



# CAREEP

CARILEC Resiliency and Energy Efficiency Project

## ConserVE-2-SaVE

# 20 TOP

## ENERGY EFFICIENCY (EE) MEASURES/TIPS FOR CARIBBEAN HOUSEHOLDS



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## ENERGY EFFICIENCY TIPS



### 1. TOP TWENTY ENERGY EFFICIENCY TIPS

The TopTwenty Energy Efficiency (EE) tips for Caribbean households, are categorized as follows:

General EE Tips (3.1.) - applicable for several type of uses and relatively easy to implement, EE tips per type of use (3.2 – 3.8) – arranged as per usage area with highest share of consumption in households.

#### 1.1 General Energy Efficiency tips

1. Utilize natural resources wherever possible like natural light, natural ventilation and air circulation, and natural shading.

Natural light, natural ventilation and air circulation help save electricity for lighting systems and reduce the cooling loads during daytime and in summer. AC units consume the largest amount of electricity and are responsible for up to 70% of the electricity cost of a household. Cleaning windows from outside and inside also helps to improve natural lighting as dirt can block up to 10% of natural sunlight.

For new residential buildings, the orientation of windows, doors and other openings should carefully be selected and considered in the design to allow cross-ventilation of air, positioned to capture the optimum natural light, and take advantage of natural shading e.g., by trees to prevent unnecessary heating through sunlight etc. Laundry can be dried outside without the use of electricity, using the warm Caribbean summer breeze can allow quick and sustainable drying.

**Investment: 0**

**Energy saving potential: +++**

**Cost-benefit: \$\$\$**

#### More information:

- How to use natural ventilation in buildings: <https://www.wbdg.org/resources/natural-ventilation>
- How to shade your windows for a cool home: <https://www.youtube.com/watch?v=fnhhj4vTzPQ>
- Passive Cooling Strategies: [https://www.youtube.com/watch?v=lvCI3Q\\_5A8Y](https://www.youtube.com/watch?v=lvCI3Q_5A8Y)
- Roof and walls design by climatic zone: <https://www.youtube.com/watch?v=Ouvk9t5T9X4>
- Smart Design for Hot/Humid Climates: <https://www.youtube.com/watch?v=LZPGVteKFtk>
- Top 5 Dumbest Ways to build in the South <https://www.youtube.com/watch?v=Vwos211XIXo>



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2.

### **INSTALL DEVICES FOR CONSUMPTION CONTROL SUCH AS TIMERS, MOTION SENSORS OR SMART POWER STRIPS.**

There are many devices on the market that can allow you to use your electrical equipment more efficiently. Timers for instance are excellent for use on lighting, hot water cylinders and several other devices. Sensors can be used to detect motion and switch appliances, lighting and other electrical devices on and off. Smart devices can be used to control devices remotely using your homes Wi-Fi network. For the implementation of this saving tip, households must make some relatively small investments.

**Investment: \$**

**Energy saving potential: +++**

**Cost-benefit: \$**

#### **More information:**

- Install timers, sensors, switches and smart devices <https://energyandwaterwise.com/install-timers-sensors-switches-and-smart-devices/>



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3.

### **REDUCE YOUR ELECTRICITY EXPENSES THROUGH SELF-GENERATION OF ELECTRICITY BY INVESTING E.G., IN A PHOTOVOLTAIC/ SOLAR SYSTEM.**

Self-generation of electricity e.g., by a roof-top PV system and self-consumption reduces the purchase of electricity and saves electricity cost after the payback of the initial investment in the PV system. Check the required permitting procedure and possible support on the website of your national government and/or your regulatory authority.

**Investment: \$\$\$**

**Energy saving potential: +++**

**Cost-benefit: \$\$\$**

#### **More information:**

- IRENA - Better Understanding of Rooftop Solar PV: <https://www.irena.org/newsroom/articles/2021/Dec/Better-Understanding-of-Rooftop-Solar-PV-Installation-Can-Support-Increased-Deployment>
- IRENA: Training Videos for Rooftop Solar PV: <https://www.youtube.com/watch?v=SIU8W2YuUGU&list=PLGZxC2IViPRpSxbkTgwKpmC6ylhF9ryUw>
- US Government: Planning a Home Solar Electric System: <https://www.energy.gov/energysaver/planning-home-solar-electric-system>
- Calculate your solar panel savings: <https://www.energysage.com/solar/calculator/>





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4.

### **REDUCE WATER CONSUMPTION, AS WATER USE (E.G., TREATMENT, HEATING, PUMPING, SEWERAGE TREATMENT) IS CLOSELY RELATED TO ELECTRICITY CONSUMPTION.**

High levels of water use often cause high electricity consumption in a household. The way washing machines, dishwashers and similar water consuming devices are used can make a large difference in the amount of electricity consumed and money saved.

**Investment: 0**

**Energy saving potential: +**

**Cost-benefit: \$**

#### **Further general guidelines and EE tips:**

- To save electricity and water it is recommended to shower with a cooler temperature and Reducing the shower time.
- Reduce the amount of hot water on shower outlets by installing low-flow showerheads, and faucets and sink aerators on bathroom and kitchen pipes.
- Use appliances on eco-mode if available.
- Use any gas stoves or other gas consuming devices efficiently and only when needed. E.g., heat only the amount of water or food on a gas stove that is actually needed.



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## ENERGY EFFICIENCY TIPS



### 5. **REDUCE THE STANDBY OR HIDDEN ELECTRICITY CONSUMPTION OF YOUR ELECTRONIC EQUIPMENT (E.G., TV, RADIO, MOBILE CHARGERS, STEREO SETS, TRANSFORMERS) BY UNPLUGGING THEM IF THEY ARE NOT IN USE FOR EXTENDED PERIODS OF TIME (E.G., AT NIGHT).**

On average, households use 24 electronic products like TV, radio, DVD, cable box, video games, computer and cell phone chargers causing up to 8% of the total electricity consumption. Transformers play a particular role as voltage levels are different in Caribbean countries (120 V versus 230 V). The origin of a device needs to be carefully selected according to the prevailing national voltage level. E.g., American devices usually come with 120 V AC, while European/English devices are designed for 230 V AC. The frequency (60 Hz in USA and 50 Hz in Europe/UK) are also important but not as the voltage level. Often, it's not known that transformers (step up/down as well as electronic chargers) continue to consume electricity (dissipated as heat) even though consumption devices are not connected to the secondary outlet.

Turning on/off these devices when they are not in use or using a power strip as a central 'turn off' point will help eliminate the standby power or hidden consumption (e.g., transformers) as appliances can continue to consume electricity even if they are not in use. Although the final cost-saving may be low and may only amount to a few US\$ dollars yearly, no investment is required to implement this saving tip but only a change of habit.

**Investment: 0**

**Energy saving potential: +**

**Cost-benefit: \$**

#### **More information:**

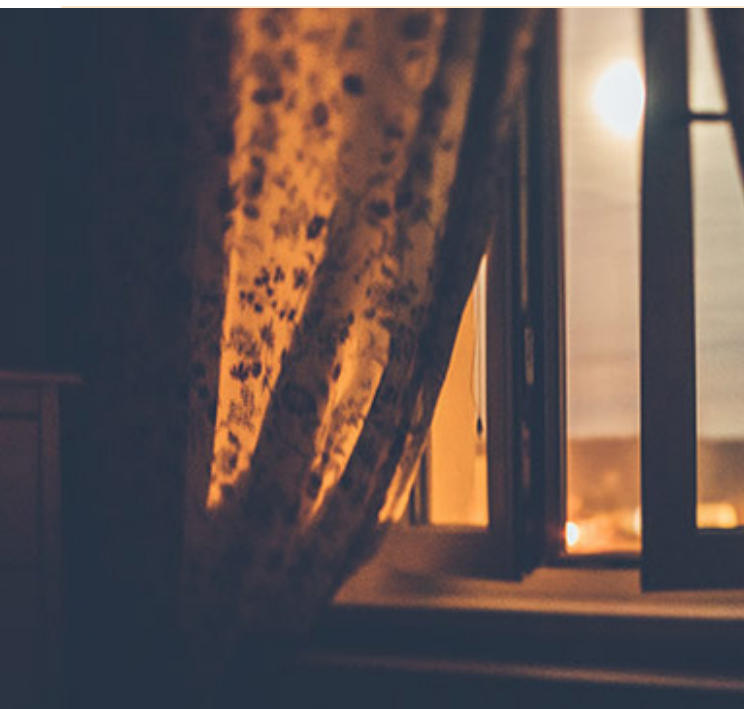
- Wikipedia: Standby-Power: [https://en.wikipedia.org/wiki/Standby\\_power](https://en.wikipedia.org/wiki/Standby_power)
- Standby-Power Losses in Household Electrical Appliances: [https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjwi-fo7vb4AhUAZDABHZXbCmEQFnoECDAQAQ&url=https%3A%2F%2Fwww.un.org%2Fesa%2Fsustdev%2Fsdissues%2Fenergy%2Fop%2Fclasp\\_mohanty.pdf&usg=AOvVaw299mDeyxUUxWxb2h\\_4ZXzQ](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjwi-fo7vb4AhUAZDABHZXbCmEQFnoECDAQAQ&url=https%3A%2F%2Fwww.un.org%2Fesa%2Fsustdev%2Fsdissues%2Fenergy%2Fop%2Fclasp_mohanty.pdf&usg=AOvVaw299mDeyxUUxWxb2h_4ZXzQ)
- IEEE- Standby Power Consumption in Belgium: <https://ieeexplore.ieee.org/document/4424225>
- Truth about Stand-by-Power: <https://www.verdeenergy.com/truth-about-standby-power/>





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## ENERGY EFFICIENCY TIPS



### 1.2 Air Conditioners

6. **USE THE AIR CONDITIONERS (A/C) UNIT ONLY WHEN NECESSARY – USE NATURAL VENTILATION, BY OPENING WINDOWS AND DOORS ON COOLER DAYS.**

Given the high contribution of the use of AC's to the household's electricity consumption, "less consumption is always better". Try to use the Caribbean breeze and shading opportunities as much as possible to achieve a comfortable room temperature. If absolutely necessary, use AC units for a limited time only, e.g., to reduce room temperature before going to bed.

**Investment: 0**

**Energy saving potential: +++**

**Cost-benefit: \$\$\$**



7. **SET THE THERMOSTAT OF YOUR AIR CONDITIONERS (A/C) UNIT(S) AT 24 TO 25 °C (75-77 °F) AND ENSURE THAT ALL A/C UNITS ARE TURNED OFF WHEN YOU ARE NOT USING THE ROOM.**

Where AC units are used by a household, the temperature should be set at the warmest comfortable temperature. The smaller the difference is between the indoor and outdoor temperatures, the lower the electricity consumption of an AC unit is; and the lower the temperature setting the more the AC unit runs. The increase of room temperature by 1 °C saves up to 10% of the total electricity consumed by the AC unit.

**Investment: 0**

**Energy saving potential: ++**

**Cost-benefit: \$\$**



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## ENERGY EFFICIENCY TIPS



8.

### **REPLACE AN INEFFICIENT A/C UNIT WITH AN EFFICIENT INVERTER TYPE SPLIT UNIT WITH A PROGRAMMABLE THERMOSTAT.**

Running an outdated and inefficient AC system (e.g., traditional window AC models) in many cases results in high monthly bills. An inverter AC unit operates at different speeds allowing a more efficient operation based on the current demand.

**Investment: \$\$**

**Energy saving potential: ++**

**Cost-benefit: \$\$**

#### **Further EE guidelines and energy saving tips for space cooling devices:**

- If you don't use central air-conditioning, consider using fans. In rooms with high ceilings, ceiling fans should not be mounted too high to enjoy the fan's cooling effect. The ideal placement is about 7 to 8 feet from the ground.
- Ensure that all windows are shut, and outside doors are closed when the AC unit is switched on.
- Don't place lamps, TVs or other heat sources close to the air conditioner thermostat. Heat from these sources may cause the air conditioner unit to run longer than it should.
- Check to ensure that no furniture or other obstacles are blocking ducts or fans. This will enable cooled air to circulate freely, making your home more comfortable.
- Regularly check the air filter of the AC unit as a clean air filter improves system efficiency, which should lead to energy savings.
- Match the cooling capacity of the AC unit to the cooling load of the room by consulting an expert.
- Where possible, locate AC fan units in well ventilated but shaded areas, or areas with surrounding trees and shrubs. This may reduce energy used by the air-conditioning units by as much as 10% compared with a unit located in an un-shaded area.
- Where possible windows should be tinted and/or have a reflective coating.
- Adding insulation on the roof is a wise energy investment and can cut your cooling costs anywhere from 15% to 45% depending on various factors like house size, air leaks, energy use and living habits.
- Avoid dark colours for roofing material.



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### More information:

- (Energy-efficient) Air-Conditioning: <https://www.energy.gov/energysaver/air-conditioning> and <https://www.savingenergy.org.za/asl/consumers/air-conditioners/index.html>
- IEA: The Future of Cooling: <https://www.iea.org/reports/the-future-of-cooling>
- How Much Power Does An Air Conditioner Use? <https://americanhomewater.com/how-much-power-does-an-air-conditioner-use/>
- How Much Electricity Does Air Conditioning Use? <https://www.inspirecleanenergy.com/blog/sustainable-living/how-much-electricity-does-air-conditioning-use>
- CUC-EE Tip for Air Conditioners: [https://onlineservices.cuc-cayman.com/hc/en-us/articles/4402154049938-Energy-Smart-\(Click-Air-conditioning\)](https://onlineservices.cuc-cayman.com/hc/en-us/articles/4402154049938-Energy-Smart-(Click-Air-conditioning))

### 1.3 Water heaters

An electric water heater, if used in a household, consumes approximately 14% of the total electricity demand, being responsible for one of the highest energy expenses in the home. Limiting the operation time of an electric water heater as well as reducing the water temperature are the most effective energy saving measures for this device.

Energy-efficient water heating and boiling depends on a variety of factors: the amount of water to be heated, the primary or secondary energy sources used (gas, electricity, firewood, etc.), the type of heating or boiling technology (immersion heater, induction cooker, ceramic hob, standard hotplate, etc.) and type and size of the vessel for boiling/heating.

The lowest carbon-footprint would apply for water heated and boiled by 100% renewable energies (RE), such as biogas, biofuels, wood or RE-based electricity. If the electricity in your power grid is mostly generated with fossil fuels (coal, diesel, natural gas), a gas stove would have a lower carbon-foot print than all electric devices, although the gas stove is less efficient than e.g., an electric stove with induction or ceramic hot plates. This is mainly due to the losses from electricity generation based on fossil fuels, which are typically higher than the differences in the technology efficiency of these devices. Hence, in most of the Caribbean markets, the kWh of gas is also significantly cheaper than the kWh of electricity. This makes gas-based water boiling or heating usually the more affordable option compared to electricity-based technology.

**As it relates to the production of hot water, the recommendation for the most-energy efficient energy source and technology would be as follows:**

1. Solar-thermal or Solar Water Heater (SWH)
2. Solar-PV-based electric water heating
3. Gas-based water heating
4. (Fossil-fuel-based) grid-electricity-based water heating





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## ENERGY EFFICIENCY TIPS



9.

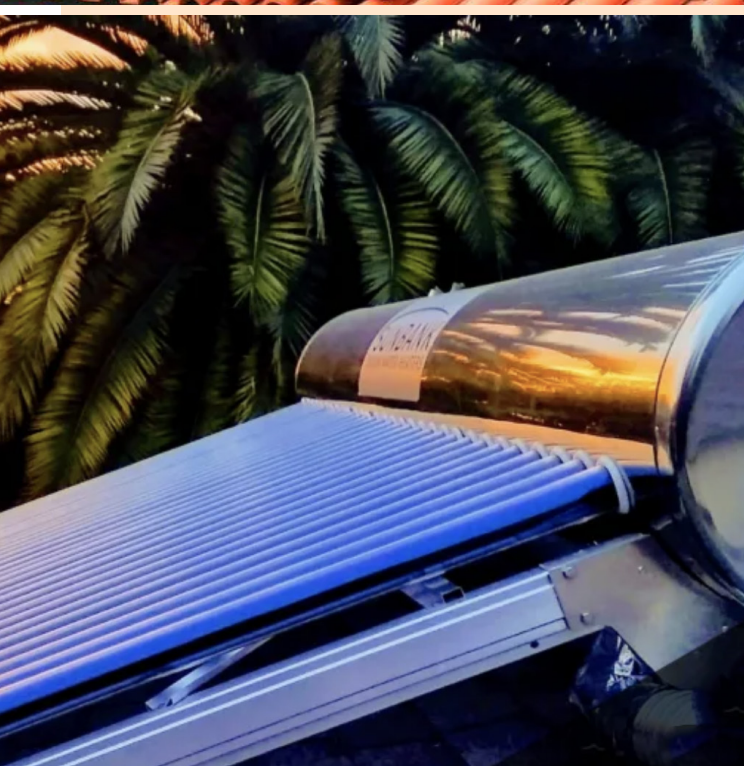
### USE A SOLAR WATER HEATER (SWH) TO GENERATE HOT WATER.

Solar water heaters are a cost-effective and environmentally friendly alternative to generate warm water and can be tied into an existing warm water system. A solar water heater is perfectly suited for residential use, and can provide a steady flow of water up to a temperature of about 63 °C (145 °F) (ca.). With an optimally sized SWH all electricity costs associated with water heating will be removed from the electricity bill.

**Investment: \$\$**

**Energy saving potential: +++**

**Cost-benefit: \$\$\$**



10.

### INSTALL A TIMER OR SWITCH ON YOUR ELECTRIC WATER HEATER MANUALLY ABOUT ONE HOUR BEFORE USE AND SWITCH OFF IMMEDIATELY AFTER USE, IF NO ADDITIONAL USE FOR THE DAY OR THE NEXT 6 HOURS IS EXPECTED.

A timer can help to reduce electricity consumption by the water heater and would need to be programmed to operate the water heater for two hours in the morning and two hours in the evening, depending on water usage and daily routine. A manual 'on/off' switch can serve the same purpose as a timer. If the residence is unoccupied for more than a day, it is recommended to unplug the water heater or shut off the circuit breaker in the panel box.

**Investment: \$**

**Energy saving potential: ++**

**Cost-benefit: \$\$**



# TOP 20 ENERGY EFFICIENCY TIPS



11.

### **REDUCE THE WATER TEMPERATURE OF YOUR ELECTRIC WATER HEATER DOWN TO 55 °C (131 °F).**

The lower the temperature setting, the lower your water heating costs.. However, the water temperature should not be set to lower than 55 °C/131 °F to avoid a dangerous bacteria, called Legionella, which grows in water systems at temperatures of 25 to 45 °C (77 -113 °F). (Legionellosis is a generic term describing the pneumonic and non-neumonic forms of infection with the bacteria.)

**Investment: 0**

**Energy saving potential: +**

**Cost-benefit: \$**

#### **Further EE guidelines and energy saving tips for water heating devices:**

- If there is a larger than normal number of family members using a relatively small water heater, the temperature may need to be set slightly higher, but no more than 60°C (140°F). In most cases, however, 55°C (120°F) should be sufficient. The reduction of the temperature to 55°C provides a sufficient margin of security to avoid the growth of the Legionella bacteria.
- Whether insulation of the water heater reduces electricity consumption depends mainly on its location and age. In many cases, the cost of insulation can save enough electricity cost to offset the investment for insulation unless the water heater has a label or sticker indicating not to add insulation. As a general precaution, the thermostat must not to be covered by insulation.
- If the electric water heater and pipelines are insulated against heat losses, the insulation needs to be controlled regularly so that it is not damaged and/or wet. Wet insulation isn't as effective because water possesses a high thermal conductivity. It is recommended to find the source of the moisture and replace any damaged insulation.
- It is also recommended to drain water from the warm water tank once a year to remove sediment that impedes heat transfer and lowers the efficiency of the water heater.
- Ways to save water (and electricity) are:



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- Repair leaky faucets promptly; a leaky faucet wastes gallons of water in a short period of time.
- Take more showers than baths. Bathing uses a high amount of warm water in an average household. If possible, cold showers should be taken.
- Although, most water heaters last 10 to 15 years, replacement should be considered if the heater is more than seven years old. It's a more costly measure, but a new water heater can also improve your home's energy efficiency.

### More information:

- How much does solar hot water cost? <https://www.energysage.com/clean-heating-cooling/solar-hot-water/costs-and-benefits-solar-hot-water/>
- How to compare solar hot water heater options: <https://www.energysage.com/clean-heating-cooling/solar-hot-water/how-compare-solar-hot-water-heater-options/>
- Installing a solar hot water heater: <https://www.energysage.com/clean-heating-cooling/solar-hot-water/installing-solar-hot-water-heater/>  
Energy Efficient Eradication of Legionella in Hot Water Systems: Energy Efficient Eradication of Legionella in Hot Water Systems
- CUC-EE Tip for Water Heaters: [https://onlineservices.cuc-cayman.com/hc/en-us/articles/4402154049938-Energy-Smart-\(Click-Water-Heaters\)](https://onlineservices.cuc-cayman.com/hc/en-us/articles/4402154049938-Energy-Smart-(Click-Water-Heaters))





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## ENERGY EFFICIENCY TIPS



### 1.4 Washing machines and laundry dryers

Washing machines and laundry dryers are the third largest electricity consumers in a home. Unlike AC units and electric water heaters, washing machines are installed in almost all households. Laundry dryers are not standard in every household but if existent and in use, it belongs to the household devices with the highest electricity consumption. The most effective EE tips for washing machines and laundry dryers are:

#### 12. DRY CLOTHES OUTSIDE IN FRESH AIR INSTEAD OF USING THE LAUNDRY DRYER.

If you have outdoor access to air-drying your laundry, this will save energy and wear and tear on your clothes! Enjoy the fresh air while hanging clothes on the line and use completely free solar energy for drying.

**Investment: 0**  
**Energy saving potential: +++**  
**Cost-benefit: \$\$\$**

#### 13. WASH CLOTHES IN COLD WATER OR USE THE 30°C WASHING CYCLE.

Use cold water for the wash cycle instead of warm or hot (except for greasy stains), and only use cold for rinses. Experiment with different laundry detergents to find one that works well with cooler water. By presoaking heavily soiled clothes, a cooler wash temperature may be fine. The temperature of the rinse water does not affect cleaning, so always set the washer on cold water rinse.

**Investment: 0**  
**Energy saving potential: ++**  
**Cost-benefit: \$\$**



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14.

### **MAKE SURE THE WASHING MACHINE IS FULLY LOADED AND IF YOU ARE WASHING A SMALLER LOAD, USE LESS WATER.**

It is important not to underload or overload either your washer or dryer. Most people tend to underload their washers rather than overload —particularly with conventional top-loaders — to make sure all the clothes are covered with water, try to load your washer to its full capacity whenever possible without overloading. If you overload, clothes may not wash clean, and you may end up washing the load a second time.

If you are unsure about the size of a load, check your machine's load capacity in pounds, then use a household scale to weigh out a few loads of laundry to get a sense of how much laundry 10 or 18 or 20 pounds represents. Thereafter, you can use your eye to judge the volume of clothes for a load. Washing one large load will take less energy than washing two loads on a low or medium setting.

Also, dry full loads, when possible, but be careful not to overfill the dryer.

Drying small loads wastes energy, while overloading causes wrinkling and uneven drying. Air should be able to circulate freely around the clothes as they tumble. If your washer and dryer are properly matched, a full washer load will be about the right size for the dryer as well.

**Investment: 0**

**Energy saving potential: ++**

**Cost-benefit: \$\$**

### **Further EE guidelines and energy saving tips for washing machines and laundry dryers:**

#### **Washing machines:**

- If possible, wash a full load of clothes but don't overload the washing machine to avoid the need to re-wash some clothes, which will waste electricity.
- Only extremely dirty clothes will likely need warmer temperatures, therefore, you can save money by limiting hot water use.



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- Soak dirty items before putting them in the machine, as well as making sure you pre-treat collars with normal soap. This will avoid potentially having to repeat a wash because stains didn't come out.
- Occasional do hot water washes if you mainly use low temperature settings to help get rid of bacteria and prevent odours building up in the washing machine.
- If available, use a high spin speed so clothes come out of the washing machine almost dry and consider drying the clothes outside in fresh air instead of using the laundry dryer.
- Wash clothes on the shortest practical cycle helps using less heated water and saving electricity.
- If available, the use of the 'eco-mode' helps also to save electricity and water.

### Laundry dryers:

- Dry several loads at once, so that your dryer isn't completely cooled down when it heats up for the next load. A second or third load can take advantage of the heat that has already built up in the dryer.
- Avoid overloading of the dryer as room is needed for the hot air to move around and work effectively.
- Avoid over-drying your clothes, it wastes energy, plus causes static and wrinkling. This not only represents a waste of energy but harms fabrics as well.
- Separate wash loads into light and heavy fabrics for the shortest drying times.
- Clean the dryer lint filter before every load to keep your dryer running efficiently.
- Give all clothes a decent shake when transferring from washing machine to laundry dryer to prevent tangled items from taking longer to dry.
- If available, use the auto-dry setting rather than a timed cycle to save time and electricity.
- Remove clothes from the dryer as soon as they're dry as some dryers continue rotating to prevent creasing, which might use unnecessary electricity.
- Clean the dryer's filters regularly to make sure they're free from fluff - this will help the machine operate more efficiently.

### More information:

- Energy Saving Benefits of Hang Drying Laundry: <https://alpscomfortair.com/energy-saving-benefits-hang-drying-laundry/>
- 10 Ways to Save Energy Doing Laundry: <https://www.consumerreports.org/laundry/energy-saving-laundry-tips-a9261296729>
- 16 Ways to Save Money in the Laundry Room: <https://www.energy.gov/energysaver/articles/16-ways-save-money-laundry-room>
- How to have the most energy efficient laundry for your family: <https://www.carbontrack.com.au/blog/family-energy-efficient-laundry/>
- Energy-efficient laundry: <https://www.uswitch.com/energy-efficiency/energy-efficient-laundry/>





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### 1.5. Lighting

Although being listed as the fourth largest electricity consuming devices in a private home (approx. 12% of total electricity consumption of an average household in Caribbean countries), replacing inefficient light bulbs (incandescent, halogen bulbs) with energy efficient ones is probably the easiest and fastest EE investment measure that can help households to reduce their electricity consumption and ultimately electricity cost. Additional costs for LED lightbulbs compared to others are typically paid back within less than a year in the Caribbean, due to their high energy saving potential.

#### 15. REPLACE INEFFICIENT LIGHT BULBS LIKE INCANDESCENT, HALOGEN AND COMPACT FLUORESCENCE LAMPS (CFL) WITH MORE EFFICIENT LED BULBS.

In traditional incandescent bulbs, about 95% of the electricity is converted into heat, only about 5% is converted into light. Additionally, with their high heat generation, incandescent bulbs significantly increase the cooling load of a room. In contrast, LED bulbs have about 75% higher energy efficiency than incandescent bulbs. Almost all electricity consumption of an LED bulb is converted into light instead of heat. Additionally, to their efficiency, LED bulbs have a lifespan about 25 times higher than incandescent bulbs and do not contain mercury like CFLs. The energy efficiency, longer lifespan and environmental advantages of LED bulbs help the user to save costs.

**Investment:** \$

**Energy saving potential:** +++

**Cost-benefit:** \$\$\$

#### 16. SWITCH OFF ALL LIGHTS THAT ARE NOT IN USE.

**Investment:** 0

**Energy saving potential:** ++

**Cost-benefit:** \$\$

#### Further EE guidelines and energy saving tips for light bulbs in private homes:

- Dust lights regularly. If dust dims the brightness of the bulb, this could lead to you using lamps or other forms of lighting to brighten the room further, therefore using more energy.
- Use LED lights for exterior or security lights with timers and/or motion sensors. In this way, lights will only be on when required.
- Current LED lights are available in many forms, sizes and colour temperatures. Therefore they are suitable for all indoor and outdoor requirements.
- Use task lighting; instead of brightly lighting an entire room, focus the light where you need it.



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- Consider using transparent shades or fittings, as a dark lampshade can absorb some of the light a bulb emits.
- Use LED tubes in large areas or areas that require bright lighting for extended hours.
- LED replacement kits are available to substitute linear fluorescent tubes. LED replacement tubes have the same size and form and can use the same lamp fittings without the need to invest in new luminaires.
- LED tubes and bulbs save about 50% electricity compared to linear fluorescence tubes and CFLs.

### More information:

- CROSQ: Caribbean Energy Efficient Building Code-Lighting: <https://codes.iccsafe.org/content/CARICOMREIBC2018/9-lighting>
- Lightbulb comparison: <https://www.viribright.com/lumen-output-comparing-led-vs-cfl-vs-incandescent-wattage/>
- How to calculate savings from LED lightbulbs: <https://www.youtube.com/watch?v=dBLviOKBjZk>
- Why Are LED's Better? (Comparing different types of light bulbs) | Basic Electronics: <https://www.youtube.com/watch?v=KyKS7nj58Oc>
- Nine Things to Consider while Buying LED Lights: <https://www.vinayelectricals.com/blog/nine-things-to-consider-while-buying-led-lights/>
- A consumer's guide to buying quality LEDs: <https://www.energyrating.gov.au/document/fact-sheet-led>
- CUC-EE Tip for Lighting: <https://onlineservices.cuc-cayman.com/hc/en-us/articles/4402154049938-Energy-Smart-Click-Lighting>



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### 1.6 Refrigeration

Surprisingly, with 4% of a home's total electricity consumption, refrigeration devices (refrigerators, freezers, combinations) are ranked number 5 after the electricity consumed by light bulbs. Refrigeration devices are standard in any Caribbean household irrespective of the income level.

**The most important EE tip for a refrigeration device is:**

**17. KEEP DOORS OF REFRIGERATORS CLOSED AND DON'T OPEN UNNECESSARILY.**

For every 10–20 seconds the door is open, it takes up to 45 minutes for the refrigerator to cool down to its originally set temperature.

**Investment: 0**

**Energy saving potential: +++**

**Cost-benefit: \$\$\$**

**Further EE guidelines and energy saving tips for refrigeration devices:**

- If possible, choose an energy-efficient appliance with a recognised EE label that provides details about the annual average electricity consumption.
- Repair or replace refrigerator door seals if you feel cold air around the closed door or if moisture is collecting.
- Dust your fridge regularly. Check the coils behind the refrigerator and use coil vacuums or dusters to clean it off to reduce excessive electricity consumption.
- Keep your freezer full – it uses less energy than an empty one. If your fridge is too empty, more warm air enters the interior, forcing your fridge to work harder to cool. On the contrary, if your fridge is overstuffed, the cold air won't properly circulate around your food to keep it chilled.
- Keep the refrigerator away from heat sources such as a stove, direct sunlight, or ducts. The heat will cause a higher electricity consumption.
- Defrost manual-defrost refrigerators and freezers at least every 6 months. Frost should not be allowed to become more than 1/4 inch (ca. 5-6 mm) thick. Frost build-up increases the amount of electricity required to keep the compartments cool.
- Do not keep refrigerators at lowest temperatures. For the fresh food compartment, temperatures should be kept at 3-4 °C (37-40 °F). Temperatures for the freezer section of a refrigerator should be kept at about -15 °C (5 °F). For stand-alone freezers temperatures should be kept at -17 °C (1 °F).





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- Cool hot foods to room temperature before refrigerating, cover liquids and wrap foods that are to be stored in the refrigerator. Moisture makes it more difficult to cool the compartment and also encourages frost build-up.
- Replace your outdated refrigeration device. New energy-efficient models can use 75% less energy than your older model.
- Refrigeration guide. <https://www.carbontrust.com/resources/refrigeration-guide>
- 11 ways to improve your refrigerator's energy efficiency <https://www.beko.com/bn-en/support/fridge-freezer-using-article/11-ways-to-improve-your-refrigerator%27s-energy-efficiency>
- UN CTCN: Energy efficient refrigerators: <https://www.ctc-n.org/technologies/energy-efficient-refrigerators>
- The Potential to Improve the Energy Efficiency of. Refrigeration, Air-conditioning and Heat Pumps: The Potential to Improve the Energy Efficiency of. Refrigeration, Air-conditioning and Heat Pumps.

### 1.7 Kitchen devices

Beside the refrigeration device, the largest electricity consumer in a kitchen is the electrical stove. If an electric stove is used for baking and cooking (including occasional use of kitchen devices like an electric water kettle, icrowave oven, toaster, or any other electrical appliances) some 3 - 4% are added to the overall electricity consumption of a home.

Energy-efficient water heating and boiling depends on a variety of factors: the amount of water to be heated, the primary or secondary energy sources used (gas, electricity, firewood, etc.), the type of heating or boiling technology (immersion heater, induction cooker, ceramic hob, standard hotplate, etc.) and type and size of the vessel for boiling/heating.

The lowest carbon-footprint would apply for water heated and boiled by 100% renewable energies (RE), such as biogas, biofuels, wood or RE-based electricity. In case the electricity in your power grid is mostly generated with fossil fuels (coal, diesel, natural gas), a gas stove would have a lower carbon-foot print than all electric devices, although the gas stove itself is less efficient than e.g., an electric stove with induction or ceramic hot plates. This is due to the losses from electricity generation based on fossil fuels, which are typically higher than the differences in the technology efficiency of these devices. Hence, in most of the Caribbean markets, the kWh of gas is also significantly cheaper than the kWh of electricity. This makes gas-based water boiling or heating usually the more affordable option compared to electricity-based technology, even though an induction stove is usually more efficient than a gas stove.

**As relates to the boiling of smaller volumes of water with electricity, the recommendation for the most-energy efficient technology would be as follows:**

1. Immersion heater
2. Electric kettle (if with automatic turn-off and based on material that has a low heat conduction)
3. Coffeemaker
4. Espresso-maker
5. Microwave
6. Induction stove
7. Stove with ceramic hob
8. Stove with conventional hob

The most important EE tips, therefore, refer to the reduction of the electricity consumption of an electric stove.



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## ENERGY EFFICIENCY TIPS



**18. MAXIMIZE THE USE OF YOUR ELECTRIC STOVE BY COOKING OR BAKING SEVERAL DISHES AT THE SAME TIME.**

**Investment: 0**

**Energy saving potential: ++**

**Cost-benefit: \$\$**

**19. IF YOU COOK AND BAKE WITH ELECTRICITY, BUT WITHOUT INDUCTION-FIELDS, TURN OFF THE BURNERS OF YOUR COOKING FIELDS OR YOUR OVEN A FEW MINUTES BEFORE THE ALLOTTED TIME. THE BURNERS WILL RETAIN HEAT LONG ENOUGH TO FINISH THE COOKING OR BAKING.**

**Investment: 0**

**Energy saving potential: ++**

**Cost-benefit: \$\$**

**Further EE guidelines and energy saving tips for kitchen devices:**

- To cook efficiently on an electric stove, heat must be transferred from the burner to the pot or pan with minimum loss to the surroundings. To help do this, select pots and pans with flat bottoms.
- When preheating an oven for baking, time the preheat period carefully, unless you're baking breads or pastries, you may not even need to preheat.
- Invest in a fan-assisted or convection oven that uses fans to circulate heat around the food as it cooks. This is more energy-efficient because it means you don't need to turn the heat up as high as you'd need to in a normal oven.
- Don't open the oven door too often to check the food condition as each opening leads to a temperature drop of 25°C. Use the glass door for visual control.
- Use glass or ceramic dishes instead of metal dishes and trays in the oven. Glass and ceramic materials retain heat better than metal, making them the most efficient to use in the oven.
- Use pressure cookers wherever possible.
- Electric slow cookers are also an energy-efficient cooking appliance, as they use only little more electricity than a traditional light bulb making them an energy-efficient kitchen device.
- Do not cook or reheat small meals in large ovens. Use smaller electric ovens, pans, toasters, or microwave ovens instead. Using a microwave oven uses less electricity than an electric one.
- Turn down the burner of the cooking field when water reaches a boiling point.
- Develop the habit of 'lids-on' cooking. Tightly fitted lids help keep heat within pots and pans, permitting the use of lower temperature settings, shorter cooking times and, saves electricity.
- Keep lids closed when boiling water. Boil water in covered pans or a kettle. Never boil water in an open pan.



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- Make sure that you only use as much water as you need. There's no point using energy to boil water you don't actually need.
- Using frozen food, defrost it ahead of time in the fridge or on the worktop to both halve the cooking time and avoid using the energy of the microwave to defrost more quickly.
- Whenever possible, use EE labelled kitchen devices.

### More information:

- Boiling water - how much energy? <https://seesustainability.co.uk/blog/f/boiling-water---how-much-energy?blogcategory=energy+use>
- One Thing You Can Do: Boil Water Efficiently: <https://www.nytimes.com/2019/05/29/climate/nyt-climate-newsletter.html>
- What's the most energy efficient way to boil water? <https://www.youtube.com/watch?v=nrH99UcceA8>
- Top five tips to save energy in the kitchen: <https://energysavingtrust.org.uk/top-five-tips-save-energy-kitchen/>
- Energy-efficient cooking: <https://www.uswitch.com/energy-efficiency/energy-efficient-cooking/>
- 10 Energy-Saving Cooking Tips For A Green Kitchen: <https://theecohub.com/10-energy-saving-cooking-tips-for-a-green-kitchen/>
- How can I be more energy-efficient when cooking? <https://www.saveonenergy.com/uk/guides/energy-efficient-cooking/>

## 1.8. Entertainment devices

Entertainment devices like TV, (including DVR, cable box, video games, stereo system, speakers) count for about 3% of the total electricity consumption of a private home. These appliances may not use a lot of electricity like other appliances but leaving them on overnight will add up. Most TVs have timers that you can set to turn the television off after use.

Entertainment devices like TVs and stereo systems are standard devices in any home with a TV being the most used device. The selection and implementation of effective EE measures in this area require some basic knowledge.

### A wide range of TV types are commonly in use with the current tendency to the investment in modern flat screen TVs:

- Plasma TVs – Plasma models without an EE label were historically the highest energy consumers among the flat screen TVs averaging 298 W for 41 - 50-inch models, and 364 W for the 51 - 60-inch models. Newer plasma TVs offer energy efficiency levels close to those of the other screen types.
- Liquid Crystal Display (LCD) TVs – These are the most widely produced and sold type of TVs. The wattage varies by model size: 32 - 40-inch models average 141 W, 41-50 inches use 185 W, and the average LCD model larger than 50 inches requires over 200 W.
- Light-Emitting Diode (LED) TVs – These TVs are similar to LCDs, but they use a backlighting technology. LED TVs use slightly less power than LCD TVs of the same size.
- Older cathode-ray tube TVs (b/w CRT, colour CRT) typically use less than 100 watts (W).

Effective EE tips in the entertainment area aim to reduce electricity consumption of entertainment devices during their use.





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## ENERGY EFFICIENCY TIPS



20.

**TURN OFF AND UNPLUG THE TV WHEN NOBODY IS WATCHING. UTILIZE THE TIMER FUNCTION OF MODERN TVs AND OTHER ENTERTAINMENT DEVICES TO TURN THEM OFF AUTOMATICALLY AFTER USE.**

**Investment: 0**

**Energy saving potential: +**

**Cost-benefit: \$**

**Further EE guidelines and energy saving tips for entertainment devices:**

- TVs are usually the centre of any home's entertainment hub but can also be one of the biggest contributors to electricity bills.
- It is, therefore, recommended to select an energy efficient (EE labelled) model that can help to reduce the electricity bill. The most energy efficient option is an EE labelled LED TV.
- Adjust the brightness level of your TV (automatically or manually) to prevent from consuming excess electricity. Using the ambient light sensor can detect the amount of light in the room and automatically adjust the brightness.
- Turn down or mute the volume of the TV entirely during commercial breaks. Using a 2% lower volume setting when you watch also saves electricity.
- Don't listen to or stream radio frequencies on an audio-visual device (TV) as this habit increases your electricity usage. Using a radio set or a mobile app is cheaper to use.
- If your TV offers a 'Quick Start Option' disable it. This feature allows turning the TV on more quickly when you press the power button but causes a much higher electricity consumption during standby mode.
- Select the size and type of screen carefully when buying a new TV. The prevailing trend is obviously to get bigger screens. However, it's worth knowing that an energy-efficient 32-inch LCD will tend to use 50% less power than a 42-inch Plasma screen TV. The smaller the TV, the less electricity will be consumed.

**More information:**

- Energy-saving tips for your TV, computer and laptop: <https://www.uswitch.com/energy-efficiency/tvs-computers-laptops/>
- Energy Efficient Computers, Home Office Equipment, and Electronics: <https://www.energy.gov/energysaver/energy-efficient-computers-home-office-equipment-and-electronics>
- Why the Way We Calculate TV Energy Efficiency is Wrong: <https://spectrum.ieee.org/why-the-way-we-calculate-tv-energy-efficiency-is-wrong>



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## ENERGY EFFICIENCY TIPS

### 2. IMPACT OF THE REBOUND EFFECT IN ENERGY EFFICIENCY

In energy conservation and economics, the rebound effect (or take-back effect) is the reduction in expected gains of implemented energy efficiency measures (EEM), because of behavioural responses and investment in additional electrical devices or more intensive use of existing devices. These responses cause additional electricity consumption diminishing the beneficial effects of the implemented EE measures.

For instance, the amount of savings for electricity in the target households (e.g. through the replacement of incandescent bulbs by LED bulbs) could be diminished by unnecessary, longer usage times of electric devices or the investment in additional electrical devices like the replacement of a flat screen TV with one of a larger screen would result in a higher electricity consumption due to the larger TV.

To fully enjoy the benefits from implemented EE measures, households must be aware and informed of this rebound effect and its potential impact on expected cost savings through energy efficiency measures.



# TOP 20 ENERGY EFFICIENCY TIPS

### 3. OVERVIEW OF EE TIPS

NO.	EE Tips	Level of Investment	Saving potential	Cost benefit
1	Utilize natural resources wherever possible like natural light, natural ventilation, air circulation, and natural shading etc.	Investment: 0 Change of habit/behaviour, (large investment only in case of new building)	Energy saving potential: +++	Cost-benefit: \$\$\$
2	Invest in EE devices for consumption control, e.g., timers for electric water heaters and AC units, motion sensors for lights, smart power strips as central 'turn-off' points etc.	Investment: \$ Small investment < 500 USD	Energy saving potential: +++	Cost-benefit: \$\$
3	Reduce your electricity expenditures through self-generation of electricity by investing e.g., in a Photovoltaic (PV)/solar system.	Investment: \$\$\$ Large investment > 2500 USD	Energy saving potential: +++	Cost-benefit: \$\$\$
4	Reduce water consumption, as water use (e.g., treatment, heating, pumping, sewerage treatment) is closely related to electricity consumption.	Investment: 0 Change of habit/behaviour	Energy saving potential: +	Cost-benefit: \$
5	Use the AC unit only when necessary – use natural ventilation instead by opening windows and doors on cooler days.	Investment: 0 Change of habit/behaviour	Energy saving potential: +++	Cost-benefit: \$\$\$
6	Reduce the standby or hidden electricity consumption of your electronic equipment e.g., TV, radio, cell chargers, stereo sets, transformers) by unplugging them if not in use for extended time (e.g., at night)	Investment: 0 Change of habit/behaviour	Energy saving potential: +	Cost-benefit: \$
7	Set the thermostat of your AC unit(s) at 24 to 25 °C (75-77 °F) and ensure that all AC Units are turned off when you are not using the room.	Investment: 0 Change of habit/behaviour	Energy saving potential: ++	Cost-benefit: \$\$
8	Replace an inefficient AC unit with an efficient inverter type split unit with a programmable thermostat.	Investment: \$\$ Moderate investment < 2500 USD	Energy saving potential: ++	Cost-benefit: \$\$
9	Use a Solar Water Heater (SWH) to generate hot water.	Investment: \$\$ Moderate investment <2500 USD	Energy saving potential: +++	Cost-benefit: \$\$\$





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## ENERGY EFFICIENCY TIPS

NO.	EE Tips	Level of Investment	Saving potential	Cost benefit
10	Install a timer or switch on your electric water heater manually about one hour before use, and switch off immediately after use, if no additional usage for the day or the next 6 hours is expected.	Investment: \$ Small investment < 500 USD	Energy saving potential: ++	Cost-benefit: \$\$
11	Reduce the water temperature of your electric water heater down to 55 °C (131 °F).	Investment: 0 Change of habit/behaviour	Energy saving potential: +	Cost-benefit: \$
12	Dry the clothes outside in fresh air instead of using the laundry dryer.	Investment: 0 Change of habit/behaviour	Energy saving potential: +++	Cost-benefit: \$\$\$
13	Washing clothes in cold water or use the 30°C washing cycle.	Investment: 0 Change of habit/behaviour	Energy saving potential: ++	Cost-benefit: \$\$
14	Make sure the washing machine is fully loaded and for smaller loads, use less water.	Investment: 0 Change of habit/behaviour	Energy saving potential: ++	Cost-benefit: \$\$
15	Replace inefficient candescent light bulbs like incandescent, halogen and Compact Fluorescence Lamps (CFL) with more efficient LED bulbs.	Investment: \$ Small investment < 500 USD	Energy saving potential: +++	Cost-benefit: \$\$\$
16	Turn off all lights that are not in use.	Investment: 0 Change of habit/behaviour	Energy saving potential: ++	Cost-benefit: \$\$
17	Keep doors of refrigerators closed and don't open unnecessarily.	Investment: 0 Change of habit/behaviour	Energy saving potential: +++	Cost-benefit: \$\$\$
18	Maximize the use of your electric stove by cooking or baking several dishes at the same time.	Investment: 0 Change of habit/behaviour	Energy saving potential: ++	Cost-benefit: \$\$
19	If you cook and bake with electricity, but without induction-fields, turn off the burners of your stove cooking fields or your oven a few minutes before the allotted cooking time. The burners will retain heat long enough to finish the cooking or baking.	Investment: 0 Change of habit/behaviour	Energy saving potential: ++	Cost-benefit: \$\$
20	Turn off and unplug the TV when nobody is watching. Utilize the timer function of modern TVs and other entertainment devices to turn them off automatically after use.	Investment: 0 Change of habit/behaviour	Energy saving potential: +	Cost-benefit: \$



# CAREEP

CARILEC Resiliency and Energy Efficiency Project

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