Environmental Audit - Energy Team

The energy audit aims to determine the level of energy used within various sections of the school. This information is valuable in targeting possible areas within the school where energy conservation strategies will have the greatest impact. (An historical audit of school energy bills/meter readings are separate pre-audit activities.)

Introduction to the audit - Why is auditing energy important?

It will help your school:

* reduce greenhouse gas emissions
* help the environment by conserving the use of non-renewable energy resources.
* save money - savings made from energy conservation strategies can be used in funding environmental improvement programs.
* raise environmental awareness about sustainable lifestyles.

A. Electricity Investigation: School Audit

Using a base map, students will work in teams of two in order to survey every building in the school. Students assess the number of items such as fans, lights, and refrigerators etc. that exist within the school and then they approximate the number of hours they are used per day. Using a computer, this information is then entered into an energy calculator, to calculate the yearly electricity consumption. The actual costs obtained from energy bills should be approximately the same as the estimated costs. While surveying the buildings, students will also measure the light levels using a light meter to determine necessary light requirements. Comparing observed results with recommended standard light levels for school buildings may provide a further strategy for reducing electricity costs.

Student Instructions

1. Discuss the meaning of the Greenhouse Effect using a model of the earth. Learn about renewable and non-renewable energy using Greenhouse posters.
2. View a graph of the historical audit of school electricity bill (Results Table 1) Discuss which month has the highest electricity consumption and suggest possible reasons.
3. Look at your map. Go to your survey area. Take clipboard/pencil, data collection sheet and light meter.
4. Count all items that use electricity and record the results on the data collection sheet.
5. Measure light levels in each room and corridor.
6. Meet back in the computer room. Using a table estimate the wattage of each item surveyed.
7. Data entry: Using the Energy Calculator, enter the items and the wattage per item (found on the Integral energy chart). The estimate of how many hours per day the item is used is already printed on your sheet.
8. Calculate the total kWh per building by scrolling to the bottom of the table on the Energy Calculator. Read total kWh from the last column. Record in Results Table 3. Compare with historical data.
9. Record your light meter readings in Results Table 4. Compare results with recommended levels.
10. Discuss possible recommendations to reduce greenhouse gas emissions.
11. Prepare a report giving a summary of your findings.

B. Light Investigation

In many schools, lights are left on when there is excellent natural lighting provided. The purpose of this audit, is to determine present levels of natural lighting with lights switched off, in order to see if it is adequate for specific uses. A table of recommended levels is included for comparisons.

Student Instructions

1. Measure light levels in your allocated building using a light meter.
2. Record your measurement in Results Table 4.
# RESULTS SHEET - ENERGY AUDIT

## Results Table 1: Historical Audit - Electricity

<table>
<thead>
<tr>
<th>Period</th>
<th>kWh</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Quarter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd Quarter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd Quarter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th Quarter</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Total Annual Electricity Usage ________________________ kWh

*Estimation of Annual School Greenhouse Gas Emissions (Electricity) __________ kg/CO₂

*Estimate the whole school energy usage by adding gas, LPG statistics to this figure.

(1-kilowatt hour (kWh) of electricity produces 1kg Greenhouse Gas)

(1 mega joule (MJ) of Natural Gas produces 0.06kg Greenhouse Gas)

(1 Litre of LPG produces 1.6kg Greenhouse Gas)

*Total School Greenhouse Gas Emissions ___________________________ kg/CO₂

## Results Table 2: School Meter Readings

*Daily Electricity Usage ___________________________ kWh (9-3pm)

*Overnight Electricity Usage ___________________________ kWh (3pm-9am)

*Daily Gas Usage ___________________________ M J

*Overnight Gas Usage ___________________________ M J

*Total Daily Greenhouse Gas emissions ___________________________ kg/CO₂

## Results Table 3: Walk Through Assessment

<table>
<thead>
<tr>
<th>A Block</th>
<th>B Block</th>
<th>C Block</th>
<th>D Block</th>
<th>E Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>___________kWh</td>
<td>___________kWh</td>
<td>___________kWh</td>
<td>___________kWh</td>
<td>___________kWh</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>F Block</th>
<th>G Block</th>
<th>H Block</th>
<th>I Block</th>
<th>J Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>___________kWh</td>
<td>___________kWh</td>
<td>___________kWh</td>
<td>___________kWh</td>
<td>___________kWh</td>
</tr>
</tbody>
</table>

*Total Annual Electricity Usage Estimate for whole school _________________________kWh

## Results Table 4: Light Meter Readings

Weather Conditions ___________________________ Outdoor light level __________ lux

<table>
<thead>
<tr>
<th>Total number of readings taken</th>
<th>Total number of readings well above standard (&gt;50 lux)</th>
<th>Total number of readings taken below standard (&lt;50 Lux)</th>
<th>Total number taken at standard Within 20 Lux either side</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments

__________________________________________________________________________________________

__________________________________________________________________________________________

__________________________________________________________________________________________

__________________________________________________________________________________________
### Data Collection Sheet / Energy Audit

**TEAM:**

**Area of the school being surveyed (Block):**

**Names of students:**

**Date:**

<table>
<thead>
<tr>
<th>Item</th>
<th>How many items in your block?</th>
<th>Estimated hours used per day</th>
<th>Estimated hours used per week</th>
<th>Days per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside lights (include corridors)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluorescent</td>
<td></td>
<td>6</td>
<td>40</td>
<td>200</td>
</tr>
<tr>
<td>Incandescent</td>
<td></td>
<td>6</td>
<td>40</td>
<td>200</td>
</tr>
<tr>
<td>Outside lights (include corridors)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluorescent</td>
<td></td>
<td>15</td>
<td>52</td>
<td>365</td>
</tr>
<tr>
<td>Floodlight</td>
<td></td>
<td>15</td>
<td>52</td>
<td>365</td>
</tr>
<tr>
<td>fans</td>
<td></td>
<td>5</td>
<td>2</td>
<td>60</td>
</tr>
<tr>
<td>air conditioners</td>
<td></td>
<td>6</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>heaters</td>
<td></td>
<td>3</td>
<td>20</td>
<td>200</td>
</tr>
<tr>
<td>computers</td>
<td></td>
<td>1</td>
<td>40</td>
<td>65</td>
</tr>
<tr>
<td>printers</td>
<td></td>
<td>8</td>
<td>40</td>
<td>200</td>
</tr>
<tr>
<td>photocopiers</td>
<td></td>
<td>8</td>
<td>40</td>
<td>200</td>
</tr>
<tr>
<td>refrigerators</td>
<td></td>
<td>24</td>
<td>52</td>
<td>365</td>
</tr>
<tr>
<td>freezers</td>
<td></td>
<td>24</td>
<td>52</td>
<td>365</td>
</tr>
<tr>
<td>hot water units</td>
<td></td>
<td>24</td>
<td>52</td>
<td>365</td>
</tr>
<tr>
<td>TV</td>
<td></td>
<td>1.5</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>video</td>
<td></td>
<td>1.5</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>microwave oven</td>
<td></td>
<td>.5</td>
<td>40</td>
<td>200</td>
</tr>
<tr>
<td>stove</td>
<td></td>
<td>1</td>
<td>45</td>
<td>220</td>
</tr>
<tr>
<td>overhead projector</td>
<td></td>
<td>1</td>
<td>25</td>
<td>125</td>
</tr>
<tr>
<td>radios</td>
<td></td>
<td>.5</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>jug/kettle</td>
<td></td>
<td>2</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>pottery kiln</td>
<td></td>
<td>5</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
School Light Survey

School: ..................................................  Date of Survey: ........................................

Weather Conditions: ..................................  Outdoor Light Level:  .................LUX

<table>
<thead>
<tr>
<th>Area</th>
<th>Light Level (LUX)</th>
<th>Suggested Light Level* (LUX) **</th>
<th>Increase or decrease</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrance Area, waiting room</td>
<td>160</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corridor, passageways</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classroom 1. .......................... general use</td>
<td>240</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classroom 2. .......................... general use</td>
<td>240</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classroom 3. .......................... general use</td>
<td>240</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classroom 4. .......................... general use</td>
<td>240</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classroom: TAS sewing/drawing</td>
<td>400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembly Hall: general use</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembly Hall: exams</td>
<td>240</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Library</td>
<td>240-400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Office</td>
<td>400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storeroom</td>
<td>80-160</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toilet</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* According to Australian Standard AS 1680  ** LUX is a light illuminance

Findings:
Total number of readings taken_______
Total number of readings well above standard ________ (50 Lux over standard)
Total number of readings taken below standard _________ (50 Lux below standard)
Total number taken at standard____________________ (Within 20 Lux either side)
Summary of Findings and Recommendations

A. Electricity Investigation

* Compare our results with the historical data. Discuss.
* Which block uses the most electricity?

* Why? _____________________________________________________________

* Suggest ways to reduce electricity consumption in different areas of the school.

* Identify any areas of the school that are already demonstrating energy efficient strategies? (E.g. energy efficient appliances, timers, skylights, low power energy saving modes etc)

B. Light Investigation

Comment on lighting around the school. Discuss natural lighting and observed behaviour (i.e. students and teachers switching off lights after leaving rooms)

* Could lighting be reduced in any areas?

* Are there any areas, which are too dark?

* Other comments

Report Plan for Assembly

Use this space to plan your short speech or act to report back to the other students about the results of our Energy Audit. Be creative!! Songs, dances, acts, art!!!