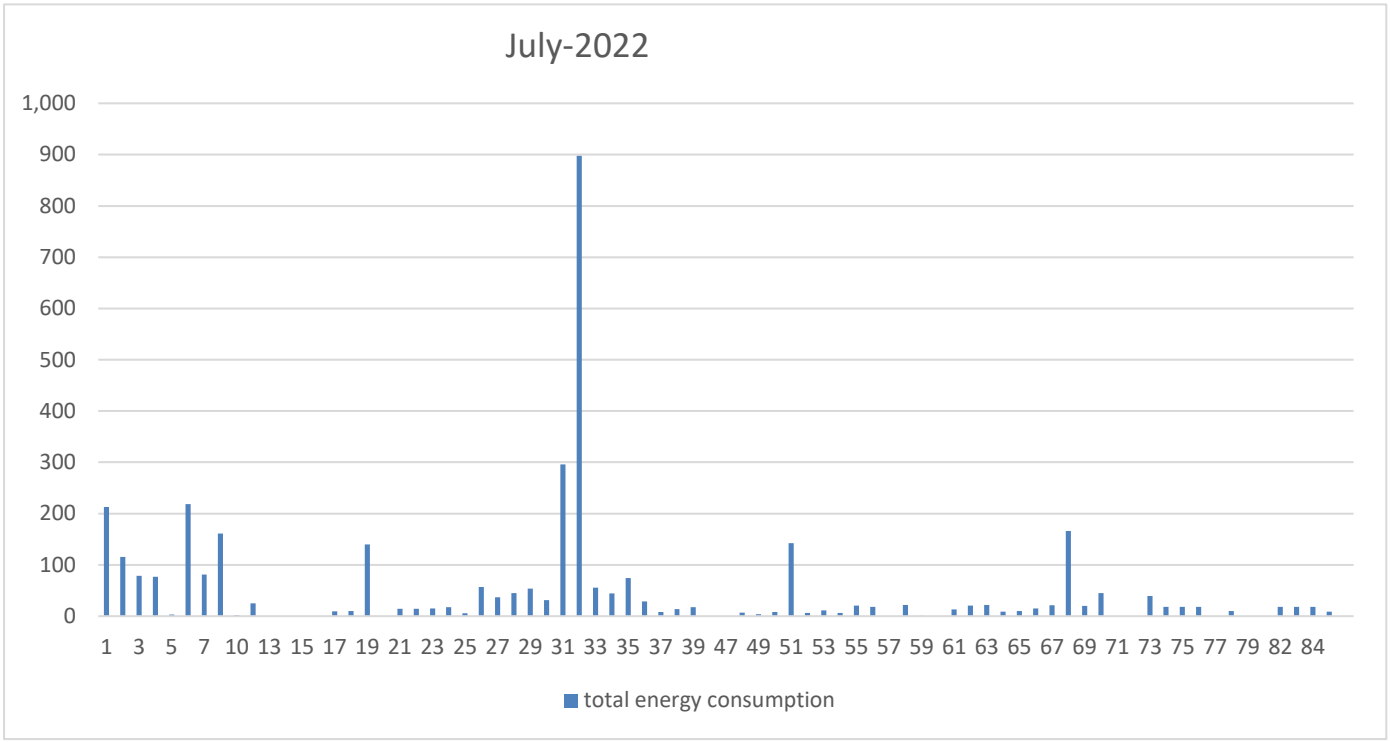
The air conditioners consume around 22% of total energy consumption.

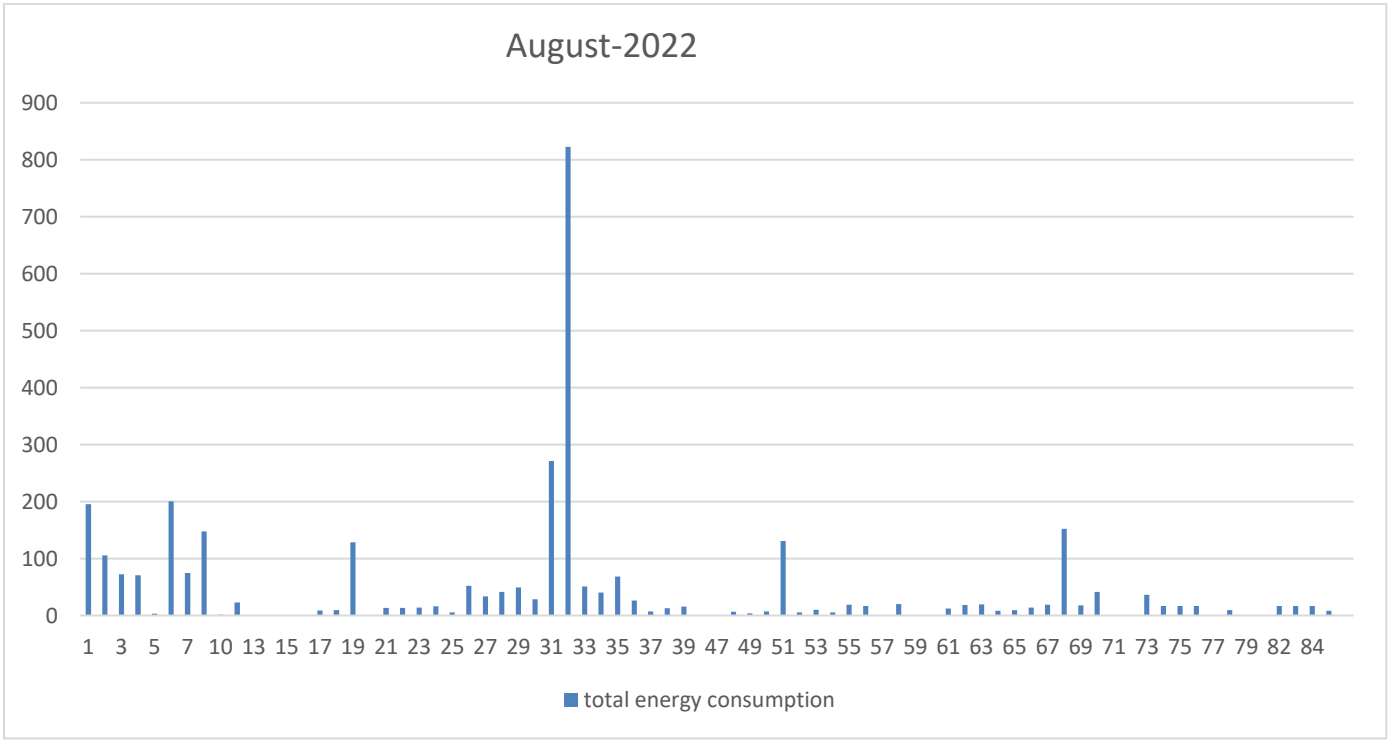
The computers consume around 34% of energy out of the total energy consumption.

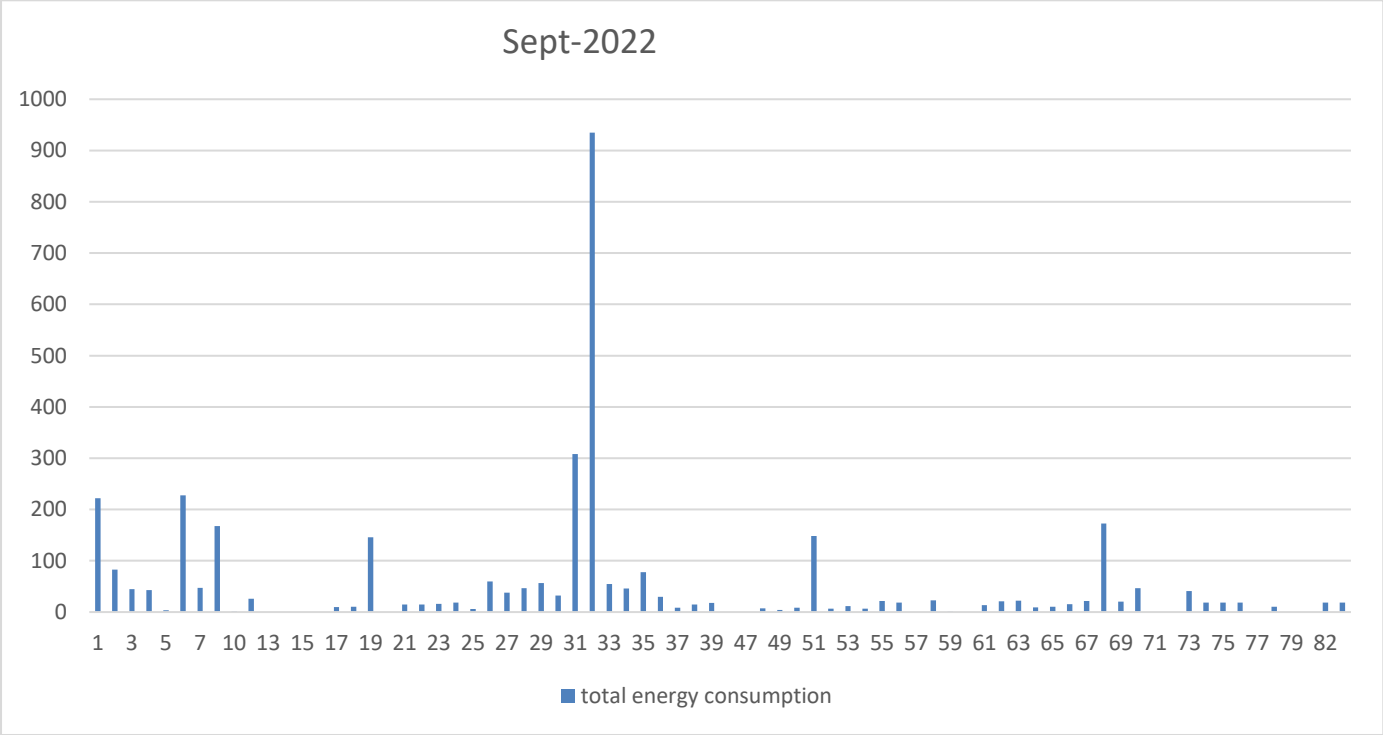
The other equipment such as water pump, CCTV Camera, Roof light, currency counting machine, xerox machine, fridge etc consumes around 17% of total energy.

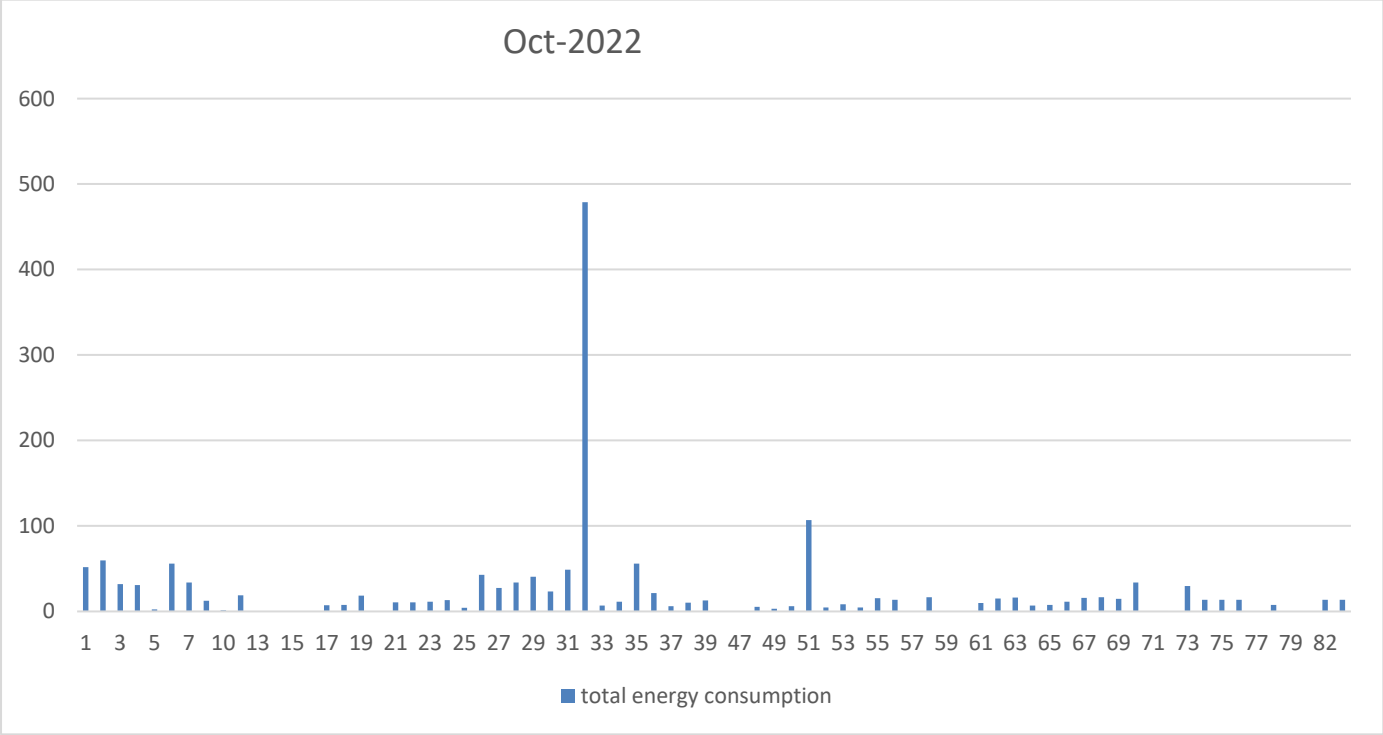
Appendix-A

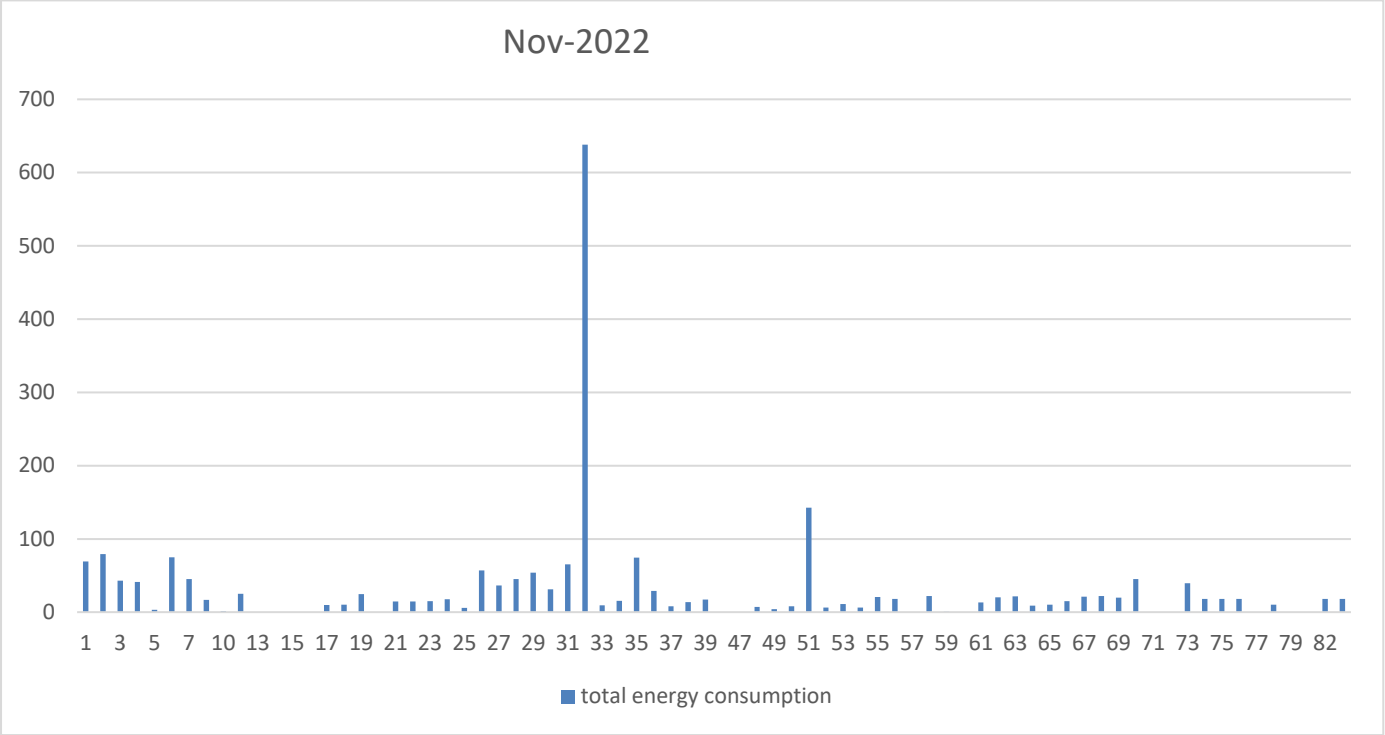
Month wise comparative energy consumption graphs of all departments

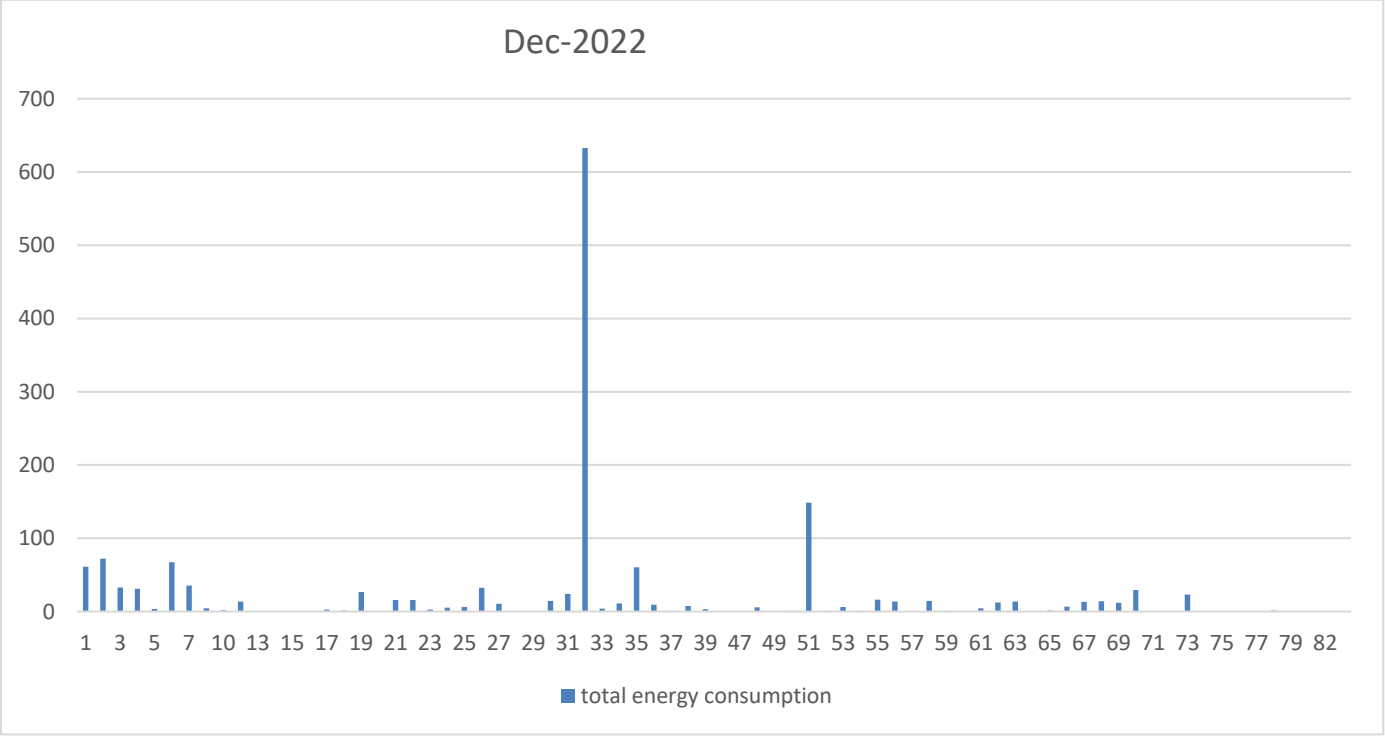


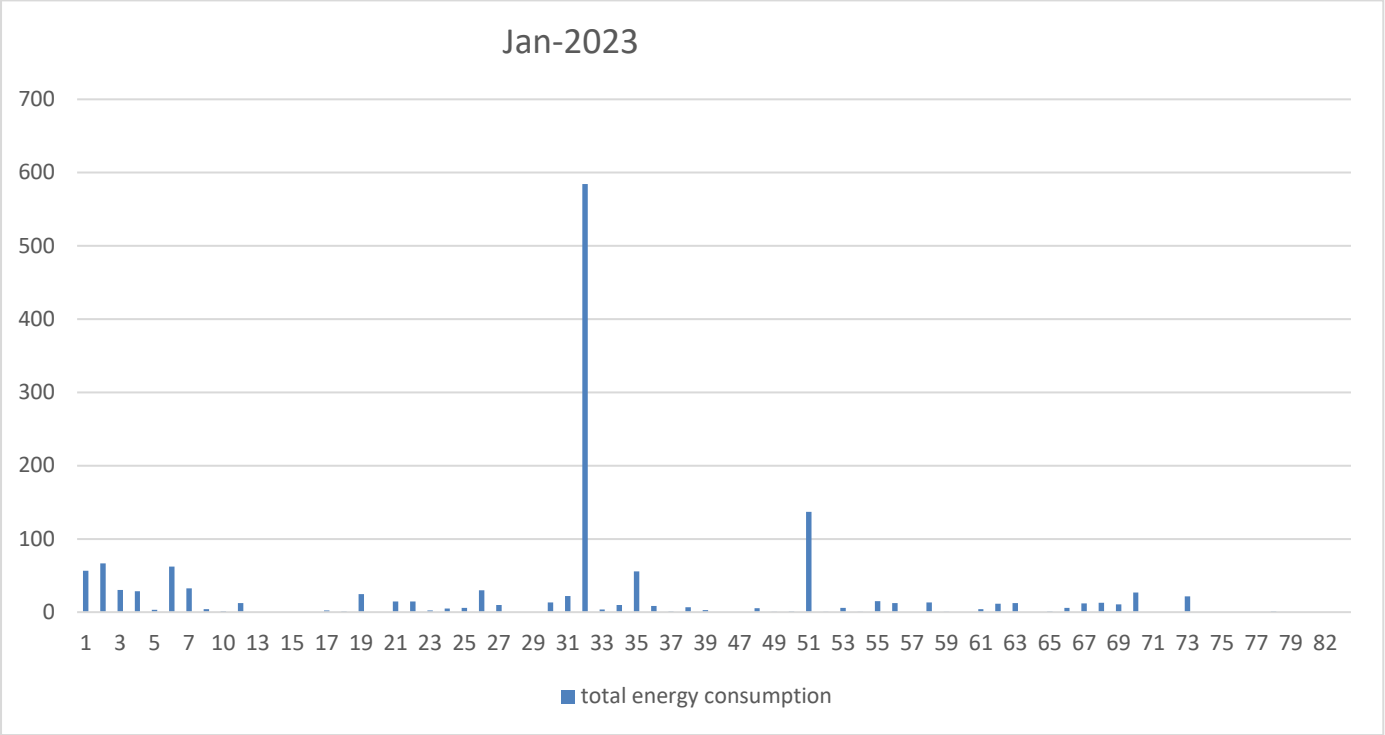


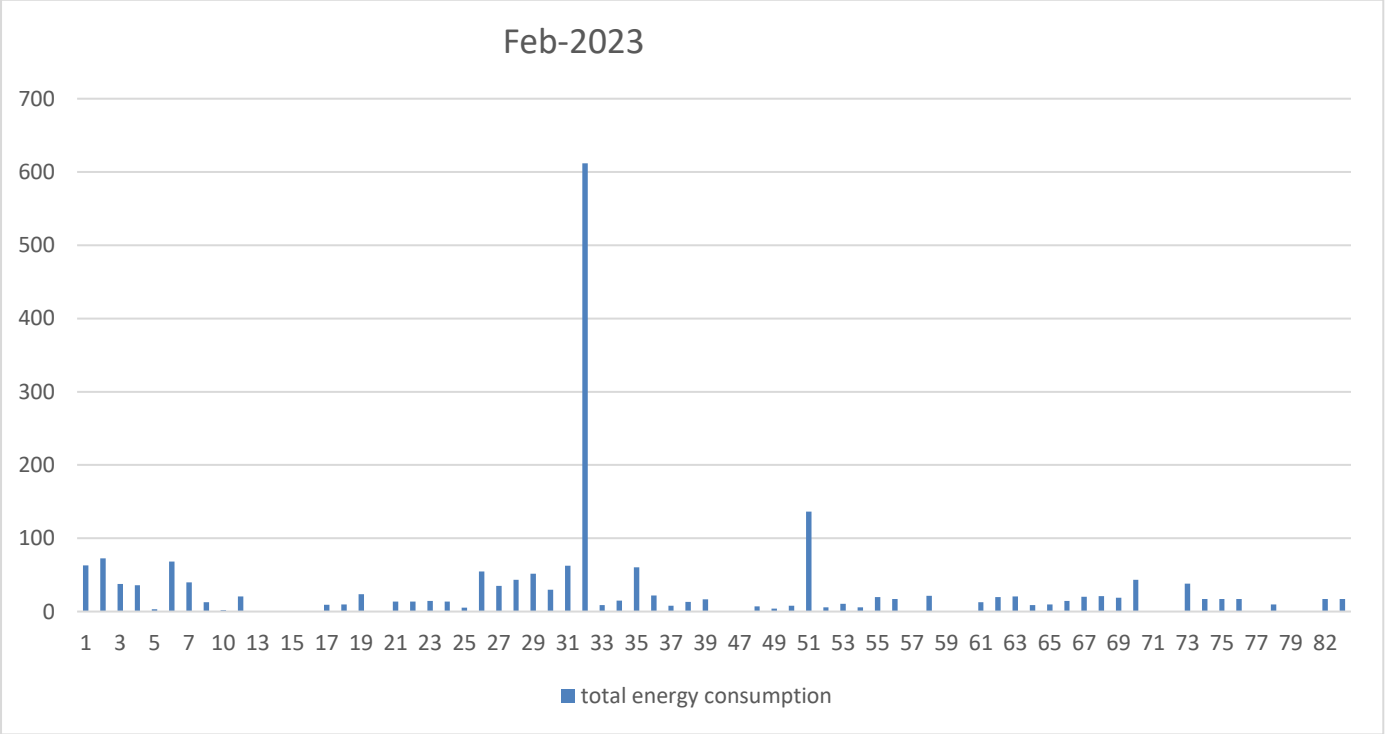

Sept-2022
1000
900
800
700
600
500
400
300
200
100
0
1 3 5 7 10 13 15 17 19 21 23 25 27 29 31 33 35 37 39 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 82
total energy consumption

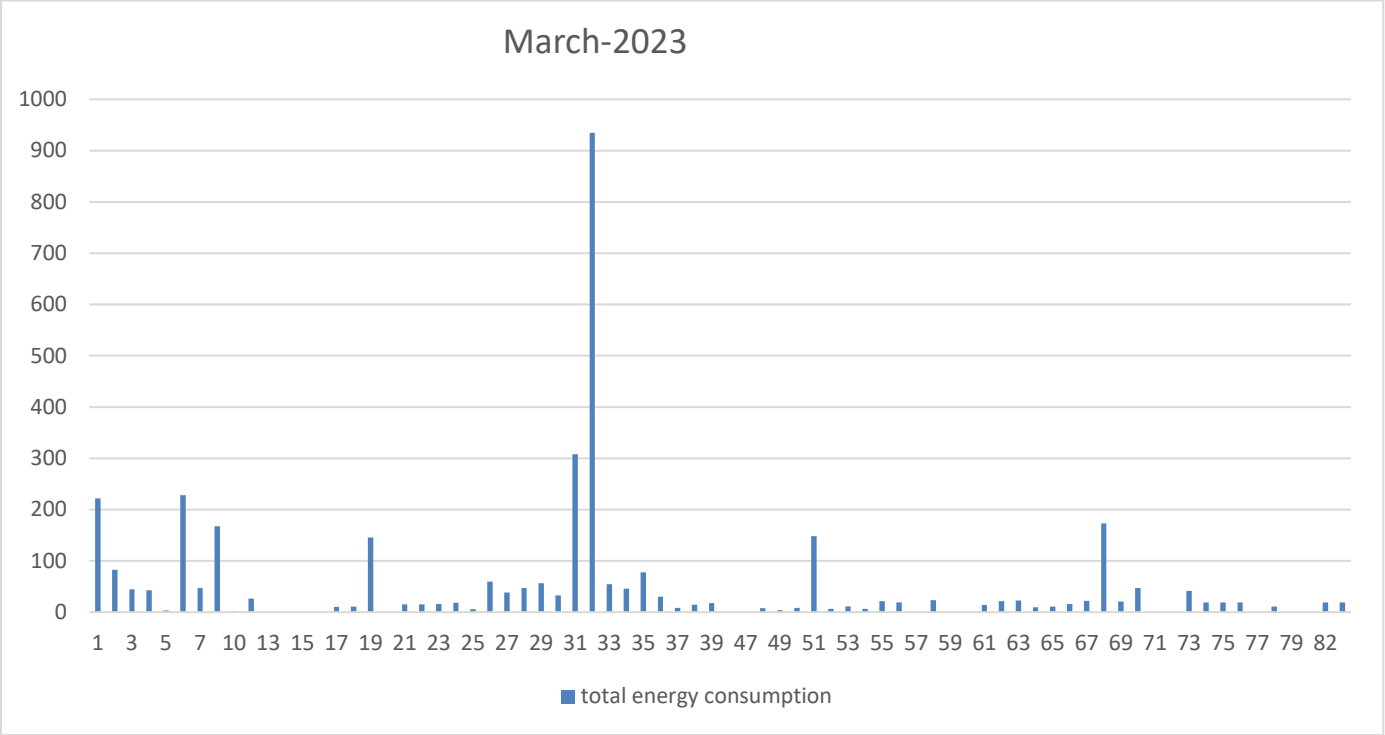

Oct-2022
600
500
400
300
200
100
0
1 3 5 7 10 13 15 17 19 21 23 25 27 29 31 33 35 37 39 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 82
total energy consumption

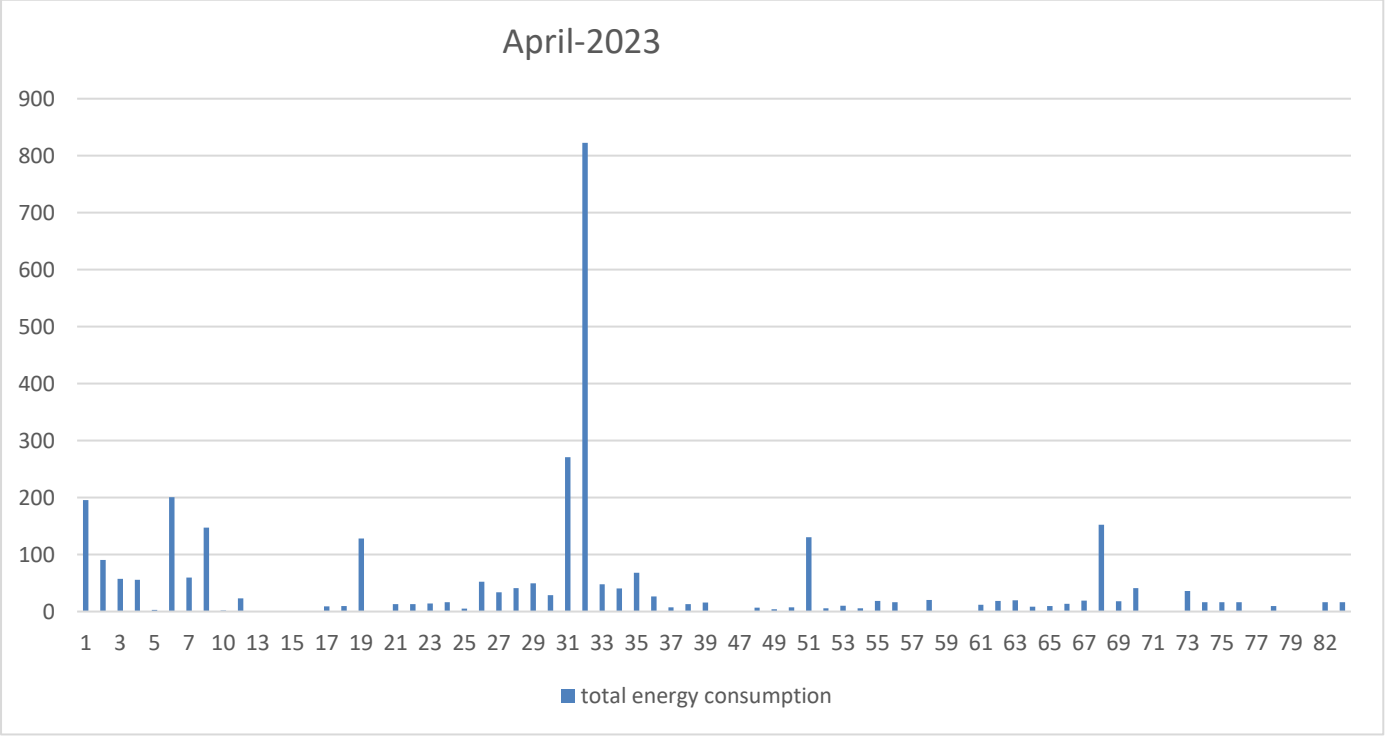

Nov-2022
700
600
500
400
300
200
100
0
1 3 5 7 10 13 15 17 19 21 23 25 27 29 31 33 35 37 39 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 82
total energy consumption

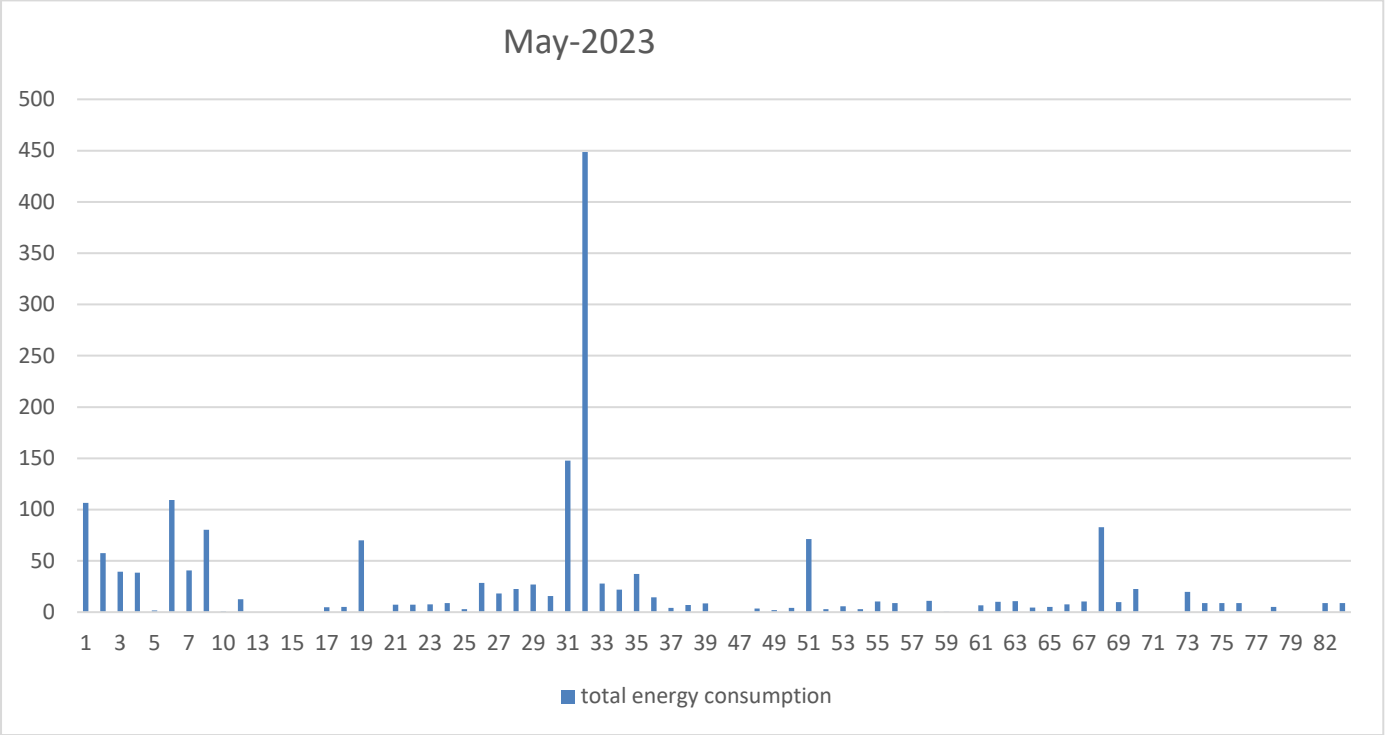

Dec-2022
700
600
500
400
300
200
100
0
1 3 5 7 10 13 15 17 19 21 23 25 27 29 31 33 35 37 39 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 82
total energy consumption

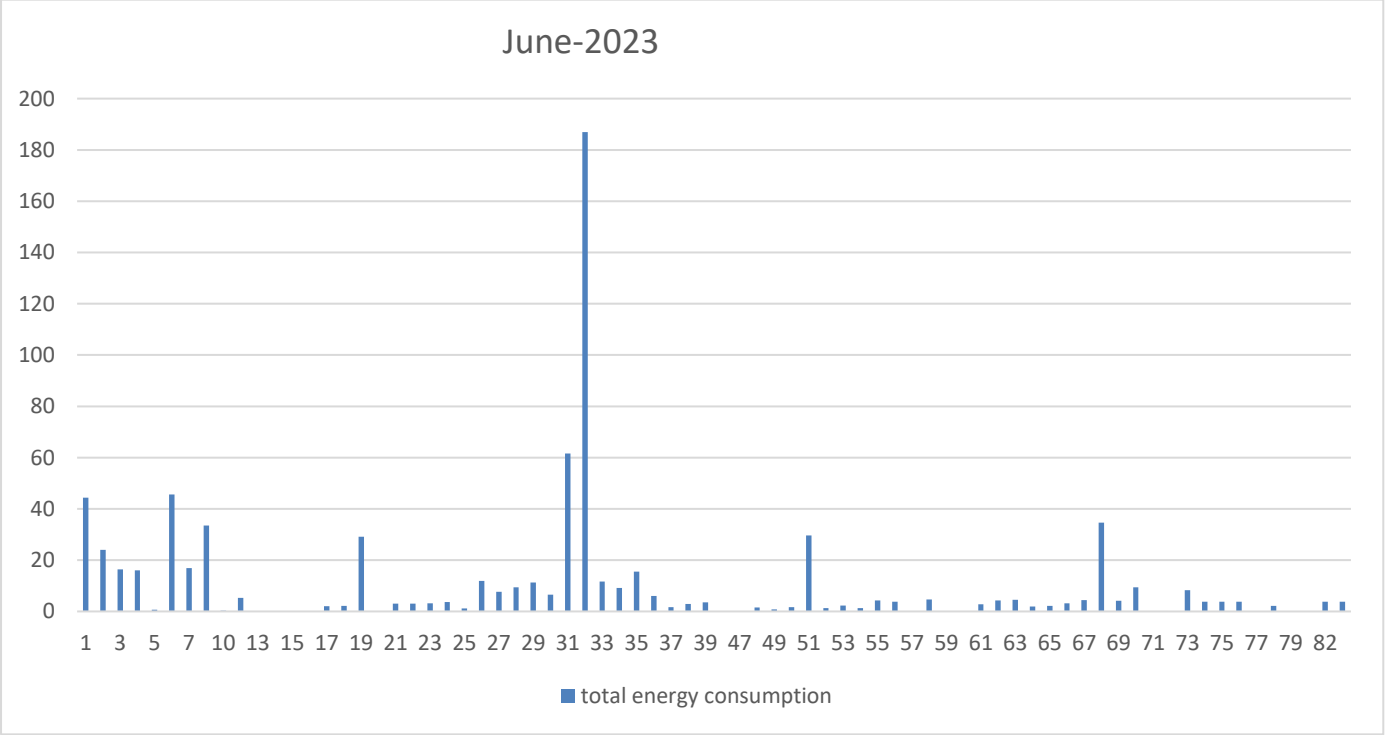

Jan-2023
700
600
500
400
300
200
100
0
1 3 5 7 10 13 15 17 19 21 23 25 27 29 31 33 35 37 39 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 82
total energy consumption


Feb-2023
700
600
500
400
300
200
100
0
1 3 5 7 10 13 15 17 19 21 23 25 27 29 31 33 35 37 39 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 82
total energy consumption


March-2023
1000
900
800
700
600
500
400
300
200
100
0
1 3 5 7 10 13 15 17 19 21 23 25 27 29 31 33 35 37 39 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 82
total energy consumption


April-2023
900
800
700
600
500
400
300
200
100
0
1 3 5 7 10 13 15 17 19 21 23 25 27 29 31 33 35 37 39 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 82
total energy consumption


May-2023
500
450
400
350
300
250
200
150
100
50
0
1 3 5 7 10 13 15 17 19 21 23 25 27 29 31 33 35 37 39 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 82
total energy consumption


June-2023
200
180
160
140
120
100
80
60
40
20
0
1 3 5 7 10 13 15 17 19 21 23 25 27 29 31 33 35 37 39 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 82
total energy consumption

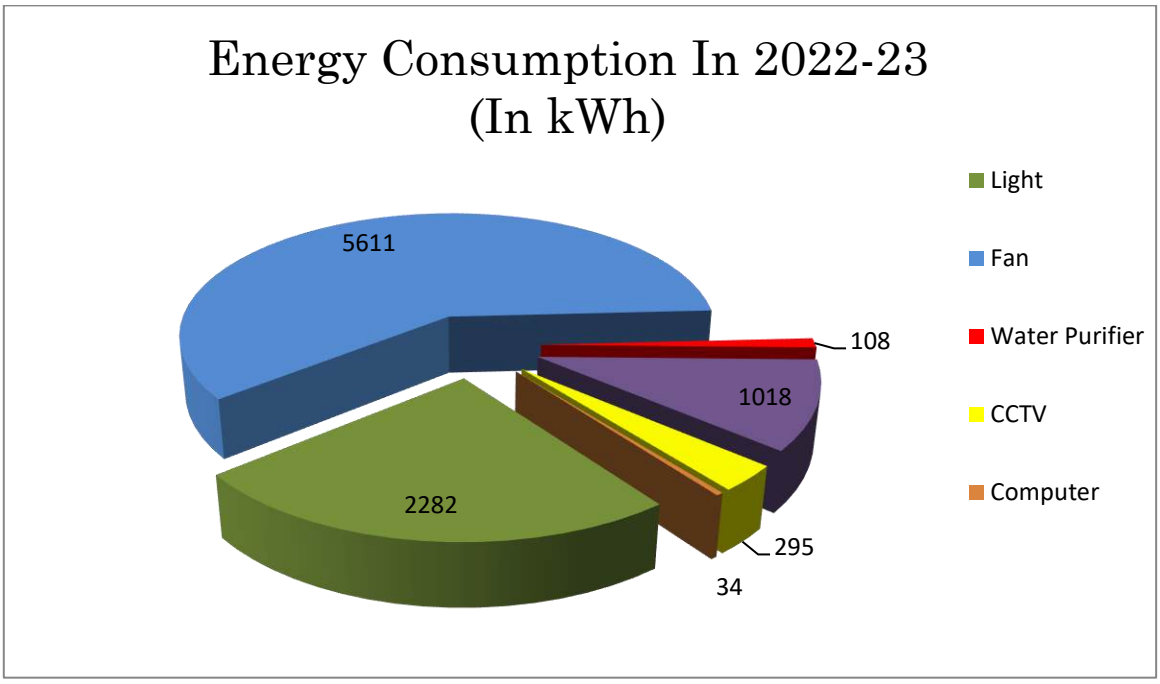
Appendix-B

Energy consumption in hostel

Ladies Hostel		
Appliances	Number	Approximate Energy Consumption (in KWh)
Light	100	1301
Fan	66	5111
Water Purifier	4	55
Water Pump	2	686
CCTV	9	55
Computer	1	23
Gents Hostel		
Appliances	Number	Approximate Energy Consumption (in KWh)
Light	116	981
Fan	27	500
Water Purifier	4	53
Water Pump	2	331
CCTV	9	240
Computer	1	11

Appliances wise energy consumption in hostel

Sl. No	Name of Appliance	Approximate Energy Consumption in 2022-23 (In KWh)
1.	Light	2282
2.	Fan	5611
3.	Water Purifier	108
4.	Water Pump	1018
5.	CCTV	295
6.	Computer	34



LAXMINARAYAN COLLEGE JHARSUGUDA

Principal
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