# Bottom-up, Tesla's Component Edge

*By John Benson*

*October, 2021*

## 1. Introduction

*"The best do sweat the small stuff. They get the seemingly insignificant details right. They have the discipline to shine at the baby things which they get gives birth to spectacular giant things."* – Robin S. Sharma, Writer

In other words, they sweat the components.

In observing Tesla for the better part of a decade, I know they do this, because of their results, because they constantly tinker with everything, and they design their products so they can do this (consider their fully connected EVs). Also because they have hundreds and hundreds of patents (go to the site linked below).

https://patents.justia.com/company/tesla

The fact that they have hundreds of patents is not unusual – any large corporation needs to protect their intellectual property (IP), especially one as innovative as Tesla. Also, Tesla/Elon has indicated that they are willing to license their intellectual property (IP) to other companies, so it is hoped that Tesla designs can move EVs and battery energy storage system (BESS) industries in general forward.

This post will look at components that Tesla is working on currently, and suggest how these might impact their future products. It will also look at third quarter 2021 results and other Tesla news.

## 2. EV System

The technique will use is both top (the whole system) down and bottom (each component) up. We will also use other Elon companies (SpaceX and the Boring Company) synergies.

The EV system consists of the following subsystems:

- Vehicles
- Charging Infrastructure
- Sales Infrastructure
- Maintenance Infrastructure
- Communication Infrastructure for all of the above

### 2.1. Vehicles

Tesla currently offers the following vehicles:

- Model S
- Model X

- Model 3
- Model Y

Tesla will probably offer the following additional vehicles by the end of 2022:

- Semi
- Cybertruck
- Low-cost electric vehicle (a.k.a. “$25,000 EV”)

Tesla may offer the following additional vehicles by the end of 2023:

- Roadster (with SpaceX cold thrusters)
- Van (first application: Transport in The Boring Company’s Tunnels)

## 2.2. Vehicle Assemblies

A Tesla EV contains the following complex assemblies:

### 2.2.1. Batteries

Batteries are one of Tesla’s potential major advantages, and they will probably continue development to increase their lead over competitors. The earlier post linked below probably contains the best coverage of Tesla’s future battery technology in section 3.2.

https://energycentral.com/c/ec/tesla-2021-update

Also, one of Elon’s old friends may help with some battery materials.

*Redwood Materials, the company started by former Tesla co-founder JB Straubel that aims to create a circular supply chain for batteries, is expanding its business. While it has been known primarily as a recycling firm, Redwood plans to simplify the supply chain by producing critical battery materials right here in the U.S.*[1]

*To get there, the company is currently scouting a location for a new million-square-foot factory, at a cost of over $1 billion, Bloomberg reported. That factory would be dedicated to the production of cathodes and anode foils, the two essential building blocks of a lithium-ion battery structure -- up to a projected volume of 100 gigawatt-hour per year’s-worth of materials, enough for one million electric vehicles, by 2025.*

*But that’s not all. By 2030, the company expects to increase its annual battery materials production to 500 GWh, enough to power five million electric vehicles.*
*These numbers are incredibly ambitious. If Redwood can pull it off, it would be putting itself squarely among the ranks of the largest materials giants in the world, many of which are located in Asia. BloombergNEF estimated that consolidating the cathode supply chain to the United States, and using a certain percentage of recycled materials, could cut emissions from battery-pack production by 41%.*

[1] Aria Alamalhodaei, Tech Crunch via Yahoo News, “JB Straubel's Redwood Materials is expanding into the battery materials business,” Sep 14, 2021, https://news.yahoo.com/jb-straubels-redwood-materials-expanding-143623965.html

*Recycling alone won't take the company to these kinds of production numbers, though Redwood is also planning to expand its recycling operations. Instead, the company said in a statement that it would produce the anodes and cathodes from both recycled batteries and "sustainably mined material." For now, the company is staying mum on its partners for this new endeavor, but it will likely mean more announcements of partnerships and expansions in the future.*

### 2.2.2. Inverters (and other Power Electronics)

*In Q3 of 2020 Tesla orders surged by 45% to the highest in company history. Despite the pandemic, it fell just shy of its 500,000 unit sales goal for 2020. How is this possible? In an effort to reduce its reliance on Asian chip makers and improve energy efficiency, the EV innovative juggernaut set out on a mission (dating back to 2016) to produce its own in-house chips. And rather than being made entirely of silicon – the preferred choice for mass produced semiconductors – Tesla pursued a new material technology known and Silicon Carbide (SiC). The company has used this new wafer makeup to great success in its latest models.*[2]

*The unique properties of silicon-carbide make it much more energy efficient and durable relative to traditional silicon wafers. Due to their improved thermal conductivity, SiCs reduce energy loss by as much as 50%. Tesla's accelerated move away from standard silicon wafer usage during the pandemic is particularly impressive and their innovation has inspired other companies to follow suit.*

Although SiC technology is primarily used for power electronics (in EVs, invertors, DC/DC convertors and rectifiers), they are, by far, the best technology for these applications. Tesla started using SiC in its main inverter in 2017, and now all major manufacturers that intend to manufacture EVs use, or intend to use this technology.

Note that conventional silicon chips are still the technology of choice for conventional data processing chips (see below) where density and speed are more important than efficiency and robustness.

### 2.2.3. Motor(s)

All of Tesla's existing cars emulate European Premium sedans and SUVs in that their base-models are rear-wheel drive. The base models also use a single motor mounted near their rear axle.

*Originally, Tesla was using induction electric motors (by the way, invented by Nikola Tesla).*[3]

*In the Model 3, the company used IPM-SynRM motor (Internal Permanent Magnet - Synchronous Reluctance Motor), known also as PMa-SynRM Permanent Magnet Assisted Synchronous Reluctance Motor.*

[2] Ariel Cohen, Forbes, "Tesla Flexes Innovative Muscle By Manufacturing Own Chips During Supply Crunch," Sep 22, 2021, https://www.forbes.com/sites/arielcohen/2021/09/22/tesla-flexes-innovative-muscle-by-manufacturing-own-chips-during-supply-crunch/?sh=7406f1fd1618

[3] Mark Kane, InsideEVs, "Tesla Model 3's IPM-SynRM Electric Motor Explained," Dec 22, 2020, https://insideevs.com/news/461811/video-tesla-model-3-electric-motor-explained/

*In general, it's a type that combines Internal Permanent Magnet motor type with Synchronous Reluctance Motor rotor type to achieve a more desired characteristic in EV application - high efficiency at low and high speeds.*

*Tesla is not the first to use this type of motor, but its version is considered one of the best (simply because of the high efficiency and range of Tesla cars).*

*Tesla's specific innovation is the segmented magnets (four parts instead of the more typical single solid magnet). This helps to reduce the eddy currents and lowers the risk of magnets overheating.*

AWD model 3s and all Model Ys (current Model Ys come standard with AWD) are equipped with induction motors to drive the front wheels. Even though these are slightly less efficient than the IPM-SynRM rear motor, they are also less powerful and used intermittently so overall efficiency remains high.

### 2.2.4. Chassis

A large majority of modern autos use unibody construction, where the body provides some to all of the structural integrity of the vehicle. This sometime called monocoque or semi-monocoque. The alternative is “body-on-frame” construction, where the frame contains most of the vehicle’s structural integrity without the body.

Tesla uses unibody construction, but they have taken this two steps further.

**Structural Batteries:** Most modern electric vehicles use a skateboard design, where their batteries are contained in a rigid chassis element on the bottom of the vehicle. Tesla has also used this to date. A future version of the model Y and all future vehicles will use structural batteries. This is best explained in earlier post linked below, section 2.1.2. Briefly, the structural battery is similar to the skateboard, but the new 4680 cells are designed to be bonded inside a redesigned bottom-structural-element, and the integrated assembly is both stronger and lighter than the skateboard with batteries.

https://energycentral.com/c/cp/battery-day-%E2%80%93-part-1

**Giga Press Castings:** All model Ys use a primary rear structural element that is the largest die-cast component in the world. In prior models this element was composed of many elements that needed to be assembled. The future version of the Model Y will also use a front primary structural element that is a Giga Press casting. Note that Giga Press castings use a new alloy that was developed by SpaceX. Also all future vehicles will use this technique for major structural elements. See the prior paper linked in subsection 2.2.1 above, section 3.1 for more details.

### 2.2.5. Interior

All Tesla’s share a lean design that is very different from all other vehicles. This was not so apparent in Teslas first volume-produced car (the Model S), but it came to fruition in the Model 3 – just one very large touch screen, very few other controls, and no “instrument cluster” in front of the driver. Model Y repeated these design elements. Now the new Model S Plaid have redesigned them again. In order to understand what Tesla is doing you need to understand their culture:

*From the time they hit the mass market nearly a decade ago, Tesla’s vehicles have garnered reputations as “iPhones on wheels,” a revolutionary technological leap that did*

*for cars what Apple's smartphone did for consumer tech. They offered large touch screens, a vast charging network and groundbreaking performance that delivered on the dream of electrification seemingly without compromise, where competing products failed to stitch all aspects of that formula into one.*[4]

*Like Apple, Tesla built its brand on exclusivity and aspirational products, prioritizing the experience of ownership as much as the utility of the device itself. And both companies have integrated software with hardware in a way that revolutionized their industries, making the transition to new technologies relatively intuitive for even the non-tech-savvy user.*

*It's no accident the companies have a lot in common, according to a half-dozen former employees who worked for both Tesla and Apple, who spoke on the condition of anonymity because of the sensitive nature of the workplace dynamics and for fear of retaliation. Tesla hired managers who brought members of their teams from Apple, importing its design language and culture. Meanwhile, those employees could be dismissive of the automotive expertise within its ranks, the former employees said.*

*"Tesla is not an automotive company, it's a tech company that builds cars," said one former employee of both companies who worked in products.*

*The companies' shared vision includes an emphasis on some forms of proprietary technology. Tesla uses a unique charging connector, similar to Apple products with their "Lightning" connectors. It has built out what it says is the world's largest fast-charging network, consisting of more than 25,000 Superchargers. The cars' groundbreaking over-the-air updates mean users can be subject to sudden performance changes if products become out of date — like battery throttling for which Apple has come under fire. Tesla's unique systems have also proved difficult for government authorities investigating crashes to decode, a problem that echoes federal authorities' difficulty unlocking Apple devices.*

*It's a far cry from a traditional auto industry built largely on standardization — from gas pumps to windshield wipers, to in-car infotainment systems with Apple CarPlay and Android integration. Tesla has its own touch-screen interface that can prove to be a learning curve for new adopters, though it enables a user experience uniquely suited for its cars — an integration of hardware and software reminiscent of Apple.*

For a good tour of the latest user interface in the Model S Plaid, go through the link in the reference here.[5]

Note two things: on the "invisible A/C system" screen you can see a good visualization of this system operating and also see Tesla's new yoke steering control (no wheel). I've heard some say that the latter is starting to become vestigial in preparation for Full Self Driving (FSD) to finally become fully function and approved (see below).

[4] Faiz Siddiqui, The Washington Post, "Tesla is like an 'iPhone on wheels.' And consumers are locked into its ecosystem," May 14, 2021, https://www.washingtonpost.com/technology/2021/05/14/tesla-apple-tech/
[5] Fred Lambert, Electrek, "First look at Tesla's new user interface," Jun. 11th 2021, https://electrek.co/2021/06/11/tesla-new-user-interface-first-look/

### 2.2.6. Data Processing Subsystems – Overview

The original Model S was designed from the beginning to be fully connected to the cloud. This means several things for all of the systems below.

- Although Teslas have powerful internal processors (see below), they can also use the processing power and more importantly the data storage of the cloud.
- Each vehicle learns and adapts to its user(s), and the Tesla cloud learns about all users (individually and collectively), all routes, all environments, all of its EVs and continues to adapt those EVs to their environment over time.
- All auxiliary systems that support the EV (chargers, maintenance facilities, etc.) also communicate with the cloud and thus know about all EVs and their users
- Any anomaly in a single EV or a single model / version of any Tesla EV is detected by the cloud. Eventually anomalies are repaired by a nightly software update whenever possible.

The latter reminds me of the way Microsoft Windows works with its periodic updates. Although Windows (including Microsoft Applications designed to run under Windows) is 100% software-based, a Tesla EV is not (if they ever invent a way to fix a punctured tire with a software update, I'll be really impressed; not so much if they invent proprietary tire designs).

### 2.2.7. Data Processing Subsystems – FSD and Hardware

Full Self Driving is uniquely dependent on in-vehicle processing power. That's because going through a data network to get to cloud resources is slow, compared with the speed that decisions need to be made when driving a car. Tesla has struggled with this since the Model S. If Elon has a fault it's that he occasionally discounts the amount of time and effort required to implement a project, and sometimes by a large amount. But he's stubborn, determined and never gives up. That is why he will eventually will solve FSD.

However along the way to this Nirvana, Elon has created much good:

*In the 1st quarter (2021), we registered one accident for every 4.19 million miles driven in which drivers had Autopilot engaged. For those driving without Autopilot but with our active safety features, we registered one accident for every 2.05 million miles driven. For those driving without Autopilot and without our active safety features, we registered one accident for every 978 thousand miles driven. By comparison, NHTSA's most recent data shows that in the United States there is an automobile crash every 484,000 miles.*[6]

The latest milestone on the way to FSD is a new data processing architecture for all new vehicles:

*At Tesla AI Day last month, CEO Elon Musk was asked whether or not Tesla is reaching the limit of the FSD computer's capacity.*[7]

[6] https://www.tesla.com/VehicleSafetyReport

[7] Fred Lambert, Electrek, "Tesla is in talks with Samsung to produce its next-gen Full Self-Driving chip," Sep 23, 2021, https://electrek.co/2021/09/23/tesla-in-talks-samsung-produce-next-gen-full-self-driving-chip/

*The CEO reiterated that he still believes the FSD computer will be able to achieve full self-driving…*

*But Tesla also always said that it plans to improve on the FSD Computer first introduced in 2019.*

*At the event, Musk referenced the "Hardware 4" or "FSD Computer 2" and linked it to the launch of the Cybertruck…*

*Now sources talking to the Korea Economic Daily said that Tesla is in the late stages of negotiating the production of the new chip with Samsung…*

*Samsung reportedly plans to produce the chip using its 7-nanometer technology at its Hwasung factory:*

*The plant would reportedly be able to handle large-volume production of the chip to satisfy Tesla's demand.*

*If the chip is to debut in the Cybertruck as indicated by Musk, it would put the release in late 2022.*

**Issues with the automotive chip supply pipeline:** I don't know if this is generally true, but apparently these issues will be resolved for Tesla:

*Tesla Inc. CEO Elon Musk said on Friday that thanks to new semiconductor plants that are planned or under construction, the global chip shortage that has pummeled the car industry this year should be short term in nature.*[8]

*Asked how long he thought the global chip shortage would affect vehicle production, Musk said: "short term I think".*

*"There's a lot of chip fabrication plants that are being built," Musk said during a joint session with Stellantis and Ferrari Chairman John Elkann, at Italian Tech Week.*

*"I think we will have good capacity for providing chips by next year," he added.*

### 2.2.8. Data Processing System – Communication

There have been ways of linking vehicles to the cloud for several decades – cellular Internet Protocol (IP) networks. Initially these were very slow and had limited coverage. But as digital cellular matured through Gen-2, Gen-3 and now Gen-4 technologies, this transport became very fast, and coverage is now almost ubiquitous.

A month or two ago, construction in my neighborhood (in Livermore) cut my Comcast fiber / cable Internet connectivity. After a few days with no repair I purchased an inexpensive Verizon 4-G hot spot. I used this for several days, and couldn't tell the speed difference vs. my Comcast service. Also I have Gen-4 coverage at my home in Arnold, CA (pop: 4,000) in the Sierras.

[8] Giulio Piovaccari, Reuters via MSN, "UPDATE 1-New semiconductor plants will end global auto chip shortage next year -Tesla's Musk,", Sep 24, 2021, https://www.msn.com/en-us/money/companies/update-1-new-semiconductor-plants-will-end-global-auto-chip-shortage-next-year-teslas-musk/ar-AAOMczh?ocid=BingNews

With Gen-5, speeds will increase and coverage of this new technology will increase over time, but as I mentioned above, Elon is impatient.

You probably have heard of Starlink. Starlink is SpaceX's (and thus Elon Musk's) global data network based on thousands of low-Earth orbit (LEO) satellites. Starlink is also designed for low-latency:

*SpaceX's Starlink satellite broadband service will exit its beta test sometime in October, though it's still unclear how this will differ from the current product…*[9]

*Today, a Starlink FAQ advises beta testers paying $99 a month (plus $499 for the terminal) that they "can expect to see data speeds vary from 50Mb/s to 150Mb/s and latency from 20ms to 40ms" but may also experience "brief periods of no connectivity at all."*

*In June, for example, Musk said… "Starting in August, we should have global connectivity for everywhere except the poles,"*

*A total of 1,658 Starlink satellites operate today; …the Federal Communications Commission (FCC) has authorized a total of 4,408 for its first phase, with tens of thousands more possible in future phases.*

Also:

*Engineering researchers external to SpaceX found a way to use the Starlink constellation signals for navigation similar to the capabilities provided by global positioning satellites (GPS), which are used in the United States and several other countries. The study represents the first time Starlink was used for navigation by researchers outside of SpaceX, the team members stated.*[10]

*Researchers triangulated the signals from six Starlink satellites to fix upon a location on Earth with less than 27 feet (eight meters) of accuracy, the team reported in a statement. That's pretty comparable to the typical GPS capabilities of a smartphone, which typically pinpoints your spot on Earth to within 16 feet (4.9 m), depending on the conditions.*

The above would be required for navigation.

It would not be totally surprised if I heard, at some point in the future, that Tesla EVs were being equipped with Starlink terminals. Could it be that's part of the "Hardware 2" upgrade described above?

# 3. Battery Energy Storage Systems (BESS)

The only problem that Elon has with BESS is building enough of them, and he is working on some solutions for that. Go through the link below to a recent post, then to section 2.

https://energycentral.com/c/cp/photovoltaic-storage-fall-2021-part-3-states-megafactory

[9] Rob Pegoraro, Fast Company vis MSN, "Elon Musk says his Starlink satellite internet is coming out of beta," Sep 20, 2019, https://www.msn.com/en-us/news/technology/elon-musk-says-his-starlink-satellite-internet-is-coming-out-of-beta/ar-AAODQvw?ocid=uxbndlbing

[10] Elizabeth Howell, Space.com via MSN, "SpaceX's Starlink broadband satellites could be used for GPS navigation," Sep 25, 2021, https://www.msn.com/en-us/news/technology/spacexs-starlink-broadband-satellites-could-be-used-for-gps-navigation/ar-AAOOvu3?ocid=BingNewsSearch

## 3.1. Synergies with EVs

There are many synergies between EVs and BESS. Specifically see the prior subsections listed below.

- 2.2.1, Batteries
- 2.2.2, Inverters (and other power electronics)
- 2.2.7 Data Processing Subsystems
- 2.2.8, Communication Infrastructure

Note that Tesla will be using LFP batteries ($LiFePO_4$ or Lithium Iron Phosphate), a.k.a. "iron based" batteries for the Megapacks. Not only do these have the lowest cost chemistries of any current LiIon battery, but they are the same chemistry that Tesla will use in the future in standard Model 3 and Model Y EVs, which have (by far) the highest volume of any EV-pair. Combined with the rapidly increasing Megapack volume, Tesla has a huge economy of scale advantage over any other BESS Manufacturer.

Also note that BESS rely extensively on inverters and other power electronics.

## 3.2. Tesla Energy Ventures

Tesla is already selling more BESS than it can produce. So why not develop a new market channel to produce even more BESS?

*Tesla filed to enter the deregulated energy market in Texas in mid-August, with the goal of becoming an official electricity retailer, according to a Thursday report.*[11]

*Texas Monthly first reported the news of Tesla's application to the state's Public Utility Commission for a new subsidiary to be known as Tesla Energy Ventures. The new branch from Elon Musk's company reportedly seeks to sell electricity directly to customers.*

*Tesla also informed the state's grid operator of plans to build two backup batteries capable of storing hundreds of megawatts of energy to serve wholesale power companies…*

*Work on building one massive backup battery in Texas is reportedly underway. That system is near Houston, in the town of Angleton, and once completed, it will be capable of storing more than 100 megawatts of energy. The battery is already registered with the Electric Reliability Council of Texas, which oversees power to more than 26 million customers.*

*Tesla also informed the Texas grid operator of plans to build a 250-megawatt battery near Austin. The battery would be near the company's Gigafactory, which is being constructed and will eventually build its Cybertrucks and Model Y SUVs.*

*Tesla Energy Ventures hopes to be registered and ready for testing for its ability to meet ERCOT requirements in October. The subsidiary's leadership team is headed up by four Tesla team members, who have a combined 15+ years of experience in the competitive*

[11] Jon Jackson, Newsweek via MSN News, "Elon Musk Aims to Provide Electricity With Tesla Power Company," Aug 27, 2021, https://www.msn.com/en-us/news/technology/elon-musk-aims-to-provide-electricity-with-tesla-power-company/ar-AANOEmx?ocid=BingNews

*electric industry, as required. Its president, Ana Stewart has been Tesla director of regulatory credit trading since 2017 and was at SolarCity prior to its Tesla acquisition.*[12]

*In the filing with the regulatory PUC two affiliates to Tesla Energy Ventures are listed as certified to provide electric service in Texas: Gambit Energy Storage, LLC, — the 100MW+ battery storage system project Tesla is reportedly developing in the state — and Giga Texas Energy, LLC, which is thought to relate to renewable energy and battery facilities for the company's Texas factory which is under construction.*

*Scheduling of the retail electricity offering will be managed by ENGIE Energy Marketing North America, an arm of European multinational energy company ENGIE. Tesla Energy Ventures will manage forecasting. According to the filing, Tesla Energy Ventures "will leverage forecasting tools, capability and knowledge already in place to support its utility-scale battery storage system in ERCOT as well as its retail offerings and virtual power plant (VPP) programs operating today in places ranging from Australia, California, Vermont, Germany and the United Kingdom (UK)."*

The above is smart on (at least) three fronts:

- Buy low and sell high always works. With Texas having a large number of intermittent wind and PV projects, and minimal connections to grids outside of ERCOT, there will be times when there is more supply than demand, and thus the price of power will be very low. There will be other times when there is no wind in the Panhandle on a summer night, and the early evening price of power in the Texas very-long, very-hot summer will be sky-high. Yippee!
- In addition to Giga-Austin, Elon has a major SpaceX Facility in Texas. Having employees that can buy power from Elon, and also install his Powerwalls and PV arrays on their rooftops, allows for very favorable tariffs for both parties (Elon and his employees). Then extend this to all of his suppliers' employees.
- I'm sure Elon can make sure that all of the above storage (BESS and distributed Powerwalls) has heaters if needed, and then advertise – "freeze-proof power." To sweeten the deal, offer the general public a similar tariff that employees get to purchase their assets (Powerwall and PV arrays) and purchase power.

By the way, Elon has done the above (at least in part) before. See the earlier post linked below, sections 5 and 10.

https://energycentral.com/c/gn/virtual-power-plant-projects

# 4. Third Quarter 2021 Results

Below are the third quarter 2021 deliveries, also with few past quarters and years for comparison:

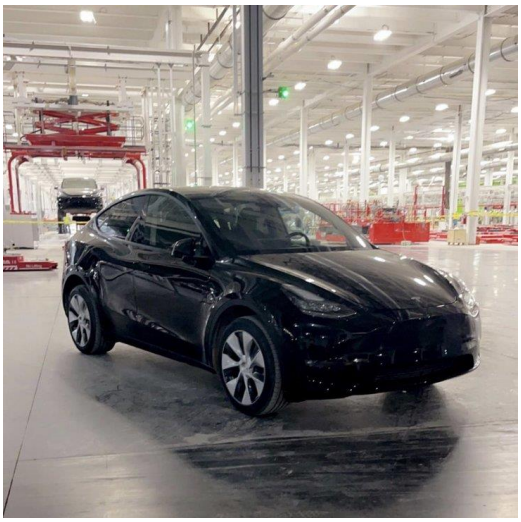
- 2019, 367,200
- First quarter 2020, 88,400 (up 40% year over year for quarter, first Model Y)

[12] Andy Colthorpe, Energy Storage News, "Tesla's Texas electricity retail operations to lean on battery storage experience," Aug 30, 2021, https://www.energy-storage.news/teslas-texas-electricity-retail-operations-to-lean-on-battery-storage-experience/

- Second quarter 2020, 90,650 (down 5% year over year for quarter due to Pandemic)
- Third quarter 2020, 139,300 (up 44% year over year for quarter)
- Fourth quarter 2020, 181,200 (up 62% year over year for quarter)
- Total 2020, 499,550 (up 36% year over year)
- First quarter 2021, 184,800 (up 109% year over year for quarter, but Fremont plant was shut down in mid first quarter 2020 due to Pandemic)
- Second quarter 2021, 201,250 (Up 122% year over year for quarter, but Q2 2020 was depressed by Pandemic, first redesigned Model S, including Plaid)
- Third quarter 2021, 241,300 (Up 73% year over year for quarter)[13]

# 5. Giga-Texas

*When Gigafactory Texas was starting its construction, officials in the area started to fondly describe the project's pace as the "Speed of Elon" on account of its rapid progress. This "Speed of Elon" seems to have never let up since Giga Texas broke ground about 13 months ago as the first image of a pre-production Tesla Model Y was just shared online. [14]*



*The image was initially shared on Instagram, and it depicted a black Model Y that looked fresh out of the production line. The post was eventually deleted, but not before the image was shared across platforms such as Twitter and Reddit. It's difficult not to be excited, after all, considering that Giga Texas broke ground just over a year ago in July 2020.*

*Based on the recently-shared image, it appears that Giga Texas' Model Y production facility is now ready to start cranking out the all-electric crossovers, at least to some degree. The vehicle was not alone in the picture either, as another Model Y in the background could also be seen passing through the assembly line.*

*It should be noted that while it may seem shocking to see Tesla Model Y pre-production units being produced this early, the company has been dropping hints for a while now that Giga Texas is already positioned to build the vehicle.*

*This doesn't mean that Model Y mass production would start in Giga Texas within the next month or so, however. For perspective, Gigafactory Shanghai's first pre-production*

[13] Joey Klender, Teslarati, "Tesla delivers record 241,300 cars in Q3, handily beating consensus estimates," Oct 2, 2021, https://www.teslarati.com/tesla-q3-2021-delivery-production-numbers/
[14] Simon Alvarez, Teslarati, "Tesla Model Y pre-production units start rolling out in Giga Texas," Aug 28. 2021, https://www.teslarati.com/tesla-model-y-first-giga-texas-picture/

*Model Ys were spotted around September 2020, but customer deliveries of the all-electric crossover in China only started around mid-January 2021. This was despite large numbers of the vehicle being spotted in Giga Shanghai's holding lots by December 2020. Considering a likely lead time of 3-4 months, Texas-made Model Y deliveries might very well begin around late November to late December 2021.*

I would guess that, depending on the volume, the initial Texas Model Ys may not have the new 4680 structural batteries, but rather these may be phased in 2022 along with the Texas 4680 battery line (part of Giga-Texas) reaching full production.