



The History of 3 Generations

Interactive Activation Content Deck V01





HISTORY



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Formula E GEN1
2014 - 2018

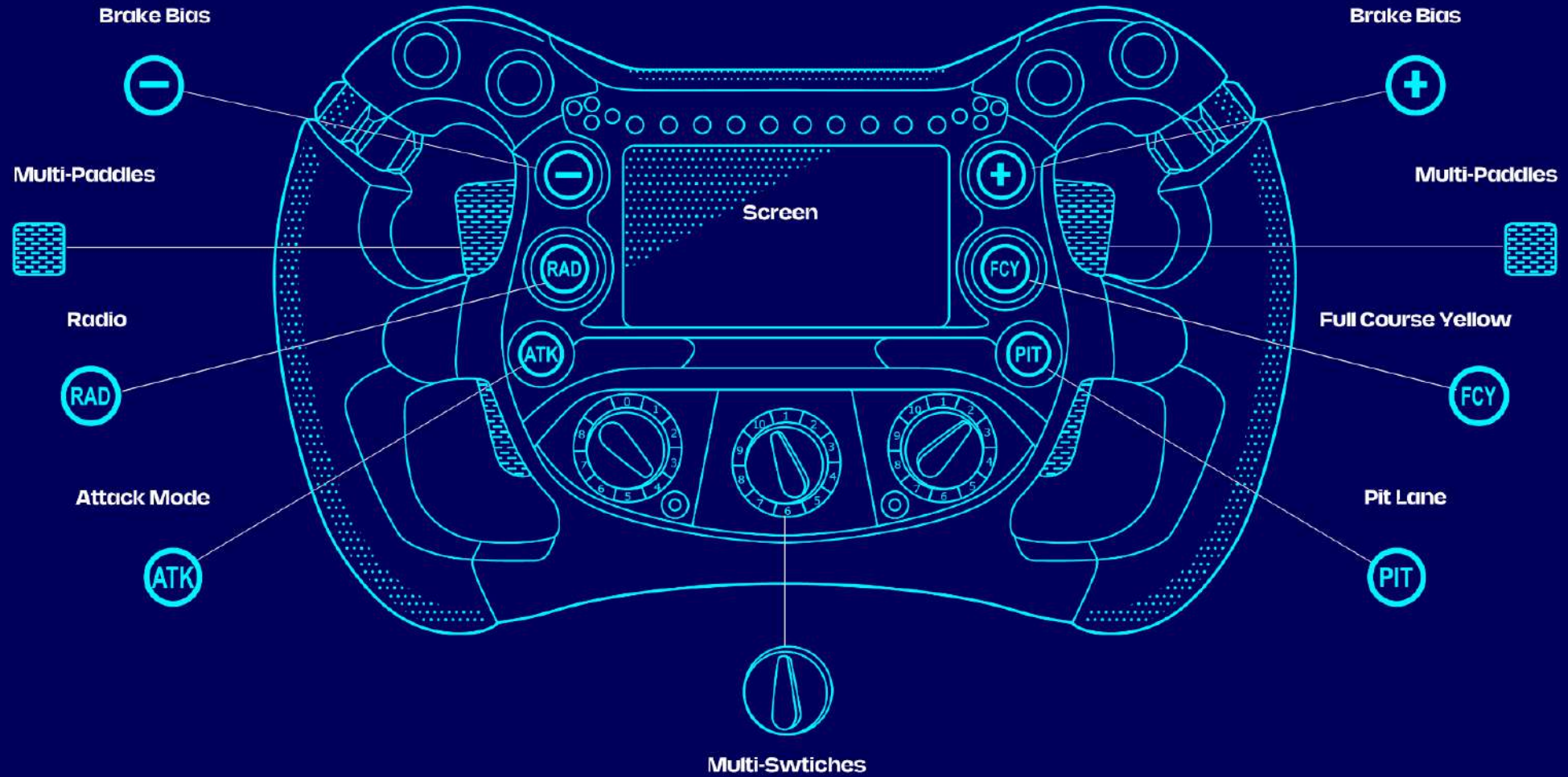


Formula E GEN2
2018 - 2022



Formula E GEN3
2022 - 2026



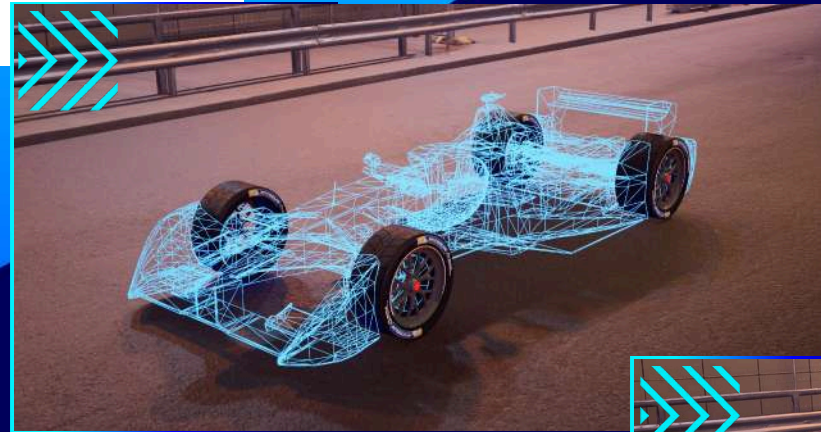
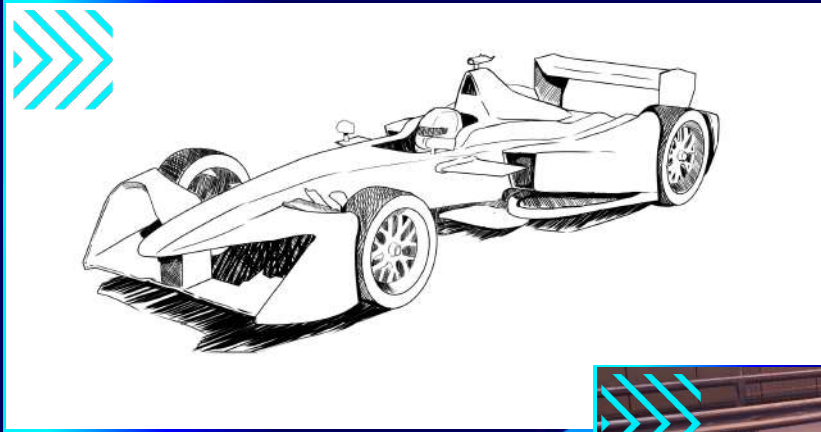




Generation 1

Back in 2014, the Gen1 car produced a humble 200kW of power, which was enough for it to hit a sizeable top speed of 225kmh and be able to regenerate 100KWh of power. While impressive for the time, the cars were a radical shift away from anything that had gone before them in motorsport, catching the eye of curious bystanders and fans as they cut their way through the streets of the world's greatest cities.





Season 1
2014/15

Season 2
2015/16

Season 3
2016/17

Season 4
2017/18

Season 1 - 2014/15

On the evening of March 3, 2011, FIA President Jean Todt and Spanish businessman, Formula E Chairman Alejandro Agag, met in a Paris restaurant and gathered their thoughts in just a few words on what would become the world's first all-electric international single-seater championship.

Formula E's founding mission was for its race through the streets of the most iconic cities in the world - with a grid full of the best racing drivers and teams around - to show just what sustainable mobility was capable of, driving electric vehicles to the fore in the race for a better, cleaner future.

In just three years, Formula E made it from concept to reality - through prototypes, innovative EV technology for the race track and on to Gen1, with the first race taking place six years ago on the series' global debut in the grounds of the Olympic Park in Beijing.

Season 2 - 2015/16

The 2015/16 calendar saw ten races in nine different cities and Formula E welcomed seven new manufacturers into the fold. Regulations were opened up to allow teams to design their own motors, inverters, gearboxes and rear suspension, with power also bumped to 170kW (230bhp).

Season 3 - 2016/17

Season 3 featured a significant calendar shake-up, with the championship's inaugural trip to Hong Kong and a first trip to Africa, in Marrakesh, the return of the Monaco E-Prix, Berlin's move back to the Tempelhof Airport Circuit after a year in Karl-Marx-Allee and finally, a double-header in New York City – the first time a motor race had been held in the Big Apple since 1896.

Jaguar made its return as a manufacturer in motorsport for the first time in 12 years as the legendary British marque took to the Formula E grid alongside the newly-christened TECHEETAH outfit whilst ABT partnered with Audi to create the Audi Sport 'factory' team. US racing giants Andretti entered a technical partnership with BMW, laying the groundwork for the German marque's impending entry in Season 5.

Season 4 - 2017/18

Season 4 welcomed ABB as title partner of Formula E, as the global technology company and the championship came together to drive progress at the forefront of electrification and sustainable technology.

The Gen2 Formula E car was unveiled to the public, with the promise of more speed, more efficiency and a leap so significant that races would no longer include car swaps. The Gen1 car would go out at maximum capacity, as power was increased from 170kW to 180kW (240bhp)

A total of nine manufacturers were now on board, including Jaguar, Nissan, BMW, Audi, DS and Mahindra, vindicating Formula E as a competitive platform for global car manufacturers and mobility providers to test and develop road-relevant technologies.

The swansong season for the Spark-Renault SRT 01E, Gen1, Formula E car saw Jean-Eric Vergne take Drivers' Championship victory, edging out incumbent champ Lucas di Grassi – though Audi Sport ABT Schaeffler did take Teams' honours ahead of TECHEETAH.





Audi Sport ABT Schaeffler



DS Virgin Racing



Panasonic Jaguar Racing



Venturi Formula E Team



Dragon Racing



Renault e.Dams



Nio Formula E Team



Techeetah



Mahindra Racing

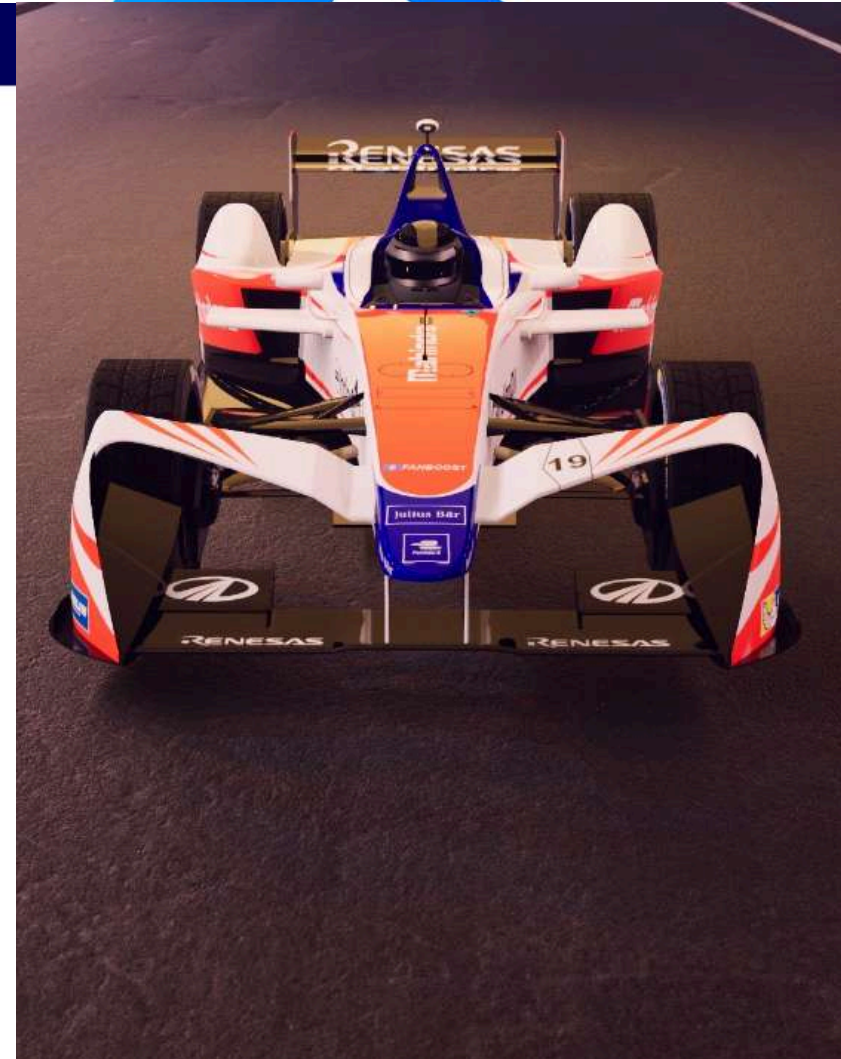


MS&AD Andretti Formula E

TEAMS

Formula E GEN 1 Technical Specifications

Length	5160mm
Width	1770mm
Height	1050mm
Front Track	1528mm
Rear Track	1492mm
Ride Height	75mm
Wheelbase	3100mm
Minimum weight (incl. driver)	880KG (65KG battery)
Max Power	200kW (268bhp)
Race Mode	180kW (240bhp)
Max regeneration	150kW
Max Speed	225km/h(140mph)
0-100 km/h	3.0s



Chassis and Monocoque

- e Built by Italian Racing Car specialists Dallara and are made of a carbon fibre / aluminium honeycomb composite

Bodywork, wings, and suspension

- e These were produced by the French company SPARK Racing Technology - a company that was established especially for Formula E
- e The fairings on the front wings are designed to minimise the wind resistance that is caused by the front wheels
- e The two large fins that protrude from the side of the chassis are part of the crash structure and offer non aerodynamic benefit.

Battery weight

- e 320kg (total) / 200kg lithium-ion cells. This is the equivalent of 300 laptop batteries or 4,000 mobile phone batteries

Battery charging time

- e 0% - 100% in 60 minutes
- e It lasts approximately for 25 minutes with the car in race mode
- e The battery would only last for half the race, and so there was the need for 2 cars per driver and mid-race car swaps.
- e The battery was built to a spec that was determined by FIA in terms of power, charge time and lifetime.

Powertrain

- e This is made up of the inverter, the motor, and the transmission

Noise

- e 80 decibels (dB) - similar to a road car at 70mph

The inverter

- e This takes electricity that is generated through the battery and converts the charge from a direct current to an alternating current, which is then used by the motor to drive the wheels.
- e The conversion rate of DC to AC happened 10,000 times per second.

The motor

- e RMP - 20,000

The transmission

- e Initially a five speed Hewland gearbox was used by all teams. However, as regulations adapted towards the end of the Gen1's life, allowing for teams to produce their own gearbox solutions, different teams utilised a different number of gears, mainly between 0-3

Breaks:

- e Carbon fibre disks rotate with the wheels of the car and when the driver applies pressure to the brake pedal, a pair of carbon fibre brake pads clamp to the disk, reducing the speed.

Suspension

- e Absorbing the bumps of the Formula E Championship's Street tracks is possible down to the rockers, dampers and torsion bars that are mounted in the chassis. These enable the car to keep flat through corners and the wheels firmly planted on the ground.

Tyres

- e Bespoke 18" treaded Michelin tyres for use in both wet and dry conditions.
- e The tires are distinctive in two ways:
 - e Low profile and designed for 18-inch rims
 - e Treaded so they can be used in both wet and dry conditions
- e These distinctive features are both to increase the efficiency in terms of the rolling resistance and number of tires needed. Traditionally, tyres need to be transported to races just in case it rains, and often go unused. Ensuring wheels can be used in both wet and dry conditions reduces this waste and inefficiency.

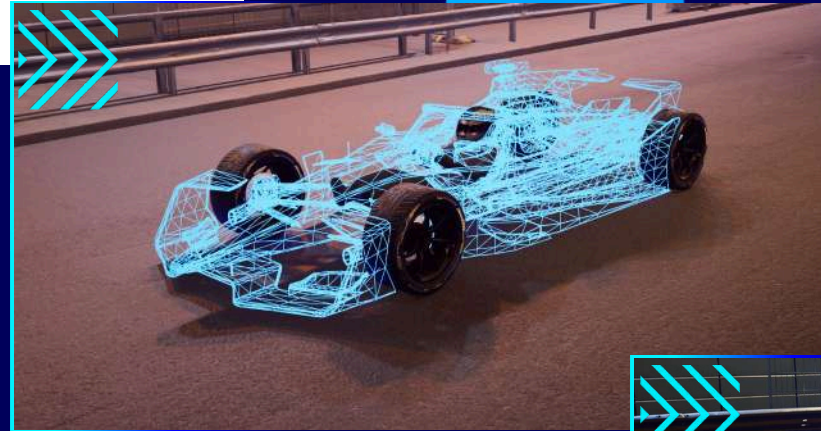
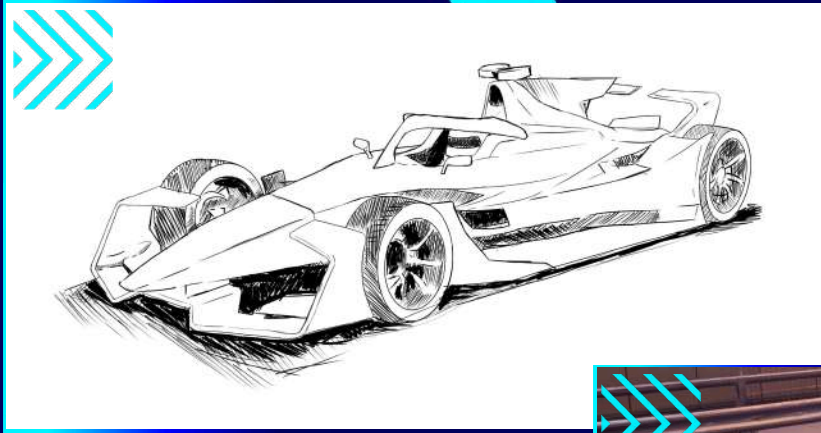




Generation 2

The tech stepped up a notch with the arrival of the Gen2 car in 2018, which packed a 250kW power pack that saw it reach a top speed of 280kmh and have the ability to regenerate its entire operating power input. With a new, bolder look and enclosed front wheel arches, the robust racer ushered in an all-new era of Formula E, which saw BMW, Audi, Mercedes-EQ, Porsche, DS, Jaguar, Mahindra, Nissan and NIO battle it out as the series grew. Taking on new street circuits, the Gen2 car carried four different drivers to the top of the championship before its final outing in Seoul, 2022.&





Season 5
2018/19

Season 6
2019/20

Season 7
2020/21

Season 8
2021/22

Season 5 - 2018/19

The first significant change was the introduction of the new Gen2 car. With dramatic Batmobile-esque styling, it had more power with a new lightweight battery now pumping out 250kW (335bhp) for a top speed of 280km/h (174mph). An increase in battery capacity also put an end to pitstops, with technological advancements now meaning one car could fulfill the new format of 45 minutes plus one lap at racing speeds.

Bringing a new tactical element to the races, Formula E reinvented racing again with ATTACK MODE. A challenge for the teams and drivers; leave the racing line to fire up ATTACK MODE but be rewarded with a timed power boost and gain an edge for a few laps.

Led by Formula 1 legend Felipe Massa at Venturi Racing, a host of new faces joined the grid, Belgian fan-favourite Stoffel Vandoorne lined up alongside DTM legend Gary Paffett in the new HWA Racelab squad. There was also promising young talent in the form of Pascal Wehrlein at Mahindra Racing and Oliver Rowland joining former champion Sebastien Buemi at Nissan e.dams, as the Japanese manufacturer entered the fray alongside German marque BMW.

Season 6 - 2019/20

Following a stunning year of racing, fans waited with bated breath for Season 6. The calendar boasted exciting new locations around the globe and the first half of the season didn't disappoint with new drivers coming to the fore in the championship standings. With the world plunged into uncertainty and lockdown following the coronavirus pandemic, however, racing was on hiatus.

There was still hope, though, with the Formula E community banding together during this trying period with Esports, charitable activities in support of UNICEF and more, before the thrilling and unprecedented return at the six-race season finale in Berlin.

In 2019/20 the ABB FIA Formula E Championship became #PositivelyCharged, as the series, its partners, teams, drivers and fans work together to grow electric racing and light up the world with its transformative power.

Season 7 - 2020/21

After six seasons of racing on the streets of the world's most progressive cities, Formula E gained World Championship status, a move granted by the FIA - motorsport's governing body in December 2019.

Season 7 saw the most competitive line-up in motor racing fight it out inaugural world title. With 12 teams, including 10 manufacturer outfits, and 24 of the best drivers from around the globe.

Diriyah not only provided the spectacular backdrop to the first race of the season, but it also broke new ground as the host to Formula E's inaugural night races. Setting in motion an enthralling run to the title that saw races in Valencia, Spain, to Puebla in Mexico and a return to the streets of London.

Season 8 - 2021/22

Season 8 was another momentous year for Formula E, with new innovations introduced, new locations visited and some major milestones achieved.

The first was the introduction of a brand-new, never-before-seen qualifying format to shake up the action on race day. There were the usual group stages, but instead of leading to Super Pole, they now fed into one-on-one duels. A one-shot lap for the drivers to battle for the Julius Baer Pole Position.

There were new locations added with global destinations joining the calendar with visits to Jakarta in Indonesia and Seoul, South Korea hosting the season finale.

Milestones were hit in the season finale, as the thrilling Gen2 era bowed out with Formula E's 100th race.





Envision Virgin Racing



Mercedes-EQ Formula E Team



Dragon / Penske Autosport



Nio 333 FE Team



Jaguar Racing



Renault e.Dams



Nio Formula E Team



Techeetah



Mahindra Racing



MS&AD Andretti Formula E



TAG Heuer Porsche Formula E



ROKiT Venturi Racing

TEAMS



Formula E GEN 2 Technical Specifications

Length	5160mm
Width	1770mm
Height	1050mm
Front Track	1553mm
Rear Track	1505mm
Ride Height	75mm
Wheelbase	3100mm
Minimum weight (Inc driver)	900KG (385kg battery)
Max Power	250kW(335 bhp)
Race Mode	200kW(270bhp)
Max regeneration	250Kw
Max Speed	280km/h(174mph)
0-100 km/h	2.8s



Design

- e Designed by SPARK and the FIA
- e The design has been aimed to increase downforce and to allow the driver to maintain aerodynamic grip when closely following another car. This helps when looking to overtake another car.
- e Most of the car's downforce comes from the underfloor, with a huge diffuser providing grip even if behind another car
- e This enables the rear wing to be downsized, with the X-Wing then adding to the car's unique looks
- e The front wheels are partially enclosed and the body work behind them cleans up the turbulence and routes along the flanks of the car, reducing turbulence to the following car.

Battery

- e This is the most notable difference between the Gen1 and Gen2 cars.
- e It has double the energy storage and so there is now no need to make a mid-race car swap
- e The Gen2 battery uses a different construction and cell technology to the outgoing battery.
- e This now sits inside the monocoque chassis and using a greater number of cylindrical 'battery' cells.
- e It utilizes a greater voltage, enabling both faster charging and less degradation over the race distance.
- e Their power output has also increased from by 50kW to 250kW.

Powertrain:

The inverter

- e The teams were free to use their own design, with the main benefits found to be in terms of size, weight, and packaging.

The motor

- e This is made up of two components - the rotor and stator.
- e The rotor contains magnets, whilst the stator comprises of coils of copper wire.
- e When an electrical current is passed through the wires it generates a magnetic field. The magnets in the rotor are attracted and repelled, and this spins the motor.

Brakes

- e New for the Gen2 car is a brake-by-wire system (BBW)
- e Previously, drivers would brake and get both the deceleration from the brakes themselves and a varying amount of slowing from the regenerative braking effect (regen) on the rear wheels.
- e Whilst drivers could adjust this Regen settings from the steering wheel, they could still be caught out by a change in the braking effort, causing them to lock up or spin
- e The new BBW system only affects the rear brakes.
- e The driver will still press the brake pedal as usual, and then the Electronic Control Unit (ECU) balances how much braking the driver wants and what braking effect will be supplied by the Regen set up. The ECU then only applies the rear brakes enough to balance the two.
- e This gives a balanced and consistent braking effect for the driver.
- e Teams are allowed to fit brake cuts to the front brakes for the first time, to tailor the brake cooling to suit the track conditions.

Tyres

- e The Gen2 car features the new Michelin Pilot Sport all-weather tyre, which is specifically designed for the unique demands of electric street racing.
- e The tyre is lighter than its predecessor and also boasts significantly lower rolling resistance and a new graphic design.

Suspension

- e There is a fixed design at the front on the Gen2 car, however manufacturers are able to fit and set up their own dampers.
- e The rear suspension design however is down to the team, with the wishbones, rockers and spring/dampers tailored to suit the powertrain.
- e The suspension can be set up and ride-height adapted to suit the specific street circuit.

Halo

- e The Gen2 car features a Halo head protection device, but this also has technology implemented to increase engagement with the race and improve the fan experience.
- e Fitted with LED strips, the Halo glows blue when the driver is in race mode, and yellow when the driver has engaged attack mode. This allows fans to easily and visually follow the strategy of their favourite drivers.
- e The Halo is made from top-grade high-strength Titanium, with walls 4mm thick.
- e It is able to withstand a force that's equivalent to 14 other Formula E cars stacked on top of it.





Formula E GEN3

Formula E's all-new car
2022 - 2026



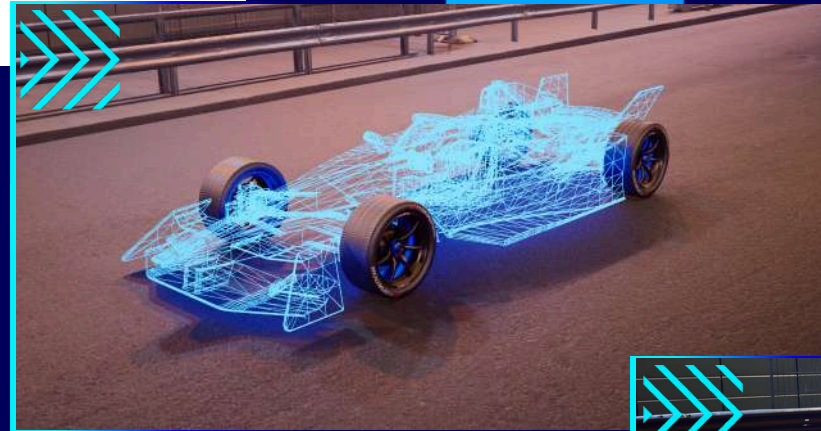
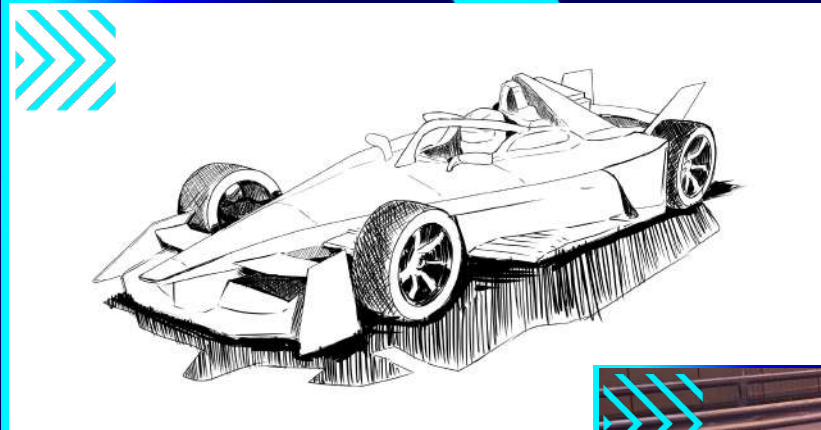
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Generation 3

With the much-anticipated arrival of the new Gen3 car for the 2022/23 season, the lessons learnt over eight years of electric racing have produced a car with 350KW of power, that's capable of 320kmh and can regenerate a staggering 600KWh of energy. Compared to the Gen1 car, the Gen3 Formula E racer is 75 percent more powerful, a greater top speed by 95kmh and six times the power regeneration capability.



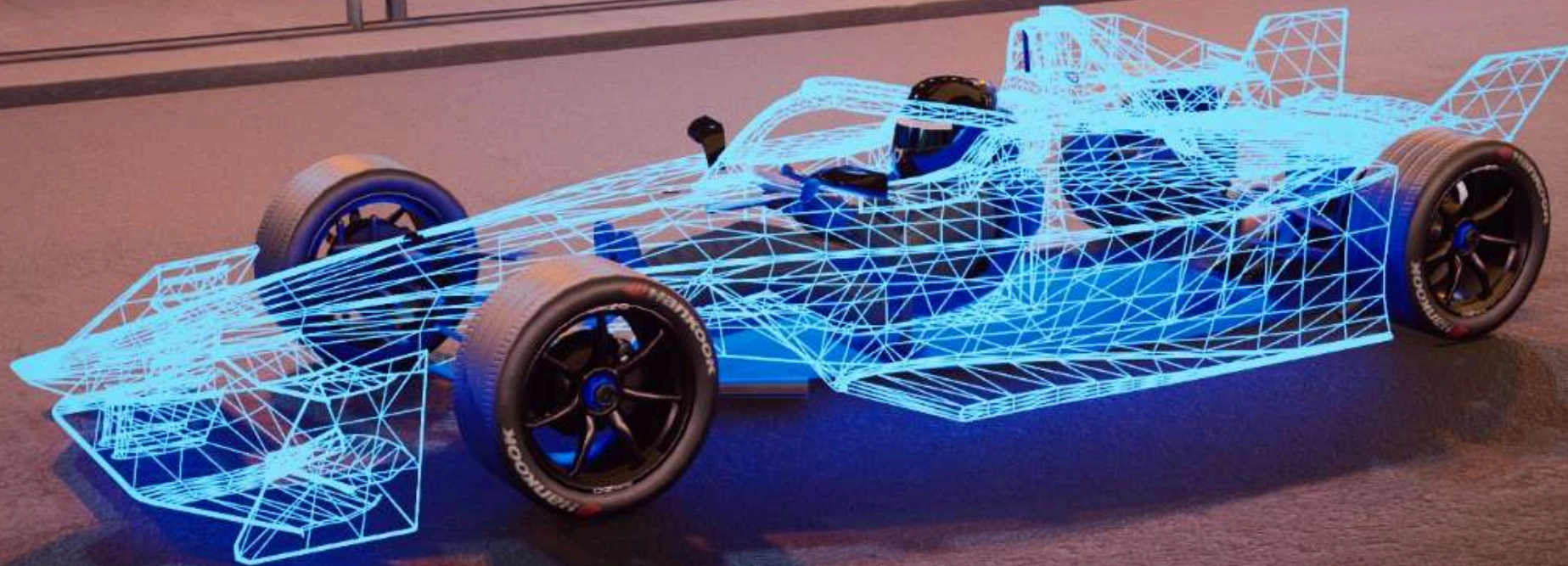






Welcome to Gen3

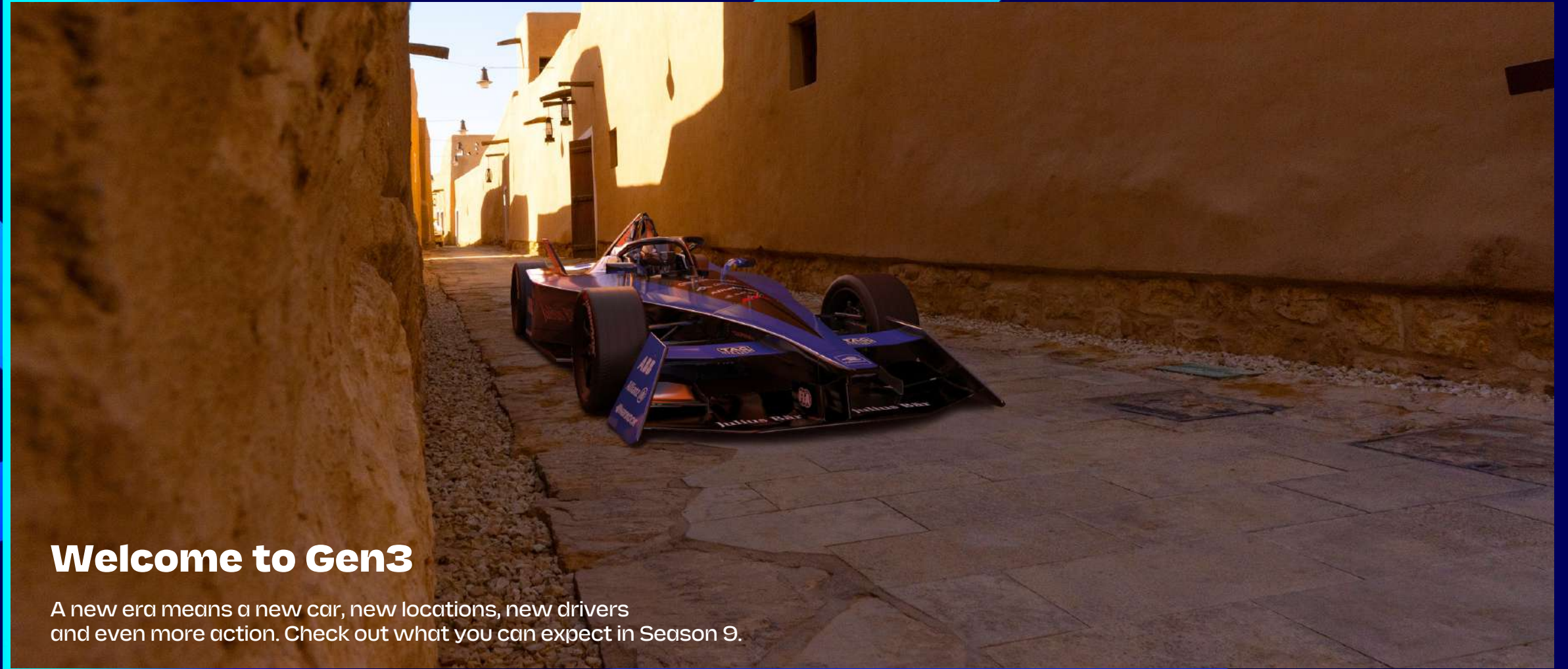
A new era means a new car, new locations, new drivers and even more action. Check out what you can expect in Season 9.



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Welcome to Gen3

A new era means a new car, new locations, new drivers and even more action. Check out what you can expect in Season 9.

Formula E GEN 3 Technical Specifications

Length	5016.2mm
Width	1700mm
Height	1023.4mm
Front Track	-
Rear Track	-
Ride Height	-
Wheelbase	2970.5mm
Minimum weight (inc driver)	840kg
Max Power	350kW (470bhp)
Race Mode	200kW(270bhp)
Max regeneration	600kW
Max Speed	320kmh / 200mph
0-100 km/h	2.6s



Performance:

- e Fastest Formula E car yet with a top speed over 322 kph / 200 mph
- e Most efficient formula racing car ever with more than 40% of the energy used within a race produced by regenerative braking
- e Around 95% power efficiency from an electric motor delivering up to 350kW of power (470BHP), compared to approximately 40% for an internal combustion engine
- e First-ever formula car with both front and rear powertrains. A new front powertrain adds 250kW to the 350kW at the rear, more than doubling the regenerative capability of the current Gen2 to a total of 600kW
- e Ultra-high speed charging capability of 600kW for additional energy during a race, almost double the power of the most advanced commercial chargers in the world
- e The first formula car that will not feature rear hydraulic brakes with the addition of the front powertrain and its regenerative capability

Sustainability:

- e Gen3 batteries are among the most advanced, sustainable batteries ever made consisting of sustainably-sourced minerals while battery cells will be reused and recycled at end of life
- e Linen and recycled carbon fibre will be used in bodywork construction for the first time in a formula car featuring recycled carbon fibre from retired Gen2 cars and reducing the overall amount of virgin carbon fibre used. This will reduce the carbon footprint of the production of the Gen3 bodywork more than 10%. All waste carbon fibre will be reused for new applications through adoption of an innovative process from the aviation industry
- e Natural rubber and recycled fibres will make up 26% of new Gen3 tyres and all tyres will be fully recycled after racing
- e The carbon footprint of the Gen3 has been measured from the design phase to inform all reduction measures taken to reduce environmental impact, while all unavoidable emissions will be offset as part of Formula E's net zero carbon commitment
- e All Gen3 suppliers will operate in line with top international standards to reduce environmental impacts of manufacturing (ISO 14001) and be FIA Environmental Accreditation 3-Star rated





ABT CUPRA Formula E



Avalanche Andretti Formula E



DS Penske



Envision Racing



Jaguar TCS Racing



Mahindra Racing



Maserati MSG Racing



NEOM McLaren Formula E



NIO 333 Racing



Nissan Formula E



TAG Heuer Porsche Formula E

TEAMS



Thank You