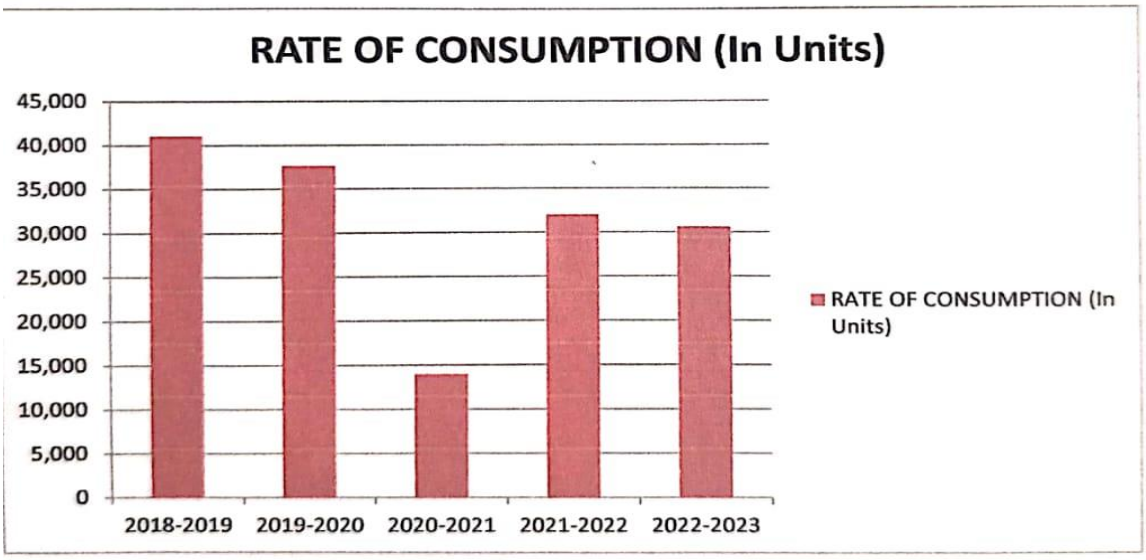
7.1.3 ADDITIONAL INFORMATION

S.K.R. GOVERNMENT DEGREE COLLEGE(WOMEN)
RAJAMAHENDRAVARAM(Estd.1968)
(Re-Accredited at B+Grade by NAAC, Affiliated to Adikavi Nannayya University)

ENERGY AUDIT COMPARISON TABLE(S)

Table-1: Power consumption comparison (In terms of units of consumption)

S.NO.	ACADEMIC YEAR	RATE OF CONSUMPTION (In Units)
1	2018-2019	41,067
2	2019-2020	37,665
3	2020-2021	13,950
4	2021-2022	31,980
5	2022-2023	30,613

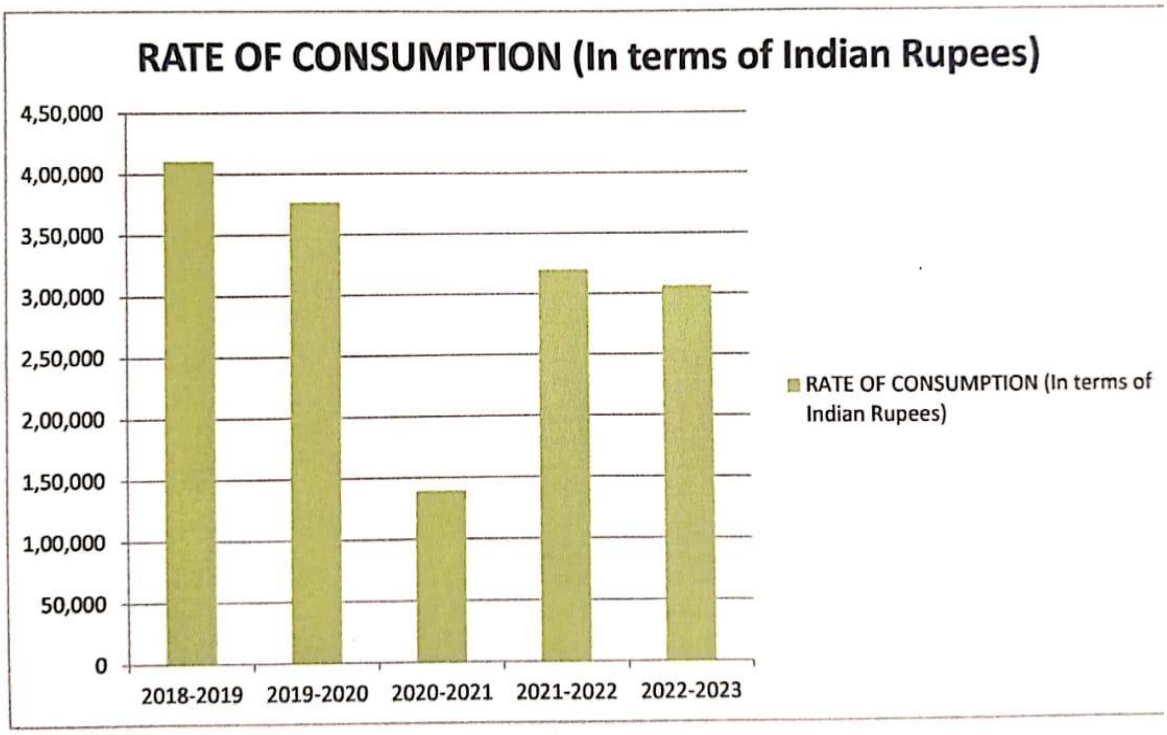


Note: 1. The decline in power consumption is low in the academic year 2020-2021 is high, as online classes were taken due to the Pandemic COVID-19.

2. Savings are decreased in the Academic year 2022-2023, as the number of working days are slightly more than the previous academic years.

Table-2: Power consumption comparison (In terms of Expenditure Cost)

S.NO.	ACADEMIC YEAR	RATE OF CONSUMPTION (In terms of Indian Rupees)
1	2018-2019	4,10,670
2	2019-2020	3,76,650
3	2020-2021	1,39,500
4	2021-2022	3,19,800
5	2022-2023	3,06,130



Note:

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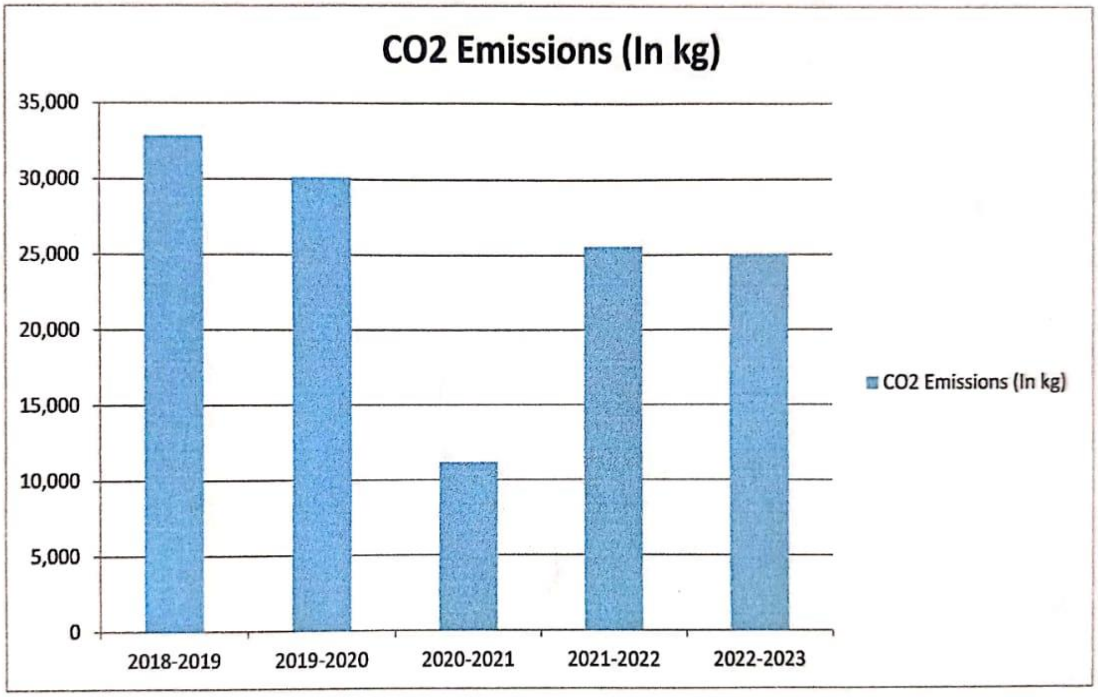
2. Savings are decreased in the Academic year 2022-2023, as the number of working days are slightly more than the previous academic years.

Table-3: Power consumption comparison (In terms of CO_2 Emissions)

S.NO.	ACADEMIC YEAR	CO_2 Emissions (In kg)
1	2018-2019	32,853
2	2019-2020	30,132
3	2020-2021	11,160
4	2021-2022	25,584
5	2022-2023	24,993



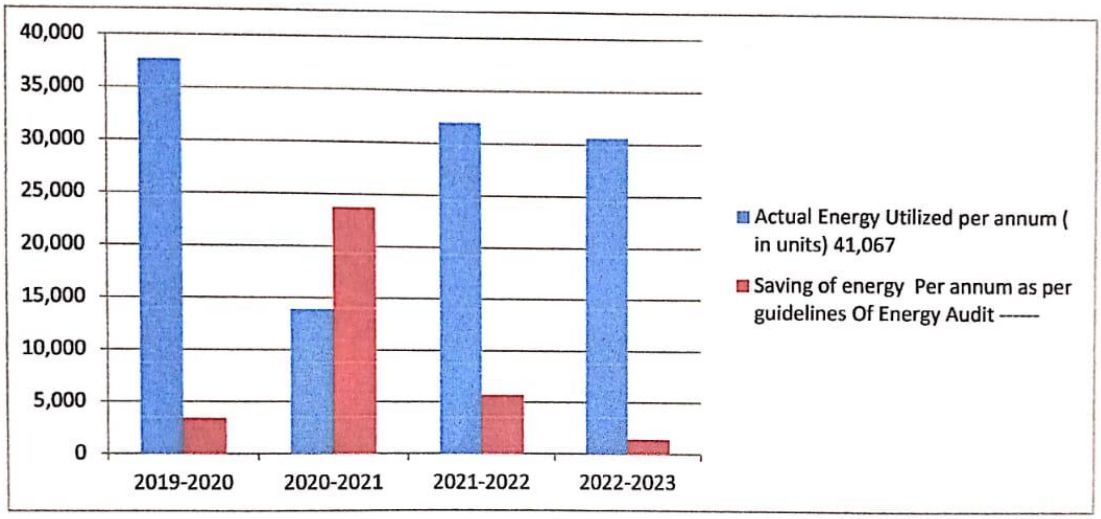
Note:

1.The decline in power consumption is low in the academic year 2020-2021 is high, as online classes were taken due to the Pandemic COVID-19.

2. Savings are decreased in the Academic year 2022-2023, as the number of working days are slightly more than the previous academic years.

Table 4.

S.NO.	Academic Year	Actual Energy Utilized per annum (in units)	Saving of energy Per annum as per guidelines Of Energy Audit	Savings on Expenditure per annum (In Rupees)	Saved CO2 Emission per annum as per guidelines of Energy Audit (in kg)
1	2018-2019	41,067	------	------	------
2	2019-2020	37,665	3402	34,020	2721
3	2020-2021	13,950	23715	2,37,150	18,972
4	2021-2022	31,980	5685	56,850	4548
5	2022-2023	30,613	1367	13,670	591



NOTE:

1. Savings are showing more in the academic year 2020-2021, as number of working days are less due to the Pandemic COVID-19. Most of the classes in this academic year are taken ONLINE.

2. Savings are decreased in the Academic year 2022-2023, as the number of working days are slightly more than the previous academic years.

IQAC Co-ordinator
S.K.R. Government Degree College (Women)
RAJAMAHENDRAVARAM.
East Godavari Dist., Andhra Pradesh

PRINCIPAL
S.K.R. Government Degree College (Women)
RAJAMAHENDRAVARAM.
East Godavari Dist., Andhra Pradesh

K. KESAIAH
Certified Energy Auditor
Reg.No: 9135
RAJAHMUNDRY.

S.K.R. COLLEGE FOR WOMEN, RAJAHMUNDRY
Reaccredited with NAAC B+ Grade

ENERGY AUDIT FOR THE ACADEMIC YEAR 2018-2019

An ***Energy Audit*** is a survey conducted by an Energy Auditor to determine how much energy a building uses and identify ways to reduce energy consumption.

As per the energy conservation Act, 2001 [pass by the government of India], Energy audit is defined as "The verification , monitoring and analysis of the use of energy including submission of technical report containing recommendation for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption consist of four phases."

These are used to improve the ***energy efficiency*** of homes, businesses, and other buildings. An energy audit has three parts: evaluation, testing, and efficiency recommendations.

Evaluation
The first step is an evaluation of your building. This includes looking at past energy bills, your building's physical characteristics, and how it functions.

Testing
Once the Energy Auditor understands your building, they will conduct tests to see how much energy it uses.

Efficiency Recommendations
After the audit is complete, the Energy Auditor will provide you with recommendations on how to improve your building's energy efficiency. These may include changes to your heating and cooling system, insulation, windows, and doors.

Energy Audit Benefits

An Energy Audit can help you reduce the cost of your energy bills and make your home more comfortable. Aside from this, an Energy Audit will:

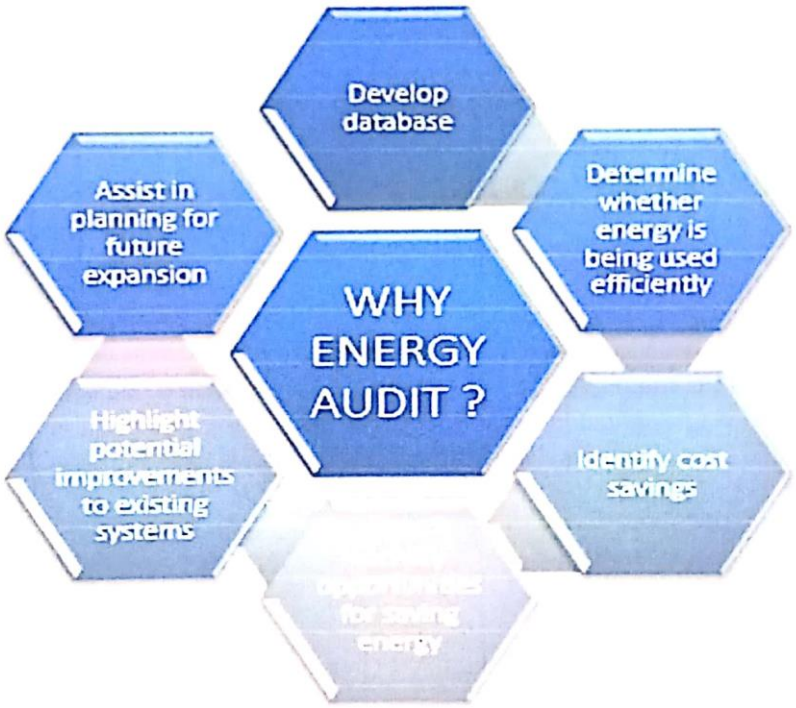
Determine Where Your Home's Energy Is Being Wasted
An Energy Audit will identify areas where your home is losing energy, such as through drafts, poor insulation, or inefficient windows.

Recommend Energy Efficiency Improvements
The Energy Auditor will provide recommendations based on the results of the Energy Audit that will save you money on your energy bills.

Identify Safety Concerns
An Energy Audit can also identify safety concerns, such as carbon monoxide leaks or electrical hazards.

Make Your Home More Comfortable
Making your home more energy-efficient can also make it more comfortable. Sealing drafts and adding insulation can help to keep your home cooler in the summer and warmer in the winter.

Estimate Cost of Improvements
The Energy Auditor will provide you with an estimate of the cost of the energy efficiency improvements that they recommend. This can help you to decide which improvements are right for you.



A detailed energy audit conducted in the Educational Institute mainly aims at the following points:

1) To Assess present pattern of Energy Consumption and Relating Energy input and Production output. 2) To study CO2 Emission.

3) To measure various Electrical parameters.

4) To assess the various equipment/facilities from Energy efficiency aspect and suggesting various measures to reduce electricity consumption and calculating Payback Period for same.

Energy: Modern civilization is possible because people have learned how to change energy from one form to another and then use it to work. People use energy to walk, and bicycle, to move cars along roads and boats through water, to cook food, to light our homes and offices, to manufacture products, and to send astronauts into space.

Energy is of different forms… Mechanical, sound, heat, light, wind, solar, tidal, electric and so on.

Electrical Energy: Electrical energy is defined as the energy generated by the movement of electrons from one point to another. The movement of charged particles along or through a wire constitute current or electricity.

People use electricity for lighting, heating, cooling and for operating appliances, computers, machinery and public transportation system.

Electric Power:

Electric power is defined as the *rate at which electrical energy is consumed* . It may also be defined as the rate at which an electric circuit transfers electrical energy per unit of time.

Electric Power P = Rate of doing work. In terms of Electrical quantities,

$P = V I$

$P = I^2R$

$P = V^2 / R.$

Where V is the Voltage, I is the current and R is the Electric resistance or Load.

The power consumption depends on the load.

The more the electric equipment we use, more will be the power consumption.

For an A C circuit,

True Power = Apparent Power x Power Factor

Apparent power refers to RMS values of AC.

Use of electricity in Educational Institutes:

The two main purposes for educational institutes to need electricity is *lighting* and secondly, *use of computers for administrative purposes*. The most energy consuming appliances in educational institutes are the ventilation and air conditioning systems.

Educational Institutes usually get their electricity from a power plant which use a variety of energy resources to generate electricity, including fossil fuels (coal, oil and natural gas) and renewable energy sources(biomass, hydro power, solar and wind).

Let us calculate the electric energy consumption bill for a class room which uses 4 ceiling fans (each 75 watt) , 4 tube lights (each 40 watt) working for 8 hours per day on an average.

Now, energy consumed per day = 4 *75 W *8 h + 4 * 40 W * 8 h
= 2400 Wh + 1280 Wh
= 3680 Wh
= 3.680 kWh.

Now, for a month of 25 working days,
energy consumption = 3.680kWh x 25
= 92 kWh
= 92 units.

If each unit costs at Rs.12 (roughly),
cost of consumption = 92 * Rs.14 (approximately)
= Rs. 1288.

This estimate is only for one class room. The number of class rooms may vary depending on the student strength of the college. Also an educational institute has Administrative Office, Library, and Laboratories etc. So, the rate of power consumption goes on increasing.

Energy consumption (per day) in SKR College for Women, Rajahmundry.

S.NO	LOCATION/ PLACE OF USE	NAME OF ITEM / APPLIANCE	POWER RATING a	NO.OF ITEMS b	HOURS OF USAGE c	RATE OF CONSUMPTION(IN UNITS/ kWh) a*b*c
1	CLASS ROOMS	CEILING FANS	75 W	90	7	47.25
		TUBE LIGHTS	40W	90	7	25.2
2	SCIENCE LABS	CEILING FANS	75W	16	3	3.6
		TUBE LIGHTS	40W	32	3	3.84
		COMPUTERS	150W	20	3	9
		PRINTERS	150W	2	0.25	0.075
		A.C.	2kW	2	2	8
3	OFFICE INCLUDING PRINCIPAL ROOM	CEILING FANS	75W	8	8	4.8
		TUBE LIGHTS	40W	12	8	3.84
		COMPUTERS	150W	4	6	3.6
		PRINTERS	150W	4	0.5	0.3
		XEROX MACHINE	80W	2	1	0.16
4	STAFF ROOM	CEILING FANS	75W	10	4	3
		TUBE LIGHTS	40W	10	4	1.6
5	LIBRARY	CEILING FANS	75W	8	6	3.6
		TUBE LIGHTS	40W	10	6	2.4
6	PHYSICAL EDUCATION	CEILING FANS	75W	4	3	0.9
		TUBE LIGHTS	40W	5	3	0.6
7	DIGITAL CLASS ROOMS	CEILING FANS	75W	4	1	0.3
		TUBE LIGHTS	40W	6	1	0.24
		COMPUTER	150W	1	1	0.15
		PROJECTOR	150W	1	1	0.15
8	CAMPUS	SUBMERCIBLE PUMP-3	2 kW	3	5	30
9	CAMPUS	STREET LIGHTS-4	40W	4	12	1.92

In addition, the College uses 8 (eight) refrigerators in various departments, Staff room and in Office. Each refrigerator consumes 2 units of electricity per day.

8x2units = 16 units per day.

From the above table, it is clear that 153 units (Rounded) of electric power is being used in the College per day.

Now, total consumption is 153+16 = 169 units.

Number of working days for the academic year 2018-2019 are 243.

169 units x 243 = **41,067 units.**

The College has 6 different heads of power connections. In these 2 heads will come under Category- II and remaining 4 under Category IV.

Category II costs Rs.14 per unit and Category IV approximately Rs.6 per unit.

On an average the cost of consumption per unit is Rs.10 (Rounded).

41067 x Rs.10 = **Rs. 4,10,670.**

(Rupees four lakh ten thousand six hundred seventy).

Per month it comes out to be Rs. 34,222.

CO_2 Emission

One unit of electrical energy releases 0.8 kg of CO_2 in atmosphere.

Now, 41067x0.8 = 32,853 kg.

So, in an year the College is emitting **32853 kg of Carbon dioxide** into the atmosphere through consumption of electric energy.

To compensate with this emission, the College is maintaining a medicinal plants garden and also the College has plenty of oxygen available from trees in the college campus.

Energy Savings:

Energy conservation is the effort to reduce useful energy consumption by using fewer energy services. This can be done by using energy more effectively (using lss energy for continuous services) or changing one's behavior to use less service.

How to save Electricity in Educational Institutes:

1. Huge amounts of energy is wasted out in educational institutes because no one really cares about switching off the fans and lights when not required. Hence, planning workshops on energy conservation to educate students can generate huge results.

2. Educational Institutes have many areas where lighting is not required at all times. Installing sensor based lighting in such areas can generate massive rewards.

3. A large percentage of schools/ Colleges use traditional lighting products which are not energy efficient, wasting energy and money. To save electricity, they can shift from traditional lights to modern LED lights.

4. Most student sessions and classes happen during daytime. By avoiding artificial lighting on sunny days, schools/colleges can save electricity.

5. Replacing old computers with ones having energy efficiency certification is the easiest way to conserve energy at schools/colleges.

6. Investment in solar lights for outdoor lighting can generate long term benefits.

7. Conduct electricity conservation sessions for staff so that they can identify power wastage when they see it.

8. Unplug overhead projectors, computers, and smart boards when not in use. This simple way to conserve energy can help save large amount of power and money in the long run.

9. In case a new block is being added to the school/college property, make sure that power efficient lighting and fixtures are installed from the very beginning.

10. Traditional electrical appliances must be replaced with power efficient ones to reduce power consumption and waste. This is precisely how to save electricity at schools and educational centers.

11. Involve all the school/college community in the task of energy conservation. This is how the best schools/colleges save electricity and reduce their power bills.

12. Create student patrols and committees to make sure that energy conservation guidelines are being implemented.

13. Check the use of light fixtures beside windows and unused corners. Since schools/ colleges have large number of rooms, this can help in conserving energy at school/ college.

While the above are some of the best ways to save energy at educational institutes, there are many other ideas that can promote power savings in college premises.

In addition to the above mentioned factors, the College management has planned some measurements to reduce power consumption, which were planned to be implemented in a phased manner:

(i) Replacing tube lights with LED lamps, which consume less power.

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(viii) Frequent checking of electrical wirings and replacing with new ones, wherever necessary.

(ix) Plantation of trees, whenever possible.

Conclusion:

To conclude, the College is following and trying to implement new methods, as far as possible to minimize power consumption and also to minimize Carbon dioxide emission levels in a phased manner.

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IQAC Co-ordinator
S.K.R. COLLEGE FOR WOMEN
HITHAKARINI SAMAJ
Endowments Dept., Govt. of Andhra Pradesh
RAJAMAHENDRAVARAM

PRINCIPAL
S.K.R. COLLEGE FOR WOMEN
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In addition, the College uses 8 (eight) refrigerators in various departments, Staff room and in Office. Each refrigerator consumes 2 units of electricity per day.

8x2units = 16 units per day.

From the above table, it is clear that 139 units(Rounded) of electric power is being used in the College per day.

Now, total consumption is 139+16 = 155 units.

Number of working days for the academic year 2018-2019 are 249.

155 units x 243 = **37,665 units.**

The College has 6 different heads of power connections. In these 2 heads will come under Category- II and remaining 4 under Category-IV.

Category II costs Rs.14 per unit and Category IV approximately Rs.6 per unit.

On an average the cost of consumption per unit is Rs.10 (Rounded).

37665 x Rs.10 = **Rs. 3,76,650.**

(Rupees three lakh seventy six thousand six hundred fifty).

Per month it comes out to be Rs. 31,387

CO_2 Emission

One unit of electrical energy releases 0.8 kg of CO_2 in atmosphere.

Now, 37665x0.8 = **30132 kg.**

So, in a month the College is emitting **30132 kg of Carbon dioxide** into the atmosphere.

To compensate with this emission, the College is maintaining a medicinal plants garden and also the College has plenty of oxygen available from trees in the college campus.


DHANVANTARI
MEDICINAL GARDEN

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3. A large percentage of schools/ Colleges use traditional lighting products which are not energy efficient, wasting energy and money. To save electricity, they can shift from traditional lights to modern LED lights.

4. Most student sessions and classes happen during daytime. By avoiding artificial lighting on sunny days, schools/colleges can save electricity.

5. Replacing old computers with ones having energy efficiency certification is the easiest way to conserve energy at schools/colleges.

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7. Conduct electricity conservation sessions for staff so that they can identify power wastage when they see it.

8. Unplug overhead projectors, computers, and smart boards when not in use. This simple way to conserve energy can help save large amount of power and money in the long run.

9. In case a new block is being added to the school/college property, make sure that power efficient lighting and fixtures are installed from the very beginning.

10. Traditional electrical appliances must be replaced with power efficient ones to reduce power consumption and waste. This is precisely how to save electricity at schools and educational centers.

11. Involve all the school/college community in the task of energy conservation. This is how the best schools/colleges save electricity and reduce their power bills.

12. Create student patrols and committees to make sure that energy conservation guidelines are being implemented.

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While the above are some of the best ways to save energy at educational institutes, there are many other ideas that can promote power savings in college premises.

In addition to the above mentioned factors, the College management has planned some measurements to reduce power consumption, which were planned to be implemented in a phased manner:

(i) Replacing tube lights with LED lamps, which consume less power.

(ii) Replacing old fans with newer and star rating fans, which consume less power.

(iii) Replacing Window ACs with split ACs.

(iv) Old Refrigerators to be replaced with star rated refrigerators which consume less power.

(v) Replacing street lights with LED lamps.

(vi) Computer plugs and & power plugs are to be equipped with good earthing and reduced leakage currents.

(vii) Incandescent lamps to be replaced with energy efficient lamps.

(viii) Frequent checking of electrical wirings and replacing with new ones, wherever necessary.

(ix) Plantation of trees, whenever possible.

Conclusion:

By replacing some of the tube lights with LED lamps, the power consumption has decreased by 3402 units per year. By this the college can save an amount of Rs. 34000 per year on electricity bill. Though it appears a small amount, , it reflects more in the context of carbon dioxide emissions, which accounts to a decrease of 2721 kg in comparison to the previous academic year (2018-19). By implementing further changes, it reduces further and the College management is trying for as minimum emissions as possible.

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IQAC Co-ordinator
K.R. COLLEGE FOR WOMEN
HITHAKARINI SAMAJ
Endowments Dept.,Govt.of Andhra Pradesh
RAJAMAHENDRAVARAM

PRINCIPAL
S.K.R. COLLEGE FOR WOMEN
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ENERGY AUDIT FOR THE ACADEMIC YEAR **2020-2021**

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As per the energy conservation Act, 2001 [pass by the government of India], Energy audit is defined as "The verification , monitoring and analysis of the use of energy including submission of technical report containing recommendation for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption consist of four phases."

These are used to improve the ***energy efficiency*** of homes, businesses, and other buildings. An energy audit has three parts: evaluation, testing, and efficiency recommendations.

Evaluation
The first step is an evaluation of your building. This includes looking at past energy bills, your building's physical characteristics, and how it functions.

Testing
Once the Energy Auditor understands your building, they will conduct tests to see how much energy it uses.

Efficiency Recommendations
After the audit is complete, the Energy Auditor will provide you with recommendations on how to improve your building's energy efficiency. These may include changes to your heating and cooling system, insulation, windows, and doors.

Energy Audit Benefits

An Energy Audit can help you reduce the cost of your energy bills and make your home more comfortable. Aside from this, an Energy Audit will:

Determine Where Your Home's Energy Is Being Wasted
An Energy Audit will identify areas where your home is losing energy, such as through drafts, poor insulation, or inefficient windows.

Recommend Energy Efficiency Improvements
The Energy Auditor will provide recommendations based on the results of the Energy Audit that will save you money on your energy bills.

Identify Safety Concerns
An Energy Audit can also identify safety concerns, such as carbon monoxide leaks or electrical hazards.

Make Your Home More Comfortable
Making your home more energy-efficient can also make it more comfortable. Sealing drafts and adding insulation can help to keep your home cooler in the summer and warmer in the winter.

Estimate Cost of Improvements
The Energy Auditor will provide you with an estimate of the cost of the energy efficiency improvements that they recommend. This can help you to decide which improvements are right for you.

A detailed energy audit conducted in the Educational Institute mainly aims at the following points:

1) To Assess present pattern of Energy Consumption and Relating Energy input and Production output.

2) To study CO_2 Emission.

3) To measure various Electrical parameters.

4) To assess the various equipment/facilities from Energy efficiency aspect and suggesting various measures to reduce electricity consumption and calculating Payback Period for same.

Energy: Modern civilization is possible because people have learned how to change energy from one form to another and then use it to work. People use energy to walk, and bicycle, to move cars along roads and boats through water, to cook food, to light our homes and offices, to manufacture products, and to send astronauts into space.

Energy is of different forms… Mechanical, sound, heat, light, wind, solar, tidal, electric and so on.

Electrical Energy: Electrical energy is defined as the energy generated by the movement of electrons from one point to another. The movement of charged particles along or through a wire constitute current or electricity.

People use electricity for lighting, heating, cooling and for operating appliances, computers, machinery and public transportation system.

Electric Power:

Electric power is defined as the *rate at which electrical energy is consumed.* It may also be defined as the rate at which an electric circuit transfers electrical energy per unit of time.

Electric Power P = Rate of doing work. In terms of Electrical quantities,

$P = V I$ (OR) $P = I^2R$ (OR) $P = V^2 / R$.

Where V is the Voltage, I is the current and R is the Electric resistance or Load.

The power consumption depends on the load. The more the electric equipment we use, more will be the power consumption.

For an A C circuit,

True Power = Apparent Power x Power Factor

Apparent power refers to RMS values of AC.

Use of electricity in Educational Institutes:

The two main purposes for educational institutes to need electricity is *lighting* and secondly, *use of computers for administrative purposes*. The most energy consuming appliances in educational institutes are the ventilation and air conditioning systems.

Educational Institutes usually get their electricity from a power plant which use a variety of energy resources to generate electricity, including fossil fuels (coal, oil and natural gas) and renewable energy sources(biomass, hydro power, solar and wind).

Let us calculate the electric energy consumption bill for a class room which uses 4 ceiling fans (each 75 watt) , 4 tube lights (each 40 watt) working for 8 hours per day on an average.

Now, energy consumed per day = 4 *75 W *8 h + 4 * 40 W * 8 h
= 2400 Wh + 1280 Wh
= 3680 Wh
= 3.680 kWh.

Now, for a month of 25 working days,
energy consumption = 3.680kWh x 25
= 92 kWh
= 92 units.

If each unit costs at Rs.12 (roughly),
cost of consumption = 92 * Rs.14 (approximately)
= Rs. 1288.

This estimate is only for one class room. The number of class rooms may vary depending on the student strength of the college. Also an educational institute has Administrative Office, Library, Laboratories etc. So, the rate of power consumption goes on increasing.

Energy consumption (per day) in SKR College for Women, Rajahmundry.

S.NO	LOCATION/ PLACE OF USE	NAME OF ITEM / APPLIANCE	POWER RATING a	NO.OF ITEMS b	HOURS OF USAGE c	RATE OF CONSUMPTION(IN UNITS/ kWh) a*b*c
1	CLASS ROOMS	CEILING FANS	75 W	90	7	47.25
		TUBE LIGHTS	20W	90	7	12.6
2	SCIENCE LABS	CEILING FANS	75W	16	3	3.6
		TUBE LIGHTS	40W	32	3	3.84
		COMPUTERS	150W	20	3	9
		PRINTERS	150W	2	0.25	0.075
		A.C.	2kW	2	2	8
3	OFFICE INCLUDING PRINCIPAL ROOM	CEILING FANS	75W	8	8	4.8
		TUBE LIGHTS	20W	12	8	1.92
		COMPUTERS	150W	4	6	3.6
		PRINTERS	150W	4	0.5	0.3
		XEROX MACHINE	80W	2	1	0.16
4	STAFF ROOM	CEILING FANS	75W	10	4	3
		TUBE LIGHTS	20W	10	4	0.8
5	LIBRARY	CEILING FANS	75W	8	6	3.6
		TUBE LIGHTS	40W	10	6	2.4
6	PHYSICAL EDUCATION	CEILING FANS	75W	4	3	0.9
		TUBE LIGHTS	40W	5	3	0.6
7	DIGITAL CLASS ROOMS	CEILING FANS	75W	4	1	0.3
		TUBE LIGHTS	40W	6	1	0.24
		COMPUTER	150W	1	1	0.15
		PROJECTOR	150W	1	1	0.15
8	CAMPUS	SUBMERCIBLE PUMP-3	2 kW	3	5	30
9	CAMPUS	STREET LIGHTS-4	40W	4	12	1.92

In addition, the College uses 8 (eight) refrigerators in various departments, Staff room and in Office. Each refrigerator consumes 2 units of electricity per day.

8x2units = 16 units per day.

From the above table, it is clear that 124 units(Rounded) of electric power is being used in the College per day.

Now, total consumption is 139+16 = 155 units.

Due to the pandemic COVID-19, classes were taken in ON-LINE mode till the middle of November-2020.

The number of working days in OFF-LINE mode are approximately 90.

155 units x 90 = **13,950 units.**

The College has 6 different heads of power connections. In these 2 heads will come under Category- II and remaining 4 under Category-IV.

Category II costs Rs.14 per unit and Category IV approximately Rs.6 per unit.

On an average the cost of consumption per unit is Rs.10 (Rounded).

13,950 x Rs.10 = **Rs. 1,39,500.**

(Rupees one lakh thirty nine thousand five hundred).

CO_2 Emission

One unit of electrical energy releases 0.8 kg of CO_2 in atmosphere.

Now, 13950x0.8 = **11160 kg.**

So, in a month the College is emitting **11160 kg of Carbon dioxide** into the atmosphere.

To compensate with this emission, the College is maintaining a medicinal plants garden and also the College has plenty of oxygen available from trees in the college campus.

Energy Savings:

Energy conservation is the effort to reduce useful energy consumption by using fewer energy services. This can be done by using energy more effectively (using lss energy for continuous services) or changing one's behavior to use less service.

How to save Electricity in Educational Institutes:

1. Huge amounts of energy is wasted out in educational institutes because no one really cares about switching off the fans and lights when not required. Hence, planning workshops on energy conservation to educate students can generate huge results.

2. Educational Institutes have many areas where lighting is not required at all times. Installing sensor based lighting in such areas can generate massive rewards.

3. A large percentage of schools/ Colleges use traditional lighting products which are not energy efficient, wasting energy and money. To save electricity, they can shift from traditional lights to modern LED lights.

4. Most student sessions and classes happen during daytime. By avoiding artificial lighting on sunny days, schools/colleges can save electricity.

5. Replacing old computers with ones having energy efficiency certification is the easiest way to conserve energy at schools/colleges.

6. Investment in solar lights for outdoor lighting can generate long term benefits.

7. Conduct electricity conservation sessions for staff so that they can identify power wastage when they see it.

8. Unplug overhead projectors, computers, and smart boards when not in use. This simple way to conserve energy can help save large amount of power and money in the long run.

9. In case a new block is being added to the school/college property, make sure that power efficient lighting and fixtures are installed from the very beginning.

10. Traditional electrical appliances must be replaced with power efficient ones to reduce power consumption and waste. This is precisely how to save electricity at schools and educational centers.

11. Involve all the school/college community in the task of energy conservation. This is how the best schools/colleges save electricity and reduce their power bills.

12. Create student patrols and committees to make sure that energy conservation guidelines are being implemented.

13. Check the use of light fixtures beside windows and unused corners. Since schools/ colleges have large number of rooms, this can help in conserving energy at school/ college.

While the above are some of the best ways to save energy at educational institutes, there are many other ideas that can promote power savings in college premises.

In addition to the above mentioned factors, the College management has planned some measurements to reduce power consumption, which were planned to be implemented in a phased manner:

(i) Replacing tube lights with LED lamps, which consume less power.

(ii) Replacing old fans with newer and star rating fans, which consume less power.

(iii) Replacing Window ACs with split ACs.

(iv) Old Refrigerators to be replaced with star rated refrigerators which consume less power.

(v) Replacing street lights with LED lamps.

(vi) Computer plugs and & power plugs are to be equipped with good earthing and reduced leakage currents.

(vii) Incandescent lamps to be replaced with energy efficient lamps.

(viii) Frequent checking of electrical wirings and replacing with new ones, wherever necessary.

(ix) Plantation of trees, whenever possible.

Conclusion:

Due to the Pandemic COVID-19, no special measures were taken regarding power consumption savings. Will be taken and implemented by the next academic year (2021-2022).

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IQAC Co-ordinator
R. COLLEGE FOR WOMEN
HITHAKARINI SAMAJ

PRINCIPAL
S.K.R. COLLEGE FOR WOMEN
HITHAKARINI SAMAJ
Endowments Dept.,Govt.of Andhra Pradesh
RAJAMAHENDRAVARAM

K. KESAIAH
Certified Energy Auditor
Reg.No: 9135
RAJAHMUNDRY.

S.K.R. COLLEGE FOR WOMEN, RAJAHMUNDRY
Reaccredited with NAAC B+ Grade

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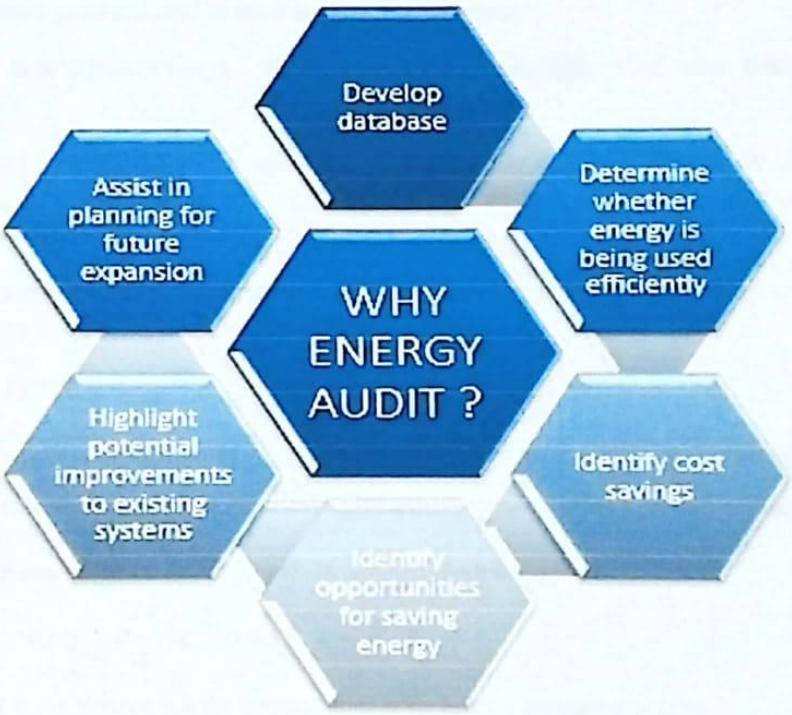

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Now, for a month of 25 working days,

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= 92 units.

If each unit costs at Rs.12 (roughly),

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This estimate is only for one class room. The number of class rooms may vary depending on the student strength of the college. Also an educational institute has Administrative Office, Library, Laboratories etc. So, the rate of power consumption goes on increasing.

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		TUBE LIGHTS	20W	90	7	12.6
2	SCIENCE LABS	CEILING FANS	60W	16	3	2.88
		TUBE LIGHTS	20W	32	3	1.92
		COMPUTERS	150W	20	3	9
		PRINTERS	150W	2	0.25	0.075
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3	OFFICE INCLUDING PRINCIPAL ROOM	CEILING FANS	60W	8	8	3.84
		TUBE LIGHTS	20W	12	8	1.92
		COMPUTERS	150W	4	6	3.6
		PRINTERS	150W	4	0.5	0.3
		XEROX MACHINE	80W	2	1	0.16
4	STAFF ROOM	CEILING FANS	75W	10	4	3
		TUBE LIGHTS	20W	10	4	0.8
5	LIBRARY	CEILING FANS	65W	8	6	3.12
		TUBE LIGHTS	20W	10	6	1.2
6	PHYSICAL EDUCATION	CEILING FANS	75W	4	3	0.9
		TUBE LIGHTS	20W	5	3	0.3
7	DIGITAL CLASS ROOMS	CEILING FANS	65W	4	1	0.26
		TUBE LIGHTS	20W	6	1	0.12
		COMPUTER	150W	1	1	0.15
		PROJECTOR	150W	1	1	0.15
8	CAMPUS	SUBMERCIBLE PUMP-3	2 kW	3	5	30
9	CAMPUS	STREET LIGHTS-4	Replaced with Solar Lighting System.			


GPS Map Camera
Rajamahendravaram, Andhra Pradesh, India
2Q6P+5Q9, Devarapalli, Rajamahendravaram, Andhra Pradesh 533106, India
Lat 17.010253°
Long 81.787108°
08/06/21 11:28 AM GMT +05:30
Google


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Rajamahendravaram, Andhra Pradesh, India
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Lat 17.010241°
Long 81.786199°
12/05/22 03:58 PM GMT +05:30
Google

In addition, the College uses 8 (eight) refrigerators in various departments, Staff room and in Office.

Out of these 4 were replaced with star rated refrigerators provided by the donors.

A star rated refrigerator consumes 311 units per year.

From the above table, it is clear that 120 units(Rounded) of electric power is being used in the College per day.

Now, total consumption is 120+10 = 130 units.

Number of working days for the academic year 2021-2022 are 246.

130 units x 246 = **31,980units.**

The College has 6 different heads of power connections. In these 2 heads will come under Category- II and remaining 4 under Category-IV.

Category II costs Rs.14 per unit and Category IV approximately Rs.6 per unit.

On an average the cost of consumption per unit is Rs.10 (Rounded).

31980 x Rs.10 = **Rs. 3,19,800.**

(Rupees three lakh nineteen thousand eight hundred).

Per month it comes out to be Rs. 26,650

CO_2 Emission

One unit of electrical energy releases 0.8 kg of CO_2 in atmosphere.

Now, 31980x0.8 = 25584 kg.

So, in a month the College is emitting 25584 kg of Carbon dioxide into the atmosphere.

To compensate with this emission, the College is maintaining a medicinal plants garden and also the College has plenty of oxygen available from trees in the college campus.

Energy Savings:

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2. Educational Institutes have many areas where lighting is not required at all times. Installing sensor based lighting in such areas can generate massive rewards.

3. A large percentage of schools/ Colleges use traditional lighting products which are not energy efficient, wasting energy and money. To save electricity, they can shift from traditional lights to modern LED lights.

4. Most student sessions and classes happen during daytime. By avoiding artificial lighting on sunny days, schools/colleges can save electricity.

5. Replacing old computers with ones having energy efficiency certification is the easiest way to conserve energy at schools/colleges.

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While the above are some of the best ways to save energy at educational institutes, there are many other ideas that can promote power savings in college premises.

In addition to the above mentioned factors, the College management has planned some measurements to reduce power consumption, which were planned to be implemented in a phased manner:

(i) Replacing tube lights with LED lamps, which consume less power.

(ii) Replacing old fans with newer and star rating fans, which consume less power.

(iii) Replacing Window ACs with split ACs.

(iv) Old Refrigerators to be replaced with star rated refrigerators which consume less power.

(v) Replacing street lights with LED lamps and **solar lighting**.

(vi) Computer plugs and & power plugs are to be equipped with good earthing and reduced leakage currents.

(vii) Incandescent lamps to be replaced with energy efficient lamps.

(viii) Frequent checking of electrical wirings and replacing with new ones, wherever necessary.

Conclusion:

By replacing some of the tube lights with LED lamps, replacing some old fans with energy efficient fans , by replacing old refrigerators with star rated ones, and by installing solar lighting system in the campus the power consumption has further decreased by 5685 units per year in comparison to the academic year 2019-2020.

By this, the College has saved an extra 1020 units of power in comparison to the last academic year (2019-2020).

In terms of money , it accounts to a saving of Rs. 56,850 in comparison to a saving of Rs. 34,000 in the academic year 2019-20.

So, with the methods implemented to reduce minimize power consumption, the college has shown a gradual decrease in the power consumption year by year.

Though the cost of purchasing the new energy saving appliances has incurred, it will bring a significant change in the power consumption, expenditure costs and CO2 emissions in a long run.

This decrease in power consumption saves expenditure costs to the College and most importantly, *decreases the emission of Carbon Dioxide* into atmosphere.

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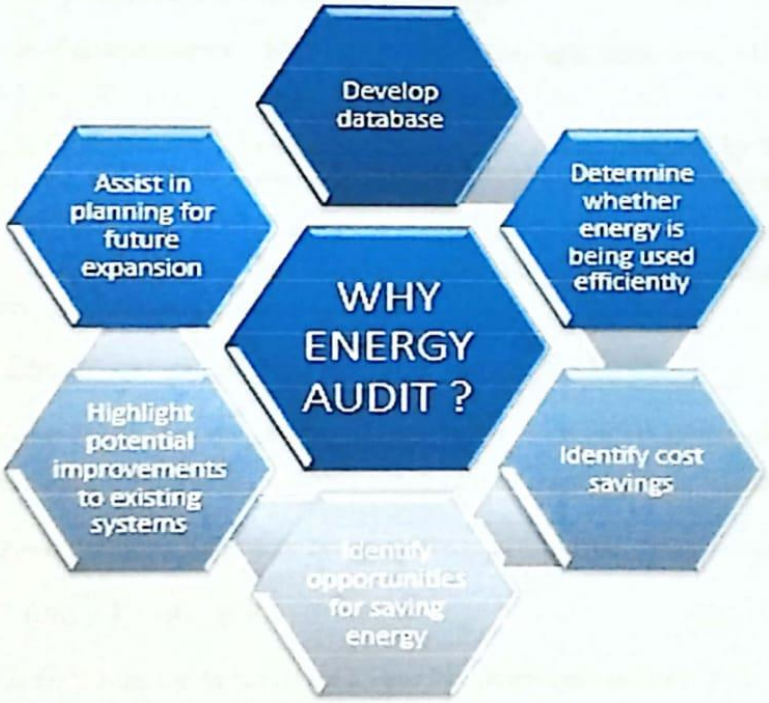

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= Rs. 1288.

This estimate is only for one class room. The number of class rooms may vary depending on the student strength of the college. Also an educational institute has Administrative Office, Library, Laboratories etc. So, the rate of power consumption goes on increasing.

Energy consumption (per day) in SKR Govt. Degree College (W), Rajahmundry.

S.NO	LOCATION/ PLACE OF USE	NAME OF ITEM / APPLIANCE	POWER RATING a	NO.OF ITEMS b	HOURS OF USAGE c	RATE OF CONSUMPTION (IN UNITS/ kWh) a*b*c
1	CLASS ROOMS	CEILING FANS	60 W	90	6	32.4
		TUBE LIGHTS	20W	90	6	10.8
2	SCIENCE LABS	CEILING FANS	60W	16	3	2.88
		TUBE LIGHTS	20W	32	3	1.92
		COMPUTERS	150W	20	3	9
		PRINTERS	150W	2	0.25	0.075
		A.C.	2kW	2	2	8
3	OFFICE INCLUDING PRINCIPAL ROOM	CEILING FANS	60W	8	8	3.84
		TUBE LIGHTS	20W	12	8	1.92
		COMPUTERS	150W	4	6	3.6
		PRINTERS	150W	4	0.5	0.3
		XEROX MACHINE	80W	2	1	0.16
4	STAFF ROOM	CEILING FANS	60W	10	4	2.4
		TUBE LIGHTS	20W	10	4	0.8
5	LIBRARY	CEILING FANS	60W	8	6	2.88
		TUBE LIGHTS	20W	10	6	1.2
6	PHYSICAL EDUCATION	CEILING FANS	60W	4	3	0.72
		TUBE LIGHTS	20W	5	3	0.3
7	DIGITAL CLASS ROOMS	CEILING FANS	65W	4	1	0.26
		TUBE LIGHTS	20W	6	1	0.12
		COMPUTER	150W	1	1	0.15
		PROJECTOR	150W	1	1	0.15
8	CAMPUS	SUBMERCIBLE PUMP-3	2 kW	3	5	30
9	CAMPUS	STREET LIGHTS-4	Replaced with Solar Lighting System.			

In addition, the College uses 8 (eight) refrigerators in various departments, Staff room and in Office.

Out of these 4 were replaced with star rated refrigerators provided by the donors.

For The Academic year 2022-23, the remaining 4 old refrigerators were also replaced with star rating ones.

A star rated refrigerator consumes 311 units per year. Per day, it comes out to be 0.85 units.

8x0.85 = 6.8 units = 7 units (Rounded).

From the above table, it is clear that 114 units(Rounded) of electric power is being used in the College per day.

Now, total consumption is 114+7 = 121 units.

Number of working days for the academic year 2021-2022 are 253.

121 units x 253 = **30,613 units.**

The College has 6 different heads of power connections. In these 2 heads will come under Category- II and remaining 4 under Category-IV.

Category II costs Rs.14 per unit and Category IV approximately Rs.6 per unit.

On an average the cost of consumption per unit is Rs.10 (Rounded).

30613 x Rs.10 = **Rs. 3,06,130.**

(Rupees three lakh six thousand one hundred thirty).

Per month it comes out to be Rs. 25,510

CO_2 Emission

One unit of electrical energy releases 0.8 kg of CO_2 in atmosphere.

Now, 30613x0.8 = 24,490 kg.

So, in a month the College is emitting 24,993 kg of Carbon dioxide into the atmosphere.

To compensate with this emission, the College is maintaining a medicinal plants garden and also the College has plenty of oxygen available from trees in the college campus.

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Energy Savings:

Energy conservation is the effort to reduce useful energy consumption by using fewer energy services. This can be done by using energy more effectively (using lss energy for continuous services) or changing one's behavior to use less service.

How to save Electricity in Educational Institutes:

1. Huge amounts of energy is wasted out in educational institutes because no one really cares about switching off the fans and lights when not required. Hence, planning workshops on energy conservation to educate students can generate huge results.

2. Educational Institutes have many areas where lighting is not required at all times. Installing sensor based lighting in such areas can generate massive rewards.

3. A large percentage of schools/ Colleges use traditional lighting products which are not energy efficient, wasting energy and money. To save electricity, they can shift from traditional lights to modern LED lights.

4. Most student sessions and classes happen during daytime. By avoiding artificial lighting on sunny days, schools/colleges can save electricity.

5. Replacing old computers with ones having energy efficiency certification is the easiest way to conserve energy at schools/colleges.

6. Investment in solar lights for outdoor lighting can generate long term benefits.

7. Conduct electricity conservation sessions for staff so that they can identify power wastage when they see it.

8. Unplug overhead projectors, computers, and smart boards when not in use. This simple way to conserve energy can help save large amount of power and money in the long run.

9. In case a new block is being added to the school/college property, make sure that power efficient lighting and fixtures are installed from the very beginning.

10. Traditional electrical appliances must be replaced with power efficient ones to reduce power consumption and waste. This is precisely how to save electricity at schools and educational centers.

11. Involve all the school/college community in the task of energy conservation. This is how the best schools/colleges save electricity and reduce their power bills.

12. Create student patrols and committees to make sure that energy conservation guidelines are being implemented.

13. Check the use of light fixtures beside windows and unused corners. Since schools/ colleges have large number of rooms, this can help in conserving energy at school/ college.

While the above are some of the best ways to save energy at educational institutes, there are many other ideas that can promote power savings in college premises.

In addition to the above mentioned factors, the College management has planned some measurements to reduce power consumption, which were planned to be implemented in a phased manner:

(i) Replacing tube lights with LED lamps, which consume less power.

(ii) Replacing old fans with newer and star rating fans, which consume less power.

(iii) Replacing Window ACs with split ACs.

(iv) Old Refrigerators to be replaced with star rated refrigerators which consume less power.

(v) Replacing street lights with LED lamps and **solar lighting**.

Conclusion:

By replacing some of the tube lights with LED lamps, replacing some old fans with energy efficient fans , by replacing old refrigerators with star rated ones, and by installing solar lighting system in the campus there is a decline of 1367 units of power consumption in comparison the previous academic year (2021-2022).

So, with the methods implemented to reduce minimize power consumption, the college has shown a gradual decrease in the power consumption year by year.

This decrease in power consumption saves expenditure costs to the College and most importantly, *decreases the emission of Carbon Dioxide* into atmosphere.

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IQAC Co-ordinator
S.K.R. Government Degree College (Women)
RAJAMAHENDRAVARAM.
East Godavari Dist., Andhra Pradesh

PRINCIPAL
S.K.R. Government Degree College (Women)
RAJAMAHENDRAVARAM.
East Godavari Dist., Andhra Pradesh

K. KESAIAH
Certified Energy Auditor
Reg.No: 9135
RAJAHMUNDRY.