



# AGL | Perth Energy Solar Car Challenge

## 2023 Rules and Regulations

Version 1.0

The AGL | Perth Energy Solar Car Challenge aims to deliver a firsthand educational experience to high school students in the areas of Science, Technology, Engineering and Mathematics (STEM) with an emphasis on design, engineering and renewable energy. The event has been designed to expand student learning and provide a practical experience in designing and building a functioning solar-powered vehicle, to gain an understanding of the engineering processes involved and recognise the importance of renewable energy for a sustainable future. It also focuses on getting students to work together as a team and demonstrate, apply and effectively communicate their learnings.

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# Administration of the Event

## Overview

Students are challenged to design, build and race their very own solar-powered cars. Guided by teachers and mentors, students will learn and incorporate science and engineering principles into their design. Testing their ingenuity, students will participate in a two-day event to determine the fastest car on the 90-metre, two-lane figure-8 circuit.

## Spirit of the Event

Students will work cooperatively in teams, applying new skills and knowledge in building and racing a solar-powered car. This opportunity is available to all high school students and in the interest of a fair and genuine learning experience, teams must strictly follow the AGL | Perth Energy Solar Car Challenge rules and regulations as outlined in this document. The competition is about utilising everyday resources and encouraging innovation without a large financial cost.

## Interpretation of the Rules and Regulations

The rules and regulations have been simplified for the AGL | Perth Energy Solar Car Challenge to encourage wider participation across all Western Australian high schools. In the case of a conflict/s, the Australian - International Model Solar Car Challenge Regulations will be used as guidance. However, the event organisers have the right to make decisions for any situation that arises not covered by these rules.

## Entries

The event is open to all Western Australian high school aged students. Schools may enter up to four cars in the AGL | Perth Energy Solar Car Challenge in October/ November; provided the car designs are different and original from each other. Teams must design, build and race their own car; no commercially built cars will be accepted. This only refers to the structural frame and body, not to the drive train components such as gears, shafts, bearings, wheels, tyres, or to suspension and steering components.

## Registrations

All schools/teams must register their expression of interest and participation online. New schools entering for the first time are also eligible to receive up to four free solar model car kits. There are a limited number of free kits available and they will be allocated on a first come, first served basis. A month before the competition, teams will be provided with event information and will be required to confirm their entries.

## Timeline

Date	Event Description
May	Expressions of interest opened
May - July	New schools will start to receive their solar model car kits
May - October	Students design and build their solar model cars
September	Team registration for the Race Days opens
October	AGL   Perth Energy Solar Car Challenge – Race Days
November/ December	Top four teams invited to represent Western Australia at the Australian -International Model Solar Car Challenge (State TBC)

## Contact Details

Mr Jun Hua Guo  
Coordinator, AGL | Perth Energy Solar Car Challenge  
Mobile: 0423 410 681  
Email: [solarchallenge@uwa.edu.au](mailto:solarchallenge@uwa.edu.au)

# Event Details

## Scrutineering

On arrival, all teams must register and have their student-designed and built cars scrutineered to ensure they meet the Rules and Regulations. Any car failing to pass scrutineering may have a 50-200g weight penalty added to “level the playing field”. This will be at the discretion of the head scrutineer. Once teams have had their cars scrutineered, they are able to test and race their cars.

## Figure 8 Track

A 90-metre “figure-8” track with a low bridge at the crossover point will be used. The corners will feature curves with an approximate 5-metre radius. The track will have a predominantly smooth surface with two parallel guide rails with dimensions 16mm wide by 16mm high. Car designs must allow for minor misalignment of joints.

## Racing

A number of Round Robin races will be held on the first day to determine the top 32 cars. These cars will then participate in elimination races the following day, until the fastest cars are determined. Before each race, teams must collect an official racing solar array to install on their cars. Teams will then line their cars up at the start gate before being counted down: “Ready, Set, Go”. The winning car will be the first car to cross the finish line, or to go the furthest in the case where both cars do not complete the lap, or if the other team’s car comes off the track. Practice and testing will be permitted when the track is not occupied for official use. Teams may also make modifications/ adjustments to their car when they are not called for racing. Where a car is significantly damaged, additional time may be provided to repair their car.

## Video Presentation

A key aspect of any innovative engineering endeavour is being able to effectively communicate the process. Upon registration, teams must also submit a 3–5 minute video presentation documenting:

- The Team – Introductions and roles, team slogan, and something unique about the car
- Renewable Energy - How does it work and what is the impact on the automotive industry?
- Design Phase - How the car was designed and what was the design process?
- Build Phase – How did you bring your car to life and describe the materials or techniques?
- Testing – How did you test your car, include footage and tell us about your testing and results.

### Video Marking Criteria

Item	Points
Team Intro and Layout of Video	5
Renewable Energy	5
Design and Engineering Process	10
Knowledge and Understanding of Project	5
Video Presentation	5
<b>Total</b>	<b>30 points</b>

## Awards

Awards will be presented to cars that finish First, Second, Third and Fourth, all of which will be invited to participate in the Australian - International Model Solar Challenge. Limited financial sponsorship will be made available to assist teams with flights and accommodation. Additional prizes for the Best-Engineered Car, Best 3D-Printed Design, Best Eco-friendly Car, Best Video, Greatest Team Effort, Most Spectacular Crash etc. may be awarded. All participants will receive a certificate of participation.

# Car Specifications

**Size Limit:** Maximum car size - 500mm long, 150mm high and 320mm wide. At no time may any part of the car extend sideways more than 190mm from the centre of the guide rail.

**Motors:** Cars must be driven by a Scorpio Technology motor - SM403. The motor can be purchased from [www.scorpio technology.com.au](http://www.scorpio technology.com.au) for \$9.13 each.

**Wheels:** To reduce damage to the track, knife-edge wheels are not allowed. Each wheel must be at least 2mm wide or have a radius of 1mm on the running surface.

**Cargo Area:** Cars are required to carry at all times when racing one standard undeformed, full 375ml drink can (unopened). The can must be transverse to the direction of travel.

**Side Panels:** All cars must have two rigid side panels, one on each side for the car's name, visible to spectators and with an additional 100mm long × 50mm high space for the event sponsored sticker.

**Steering (Appendix A):** Each car must incorporate a means of steering around the track. The guide rails are approximately 16mm wide and 16mm high. The steering mechanism must be designed to operate on the outside of the guide rail.

**Driver (Appendix B):** Each car must have space for a driver to navigate the track. To see where they are going, the driver must have 180° vision in the horizontal plane and 90° upwards forward of the vertical plan. These occupants will be a regular raw ~50g egg provided by the organisers.

**Stopping Block:** Cars will need to be capable of withstanding a collision with a weighted styrene foam stopping block approximately 400mm long, 250mm wide, 100mm high and approximately 500 grams.

**No Energy Storage Systems:** No energy storage system, whether electrical, mechanical or chemical, which assists in the performance of the car, will be permitted.

**Electronics:** Electronics of any kind are allowed but will need to be documented at registration on the day. Any capacitors on the electronic circuit will be fully discharged before the start of the race. The AUTOMAX SOLAR MPPT and PICSPPC08M are the most commonly used Maximum Power Point Tracker (MPPT) and can be purchased from [Scorpio Technology](http://Scorpio Technology).

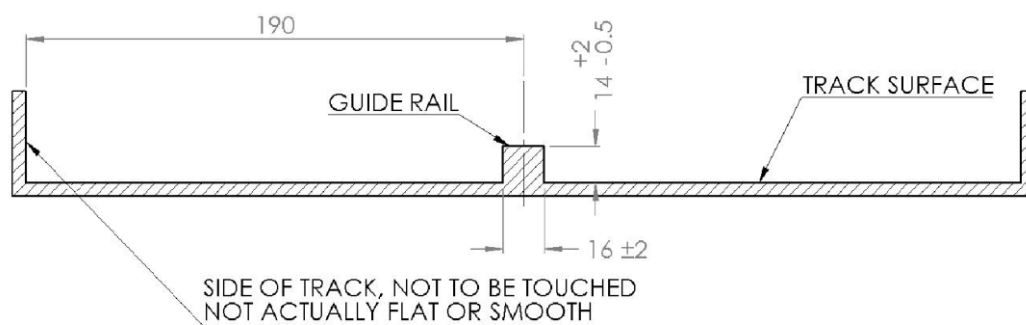
**ON-OFF Switch and Wiring:** Each car must be fitted with a commercial 'ON/OFF' switch with all wiring and electronics visible when scrutineered. Cars must be able to connect to 4mm banana sockets on the solar array.

**Solar Array (Appendix C):** All races and time trials will be conducted with the PV array provided by the organisers. Cars must be able to detach/attach and connect to the PV panel quickly. Arrays provided by the organisers will have a power output of 5.5 watts +/- 0.1 watts.

Typical electrical output of the provided array at AM 1.5, 25 Deg. C when connected in series:

Volts open circuit	8.64V
Volts at maximum power	6.88V
Current at maximum power (amps)	0.808A
Current at short circuit	0.9A
Maximum power (watts)	5.56W

# Appendix A – Track and Steering

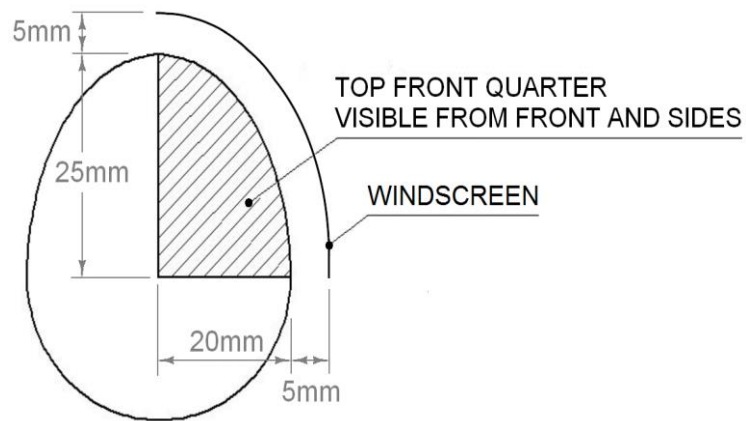


**Note: The Western Australian track does not have sides on it.**

## Appendix B – Driver

In the case of adverse weather, the driver ~50g eggs, would prefer to remain dry, so the cabin must be totally sealed from the elements to prevent water getting inside – or broken eggs on the track! The windscreen must have a clearance (not closer than) 5mm to any part of the driver.

During the race, if the driver suffers an injury (any damage at all) that team will lose the race. Eggs will be checked after each race. It will be the team's responsibility to provide medical attention to the eggs (clean up the mess!).

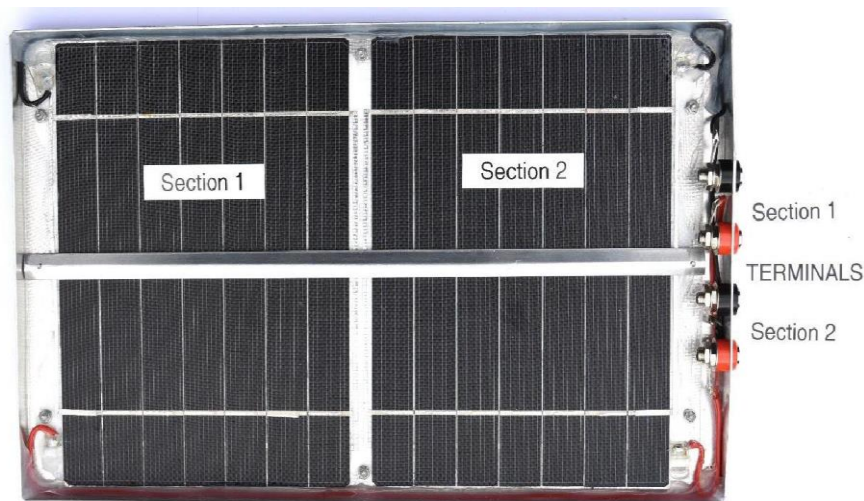


# Appendix C – Solar Array

**Dimensions:** Overall dimensions, length 276 to 280 mm not including the terminals, width 165 to 170 mm, maximum height of sides 20 mm at terminal end, other sides 12 mm. Weight 240 plus or minus 15 grams.

**Terminals:** Kits include a set of banana plugs to connect to the Jaycar sockets mounted on one end; catalogue PS-0406 (red) PS-0408 (black). Banana sockets are spaced at a nominal 20 mm (+ or – 2mm) apart. Solar Arrays will have a set of banana plugs already plugged in to make it in series configuration.

**Mounting:** Velcro loop tape 25 mm wide is available all around the outer edge on the back. The fluffy side will be mounted on the Solar Array.



## Resources & Website Links

[Australian-International Model Solar Challenge](#)

[Scorpio Technology](#)

[R&I Instrument & Gear Co](#)

[Tasmanian Model Solar Challenge Help Resources](#)