ENERGY EFFICIENCY GUIDEBOOK FOR EDUCATIONAL INSTITUTIONS

Dubai Electricity and Water Authority (DEWA) seeks to provide sustainable electricity and water services for all customers, according to the highest international standards of reliability, efficiency and safety.

DEWA is eager to bring up a generation conscious of the importance of conserving natural resources, thus it launched several educational initiatives in Dubai, notably the ‘Conservation Award,’ to honor educational institutions on their efforts to conserve electricity and water consumption.

This guide provides you with step-by-step guidance on the basics needed to develop a constructive energy conservation plan to achieve noticeable savings in electricity and water consumption within the institution. It focuses on the technical and behavioral side of electricity and water efficiency. This book supports the Award's first category, namely ‘Distinguished Educational Institution in Conservation’.

Everyone is responsible for energy conservation, so we should actively engage and undertake general conservation measures, adopt best established environmental practices, use energy-efficient appliances, and complete new projects that contribute to improving energy efficiency in Dubai.

ESTABLISHING AN ENERGY CONSERVATION TEAM

Establishing an energy conservation team with the right composition is a crucial step to ensure a comprehensive plan is developed and successfully implemented. The team should have at least:

1. One member of the institution’s management (e.g. principal, vice principal, CFO) – to enable decision making
2. One teacher
3. One facility manager – to bring technical knowledge about schools energy systems

Preference should be given to staff that have received energy efficiency training/certifications. If none of your staff is trained in the field, consider enrolling the "Energy Conservation Team" in relevant trainings (e.g. certified EM).

OUTLINE OF A MEASURABLE ENERGY CONSERVATION PLAN

The energy conservation plan should:

1. Identify the measures your institution is going to undertake to reduce its electricity and water consumption
2. Indicate the method used to prioritize these measures
3. Outline the plan your institution is going to follow to implement these measures
4. Set the targets and track changes in monthly energy bills

A measurable plan should follow these steps:

STEP 1
Describe the working space

STEP 2
Calculate the consumption baseline

STEP 3
Describe previous electricity and water saving measures

STEP 4
Identify measures to save electricity and water

STEP 5
Select energy conservation measures to implement

STEP 6
Set targets and monitor results
**STEP 1**

**Describe the working space**

A working space refers to the area where you plan to implement your conservation measures.

1. Area in square meters (m²), total built-up area
2. Roof area in square meters (m²)
3. Number of students and faculty members
4. Number of toilets, wash basins, urinals and water coolers
5. Type of lighting, number of units per type
6. Air conditioning, number of units per type
7. Office and class appliances that consume electricity and water
8. Area in square meters (m²) for the greenery area, and type of irrigation system used

**STEP 2**

**Calculate the consumption baseline**

Why do you need a baseline?

Your consumption baseline defines your current electricity and water use. The baseline is a key element enabling you to assess the effectiveness of the measures you are taking to reduce your consumption, as it provides the parameter against which you can measure the effectiveness of your energy conservation plan.

This assessment plays an important factor in your journey towards sustainability. The baseline can provide valuable information regarding your previous consumption, such as:

1. Monthly consumption patterns
2. Impacts of previously introduced conservation measures
3. Most consuming end-use components
4. A benchmark of your consumption against similar locations

Knowing your baseline will help you answer these type of questions:

- Are there peaks of consumption over the summer months?
- Is the water use unexpectedly higher from a certain month onwards?
- Is there a leak that needs to be fixed?

The ideal baseline should be collected from 12 continuous months for 2-3 years of electricity (kWh/month) and water (GL/month) use, either read through a meter that covers the working space(s) you select or utility bills. If possible, it is preferable to choose the year before you started implementing electricity and water saving measures.

Plot those numbers in a simple Excel graph showing your electricity and water use month by month. It should also be useful to calculate your average consumption as well as the average for the hotter and colder months of the year. The baseline should also be verifiable.

**STEP 3**

**Describe previous electricity and water saving measures**

Your educational institution might have already implemented some conservation measures to save electricity and water. Whether the measures implemented were technical changes, behavioral changes or both; it is important to describe and evaluate them to build a more complete picture for your energy conservation plan.

This will allow you to reflect on their effectiveness, learn from them and make improvements, and will help you to decide which of these can be incorporated into your final energy conservation plan.

You could do this by creating a checklist like the one in Table 1 below, allowing you to integrate existing measures with future ones you plan to implement.

**STEP 4**

**Identify measures to save electricity and water**

There are two approaches to implementing steps 4 and 5:

1. Do it yourself (DIY)
2. Opt for professional support from energy auditors (refer to useful contacts section)

It is recommended to use help from energy auditors. If you choose to do it yourself, it is important to identify potential savings in order to create a clear picture of what your institution can achieve. You may use the checklist from the Table 1 below.

This step analyses key areas: Table 1 below

1. Air conditioning
2. Indoor and outdoor lighting
3. Water heaters
4. Other energy consuming appliances (e.g. refrigerators, dishwashers)
5. Water consumption (including water fixtures and irrigation)
6. Building envelope (windows, walls, ceilings)
7. Distributed Solar
8. Other renewable sources of energy
9. Other engagement activities
### Areas of potential electricity and water savings

<table>
<thead>
<tr>
<th>Category</th>
<th>Checklist</th>
<th>ECM (energy conservation measure)</th>
<th>Already implemented</th>
<th>Implement (again)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air conditioning</strong></td>
<td>Type of AC (split, window, ducted or district cooling connection)</td>
<td>Window type is the least energy efficient - Replace your window AC to split or ducted with a high efficiency (5 or 4 energy stars). District cooling is the most energy efficient cooling solution. If possible, connect to district cooling</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Age of AC</td>
<td>Optimal lifetime of ACs is 10 years. If older, consider replacing it with new energy efficient AC (5 or 4 energy stars)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Maintenance of AC</td>
<td>Clean AC filters at least 2 times per year</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Energy label and AC efficiency</td>
<td>If less than 3 energy stars, consider replacing it with an energy efficient AC (5 or 4 energy stars)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Thermostat temperature</td>
<td>Always keep it on 24°C or above</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td><strong>Indoor and outdoor lighting</strong></td>
<td>Type of light bulbs</td>
<td>Replace all your light bulbs with LED</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Reduce lighting use when possible</td>
<td>Turn off the lights when you go out of the room Turn off the lights when you can use the daylight Turn off the lights outside of official working hours</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Smart lighting</td>
<td>Install BMS, motion sensors, dimmers and other smart options</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Power source of the outdoor lights</td>
<td>Install solar outdoor lights</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td><strong>Water heaters</strong></td>
<td>Type of water heaters</td>
<td>Install solar powered water heaters</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Time of use of water heaters</td>
<td>Switch off your water heaters during summer if possible, the water naturally gets heated at that time of the year</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Age of water heaters</td>
<td>Optimal lifetime of water heaters is 5 years. If older, replace with new energy efficient water heater (5 or 4 energy stars) or install solar powered water heater</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td><strong>Other energy consuming appliances</strong></td>
<td>Age of other energy appliances</td>
<td>Average optimal lifetime of home appliances is ~ 10 years If older, consider replacing them with new energy efficient appliance (5 or 4 energy stars)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Energy efficiency of appliances</td>
<td>If less than 3 energy stars, consider replacing them with an energy efficient appliance (5 or 4 energy stars)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Time of use of appliances</td>
<td>Switch off/unplug when not needed and outside of working hours Set power intervals at lowest settings (e.g. stand-by mode, low brightness)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td><strong>Water consumption</strong></td>
<td>Irrigation system</td>
<td>If manual, replace it with smart drip (depending of your need)</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td></td>
<td>Irrigation timing</td>
<td>Water your garden during the night to reduce water evaporation</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td></td>
<td>Type of water used for irrigation</td>
<td>Use recycled water for irrigation purposes (if possible)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Water fixtures</td>
<td>Install aerators on your water fixtures</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Water leakages in the water pipes and water heater systems</td>
<td>Fix all water leakages detected and regularly maintain all water pipes</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td><strong>Building envelope</strong></td>
<td>Air leakages</td>
<td>Fix all air leakages detected (this can be done simply with silicone sealant)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Type of the windows</td>
<td>Upgrade your windows to double-glazed</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td><strong>Distributed solar</strong></td>
<td>Size your rooftop and assess the possibility of installing solar panels</td>
<td>Install solar panels (refer to DEWA’s Shams Dubai initiative website – included in useful contacts)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td><strong>Other renewable sources of energy</strong></td>
<td>Possibility of using other sources of energy (e.g. wind power, hydro power)</td>
<td>Consider installing renewable systems</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td><strong>Other engagement activities</strong></td>
<td>Regularly train and monitor staff on electricity and water saving measures</td>
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<td>☐</td>
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</tr>
<tr>
<td></td>
<td>Monitor school consumption levels on a monthly basis</td>
<td>☐</td>
<td>☐</td>
<td></td>
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<tr>
<td></td>
<td>Conduct energy conservation activities for students</td>
<td>☐</td>
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</tbody>
</table>
STEP 5
Select measures to implement

After you have identified the potential areas for savings in step 4, we recommend you follow these subsequent steps:

1. Define the measures that you can do yourself and the ones for which you need help from professionals (e.g. Energy Services Companies, Solar installers).

2. Evaluate the costs or capital investment of implementing the various measures identified. Some of them might have very low costs, like engaging your team to adopt simple behavioral changes, and some might be significant. If you cannot quantify the cost, prioritize the measures based on relative cost. (high, medium, low).

3. Estimate the potential electricity savings in kWh and the potential water savings in imperial gallons per year. You can calculate these savings with the specifications of the current fixtures and the proposed ones.

4. Estimate payback times. Payback times are calculated by dividing the investment required for each measure, by the potential electricity and water savings per year. The lower the payback, the faster you will recuperate your investment of any given measure. For example, fastest payback time is lighting followed by air conditioner.

5. Estimate the carbon dioxide emission reductions. Carbon dioxide (CO2) emission reductions can be calculated using estimates of electricity and water saved. With this information, multiply the estimated kWh reductions by the CO2 intensity of electricity factor (t CO2/kWh). Likewise, multiply the estimated IG savings by the CO2 intensity (t CO2/IG).

6. Calculate CO2 reductions per dirham invested. This is the CO2 emission reductions divided by the investment for each measure. With these additional parameters, we recommend you choose the measures with higher CO2 savings per dirham and lower payback times. This way you would be optimizing both the environmental and the financial benefits of your energy conservation plan.

7. Define the measures that you cannot do by yourself and for which you need support from energy professionals. (refer to useful contacts section)

Table 2
Areas of potential electricity and water savings

<table>
<thead>
<tr>
<th>#</th>
<th>ECM to implement</th>
<th>Professional support needed (tick the box)</th>
<th>Capital investment of implementation (AED or high/medium/low)</th>
<th>Potential energy savings (kWh/year or IG/year)</th>
<th>Potential monetary savings (AED/year)</th>
<th>Payback time (years)</th>
<th>Avoided CO2 (tons)</th>
<th>CO2 reduction per AED invested (CO2/AED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Select the ECM from the table 1</td>
<td>☐</td>
<td></td>
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</tr>
</tbody>
</table>

STEP 6
Set targets and monitor results

Based on the selected energy conservation measures (ECMs), set water and electricity saving targets for your educational institution. Your energy conservation plan should contain a section explaining how you are going to keep track of your actions and monitor the results. An easy way to measure your consumption is to register your monthly electricity and water use and measure it against the baseline. This will provide you information on whether the measures adopted are working, allowing you to adjust your energy conservation plan if necessary.
USEFUL CONTACTS
For more information on:

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