



# EECCOA Energy Challenge

## Project Builder Workbook

January 2021

**About the EECCOA Challenge:** This challenge provides students the opportunity to research, design and implement sustainability project proposals to reduce their home's utilities costs as well as their environmental footprint. This document was created to help students or teams develop and potentially implement projects focusing on reducing the energy consumption of their home. We hope you are up for the challenge!

The MERITO Foundation, sponsors, and partners will award cash or in kind prizes to the students authors of the best 3 projects for each tier (energy efficiency, water conservation, waste reduction, or outreach regarding ocean acidification) in the Spring of 2021, and might include funds, gifts, or additional support to help with the implementation costs of the most cost-effective project proposals.

This project builder workbook is for the **ENERGY CONSERVATION tier**: *To design and propose a tangible method to reduce the electrical energy use in your home.*

**The deadline to submit your project proposal is: April 9, 2021**

**EECCOA Virtual Challenge & Award Ceremony is: April 30, 2021**

Below are the challenge guidelines to help you develop your project proposals in **6 STEPS**, and worksheets to help you outline your project ideas and methods. Additional, more detailed worksheets will be made available by you teacher. The more your project proposal becomes an executed project, the more points you will receive, and you will have a better chance to win.

*You will find additional links to information and resources in the last page of this document.*

**STEP 1. Project and Student Name (5 Points):** For the EECCOA Virtual Challenge 2021, you will be working on project proposals for energy efficiency in your home, and you will be allowed to submit a project as an individual. If you wish to work as a team, you can create a team with 3-5 members. Fill in the box below to start your project proposal.

Before you get started, check out this introductory video on the EECCOA Challenge and the resources available to you online:

<https://www.youtube.com/watch?v=Lh2e4T4LX2M&list=PLy8PMsb7nt-tvQbUjp2iMfuMu8cSha2KS>

Student Name:	
Project proposal name:	
Tier (Project Goal)	<b>To reduce the energy consumption in my home</b>
School name:	
Grade:	
Teacher's name	

**STEP 2. Conduct an ENERGY ASSESSMENT (also known as energy audit) of your home (20 possible points).** To conduct an energy audit, follow the guidelines on Lesson 2.5 of the EECCOA Activity Guide titled “Power Used at Home” (provided by your teacher), supporting PowerPoint presentations, and worksheets. Use the worksheet “Energy Audit” (2.5.2) and accompanying spreadsheet to complete the audit, and then summarize it on the table in the next page. The energy audit will help you assess how much electric power is used in your home. You should also include the records from your household’s electric bill to make a good case financially for your proposal. Your parents might have saved these bills, or they can access them through the Southern California Edison website at <https://www.sce.com/partners/partnerships/access-energy-usage-data>. Look at the records and find patterns such as in which months your household used the most electricity year after year, or in the last year. Proposals that show graphs of the data with averages, maximum and minimum water usage receive extra points. The Energy Audit of your home will help you assess the present condition, identify which devices use the most electricity, and gain a reference value to work with. The audit will also allow you to estimate the changes resulting from your project’s implementation. How much electricity and money will you save by implementing those changes?

If you need help organizing and visualizing your data, watch this short tutorial on the topic (move ahead to 0:58 second to skip the intro):

<https://www.youtube.com/watch?v=2DTt5bhvnTw&list=PLy8PMsb7nt-tvQbUjp2iMfuMu8cSha2KS&index=5>

### Methods for an Energy Audit:

Let’s explore the usage of electricity in your home:

1. Review the PowerPoint slide show ‘Power Used in your Home’ (your teacher will share this with you). It is very simple!
2. Identify the ways in which electricity is used in your home and list them in the Home Energy Audit Worksheet
3. Perform an energy assessment following the steps in the Home Energy Audit Worksheet to determine the amount of power used in your home by lighting and other electronic devices. You will use one of the following methods:



- Determine the power used by reading UL sticker or other information on the device itself
- Measure the power used by employing a Kill-A-Watt meter (if you already have one at home)
- Find out the power used by certain electronics by researching it on the internet. DO this if you can’t find the UL sticker on the device. Cite your source.

**Note:** A Kill-A-Watt meter is a device that will measure the instantaneous power used by an electrical device. All that is required is that you can plug the device into the meter itself, and the meter into the electric outlet. Notice that amps, volts, watts, and kWh can be measured easily with the push of a button. These devices will not be provided to you, so use this device only if you have one available at home.



4. Summarize the information from the “Energy Audit at Home” worksheet in the data table shown below. Note an example is provided in the first row.

### Data Table for a Home Energy Audit

Numbe	Device Type	# of Devices	How was data determined?	Current and Voltage	Power for each device	Total Power for these devices
1	HP Laptop	2	UL Sticker	$i = 3.5 A$ $V = 18.5 V$ $P = 65 W$	$P = iV = (3.5A)(18.5V) =$  $<<<< 64.75 W$	$(65)(2) = 130 W$
2						
3						
4						
5						

5. You can determine the energy consumption for your entire household and the amount paid every month by obtaining your home's electric bills.

6. Using the information in the data table above and your electric, and with your team partners, answer the following questions:

- Which electrical devices in your home use the most power?
- Which electrical devices in your home use the least power?
- What is the total power used for lighting in your home?
- Did anything about the audit surprise you? Why or Why not?
- The U.S. Energy Information Administration estimates heating and cooling are the largest residential energy uses, up to 32% (<https://www.eia.gov/energyexplained/electricity/use-of-electricity.php>). Can you estimate the Power used for heating and cooling in your home?
- What are some ways that we can decrease the power used or increase energy efficiency in your home?

### **STEP 3. Choose your project's SMART objective(s) 'THE WHAT': (20 possible points)**

Now that you have an assessment of the electric power used at your home and understand the present condition, ask yourself, **What do you want to modify? How much electric power can we save?; By**

when? Then ask yourself, is it doable? The answers to these questions in one or a few sentences are **your objectives**. Your project proposal can have one or multiple objectives and must be specific and realistic.

This tutorial walks you through writing a SMART objective (*move ahead to 0:58 second to skip the intro*): <https://www.youtube.com/watch?v=8yS3yUM4or4&list=PLy8PMsb7nt-tvQbUjp2iMfuMu8cSha2KS&index=2>

#### Examples of SMART objectives:

- To reduce the use of electric power in my home by 'X' kWh and/or 'Y' \$ per month by converting the current Z lighting in 'M' areas of the house, into 'Q' system which is 'R%' more efficient. The reduction will be evident on the next electric bill one month after changes are made.
- To reduce the energy usage of my home by improving the heating, ventilating, and air conditioning (HVAC) system by changing the set temperatures of the thermostats in the AC and heater to Y degrees from Z degrees which will reduce X kWh, Q \$ and R pounds of CO<sub>2</sub> released by year 1.
- To reduce energy consumption of my home by X kWh by creating an energy savings checklist with simple tasks and habits for the members of my household assigning an energy saving responsibility to each. If Z items in the list are implemented, it will save our Y \$ per year after one year of voluntarily implementing the checklist.

**In summary, to write your objectives be specific on what you want to change, how much and by when. These are called SMART Objectives!**

SMART Objectives:	Are one or two sentences that say what you want to modify. They are <b>Specific</b> (e.g. change lighting system? HVCA? Get rid of energy vampires?). They are also <b>Measurable</b> . That is they say how much energy is consumed, how often, and how much you propose to reduce it, and in what unit (e.g. KW, %); Are <b>Attainable</b> (Is it doable? Can it be done?); Are <b>Relevant</b> to the goal of improving energy efficiency? And are <b>Time bound</b> . That is, if the proposal is to be implemented, by when?
#1	
#2	

Your project can have one or multiple SMART objectives.

#### STEP 4. Design your project's METHODS. This is 'THE HOW' (25 possible points)

The project methods is **how** you or your team proposes to reach your project goal to reduce the energy consumption assessed in STEP 2, to make the specific change of what, how much and by when as described in your objectives in STEP 3. Now think and describe HOW (step-by-step) you propose to make the change(s) happen. Provide as much detail as possible about your recommended approach, methods, materials, and costs. Including a budget is very important!

#### Project A example:

*Sample Goal: To reduce my home's energy consumption*

*Sample Objective: To reduce energy consumption of my home by X kWh by creating an energy savings checklist with simple tasks and habits for the members of my household assigning an energy saving responsibility to each. If Z items in the list are implemented, it will save our Y \$ per year after one year of voluntarily implementing the checklist.*

**Sample methods:**

- o Calculate how much energy is consumed per month, or year. How much money will adopting identified energy saving habits in your checklist save your household?
- o Deduct that from the home's monthly electric bill.
- o Present the findings to your family members? Educate them about the importance of saving energy to get them on board
- o Present your energy savings checklist with simple tasks and habits and get family members to sign up for different responsibilities or tasks
- o Create a campaign to build awareness about the importance of energy efficiency in your community, church, etc.

Be as specific as possible in your methods. You may want to include materials and supplies needed, estimated costs of materials, estimated costs of installation; where to buy materials...

**Note:** The above is an example, not a real proposal for energy savings at home. Your proposal should be more specific and include more details.

For help and more examples for this step, go to (*move ahead to 0:58 second to skip the intro*):

<https://www.youtube.com/watch?v=05IUoYpcoA0&list=PLy8PMsb7nt-tvQbUjp2iMfuMu8cSha2KS&index=3>

**In the table below, write the methods you propose for your project designed and implemented. Be as detailed as possible.**

Step	Cost (\$) of change	Save in kWh and \$
Example: Switch 60-Watts light bulbs for energy efficient ones (LED) that only use 10-Watts.	\$5 per LED bulb \$5 x 10 bulbs = \$50	50 Watt kWh for 10 hours/day =0.5 kWh * 10 bulbs = 5kWh per day -> 1825 kWh *22cents/kWh =\$401.5 saved /year


Remember  $P$  (Power):  $= i$  (current) \*  $V$  (Voltage) and  $E(\text{energy}) = P(\text{power}) * t(\text{time})$  Power is measured in W; Current in Amps; Voltage in Volts; Energy in kWh; kW=1000Watts

### STEP 5. Figure out how to measure your project's effectiveness. This is called project EVALUATION (15 possible points)

This is where you describe how to determine the success or impact of your project proposal after it is carried out. Imagine it happens, that all you propose is implemented. How would you measure the changes that result from the actions you proposed in the methods (STEP 4)?

In the first part of this video, you can learn more about ways you can evaluate the success of your methods (move ahead to 0:58 second to skip the intro):

<https://www.youtube.com/watch?v=5RO5xcvfWk8&list=PLy8PMsb7nt-tvQbUjp2iMfuMu8cSha2KS&index=4>

Example:

	<b>Write here how would you be able to see or measure that the water usage in the school is reduced after implementing your proposed ideas</b>
<b>Examples of evaluation measures</b>	-We will know our proposal works by seeing a reduction of X% in electric bill of my home every month -We will repeat an energy audit of the lighting in my home after we switch 10 light bulbs to energy efficient ones.
<b>Write your evaluation measures here</b>	

You can have more than one evaluation measure. Having more than one measurement of your results is more reliable and convincing which adds value to your proposal.

### STEP 6. Outline a COMMUNICATION plan for your proposal to let others know of your project, actions, or to persuade your audience, community or household members to change certain behaviors (15 possible points maximum).

Examples:

- o Create a website, newsletter article, Facebook account, or other social media to share your ideas about saving energy with others (5 points)
- o Indicate you will report the energy consumption per month used and money savings to the member of your household (5 points)
- o Come up with a game to keep track of good energy efficiency habits by the member of your household (5 points).



Check out this video tutorial for more details and examples (this section start at minute 2:00):  
<https://www.youtube.com/watch?v=5RO5xcvfWk8&list=PLy8PMsb7nt-tvQbUjp2iMfuMu8cSha2KS&index=4>

	Write here how would you inform your community or audience about the success of your project (when implemented)
Method #1:	
Method #2:	

**You do not need to reinvent the wheel! Below are on-line resources with examples or for inspiration.**

#### **Additional Resources**

- <http://energy.gov/energysaver/do-it-yourself-home-energy-audits>

#### **Reduce Energy Consumption of School Grounds**

- U.S Dept. of Energy *Energy-saving homes, buildings & manufacturing*  
<http://energy.gov/eere/office-energy-efficiency-renewable-energy>
- Energy Saving tips  
<http://www.nrdc.org/air/energy/genenergy.asp>
- Checklist  
<http://smarterhouse.org/start-here/quick-fixeshome-energy-checklists>
- Home Energy Saving Calculator - *Lawrence Berkeley lab* <http://hes.lbl.gov/consumer/>

**PROJECT PROPOSAL FORMAT:** The project proposals should be submitted by using PowerPoint, Sway, or Google Drive to create a presentation that includes all the steps from this project builder as well as images to enhance your proposal. Submit the ppt or pdf to your teacher on the date provided by her/him/them. Students are encouraged to produce their own videos explaining their proposals. This is an opportunity to explain to judges what you are proposing and use visuals to help them understand. You can get up to 5 extra points for recording your own video. TIP: embed the slides into the video.

A successful project proposal needs to include all 6 steps above described. This how much each step is worth:

1. Project summary with name of team, project title, authors (students names), school name, and teacher's name: 5 points
2. Assessment/audit results: 20 points
3. Objective(s): 20 points
4. Methods (including any costs and budgets): 25 points
5. Evaluation method(s): 15 points
6. Communication plan: 15 points

For guidance on the use of the energy audit materials, please contact [info@meritofoundation.org](mailto:info@meritofoundation.org)