

Tesla, Inc. NasdaqGS:TSLA

FQ2 2021 Earnings Call Transcripts

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S&P Global Market Intelligence Estimates

	-FQ2 2021-			-FQ3 2021-	-FY 2021-	-FY 2022-
	CONSENSUS	ACTUAL	SURPRISE	CONSENSUS	CONSENSUS	CONSENSUS
EPS Normalized	0.98	1.45	▲47.96	1.22	4.51	NA
Revenue (mm)	11398.67	11958.00	▲4.91	12942.89	49114.48	NA

Currency: USD

Consensus as of Jul-22-2021 12:08 PM GMT

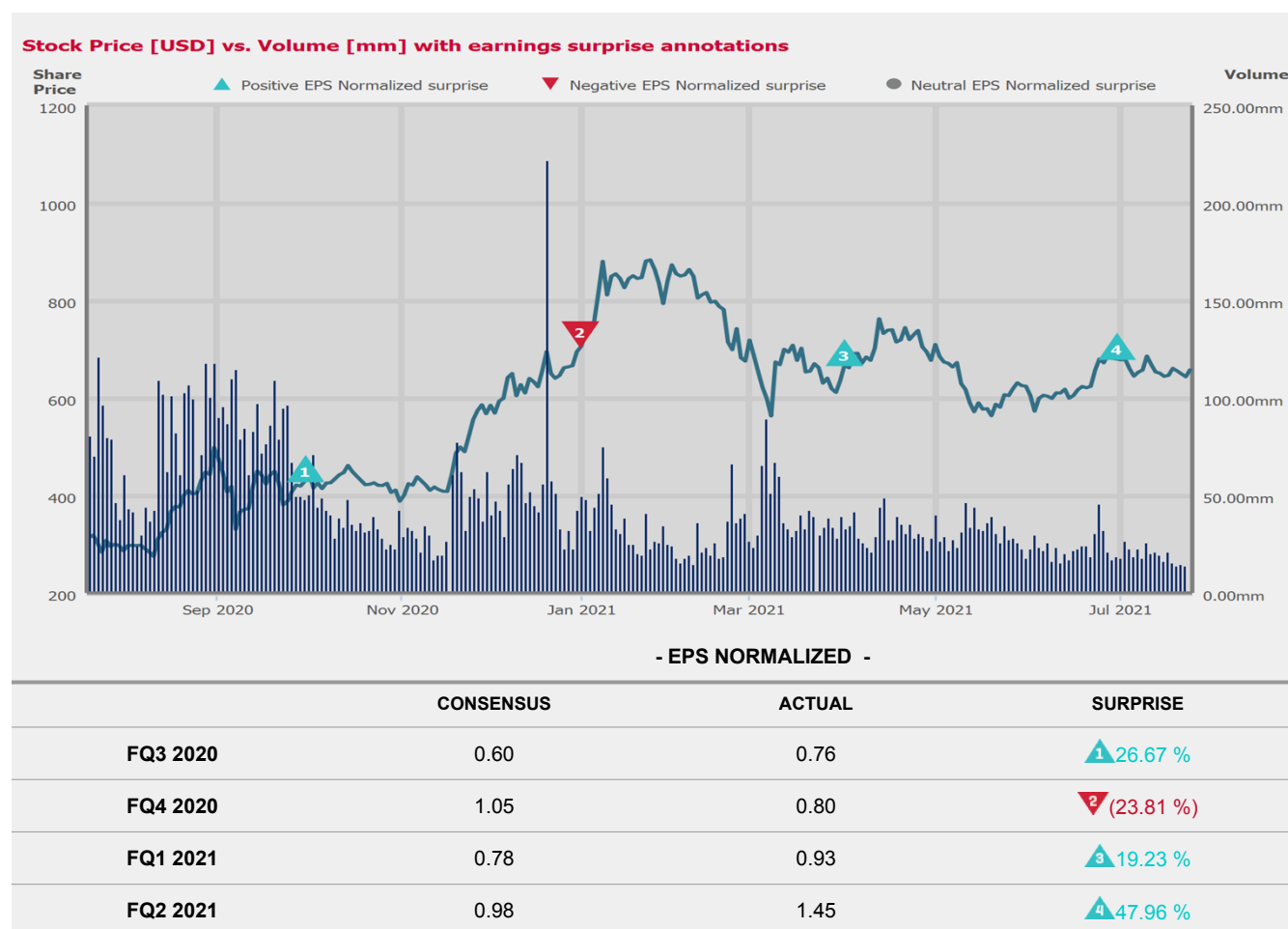


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Call Participants

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Presentation

Operator

Good day, and thank you for standing by. Welcome to the Tesla Second Quarter 2021 Financial Results and Q&A Webcast. [Operator Instructions] Please be advised that today's conference is being recorded. [Operator Instructions] I would now like to hand the conference over to your speaker today, Martin Viecha, Senior Director of Investor Relations. Please go ahead.

Martin Viecha

Senior Director for Investor Relations

Thank you, and good afternoon, everyone. And welcome to Tesla's Second Quarter 2021 Q&A Webcast. I'm joined today by Elon Musk, Zachary Kirkhorn and a number of other executives. Our Q2 results were announced at about 1:00 p.m. Pacific Time in the update deck we published at the same link as this webcast.

During this call, we will discuss our business outlook and make forward-looking statements. These comments are based on our predictions and expectations as of today. Actual events and results could differ materially due to a number of risks and uncertainties, including those mentioned in our most recent filings with the SEC. [Operator Instructions] But before we jump into Q&A, Elon has some opening remarks. Elon?

Elon R. Musk

Technoking of Tesla, CEO & Director

Sure. So to recap, Q2 2021 was a record quarter on many levels. We achieved record production, deliveries and surpassed over \$1 billion in GAAP net income for the first time in Tesla history. I'd really like to congratulate everyone at Tesla for an amazing job. This is really an incredible milestone.

It also seems that public sentiment towards EVs is at an inflection point; and at this point, I think almost everyone agrees that electric vehicles are the only way forward. Regarding supply chain, while we're making cars at full speed, the global chip shortage situation remains quite serious. For the rest of this year, our growth rates will be determined by the slowest part in our supply chain, which is there's a wide range of chips that are, at various times, the slowest parts in the supply chain.

I mean it's worth noting that if we had -- everything else, if we had vast numbers of vehicles themselves, we would not be able to make them -- if everything, except the chips, we wouldn't be able to make them. The chip supply is fundamentally the governing factor on our output. It is difficult for us to see how long this will last because we don't have -- this is out of our control essentially. It does seem like it's getting better, but it's hard to predict.

So in fact, even achieving the output that we did achieve was only due to an immense effort from people within Tesla. We were able to substitute alternative chips and then write the firmware in a matter of weeks. It's not just a matter of swapping out a chip. You also have to rewrite the software. So it was an incredibly intense effort of finding new chips, writing new firmware, integrating with the vehicle and testing in order to maintain production.

And I'd also like to thank our suppliers who worked with us. And there have been many calls at midnight, 1 a.m., just with suppliers but -- in resolving a lot of the shortages. So thanks very much to our suppliers.

Let's see. In terms of FSD subscription, we were able to launch full self-driving subscription last month. And we expect it to build slowly and then -- but then gather a lot of momentum over time. Obviously, we need to have the full-self driving build widely available for it really to take off at a high rate and make a lot of progress there. So yes, I think FSD subscription will be a significant factor probably next year.

With regard to Giga Texas and Giga Berlin, we're actually doing this earnings call from Giga Texas, so we're in the factory right now doing this earnings call. And the team has made incredible progress here. You can see the pictures online and see that there's basically nothing a year ago and this -- a large -- a mostly complete large factory a year later. So it's really great work by the Giga Texas team. And then also great work in Berlin, Brandenburg with the team there.

So we expect to be producing the sort of new design of the Model Y in both factories in limited production later this year. It's always like it's not -- it's hard to sort of explain to people who have not been through the agony of a manufacturing

ramp. Like why can't you just turn it on and make 5,000 a week? This is -- it is so hard to do manufacturing. It is so hard to do production. At gross approximation, there are 10,000 unique parts and processes that have to work. And the greater growth of production goes as fast as the least lucky and dumbest of those 10,000 things. And a bunch of them are not even in our control, so it's like -- it's insanely difficult.

I'm fond of saying that prototypes are easy and production is hard. And arguably, the really remarkable thing that Tesla's done is not to make an electric car or to be a car start-up because there have been hundreds of car start-ups in the United States and outside United States. So the thing that's remarkable is that Tesla didn't go bankrupt in reaching volume production. That's the amazing part because everyone else did, because they all got the prototype before the idea was the hard part and it is not. It is trivial by comparison with actual production.

So it's always worth noting that of all the American car companies, there are only 2 that have not gone bankrupt and that is Ford and Tesla. So the seeds of defeat are sown on the day of victory, and we must be careful that we do not do that. So often, if you look at history, so often, the seeds of defeat are sown on the day of victory. We will endeavor not to make that the case of Tesla.

So let's see, the model lines in Texas -- and mainly in Texas and Berlin will be -- will look very much like the Model Ys we currently make, but there are substantial improvements in the difficulty of manufacturing. So for example, the Model Y made here and in Berlin will have a cast front body and a cast rear body, whereas the one in California has a cast rear body but not a cast front body. We're also aiming to do a structural pack with 4680s cells, which is a mass reduction and a cost reduction.

But we're not counting on that as the only way to make things work. We have some backup plan with nonstructural -- with a nonstructural pack and 2170s essentially. So -- but at scale production, we obviously want to be using 4680s and a structural pack. From a physics standpoint, this is the best architecture; and from an economic standpoint, it is the lowest cost way to go. So the lightest, lowest cost.

But there's a lot of new technology there, so it is difficult to predict with precision when does it work and when do you reach scale production. And Drew's going to talk a bit more about the 4680 production. Yes.

So we're all making great progress on the 4680 cells, but there is a tremendous amount of innovation that we're packing into that 4680 cell. And so it's not simply a sort of minor improvement on state of the art. There are -- and we went through this on the Battery Cell Day -- really dozens of -- half a dozen major improvements and dozens of small improvements. So I think it will be great, but it's difficult to say when the last of the technical challenges will be solved.

So in conclusion, our team continues to make huge efforts to make our factories run at full speed, which is very difficult. We have had some factory shutdowns due to part shortages, and we hope those will be relieved in the coming weeks and months. And we're making great progress on full self-driving. Some of the progress is not easy to see because it is at a foundational software level, and so then it ends up being sort of a 2 steps forward, 1 step back situation. And -- but over time, you do 2 steps forward and 1 step back and keep going, you do move forward.

So I'm highly confident that the cars will be capable of full self-driving. If they have a full self-driving computer and the cameras, I'm confident that they will be able to drive themselves with the safety level substantially greater than that of the average cars.

Once again, thanks to all of our employees who are making this a breakthrough year for Tesla and an incredible quarter. Thanks, guys.

Martin Viecha
Senior Director for Investor Relations

Thank you very much. And we have some follow-up remarks from Zachary Kirkhorn.

Zachary J. Kirkhorn
Master of Coin & CFO

Yes. Thanks, Martin, and thanks, Elon. Just to reiterate, Q2 was a great quarter for the Tesla team with strong improvements across the business. In particular, auto gross profit and margin, excluding credit, increased substantially. This was primarily driven by better cost optimization across our factories, good execution against our cost reduction plans as well as increases in production and delivery volumes.

There was some benefit from pricing action mostly in North America. However, it was small in the context of the other contributors. Note that the Model S and X program was at a slight loss for the quarter due to the relatively low volume. And supply chain challenges, including expedites, continue to provide cost headwinds.

Additionally, it's encouraging to see the progress made on profitability within our energy and services and other businesses. While there's some benefit to looking at our progress quarter-over-quarter, I find it more helpful to look at progress over a slightly long-term horizon. Over the last 2 years, our vehicle delivery volumes have more than doubled. This volume increase was made possible by a steady decrease in ASPs of more than 10%, driven by our road map to increase affordability and shifting mix towards our more affordable vehicles. Yet over that same period of time, our auto gross margin, excluding credit, has increased nearly 10 percentage points to our highest yet since the introduction of Model 3. This is only possible because our average cost per vehicle has reduced by more than the reduction in average price. This is a remarkable achievement in the context of the volume growth and ASP reduction, as mentioned, and a testament to the hard work by the Tesla team.

Additionally, OpEx as a percentage of revenue has declined and in particular, SG&A, representing the work we've done to become more efficient as we scale the company while still making the required R&D investments to support our future. As a result, our GAAP operating margins have risen from negative to double digit in line with what we have guided. By managing our overhead costs and driving higher volumes, our P&L is benefiting from the marginal profitability of each incremental unit, or said differently, we are recognizing the benefits of scale and improved fixed cost absorption.

With strong operating cash flows and cash balance, we are putting that cash to use. CapEx continues to tick up, primarily driven by capacity investments in Austin, Berlin and Shanghai. Additionally, each quarter, we are using our cash to retire legacy debt, which was taken on at a time when interest rates and company risks were much higher than in today's environment.

As I've mentioned before, our 2021 volumes will skew towards the second half of the year as we push for continued sequential increases in volume. Despite the great work so far managing the instability of the supply chain, these challenges remain and are unfortunately increasing in pain with the higher volume. As we work through the uncertainty, we want to ensure we do our best to manage customer wait times as well as the impact these interruptions have on our employees and costs.

And as Elon mentioned, volume growth will be determined by part availability as we have the factory capacity ready and are in a strong demand position. I'm excited to see the progress made by the Tesla team as we continue building the business and strengthening our financials. Thank you very much.

Martin Viecha

Senior Director for Investor Relations

Great. Thank you very much, Zach. And now let's go through the retail investor questions on say.com.

Question and Answer

Martin Viecha*Senior Director for Investor Relations*

The first question from Robert M. is Tesla's website still says Cybertruck production is expected to begin in late 2021. Can Tesla share more details on the current status of the Cybertruck and confirm if production is still [Technical Difficulty] Lars, do you want to...

Lars Moravy*Vice President of Vehicle Engineering*

Sorry, we cut out there for a second. Yes, the Cybertruck is currently in its alpha stages. We finished the basic engineering, architecture of the vehicle. With the Cybertruck, we're redefining how the vehicle is being made. As Elon said, it carries much of the structural pack and large casting designs of the Model Y being built in Berlin and Austin. Obviously, those take priority over the Cybertruck, but we are moving into the beta phases of Cybertruck later this year, and we'll be looking to ramp that in production in Giga Texas after Model Y is up and going.

Elon R. Musk*Technoking of Tesla, CEO & Director*

Yes, just worth reemphasizing that the extraordinarily difficult -- extraordinary difficulty of ramping production of large manufacturing items. The risk of being repetitive, it's actually easy to make prototypes or sort of handle small volume production. But anything produced at high volume, which is really what's relevant here, is it's going to move as fast as the slowest of the, say, at rough order of magnitude, 10,000 unique parts and processes.

And so you can have 9,999, which is 1 is missing. I mean we were missing -- for example, like a big struggle this quarter was the module that controls the airbags and the seatbelts. And obviously, you cannot ship a car without those. And that limited our production severely worldwide in Shanghai and in Fremont. So it -- like it wouldn't have mattered if we had like 17 different car models because they won't need the airbag module, so it's irrelevant.

So the -- in order for Cybertruck and Semi to scale to volume that's meaningful for customer deliveries, we've got to solve the chip shortage or working with our suppliers and people just want to say, "Why don't you just build a chip fab?" Okay, well, okay, that would take us, even moving like lightning, 12 to 18 months. So it's not like you can just whip out a chip fab, just like, yes, I'll just make a quick chip fab.

So some of these things are -- yes, anyway. It is quite a trial dealing with all of the constraints of scaling a large manufactured object. I think it may be the case that Tesla is scaling. It's -- I think we might be the fastest in history ever for scaling a large manufactured object. I think maybe the Model T would have been comparable back in the day, the Ford Model T. Probably, the Internet knows the answer. But I think we may be scaling large manufactured object at the fastest rate in history. Or I'd like to know who did it faster, so we can learn from them. So it's worth just noting that, and in the grand scheme of things, it's not bad.

So yes, so Cybertruck and Semi, actually both are heavy users of cell capacity. So we've got to make sure we have the cell capacity for those 2 vehicles or it's kind of pointless. We can make a small number of vehicles, but the effective cost if you make a small number of vehicles is the same. Like they literally cost like \$1 million a piece or more. There's a reason why you do things at volume production, which is to get the economies of scale that get us down.

So we are looking at a pretty massive increase in cell availability next year, but it's not like in January 1. It comes through -- it ramps up through the course of next year. But even without Tesla -- Tesla's [Technical Difficulty] Hello? Okay. Even without Tesla cell production, we believe our suppliers will be able to deliver about twice as much cell output in next year as this year. And Drew, do you want to talk more about that?

Andrew D. Baglino*Senior Vice President of Powertrain & Energy Engineering*

Yes, given concerns over cells bottlenecking growth, our target is to grow cell supply ahead of the 50% year-on-year growth targets of the vehicle business and also enable increased energy storage deployments. So yes, our cell suppliers are tracking to double their production in 2022.

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes. It's worth thing like if you have a target of a certain number, that doesn't mean it happens like as sure as night follows day. It's a target. So if there is some calamity in the world that it drops the supply chain, then it will be less. But the contracts that we have with cell suppliers quote roughly a doubling of cell supply to Tesla in 2022.

And we have to juggle these exponential -- there's a whole bunch of exponential graphs sort of overlay on top of each other, and small changes in where you are on the X axis of time can quite substantially change the area under the curve. So what we're thinking of doing is like depending on -- it's basically overshooting on cell supply for vehicles, and then as we have, say, excess cell supply in 1 month or another, then routing that cell output to the Megapack and Powerwall. Oh by the -- if we're -- prior to [taking] vehicle production, if there's a shortage of cell output, for some reason, then we will throttle down Megapack and Powerwall production. So it will be something's got to give basically.

Andrew D. Baglino

Senior Vice President of Powertrain & Energy Engineering

Or if there's a disruption to vehicle production, you have an outlet for the cell capacity.

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes, exactly. There's a tremendous amount of inertia in the supply chain. So if we say to a supplier we want you to double cell output, well, even doing that in a year is very difficult. And then that system has a tremendous amount of momentum. It is like a [plateau] of supertankers. It's insane.

Andrew D. Baglino

Senior Vice President of Powertrain & Energy Engineering

Speaking of which, from a raw materials perspective, we also have long-term contracts to secure our supply chain to also enable its growth. So we're not just looking at the suppliers but upstream from there.

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes.

Andrew D. Baglino

Senior Vice President of Powertrain & Energy Engineering

Which has more flow to it.

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes, exactly. As mentioned, things will move as fast as the slowest part of the entire supply chain, which goes all the way back to raw materials, lithium and nickel and that kind of thing. And there's sometimes perception that Tesla uses a lot of cobalt, but we actually don't. Apple uses, I think, almost 100% cobalt in their batteries in cellphones, laptops. But Tesla uses no cobalt in the iron phosphate packs and almost none in the nickel-based chemistries. So on a weighted average basis, we might use 2% cobalt compared to the Apple's 100% cobalt.

Anyway, so it's just -- it's really just not a fact. We expect to basically have 0 cobalt in the future. So I do -- maybe with -- I think probably there is a long-term shift more in the direction of iron-based lithium-ion cells over nickel. As the energy density of sort of iron ore or the iron phosphate -- might as well just call it iron. The phosphate is taken for granted. But iron-based cells, lithium-ion cells and nickel-based lithium-ion cells, I think probably we'll see a shift. My guess is probably to 2/3 iron, 1/3 nickel or something on that order.

And this is actually good because there's plenty of iron in the world. There's an insane amount of iron. But nickel is -- there's much less nickel, and there's way less cobalt. So it is good for relieving the long-term scaling to move to iron-based cells mostly. And I think long term, possibly all -- there's a good chance that all stationary storage, that is Powerwall and Megapack, moves iron, which is most likely the case since you do not need to transport it and there's [less volume that match] constraint for stationary storage. So then nickel would be for -- really for long-range road transport, ships and aircraft, that kind of thing.

Martin Viecha

Senior Director for Investor Relations

Thank you. Let's go to the second question from retail, which is Elon has said that Tesla will be opening up the Supercharger network to other EVs later this year. Can you share some more details on how this will be structured? Will this be at select brands? Or will they contribute to the growth of this network?

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes. We're currently thinking it's a real simple thing where you just download the Tesla app and you go to a Supercharger, and you just indicate which stall you're in. So you plug in your car even if it's not Tesla, and then you just access the app and say turn on this stall that I'm in for how much electricity. And this should basically work with, I think, almost any manufacturer's cars.

There will be a time constraint. So if the charge rate is super slow, then somebody will be charged more because the biggest constraint at the Superchargers is time, how occupied is the stall. And we'll also be smarter with how we charge for electricity at the Superchargers. So rush hour charging will be more expensive than off hours charging because there are times when the Superchargers are empty and times when they're jampacked. And so it makes sense to have some time-based discrimination.

Andrew D. Baglino

Senior Vice President of Powertrain & Energy Engineering

Yes. We've been doing that, and it's been working and people respond. It helps with utilization.

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes, exactly. So yes, I think we're -- in Europe and China and most parts of the world, it's the same connector for everyone. So this is a fairly easy thing to do, develop our own connector, which, in my opinion, is actually the best connector. It's small and light, looks good, so standard. So we developed our own connector, which in my opinion, is actually the best connector. It's small and light, looks good.

So an adapter is needed to work for EVs in North America. But people could buy this adapter, and we anticipate having it available at the Superchargers as well if people don't sort of steal them or something.

Andrew D. Baglino

Senior Vice President of Powertrain & Energy Engineering

We have a good solution for that.

Elon R. Musk

Technoking of Tesla, CEO & Director

Okay. So -- but that is -- that's a constraint on North America thing. That's basically a vestige of history. But I think we do want to emphasize that it is -- our goal is to support the advent of sustainable energy. It is not to create a walled garden and use that to bludgeon our competitors, which is sometimes used by some companies.

Andrew D. Baglino

Senior Vice President of Powertrain & Energy Engineering

I think it's also important to comment that increasing the utilization of the network actually reduces our costs, which allows us to lower charging prices for all customers, makes the network more profitable, allows us to grow the network faster. So that's a good thing there. And no matter what, we're going to continue to aggressively expand the network capacity,

increasing charging speeds, improving the trip planning tools to protect against site congestion using dynamic pricing, as Elon mentioned, and just continuing to focus on minimum wait time for all customers.

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes. Obviously, in order for this to be -- for the Supercharger to be useful to other power companies, Lars, we need to grow the network faster than we're growing vehicle output, which is not easy. We're growing vehicle output at a hell of a rate. So Superchargers need to grow faster than vehicle output, so this is a lot of work for the Supercharger team. But it is only useful in the grand scheme of things. It's only useful to the public if we're able to grow faster than Tesla vehicle output. So that is our goal.

Martin Viecha

Senior Director for Investor Relations

Thank you very much. And the third question is Elon said 4680 cells aren't reliable enough for vehicles. Is this referring to cycle life degradation or something else? Please update us on progress of 4680s? And what still needs to be done to make them reliable enough for vehicles?

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes. I mean, really, this is about -- we'll definitely make the 4680 reliable enough for vehicles. And we, I think, are at the point where, in limited volume, it is reliable enough for vehicles. The -- again, going back to like limited production is easier. Prototype production is easy, but high-volume production is hard. There are a number of challenges in transitioning from small-scale production to a large-volume production.

And not to get too much into the weeds of things, but right now, we have a challenge with basically the, what's called calendaring or basically squashing the cathode material to a particular height. So it just goes through these welders and get squashed like pizza dough basically and -- but very hard pizza dough. And the -- it's causing -- it's denting the calendar rolls. This is not something that happened when the calendar rolls were smaller, but it is happening when the calendar rolls are bigger. So just like -- we're like, okay, weren't expecting that.

Andrew D. Baglino

Senior Vice President of Powertrain & Energy Engineering

Yes. It's not a like science problem. It's an engineering problem. It's not a question of if. It's a question of when, and the team is 100% focused on resolving these limiting processes as quickly as possible.

Elon R. Musk

Technoking of Tesla, CEO & Director

Exactly.

Andrew D. Baglino

Senior Vice President of Powertrain & Energy Engineering

Yes. And on the reliability side, as Elon mentioned, we have successfully validated performance and the lifetime durability of the 4680 cells produced for Kato. And we're continuing ongoing verification of that reliability. We're actually accruing over 1 million equivalent miles on our cells that we produce every month in our testing activities. The focus on that is very clear. We want high-quality cells for all of our customers.

And yes, we're just focused on the unlucky, limiting steps in the facility. And with the engineers focused on those few steps remaining, we're going to break through as fast as possible.

Elon R. Musk

Technoking of Tesla, CEO & Director

In the meantime, we're -- we have a massive amount of equipment on order and arriving for the high-volume cell production in Austin and Berlin. And -- but obviously, given what we've learned with the pilot plant, which is in Fremont, which is really quite a big plant by most standards, we will have to modify a bunch of that equipment. So it won't be able to

start like immediately, but it seems like -- I mean, Drew, correct me if I'm wrong, but like we think most likely, we will hit an annualized rate of 100 gigawatt hours a year sometime next year.

Andrew D. Baglino

Senior Vice President of Powertrain & Energy Engineering

We'll have all the equipment installed to accomplish 100 gigawatt hours. And it's possible that by the end of the year, we will be at an annualized rate of 100 gigawatt hours by the end of the year.

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes. I mean my guess is, more likely than not, about 50% of reaching 100 gigawatt hours a year by the end of next year on an annualized rate, something like that. It could shift by a little bit, so -- but nothing -- as Drew mentioned, it's nothing fundamental. Just a lot of work.

Andrew D. Baglino

Senior Vice President of Powertrain & Energy Engineering

Yes. And even to the large roller question, Elon, right, like on the anode side, the large rollers were great, no concerns. And so we're just learning as we go. And the nice thing about having that facility on the fast track like we had it and we talked about it at Battery Day was really derisking the big factories here. That's what we've done, and we've learned a lot. And with each successive iteration, the ramp-up and the equipment installation will be faster and more [safe].

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes.

Martin Viecha

Senior Director for Investor Relations

All right. Thank you very much. And the last question from retail is from Emmet. Can Elon do an interview with one of our YouTube channels once or twice a year? I would nominate Dave Lee on Investing or Rob Mauer's Tesla Daily channels as first possible candidates.

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes. I guess I'll do an interview. I mean, just bear in mind, like if I'm doing interviews, then I can't do actual other work. So it's not -- I only have so much time in the day, so -- but yes, I'll do one. I won't do it annually, but I'll do it once.

I think also like this is the, I wouldn't say the last time I'll do earnings calls, but this is the -- I will no longer be defaults during earnings calls. So obviously, I'll do the annual shareholder meeting, but I think going forward, I will most likely not be on earnings calls unless there's something really important that I need to say.

Martin Viecha

Senior Director for Investor Relations

Okay. Thank you. Now let's go to institutional questions. The first one -- and we covered a lot of this already. Can you please update us on time lines for the start of production of Berlin and Austin Model Y, Cybertruck and the Semi? Do you expect the ramp of Cybertruck to be as difficult as it is a new process?

Elon R. Musk

Technoking of Tesla, CEO & Director

I think Cybertruck ramp will be difficult because it's such a new architecture. I mean it's going to be a great product. It might, I think, be our best product ever. But it -- there's a lot of fundamentally new design ideas on Cybertruck. Nobody's ever really made a car like this before, a vehicle like this before. So there'll probably be challenges because there's so much unexplored territory. Yes.

Martin Viecha

Senior Director for Investor Relations

Thank you. I think question 2 and question 3, we can skip given we have already addressed this. I'll go to question 4. In 5 years' time, how much faster or better could you be at manufacturing capacity expansion using cut and paste? And what are the biggest issues you need to solve to get to that rate?

Elon R. Musk

Technoking of Tesla, CEO & Director

Well, like I said, I think we might be the fastest growing company in history for any large manufactured items. So those who have not actually been involved in the manufacturing ramp-up just have no idea how painful and difficult it is. It's like you got to eat a lot of glass, and for [auto] manufacturing ramp, it's hard.

Lars Moravy

Vice President of Vehicle Engineering

Yes. I mean I think if you look at the expansion we've done in Shanghai, that factory was built in less in a year and ramped in 5 to 6 months to full volume. When you...

Elon R. Musk

Technoking of Tesla, CEO & Director

I think it's longer than that. It's longer than that, about a year.

Lars Moravy

Vice President of Vehicle Engineering

And when you consider cut and paste, we've repeated that in Fremont and whatever. But now with Berlin and Austin, we have new factories and new designs. And so there's always challenges, as you said, Elon, with new designs in ramping that. But I think having teams in 3 locations or 3 continents will definitely expand our ability and our capacity to grow more lines rather than just having the 1 factory in Fremont that we had 1.5 years ago.

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes. So I mean, for Shanghai, incredible team both the factory in 11 months, but it took longer than building the factory because it took longer than that to actually reach volume production -- a high-volume production, so took about a year. So when you put a factory in a new geography, in order for that factory to be efficient, you have to localize the supply chain. So there's no such thing as cut and paste. It does not exist.

And it obviously be insane to do vehicle production in Europe but send vast numbers of parts from North America. That would be -- that would make the producing in Europe, for example, just crazy. You've got to localize the supply chain to have efficiency and then you're moving as fast as your least lucky, least good supplier.

Yes. It's only supply chains where you go like 3 or 4 layers deep. It's frankly -- I feel at times that we are inheriting all force majeure or -- so if anything goes wrong anywhere on Earth, something happens to mess up the supply chain. So yes. Yes.

Andrew D. Baglino

Senior Vice President of Powertrain & Energy Engineering

I think the human capital growth though of having factories here, Berlin, Shanghai, Fremont does allow us to maybe not exponentially grow but, well, hopefully grow.

Elon R. Musk

Technoking of Tesla, CEO & Director

We are exponentially growing.

Andrew D. Baglino

Senior Vice President of Powertrain & Energy Engineering

Yes, hopefully maintain that exponential growth.

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes. So yes. It's also -- it takes a while to hire old people and train old people to operate the factory. The factory is like a giant cybernetic collective, and you can't just hire 10,000 people and have them work instantly. It's not possible. I really encourage more people to get involved in manufacturing.

I think especially in the U.S., like this has just not been an area where all that many smart people have gone into. I think U.S. has an overallocation of talent in finance and law. It's both a criticism and a compliment. I'm not saying we shouldn't have people in finance and law. I'm just saying that this might be -- maybe we have too many smart people in those areas. So...

Andrew D. Baglino

Senior Vice President of Powertrain & Energy Engineering

Manufacturing is fun.

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes, manufacturing is great. It's a very interesting problem to solve. And obviously, you can't have stuff unless someone makes it. That's how we kick this up. Yes.

Martin Viecha

Senior Director for Investor Relations

Okay. Thank you very much. And let's go to the last investor question. Does Tesla plan to offer more services beyond FSD or high-speed connectivity as part of its subscription bundle going forward? What areas, in particular, present an opportunity?

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes. We don't have a lot of ideas on this, to be frank. Really, full self-driving is the main thing. Things are obviously headed towards a fully autonomous electric vehicle future. And I think Tesla is well positioned and, frankly, is the leader objectively in both of those arenas, electrification and autonomy.

So it's always tempting to try to find analogies, but -- with other companies or whatever, but really the value of fully electric autonomous fleet is generally gigantic, boggles the mind really. So that will be one of the most valuable things that is ever done in the history of civilization.

Martin Viecha

Senior Director for Investor Relations

Thank you very much. And now let's go back to analyst Q&A, please.

Operator

[Operator Instructions]

Our first question comes from Colin Rusch with Oppenheimer.

Colin William Rusch

Oppenheimer & Co. Inc., Research Division

Can you speak to the attach rates for FSD so far and what you're targeting in terms of the subscription levels?

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes. It's not worth commenting on right now. It's not meaningful. We really need full self-driving, at least the beta, to be widely available, so anyone who wants it can get it. Otherwise, it'd be pointless to read anything into where things are right now. So, yes.

Colin William Rusch

Oppenheimer & Co. Inc., Research Division

Okay. And then just the follow-up there is about the cadence of the regulatory environment keeping up with the technology. Are you seeing meaningful evolution in terms of the regulators really understanding the technology and beginning to set some standards here sometime in the near term?

Elon R. Musk

Technoking of Tesla, CEO & Director

At least in the U.S., we don't see regulation as a fundamental limiter. We've got -- we're obviously going to make the work and then demonstrate that the reliability is significantly in excess of the average human driver for it to be allowed -- for people to be able to use it without paying attention to the road.

But I think we have a massive fleet, so it will be, I think, straightforward to make the argument on statistical grounds just based on the number of interventions or especially interventions that would result in a crash. At scale, we think we'll have [billions] of miles of travel to be able to show that it is the safety of the car with autopilot on is 100% or 200% or more safer than the average human driver. At that point, I think it would be unconscionable to -- not to allow autopilot because the car just comes way less safe.

It will be sort of like if you take the elevator analogy. Back in the day, you used to have elevator operators with like a big sort of switch that operates the elevator and moves between floors. But they get tired or maybe drunk or something or distracted, and every time and again, somebody would be kind of sheared in half between floors. That's kind of the situation we have with cars. Autonomy will become so safe that it will be unsafe to manually operate the car, relatively speaking.

And today, obviously, we just get in an elevator. We press the button for which floor we want, and it just takes us there safely. And it would be quite alarming if elevators were operated by a person with a giant switch. That's how we'll be with cars.

Operator

Next question comes from Rod Lache with Wolfe Research.

Rod Avraham Lache

Wolfe Research, LLC

Your cost of goods sold per vehicle is already down to the mid-\$37,000 range in the quarter. It's down \$5,000 year-over-year despite some of the inefficiencies that you talked about. And I know that a lot is going to change from here just given how mix is going to evolve. But if you're successful on the structural pack and front and rear castings and the launch of the 4680 cell, can you just maybe give us a sense of what a successful outcome would look like maybe a year from now? Obviously, a lot has to go right. But just any kind of broad framework for us to think about?

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes. It's really difficult for us to -- to make specific predictions, it's very difficult. I think we feel confident of, let's say, at least a 50% growth year-over-year next year and maybe it's 100%, but that's -- you need a lot of crystal balls to figure out exactly what it's going to be. And we're just -- it is literally impossible to make a specific prediction. But at least 50%, maybe 100%, something like that.

Rod Avraham Lache

Wolfe Research, LLC

Okay. And maybe just separately from this, can you just clarify what the status is of some of the advances in battery manufacturing, things like dry cathode mixing that you talked about on Battery Day? What's the time line? How are those evolving?

Andrew D. Baglino

Senior Vice President of Powertrain & Energy Engineering

Yes. We commented on it today already actually. But in the facility at Kato, over 90% of the -- like processes have demonstrated rate there, but we are limited by the unlucky few that have not, and that's what we're working on. One of them that Elon mentioned was running the full-scale cathode calendar. We're working through some improvements that we need to make to that equipment and to the actual raw material itself to not have those limitations. But again, it's an engineering problem. It's not a question of if. It's a question of when.

On the mixing side, we haven't actually really had any challenges specific to your question. Fundamentally, we're still happy with the dry process direction in terms of the factory footprint, complexity, utility consumption, space and overall complexity simplification. And I mean -- and the costs associated with everything that I just mentioned.

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes. And don't want to overemphasize dry cathode, I mean, it is -- I don't know, maybe it's like 10% or 15% of the cost improvement or something like that. I don't know, 20% maybe of wet...

Andrew D. Baglino

Senior Vice President of Powertrain & Energy Engineering

Yes, 10%, closer to 10%.

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes. So it's like -- just like people don't think like this is like the messiah or something. Wet versus dry reduces -- to dry is like 10% less cost than wet. So it's not -- now 10%, still nothing to sneeze at, especially if you're making hundreds of gigawatt hours a year, but it's not the messiah basically. Yes.

Andrew D. Baglino

Senior Vice President of Powertrain & Energy Engineering

Yes.

Operator

Next question comes from Pierre Ferragu with New Street Research.

Pierre C. Ferragu

New Street Research LLP

I have another question actually on batteries but on a slightly different angle. I was wondering how you're looking at your sourcing strategy for the 4680. You've talked a lot about all the work you're doing to develop your in-house production. But what about asking other battery manufacturers to do 4680 cells with their own technology, maybe less innovation than what you guys are lining up internally? And I was wondering if the first 4680 cells that we'll see on the road will definitely come from Tesla's own manufacturing lines or whether they could be coming actually from outside suppliers as well. And I have a quick follow-up.

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes. We are, in fact, working with our existing suppliers to produce 4680 format cells. And this is just a guess right now, but I see us sort of like consolidating around 4680 nickel-based structural pack and for long-range vehicles. And then not necessarily a 4680 format but some other format for iron-based cells. And so we -- right now, we kind of have the Baskin-Robbins of batteries situation with us. We have so many formats and so many chemistries that it's like we've got like 36 flavors of battery this way.

This is just -- this results in an engineering drag coefficient where each variant of cell chemistry and format requires a certain amount of engineering to maintain it and troubleshoot, and this inhibits our forward progress. So it is going to be important to consolidate to just maybe ideally 2 form factors, maybe 3 but ideally 2 and then just 1 nickel chemistry and 1 iron chemistry and -- so we don't have to troubleshoot so many different variants.

Andrew D. Baglino

Senior Vice President of Powertrain & Energy Engineering

Yes. And towards that end, we are engaging with the suppliers that we've had good partnerships with on 4680 designs to enable that simplification, and so far, so good. They're working on -- they're bringing their core competencies to bear on that. We're not mandating like what's going on inside, but it's been a good collaboration.

Elon R. Musk*Technoking of Tesla, CEO & Director*

Yes. And we do expect to see significant increases in supply from our existing suppliers in addition to the cells that Tesla's making. So it's both. Sometimes I get questions from our cell suppliers of like are we just going to make all the cells ourselves and we're like no. Please make as many as you possibly can and supply them to us. We have a significant unmet demand in stationary storage.

Megapack is basically sold out until the end of next year, I believe. We have a massive backlog in Powerwall demand. The demand of Powerwall versus production is an insane mismatch. Now part of that problem is also the semiconductor issue. So we use a lot of the same chips in the Powerwall as you do in a car. So it's like which one do you want to make? Cars or Powerwalls? So we need to make cars, so therefore, Powerwall production has been reduced.

But as that semiconductor shortage is alleviated, then we can massively ramp up Powerwall production. I think we have a chance of hitting an annualized rate of 1 million units of Powerwall next year maybe towards -- on the order of 20,000 a week but again, dependent on cell supply and semiconductors.

But in terms of demand, I think there's probably demand for in excess of 1 million Powerwalls per year and actually -- and just a vast amount of Megapacks for utilities. As the world transitions to a sustainable energy production, solar and wind are intermittent and, by their nature, really need battery packs in order to provide a steady flow of electricity. And when you look at all of the utilities in the world, this is a vast amount of batteries that are needed. That's why long term, we really think sort of, combined, Tesla and suppliers need to produce at least 1,000 gigawatt hours a year and maybe 2,000 gigawatt hours a year.

Pierre C. Ferragu*New Street Research LLP*

Okay. Great. And I have a quick question. I know, Elon, you don't think it's meaningful today, but I'd be curious to know if you have any stats about when you announced the new pricing on the FSD moving from \$10,000 from -- to \$199 with the lock-in. I'd be curious to understand how it affected behavior and if you saw like a massive uptake in the service. And I'm not thinking about people looking at it as an FSD but more to try the most advanced version of autopilot and to try it. So in the first days, you've announced the pricing. Have you seen like a very significant spike in the take rate? And can you give us a sense of how big it was?

Elon R. Musk*Technoking of Tesla, CEO & Director*

Okay. So you're asking like is the FSD take rate too expensive and that's why we're doing subscription? Or I'm not sure if I understand your question correctly.

Pierre C. Ferragu*New Street Research LLP*

No, my question is from the time you announced like the subscription at the \$199 per month, how much did like the take rate increase, like the percentage of people who basically took the subscription as they bought a new car versus how it was when they had to pay \$10,000 upfront.

Zachary J. Kirkhorn*Master of Coin & CFO*

Yes. This is Zach here. I mean I think we're still early in understanding how FSD subscription will unfold, but a couple of data points here. So we took a look at our backlog to see, of customers in our backlog who have ordered FSD, did they cancel presumably to go to subscription after they take delivery. And the level of cancellations there was we're not seeing cannibalization there. It's possible that, that changes, but that was also part of our pricing strategy at \$99 and \$199.

Elon R. Musk

Technoking of Tesla, CEO & Director

Yes. I mean we -- I think like any given price is going to be wrong, so we'll just adjust it over time as we see the value proposition makes sense to people. So we're just really -- I'm not thinking about this a lot right now. We need to make full self-driving work in order for it to be a compelling value proposition. Otherwise, people are kind of betting on the future.

I mean, like right now, is it -- does it make sense for somebody to do FSD subscription? I think it's debatable. But once we have full self-driving widely deployed, then the value proposition will be clear. And at that point, I think basically everyone will use it or be rare -- a rare individual who doesn't.

Martin Viecha

Senior Director for Investor Relations

Okay. Thank you very much for your help, and I think that's all the time we have for today. Thanks for all your questions, and we'll speak to you again in 3 months' time. Have a good day, everyone.

Elon R. Musk

Technoking of Tesla, CEO & Director

All right. Thank you.

Operator

This concludes today's conference call. Thank you for participating. You may now disconnect.

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