ENERGY EFFICIENCY IN GOVERNMENT BUILDINGS

Under

Low Carbon Communities in the Caribbean Project (LCCC)* and the *Caribbean Sustainable Energy Program (CSEP) with the financial assistance of the European Union and the United Nations Industrial Development Organization* (*UNIDO)

Organization of American States

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Energy Efficiency in Government Buildings

Under the LCCC and the CSEP initiatives energy audits were performed in:

- Antigua
- Dominica
- Grenada
- Nevis
- St. Kitts

Government in the form of Permanent Secretary for Energy together with the Energy Desk/ CSEP Focal Point select the buildings to be audited. Buildings included office buildings and one hospital.

Out of those 10 buildings only 8 were used for this summary, as one country choose a residential and a commercial building.

Energy Efficiency in Government Buildings

Building Name	from	to	average
Area of Building (m^2)	285	10,864	3,437
Area under A/C	42.15%	100%	81.89%
Area under A/C (m2)	285	10,088	2,624
Number of Employees	4	215	105
Electrical Energy Index Junl 11 - May 12 (kWh/total area)	85.85	184.55	118.75
Electrical Energy Index Junl 11 - May 12 (kWh/ area under A/C)	87.46	230.69	156.72
Total EUI (kWh/employee/days)	5.88	38.71	16.85
Water consumption Index 2011 in liters/ employee/day	27.58	746.1	149.57

Buildings were from one story to 7 stories, from 4 to approx. 40 years old.

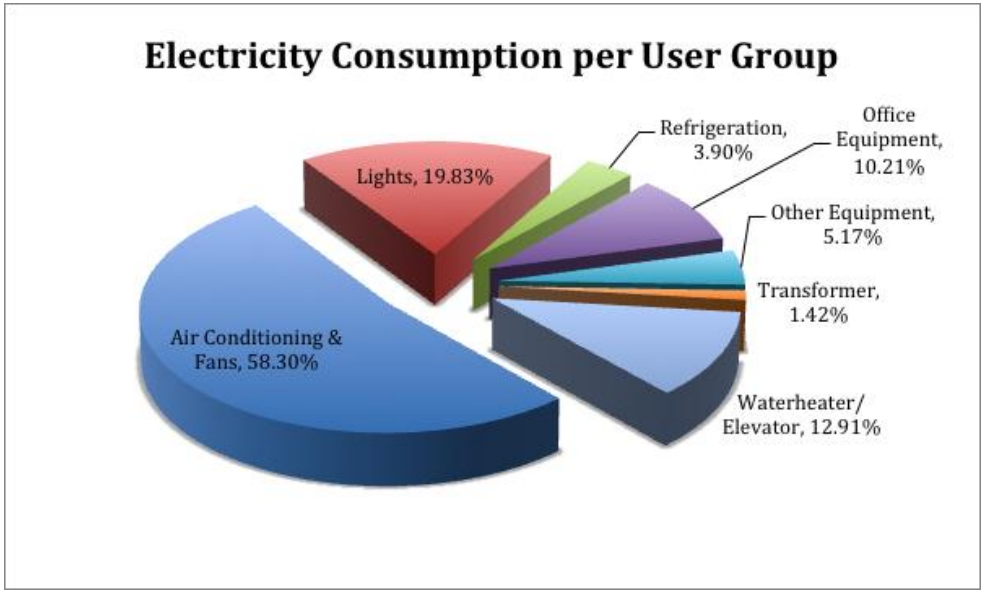
As per EU standards Energy Efficient Building uses 15 kWh/ m^2
As per DEFRA (UK) water usage per person/ work day 26 – 36 l

Energy Efficiency in Government Buildings

Electricity use account for 90 to 99% of utility costs, water for the rest. Diesel used for back-up generators was not counted as there are no records kept.

How is electricity used?

Percentage of Total Consumption	average
Air Conditioning & Fans	58.30%
Lights	19.83%
Refrigeration	3.90%
Office Equipment	10.21%
Other Equipment	5.17%
Transformer	1.42%
Waterheater/ Elevator	12.91%



Energy Efficiency in Government Buildings

HVAC Findings and Recommendations:

- None of the audited buildings had any glazing on the single pane windows – recommendation for double pane, energy efficiency rated windows
- Many buildings had louvered glass windows with big gaps – add internal glass pane or change to double pane windows
- Some buildings have overhangs/ awnings above the windows
- Some buildings have interior jalousies which were not used appropriately – pull them before leaving work on Friday / prior to holidays
- Curtains restricting the airflow of air handlers installed under the window
- Wrong installed air handlers (ceiling units installed under windows)
- Gaps in doors all around

Energy Efficiency in Government Buildings

HVAC Findings and Recommendations continued:

- Mostly inefficient HVAC systems installed – split units - only two buildings had a chilled water system or central system
- Only one building had an energy efficient rated split system installed
- Maintenance of split system is lacking:
  - Dirt around compressor units
  - Missing insulation on outside refrigerant lines
  - Black insulation on refrigerant lines exposed to the sun
- None of the buildings had any insulation, inside or out, towards open air areas (like stairways, washrooms)
- None of the buildings had any insulation towards the roof (beside plywood or drywall ceilings)
- None of the buildings had on the doors automatic closure mechanisms
- None of the buildings used air curtains for heavy traffic area doors between inside cooled areas and outside

Energy Efficiency in Government Buildings

HVAC Findings and Recommendations continued:

- Drastic Oversized systems (up to 40% average)
- Overall 40% of the consumption could be improved by appropriate sizing of A/C system – with a low of
  - 6% for the chilled water system up to
  - 86% for a split systems, which were drastically oversized.
- Education of employees eg. fans cool people not rooms, offices are cooled although minister is away, etc.
- Only one building left the A/C system on 24/7
- The moment A/C is available it is used
- Temperature setting is to low (21degree C)
- Is dress code appropriate for our climate?
- Cluttered offices which restrict airflow (too high separation walls, too many boxes around, etc.)
- Too many heat sources because they are status symbols (printers, minibars, etc)

Energy Efficiency in Government Buildings

LIGHTING Findings:

- Only found space lighting and no task lighting
- Mostly fluorescent (T12 with magnetic ballast and T8 with electronic ballast)
- Only few areas had used incandescent lighting, for areas hardly used
- Security lights are either High Pressure Sodium Lights or Halogen Lights – should be replaced with LED lights
- Specifically corridors are over lit – remedy was to take one or two lamps out of a 4 lamp fixture leaving the ballast of the none used lamps in
- Unused stairs lit 24/7
- Bathrooms lit throughout the working day

- Motion sensors for bathrooms/ stairs were not recommended at this time as they affect the lifetime of fluorescents and CFLs
- Simple measures as “turn off when you leave” signs
- Change to LED lights instead of fluorescents, HPS and Halogen lights

Changes from Fluorescent to LED lights could save up to 65% on lighting electricity consumption.

Energy Efficiency in Government Buildings

REFRIGERATION findings and recommendations:

This group includes refrigerators and water coolers

- Refrigerators are used in kitchens and in offices
- Location should be away from heat sources eg. refrigerator in front of south sided un-shaded window or next to a stove
- Don't use the "heating" feature of a water cooler its like the worst hot water heater
- "minibar" as status symbol

- What are we cooling in there?
- Clean seals regularly
- Test seals - the door of the refrigerator should close tightly
- Change refrigerator in time – we tend to us equipment till it breaks down – the older the refrigerator the higher the consumption

- Energy efficient rated refrigerators can save more than 70% of the consumption over their lifetime – investment in refrigerator is neglectable versus the consumption over the next 12 years (eg. European top models use 145 kWh per year compared to unrated models with 900 kWh per year)

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Computer Findings and Recommendations:

In the complete context this category takes only a small proportion – although savings can be achieved pretty easily and without any major investment

- Turn off at the end of the day
- Turn off the transfomer at the end of the day
- Put all computer on “power save mode” – saves up to 600 kWh per year
- Check whether computer has dual voltage and eliminate the transformer
- Purchase energy star rated computers and printers
- Consider to change from desktops to laptops

- Use of one printer instead of individual ones was not recommended as “own” printer is considered a status symbol
- Recommendation was towards energy efficiency rated computers and printers

Savings in the amount of 60% on consumption could be achieved

Energy Efficiency in Government Buildings

Other Equipment Findings and Recommendations:

This category deals with household appliances, washers, pumps, etc.

- Water kettles – how much water do you put in the kettle for your cup of tea? – measure it
- Microwave – choose the appropriate setting
- Washing machines – choose the appropriate setting or wash only full loads
- Pumps – in the Caribbean pumps are generally oversized at least by one third
- Energy efficient pumps use up to 30% less energy to do the same job

Energy Efficiency in Government Buildings

Energy Management - Findings and Recommendations:

The DEFRA Energy Management Matrix was used to assess the policy, awareness, training, information and purchase behavior of the users of the building.

All the islands showed lots of areas of improvement from a maximum of 24 points the highest rating reached was 9, indicating there is a lot of improvement possible

- First step is to measure what is consumed – as governments are sole or majority share holder. Do they care about consumption?
- Select someone to monitor the consumption – only what can be measured can be assessed and reduced
- Start energy efficiency awareness program highlighting all those issues addressed before
- Make employees aware that each single action is measurable
- Combine the training with a log of maintenance of the building

This recommendation can save up to 15 % of energy consumption

Energy Efficiency in Government Buildings

Summarizing the recommendations for government buildings:

On average more than 47% of the energy could be saved by implementing the discussed recommendations (excluding any structural changes to the building like windows, insulation etc.).

900 tons of CO_2 emissions could be avoided

The average IRR calculated was at 94%

With further installation of

- PV system with a payback between 5 and 7 years.
- Solar Thermal systems instead of electric water heaters

Up to 78% of the energy consumed could be reduced

Thank you

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Born in Austria, a deep concern for the environment was always part of my life. In the Caribbean I realized that more needed to be done to protect those fragile islands; as an Environment, Health and Safety manager for an international hotel chain I further discovered the wastage of resources around us, which encouraged me to start with energy audits. Now I work as an independent Certified Energy Manager.