

A New Breed of Hybrid: The 2022 Tundra i-FORCE MAX

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An electrified pickup truck once seemed like an anomaly. But when Toyota set out to design the [2022 Tundra i-FORCE MAX](#) — the brand’s all-new powerful hybrid-electric pickup — it knew that challenging expectations would be the only road to success.

Winning consumers over on hybrids has never been an easy feat. Toyota knows this firsthand because the automaker accepted the challenge years ago.

The Birth of Hybrid Vehicles

A little over two decades ago, Toyota released the first mass-produced hybrid vehicle. The Prius (“before” in Latin) introduced people across the globe to a car that could function the same as the standard compacts they were used to – but with the added benefits of improved fuel economy ratings and lower emissions. But even as the Prius became popular, few could have predicted how popular these vehicles would become just 20 years later.

Jay Sackett, executive program manager in product development at Toyota Motor North America (Toyota), helps illustrate the role engineers have played: “We are now offering our fifth generation Toyota Hybrid System (THS). Each generation has built off that first Prius.”

For years, hybrid vehicles were primarily confined to small-car segments. The common thinking was that hybrids were an easy way to help save money on gas and reduce your carbon footprint – they were not known to be able to match the power and speed of a full combustion engine. So, as a collective understanding that carbon emission impacts climate change, the decision by Toyota to electrify its vehicle fleet became less of an “if” and more of a “when.” That left individuals, families and businesses that rely on full-size vehicles, like minivans and pickup trucks, wondering if electrification would catch up to their mobility needs. Toyota, always innovating to meet customer needs, saw this as an opportunity. The company now offers an electrified option in every category (sedan, minivan, SUV and truck).



Defining a Mission

When the Toyota Motor North America Research & Development team began to design the 2022 Tundra i-FORCE MAX, they knew exactly the challenge they were taking on: In the eyes of America's drivers, fuel economy and great performance are not always synonymous. But, in the case of the Tundra i-FORCE MAX, it was a necessity that they are.

“We were very sensitive to that point of view in the market, especially in the truck segment,” says Sackett.

So, the mission of the new Tundra — and especially the i-FORCE MAX — was determined. The vehicle was to not just meet the expectations of drivers awaiting a legitimately powerful, hybrid-electric pickup truck. It was to exceed them.

Toyota engineers came up with a solution. By putting the electric motor and V6 turbo engine in tandem, the dual-motor performance would be additive. As opposed to alternating between the electric motor and the combustion engine like with a traditional hybrid, the two would work in parallel to boost the total output of the truck, beyond even what the outgoing model's V8 engine could do.

Making it work would take a technological breakthrough.

“While some of the technology used, like motors and inverters, is similar to the THS, this architecture and operation is totally different,” says Sackett, “Through our new i-FORCE MAX one-motor system, torque and power are supplied to the wheels in two individual paths, via the V6 turbo engine *and* via the electric motor.”



Powerful Design

To achieve that vision, the engineering team needed to physically put the electric motor between the engine and the transmission. The motor would be asked to supplement the engine's output when necessary, adding more torque as the driver demands it or, in the case of very subtle throttle input, taking on the full load and allowing the engine to conserve fuel.

In Sackett's words, "The amazing thing with this powertrain is that now the customer does not have to compromise power and torque to have better fuel economy ratings."

The result is a truck that sports 437 horsepower and 583 pound-feet of torque. It can haul up to 1,665 pounds in its payload and can tow up to 11,450 pounds in a way that engineers have come to call "confident and natural."

"Our two powertrains achieve peak torque at very low RPM [revolutions per minute] compared to the outgoing V8," says Sackett, "This means the engine runs quieter, the vehicle drives smoother, and it really pulls your trailer."

Another benefit is the 10-speed automatic transmission which gives drivers the feel of gear shifting that's expected in trucks and aids in towing. Where a driver would naturally downshift to control speed — especially in hilly terrain — the Tundra is designed to do it on its own. That same functionality helps in off-road situations where low speed (but high torque) is desired.

The magic of this dual powertrain — that confident and natural feeling — is that, whether it's just the electric motor, just the combustion engine, or both in sync, the driver can control the vehicle comfortably and may not even feel the changes occurring beneath the hood.

"It is barely perceptible when it engages and disengages [hybrid operation]," says Sackett. "On our test drives, we kept an eye on the speedometer. It was surprising how quickly you got up to speed."



Reimagining Mobility

Toyota's journey from originator of one of the first mass-produced hybrid vehicles to developer of the powerful 2022 Tundra i-FORCE MAX was motivated by a goal: Achieve [carbon neutrality](#) by 2050.

As Toyota continues its evolution to a mobility company, reimagining the role that cars and trucks play in human movement is key. While realizing what the future of mobility looks like, innovation will be measured by meeting the needs of humans today without compromising the planet for humans tomorrow. The Tundra i-

FORCE MAX fits into this role and gives drivers a pickup truck that is designed to tow their haul and carry their load with fewer carbon emissions.

“Our transition to a mobility company, to me, means finding new, exciting ways to connect people to their destinations,” adds Sackett. “With the new Tundra, we are moving further into the exciting future with electrification and uncompromised performance.”

That’s the very core of the 2022 Toyota Tundra i-FORCE MAX: improved fuel economy and great performance, hand in hand, ushering in a new vision for the electrified pickup of tomorrow.