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7.4.5 Assistance to low-carbon innovation

Provide assistance for start-ups that foster and support a low-carbon economy or technology



GO-KART ELECTRICAL SYSTEM DESIGN CHALLENGE FOR A LOW-CARBON ECONOMY

This project proposes an innovative competition and development program aimed at designing an advanced **low-carbon electric go-kart propulsion system**, centered around a **6 kW Permanent Magnet Synchronous Motor (PMSM)**. The initiative targets start-ups, student teams, and early-stage innovators who are working on sustainable mobility solutions. By integrating high-efficiency electric propulsion technology with hands-on engineering challenges, the program accelerates the adoption, understanding, and commercialization of low-carbon electric mobility technologies.

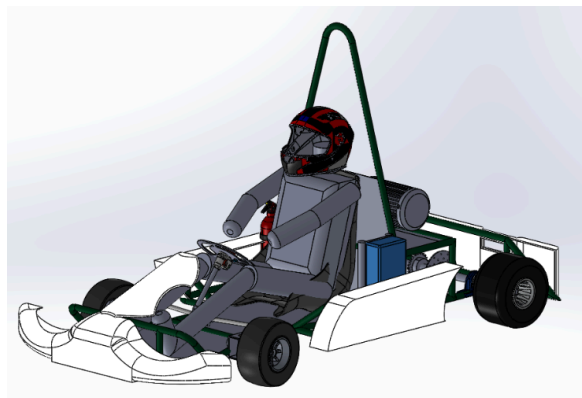
The challenge will promote **clean, renewable, and energy-efficient transportation**, strengthen technical talent in green technologies, and stimulate start-ups contributing to a low-carbon economy.

Electric Go-Kart System Design Challenge

The project proposes the creation of a national-level or institute-level challenge where participants design and develop the **electrical propulsion system of an electric go-kart** using a **6 kW PMSM motor**. The competition will emphasize:

- High-efficiency drivetrain design
- Battery and power electronics optimization
- Low-carbon lifecycle considerations
- Intelligent motor control (FOC, regenerative braking, thermal management)
- Safety, sustainability, and real-world engineering practices

This challenge functions as a practical platform for **low-carbon innovation**, guiding participants through the design, fabrication, and testing of electric mobility systems.



Low-Carbon Technology Justification

The **6 kW Permanent Magnet Synchronous Motor** is a high-performance, energy-efficient motor widely adopted in electric vehicles and green industrial applications. Key attributes relevant to low-carbon innovation include:

High Energy Efficiency

- PMSMs operate with **minimal energy losses**, significantly outperforming induction motors and brushed DC motors.
- Their superior efficiency directly reduces power consumption and environmental impact.

High Torque-to-Weight Ratio

- Ensures strong acceleration and performance with reduced material use, promoting lightweight, low-carbon vehicle design.

Precise Speed and Torque Control

- Supports advanced motor control strategies for **energy optimization**, regenerative braking, and extended battery life.

Brushless, Low-Maintenance Operation

- Reduced wear and maintenance translates to a longer product lifecycle and minimized waste generation.

Environmentally Friendly

- Zero tailpipe emissions
- Reduced carbon footprint from higher efficiency
- Suitable for renewable-powered charging systems

Overall, the 6 kW PMSM motor offers industry-grade performance while supporting sustainability goals and enabling next-generation electric vehicle research.



Electrical propulsion system of an Electric go-kart using a 6 kW PMSM motor