



# Appendix 3.a EECCOA Energy Challenge

## Project Builder Workbook

February 2022

**About the EECCOA Challenge:** This challenge provides students the opportunity to research, design and implement sustainability project proposals to reduce their school’s utilities costs as well as the school’s environmental footprint. This document was created with the intention to help students’ teams develop and potentially implement projects focusing on reducing the energy consumption of their school campus. 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 the Matilija Dam removal) in the spring of 2022, and will match funds to participating schools for part of the implementation costs of the most cost-effective project proposals.

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

**The deadline to turn in your project proposal to your teacher is \_\_\_\_\_**

**EECCOA Challenge Award Ceremony is scheduled for \_\_\_\_\_**

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.

**STEP 1. Create a TEAM (5 Points):** Your team must consist of minimum 3 and maximum 5 students (with a few exceptions). Include the name of your team, the name of your project, names of your team members, school, grade, your teacher’s name. Fill in box below to start a project draft.

Team name:	
Project proposal name:	
Tier (Project Goal)	<b>To reduce the energy consumption at my school campus</b>
Team members names:	
School name:	
Grade:	
Teacher’s name	

**STEP 2. Conduct an ENERGY ASSESSMENT (also known as energy audit) of your school campus (20 possible points).** *To conduct an energy audit follow the guidelines on lesson 2-5 of the EECCOA Activity Guide, Chapter 2, lesson titled ‘Power Used in your Classroom and School’ (your teacher has a copy), or the summarized version in page 2 below. The energy audit will help you assess how much electric power is used in your classroom, in a section of your school and you can infer (extrapolate) to the whole school campus. It will be very useful to include the records from your school’s electric bill to make a good case for your proposal. Perhaps your teacher can request these to the school’s administrative personnel.*



Look at the records, learn how to read them and find patterns such as months when more electricity is used year after year, or within a year. Proposals that show graphs of the data with averages, maximum and minimum water usage receive extra points. The Energy Audit of your school will help you assess the present condition and gain a reference value to work with. The audit will also allow you to estimate the changes resulting from your project's implementation. Enter in the box below any information you have about energy usage in your school campus:

### Materials and Methods for an Energy Audit:

Let's explore the usage of electricity in our classroom.

1. Read the power point slide show 'Power Used in your Classroom and Your school' (your teacher will give you access to it). It is very simple.
2. Identify ways in which electricity is used in our classroom and list them below:
3. Perform an Energy Audit to determine the amount of power used in your classroom by lighting and office equipment through one of the following methods:
  4. Estimate the power used by research on the internet. Cite your source.
  5. Determine the power used by reading UL sticker or other information on the device itself,
  6. Measure the power used by employing a Kill-A-Watt meter



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. Notice that amps, volts, watts and kWh can be measured easily with the push of a button. Look at your Kill-A-Watt meter. Ask your teacher if she/he has access to these devices.

4. Fill in the energy audit data table shown below. An example is provided in the first row. Each classroom will have a different table.
5. You can determine the whole school's energy consumption if you have access to your school electric bills. By adding the total power used in your classroom, multiply it by the number of classrooms in your school, and subtracting to the overall power used as per electric bill, you can estimate the power used by the rest of the school. Another method is presented in the School Energy Audit in sample sheet 2.



**Data Table for a Classroom Energy Audit**

Team #	Device Type	# of Devices	How was data determined?	Current and Voltage	Power for each device	Total Power for these devices
4	HP Laptops	10	Kill-A-Watt meter	$i = 2 \text{ A}$ $V = 120 \text{ V}$	$P = iV = (2\text{A})(120\text{V}) = 240 \text{ W}$	$(240)(10) = 2400 \text{ W}$

6. Using the information in class spreadsheet or data table, and with your team partners, answer the following questions:

- a. For which electrical device does our classroom use the most power?
- b. For which electrical device does our classroom use the least power?
- c. What is the total power used by our classroom for lighting and office equipment?
- d. Did anything about the audit surprise you? Why or Why not?
- e. It is estimated that lighting and office equipment make up 56% of the total power used in our classroom. Estimate the total power used in our classroom.
- f. What are some ways that we can decrease the power used in the classroom?

We have included supporting documents to this EECCOA Energy Challenge Project Builder workbook, the power point slides about concepts needed, a sample spreadsheet for classroom energy audit, and sample spreadsheet for school energy audit.

**STEP 3. Choose your project objective(s) 'THE WHAT': (15 possible points)**



Now that you have an assessment of the electric power usage at your school 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.

**Examples of objectives:**

- a. To reduce the use of electric power in our school by ‘X’ kWh and/or ‘Y’ \$ per month by converting the current Z lighting system of the ‘M’ areas of the school, into ‘Q’ system which is ‘R%’ more efficient. The reduction will be evident a month after changes are made.
- b. To reduce the energy usage of our school campus 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.
- c. To reduce energy consumption of our school campus by X kWh by creating a voluntary energy savings checklist tailored for our school, and educating students and school personnel on why and how to implement the items in the list. 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 ride 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 they <b>Relevant</b> to the goal of improving energy efficiency? And are <b>Time</b> bound. 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 the **how** 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 the school's energy consumption*

Sample Objective: Reduce X kWh of electric power to school X by identifying where are the energy losses of the school campus through a school wide energy audit, and creating a voluntary plan that includes a checklist for students and school personnel to adopt by end of current school year.

**Sample methods:**

- Calculate how much energy is consumed per month, quarter, semester (costs). How much money does adopting identified energy saving behaviors as presented in our checklist will the school save (savings) and deduct from the school's electric bill as reported by your school custodian or administrator.
- Present the findings of your school energy audit
- Present your checklist of modifying behaviors for school students and personnel
- Be as specific as possible in your methods. You may want to include materials and supplies needed, estimated costs, estimated costs of installation; where to buy materials...
- Create a campaign to build awareness of energy conservation on campus using social media, flyers, Earth Day booth, etc.

Note: The above is an example, not a real proposal for energy savings in a school.

**Write in the table below the methods you propose in your project. Be as detailed as possible.**

Step	Cost (\$) of change	Save in GPF or GPM and \$
Example: Computers, Printers and Monitors off at end of daily use.	No cost	15 kWh * 25 computers in school/ day = 375 kWh

Remember P (Power): = i (current) \* V (Voltage) and E(energy) = P(power) \* t(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 (10 possible points)**

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

Example:

	<b>Write here how you would be able to see or measure that the energy 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 the school every month -We will measure the kWh of our classroom every week to assess if energy usage changed by our proposal
<b>Write your evaluation measures here</b>	

You can have more than one evaluation measure, and more than one may be more reliable and convincing of the value of your proposal.

**STEP 6. Outline a COMMUNICATION plan for your proposal to let others know of your project, actions, or to persuade your audience to change certain behaviors (25 possible points maximum).** Examples:

- Present your proposal at a meeting of your school district’s board, a City Council meeting or a PTA meeting of your school (25 points)
- Create a website, newsletter article, Facebook account (10-15 points)
- Indicate you will report the energy consumption per month used and money savings to your fellow schoolmates, teachers and administration every month (10 points)

	<b>Write here how would you inform your community (School district board, PTA or all of Ventura) about the success of your project (when implemented)</b>
<b>Method #1:</b>	
<b>Method #2:</b>	

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

**Conduct Energy Audits of Schools**

New York Times How to Conduct an Energy Audit Steps and on-line resources blog  
[http://learning.blogs.nytimes.com/2011/02/16/how-green-is-my-school-conducting-an-energy-audit/?\\_r=1](http://learning.blogs.nytimes.com/2011/02/16/how-green-is-my-school-conducting-an-energy-audit/?_r=1)



### Additional Resources

- <http://centerforgreenschools.org/articles>
- <http://energy.gov/energysaver/do-it-yourself-home-energy-audits>
- <http://www.browardschoolsconserve.com/toolsforschools.htm>
- [http://www.browardschoolsconserve.com/docs/Energy\\_Reduction%202015-2016.pdf](http://www.browardschoolsconserve.com/docs/Energy_Reduction%202015-2016.pdf)
- [http://www.greeningschools.org/resources/view\\_cat\\_admin.cfm?id=65](http://www.greeningschools.org/resources/view_cat_admin.cfm?id=65)

### 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/genergy.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 presented as verbal (oral) presentation using Power Point or Sway. Presentations must last 5 minutes maximum per team. Submit the ppt or pdf to your teacher on the date provided by her/him. We will collect all proposals in pdf or ppt by email or in USB drive from teachers. Students can produce their own videos if they want and are encouraged. 5 extra points for teams who record their own video and 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): 15 points
4. Methods (including any costs and budgets): 25 points
5. Evaluation method(s): 10 points
6. Communication plan: 25 points

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