

Rug Centre Ltd. Energy Consultation

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1. Introduction

The purpose of this energy consultation was to discover potential areas of energy reduction and savings within the Rug Centre Ltd.. This consultation was conducted using a questionnaire and check list during a walk-through, with supplementary data on past gas and electric usage. The Rug Centre Ltd. occupies part of the lower floor of an older building and is home to an area rug sales floor. Due to its age there are many opportunities to save electricity in this building.

The energy consultation, analysis, and report were completed by four American university students, for a project requirement for Worcester Polytechnic Institute. These students are working with the Mole Valley District Council to help reduce the carbon emissions of small and medium enterprises in the Mole Valley.

Notice: While there has been an effort made to ensure that the information contained in this report is accurate, it should be taken into consideration that some of the information may be incomplete, inaccurate, or become out of date. Therefore, Mole Valley District Council, Worcester Polytechnic Institute, and all associated persons do not provide any guarantees on the information provided in the following report.

2. Action Plan

The recommendations listed below are prioritized by payback period and estimated costs. Further explanations of each recommendation are provided.

Priority	Recommendations	Estimated Annual Savings			Estimated Costs (£)	Payback Periods (years)
		(£)	CO ₂ (tonnes)	(kWh)		
1	Behavioural Changes	-	-	-	Minimal	Immediate
2	Change Electric Supplier	217	-	-	Minimal	Immediate
3	Repair Heater	142.2	77.58	142.3	190	1.34
4	LED Lighting	477.0	2364.15	4336.3	990.0	2.08
5	Door Insulation	11	54.52	100	40	3.64
Total		847.20	2496.25	4578.6	1220	1.44

3. Current Use and Potential Savings

This is a breakdown of your current costs and what your expected cost may be with these recommendations.

Category	Energy Consumption		Costs		CO ₂ Emissions	
	kWh/year	%	£/year	%	CO ₂ (tonnes)	%
Heating	6,473.80	50.17%	647.38	50.17%	3,529.65	50.17%
Lighting	5,148.87	39.90%	514.89	39.90%	2,807.27	39.90%
Other	1,282.32	9.94%	128.23	9.94%	699.15	9.94%
Total	12,904.99	100	1,290.50	100	7,036.06	100

4. Energy Savings

a. Priority 1: Taking Regular Meter Readings

Action

The business manager should consider taking meter readings twice a month and documenting them. These meter readings should be submitted to your electric supplier, however if you have a smart meter installed, the readings no longer need to be recorded.

Explanation

Energy companies may overestimate electrical usage because the readings can be estimated. Documenting the building's usage on a regular basis will help monitor energy consumption and identify any inconsistent charges. As well as showing the company's energy consumption patterns, submitting monthly readings to your electric company will ensure that the amount charged is accurate. Readings can be submitted by phone or online. For EDF energy, the link is here: <https://edfenergy.com/meter-reading/edf-energy/start-2.do>

b. Priority 2: Change Electric Supplier

Action

Consider contacting different electric companies and trying to sign a contract, using an economy7 tariff, with the company that is best for your enterprise. For further information on how to choose a better electric company, see 0.

Explanation

EDF energy charges your enterprise 11p/kWh, while contracted prices tend to be up to 15% lower than this. With a contract, energy companies can provide an economy 7 tariff, meaning lower prices for energy that is used during the night. Economy7 in the UK is usually 0130-0830 during daylight saving times and 0030-0730 during normal times. Since storage heating systems that consume electricity at night are being used, having differing night and day rates will be beneficial. The economy7 tariff plan will lower energy bills if daytime energy consumption is below 77.8% of the total consumption. Calculations show that only about 70% of your electricity is spent during the day, due to your use of storage heaters. Using low-power lighting and more storage heaters instead of portable heaters will make an economy 7 tariff more beneficial.

When contacting electric companies, we also suggest that you ask about having a smart meter installed. With a smart meter you do not have to take down the meter readings since they will be automatically recorded. These readings will still need to be submitted to the electric company for billing, though it is a more accurate and convenient method of obtaining regular meter readings. With a smart meter, you can retrieve your energy consumption records easily without reading the meter itself. A smart meter is typically installed by your electric supplier and costs £100.

c. Priority 3: Envelope and Door Insulation

Action

Add rubber seals and skirts to the front door of the enterprise. Consider covering the vent hole on the back wall with better materials. Also, look into window insulation film to improve window insulation.

Explanation

Doors that protect rooms from different temperature air should close properly and have rubber seals and skirts. Doors that are not insulated or do not close will cause drafts in a building, resulting in the heating and cooling systems to work harder to maintain the building's temperature.

The front door is the only insulation between the outside air and the warm inner air, in the front of the store. This door has gaps along the edges, which should be sealed. The top and outside edges should have rubber seals installed. The bottom and middle should have appropriate skirts added. These will prevent the infiltration of outside air.

Holes in the envelope of a building result in drafts causing the heating system to overwork. Sealing holes in the envelope of the building will reduce energy bills, because the heating and ventilation systems won't have to work as hard to maintain the temperature of the building. Even though you have some insulation during winter, adding better insulation will reduce the amount the room needs to be heated.



Figure 1 Hole in the back wall

d. Priority 4: Repair and Use Storage Heater and time switch

Action

Consider having the large storage heater at the back of your shop repaired and the time settings all of the storage heaters checked. Use the portable heaters as little as possible, especially if economy 7 rates are being applied.

Explanation

The portable heaters (convactor heater) are responsible for nearly half your heating related energy consumption. If the use of these can be limited, or even stopped entirely, the enterprise's energy consumption, due to heating, will drop. This will also move much of the electricity consumed by heating during the day to nighttime, further reducing energy bills. Mended the large storage heater, through Dimplex, will cost £190, while the estimated annual energy savings will be approximately £142. The customer service and model number of the large storage heater are in the table below, for reference when contacting Dimplex.

Vendor	Dimplex
Customer Service Number	0845 600 5111
Equipment Model	XT-24

If the running time of your heaters can be adjusted, the “input control” knob should be turned to 5 and the time switch should be adjusted, to determine how long the heater runs at night. Turn on the heater as late as possible and turn off just before the low energy rate period ends.

If you CANNOT adjust the running time of your heaters, you should adjust the “input control” knob to control the amount of heat stored in the heater.

In both situations, always keep the “boost control” at minimum when you leave. During business hours, turn up the boost control to allow the heater to release heat. The boost control is how fast the stored heat is released. The input control directly affects your bills, while boost control indirectly affects your bills since you might require a higher input. Also consider turning off the heat an hour before leaving the store, in order to further conserve heat.

e. Priority 5: LED Lighting

Action

Consider changing all of the halogen spotlights to LED spotlights. Consider rearranging your shop front for better display of stock, since sunlight restricts potential customer's view into the store.

Explanation

Many old lighting elements have become inefficient over the years. Replacing the existing elements with LED equivalents allows you to save significant amounts of money on your energy bill. Currently, lighting takes up 40% of your total energy consumption. Changing all of the halogen spotlights to LEDs, will save £477 annually based on 37-hour weekly operation. Refer to second chart of Appendix A for suggestions and calculations. The pay back period for changing all halogen spotlights to LED spotlights is about two years, if each bulb costs £10 and each additional fixture costs £30.

Rearranging the front setting so that it displays more of your product, instead of using more indoor lighting to compete with the sun's glare, will attract customers without spending more energy. Since it is difficult to see inside the store during morning and early afternoon hours, putting additional rugs in the display window will allow more of the product to be seen. This may also allow for there to be fewer lights on inside the store, possibly saving on energy bills. However you mentioned that direct sunshine may fade the colors of rugs, so it is up to you to decide whether or not to rearrange your storefront.

5. Brief Summary

In summary it can be seen that there are a number of ways to save energy for this building. Many of these savings are from behavioral changes such as taking regular energy meter readings, and having radiators on appropriate settings. Other changes require some capital but can result in great savings such as the LED lighting, which can save £477/year. Taking these steps and more will help to reduce your energy bill and save you money.

Appendix A Detailed Energy Use Breakdown

This is a detailed break down of your current and proposed energy consumption. All numbers are estimated based on assumptions, meter readings and device ratings and may differ from reality. Assumptions are mostly indicated in the note column.

Below is a calculated annual energy consumption break down for current situation.

	Power	Day Hours each week	Night Hours each week	Weeks	Day Energy	Night Energy	Total	Note on Power Rating	Assumptions on Operating Hours
	kW	h	h		kWh	kWh	kWh		
Storage Heating(winter)	4250	0	30	17	0	2167.5	2167.5	1.7kW and 2.55kW	Nov 1 - Feb 28, 6 hours at night, 5 days a week
Portable Heater(winter)	4700	37	0	17	2956.3	0	2956.3	2.2kW and 2.5kW	Nov 1 - Feb 28, during business hours
Storage Heating(spring)	3000	0	30	9	0	810	810	1.7kW and 2.55kW	Mar 1 - Apr 30, 6 hours at night, 5 days a week
Storage Heating(fall)	3000	0	30	6	0	540	540	1.7kW and 2.55kW	Sep 15 - Dec 30, 6 hours at night, 5 days a week
Strip Lights	160	37	0	51	301.92	0	301.92	two 60W tubes, two 40W tubes	during business hours
Spot Lights (East Wing)	650	37	0	51	1226.55	0	1226.55	13 bulbs, 50W each	during business hours
Spot Lights (Centre)	850	37	0	51	1603.95	0	1603.95	17 bulbs, 50W each	during business hours
Spot Lights (West Wing)	1050	37	0	51	1981.35	0	1981.35	21 bulbs, 50W each	during business hours
Exterior Light	100	6.75	0	52	35.1	0	35.1	2 bulbs, 50W each	6:45-9:30, 17:00-20:00. 405 min per day
Fridge	70	119	49	52	433.16	178.36	611.52		always on
Bug Light	45	119	49	52	278.46	114.66	393.12		always on
Vacuum Machine	1200	0.25	0	52	15.6	0	15.6		15 minues / week
Other Appliances	30	119	49	52	185.64	76.44	262.08	fax and security	always on
Total					9018.03	3886.96	12904.99		

Below is a proposal annual energy consumption break down if you follow all the actions on the action plan. There will be a slight drop in heating and significant drop in lighting related energy consumption.

	Power	Day Hours each week	Night Hours each week	Weeks	Day Energy	Night Energy	Total	Note on Actions
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	kW	h	h		kWh	kWh	kWh	
Storage Heating(winter)	7650	0	30	17	0	3901.5	3901.5	Repair large heater; adjust the timer; use heaters correctly
Portable Heater(winter)	4700	0	0	17	0	0	0	stop using
Storage Heating(spring)	5400	0	30	9	0	1458	1458	
Storage Heating(fall)	5400	0	30	6	0	972	972	
Strip Lights	160	37	0	51	301.92	0	301.92	
Spot Lights (East Wing)	64	37	0	51	120.768	0	120.768	use 16 LEDs instead of 13 bulbs
Spot Lights (Centre)	84	37	0	51	158.508	0	158.508	use 21 LEDs instead of 17 bulbs
Spot Lights (West Wing)	104	37	0	51	196.248	0	196.248	use 26 LEDs instead of 21 bulbs
Exterior Light	100	6.75	0	52	35.1	0	35.1	
Fridge	70	119	49	52	433.16	178.36	611.52	
Bug Light	45	119	49	52	278.46	114.66	393.12	
Vacuum Machine	1200	0.25	0	52	15.6	0	15.6	
Other Appliances	30	119	49	52	185.64	76.44	262.08	
Total					1725.404	6700.96	8426.364	

Appendix B Choosing the right electricity Company

This basic guide has been written in order to provide small businesses with a means to negotiate electricity prices. According to the figure below, gas prices and electricity prices are rising at an increasing rate. The figure shows average electricity prices from the company Powergen, one of the “Big 6” utility companies.

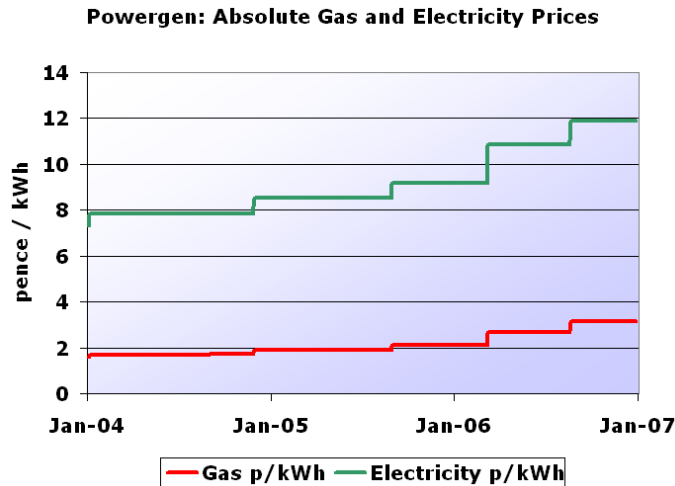


Figure 2: Quarterly comparison of electricity prices from Powergen¹

Though the plot only shows prices for Powergen, when one company increases their prices, the others usually follow in a relatively quick time period.

The worst way to pay for energy is through a **non-contracted agreement**, or **tariff rate**, with variable pricing for estimated units of electricity used. The best is a **contract** with a locked electricity rate for an agreed amount of time. Choosing the time period of the contract can be tricky because longer contracts will have a higher price per kilowatt hour (kWh) in an attempt to factor in the rising electricity prices. The most common advice is to go with the longer contract unless the price is significantly higher than the short-term rate.

There are two types of billing options for a contracted electricity agreement, these are **debit** and **quarterly** bills. Debit billing, usually the cheaper option, allows the energy user to pay a fixed rate every month, while quarterly billing allows the user to pay a variable bill, bill dependent upon energy use, every quarter.

These billing statements include two types of fees, the **price per unit** and the **standing price**. The standing price is a charge per day and can vary based on the electricity company, but should not be the major factor in making a decision. The price per unit is how much an electricity company charges for a kWh. Since not all energy companies raise their prices at the same time, shopping around is very important.

Energy companies will allow separate pricing for electricity used during the day and electricity used at night, known as **Economy 7** or **Economy 10**, provided the correct meter is installed. Generally, Economy 7 is most beneficial

¹ Figure from: http://uk.theoildrum.com/uploads/465/cv_powergen_gas_elec.png

when less than 75% of the total electricity used in total is during the day. The typical hour for which Economy 7 starts is 21.00-6.00, 0.00-7.00 or 1.00-8.00, this depends on service area and energy provider. Be sure to ask an energy consultant about both Economy 7 and Economy 10 and whether it is right for you or not. For more information on Economy 7 please visit: <http://www.uswitch.com/gas-electricity/economy-7>

The best type of meter for Economy 7 pricing is a smart meter, which takes half-hourly or hourly readings. **By the year 2020, all businesses will be required to have smart meters.** Usually these are not free but can be paid for incrementally through the standing charge portion of an electricity bill. Since smart meters cost around £100, an increased standing charge of 30p a day will accumulate to a smart meter after one year. This smart meter will be purchased by the building owner and will belong to them, not the electricity company. The purchased meter can be used if the electricity company is changed, provided the new electricity company supports smart metering. Most of the “Big 6” electric companies support smart metering, be sure to ask upon calling. Most of these major electricity companies also do a combined gas and electricity bill. Be sure to ask if this lowers the price at which energy is purchased.

A list of the biggest electric companies has been provided below to facilitate comparative pricing.

Company Name	Phone Number
E.ON	0800 051 5517
Powergen	0800 051 0760
British Gas	0800 480 0202
EDF	0845 366 3664
Scottish and Southern Energy	0808 156 0056
Npower	0845 270 0926
Scottish Power	0800 980 2476

A list of impartial websites for advice on finding a cheaper company or energy saving advice is also provided.

Website Name	Website Address
Consumer Focus: Energy Watch	http://www.energywatch.org.uk/
Surrey Business Link	http://www.businesslink.gov.uk/south_east.html
uSwitch	http://www.uswitch.com/electricity-gas/

After research on comparative prices has been done, a free energy consultant can be contacted. They will find the cheapest electricity available and use the prices you found to possibly find better deals.

Company Name	Phone Number
Business Advisory Service	0845 180 0700
Blue Mark Consultants	0800 987 5505
Quaestor Cost	0800 970 0432