



Questions continue to be received concerning regulations for the 2013 event published on World Environment Day 2012. The World Solar Challenge is primarily a design competition - create a solar EV to a given set of criteria (Regulation 1.6). Having adopted UNECE and NCOP regulations as the basis for our individually constructed vehicles, there is an opportunity for young engineers and designers to work to the real world specifications and standards, thus extending the experience and educational value beyond the traditional boundaries of the event.

These notes have been prepared to assist in the interpretation and clarification of the requirements. Teams that build Solar EVs with small margins for error may experience anxiety during scrutineering.

World Solar Challenge FAQ at 1 January 2013

This document is arranged in two parts: Clarification of Regulations and General Questions concerning the event. If your question is not answered, please email teams@worldsolarchallenge.org

Part One - Clarification of Regulations

- * **Regulation 2.7 and 2.8** apply to Challenger and Cruiser Class Solar EVs only.
- * **Regulation 2.14** The chassis may form all or part of the safety cage. The safety cage may be made from any appropriate material, provided that the structure is capable of protecting the driver from an impact of 5 G from any direction. Documentation will need to show appropriate modelling.
- * **Regulation 2.15** Cruiser Class vehicles aim to be practical. Local road traffic authority requirements differ around the globe. Teams seeking the ultimate accolade of practicality - that of having a licence plate allowing their vehicle to be used on their own public roads - will need to meet the requirements of their own country. As mentioned in the preamble, meeting design criteria is an essential part of qualifying and it is an event requirement that vehicles have rollover protection. There are many published standards for this aspect of design and the requirement is for the entrant to nominate, and document, the standard the Solar EV is designed to meet.
- * **Regulation 2.17** Challenger and Cruiser Class Solar EVs must be designed so that no part of the structure of the car lies inside the region 45° forwards and 25° backwards of the reference point shown in the diagram accompanying Regulation 2.17. It is acknowledged that ambiguity with broader regulations is introduced by the fact that the NCOP allows (a) head-space encroachment by the windscreen and (b) does not consider roll bars as original equipment.

The technical committee of the WSC have determined that, for the purposes of the event, the entire area described by 2.17 must be clear because it is the region that the driver's head may pass through in the event of a crash.

If a rear seat is fitted, the front seat may lie inside the forward arc segment of the rear seat, as shown in the diagram. Teams should consider the use of appropriate padding on the back of the front seat if it could be struck by a passenger's head in a crash.

Non-structural components such as the steering wheel, rear vision mirrors and parts of the dashboard containing controls may lie wholly or partly inside the head space region defined in Regulation 2.17, but should be designed to minimise the severity of injury in a crash.

This regulation will be tested at scrutineering by placing a gauge on the reference point shown in the diagram on Page 12 of the regulations. The lateral extremities of the gauge will extend 100 mm each side of vertical, measured along an arc about the pivot point.

*** Regulation 2.18** Challenger and Cruiser Class Solar EVs must be designed to meet all parts of this field-of-view regulation.

For eye heights less than about 1.9 m, designs that comply with the second part will also comply with the first part.

If the forwards direction of travel is considered to be 0 degrees, "every forward angle" means every angle, about a vertical axis, between -90 degrees and +90 degrees.

The driver must have direct line of sight to every forward angle.

All measurements will be taken with the seat at its lowest position and the driver's posture in the normal driving position. The driver may move within the constraints of the seatbelt system in order to overcome any blind-spots such as may be caused by structural pillars.

An individual driver whose physical stature falls into the lowest 2.5 percentile of adult heights, may use a seat cushion/booster seat when testing the vision requirements, provided that the driver's head is within the defined head space and that the seat head restraint is still effective. The booster seat must have a means of identification, and used by the individual at all times whilst driving. Should a team contain a driver who falls into this category, the Team Manager will be required to prove the case and the Observer will ensure the approved booster seat when the individual concerned is driving the solar EV.

***Regulation 2.27** In practical terms, the seat angle is no longer relevant to posture as it is free to be adjusted for driver comfort within the designated space. The posture of the occupants will be assessed by observation. It will be easy to confirm that the heel position is lower than the seat. The angle between the shoulders, hips and knees will not be measured at scrutineering. However, if the angle appears to be significantly less than 90 degrees, scrutineers will ask the team to demonstrate that the angle is compliant with the regulation.

* **Regulation 2.49** Regulation Bulletin #1 2012 allows approval to be sought to use tyres that do not have (E) or DOT compliance markings.

Any team wishing to apply for tyre approval must arrange for a sample tyre to be delivered to the WSC office with the supporting documentation required (including information on supply) for evaluation.

***Regulation 2.61** Vehicle Identification Numbers must be indelibly engraved and permanently attached to a structural member visible to inspection without dismantling the vehicle (in the cockpit is good).

* **Regulation 2.65** The rectangular signage area at the leading edge of the car is for the benefit of the entrant and their team sponsors. It does not have to be horizontal. It may wrap around the curve of the car. It may be placed at any orientation. The event logo will be supplied. Teams who choose not to use the area for the benefit of their sponsor will still be required to show how they have met the design requirement to provide unbroken space and should bear in mind that the requirements of 2.65 demand that the name of the entrant, the car, the country and the event logo are clearly visible to a person standing 5 m in front of the solar EV.

***Regulations 2.68 and 2.69** High-current circuits must be capable of mechanical isolation. Using a mechanical switch to operate a non-mechanical isolator on the high-current path is not acceptable. The mechanical isolator should be capable of opening when normal, and even abnormal, currents are flowing. An AC circuit breaker may not be suitable for interrupting DC current.

A low voltage supply to power instruments and control systems may be provided from component cells or a DC-DC converter inside an energy storage pack. It is permissible to have a low voltage supply enabled while the high voltage supply is isolated, provided that the driver is able to isolate all power supplies, both high voltage and low voltage, so that any conductor emerging from an energy storage system is incapable of delivering more than 10 mA. The emergency stop switch must also isolate all energy supplies capable of delivering more than 10 mA.

Starting the car will usually require closing a contactor in each energy supply pack. There are a number of ways that a contactor can be closed without having more than 10 mA emerging from an energy storage pack while the pack is isolated. These may include:

- * mechanical remote actuation or pneumatic switch
- * an external low-voltage capacitor trickle-charged from a low-current supply from an energy storage pack.
- * a low-current loop that can enable the low-voltage supply (this option must not be able to operate when the emergency isolation is engaged).
- * a novel method you have yet to think of.

Once a low-voltage supply has been enabled in an energy storage pack the car is considered 'on' and more than 10 mA can be supplied from this pack to the other storage pack (if there is one) or to the solar panel contactors.

* **Regulation 2.77** Teams wishing to use a mixture of photovoltaic cell types should propose a configuration to the Organisers for approval. It is reasonable to propose

a configuration such that if the proposed area of silicon cells is A_s then the maximum allowable area of GaAs cells is $A_g = 3 \times (1 - A_s/6)$.

* **Regulation 2.82** Capacitors other than described by 2.82 are considered part of the energy storage system and may be charged at the start, however the requirements of Regulation 2.87 apply and the allowable mass will be determined by the Chief Energy Scientist.

* **Regulation 6.13** For Cruiser Class and Adventure Class, the Darwin – Adelaide time will be the sum of the stage times. It will not include the time allocated for Control Stops, but will include penalties.

The stage time for a stage is:

- ✱ the elapsed time between the stage start time and team's arrival time at the end of the stage.
- ✱ less the time between the daily finish time and the daily start time for each overnight stop
- ✱ less the designated control stop duration for each intermediate Control Stop

- ✱ plus any / all outstanding penalty times.

Part Two – General Frequently Asked Questions

I need an instant answer – who is the best person to contact?

All questions regarding the event should be addressed to teams@worldsolarchallenge.org This will allow the question to be answered by the most appropriate person. It may be mid afternoon for you, but calling the Event Director at 3am Central Australian Time will not speed up the process!

Different members of our team got different answers to the same question – what can you do about that?

If an individual puts a question without any context we will do our best to answer it, but it is too easy for the same question to be put in different ways. It is helpful to have some supporting information such as a team, class, or by directing all questions through one member of your group. Once your team registration has been accepted, our policy is to only communicate with the Team Manager. In practical terms, this policy is satisfied when the Team Manager is copied into emails.

Can I put my questions directly to the technical faculty?

The Technical faculty are all busy people who give their time to the World Solar Challenge. They also travel extensively so writing to them personally may only delay an answer. Whilst there will be times when team managers are invited to have direct contact with technical faculty members, all questions should be addressed to teams@worldsolarchallenge.org in the first instance.

How will the new Cruiser Class be managed?

Cruiser Class will be divided into four stages. Teams will travel between stages in the traditional format of making their own camp at the end of each day. The intention

is that Cruiser teams will camp together at the end of each stage (Tennant Creek, Alice Springs and Coober Pedy) where they may, if desired, recharge from the electricity grid overnight. The Organiser will arrange a 'powered camp' site, typically with single phase 10A 240v power outlet. Entrants may choose to make other arrangements at their own cost.

It is proposed that the start times for Cruiser Class stages will be:

- ✿ *Darwin: 08:30 on Day 1*
- ✿ *Tennant Creek: 08:00 on Day 3*
- ✿ *Alice Springs: 07:00 on Day 4*
- ✿ *Coober Pedy: 08:00 on Day 5*

or such other times as determined by the Organisers.

Teams will not be allowed to start a stage before the designated start time. Teams arriving at the end of a stage after the daily finish time will be given a time penalty (Regulation 6.65).

Teams not able to keep up will be required to trailer forwards. The start order of each stage will be determined from previous stage times. Evolution Class participants are not time competitive, however, it is part of the event risk management strategy that they are not left in desert unsupported. For these reasons it is essential that Evolution Class vehicles keep up with the progress of the event. This calls for an average progress of 500Km per day (3000Km over 6 days). Key progress indicators will be that Evolution Class vehicles meet the time stamps required of Cruiser Class.

When can we expect the exact route to be announced?

The traditional route of the World Solar Challenge is from Darwin city centre to Adelaide City centre. There is only one road across the centre of Australia, the Stuart Highway, which runs for 2700Km from Darwin to Port Augusta. The final 300Km completes the journey from Port Augusta down to Adelaide on Highway One.

To ensure the most accurate information as possible is available at the time of the event, detailed route notes with timing and location of those control points which will be declared before the start of the event will be published following the final route survey scheduled for July 2013.

When can we expect technical templates to be circulated?

We anticipated that these will be published in February 2013.

Do I need a visa to come to Australia?

The documentation required to travel as a visitor to Australia depends on your country of origin. Many nationalities may enjoy the online Electronic Travel Authority (ETA) scheme, while others may need a tourist visa. Members of commercial film crews and media representatives may need other visas. Full information on visa requirements are published at www.immi.gov.au

The Organisers will seek 'Event Status' with Customs and Immigration which will make applications easier and mean that there will be no requirement for "Letters of Invitation". Letters confirming registration may be provided to assist those who require exit visas for their own countries, but should be requested in plenty of time

Where can I get a VIN Number for my solarcar?

While Regulation 2.61 requires a unique identification number, it is not an event requirement for this to comply with any international standards. If the customs authorities in your own (exporting) country demand a 17 digit ISO VIN, it would be wise to contact the local motor vehicle registry in the first instance stating that the number is required for customs purposes as some countries use the US standard (ISO 3779) which is different to the standard used in other parts of the world (ISO 3780).

Should you wish to construct a full 17 digit number, you will find sufficient information on each of the 17 segments to allow an ISO VIN to be constructed that contains a valid check digit at: http://en.wikipedia.org/wiki/Vehicle_Identification_Number

Teams with Cruiser Class vehicles seeking road registration should consult their local authorities.