

# How Much Energy Can You Conserve?

CONTEST

Win a  
Trip To...

Washington, DC  
and the Festival  
Expo!

**Contest is open to Middle  
and High School Students**

**USA Science and  
Engineering Festival**  
[www.usasciencefestival.org](http://www.usasciencefestival.org)

**Washington, DC**  
**April 2012**



*Sponsored by*

**A** AMERICAN  
**ACADEMY**  
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**"You've gotta be in it to win it!"**

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# AMERICAN ACADEMY OF ENVIRONMENTAL ENGINEERS (AAEE)

## “How Much Energy Can You Conserve” Contest

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### BACKGROUND

The world focus these days is on energy:

- How do we generate *energy*?
- Do we have enough resources to continue to generate *energy* in the future?
- How much *energy* do we use?
- How do we transmit *energy* from where it's generated to the point of use?
- How sustainable are the ways we currently generate *energy*?
- How can we conserve *energy*?
- Do we realize just how much *energy* we consume?
- How much do we depend on foreign countries to provide the resources to create *energy*?
- How much *energy* does the U.S. use compared to other countries?
- How much pollution or adverse effects are created when we produce *energy* by burning coal or diesel fuel?
- How much risk are we facing based on how we generate *energy*?

It is hard not to pick up any newspaper/news magazine or watch any news program without a mention or segment about some facet of energy.

The world economy may be slowing, but the world demand for energy keeps on rising as we keep increasing the number of: vehicles on our roads; computers in our homes, schools, and businesses; cell phones and personal electronic Internet devices; Internet users; electronic surveillance; products we consumers demand; facilities needed to treat and deliver clean water, and collect and treat wastewater. Combine all that with the rising energy needs to keep existing and new buildings (homes, stores, offices, industries, etc.) safe and inhabitable with lighting, elevators, heating, ventilation, air conditioning and other purposes.

Some of us, particularly those of us in developed countries, tend to take access to energy for granted. That easy access is not only present during our normal daily lives, but also when we go away on vacation. We have become so reliant on energy to make our daily existence livable that we have forgotten what it is like to do without. It takes unwanted reminders associated with the forces of nature (earthquakes, cyclones, tornadoes,



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hurricanes, snow storms, heavy rains) when all electric power is cut off to a region or small/local area that we realize that we cannot live without energy. But in order to continue to meet our rising appetite for energy, it appears that we must:

- **Understand** how much energy we currently use
- **Learn** how we can conserve energy
- **Study** new ways to produce sustainable energy
- **Examine** better ways to deliver energy
- **Realize** that we are all in this together and that grassroots individual efforts are what is needed to get us all moving in the right energy direction !

### CONTEST CHALLENGE

The applicant is asked to define the energy footprint of either his/her family home/residence, or her/his school. The applicant should select a specific time of year and location, and must conduct the research necessary to identify where energy is used (from the small energy demands of the home wall thermostat to the larger demands of a school boiler) and estimate the amount of energy used by each device. Compare this estimate with the amount of energy that is associated with the home's/school's routine utility bill. Don't forget to consider the time of year that you conduct your analysis so that the utility bill matches the devices you identify. How close do you come to matching the utility bill? Explain the differences in your estimate and the utility bill summary. It is not as easy as you first thought! Trying to estimate energy usage associated with devices that demand varying levels of energy depends on how they are operated and/or changes in external forces (temperature), is extremely difficult.

Organize all the energy using devices identified according to the amount of energy you have determined they use. List them in a table from the highest (top of the list) to the lowest (bottom of the list). Include a column on this table that indicates which of these devices you believe you can work with to conserve energy. Use a yes, no, or maybe to populate this column. This column should be developed at the time the devices are first identified and before any research is conducted to determine what steps might be recommended to conserve energy.

The second part of this Contest Challenge is to determine how to reduce the energy footprint you just identified above. You are not obligated to keep the devices you

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currently use, nor the electronic systems that operate those devices in your home/school. In fact, you are encouraged to seek more energy efficient devices/operating systems. **Be creative!**

Consider alternative energy sources that you could safely install and operate separate from your local utility. Some of these alternative energy sources will be contingent on where you live. Describe what those sources are, the feasibility of installing and operating them, and estimate the amount of energy that they would create to off-set the local utility. Don't forget to consider how much these systems would cost to purchase, install and operate. Do they cost more than the cost for energy provided by the local utility? Is it more sustainable? Make a case for why you would or would not recommend moving forward with implementing the alternative energy sources you have identified.

What other steps would you recommend in order to reduce your energy footprint? Think about the following incomplete list of areas to consider: lighting; heating; ventilation; insulation; windows; etc. Review your table of energy using devices and assess where you could reduce the amount of energy used with each device. Can you come up with recommendations that reduce your energy footprint by 10%, 20%, 50% or more? Don't forget to take credit for a consistent, reliable alternative energy source.

Go back to the table generated in part one and redo the table by adding the estimated reduction in energy you have determined by implementing your recommended actions. Indicate replacement devices or new steps that you are recommending that will reduce your energy footprint.

How much energy have you saved/conserved?

A list of the required submittals is presented in the following pages along with the contest rules and a description of the write-up required.



# AMERICAN ACADEMY OF ENVIRONMENTAL ENGINEERS

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# RULES

**Submit by:**  
**March 7, 2012**

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**Please read and adhere to the following contest rules:**

- Each project may be submitted by either an individual or a group/class. If a group/class submits a project, we suggest that the group/class be broken up into sub-groups to work on individual areas of the home/school.
- **Projects must be submitted by March 7, 2012.**
- We will have two categories that will be judged separately:
  - Middle School (Grades 5 through 8)
  - High School (Grades 9 through 12)
- The top winner in each category will have a chance to present their submittal in Washington, D.C. during the USA Science and Engineering Festival – Expo at the Washington Convention Center, April 28 and 29, 2012. For more information regarding the USA Science and Engineering Festival and the Expo at the Washington Convention Center, please visit their website at [www.usasciencefestival.org](http://www.usasciencefestival.org). The AAEE may sponsor one child representative, one school representative, and one parent from the winning submittal. Winners will be invited to attend the Expo at the Washington Convention Center along with their projects and be prepared to explain their work and answer questions from the people passing by and participating in the Expo. Individual details will be worked out with each winner.
- A submittal shall consist of:
  - An electronic poster that graphically depicts the areas in your home/school that you reduced/conserved the amount of energy used. This electronic poster will be part of the contest package you submit.
    - Place your name, school and category (Middle School or High School) on the electronic poster in the lower right hand corner.
  - A copy of the attached Application, completely filled in:
    - Make sure to indicate the contact person, and the contact person’s name, phone number and email address.
    - Include the full names and ages/grades of everyone involved on the project.
    - Include the full name and address of the school and supervisor/project coordinator if different from the contact person.

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- A written discussion (1,000-2,000 words typed in Times New Roman, 12 point, and double spaced). The write-up should consist of the following key discussion points:
    - A table listing all of the energy using devices you identified in your home/school, along with the estimated amount of energy each device uses and whether you believe you can find a way to conserve its energy use.
    - List the devices in the table in order of the amount of energy they use with the top energy users at the top of the list.
    - A discussion of how you calculated the amount of energy for each device. Please include all calculations and references used to estimate the amount of energy.
    - A discussion of how close you came to matching the amount of energy you estimated with the actual usage from the utility bill. Explain potential reasons for the differences.
    - A discussion of any alternative energy sources that you recommend. Describe how feasible this application is, the amount of energy it would create to off-set buying from the local utility, and the cost to install and operate. Explain whether the cost for this alternative energy source is more than what you are paying your local utility. Discuss whether the alternative energy is more sustainable and why you might recommend it over the local utility.
    - A discussion of other steps you recommend to reduce your energy footprint.
    - A second table that identifies the estimated reduction in energy you have determined for all the devices listed in the first table. Include any additional actions you recommend that will reduce your energy footprint.
    - A discussion of how much energy you were able to save and how easy/difficult you think it will be to implement these energy saving actions. Can you convince your parents/school to move forward with your energy saving recommendations? How would you go about convincing them?
  - The submittals will be judged on creativity, depth of research, functionality of alternative energy sources and energy saving approaches, and presentation. The electronic poster is visually an important component of the submittal and will be judged along with the accompanying write-up.

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**Submit by:**  
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- Contestants will be notified by March 23, 2012 of the results of the judges.
  - Each contestant will receive a certificate of participation from AAEE and their submittals will be posted on the AAEE website.
  - The top winner in each category will be offered an opportunity to participate in the Expo at the Washington Convention Center (April 28 and 29, 2012) in Washington, D.C. as part of the USA Science and Engineering Festival. Each top winner would be asked to spend one day, either Saturday or Sunday (to be determined by AAEE) at the AAEE booth with their poster to explain their research and conclusions to the festival attendees. One student, one school representative, and one parent will be invited to attend this two day event. Details will be worked out with the top winner in each category after the Judges results are final.

**AMERICAN ACADEMY OF ENVIRONMENTAL ENGINEERS**  
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**Application Form\***

**Submit by:**  
**March 7, 2012**

Category Submitting Under:  Middle School  High School

Name of School: \_\_\_\_\_

School Representative/Contact Person: \_\_\_\_\_

Name of Individual Student/Student Representative: \_\_\_\_\_  
(Attach names of additional student participants)

<p>School Address: _____</p> <p>_____</p> <p>_____</p> <p>School Email Address: _____</p> <p>School General Phone Number: (____) _____</p> <p>Contact Person Phone Number: (____) _____</p> <p>Contact Person Email Address: _____</p>
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**Send project submittals to:**

Contact AAEE via mail, call/FAX or send an email to:

AAEE  
c/o Mr. Joseph Cavarretta  
130 Holiday Court, Suite 100  
Annapolis, MD 21401

410-266-3311; FAX: 410-266-7653

[jcava@aee.net](mailto:jcava@aee.net)

\* Please be sure to place your Name, School and Category on the write-up and poster (in the lower right hand corner).