



## Energy Investigation Organization

### A. Building Information, Energy Costs, and Energy Sources

This section includes general questions about the school building, as well as questions about energy costs and sources for the school.

### B. Individual Room Energy Survey

In this section, information is gathered about energy use, lighting, and temperature control for the various types of rooms in the school.

### C. Schoolwide Energy Survey

The information gathered in section B is used to complete section C. In the "Schoolwide Energy Survey," you will also have the opportunity to record ideas for ways the school could make improvements to increase energy efficiency and to reduce energy-related costs.

### D. Education, Training, and Community Connections

This section includes questions about energy-related academic standards, professional development for teachers, community projects, and more.





## A. Building Information, Energy Costs, and Energy Sources

*(This section may require input from your head custodian, facility supervisor, office manager, or school financial officer.)*

1. What year was your school built?
  - Before 1950
  - Between 1950 and 1975
  - Between 1975 and 1990
  - After 1990
  
2. Has the school building been renovated?
  - Yes If yes, what year(s)? \_\_\_\_\_
  - No
  
3. Approximately how old is the school's heating, ventilation, and air conditioning (HVAC) equipment?
  
4. How is the temperature setting for your school controlled?
  - Offsite remote control
  - One central control in the school building
  - Separate thermostats for each room or each group of rooms
  
5. Does your school follow a routine schedule for servicing HVAC equipment?
  - Yes
  - No
  
6. Are furnace and ventilation filters cleaned or replaced on a routine maintenance schedule?
  - Yes
  - No
  
7. If your school has central air conditioning, is the outside unit in the shade to increase efficiency?
  - Yes
  - No
  
8. Are there trees on the south side of the school building to provide shade during the hotter months?
  - Yes
  - No
  
9. Are there trees on the north and west sides of the school building to provide a windbreak in the colder months?
  - Yes
  - No





10. Obtain a copy of your school's energy bills. Use the bills to answer the following questions. What is the average cost of energy for one month? What is the cost for one year?

	Per Month	Per Year
Electricity	_____	_____
Natural Gas/Oil/Propane	_____	_____
Other: _____	_____	_____

Using the answers above, calculate how much money is spent on energy-related utilities per student. (Total cost of energy per month or per year divided by the number of students.) \_\_\_\_\_

Does the utility bill indicate how much is charged per kilowatt-hour (kWh) for energy?

- Yes If yes, how much? \_\_\_\_\_
- No

11. Which of the following sources provide energy for your school?

You can contact your school's energy providers or use this U.S. Environmental Protection Agency (EPA) website to find out your region's energy sources: [www.epa.gov/cleanenergy/energy-and-you/how-clean.html](http://www.epa.gov/cleanenergy/energy-and-you/how-clean.html). See **How to the Find the Fuel Mix for Your School** found on page 40 for sample printout.

- Coal \_\_\_\_%
- Nuclear \_\_\_\_%
- Hydroelectric \_\_\_\_%
- Oil \_\_\_\_%
- Natural Gas/Propane \_\_\_\_%
- Wood \_\_\_\_%
- Solar \_\_\_\_%
- Wind Power \_\_\_\_%
- Geothermal \_\_\_\_%
- Other: \_\_\_\_\_%

12. Does your school have any onsite renewable energy systems?

- Solar Photovoltaic
- Wind Power
- Geothermal
- Solar
- Other: \_\_\_\_\_

13. **Brainstorm**, and record a list of ways to improve energy efficiency at your school based on the information gathered on the building, energy costs, and energy sources.





## B. Individual Room Energy Survey

Complete this **Individual Room Energy Survey** for each room to be included in the investigation. Then, use the results to help complete the **Schoolwide Energy Survey** that follows. To reduce interruption of instruction, coordinate with classroom teachers to schedule a time to complete this survey.

Make a copy of this **Individual Room Energy Survey** for each room being assessed. Alternatively, sample representative room types, multiply by the number of rooms in that category, and use the data to complete the **Schoolwide Energy Survey**.

Date: \_\_\_\_\_ Room # or Location: \_\_\_\_\_

Teacher or Supervisor: \_\_\_\_\_ Grade or Use: \_\_\_\_\_

Average number of people using the room each day: \_\_\_\_\_

### SECTION B.1. Appliances and Electronic Devices

On the **Appliances and Electronic Devices** chart, record data about the appliances and electronic devices that are found in the room and that use energy. See the instructions that follow.

### Appliances and Electronic Devices Chart

Item	Number of devices in room	Average watts used	Hours used per day	Energy used per day (kWh)	How many of these devices have an ENERGY STAR label?
	A	B	C	$D = B \times C$	E
Computers					
Monitors					
Printers					
Copiers					
Televisions					
DVD/VCRs					
SMART Boards					
LCD projectors					
Other projectors					
Fans					
Heaters					
Small dorm-size refrigerators					
Microwaves					
Other:					
Other:					





## B. Individual Room Energy Survey (cont.)

*Instructions:*

**A–Quantity:** Record the number of each device found in the room.

**B–Average watts used:** Many devices will have a label indicating how much power they use, which often may be found on the back or base or on the power cord. If available, use a watt meter to see how much electricity the devices actually use. Electricity is measured in units of power called watts. The amount of electricity used over a period of time is measured in kilowatt-hours (kWh), which is the energy required to power a 1,000-watt device for 1 hour. You may be able to borrow a watt meter from your local power provider or from your public library.

**C–Hours used per day:** Record the typical number of hours that the device is used each day.

**D–Energy used (kWh):** Calculate the amount of energy the device uses by multiplying the hours used per day times the average watts used.

**E–ENERGY STAR:** Many devices have an ENERGY STAR label indicating that they have been certified as energy conserving. Look for the ENERGY STAR label on each device. Count and record the number with labels.

### Questions on Appliances and Electronic Devices:

1. Do the computers in the room have a sleep mode that allows them to conserve energy when not in use?

- Yes
- No

2. Do the monitors in the room have a sleep mode that allows them to conserve energy when not in use?

- Yes
- No

3. Are the following devices typically turned off when not in use?

a. Computers

- Yes
- No

b. Monitors

- Yes
- No

c. Printers

- Yes
- No

4. Are power strips used with appliances or electronics to make it easy to turn off multiple devices at once?

- Yes
- No





## B. Individual Room Energy Survey (cont.)

5. Do any of the appliances or electronic devices in the room have a phantom load?

(A phantom load is the amount of energy that a device uses while in standby mode or while switched off. Some appliances, such as DVD players and TVs with remote controls, use energy even when they are turned off, because they are not actually off but are in standby mode. Devices with an internal clock, such as a microwave, also carry a phantom load. You can use a watt meter to check for and measure phantom loads.)

Yes

No

If yes, list the types of devices: \_\_\_\_\_

### SECTION B.2. Lighting

Adequate lighting is essential to maintaining a safe and productive learning environment. Lighting may be provided either through natural sources (daylighting), artificial light, or a combination of the two.

**Note:** Because of the difficulty with access, outdoor and stage lighting are not included in this analysis of lighting.

## Artificial Lighting Chart

On the **Artificial Lighting** chart, record information on the types of artificial lighting found in the room, as well as information on bulbs, usage, and energy consumed.

Type of bulbs <sup>1</sup>	Number of fixtures	Number of bulbs per fixture <sup>2</sup>	Average wattage of the bulbs <sup>3</sup>	Average hours "on" per day	Energy Consumed per day (kWh) <sup>4</sup>
	A	B	C	D	$E = \frac{A \times B \times C \times D}{1,000}$
Compact fluorescent (CFL)					
Fluorescent tubes					
Incandescent					
LED					
Other:					

#### Notes:

- For information on lighting types, see **Fact Sheet: Lighting**. You can also ask the school's custodial staff members or building engineer about the types of lighting used in rooms.
- Many light fixtures that use a particular type of bulb take a set number of bulbs per fixture. You can indicate an average number of bulbs per light fixture if this number varies.
- If light bulbs of one type have differing wattage, take an average, or use the most common wattage.
- Calculate the kWh used per day by multiplying the number of light fixtures of each type by the number of bulbs per fixture, the average bulb wattage, and the average time in use per day, and then dividing by 1,000 to obtain the correct units.





### B. Individual Room Energy Survey (cont.)

#### Questions about Artificial Lighting

1. Are lights controlled by motion, photo, or infrared sensors?

- Yes If yes, what type? \_\_\_\_\_
- No

(Photo sensors automatically turn lights on and off depending on the amount of natural light in the room. Motion sensors automatically turn lights on and off based on movement in the room. Infrared sensors automatically turn lights on and off based on body heat.)

2. Are all overhead lights typically on when room is in use?

- Yes
- No

3. If fluorescent tube light fixtures are present, are the ballasts the newer electronic type?

- Yes
- No

(Older light fixtures may still be using the magnetic-type ballasts. A ballast tester can be used to determine the type, or ask a member of your school’s maintenance staff. Electronic ballasts increase energy efficiency.)

#### Daylighting

Daylighting is the illumination of indoor spaces by natural light from windows or skylights. If you have access to a light meter,<sup>1</sup> take the following measurements and record data on this chart. If you do not have a light meter, record “adequate” or “inadequate” on the chart. Standards for adequate lighting in classrooms have been established.<sup>2</sup>

Location	Light quantity with all lights on foot candle (fc)	Light quantity with half of lights off, if possible (fc)	Light quantity with all lights off (fc)	Natural light adequate with ... <sup>3</sup>	
				half of lights off	all lights off
On a desk near the windows					
On a desk in the middle of the room					
On a desk far away from the windows					
In the hallway outside room					
What is the main source of artificial lighting in this room? <input type="checkbox"/> CFL <input type="checkbox"/> Fluorescent tubes <input type="checkbox"/> Incandescent <input type="checkbox"/> LED <input type="checkbox"/> Other (specify): _____					
Weather (sunny, partly cloudy, cloudy): _____					





## B. Individual Room Energy Survey (cont.)

### Notes:

1. A light meter measures the amount of light falling on a surface. Measurements are typically made in units called a foot-candle (fc). You may be able to borrow a light meter from a photography class or photographer. See the **Resources** section for information on where to purchase one.
2. The Illuminating Engineering Society of North America has set standards for indoor lighting. The standards for lighting of a typical classroom should be in the range of 30 to 50 fc, depending on the task being performed. For example, reading very small print or examining photographs will require more light than reading large print or viewing a computer screen. Hallways and lower-use areas can be approximately 25 fc. With daylighting, it may be possible to use fewer lights and ultimately less energy. (Source: [www.iesna.org](http://www.iesna.org))
3. Using the upper bound of the illumination standard (50 fc), enter a yes or no in the columns to indicate whether natural light is adequate.

### Questions on Daylighting

1. Do the light meter readings vary depending on the location within the room?  
 Yes  
 No  
Range \_\_\_\_\_
2. Can the lighting in the room be adjusted to take advantage of natural light when available?  
 Yes  
 No
3. Are any rooms or areas over lit or under lit for the tasks being performed?  
 Yes  
 No  
Explain: \_\_\_\_\_
4. If the weather was cloudy when the daylighting chart was completed, try repeating the measurements on a brighter day. Would you expect the readings to change?  
 Yes  
 No  
Explain: \_\_\_\_\_





## B. Individual Room Energy Survey (cont.)

### SECTION B.3. Temperature Control

After the room has been in use for a couple of hours, use a thermometer (regular or an infrared temperature gauge) to measure and record the room temperature at waist height at various locations. Take several readings at each location described in the **Temperature Readings** chart. Then, calculate an average temperature. Record data on the chart. Indicate Fahrenheit or Celsius units.

### Temperature Readings Chart

Location	Reading 1	Reading 2	Reading 3	Average
On an outside wall near windows				
In the middle of the room				
Far away from the windows				
At or near an air-output vent				
In the hallway right outside the room				
Weather (sunny, partly cloudy, cloudy): _____				
Outside temperature range during the day: _____				

- Do temperatures vary significantly around the room?
  - Yes
  - No
- Do you see any blocked air vents or ducts?
  - Yes
  - No
- Does this room have a thermostat?
  - Yes
  - No
- If the room has a thermostat, is it digital?
  - Yes
  - No
- If the room has a thermostat, is it programmable?
  - Yes
  - No

