



Energy Whiz Expo  
 Lake Nona High School  
 April 2, 2016



## CENTRAL FLORIDA ENERGYWHIZ EXPO

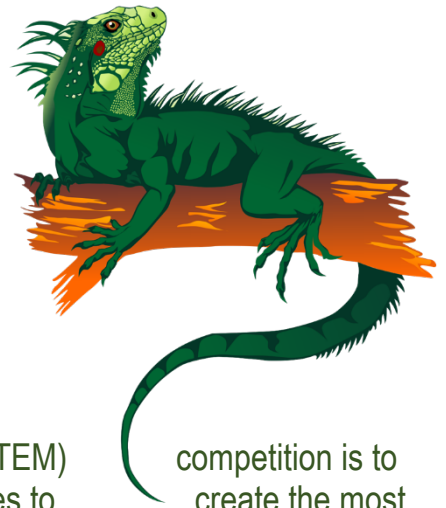
When	Saturday, April 2, 2016
Where	Lake Nona High School      12500 Narcoossee Rd      Orlando, FL 32832
Who	<ul style="list-style-type: none"> <li>• Students at all levels- elementary, middle, and high school</li> </ul>
What	<p>Three Competitions: (Rules can be found at <a href="http://tinyurl.com/z8mnloy">http://tinyurl.com/z8mnloy</a>)</p> <ul style="list-style-type: none"> <li>• <u>Junior Solar Sprint</u> <ul style="list-style-type: none"> <li>○ Design and race a model solar car (GRADES 4 - 8 ONLY)</li> <li>○ Teams of 2 – 3 students</li> <li>○ Elementary and Middle School divisions</li> <li>○ Medals will be awarded for race time, innovation of design, and best design</li> </ul> </li> <li>• <u>Solar Cook-off</u> <ul style="list-style-type: none"> <li>○ Design a solar cooker and develop a tasty recipe to cook in it</li> <li>○ Teams of 2 – 5 students</li> <li>○ Elementary, Middle, and High School divisions</li> <li>○ Medals will be awarded for cooker design, culinary (recipe and taste), and WOW! (creativity)</li> </ul> </li> <li>• <u>Critter Comfort Cottage-</u> <ul style="list-style-type: none"> <li>○ Design a cost-effective, comfortable “home” for a critter</li> <li>○ Create a communication and marketing piece aligning with the “home”</li> <li>○ Teams of 2 – 6 students</li> <li>○ Elementary and Middle/High School divisions</li> <li>○ Medals will be awarded for design and WOW! (creativity)</li> </ul> </li> </ul>
How	<ul style="list-style-type: none"> <li>• Organize student teams according to the numbers above- have teams select a team name and a captain</li> <li>• Register at <a href="http://tinyurl.com/gpg7tbd">http://tinyurl.com/gpg7tbd</a></li> <li>• Registration is required for <b>EACH</b> team (for example, if your school has 3 cooker teams and 2 car teams, you need to register 5 teams)           <ul style="list-style-type: none"> <li><b>**You will need the team name, the number of students on the team, the event they are competing in, and the captain's email address</b></li> </ul> </li> <li>• You will receive a Coach Waiver and Student Waivers via email once you have registered</li> <li>• Send in your Coach Waiver and Student Waivers to <a href="mailto:Valerie.ledford@ocps.net">Valerie.ledford@ocps.net</a> or bring them to the competition (you MUST have them on file to compete)</li> </ul>
Why	To encourage future scientists and engineers to explore science in their community and to problem solve while designing their solar car models and solar cookers. (Oh, and to have fun!)

# Critter Comfort Cottage

## RULES FOR THE CENTRAL ENERGYWHIZ EXPO

The Critter Comfort Cottage (C3) competition is a real-world, engineering and communications challenge for elementary (4 & 5 grades), middle (6-8 grades) and high school students (9-12 grades), which showcases energy efficient building design and construction.

The purpose of this Science, Technology, Engineering and Mathematics (STEM) competition is to utilize energy-efficient and green building design and construction techniques to create the most cost-effective, comfortable “home” for a critter. The **engineering, design and construction** team must also create a **communication and marketing** component which effectively describes the features and benefits of their Comfort Cottage for the critter they have selected. A critter in this context is considered to be any living creature, such as a mammal, bird, fish, insect, arachnid, amphibian or reptile.



### ENGINEERING, DESIGN AND CONSTRUCTION

Under the supervision of a teacher or mentor, each team of two to six (2 – 6) students is responsible for designing and building a pet home (“cottage”) that strives to provide maximum comfort for the critter that occupies the built space, while being as energy and resource efficient (“green”) as possible. Renewable energy technologies that enhance the comfort or quality of life for the critter are also allowed.

### DESIGN AND CONSTRUCTION:

1. Teams must build full-sized and fully-realized designs that can be actually occupied by the critter or critters, for which it was designed.
2. Research on the habits and needs of the critter that will occupy the space must be taken into consideration in the design of the structure. This research is to be documented in the design journal and reflected in the marketing component of the competition.
3. A representation or facsimile of the selected critter or critters is to be displayed along with the pet home at the EnergyWhiz Expo event; no live critters will be permitted.
4. All teams must be able to discuss their product with the judges and explain the energy efficient and green design and construction components. Refer to the Judging Criteria for what areas will need to be covered.
5. In the event that a team is unable to transport their design to the competition, the team must adequately convey to the judges the overall design features, product essence and incorporation of energy efficiency and/or green technologies into the structure. This can be done through any number of medium such as documents, photos, videos, simulations, schematics, charts, blueprints, drawings, etc. Teams should have enough supporting materials to adequately represent their design and student construction.
6. The constructed “cottage” may not have sharp points or edges that could injure the selected critter or someone who touches it.

***Projects that are deemed unsafe will be disqualified.***

## COMMUNICATIONS AND MARKETING

Each team is to create a marketing piece to accompany their design. The purpose of this is to highlight the energy efficient design, use of reusable or recycled resources and any green aspects of the structure. These can be in any format that the team chooses. The marketing piece should be geared toward the general public. The examples below are not meant to be exclusive; students are encouraged to be creative. Some marketing examples include:

- Brochure/flyer/handouts
- Video clip/television commercial
- Poster
- Web page

Teams will also be judged on how well the design is marketed to the judging team. This will include team member knowledge, verbal presentation to the judges, and salesmanship. Teams are also encouraged to interact with the public.

## COMPETITION DAY

- Display spaces will be outdoors. Teams are encouraged to bring umbrellas or canopies for shade.
- Each team will have a space ten feet wide, in which to showcase their design, marketing materials or anything else they choose.
- Tables and anything else needed for display should be brought by the team.
- The teams will be judged on their designs, as well as creativity and presentation. Judges will be looking for knowledge of energy efficient design, green construction techniques and use of alternative energy sources. In addition, the team should have an understanding of their chosen critter's optimum living conditions and what constitutes its well-being.

## JUDGING CRITERIA

- *Design Decisions*--How well does the team understand energy efficient/green building design? How well thought out are their design decisions? Was careful attention paid to parts selection and integration? Was proper attention paid to safety issues? How much energy has been saved? How was this calculated? What was the project cost or cost savings?
- *Construction Technique*--How well did the students construct their design? Is the design durable? Can the construction be altered to accommodate changing needs of the pet?
- *Design Function*--How well does the design function according to team specified energy efficiency goals? How well will it house the selected type of 'critter'?
- *Delivered Message*--How well is energy efficient building technology, green building practices and renewable energy represented both in the project and marketing?
- *Creativity of Design*--How creative is the design? Is it a novel or interesting solution to a problem?
- *Marketing Materials*--Do the marketing materials inspire interest or create demand for the product?

## CRITTER COMFORT COTTAGE AWARDS

The awards will be as follows:

- 1st Place Design (separate awards for middle & high school)
- 2nd Place Design (separate awards for middle & high school)
- 3rd Place Design (separate awards for middle & high school)
- WOW! Award, for the most creative/artistic entry



# Junior Solar Sprint

## RULES FOR THE CENTRAL ENERGYWHIZ EXPO

### INTRODUCTION & OVERVIEW

Each team is responsible for designing and building a solar powered race car. Cars are judged on design, innovation and performance. Each team's effort is focused toward the final event – a 20 meter, wire-guided sprint race where the best design and construction techniques will pay off with the win!!

### CAR PARAMETERS

The dimensions of a Junior Solar Sprint car cannot exceed:

- 30 cm. in width
- 60 cm. in length
- 30 cm in height

Teams will not be allowed to bolt the axles and wheels to the solar cell.

Each vehicle must have a panel on the side which is large enough to display a 3cm x 3cm number decal, which will be provided by the race committee. Each entry begins construction with:

- a 3V photovoltaic panel (Solar Made or Pitsco)
- a motor matched to the PV panel

The solar panel may not be modified. The motor may not be modified (i.e. rewound, lightened, etc.). The specific motor supplied with the panel (in the kit) must be used. If a replacement motor is needed, it must be purchased from the company who supplied the panel and be the model of motor originally supplied with the panel. One solar cell and motor are permitted per car. Any modification to the solar panel or motor will result in disqualification. At least one wheel must be driven by the motor.

Each vehicle shall:

- carry a standard, unmodified table tennis ball (aka ping-pong ball) of approximately 40mm in diameter,
- NOT glue, tape, or otherwise permanently affix the ball to the vehicle,
- NOT wedge the ball between the chassis and solar panel (using only those two things to hold the ball in),
- be designed to allow for the purposeful removal of the ball with minimal effort,
- transport the ball (without losing it) down the entire track.

Each vehicle must include:

- a battery holder mounted that is capable of holding 2 AA batteries. In the event of a severely overcast day, rechargeable batteries that have been previously charged by solar, will be supplied by the Florida Solar Energy Center (see Inclement Weather section below).
- a switch or other easy to operate method of 'switching on' the battery power at the starting line.

### CONSTRUCTION

Each team will add the additional parts needed for the construction of the car:

- wheels
- car body/chassis
- axles
- wiring
- connectors
- gears
- brackets

Individual decals may be affixed, and the body may be decorated at the team's discretion, but a 3 cm. square space must be left free on each side and the bottom for the Sprint decal number.

The material for the body of the car can be any type of light material.

### STEERING

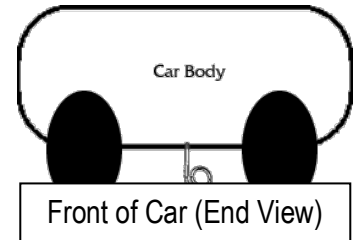


An eyelet (see examples below) must be attached to the bottom of the car (our example—bottom front of the chassis, however any placement on the vehicle is okay). A guide wire, 1 cm.(+/- .5cm) from the surface of the track, will go through the eyelet, serve as the steering mechanism, and keep the car in its lane. The vehicle must be easily removable from the guide wire, without disconnecting the guide wire. This is the only allowable method of steering the car. No radio control is permitted in Junior Solar Sprint cars. Lane changing/crossing will result in disqualification.

Eyelet

The vehicle must be safe to contestants & spectators (i.e. no sharp edges, projectiles, etc). Any energy-enhancing devices, like mirrors, must be attached to the vehicle.

**Failure to meet these expectations will result in disqualification.**



### TEAM LOG/JOURNAL

A Team Log which includes a component list is required to be submitted with the vehicle for technical judging.

The Team Log should contain notes on the design process, important points of the car's design and concrete decisions taken by the team to arrive at the final product. The Team Log should not be a finished, 'polished' document, but rather a collection of notes, sketches and test results of the design in progress. The purpose of this document is to help the design judges understand the decisions made during the design and construction process. These documents will not be returned to the teams, and parts of these documents may be published or disseminated to future participants. Failure to turn in a Team Log will result in loss of points in the design portion of judging.

The log document must include:

- team member names and roles/strengths
- amount of time spent on the vehicle
- specifications of final vehicle (size, weight, wheel size, gear ratio, etc.)
- component list--all parts purchased for your vehicle (including the name of the supplier and the price of the part)
- design and assembly process
- greatest obstacles (issues and problems encountered and modifications made)

The log document might include:

- design drawings
- electrical schematics
- formulas and calculations used
- photos taken periodically during construction process
- anything else the team wants to include for the design judges

### DESIGN JUDGING

Teams must submit their cars for initial inspection and complete a trial run on a guide wire before Design Judging. It is the team's responsibility to complete these steps prior to 9:15am. Cars arriving late will not be considered in the Design Judging.

### RACE PARAMETERS

#### RACE DIVISIONS:

The race will be conducted in two phases: time trials and a head-to-head competition for each division.

The **Green Division** is composed of teams where the member in the highest grade is in the **4th through 6th grade**.

The **Blue Division** is composed of teams where the member in the highest grade is in the **7th or 8th grade**.

#### TIME TRIALS:

During the time trial phase of the race, teams have the opportunity to attempt to have their vehicle drive down the track (a run) up to three times. After each run, the vehicle's time will be recorded. A 'DNF' or 'Did Not Finish' will be recorded for vehicles that lose their table tennis ball, drive off the track, do not cross the finish line, or are otherwise disqualified.

Time trials will be offered every two minutes for a given period of time. Event times will be posted the day of the race; teams are encouraged to perform their runs as soon as possible. It is a team's responsibility to line up and run their vehicle (up to three times) within the time allotted. Any teams in line when the end of the time trial event is called by the judges will not be allowed to run. When 'Go' is called, vehicles that do not start moving before the other vehicle reaches the finish will

be given a DNF and must be removed from the track immediately. If neither vehicle moves, the teams will be given 30 seconds after 'Go' is called before DNF's are given to both vehicles. Vehicles are then to be promptly removed. The ten teams in each division with the fastest individual run times will move to the head-to-head competition.

#### **HEAD-TO-HEAD COMPETITION:**

The head-to-head competition is a ten-team, double elimination event. This means that a team must lose twice before being eliminated from the competition. Teams will race against other teams in their division to determine the first, second, and third place winners.

#### **THE TRACK:**

- The racetrack is 20 meters long and 60 centimeters wide
- The track is set up on a hard, flat, smooth surface such as a tennis court.  
For the Florida EnergyWhiz Expos and the EnergyWhiz Olympic event, a non-slick vinyl surface will be used for the track lanes.

#### **THE STARTING LINE:**

- One team member will hold a piece of cardboard or other shading device over the panel, and remove it when the start signal is given.
- Team members may not push a vehicle to start it.
- Team members may not accompany the vehicle in its lane during the race.

#### **DURING THE HEAT:**

- One team member may free the vehicle from wire binding or track imperfections should such problems occur.
- Team members may not push the vehicle or give any other physical assistance.
- Team members may not change the vehicle's mechanical or electrical characteristics (e.g. shift a transmission) after the start of the heat.

#### **BETWEEN HEATS:**

- Repairs may be made to vehicles as necessary between heats.  
However, no extra time will be given for repairs, and the race will not be paused for repairs to be completed.

#### **THE FINISH LINE:**

- One team member must be present at the finish line to stop the vehicle, preventing any damage to it.
- The vehicle must remain in its lane at the finish line until the order of the race vehicles has been established.

**Decisions made by the racing officials are final.**

#### **INCLEMENT WEATHER:**

**Partially Cloudy** - Because weather in Florida is changeable, the race will not be postponed for partly cloudy or mostly cloudy weather. Teams should be prepared to race in all moderate weather conditions.

**Severely Overcast** - If the solar irradiance (amount of sunlight) averages less than 500 Wm<sup>2</sup> during a 15 minute period (as measured by equipment at the Florida Solar Energy Center) just prior to the **start** of either the Time Trials or one of the Head-to-Head Competitions, the race will be switched to a battery powered race. The Florida Solar Energy Center will loan the teams (2) AA rechargeable batteries that have been charged by solar and tested for charge level prior to distribution, as well as a 'shade' to cover the photovoltaic panel. Only the batteries supplied by FSEC may be used. From the time that the race is changed to batteries, it will remain battery powered and not switch back to solar, regardless of increasing irradiance levels. (Note: a typical full sun day at solar noon in Florida is usually 1000 Wm<sup>2</sup>)

**Rain/Thunderstorms** - If the solar irradiance averages less than 500 Wm<sup>2</sup> during a 15 minute period plus the amount of rain occurring makes the track unusable or unsafe, the race will be canceled. If one division has already raced, then only the second division's race will be canceled. If only the time trials have been run, those times will be used to award the race winners. If the time trial portion has not been completed, then only design awards will be given and no race will occur. The decision whether or not to cancel the race portion will be made by the event leadership team, and from the time that the race is canceled, it will not be reinstated even if the weather clears.

#### **JUNIOR SOLAR SPRINT AWARDS**

The awards will be as follows for each division:

- 1st, 2nd and 3rd Place, Race
- 1st, 2nd and 3rd Place, Best Design
- 1st, 2nd and 3rd Place, Most Innovative

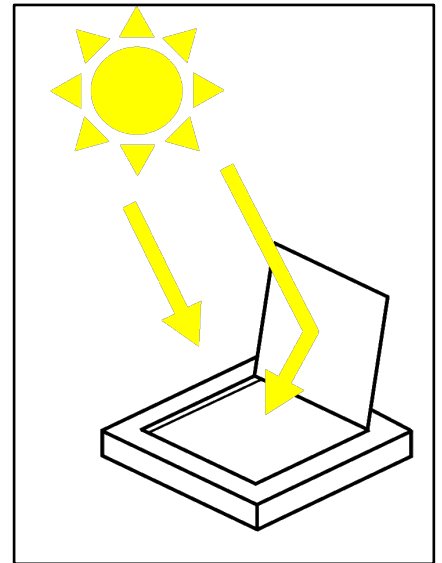
# Solar Cook-off

## RULES FOR THE CENTRAL ENERGYWHIZ EXPO

The **Solar Energy Cook-off** is a two part competition encompassing design of a functional solar cooker and the creation of a dish cooked in this same cooker. This competition was developed to provide a real world solar thermal challenge for upper elementary, middle and high school students.

### COMPETITION STRUCTURE

Each team of 2 - 6 students is responsible for designing and building a fully operational solar cooking device and then cooking a dish of their choice with their device. The challenge is to design an effective solar cooker and to pair the operational capability of the cooker to the type of food cooked.



### ELIGIBILITY REQUIREMENTS:

- Each competing team consists of 2 - 6 students in grades 4 through 12.
- The competition is divided into three divisions:
  - Yellow Division (grades 4 - 6),
  - Orange Division (grades 7 and 8) and
  - Red Division (grades 9 - 12).
  - Teams of mixed grade levels will compete in the division of the highest grade level student.

### CONSTRUCTION REQUIREMENTS:

- Teams may design and build any style of cooker (i.e. box, panel, parabolic, etc).
- Teams may use any non-toxic materials they wish to build their solar cooking device.
- Only students are allowed to build their cooker **-this is not a parent project**. However, for safety reasons, teams may have assistance with power tools, and may buy pre-cut parts such as glass or plexiglass. Adults are encouraged to monitor the use of tools.
- The solar cooker is to be powered exclusively by the sun using solar thermal energy to heat the food. No additional power sources are permitted for heating food. For example, photovoltaic powered hotplates are not allowed.
- The cooker submitted for design judging must be one created for this year's event, it cannot have been used in a previous Energy Whiz event. However, cookers from previous years may be used in the cooking process--teams may use several cookers to prepare their food, but must submit only one to design judging.
- All cookers must be large enough to cook at least (3) servings of the food to be judged.
- All teams **must complete** the cooker **CONSTRUCTION & DESIGN FORM** and turn in the morning of the event **AT CHECK IN**.
- Teams are expected to discuss their cooker design with a panel of judges, as well as be able to explain how solar cookers work.
- Extra design points will be given for unusual designs and creative use of materials such as recycled items.

### COOKING REQUIREMENTS:

- Teams prepare a recipe of their choosing and heat it using their cooking device.
- The food cooked must be paired to the operational capability of the team's cooker, such as heat attainable, type of cooking (baking, frying), size of cooker, etc. Since the weather on the day of the competition is unknown and can vary, teams may want to plan for different types of cooking conditions.
- Teams may use any kind of non-toxic cooking vessel or container.
- Non-cooked items may be added as garnish to a dish after it has been in the cooker. However, this garnish must be specified in the printed recipe.

- Recipe ingredients may not be added or subtracted the day of the event from those specified in the printed recipe given to the judges.
- The team must cook at least three servings of their dish to be judged. Teams may if they wish, cook additional servings for the public to sample after the official judging.
- The team's food will be judged on taste, appearance, creativity, complexity of recipe and general appeal.
- The team's recipe(s) must be printed out and at least (2) copies provided for judging. These copies must be turned in at registration. If the team wishes, additional copies may be made available for the general public.
- Teams must be able to discuss the cooking of their recipe with a panel of judges, as well as be able to explain why they chose this particular recipe.

## COMPETITION DAY

At the competition, each team will have a 10X10 area, in which to set up, cook their food, discuss their cooker with the judges and present to the general public. Each team is responsible for removing their cooker and any associated cooking debris from the premises once the competition is complete.

- Tables, decorations, and all required tools are to be brought by the teams
- At **CHECK IN**, teams should turn in their "Construction and Design" form **AND** their recipe
- At check-in, teams will receive team numbers that should be worn by team members during the day
- The teams are **judged** in two separate categories - **design and culinary**.

## JUDGING CRITERIA - DESIGN:

- Design Decisions--How well does the team understand solar cooking and solar thermal design? How well thought out are their design decisions? Was careful attention paid to parts selection and integration?
- Construction Technique--How well did the students construct their design?
- Function--How well does the design function as a cooking apparatus?
- Creativity--How innovative is the design? How creative is the use of materials? Is the design/project presented in a creative way?
- Durability – How well does the design stand up to human handling and variable weather conditions such as wind and humidity?

## JUDGING CRITERIA - CULINARY:

- **Suitability** - Does the prepared recipe fit the capabilities of the cooker design? Was the team able to prepare it easily? Did the team finish cooking in a timely manner?
- **Appeal** -How appealing is the prepared dish in appearance and taste?
- **Difficulty** -Was the recipe too easy (i.e. a simple heat and serve)?
- **Nutrition** -How nutritious is the recipe? Does the recipe use a variety of ingredients?

## RAIN DATE

The Solar Energy Cook-Off will not be canceled for cloudy weather—teams will be expected to do the best that they can in all weather conditions except hard rain. In the event of severe inclement weather, the culinary portion of the competition will be canceled. The decision whether or not to cancel the culinary judging will be made by the event leadership at 11: a.m. on the day of the event. The Design Judging and Awards will continue.

## Solar Cook-Off Awards

The awards will be as follows for each division:

- 1st, 2nd and 3rd Place Design
- 1st, 2nd and 3rd Place Culinary
- WOW! Award





Energy Whiz Expo  
 Lake Nona High School  
 April 2, 2016



# CENTRAL FLORIDA ENERGYWHIZ EXPO

## SOLAR COOKING CONSTRUCTION AND DESIGN FORM

Submitted by: (Team Name): \_\_\_\_\_ Team Number \_\_\_\_\_

Type of cooker: \_\_\_\_\_

*This form must be filled out ONLY for the cooker being submitted for design judging. (If your team has only one cooker, then use that cooker to complete this form.) You may extend answers onto another sheet of paper if necessary, or include photographs or other supporting material.*

List any help you received from non-team members (i.e. Home Depot staff, internet, parents, teacher, etc.). Include in this section any help you had with power tools, plans you downloaded or items that you had pre-cut at the store or shop.

Person/Source	Assistance Provided
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Where did the idea for your cooker come from? Be specific.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

What was your greatest challenge(s) during construction of the cooker? How were you able to overcome them?

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

On the back of this form (or attach graph paper), draw a **scale model** of your cooker. Include a scale and units, and use specific labels for all parts.