Formula E: The world's fastest electric vehicles could spark widespread innovation
By Brennan Doherty | 26 April 2024

The common electric vehicle (EV) doesn't need to hit lightning speed, but Formula E race cars might usher in a new era of innovation for all**. When** Formula E's Season 10 kicked off at Mexico City's Autodromo Hermanos Rodriguez in January, the roar of 40,000 spectators drowned out the high-pitched whine of the 24 all-electric race cars zipping off the starting grid. Traveling at speeds of over 300 km/h (186 mph), some of the world's best drivers jockeyed for position along the circuit.

Dreamed up in 2011 at a Paris restaurant, Formula E is now over a decade old. It features 11 teams, with 22 drivers total, operating single-seater race cars similar in appearance to the open-cockpit vehicles of Formula One (F1). "The standard of driving is very high," says Graham Evans, director of auto supply chain and technology for S&P Global Mobility, an automotive intelligence firm. "These are highly skilled, experienced professional drivers."

Since its inaugural season in 2014, Formula E has grown into a lucrative business. Intelligence company GlobalData estimates the championship's total sponsorship for the 2023-2024 season at $102.5 million, with international viewership and attendance estimated at 344 million worldwide in 2023.

The batteries in the current generation of Formula E cars deliver up to 350kW of power, propelling drivers to speeds of up to 320 km/h (199 mph). While Formula E might not yet have the pedigree or budget of F1, **it** provides an important testing ground for new battery technology that could benefit the entire EV industry.

Sustained High Performance

Competition among engineering firms to design batteries for Formula E is fierce, says Ashley Nunes, an associate at Harvard University's department of economics, who studies the EV market. Only a handful of elite companies, such as WAE, McLaren, Podium Advanced Technologies, and Atieva (Lucid Motors' tech arm), are capable of building the high-performance batteries needed for the series. **Although** developing **this** technology brings in short-term revenue, there's significant long-term potential in engineering these batteries.

The technology used in Formula E is far more advanced than the batteries found in a typical road EV. A Tesla Model S, for example, will start to slow down as its battery depletes, while Formula E cars maintain performance. Formula E batteries are also required to be lightweight (284 kg/626 lbs), capable of ultra-fast charging, and need sophisticated cooling systems to prevent overheating during races.

The engineering challenges, along with high capital investment, limit the number of companies able to produce these batteries. The Fédération Internationale De L'Automobile (FIA) reported that the cost of the GEN3 battery system for the 2022-2023 season was €264,812 ($268,000). The companies investing in this tech are multi-billion-dollar organizations, such as Mercedes and Ferrari, with deep pockets.

From the Track to the Road

The development of Formula E batteries also holds the potential to benefit consumer EVs. Innovations in battery pack configurations, cooling systems, and fast-recharge techniques may be patented and licensed to mainstream automakers. Historically, many technologies used in everyday cars, such as tire pressure gauges, have **their** origins in racing.

Though Formula E batteries have different requirements from road EVs (which prioritize high range, capacity, and longevity), new technologies developed on the racetrack—**such as** fast charging and immersion cooling—are already catching the attention of the broader EV industry. Immersion cooling, in particular, immerses batteries in a refrigerant fluid, resulting in a cooler and higher-performing battery. Combined with ultra-fast charging, innovations in Formula E could serve as a stepping stone for EV development worldwide.

1. Decide if the 10 sentences are True or False, justifying both answers by transcribing evidence from the text.

1. Formula E's inaugural season took place in 2014.

2. Formula E cars have a higher top speed than Formula One cars.

3. Formula E started as an idea in a Paris restaurant.

4. The power of Formula E batteries is 400kW.

5. Formula E drivers are amateur racers learning the sport.

6. The 2023-2024 sponsorship for Formula E was worth $102.5 million.

7. Formula E cars weigh more than 500 kg.

8. Formula E batteries are cheaper to manufacture than typical road EV batteries.

9. Road EV batteries are more advanced than Formula E batteries.

10. Immersion cooling is one of the techniques developed in Formula E that is being explored for consumer EVs.

2. Answer these 10 questions about the text.

1. When did Formula E's Season 10 start?

2. How fast can Formula E cars travel?

3. What is Formula E's total sponsorship for the 2023-2024 season?

4. Who is Graham Evans, and what does he say about the drivers?

5. What is one of the key challenges of Formula E battery design?

6. What is the significance of immersion cooling in Formula E batteries?

7. What company studies the EV market and comments on the competition in Formula E battery design?

8. How much does a GEN3 Formula E battery system cost?

9. What was the estimated global viewership of Formula E in 2023?

10. What are some of the potential benefits of Formula E innovations for the broader EV market?

3. What do the underlined words in the text refer to?

Although developing **this** technology brings in short-term revenue, there's significant long-term potential in engineering these batteries.

Historically, many technologies used in everyday cars, such as tire pressure gauges, have **their** origins in racing.

4. What is the meaning of the following connectors?

When

Although

such as

5. find a synonym for:

started (paragraph 1)

compete (paragraph 1)

trained (paragraph 2)

income (paragraph 5)

6. Write a short summary about the text (4 or 5 lines)