



**Challenge Regulations  
for the  
2014 Event**

28.09.2014. Release version 1.1

This document should be read in conjunction with the Technical Regulations

## 1 Introduction

The European Solar Challenge presents itself in the year 2014 with a totally new concept. In the past the Events have been smaller and have taken place in public places. This year a lot will change as the ESC will take place on the former Formula-1 race circuit Zolder in Belgium, surrounded by a great framework event concerning the topic of electro-mobility.

The challenge for the Teams during this event is focused on the strategy development to successfully perform a long run solely with the energy of the sun. It's a "brain" Sport!

This document provides the details of the challenge regulations in order to ensure a smooth and fair procedure of the different challenges. If you have any questions or concerns about these regulations, please do not hesitate to contact us. In this case Yago Elbrecht (yago.elbrecht@europeansolarchallenge.eu) will be the contact person.

We are looking forward to welcoming you at the event and we are hoping for an exciting, fair and entertaining event.

The Event Organizers

## 2 General Information

### 2.1. Race Circuit Zolder

Address:  
vzw Terlamen  
Terlamen 30  
3550 Heusden-Zolder

Phone: +32 11 85 88 88

[www.circuit-zolder.be](http://www.circuit-zolder.be)

### 2.2. Data

Location Heusden-Zolder, Belgium  
Length 4.011 km (2.492 mi)  
Turns 10

For detailed site plan see appendix A.

### 2.3. Flag Signals

Flag	FIA-sanctioned championships	Location	Use
	Start of race / Restart / End of hazard / Safe racing conditions / Pit lane open	Whole course	Waving flag
	Local caution / Full-course caution (if displayed with "SC" sign Safety Car on course)	Whole course	Waving flag / if necessary shown with „SC“ sign
	Debris, Fluid, or Oil on track	Whole course	Hold still
	Session stopped	Whole course	Waving flag
	Slow vehicle on track	Whole course	Waving flag
	Faster car approaching — during races / Lapped cars should give way to faster cars	Whole course	Waving flag
	Session finished / Winner	Race organizers only	Waving flag

2.3.1. Only for the ESC relevant flag signals are listed

2.3.2. Non-compliance of the flag signals will lead to time-penalties which will be assigned by the race control.

## 3 Race Organisation

### 3.1. Race Commission

- 3.1.1. Every team has to provide **one team member** for the race commission. As follows the Race Commission will consist of one team member of each participating team and **one** person from the race control of the organizers
- 3.1.2. The Race Commission makes decisions by majority.
- 3.1.3. A person of the race control will organise and lead the race commission, however does not participate in the votes.
- 3.1.4. All race commissioners have to be available on Friday the 10th of Oct 2014 from 9h00 to 11h00 for a meeting. Not providing a team member to this meeting will result in the immediate disqualification of the team.
- 3.1.5. The task of the race commission is to clarify discrepancies regarding the regulations. Furthermore, the race commission takes decisions concerning unpredictable influences respecting the race e.g. the termination because of heavy rain.
- 3.1.6. Each team is allowed to call a meeting of the race commission **once** during the event. Every further summoning will cost the team 500 € **Exception:** The race commission can be summoned as soon as more than 50% of the teams have the same objection.

### 3.2. Race Control

- 3.2.1. The race control consists of three persons decided upon by the event organizers.
- 3.2.2. The task of the race control consists in the surveillance and controlling of the race event. All communication channels during the event end up at the race control. The race control decides about the release of the race circuit, status of the flags, time penalties and the safety car inclusions.
- 3.2.3. If discrepancies exist the teams can contest time penalties through the race control. The objection will cost the team another time penalty. One again, the issue will be examined together. If the race control decides in favour of the team the time penalty will be adjusted or withdrawn.
- 3.2.4. The race control can always summon the race commission.

### 3.3. Line-up and Raffle

- 3.3.1. After the scrutineering the raffle will follow. The start-numbers of the teams that have passed the scrutineering will be placed in the draw pot and will be drawn by the Fairy of Fortune.
- 3.3.2. The order of the start-numbers corresponds with those of the line-up for each Challenge.

### 3.4. Safety equipment

The teams have to dispose of the following equipment:

- 3.4.1. First-aid-box, ABC fire extinguisher (10 kg or more), reflective vests for all team members, battery datasheet, battery safety container and a safety method to extinguish a battery fire.
- 3.4.2. The battery safety container and first-aid box have to be ready to use in the pit lane. Each team member, who is on the pit lane or the race track has to be wearing a reflective vest.

### 3.5. Support vehicles

- 3.5.1. Without an allowance **no** supportive vehicles are allowed on the race track.

### 3.6. Safety vehicles

- 3.6.1. Safety vehicles will be driven by the official event organizers of the ESC or by employees of the race track themselves (ambulance).

If a safety car is required it will drive on the „slow side“ of the race track. No driver may overtake another solar car on the track, including the safety car, until the safety car re-opens the track and car returns to the pit lane. As well as when the yellow flag is up, overtaking is not allowed.

### 3.7. Radio Communication

- 3.7.1. The teams have to have a two-way channelled radio, which allows the communication between the pit lane and the solar car.

### 3.8. Pushing

- 3.8.1. It is not allowed to move the solar car manually (by pushing or pulling) as soon as they have been placed on the starting position. This is only allowed in the pit lane.

- 3.8.1.1. **Emergency:** In an emergency situation, technical failure or vehicle damage, the vehicle has to be removed from the race track immediately. In this case it is allowed to push, pull or lift the vehicle from the race track. If the challenge will be continued it is allowed to push, pull or lift the vehicle to the exact position where it was removed from the race track.

### 3.9. Damage and vehicle failure

- 3.9.1. Each solar car which breaks down on the track or encounters any mechanical problems or battery shortage has to be removed from the race track as soon as possible before a repair can take place (for details look into the safety concept). Each solar car has to carry a towrope within the vehicle at all times in order for the safety car to be able to tow off the vehicle from the track into the pit lane. It is prohibited for team members to enter the track until they get the OK from the marshals. All people have to follow the rule of wearing a reflective vest when on the race track at all times! Every vehicle which is towed off the race track has to be inspected again before re-entering the race track.

- 3.9.2. **Stopping** on the Race track for any reason will cause time penalties.

### 3.10. Energy Sources

- 3.10.1. With exception of the Second Challenge, “Long Run” any kind of charging the Batteries is allowed.

### 3.11. Static Scrutineering

- 3.11.1. Qualification must be achieved in road ready configuration. Vehicles unable to present at the designated time, or are not ready to start, may fail to qualify.
- 3.11.2. Each team must provide appropriate tools and personnel to facilitate the inspection of structural components.

One group of checks will be made with the solar panel in place, and another group of checks will be made with the solar panel removed.

Checks with the panel in place include:

- signage
- Solar EV size
- solar collector type and size
- vision (all Solar EV drivers required)
- lights, indicators, horn.

Checks without solar panel:

- mechanical systems (seats, tyres, brakes, steering)
- electrical systems
- energy storage system
- roadworthiness.

- 3.11.3. The official mass of each solar car driver, as weighed at scrutineering with helmet and driving clothes, shall be 80 kg.
- 3.11.4. If the mass of a driver is less than 80 kg, ballast will be added to make up the difference.
- 3.11.5. No credit will be given if a driver or passenger weighs more than 80 kg.
- 3.11.6. Ballast will be provided by the Organizer.
- 3.11.7. The Entrant must provide, at the time of scrutineering, two printed copies of a diagram (plan view, front of the Solar EV at the top), clearly showing how emergency isolation is to be activated. One copy will be placed in the Observer's log book; the other will held by the Organizer.

## 4 Penalties

Any team failing to comply with these regulations during scrutineering, the qualifier, or the challenge will be penalized. Penalties range from official warnings to disqualification from the event.

### 4.1. Penalty Times

4.1.1. All penalty times listed are suggested minimums. Driving conduct may double with each subsequent infraction. Mathematical penalties will normally be the same for each infraction. If the Inspectors believe the teams are deliberately violating traffic or driving regulations for strategic advantage, they may impose more penalties up to and including potential disqualification.

### 4.2. Protests

4.2.1. The Race Commission has the possibility to protest against the penalties (see 3.1 Race Commission).

### 4.3. Conduct

4.3.1. Penalties, including disqualification from the event, may be imposed for improper conduct or the use of alcohol or illegal substances. Improper conduct may include, but is not limited to, improper language, unsportsmanlike conduct, unsafe behaviour, or cheating. Teams are responsible for the conduct of all persons associated with the team, whether or not they are officially registered.

### 4.4. Reduce Lap Penalties

4.4.1. Speeding: Any solar car found to be speeding will be penalized. Speeding penalties may be assessed based on the following factors: (1) velocity over posted speed limits, (2) length of time of speeding infraction. The speed of either the solar car itself or the trailer vehicle may be used in determining a speeding infraction.

4.4.2. Traffic Violations: Any solar car committing a traffic violation may be penalized, up to disqualification. Any solar car driver who commits three (3) traffic violations (including speeding) over the course of the challenge may be individually disqualified from the event.

4.4.3. Pushing: A one lap penalty for every team who pushes a solar car along the Track. (Except in an emergency).

4.4.4. Improper Ballast: A five lap penalty may be assessed each time a team operates their solar car with ballast that does not match the solar car driver.

4.4.5. Unauthorized Drivers: Any solar car that drives with an unauthorized driver will be required to return to pit lane and drive with an authorized driver. Unauthorized driving will not be counted.

4.4.6. Non-Solar Charging of Batteries: From the start of the second challenge until the official finish, teams will be disqualified from the event for charging their solar cars' storage batteries from any other source.

4.4.7. Disturbing Official Battery Seals: Solar car batteries will be marked with an official seal. Disturbing these seals in a manner that prevents proper identification by an observer may be penalized as though all of the battery modules affected had been replaced as in Reg. 4.4.8.

- 4.4.8. Replacement of Batteries: Decisions to exchange all or part of a battery must be communicated formally to the team's observer. The penalty will be computed as follows:  
One Lap penalty for each single physical cell
- 4.4.9. Exceeding Size Specifications: Oversized solar arrays will be penalized one lap per excess centimetres in each dimension beyond the allowed size specification.
- 4.4.10. Restriction on Overtaking: On the track there are three dangerous curves where overtaking is not allowed. The restriction on overtaking will be marked with red tire stacks (will be published in the Team meeting), three laps penalty for overtaking in the marked zones.
- 4.4.11. Shortcut curves on the green areas beside the track will be penalized with one lap penalty.

## 5 The Challenges

5.1.1. The Challenges entail four different challenges which are distributed over three days. Through the participation in each of the four different challenges the teams can achieve a score which will be weighted according to the figure below (Figure 1).

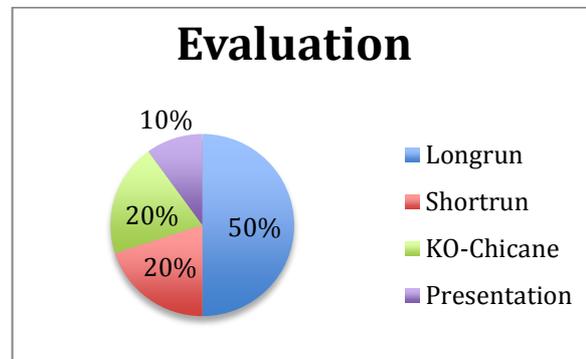


Figure 1: Evaluation

5.1.2. The scoring for the different challenges is divided as follows:

	First Challenge Short Run	Second Challenge Long Run	Third Challenge Presentation	Fourth Challenge KO - Chicane
<b>1st</b>	20	50	10	20
<b>2nd</b>	15	40	8	15
<b>3rd</b>	10	30	6	10
<b>4th</b>	5	20	4	5
<b>5th</b>	-	10	2	-

Table 1: Overview of the scoring for each challenge

5.1.3. The team with the highest score is the winner.

5.1.4. In the case that we have 10 teams or more participating the prize money for the first three teams is:

1st place	10.000€
2nd place	5.000€
3rd place	2.000€

If there are fewer teams participating the prize money will be adjusted according to the amount of teams participating. See following formula:

$$\text{Prize money} = \frac{\text{Price money (10 Teams)}}{10} \times \text{participating teams}$$

## 5.2. First Challenge: Short Run

- 5.2.1. The Short Run will take place on Friday the 10th of Oct 2014 from 18h00 to 21h00.
- 5.2.2. After a flying start every team has to complete a lap which is time measured.
- 5.2.3. The team with the fastest lap wins the challenge.
- 5.2.4. Each team is allowed to perform two run-throughs. Only the fastest lap prevails.

## 5.3. Second Challenge: Long Run

- 5.3.1. The Long Run takes place on Saturday the 11th of Oct 2014 from 8h30 to 19h00.
- 5.3.2. The Long Run consists of 9 hours driving time and will be divided into two stages interrupted by a break. Each stage starts with a Le-Mans-Start where the second start begins in inverted order (see Figure 2).

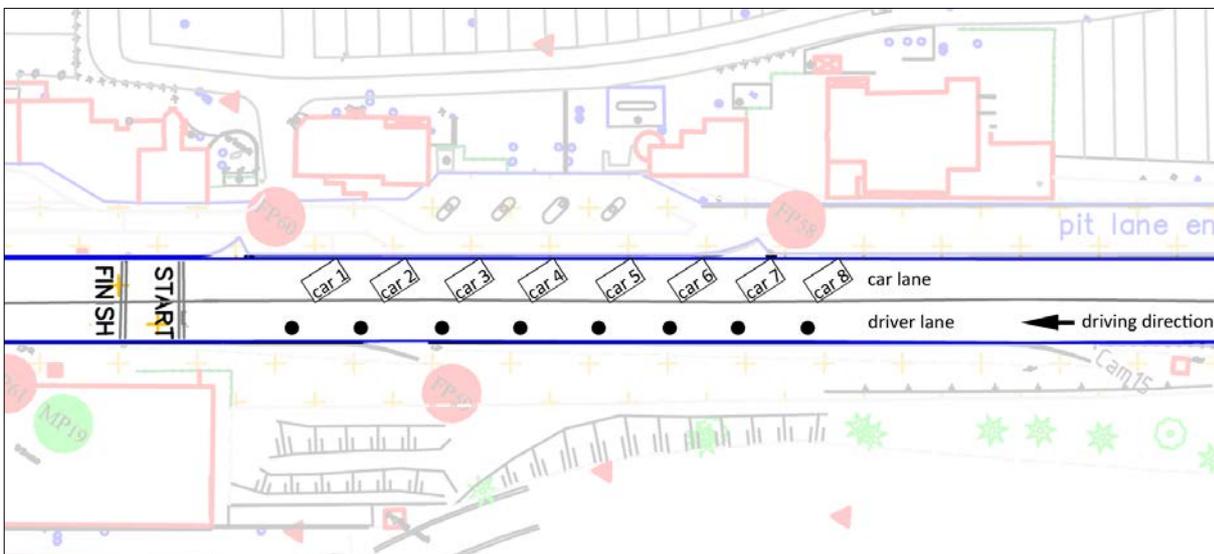


Figure 2: Le-Mans line-up

- 5.3.3. All teams have to take part in both starts. After leaving the pit all teams drive one lap before the line-up which will be guided by the volunteers (for starting position see chapter 3.3).
- 5.3.4. The first stage will take place from 8h30 until 12h00 where each team has to complete a **change of driver**. The second stage will take place from 13h30 until 19h00 **where 2 changes of drivers** have to be completed. When disregarding this rule the team will be disqualified.
- 5.3.5. At 8h20 as well as at 13h20 the **line-up** has to be **completed by all teams**.
- 5.3.6. Each team has the possibility to assign one team member to help the driver enter the solar car during the start.
- 5.3.7. Depending on the challenge strategy all teams can decide when their solar car exits and enters the race track during the given race time.
- 5.3.8. Within the given challenge time technical problems can be fixed (tyre change etc.). All changes have to comply with the ESC regulations.
- 5.3.9. The teams are only allowed to charge their batteries with solar power in the break and during the challenge time. Charging time will be between 12h10 and 13h10 on the charging

area. The orientation of the panels is only allowed on the declared charging area [the charging area will be announced during the event].

- 5.3.10. During the break technical changes are not allowed to take place (exception tyre pressure).
- 5.3.11. The team that completes the most laps in the predefined time wins the challenge.
- 5.3.12. All times in overview:

8h20	Line-up completed
8h30	1st Start of challenge
12h00	Begin Break
12h10	Start of charging
13h10	End of charging
13h20	Line-up completed
13h30	2nd Start of challenge
19h00	Finish

#### 5.4. Third Challenge: Presentation

- 5.4.1. The presentation will take place on Saturday the 11th of Oct 2014 between 16h00 and 18h00.
- 5.4.2. Each team has to give a 10 minute technical presentation about a particular exception or a technical innovation of the vehicle (please present an example of the particular exception or the technical innovation)
- 5.4.3. The presentation has to be held in English.
- 5.4.4. The teams can decide themselves how many people will be involved in the presentation.
- 5.4.5. The order of the presentation will be related to the raffle of the line-up (see chapter 3.3).
- 5.4.6. The presentations have to be handed in to the organizers in PDF format during the scrutineering. The organizers will make sure that a laptop and a beamer are in place (all handed in presentations will already be saved on the laptop).
- 5.4.7. The presentation laptop will have a preinstalled version of Adobe Acrobat X Pro and Microsoft PowerPoint 2010 which can be used. Other programs are not supported (if you want to use others please contact the organizer).
- 5.4.8. If the presentation will not be handed in until the deadline the presentation will not be regarded in the overall evaluation.

The evaluation of the presentations will take place by an independent jury, consisting of 5 specialists. The assessment criteria are:

- Innovativeness: 40%
- Overall impression of the presentation: 30%
- Quality of the slides: 20%
- Compliance of the time limit: 10%

## 5.5. Fourth Challenge: K.O. - Chicane

- 5.5.1. The KO - Chicane will take place on Sunday the 12th of Oct 2014 from 9h00 until 12h00.
- 5.5.2. Each Team one after the other drives through a predefined segment of the race track including a chicane (see Figure 3).

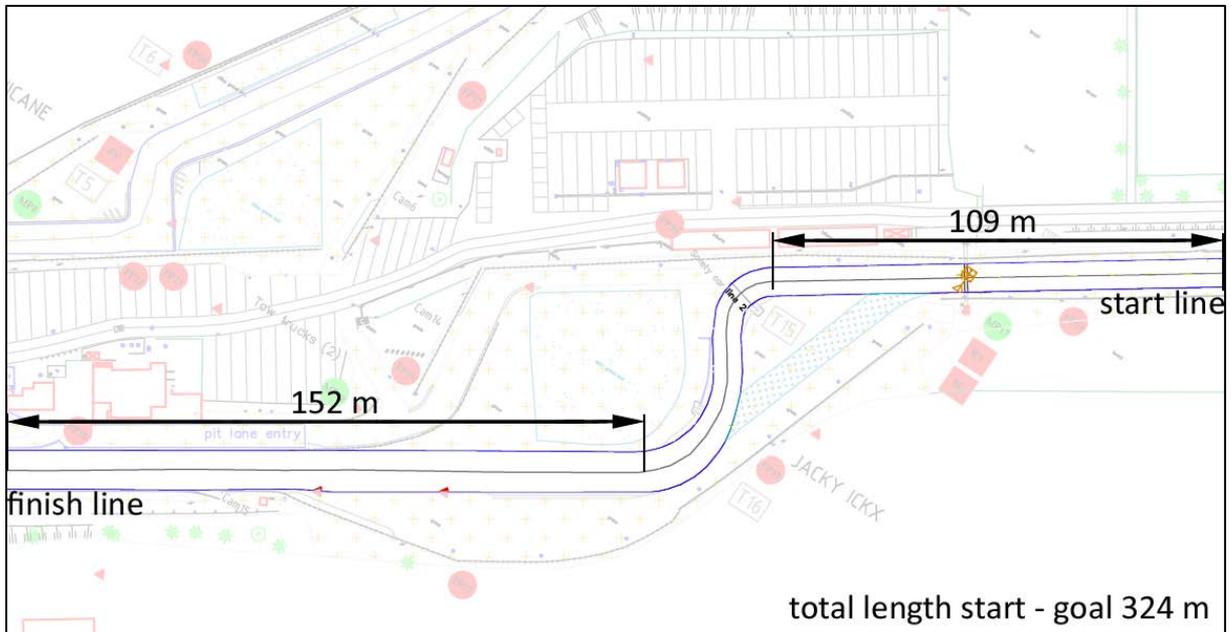


Figure 3: Overview of the chicane

- 5.5.3. The time from start to finish will be measured and is crucial for the determination of the winner.
- 5.5.4. The event is composed of a qualifying and a KO-system.
- 5.5.5. The qualifying will take place in the time frame of 1 hour. Within this hour each team is allowed to perform **three run-throughs** (only the fastest time will be measured). The best teams will qualify themselves for the KO-system.
- 5.5.6. After the qualifying there will be a half hours (30 min) break. In this break the participants of the KO-system will be determined by a raffle.
- 5.5.7. Depending on the number of participating teams there are different scenarios for the KO-system. The raffle and the competition will take place according to the respective scheme (see Appendix A and Appendix B).
- 5.5.8. Each duel consists of one run-through. The team with the faster time will go through to the next round.
- 5.5.9. When the two teams have to exact same time both teams have to race again.
- 5.5.10. The first four rankings will receive points (see Table 1).



Figure 4 Circuit Zolder site plan

## Appendix A

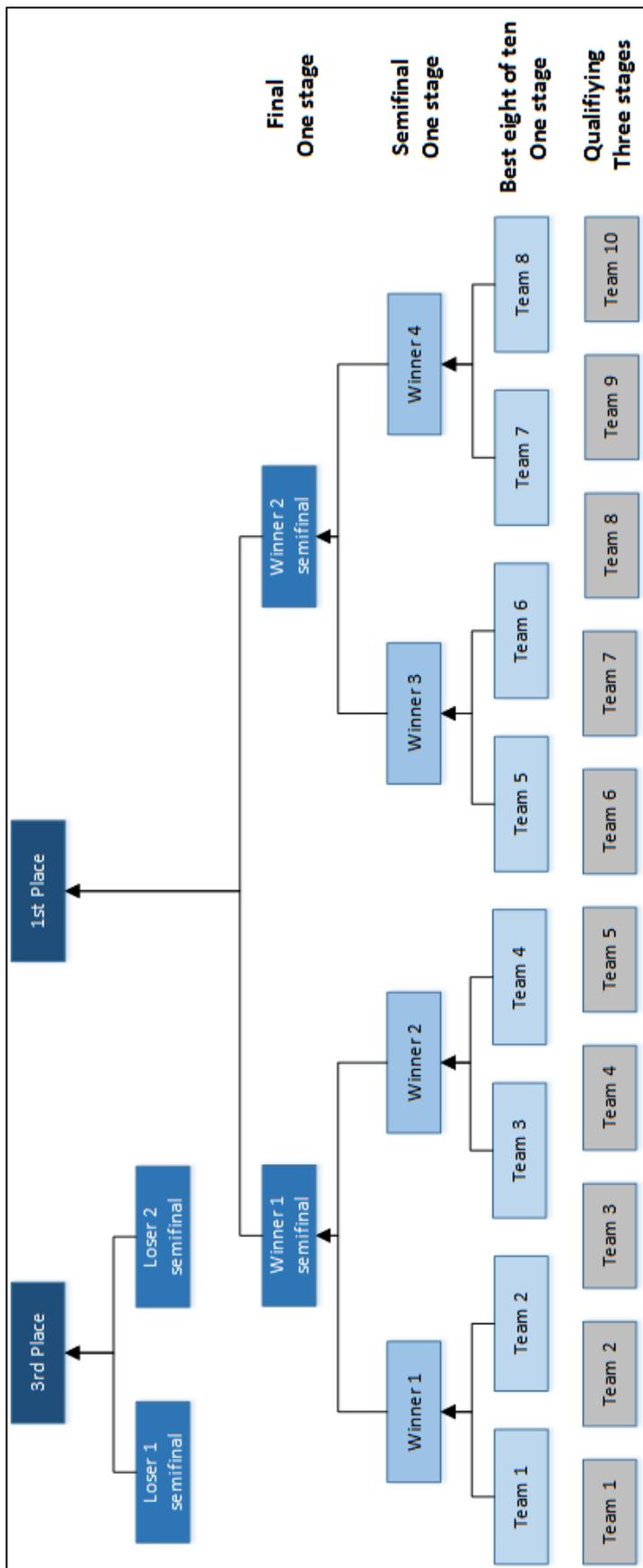


Figure 5: Scenario with participants:  $n > 8$

## Appendix B

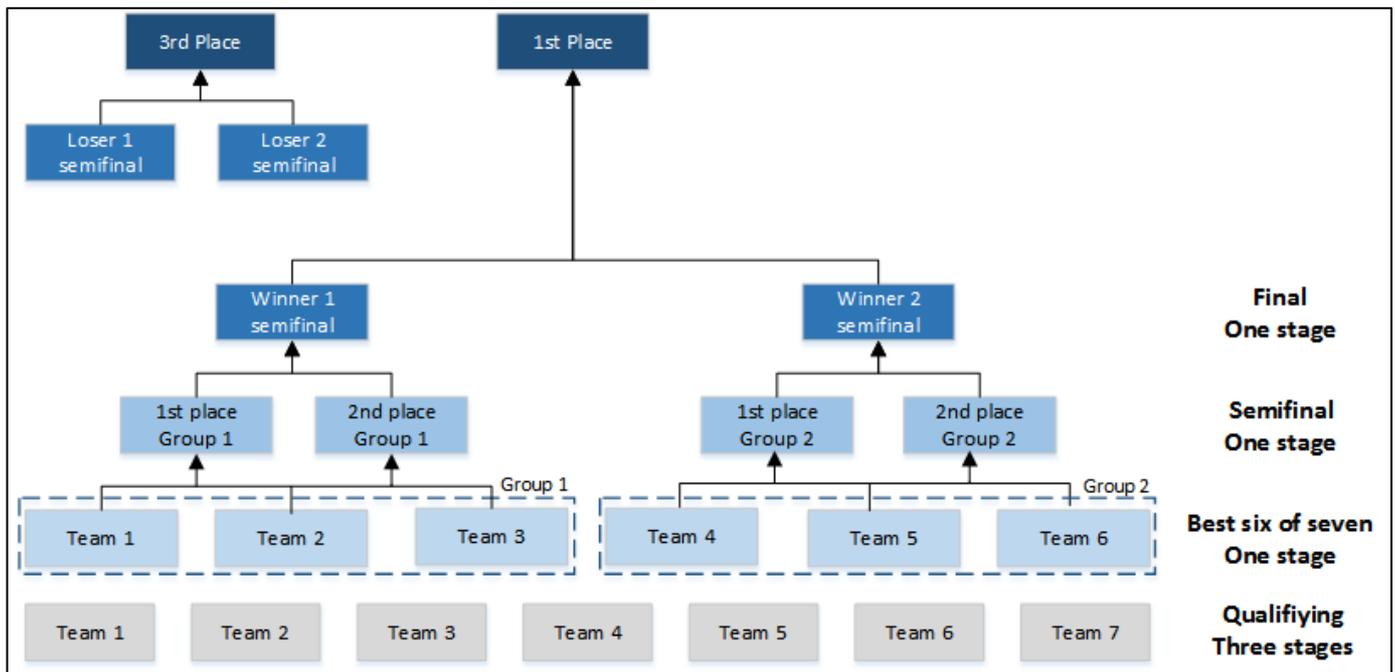


Figure 6: Scenario with participants:  $n > 6$

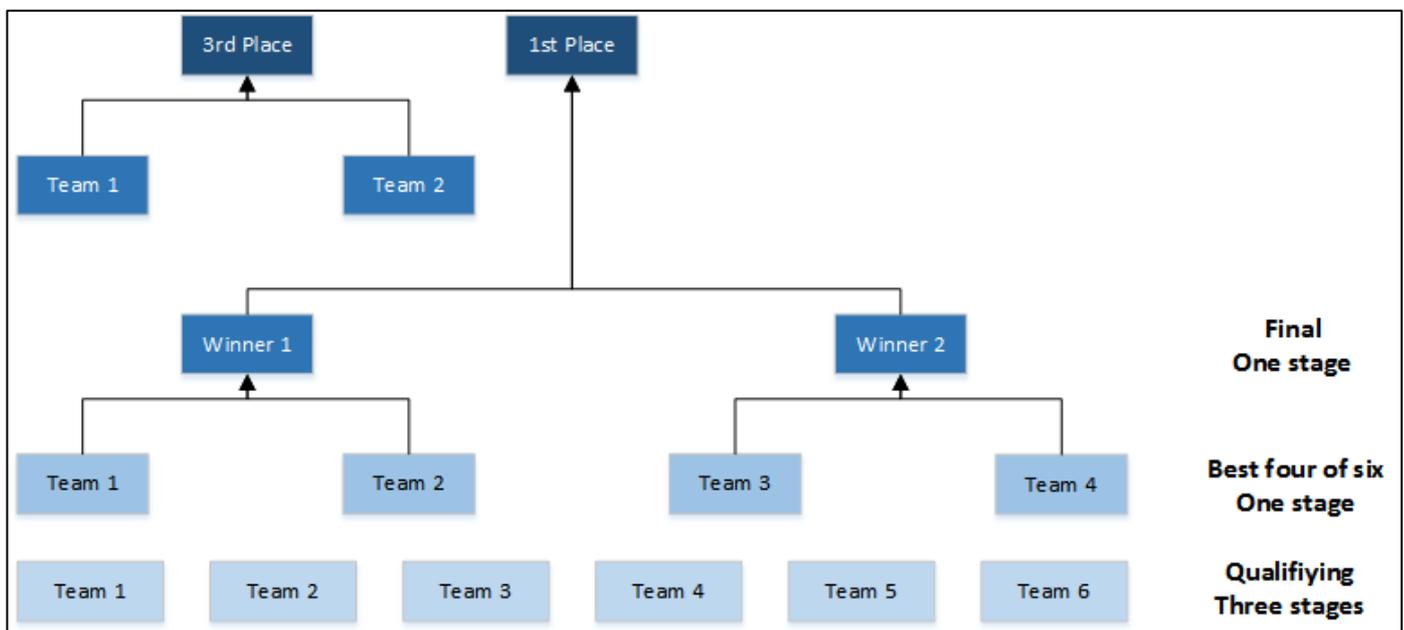


Figure 7: Scenario with participants:  $n > 4$

## Appendix C