



EV Prize 2018 Rules - Schools Division

(Battery limited to 5kg and 384Wh nominal capacity)

Practice Session is on Wednesday 31 October 2018 and Race Day also on Wednesday 31 October 2018. We reserve the right to alter the rules at any time including postponing or cancelling the event. The event has been growing in size each year and we fully expect it to go ahead as planned. We are **seeking sponsorship** and **registration of teams** on the website. Get registered and start planning, designing and building, your bikes for this annual event. To assist you in the process we have the **2018 Teacher Resource Kit available** for download. Please note that the organisers may have to postpone and/or cancel the event if the weather conditions on the day are not safe to host these events.

Prizes

The Schools Division is open to High School teams and to teams of Students from independent/home schooled/TVET circumstances. Teams must consist of a minimum of three Student members and be supervised by an adult 'team manager'. There is no maximum size of a team. The Schools Division contains a number of prizes (see below). Teams must enter the Schools Endurance Cup and Fastest Lap Prize to be eligible for the other Prize categories. Teams do not have to enter the other prizes to be eligible for the Schools Endurance Cup and the Fastest Lap Prize. All prizes will be determined at the race day on Wednesday 31 October 2018 held at the Newcastle Kart Racing Club Circuit in Cameron Park (see <http://www.hunterevfestival.net/>).

The Prizes:

1. **High School Grand Champion Prize (Highest Overall Points Scored)** – (Winner 2017 Toronto High School - Team 30 - Toronto High School Chain)
2. **High Schools Design, Innovation and Entrepreneur Prize** (Winner 2017 St Phillips Christian College – Team 31 – Zip Tie Technicians)
3. **High Schools Rotary Team Spirit Prize** (Winner 2017 Maitland Grossman High School)
4. **High Schools Endurance Cup Hub class** (2017 Winners Hunter Valley Grammar – Team 6 - Nuts and Volts 1)
5. **High Schools Endurance Cup Chain class** (2017 Winners Toronto High School - Team 30 - Toronto High School Chain)
6. **High Schools Fastest Lap Prize Hub Class** (2017 Winner Glendale Technology High – Team 18 –Kangaroo)
7. **High Schools Fastest Lap Prize Chain Class** (Winner 2017 Toronto High School - Team 30 - Toronto High School Chain)

The High School Grand Champion Prize

The Grand Champion Prize was introduced in 2016 and will be awarded to the team that accrues the most number of points stemming from participating in the 2018 EV Prize events Hub Class and Chain Class in the Schools Division.

This is a perpetual trophy given to the school that has the highest total of points from entering the EV Prize Races including the High Schools Design, Innovation and Entrepreneurs Prize, High Schools Rotary Team Spirit Prize and the High Schools Endurance Cup (Chain Class or Hub Class) and the High Schools Fastest Lap (Chain Class or Hub Class). Points will be allocated based on their position in each of the four categories as the overall performance in these competitions.

The High Schools Design, Innovation and Entrepreneurs Prize

The Design, Innovation and Entrepreneurs Prize will be awarded to the team that has best developed, manufactured and marketed a component or device that is part of the electric bike ecosystem. This may be either an electrical or mechanical component on the bike itself, a rider aid, or part of the off bike support systems.

1. Teams entering the Design, Innovation and Entrepreneurs Prize are asked to develop a 'kickstarter' type presentation along with their prototype product (see www.kickstarter.com)
2. Note that a kickstarter type launch for crowd funding requires teams to understand their product market, supply chains and manufacturing as well as the begins of marketing and distribution
3. A 'Kickstarter' type video is highly recommended as part of your presentation along with a plan of how you team would use social media to raise the profile of your kickstarter campaign if and when it was launched

The High Schools Rotary Team Spirit Prize

The Rotary Team Spirit Prize is awarded by the Rotary Club of Charlestown to the team with the best team participation. Consideration will be given to:

1. How the team was structured to be inclusive and allow contribution from all members
2. How conflict or differences of opinion was managed within the team
3. The team spirit on display during the race day
4. The Rotary Club of Charlestown will determine the winning team during interviews and observations during practice and race sessions.

The High Schools Endurance Cup (Chain Class and Hub Class)

1. Grid position will be determined by the order of entry

2. The winning vehicle is the first vehicle on the lead lap to cross the finish line after one hour of racing – (**Note**:-this time limit is subject to change on race day depending on the number of teams registered to participate) Should no vehicle on the lead lap be in a position to cross the start/finish line at the conclusion of one hour of racing, the vehicle that stops furthest around the track is the winning vehicle.
3. Human power other than for vehicle control is excluded from the competition. Teams may only use human power to launch their vehicle after an incident or to move their vehicle to a safe position perpendicular to their stopping point on the track.
4. Schools class teams must have a compulsory rider change at a team determined time sometime after 10 minutes of racing and before 50 minutes of racing.
5. Teams should expect to race at an average speed of approximately 35kmh⁻¹.
6. Vehicles will have a recharging window for their battery between qualifying and the endurance competition, or may use an identical battery approved by the scrutineers that has been charged prior to the competition (recommended).
7. Drafting is not allowed in the Schools Endurance Cup. Teams deemed to be drafting will be given a warning per rider and will face a one lap penalty for further infringements.
8. Schools may enter teams in either or both of the '**Chain Class**'(where power is supplied to the wheel via a chain or drive belt) or the '**Hub Class**'(where the wheel is powered by a motor that is integral to the wheel)

The High Schools Fastest Lap Prize (Chain Class and Hub Class)

1. The Fastest Lap Prize will be awarded to the team that completes the fastest lap during the School Endurance Cup Race
2. To be eligible for the Fastest Lap Prize the vehicle must complete 75% or more of the laps completed by the winning vehicle in their class
3. Should Two or more vehicles have identical fastest lap times, the vehicle that has travelled further at the conclusion of the race will be deemed the winner

EV Prize Schools Division - Vehicle and Safety Specifications

A: Electric Vehicle Definition

- For the purposes of the EV-Prize an electric vehicle is defined as a vehicle where the on board energy storage system is recharged using electricity and an electric motor is used as the sole source of motive power
- Harvesting of renewable environmental energy by the vehicle during the competition is allowed, as is regenerative braking
- Human energy input for motive power is not allowed in the event

B: Occupant Mass

- 1 Person >50kg

C: Maximum Vehicle Dimensions (including occupants)

- Eye line >1.2m, length <2.5m, width <0.9m and height <2.0m
- The vehicle and occupants must fit entirely within these dimensions

D: Battery Compliance

- The mass of the battery must be less than 5kg (the mass of the battery management system is not counted)
- The nominal energy capacity of the battery must not be greater than 384Wh
- In the context of the EV-Prize, “battery” is a generic term corresponding to any rechargeable device capable of being recharged by electrical energy. Examples of rechargeable storage mechanisms are ‘**electrochemical storage**’ (commonly called rechargeable batteries), ‘**capacitive storage**’ (commonly called capacitors) and ‘**mechanical storage**’ (flywheels etc.)
- Teams may use any untampered commercial e-bike battery pack that complies with the specified storage, voltage and weight limits. Those teams wishing to construct their own battery pack or modify an existing commercial e-bike battery pack (including the battery management system) in any way are restricted to using either Lithium Iron Phosphate, Lithium Titanate, Nickel Metal Hydride or Lead Acid chemistries.
- Commercially produced e-bike battery packs are limited to a nominal voltage of 36Volts
- Custom made LiFePO4 battery packs are limited to a nominal voltage equivalent to 12 cells (nominal voltage 3.2-3.3Volts) in series

E: Vehicle Mass

- Team Determined

F: Minimum Terminal Speed

- There is no minimum terminal speed, however if the vehicle is not capable of >40km/hr on level ground with no wind assistance it is unlikely that the vehicle will reach the expected average speed of 35km/hr due to corners and hills on the track.

G: Sponsorship

- The vehicle must have a panel area of >0.1m² on each side of the vehicle that can be seen unobstructed for advertising purposes

H: Braking System

- Each vehicle must be fitted with at least two completely independent braking systems
- At least one braking system must be a friction braking system

I: Braking Performance

- The vehicle and occupant(s) must be able to brake safely from 20kmh-1 to a full stop in less than 8m

J: Dynamic Performance

- Vehicles must be able to confidently swerve from a straight line, past an object placed 1m perpendicularly from the line and back onto the straight line within 8m at 20km/hr

K: Electrical System Safety

- Voltage is limited to a maximum of 36 Volts DC (pulse width modulation is allowed)
- Each vehicle must be fitted with a functional battery isolation switch accessible from both sides of the vehicle and visible to the driver/rider when in the normal vehicle operation position
- All vehicle power circuits must include a fuse or breaker rated to the operational voltage
- All vehicles must include a 'Power On' indicator light adjacent to the battery isolation switch that is lit when the isolation switch is on
- The battery pack must be compliant with the rules outlined in the 'Battery Compliance' section. Note that custom made battery packs or modified battery packs or battery management systems are limited to only specified chemistries

L: Lighting System

- Each vehicle must have a 'white' front headlight of at least 50 lumen (>1Watt) capacity mounted at least 40cm above the road surface
- Each vehicle must have a rear lighting system comprising a red taillight, a red brake light. The brake light must be activated whenever the friction or dynamic (regen) braking systems are activated
- The rear lighting system must be clearly visible to a person with normal vision at a distance of 20m in full daylight
- The front headlight and red taillight should be on whenever the battery isolation switch is in the 'On' position (recommended but not essential)

M: Safety Clothing

- The rules for safety clothing have been devised so that Riders should walk away uninjured from a sliding incident at 40km/hr on a bitumen road surface
- Riders must wear a motorcycle type helmet compliant with AS1698
- Riders are encouraged to wear motorcycle jackets, pants, gloves and boots
- Riders must have all skin below the neck covered by abrasion resistant clothing
- Riders must have armour or pads covering their knees and elbows at all times
- Riders footwear (preferably leather) must cover their ankles
- Riders must wear protective gloves - preferably leather
- Long hair, scarves etc. must be secured beneath protective clothing to remove the risk of entanglement with mechanical components

N: Chassis Safety requirements

- Batteries must be secured so that they do not appreciably move during vehicle acceleration, deceleration or vehicle rollover
- Electrical system components such as batteries and control electronics should be protected with a covering to prevent contact and damage
- Mechanical pinch points such as chains and gears must be enclosed in a covering to prevent entanglement
- The bike must have no sharp protrusions or edges that could pose a safety risk
- Tyre width as indicated on the side of the Tyre must be at least 23mm
- If the bike is designed to have multiple hand positions, a complete set of controls (accelerator, brake levers etc.) must be present at each hand position
- At least one designed hand position must be separated by more than 300mm

O: Seating Position

- No seatbelts or restraints are to be used in this class
- The vehicle must be designed so that the rider is not enclosed by the vehicle and will be easily separated from the vehicle in the case of an accident. This means that any fairings must not enclose the rider when viewed from either the side or top

- When seated on the vehicle, both of the riders feet must be able to simultaneously sit flat on the ground
- The knees of the rider must be in front of the centre of mass in the normal riding position
- The pelvic sit bones must be weight bearing in the normal riding position
- The rider must be able to seamlessly transition from the normal riding position to a standing position on the foot pegs or running boards without stopping the vehicle

P: Safety

- Teams are expected to conduct a continuous safety audit of their activities to ensure their own safety during development
- Teams are expected to make themselves aware of any existing Australian standards or materials safety data sheet relevant to their entry (See <http://www.safeworkaustralia.gov.au/sites/swa/whs-information/hazardous-chemicals/sds/pages/sds>)
- Teams looking to bring any pressurised or highly flammable gasses, liquids or solids to the event must develop a safety plan and notify the organisers for approval prior to the event

Rule updates should they occur will be posted on the Festival website.

All registered teams will be notified of rule changes/clarifications via email

If you would like to discuss or clarify sections of the rules please contact:

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