



MSOSW Curriculum

Lesson Five: Standby Power

What is standby power and what devices use it?

Overview: In this lesson, the student will learn what standby power is, how it affects our power consumption, and what devices are usually associated with it.

Objectives:

The student will:

- Define standby power.
- Identify devices in his/her home that use electrical energy.
- Explain how to determine if a device likely uses standby power.
- State the percentage of standby power in an average home.
- Calculate the total standby power used by a device over time.
- Understand the cost of standby power in devices.

Standards Addressed:

- Science as Inquiry: Use of Mathematics in All Aspects of Scientific Inquiry
- Science and Technology: Evaluate Completed Technological Designs or Products

Suggested Grade Levels: Middle School (6th-8th)

Timeline: 1 class period

Materials:

Day 1: Standby Power Notes sheets
Standby Power Worksheet
Completed plug in appliance inventory sheet
Belkin energy monitoring device
Appliance that uses standby power

Procedure:

Day 1: Standby Power

- Hand out Standby Power Notes worksheet (or have in project folders ahead of time).
- Have students define standby power. Be sure to discuss that there are many other terms for this type of energy use that students may have heard, including vampire power, leaking electricity, phantom power, or

phantom load. (These terms are all interchangeable, but in this curriculum we'll be referring to it as standby power.)

- In small groups or with partners, have students brainstorm for 5 minutes to create a list of devices they think might use standby power.
- On the board, post the following tips for identifying devices that use standby power:
 - Device has a clock display
 - Device has a light that stays on even when it's off
 - Device is warm to the touch after being off for a few hours
 - Device operates with a remote control
 - Device has an "instant-on" feature
 - Use a meter to find out for sure!
- Have students revisit their lists of standby power devices and cross off those that they don't meet the criteria.
- Calculating standby power usage:
 - Use a Belkin meter and a device that uses standby power to demonstrate how much standby power can be used at a particular time. Ask students if they think standby power drain constitutes an issue for people in terms of how much power they use and discuss.
 - Remind students what a kilowatt-hour (kWh) is and calculate how many kWh are used by this device daily, monthly, and yearly (if plugged in and not used all day). For instance, if a DVD player uses 4 watts of energy in standby mode, that means it uses $4 \text{ watts/hour} = 0.004 \text{ kWh}$. Multiply that by 24 hours – 0.096 kWh in a day. Multiply that by 30 days – 2.88 kWh in a month. Multiply that by 12 – 34.56 kWh in a year.
 - Have students record the average electricity cost (per kWh) for your area and then calculate how much money that device can cost over a year's period. (Example – a DVD player that uses 34.56 kWh in a year in the previous example, at an energy cost of 18.1 cents per kWh means that DVD player, even though never used, costs \$6.25.
 - On average, standby power consumption in most homes in the US is probably between 5-15%. The average energy bill in the US is \$99.70. Have students calculate how much can be saved each month and each year by reducing standby power.
- Using the electronic version of the Belkin Measurement Worksheet, have the students use their individual plug-in appliance inventory worksheets. As a class, make a list on the electronic document, of 15-20 appliances they think may have standby power. This will be the list they will choose from to measure at home using their Belkin devices. Save the document and make a copy for each student to use for Lesson 6.

- If time remains, discuss the devices that students will be testing with the Belkin meters.
- Homework: Standby Power Worksheet

Assessment Options for this Lesson:

- Standby Power Worksheet