Google Cloud AI Helps Formula E in Groundbreaking 'Mountain Recharge' Energy Feat

GENBETA car completes Monaco E-Prix lap powered solely by regenerative braking after AI-planned mountain descent; the feat was filmed and produced by Red Bull Media House

MONTE CARLO, Monaco and LONDON, May 3, 2025 /PRNewswire/ -- In a daring demonstration enabled by Google Cloud's AI capabilities, Formula E successfully charged its GENBETA prototype race car using only regenerative braking during a 1,000-vertical-meter mountain descent – generating enough energy to complete a full lap of the iconic Circuit de Monaco. Leveraging the Gemini API via Google AI Studio, Formula E planned the optimal "Mountain Recharge" route down a French alpine pass, analyzing data in real time to maximize energy recuperation.

The groundbreaking "Mountain Recharge" project, undertaken in collaboration with Google Cloud, Formula E's Official Cloud Technology Services Partner and Official Cloud Security Partner, highlights the significant energy efficiency of Formula E vehicles. During races, the competing cars must regenerate approximately 40% of their required energy through braking.

The challenge involved the GENBETA car descending the Col de Braus mountain road in "free-wheel mode", starting with only minimal energy for system power-up. Driven by Formula E Test Driver James Rossiter, the car successfully generated the 1.6 to 2.0 kWh needed for the 3.337 km Monaco lap solely through gravity and optimized braking – equivalent to fully charging nearly 60 Google Pixel 9 Pro XL devices. The feat was filmed and produced by Red Bull Media House.

To determine the feasibility and plan the execution of the "Mountain Recharge" Formula E utilized several Google Cloud technologies:

- **Google AI Studio:** The Gemini API via Google AI Studio was used to analyze the complex variables of the descent. The AI model helped identify and analyze optimal braking zones, calculate the impact of speed-to-weight ratios and gravitational forces, and refine driving angles to maximize energy regeneration.
- **BigQuery:** Google Cloud's unified, serverless data to AI platform collected, stored, and analyzed real-time telemetry data transmitted from the car during the descent, providing crucial insights for verification and analysis.
- **Firebase**: Google Cloud's application development platform, Firebase was used to rapidly build and host the intuitive dashboard application that allowed race engineers to visualize real-time car telemetry data from BigQuery on their Chromebooks and Pixel devices.
- **NotebookLM:** Google's AI-powered research and writing assistant, NotebookLM, was used throughout the project lifecycle to consolidate technical specifications, logistical plans, and engineering data, streamlining collaboration between Formula E and Google Cloud teams.

Alex Aidan, VP Marketing, Formula E said:

"This isn't just another attention grabbing racing story - it's a case study in how high-efficiency regeneration and cloud-based AI can revolutionise how we think about mobility, energy optimisation and sustainability. The challenge we faced illustrates the kind of real-world problems Google Cloud's technology and that of our wider partner group can solve – whether it's regenerative braking for road cars, dynamic route planning for delivery fleets, or efficient energy management in smart cities. It's about developing technology that is designed to handle everyday circumstances and engineered to outrun.

"At Formula E and with the GENBETA project, we're all about pushing the boundaries of what's possible and doing things others have never dreamed of. The way our partnership with Google Cloud has rapidly evolved and our longstanding relationship with ABB not only shows the potential for technology to transform racing, but how global brands are bringing their narratives and products to life through impactful collaboration.

Guillaume Roques, Senior Director, EMEA Marketing, Google Cloud said:"Google Cloud thrives on helping partners solve unique challenges with data and AI, and the 'Mountain Recharge' project is a fantastic demonstration of how AI can tackle complex, real-world challenges. Using our technologies, we were able to model the intricate physics of the descent and precisely calculate the regeneration potential. This isn't just about race cars; it's about how our AI capabilities can help any organization optimize for efficiency and sustainability by turning data into actionable insights."

For more information you can watch the video here and read more in our blog post here.

Supporting Partners:
The GENBETA project and the 'Mountain Recharge' were also supported by GENBETA partners ABB, Hankook and SABIC.

About Formula E and the ABB FIA Formula E World Championship:

As the world's first all-electric FIA World Championship and the only sport certified net zero carbon since inception, the ABB FIA Formula E World Championship brings dramatic racing to the heart of some of the world's most iconic cities providing an elite motorsport platform for the world's leading automotive manufacturers to accelerate electric vehicle innovation.

The Formula E network of teams, manufacturers, partners, broadcasters, and host cities are united by a passion for the sport and belief in its potential to accelerate sustainable human progress and create a better future for people and planet.

www.FIAFormulaE.com

About ABB:

ABB is a global technology leader in electrification and automation, enabling a more sustainable and resource-efficient future. By connecting its engineering and digitalization expertise, ABB helps industries run at high performance, while becoming more efficient, productive and sustainable so they outperform. At ABB, we call this 'Engineered to Outrun'. The company has over 140 years of history and more than 105,000 employees worldwide. ABB's shares are listed on the SIX Swiss Exchange (ABBN) and Nasdaq Stockholm (ABB). www.abb.com

About Google Cloud

Google Cloud is the new way to the cloud, providing AI, infrastructure, developer, data, security, and collaboration tools built for today and tomorrow. Google Cloud offers a powerful, fully integrated and optimized AI stack with its own planet-scale infrastructure, custom-built chips, generative AI models and development platform, as well as AI-powered applications, to help organizations transform. Customers in more than 200 countries and territories turn to Google Cloud as their trusted technology partner.

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