



**THE CYPRUS
INSTITUTE**

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THE CYPRUS INSTITUTE SOLAR CAR CHALLENGE

SOLAR CAR DESIGN GUIDE AND EVENT PARTICIPATION REQUIREMENTS

EVENT – JUNE 2019

Compiled by The Cyprus Institute

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Introduction

The purpose of this document is to provide the potential participating teams with the following general information and guidance:

- Technical areas that need to be considered during the design phase of a Solar Car.
- Possible parts suppliers and associated costs.
- Project Management.
- Provide references to some Internet sites that are directly relevant to the Cyprus Institute Solar Car Challenge.
- Documentation required by Cyl in order for teams to be accepted for participation in the event.
- Documentation required in order for the teams to be eligible for any financial support (funding) by the Cyl.

This document must be read in conjunction with the event rules, “**The Cyprus Institute Solar Car Challenge Rules**”.

Cyl reserves the right to make any changes to this document and to the Rules as it deems necessary. Any changes made will be notified to the potential participating teams through the web page which is to be set up by Cyl. It is the team’s responsibility to ensure that they become aware of any changes by frequent visits to the relevant web pages.

It should be noted that this document is not intended to be a complete guide as to how to design a Solar Car but it is merely intended to provide a general guide during the initial design and costing phase.

I. Technical areas to be considered during the design phase

1. **Read the Rules** - The Cyprus Institute Solar Car Challenge 2018 Rules
2. **Background reading** -
Dell Winston Solar Car challenge, (www.winstonsolar.org/challenge/)
The Dell Winston Solar Car Challenge is a very useful Internet site and contains a wide range of very relevant information including the following:
 - a. how to build a solar car,
 - b. technical schematics,
 - c. parts suppliers and approximate costs,
 - d. a wide range of solar cars with their dimensions, weight, motor type, solar array type etc.
3. **Background reading** - Appendix A of this document provides general information on the following:
 - e. Simplified block diagram of Pascal Solar Car and motor characteristics,
 - f. Maximum theoretical speed, thrust force and climbing angle calculations,
 - g. Aerodynamic design aspects of a solar powered car
 - h. Various solar car designs
 - i. Measurement of Drag Coefficient, Cd in a school laboratory
4. **Wheel configuration and suspension** - three or four wheels and type of suspension?
5. **Tire dimensions** - diameter, thickness and pressure?
6. **Battery bank** - voltage, capacity, mass?
7. **Drive system** - hub or chain/belt driven?
8. **Maximum design speed** - wheel radius and corresponding rpm?
9. **Motor selection** - brushed or brushless, power rating, rpm, torque, efficiency?
10. **Motor controller selection** - suitability for chosen motor and maximum speed?
11. **Solar cells or solar panels** - power requirement and configuration?
12. **Solar panel/cells** - Dimensions, area and power?
13. **Solar charge controller** - number to be used, standard or MPPT, efficiency?
14. **Auxiliary electronics** - speedometer, odometer, lights, turn indicators, voltage, power, step-down DC to DC converter?
15. **Array and battery disconnect** - electrical high current disconnect switches/circuit breakers?
16. **Chassis mechanical structure** - dimensions, materials, solar panels/cells support.
17. **Chassis and solar panels/cells arrangement** - unified body and panel or separate cab and panel (see Appendix A)
18. **Breaking system**- hydraulic or mechanical?

19. **Parts salvage** - are there any individual parts from broken down cars, scooters etc. that can be potentially used in certain areas?
20. **Solar car weight** - estimated mass, acceleration, climbing capability?
21. **Regenerative braking** - what would be the benefits in this event and is it important to incorporate?

II. Project Management

Among other aspects of managing the overall project by the various teams, the following areas need to be considered:

1. **Team structure** - how many people and their responsibilities (task allocation)?
2. **Race registration** - how and what information is needed to register for the Cyprus Institute Solar Car Challenge? See Paragraph III on the next page.
3. **Team training** - how can the team members be made familiar with the design process and the technical/practical skills required?
4. **Location** - Where will the construction take place?
5. **Pricing of parts and datasheet collection** - cost breakdown and manufacturers technical documentation for the various parts (motor, batteries, charge controller/MPPT, motor controller, solar panels/cells, other items or services).
6. **Lead time of various parts** - how long will it take to have the various parts available?
7. **Time Plan** - produce a time plan of the time required to complete the various activities until the completion of the project.
8. **Testing** - at what stages will extensive tests be carried out and how much time should be allocated?
9. **Driver training** - when and how?
10. **Planning for the race** - transportation of solar car etc.?
11. **Safety** - What safety steps need to be taken at each stage of testing and manufacturing? Who would act as the safety officer and how would they be trained?

III. Design Phase – Documents and drawings to be produced and submitted to Cyl

In order to be considered for participation in the Cyprus Institute Solar Car Challenge, each team must submit the following information to Cyl not later than 20th January 2014.

2. **Data Sheets** – Each team must submit data sheets for the following major parts:
 - a. Motor
 - b. Motor controller

- c. Charge controller/MPPT
- d. Batteries
- e. Solar panels/cells

3. Drawings –

- a. Complete, detailed drawing(s) showing the mechanical structure of the vehicle. These should be drawn with a drafting program such as AutoCAD or Corel Draw. The drawing(s) must include crush zones, frame structure, and overall dimensions in three views (front, side, top).
- b. A complete, detailed schematic wiring diagram showing the electrical layout of the vehicle. This schematic must include but does not need to be limited to all the wiring for the propulsion, instrumentation, and battery systems.

4. Solar car specification - the specification should include the following:

- a. Estimated weight and maximum speed
- b. Dimensions including solar panel
- c. Number of motors
- d. Number of charge controllers/MPPTs
- e. Number of solar cells/solar panels
- f. Total number solar cells/solar panel area
- g. Total mass and number of batteries.
- h. Solar car body type, unified airfoil body and panel or separate cab and panel

5. Cost breakdown of the following items:

- a. Motor
- b. Motor controller
- c. Charge controller
- d. Batteries
- e. Solar panels/cells
- f. Estimated cost of all other items

6. Schedule for major activities until completion and testing of the finished design.

All the above documents will form the basis for event participation acceptance.

Updated drawings/schematics must be submitted if there have been any design changes since the first drawing was submitted.