

ECOGREEN GAS Race Pays de la Loire 2022

May 18 and 19 2022

Fay de Bretagne circuit



OFFICIAL RULES

Challenge ECOGREEN GAS Pays de la Loire 2021

OFFICIAL RULES

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INTRODUCTION

Here are the objectives of the "Challenge ECOGREEN GAS Pays de la Loire" competitions supported by GRT Gaz:

- To build, in an educative frame, a 3-wheels or 4-wheels vehicle to safely reach a 20km distance on an automotive track at a minimal average speed of 25km/h with the lowest energy consumption possible.
- To promote the great potential of bio gaseous fuels (biomethane used in an internal combustion engine or the biohydrogen used in a fuel cell) in the fight against climate change.
- To encourage meetings between actors in the biogas sector, the public and institutional decision-makers.
- To train a generation of technicians and engineers to master and develop these energies and their associated technologies.

The competition includes 4 categories:

Prototype powered by biomethane with an ICE

Prototype powered by biohydrogen with a fuel

cellUrban powered by biomethane with an ICE

Urban powered by biohydrogen with a fuel cell

The rules reflect the spirit and principles of the energy competitions which began in England in 1976 and in France in 1985.

RACE CHARACTERISTICS

- Track length: around 1942 m
- Track width: 8 m
- Minimal average speed: 25 km/h
- Number of laps: 9

I. GENERAL ORGANISATION

- a) Organizers - The association "La Jol'toujours" organizes the "Challenge ECOGREEN GAS Pays de la Loire" event.
- b) Team - group of individuals with a team name and a vehicle name that has been accepted to participate at the Challenge ECOGREEN GAS Pays de la Loire competition.
- c) Participant - member of a team.
- d) Team Manager - participant who has been appointed on the team registration document as the liaison between the team and the organizers.
- e) Educational Advisor - member of the professional staff of the educational institute who represents the team.
- f) Race Director - person designated by the organizers, who is responsible for the management of the event, who controls the activities in the stands, on the camping and on the track and who sanctions any illegal or dangerous activities or behavior.
- g) Track Marshal - person designated by the race director to act on his/her name, to assure on-track safety and to observe on-track rule compliance.
- h) Fuel Managers - persons who supervise refueling and measurement activities in conformity with the requirements of the regulation, either for biomethane or for biohydrogen.
- i) Technical Directors - two people designated by the organizers, who are responsible for assuring the technical compliance of the vehicles and the integrity of the Challenge ECOGREEN GAS Pays de la Loire competition for both energies.

Article I: ACCEPTANCE

- a) Applications entries in the competition must be made via online registration on the www.lajoltoujours.fr website or by email to the address given to you on pre-registration. The organizers will review all applications and select the teams.
All decisions made by the organizers and the race director on any part of these rules will be definitive and executives.
The organizers reserve the right to add, to comment in cases not provided by the official regulations, including for unexpected reasons due to, but not limited to, adverse or extreme weather conditions, the occurrence of a natural disaster, acts of terrorism or security concerns.
- b) No claims for compensation will be accepted.
- c) Participants agree that photo, audio, and video recordings will be made during the event and used by partner companies.

Article 2: ENTRIES

- a) The educational institutions eligible for "Challenge ECOGREEN GAS Pays de la Loire" participation are colleges, high schools, training centers, universities, and engineering schools.
- b) Their participation must be approved by one of the institution's officials with his/her signature and the institution's stamp on the registration form.
- c) The team leader and the drivers must be registered in the institution on the date of the competition as a pupil or student. Each team leader is responsible for a vehicle.

Article 3: TRACK ACCESS CONDITIONS

During both the practice sessions and the competition, all vehicles must comply with the technical and safety rules of the event.

Article 4: IDENTIFICATION

- a) Racing numbers and official sponsors stickers must be fixed to the vehicle body in accordance with the diagram provided (see Appendix I) to be clearly visible during the race.
- b) These numbers and logos will be provided by the organizers. They must be clearly visible during all public presentations, in promotional films and on any picture.
- c) The "Challenge ECOGREEN GAS Pays de la Loire" logos, official sponsors stickers or racing numbers cannot be changed in any circumstance.
- d) A mandatory 100 mm space must be left free on the four sides of the "Challenge ECOGREEN GAS Pays de la Loire" number.
- e) Any other sponsor names or logos must be smaller than the "Challenge ECOGREEN GAS Pays de la Loire" number.
- f) The trademarks or logos of tobacco companies or alcoholic drinks producers are prohibited. For the ones of other energy companies, direct competitors to event sponsors, prior written approval of the organizers must be requested.
- g) In the event of a breach of this rule, the organizers reserve the right to remove any sponsor logos. In case of refusal, the vehicle will not be allowed to take part in the competition.
- h) All vehicles are subject to the organizers' approval concerning these provisions.

Article 5: COMPLIANCE

- a) Only vehicles that comply with the present Official Rules can participate

at the race. No vehicle can be allowed on the track for practice sessions or competition until the Organizers have approved it during the Technical Control.

- b) Organizers must be informed about all the modifications on the vehicle after the Technical Control validation.
- c) Vehicles must comply with all safety rules.

Article 6: PROTESTS

Protests must be brought to the attention of the Technical Director, in writing, by the Team Manager only. Protests must be lodged within the following times:

- a) Vehicles: before track closure on the current day.
- b) Team and Driver behavior: within 30 minutes following the end of the attempt.
- c) Results: within 1 hour after the result of an attempt has been posted

Article 7: PENALTIES

- a) An attempt can be cancelled, or a team may be disqualified, depending on the severity of the breach.
- b) The Race Director or the Technical Director may exclude, disqualify or penalize a competitor who, in the judgment of the Race Director, gained an unfair advantage due to any breach of the Official Rules, hinder the attempt of other participant, or any act or omission capable of misrepresenting performance, especially regarding energy consumption or method of propulsion.
- a) The Organizers will apply the following penalties, depending on the severity:
 - Formal warning.
 - Best overall attempt invalidated at the end of the competition.
 - Immediate team disqualification.

2.SAFETY AND DRIVING RULES

Article 8: SAFETY RULES

- a) As with any motor sport activity, it is important to be aware that certain risks are inherent to this activity.

Recognizing and controlling these risks are vital for the well-being of people, local surroundings and equipment and is in no way intended to curtail the spirit of competition. In the event of an inappropriate activity (unsafe or outside of the spirit of the event), appropriate measures will be taken by the event organizers. The race director must inform the organizers about anomalies or incidents to help teams comply with safe practices. The use of the track is at the sole discretion of the organizers depending on the weather conditions.

- b) The average speed will depend on the track selection to ensure maximum safety for all vehicles. This average speed on the Fay de Bretagne circuit is 25 km/h.
- c) The maximum speed on track is limited to 50 km/h.

Article 9: KNOWLEDGE OF GOOD CONDUCT RULES

- a) Only the registered driver and the reserve driver will be authorized to drive the vehicle.
- b) Drivers may be questioned about their knowledge of the driving rules during the technical inspection. Drivers must know the meaning of the various flags used by the ramp stewards (Appendix 2).

The organizers reserve the right to deny track access for drivers with insufficient knowledge of these rules.

Article 10: DRIVING UNDER THE INFLUENCE OF ALCOHOLIC/ILLEGAL SUBSTANCES

- a) All drivers and reserve drivers entering the track must have a zero-alcohol concentration.
- b) Any breach will be penalized in line with Article 7 by an immediate disqualification of the entire team.

Article 11: BRIEFING

The attendance of the daily Drivers' Briefing is mandatory for the Team Manager and all registered Drivers. Failure in attending these briefings disqualifies the team for the entire day unless there is a specific reason.

Article 12: ACCESS TO THE TRACK

For practice sessions and competition, only vehicles with the following stickers will be allowed to access to the track:

- a) - Chassis Compliance (Green Dot)
- b) - Propulsion Compliance (Blue Dot)
- c) - Fuel System Compliance (Red Dot)

A maximum time of one minute is imposed once the vehicle is placed on the starting line to cross that line. After this period, the vehicle must leave the starting line.

At no time on the track are drivers allowed to push their vehicle or have it pushed.

Article 13: RACE DIRECTION

Driving in reverse gear or driving in the opposite direction of the race is forbidden.

Article 14: RADIO COMMUNICATION AND TRANSPONDER

- a) A headset is allowed if both driver's hands remain on the steering system.
- b) All validated vehicles will receive an electromagnetic transponder that must be attached with duct tape or screws and nuts inside the driver compartment. Fixing is the responsibility of the team.

Article 15: OVERTAKING

- a) Drivers are required to facilitate the passage of vehicles that wish to overtake while maintaining their trajectory. The catching vehicle is responsible for the safety of its manoeuvre.
- b) At each pass, the driver must honk for at least 3 seconds to warn of his/her presence and manoeuvre.

Article 16: BREAKDOWNS AND OTHER INCIDENTS

- a) Intentional stopping on the track is forbidden.
- b) The driver is allowed for 60 seconds to attempt to re-start his/her vehicle from within his/her driving position. In event of a breakdown, the driver must clear the path and wait in his/her vehicle for the marshals.
- c) In an emergency, the driver must exit the car and wait in a safe place off the track.
- d) Repairs are prohibited on track.

Article 17: OFF-TRACK VEHICLE MOVEMENT

- a) All vehicles must be parked inside or directly in front of the designated paddock area.

- b) Off the track, vehicles must be moved without the use of the engine. They must be pushed or pulled. Any engine test with the vehicle driving in the paddock area is prohibited.

Article 18: DRIVERS' WEIGHT

- a) The minimum driver weight is 50 kg for the prototype category and 70 kg for the Urban Concept category.
- b) The weight of the driver is defined as the weight of the person driving the vehicle, in full clothing with helmet, gloves, goggles and his/her communication device.

If the driver's weight does not meet the minimum weight required, a ballast must be mounted on the vehicle. This weight must be provided by the team, in the form of diving weights or rectangular metal plates. No other form of ballast is allowed.

All ballast must be attached to the vehicle chassis to ensure the safety of the driver in the event of a collision or roll over, and it must be easily removable for weighing. For less than 1kg, the driver has the option to put it in one of the pockets of his/her suit.

- c) The driver in full clothing with his/her weight will be weighed before each attempt.

Article 19: HELMETS

- a) For testing and racing, drivers must wear a helmet suitable for motorsport. Bicycle/riding/skating/type luge helmets are not allowed.
- b) The helmet label (CE) must be clearly legible. Helmets worn by all drivers will be subject to inspection and comply with automotive or motorcycle regulations. The helmet must be fitted with a visor, otherwise the driver must wear goggles.

Article 20: DRIVERS CLOTHING

- a) All Drivers must wear a racing suit as the outer layer of clothing, and the racing suit must be classified as Flame Retardant Clothing (FRC). While in the vehicle, drivers are not allowed to wear:
 - Street clothes;
 - Synthetic clothes or underwear.
- b) Gloves (covering completely all fingers) and shoes are mandatory and must be provided by the team without synthetic material.

Article 21: GENERAL SAFETY

Each team must give and use the following during work on and off the vehicle based on the tasks and equipment used (Appendix 3):

- a) General work gloves: leather or canvas.
- b) Safety glasses for all team members (disposable type allowed).
- c) Hearing protection for all team members when handling cylinders and tires (approved earplugs).
- d) Tape to secure cords or cables on the floor of the stand.
- e) When installing stands and handling heavy loads, safety shoes are mandatory.
- f) Each team shall provide one fire extinguisher for their stand with a minimum fire extinguishing capacity of 5 kg of the Class "ABC" of Fires. The extinguisher must be accessible in the team's specific stand area. The extinguisher must be full (never used) with a date of manufacture or expiry date. If the extinguisher has no expiry date, it will be accepted (meaning validated) if it has been manufactured within the last three years.

The fire extinguisher beyond the expiry period that has been re-inspected and marked with a dated certification will also be authorized.

- g) Specific equipment required to mitigate and/or extinguish fire of lithium-based batteries must be used when charging the battery if the battery is charged in or outside the vehicle. It must prevent or contain the spread of any fire during battery charge. The equipment to be used includes:
 - A battery charging bag that is designed to contain a lithium battery fire.
 - A fireproof cover that can be placed above and under the battery during charging. The cover must be large enough to fully cover the battery and contain a fire.

3. VEHICLE DESIGN

3A- GENERAL (ALL CATEGORIES)

Article 22: VEHICLE DESIGN

- a) During vehicle design, construction and planning, the participating teams must pay attention to all aspects of safety, including the safety of the driver, team members, volunteers, and spectators.

Prototype vehicles must have three wheels which, under all conditions, must be in constant contact with the road.

The Urban Concept vehicles must have four wheels which, under all conditions, must be in constant contact with the road.

- b) Aerodynamic appendages, which adjust or are prone to changing shape due to wind, while the vehicle is in motion, are forbidden.

- c) Vehicle bodies mustn't have external appendages that might be dangerous to participants.
- d) The vehicle body panels must be rigid enough not to change shape due to wind.
- e) The interior of the vehicle must not contain dangerous or loosen object that might injure the driver in the event of a collision.
- f) Windows must not be made of material that can break into sharp shards. In the case of polycarbonate windows, a protective film is required with certification from the manufacturer. It is recommended to use a "Body sense" film from the Hexis brand.
- g) All parts of the drive chain (energy storage / engine/ transmission/ battery/ ...) must be inside the engine compartment.
- h) The engine compartment bonnet must be easy to open for quick access during inspection.
- i) All objects in engine compartment must be securely mounted.
- j) All vehicles must have a strong floor and a frame that prevent any part of the driver's body from contacting the ground.
- k) All vehicles (including prototype) must be entirely covered. Open top vehicles are not allowed.
- l) The vehicle's body must ensure that the gases are evacuated at the highest point of the engine compartment through an opening (or openings) with a minimum pass surface of 5 cm². The shape and number of openings are free. For a gas evacuation in the driver cockpit, a total opening (or openings) of 5 cm² must also be made at the highest point of the vehicle in the driver cockpit. The shape and number of openings are free.

Article 23: CHASSIS/ MONOCOQUE SOLIDITY

- a) Teams must ensure that the vehicle chassis or monocoque will safely protect the driver's body, including crumple space in the event of the front, side, or rollover collision. The organizers may exclude any vehicle whose construction is considered dangerous.
- b) The vehicle chassis must be equipped with an effective roll bar that extend 50 mm around the driver's helmet when seated in normal driving position with the safety belts fastened. If this position impairs the driver visibility it will be deemed that the roll bar is not adequate. The effectiveness of the bar and driver's visibility will be validated simultaneously, meaning that the driver must not be in such position that he or she must raise their head or torso above the roll bar to pass the visibility test.
- c) The roll bar must extend in width beyond driver's shoulders when seated in normal driving position with safety belts fastened. Teams may use a tubular or panel roll bar. If a tubular roll bar is used, it must be metal. A panel roll is

the rigid bulkhead separating the cockpit from the energy compartment, and it must be integrated into the vehicle or monocoque chassis.

- d) Any roll bar must be capable of resisting a static 700 N load applied to a vertical direction, without deformation higher than 10 mm.
- e) To protect the driver's feet in the event of a forward impact, a 100 mm protection zone is recommended between the front of the vehicle and the driver's feet.

Article 24: PROPULSION SYSTEM AND DRIVER ISOLATION

- a) A permanent and rigid bulkhead must safely isolate the engine compartment from the driver compartment.

This means that engines, fuel cells, fuel tanks, auxiliary battery, supercapacitors... must be placed outside of the driver compartment. The purpose of this bulkhead is that, in the event of a leak or fire, it prevents liquids and/or flames and/or smoke from reaching the driver compartment.

- b) The bulkhead must prevent manual access to the engine compartment by the driver.
- c) If holes are made in the bulkhead to pass wires or cables, they must be protected by a grommet or a similar protection to prevent chafing or damage. All the holes must be filled.

Article 25: VISIBILITY

- a) The driver must have access to a direct arc of visibility in front of the car and to 90° of each side of the longitudinal axis. The field of vision must be achieved without the help of optics. The movement of the driver's head for realizing a full arc of vision is allowed.
- b) The vehicle must be equipped with a wing mirror on each side of the car, each with a minimal area of 25 cm². The visibility given with these mirrors, and their mountings, will be subject to an inspection. An electrical system may not replace a wing mirror.
- c) During the Technical Control, the visibility test will consist in evaluating the visibility of 60 cm cones placed every 30° on a semi-circle with a radius of 4 meters located in front of the vehicle with the head's driver as the center.
- d) For the Urban Concept vehicles, the visibility in rainy weather is necessary.

Article 26: SEAT BELT

- a) The driver's seat must be equipped with an effective safety harness with at least five mounting points, bolted if possible, to maintain the driver safely in his/her seat. The five or six independent seat belts must be firmly attached to the main body of the car and be fitted into a single buckle, specifically

designed for this purpose. The fixing points must be installed so that the belts will be self-aligning with the load's direction.

- b) The safety harness must prevent any upward or forward motion of the driver's torso. The harness must be adjusted by using the seat belt length adjuster. The mounting point of the crotch strap must be on the top of the pelvis line and the highest straps must be at a maximum angle of 10° below the shoulder line.
- c) The safety harness must always be worn tight and fastened to prevent the driver from having free movement when the vehicle is in motion.
- d) The ability for using the harness and for setting it up will be evaluated during the Technical Inspection.

Article 27: VEHICLE ACCESS

- a) It is imperative for drivers, fully harnessed, to be able to go out of their vehicle at any time without assistance in less than 10 seconds.
- b) The Prototype vehicles must be equipped with a large enough opening for the cockpit. The opening of the driver's compartment must be designed in such a way that the emergency services can easily extract the driver of the vehicle, if necessary.
- c) For Prototype vehicles, the opening can be joined in whole or in part by means of a hinge, a removable door and/or folding, provided that a release mechanism is readily usable from the inside and that the opening mode, from the outside, does not require tools and is clearly marked by a red arrow which is at least 100 mm long.
- d) It is forbidden to use tape to close the driver opening from the outside.

Article 28: HORN

- a) Each vehicle must be equipped with an electrically powered horn from a production automobile. The horn must be mounted towards the front of the vehicle, so that the sound is effectively audible to other vehicles and track marshals. With a properly charged battery, the horn must emit a sound greater than 90 dB measured horizontally 4 meters in front of the vehicle. The horn powered by an independent battery is allowed.
- b) The horn will be tested at the beginning of each attempt on the starting line. If the horn does not work properly, the start cannot be given.

Article 29: DRIVER POSITION

- a) For safety reasons, the head-first driving position is prohibited. The driver position must be such that the top of the helmet is 5 cm below the C-arm and

the visibility for the driver is at the same time optimal.

Article 30: CLUTCH AND TRANSMISSION

- a) Propulsion of all vehicles must be achieved only through the wheel-to-road contact.
- b) All vehicles equipped with internal combustion engines must be equipped with a clutchsystem.
- c) For automatic centrifugal clutches, the starter motor speed must always be below theengagement speed of the clutch.
- d) Only Urban Concept with ICE must have "idling capabilities", meaning that the vehicle mustbe able to remain stationary while the engine is running.
- e) For manual clutches, the starter motor must not be usable with the clutch engaged. Lockingis required to facilitate this functionality.

Article 31: EXHAUST SYSTEM

- a) Exhaust gases must be evacuated outside the vehicle body.
- b) The exhaust pipe must not extend beyond the rear or the side of the vehicle body.

Article 32: NOISE LEVEL

- a) The noise level of the vehicle must not exceed 85 dB measured 4 meters from the vehicle.

Article 33: EMERGENCY SHUTDOWN

- a) The purpose of the emergency shutdown system is to disable the vehicle's propulsion system.
- b) The vehicle must be equipped with both an external and an internal shutdown mechanism.
- c) The external shutdown mechanism must be performed using a red lock button that can only be reactivated by rotating it. The external shutdown mechanism must be at the rear of the vehicle and permanently installed on a non-detachable part of the bodywork. A standard sticker (blue triangle with red electrical arc) provided by the organizer (within the stickers kit) must be placed on the body of the vehicle to clearly indicate the exterior position of thisactuator.
- d) The indoor shutdown mechanism must be easily accessible by the driver.
- e) Each emergency shutdown must cut simultaneously:

- the power supply of the solenoid valve from the gas cylinder and the ignition system for biomethane vehicles.
 - the power supply of the solenoid valve from the gas cylinder and electric propulsion motors for hydrogen vehicles.
- f) In addition to the above devices, all vehicles must be equipped with a "dead man's" safety device or sometimes called "operator presence control". The purpose of this device is to ensure that in case the driver becomes incapacitated, the vehicle's propulsion power is automatically disengaged (meaning returns to an idle state). An electric dead man switch is permissible if the switch is located on the steering wheel. If this "dead man" switch is used, the driver must always directly (for example by thumb or index finger) engage the switch while driving (such as a push button without holding).
 - g) This device is a separate switch from the necessary emergency shutdown mechanisms.
 - h) If an ICE prototype vehicle is designed with a WOT (wide open throttle), operation of the dead man switch must switch off the ignition system.

Article 34: ADDITIONAL INSPECTIONS

- a) After passing the technical inspection, replacement and/or modification of the engine, or any other part of the vehicle must be re-approved by the organizers.
- b) After any significant incident to the vehicle, it will be inspected again.
- c) At any time, organizers may carry out unannounced inspections on the vehicles.
- d) A self-assessment sheet will be provided to the competitor.

3B - PROTOTYPE CLASS

Article 35: DIMENSIONS

- a) The maximum height of the vehicle must be less than 1000 mm.
- b) The vehicle track width must be at least 500 mm, measured between the midpoints where the tires of the outermost wheels touch the ground.
- c) The height ratio divided by track width must be less than 1.25.
- d) The wheelbase of the vehicle must be at least 1000 mm.
- e) The maximum total width of the vehicle must not exceed 1300 mm.
- f) The maximum total length of the vehicle must not exceed 350 cm.
- g) The maximum weight of the vehicle, without the driver is 100 kg.

Article 36: WHEELS AND TYRES

- a) All types of tires and wheels are allowed.

- b) Any type of wheel rim may be used. Rims must be compatible with the size of the selected tire to meet safety standards.
- c) All installations must be carried out in such a way that there is no risk of wheels touching other parts of the vehicle (such as cables, wires, hoses, and the engine compartment components such as batteries, etc). These must be safely mounted/secured so that they cannot interfere with the rotating wheel while driving and cause accidents.

Article 37: FRONT AXLE AND STEERING

- a) Only front wheel steering is allowed. If organizers are not satisfied with the effectiveness and / or with the vehicle steering system control, it will be removed from the competition.
- b) The turning circle must be 8 m or less. The turning radius is the distance between the center of the circle generated by the middle path of the vehicle external wheel. The external wheel of the vehicle must be able to follow a 180° arc with a radius of 10 m for prototypes and of 8 m for Urban Concepts in both directions. The steering system must be designed to prevent any contact between tire and the vehicle body or chassis.
- c) Electrically operated indirect steering systems are allowed providing they are operated by a steering wheel or similar (rotary potentiometer), joystick operation is not allowed. If electronic steering systems are used and if the driver releases the steering wheel or if there is an electrical failure, the vehicle must return to the straight-ahead position.
The steering must be precise and with no play.

Article 38: BRAKING

- a) A system must act on all the front wheels, the other on all the rear wheels. During braking on the steering front wheels, two calipers must be used (one per wheel), triggered by only one controlling system. Furthermore, the left and right brakes must be well balanced.
- b) The rear brake system must operate on each wheel, unless the two wheels are linked by the same shaft, in which case only one system is necessary.
- c) The driver must have the possibility to operate both system at the same time without taking either hand off the steering system. A single controlling pedal is recommended.
- d) The effectiveness of the braking systems will be tested during technical inspection. The vehicle will be placed on a tilted plan with a slope of 20° with the driver inside. The brakes will be activated, and they need to maintain the vehicle immobile.
- e) During practice or competition runs, the brakes must be protected against

any adjustments made by the driver. The effectiveness of the protection will be evaluated during technical inspection. In addition, vehicles might be checked at the start and/or finish of each attempt (practice or race). Any system that has been compromised will invalidate that run.

- f) The use of a hydraulic braking system is strongly recommended.

3C - URBAN CONCEPT CLASS

Article 39: URBAN CONCEPT NUMBER OF PLACES

The vehicle Urban Concept may dispose of one or two seats. At all time during practice and competition runs, only one person (the driver) must be seated in the vehicle, regardless the number of seats in the driver compartment.

Article 40: DIMENSIONS

- a) The total vehicle height must be between 1000 mm and 1300 mm.
- b) The total vehicle width, excluding rear view mirrors, must be between 1200 mm and 1300 mm.
- c) The total vehicle length must be between 2200 mm and 3500 mm.
- d) The track width must be at least 1000 mm for the front axle and 800 mm for the rear axle, measured between the midpoints where the tires touch the ground.
- e) The wheelbase must be at least 1200 mm.
- f) One or two of the doors, left and/or right, of the driver must be at least 880 mm high and at least 700 mm wide at the level of the shoulders of the driver. An 880 mm x 700 mm board must be able to penetrate the cockpit. During this control, the board can be tilted up to 30° to validate these dimensions.
- g) The vehicle body and chassis ground clearance must be at least 100 mm with the driver and necessary ballast in the vehicle.
- h) The maximum vehicle weight (excluding the Driver) is 200 kg.

Article 41: VEHICLE BODY

- a) The vehicle body must cover all mechanical parts when viewed from all sides. The wheels and suspension must be fully covered by the body when seen from above, and the wheel must be covered up to the axle center line when seen from the front or the rear. The covering for the wheels and suspension must be a rigid, integral part of the vehicle body.
- b) Driver access must be easy and practical.
- c) Any access opening mechanisms must be firmly attached to the vehicle

body by means of hinges or sliding rails. Adhesive tape, Velcro, or similar materials are not permitted for this purpose.

- d) The vehicle must have a fixed roof covering the Driver's compartment.
- e) A windscreen with effective wiper(s) is mandatory.
- f) Space must be available for a rectangular rigid luggage with dimensions of 500 x 400 x 200 mm (L x H x W). This space must be easily accessible from the outside and must include a floor and sidewalls to hold the luggage when the vehicle is moving. The luggage must be supplied by the participant and must be placed in the space during inspection and competition.
- g) Vehicle bodies must not include any external appendages that might be dangerous to other Teams.
- h) A towing hook or ring is mandatory at the front of the vehicle. It can be rigid or flexible (cable or strap). If it is rigid, it must be placed fully under the body for safety reasons. Alternatively, it may be retractable or removable but must be easily accessible. It must be used to tow the vehicle in case of breakdown on the track. It must have a traction resistance equivalent to the weight of the vehicle and have an opening width of at least 30 mm.

Article 42: TURNING RADIUS AND STEERING

- a) Vehicle steering must be achieved by one system operated with both hands using a turning motion. It must be precise, with no play or delay.
Steering must be operated predominately through the front wheels.
- b) Steering systems such as joysticks, indirect or electric systems are not permitted.
- c) The turning radius must be 6 m or less. The turning radius is the distance between the center of the circle and the external wheel of the vehicle. The external wheel of the vehicle must be able to follow a 180° arc of 6 m radius in both directions. The steering system must be designed to prevent any contact between the tires and body or chassis.
- d) The Organizers reserve the right to set up a vehicle handling course to verify the following when the vehicle is in motion: the driver's skills, turning radius and steering precision.

Article 43: WHEELS

- a) The rims must be between 13 to 17 inches in diameter.

- b) The wheels located inside the vehicle body must be isolated from the driver.

Article 44: TYRES

All types of tires are allowed if they are compatible with the dimensions of the rims recommended by the manufacturer and have a tread pattern of at least 1.6 mm.

Article 45: LIGHTING

The vehicle must have a functional external lighting system including:

- a) 2 front headlights.
- b) 2 front indicator lights.
- c) 2 rear indicator lights.
- d) 2 rear red stop lights.
- e) 2 rear red lights (possibility to combine with stop lights).
- f) The center of each light unit must be located at an equal distance and at least 300 mm from the vehicle centerline.
- g) The mandatory red indicator light for the self-starter operation must be separate from any of the above.

Article 46: BRAKING

- a) The vehicle must be equipped with a four-disc hydraulic brake system, with a single brake pedal, which has a minimum surface area of 25 cm². The brake pedal must operate the master brake cylinders either directly or through a rigid mechanical link. Wires/ cables are prohibited.
- b) Brakes must operate independently on the front and rear axles or in an X pattern (i.e. right front wheel with left rear wheel and left front wheel with right rear wheel).
- c) A single master brake cylinder may be used provided it has a dual circuit (2 pistons and 2 tanks).
- d) The effectiveness of the brake system will be tested during vehicle inspection. The vehicle must remain immobile the driver inside when it is placed on a 20° incline with the main brake activated.
- e) A parking brake function is required to keep the car stationary during technical inspections, gas cylinders handling or to let the driver safely exit the car. It must provide a brake force of at least 50 N.

Article 47: RACE CONDITIONS

- a) In rain/drizzle weather conditions, Urban Concept vehicles (only) may be required to run on the track during competition with approval of the race

director. Urban Concept vehicles must be adapted to operate under such conditions.

- b) The vehicle must be equipped with an effective electric wiper typically found in a production car.
- c) The operation of the windshield wiper must be activated by an independent switch easily accessible to the driver.
- d) The proper operation of the wiper and its effectiveness will be inspected.
- e) The vehicle must be adequately ventilated to prevent the driver's compartment from fogging.

4. ENERGY SOURCES

4A - GENERAL

Article 48: ENERGY TYPES

Vehicles must use one of the following energies provided by the organisation:

- a) Internal combustion engine: biomethane
- b) Fuel cell: biohydrogen.

Article 49: RESULTS CALCULATIONS

- a) The performance calculation will be carried out using the biomethane NCV provided by "GRT gaz" with its composition. This information will be given on the first day of the event. The NCV of bio methane depends on its composition and especially on its methane content. The results for the ICE category will be expressed in **km/kWh**, **km/m³** of methane and **km/litre of SP 95** (theoretical distance travelled using the energy contained in 1 litre of gasoline at a temperature of 15°C).

For this calculation, the mean constant is 8.99 kWh per litre of SP 95.

- b) Fuel cell vehicles must use a "COMPACT" type flow meter of the "VOEGHIN" brand (20 L/min H₂) from the Alto Instrument company to measure the volume of H₂ consumed in normal m³.
- c) The results will be expressed in **km/kWh**, **km/m³** of hydrogen and **km/litre of SP 95** (theoretical distance travelled using the energy contained in 1 litre of gasoline at a temperature of 15°C)

The NCV for hydrogen is 120,000 J/g with a density in normal m³ of 0.0898 g/dm³ or 2.99 kWh/m³.

- d) As with other vehicles, the results for hybrid vehicles will be expressed based on the primary energy used.

Article 5O: CYLINDER HANDLING

Participants handling cylinders must wear safety glasses, ear plugs or chemical resistant helmets and gloves.

Article 5I: ELECTRICAL SYSTEM

- a) For safety reasons, the maximum voltage on-board of any vehicle at any point must not exceed 48 Volts nominal or 60 Volts max. (This includes on-board batteries, external batteries, supercapacitors, fuel cell stack, etc.)

Battery definition: A 'battery' is defined as a source of electrical energy, which has exactly two connectors and can be described as a unit. This unit may contain more than one sub-unit.

- b) For all vehicles, only one battery of accessories is allowed.
- c) If a lithium-based battery is used, a battery management system (BMS) adapted to this chemistry must be used to control and protect the battery from fire risks.

The BMS must provide cell balancing and overvoltage protection during off-track charging. If a lithium battery contains more than one subset or cell, the basic sub-unit must first be connected in series, before being connected in parallel. Otherwise, it would be impossible for the BMS to control the current of each individual cell.

For lithium-based batteries, the BMS balancing and overvoltage protection cell can be contained as part of the external charger.

- d) Any lithium-based battery must be enclosed in a metal containment box. When charging, the battery should be placed in a suitable charging bag.
- e) All batteries and supercapacitors must be short circuit protected. Protection may be in the form of a fuse, fusible link, or a current interrupting device (circuit breaker). Short-circuit protection devices must be located on the positive conductor and as close as possible (maximum 300 mm from the positive terminal) to the battery or supercapacitors. The rating of the protective device must be adapted.
- f) For safety reasons, the two positive and negative connections of the supercapacitors must be electrically insulated from the vehicle chassis.
- g) All electrical circuits in the vehicle must be protected from electrical overload by fuses or circuit breakers.
- h) The accessory battery must have a negative mass.

The accessory battery provides all authorized electrical needs such as safety devices (windshield wipers, horn, meter, data acquisitions, telemetry, driver ventilation, lights, hydrogen sensors, hydrogen relay and hydrogen shutdown, biomethane electro vane...) or systems essential to the proper

operation of the engine (ignition, fuel injection calculator, injector, gas pressure sensor, starter, oil pump, water pump, electromagnetic distribution...).

- i) An analysis of the accessory battery capacity will be examined during the technical inspection to validate its capacity.
- j) The accessory battery must be installed in the engine compartment.
- k) Electrical wiring must be in good condition, clean, clearly labelled, secured and away from all moving parts (e.g. wheels, chains). "Spaghetti" wiring is prohibited, and organizers can ask the team to rewire part of the electrical system.
- l) Electrical connections must be secured so as not to detach.

Article 52: TECHNICAL DOCUMENTATION

- a) Participants must provide technical documentation during the technical inspection.
- b) Teams must print their documentation prior to the event. During the technical inspection, the documentation will be compared to the vehicle. Differences between the technical documentation and the vehicle will have to be corrected before the complete validation of the technical inspection. The printed documentation must be linked and divided into the following sections:

For biogas ICE:

- Energy supply diagram: cylinder, regulator, pressure gauge, pressure relief valve, safety solenoid valve, gas line, pressure sensor (optional), injector, engine, safety card for detection and safety solenoid valve cut-off in case of leakage.
- Diagram of the propulsion system
- Electrical diagram
- Hybrid system diagram with supercapacitor
- Battery/ BMS +

For bio hydrogen cell:

- Energy supply diagram: cylinder, solenoid valve, pressure relief valve, flow meter, fuel cell, check and order map, supercapacitor, engine, safety card for detection and safety solenoid valve cut-off in case of leakage.
- Diagram of the propulsion system
- Electrical diagram
- Supercapacitor
- Battery/ BMS +

+ If a lithium accessory battery is included in the vehicle.

- Electrical diagram: provide a vehicle level schematic showing all vehicle wiring and associated components and connections. The schematic should include component values such as voltage levels and fuse ratings. Schematics of components such as the engine management system or fuel cell controller are not required in this section.

- Hybrid System: Include schematics describing the energy flows in and out of the hybrid system. Include supercapacitors documentation.

Battery/ BMS: (For lithium-based batteries only) Provide, at a minimum, battery (characteristics) and BMS documentation.

4B - ICE PROPULSION WITH BIOMETHANE

Article 53: PROPULSION

- a) The type and design of internal combustion engines are not limited, but they must only work with the biomethane provided by the organizers.
- b) Only the use of electronic injection is permitted.
- c) If the engine temperature is regulated, only pure water at atmospheric pressure is permitted. The control temperature for the engines so equipped is therefore limited to 100°C.
- d) The use of supercapacitors for energy storage is permitted only for Urban Concepts.
- e) This capacitor must be the only energy storage source for the vehicle propulsion electric motor.
- f) Two connectors must be safely mounted outside the vehicle for voltage measurement on the starting line. They must be labelled "Super capacities" with a red electric terminal for the + and a black electric terminal for the -.
- g) The state of charge of the Supercapacitor will be checked before and after each run by measuring its voltage. The voltage registered after the run must be at least equal to the voltage registered before the run. In the event of the contrary, the Supercapacitor must be re-charged by running the engine until its voltage is equal to the voltage registered before the run. The driver has a maximum of 10 minutes beyond the end of the time corresponding to the maximum duration of the race to validate an attempt (final maximum time to make official measure = starting time + maximum race time + 10 minutes). No team member can work on the vehicle during this period.
- h) An electric starter can be used during the competition only if this starter can function only when the ignition and fuel system are activated.
- i) It must be clearly established that the starter is never capable of providing any forward propulsion to the vehicle.
- j) A clearly visible red light, equivalent in its luminescence to a classical 20W light bulb, must be installed at the rear of the vehicle and must be clearly visible from both sides of the track to signal any operation of the starter motor.
- k) At the start, the starter and the starter light must be extinguished by the time the rear wheel of the vehicle crosses the start line.
Failing to comply will invalidate the run.

Article 54: BIOMETHANE FUEL CIRCUIT

- a) Except for the injector, a possible pressure sensor, a card for the detection of leak of biomethane and lines, all elements must come from the AD Vento company which developed a suitable system for engines and vehicles. Appendix 4 specifies the characteristics of the elements supplied by AD Vento.
- b) The Cylinders for biomethane storage allowed are the followings:
 - Carbon cylinder from the brand ULLIT, 1 liter, 70 bars.(78 mm x 360 mm), 0.75 kg.
 - Aluminum cylinder from the brand AD Vento, 2 liters, 70 bars.(102 mm x 365 mm), 1.5 kg.
- c) For safety reasons, the cylinder must not exceed a temperature of 50°C at any time. To avoid high temperature of the cylinder, it should not be placed above the battery, directly exposed to sun light or close to the exhaust system.
- d) Cylinders must be safely mounted on the vehicle under the supervision of a Fuel Manager. Cylinders filling will be managed by the Fuel Manager who is responsible of the logistics. Safety advice: Cylinders must be handled with great care.
- e) Technical inspection/ Measurement

The fuel system must be easily accessible for inspection and measurements. The gas consumption will be measured with weight measurement. Before the attempt start, a technical marshal will weigh the entire system et take photographs of it (tank, pressure regulator, shut-off solenoid valve, limiter, hose, and injector). The entire line must be compact and easily removable for the weight measurement. After the attempt, the entire fuel system will be removed and weighed again on the same weighing scale. This operation, mounting and unmounting from the vehicle and the transportation to the weighting area, must be done by the team manager helped by 2 persons he/she chooses.

The entire fuel system management process will be supervised by a Fuel Manager.
- f) Biomethane leak detector.

A methane leak sensor must be installed in the engine compartment, at the highest point of the engine bulkhead. This methane sensor must directly close the gas solenoid valve on the regulator.

The trigger level of the methane sensor must be set to 25% LEL (Low Explosive Limit) of methane, so being 1% of methane in the air.

The methane detector reset must be done manually by a switch located in the engine compartment.

This switch must not be accessible by the driver from the cockpit.
- g) The vehicle must be equipped with an assembly provided by AD Vento. The entire system includes a pressure regulator, shut-off solenoid valve,

pressure gauge after pressure regulator and pressure relief valve set to 5 absolute bars.

- h) The maximum operating injection pressure is limited to 3 relative bars. A pressure sensor is allowed between the pressure regulator and the injector for the injection management.
- i) The line which connects the regulator's exit to the injector must have an external diameter of 6mm.
- j) The discharge line which is linked to the wastegate towards the outside must have an external diameter of 10mm.

The gas must be evacuated towards the outside of the vehicle, through the upper part of the engine compartment bodywork or through the 5cm² area.

- k) The shut-off valve is closed without any voltage.
 - l) The ignition/ injection power unit must be shut down automatically and simultaneously with the shut-off valve. This must be done thanks to an appropriate safety relay.
 - m) In case of a leak, these valve and relay must be activated by one of the three followings:
 - 1. Biomethane leak detected by the methane sensor.
 - 2. Emergency shutdown push-button located outside the vehicle. An emergency shutdown sticker provided by the organizers must be placed on the vehicle bodywork to clearly show its position.
 - 3. Another emergency shutdown push-button which can be activated by the driver in driving position.
- If one of these three elements are activated, the valve and the relay must act simultaneously. These three possibilities will be tested during technical inspection.
- n) Whatever the reasons, the gas line hoses must be designed for gas use.
 - o) Hoses and connectors must resist to 9 bars pressure (i.e. 3 times the maximum of the operating pressure of 3 relative bars).

4C - BIOHYDROGEN FUEL CELL PROPULSION

Article 55: SUPPLY SYSTEM

- a) The competitors must provide a precise description and a technical diagram of the supply system. The fuel cell must work independently. The electricity required to operate the following elements must come from the fuel cell itself (and not from the accessory battery): temperature control, fan, compressor, electronic control system, electric motor.

- b) The hydrogen supply system must be designed in the following way: H₂ cylinder, 1st stage pressure regulator directly mounted on the cylinder, emergency shutdown valve mounted directly at the outlet of the pressure regulator, possibility of adding a 2nd stage expansion, flow meter and battery. The flow meter must be installed at the entrance of the battery. Both must be at the same pressure.

Article 56: CYLINDER

- a) During the competition, the competitor must use their own cylinder.
- b) Each vehicle must be equipped with only one cylinder.
- c) The Organizers take care of the filling of the cylinder.
- d) The hydrogen cylinders between BO4 and B2 are allowed.

Article 57: VENTILATION

See Article 22

Article 58: HYDROGEN DETECTOR

The hydrogen sensor must be installed inside the fuel cell compartment, next to the 5 cm² ventilation hole. This hydrogen sensor must command the valve and the emergency shutdown relay. The trigger threshold of the hydrogen sensor must be set to 25% of the Lower Explosive Limit (LEL) of the hydrogen in the air. A test will be realized during the Technical Inspection.

- a) The reset of the hydrogen sensor, namely the sensor and its electronics, must be done manually via a switch located in the fuel cell compartment. This switch must not be accessible by the Driver from the cockpit.

Article 59: EMERGENCY SHUTDOWN VALVE AND RELAY

- a) The hydrogen supply circuit must be equipped with an emergency shutdown solenoid valve.
- b) This solenoid valve must close normally in case of a power cut. It must be situated immediately at the end of the pressure regulator. The current supplying the motor must automatically cut out at the same time as the above solenoid valve is activated. This operation must be realized with a reliable relay, especially designed.
- c) The solenoid valve and the relay must be activated by one of these three devices:
 - The hydrogen detection, as explained above.
 - The external emergency safety shutdown situated at the outside.
 - The internal emergency safety shutdown activated by the driver in driving position.

In case of use of one of the three devices, the solenoid valve and the relay

must work at the same time.

The three devices will be checked during the Technical inspection.

Article 60: PIPES AND CONNECTIONS OF THE HYDROGEN CIRCUIT

- a) In all cases, piping and connectors of the hydrogen circuit must be designed for hydrogen use. The Team Manager must be able to present during the technical inspection the technical data sheets from the manufacturer of these piping and connectors to show that they are suitable for hydrogen use.
- b) The use of PTFE pipes is recommended for pressures less than or equal to 1.5 absolute bars. If the pressure in the hydrogen circuit is higher than 1.5 bar absolute (= 0.5 bar above atmospheric pressure) piping must be made of steel and connectors must be screw/compression type.

Article 61: PURGE PIPE

If a purge pipe is needed, its end must be located outside the vehicle.

Article 62: MEASUREMENTS AND EQUIVALENCIES

- a) The consumption of hydrogen is measured by an embedded flow meter. The volume of hydrogen consumed is displayed in liters under normal temperature and pressure conditions.
- b) Pulsing the hydrogen flow is prohibited.
- c) The flow meter display must be easy to read from outside the vehicle when the vehicle body is closed. It must be placed in the engine compartment.

Article 63: OXYGEN AND RESERVES

Oxygen for the fuel cell's operation must be from the surrounding air, not from oxygen tanks or compressed air reserves.

Article 64: SUPERCAPACITORS

- a) The state of charge of the super capacities will be checked before and after each attempt by its measurement of the voltage.
- b) The voltage recorded after the attempt must be at least equal to the voltage recorded it.
- c) The voltage registered after the run must be at least equal to the voltage registered before the run. In the event of the contrary, the Supercapacitor must be re-charged by running the fuel cell until their voltage is equal to the voltage registered before the run. The time allowed to perform this operation is 10 minutes beyond the end of the time corresponding to the

maximum race time to validate an attempt (maximum final time to perform the official measurement = start time + maximum race time + 10 minutes). No member of the team is authorized to intervene on the vehicle during this period.

Article 65: EXTERNAL STARTER BATTERY

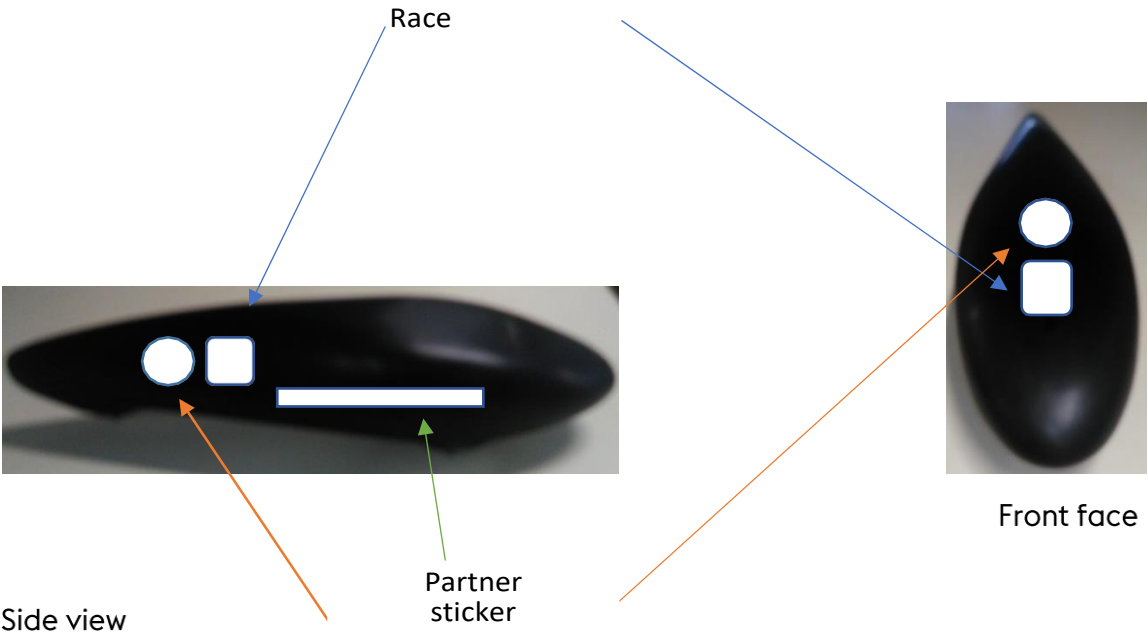
- a) An external battery is permitted on the starting line to start the fuel cell system. As soon as the vehicle is on the line ready to leave, the battery must be unplugged.
- b) If an external battery is used, two connectors must be installed outside the vehicle to allow a quick connection and fuel cell system start on the starting line. Only an autonomous external battery can start the fuel cell system.
- c) It is mandatory to operate the hydrogen detector and horn with the accessory battery. This battery can also provide power for the emergency shutdown valve and its relay and vehicle lighting system from the Urban Concept vehicles.

Article 66: ELECTRICAL AND ELECTRONIC CIRCUITS

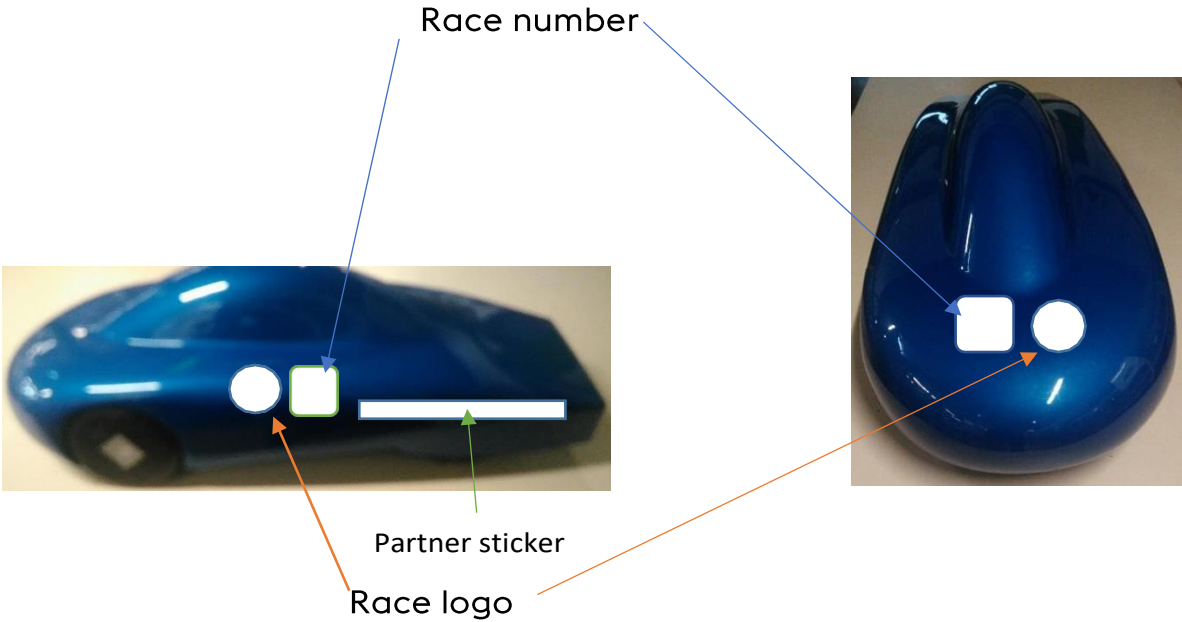
- a) All electrical/electronic cards and enclosures made by competitors must be protected at least by a transparent plate.
- b) A fuse must be installed on the positive terminal of the fuel cell stack.
- c) Its melting current (expressed in Amps) must not exceed 0,5 times the active area (expressed in cm²) of one cell of the stack.
- d) If a Supercapacitor is used in the circuit, a fuse must be installed on the positive terminal of the Supercapacitor pack. Its melting current must be less than the electrical current corresponding to an electrical power of 1000 W for the Urban Concept vehicles, assuming that the supercapacitors are charged to their maximum voltage.

Appendix I : Vehicule identification


PROTOTYPE



URBAN CONCEPT



Logos, race number and partner sticker will be positioned on each side of the car.

Identification	Position	Format	Quantity	Remarks
Logo race	. Left side . Right side Front vehicle	200 mm*215	3	Mandatory
Race number	. Left side . Right side Front vehicle	200 mm*260	3	Mandatory
Partner sticker	. Left side . Right side	770 mm*80	2	Mandatory
Emergency stop sticker 	. Near emergency stop button	120 mm*105	2	Mandatory

Appendix 2 : Race flags

USE OF FLAGS

- National flag: FLAG USED BY TRACK MANAGEMENT

Opening of the track for competition. Signal for the start of the time trials or the start of the race. Authorization to take the track and to begin the attempt.

- Checkered flag: FLAG USED BY TRACK MANAGEMENT

End of practice, practice and/or race session.

- Red flag: FLAG USED BY THE COMMISSAIRES ONLY ON INSTRUCTION OF THE TRACK DIRECTOR

Signal to stop a race. The vehicles must slow down, no longer overtake each other, drive at a reduced speed, stop at the place defined by the track director during the briefing. At the presentation of this flag, all the stewards will wave their RED flags all along the circuit to signal the stop of the race.

- White flag: FLAG USED BY THE COMMISSAIRES

The WHITE flag is always presented Waved. It indicates to the driver that a recovery vehicle has entered the track.

- Yellow flag: FLAG USED BY COMMISSAIRES

Still: it warns of an obstacle (broken down or damaged car). The driver must be vigilant and be ready to slow down.

Waved: It means that overtaking is forbidden.

- Green flag: FLAG USED BY COMMISSAIRES

Fixed: It indicates the end of the danger zone indicated by the yellow flag or a resumption of the normal race after an intervention vehicle. Placed in a visible place without a marshal, it indicates that the track is free.

Agitated: It signals to the driver that a vehicle is about to overtake him.



Appendix 4 : Biomethane circuit by AD VENTA



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Bio GNV H2 vert

Kit d'alimentation @200b Kit d'alimentation @200b



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AD-VENTA
INNOVATIVE

Système de remplissage H2/GNV pour valve de bouteille 0-70b 0-200b 0-300b

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Pour des raisons de sécurité :

Une formation au système de remplissage est obligatoire afin de permettre aux équipes d'être autonome. Les bouteilles sont obligatoirement vendues avec leur valve. Il est également impératif d'assurer le transport des bouteilles à vide (sans pression).

AD-VENTA préconise de fournir deux fois plus de bouteilles que de détendeurs. Par expérience d'assistance de course, il est préférable d'avoir plus de bouteilles + valve pour assurer un roulement lors de l'épreuve.

AD-VENTA décline toute responsabilité en cas de non-respect des consignes d'utilisation de ses produits.

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AD-VENTA
INNOVATIVE

Pricing

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Kit Bio GNV

P.U. H.T.

2 Bouteilles Alu 2L @200b
Valve de bouteille TPED
Détendeur MiniReg et ses accessoires
Total Kit

805 €

724,50 €

Remise
équipe
-10%

Kit H2Vert

P.U. H.T.

2 Bouteilles Composite 2L @300b
Valve de bouteille TPED
Détendeur MiniReg et ses accessoires
Détendeur MicroReg
Total Kit

1 375 €

1 237,50 €

Formation au remplissage

P.U. H.T.

Système de remplissage et ses accessoires
+ Test de fonctionnement
+ Test d'étanchéité

800 €

Formation aux manipulations gaz techniques entre les lignes HP et BP

540 €

Assemblage des composants sur votre système :
► Remplissage réservoir à l'aide du kit remplissage
► Connexion/déconnexion du kit de détente
► Mise en fonction du kit de détente en situation réelle
+ Fourniture d'un support de formation (hors frais de déplacement)
Total

1 340 €

1 206 €

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3



AD-VENTA
INNOVATIVE

Conditions

Délais : 8-10 semaines, à réception de commande (hors congés et selon charge en atelier).
Les délais sont fournis à titre indicatif et seront confirmés à la réception de la commande.

Conditions de paiement : Acompte de 30% à la commande. Le solde par virement bancaire et à 30 jours fin de mois, après facturation.

TVA : Nos prix sont exprimés en HT. La TVA, au taux en vigueur au jour de l'émission des factures, est facturée en sus.

Emballage et port : EXW À la charge du client. Non inclus dans cette Proposition Commerciale.

Tout ce qui n'est pas explicitement décrit dans le présent document ne fait pas partie de la prestation.

Service Commercial
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Service Technique
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