

# Hydrogen Concept Challenge

version 1.0 June 09th, 2023

We are really interested in your ideas and concepts for the future of Formula Student race cars and therefore ask you to participate in the FSA, FSEast & FSAA Hydrogen Concept Challenge!

We want to expand the options for powertrains that can be used in Formula Student, so after the CV class now has the option of a hybrid powertrain and we are even thinking about using E-fuels, we want to see if hydrogen can be a part of Formula Student in the future as well.

**The Concept Challenge is aimed at teams of both classes! It includes both:**  
**Hydrogen Fuel Cell technology within the existing EV class - short: [EV H2 FC]**  
**Hydrogen Combustion within the existing CV / CV Hybrid class - short: [CV H2]**

There are not yet any rules for this new hydrogen powertrain options but here is a quick rundown to be used as basis for the challenge:

- Hydrogen shall be integrated into the existing EV / CV Rules with only minimal adaptations
- Standardized hydrogen fuel tank and directly attached pressure regulator and self checking dual safety valves (we are aiming towards approx. 17 liters volume)
  - one such 17 liter bottle intended for EV fuel cell application (your concept can vary from that!)
  - two such 17 liter bottles intended for CV application (your concept can vary from that!)
- Maximum fuel tank pressure: 350 bar
- Fuel tank(s) must be protected from impact like the accumulators and must be easily removable
- For the design challenge: plan with a 280mm diameter and 400mm long pressure bottle
- For EV Hydrogen Fuel Cell cars only [EV H2 FC only]:
  - The hydrogen may only be used via a fuel cell
  - Any type and size of accumulator is allowed as a "buffer" and for recuperation, EV rules apply
  - Power limit for power drawn from the accumulator: same as normal EV-cars, enforced via tracking with the data logger
  - No power limit for power drawn from the H2 fuel cell
- For CV Hydrogen Combustion cars only [CV H2 only]:
  - The hydrogen may only be used in 4-stroke internal combustion process
  - Only one type of combustible fuel per car allowed (no combination of fuels / "Flex Fuel"/ "Dual Fuel")
  - Higher power limit intended as current CV
  - Hydrogen Combustion engine can be coupled with hybrid system as well (CV Hybrid Rules)

Judging Process:

Submission of Concept Paper (up to 5 Pages) per email to [hydrogen@fs-world.org](mailto:hydrogen@fs-world.org) until 2023-07-07 23:59

Personal Discussion per appointment at FS Austria on 2023-07-26 (20 minutes)

Personal Discussion per appointment at FS East on 2023-08-05 (20 minutes)

Personal Discussion per appointment at FS Alpe Adria on 2023-08-25 (20 minutes)

What do we want to see in your paper / discuss with you:

- Proposed system layout from fuel source to wheel / Integration with the powertrain
- Proposed electrical layout (Voltage, Capacities, Controllers, Sensors,...) [EV H2 FC only]
- Fuel cell power output and size as well as type and sizing of electrical energy storage device [EV H2 FC only]
- Type and size of engine, combustion recipe for H2, type of H2-air mixing device or devices [CV H2 only]
- Design proposal of a limiting device to limit the power at the wheel to the same level as CV cars [CV H2 only]
- Concept for packaging of the additional components
- Operational strategy & functions
- Safety concept for handling of hydrogen over the entire season from build to transport, testing, competition,...
- Concept for refueling of the hydrogen tanks that is suitable both for the competitions and the testing phase
- Expected performance impact and expected performance relative to current CV/EV designs
- Main performance limitations / limiting factors in regard to rules
- Proposal for required rule adaptations to accommodate H2 component
- Estimate of your fuel consumption for a typical Endurance

**Grand Price: Plaquette and a present**

We're looking forward to your submissions