S&P Global
Market Intelligence

Tesla, Inc. NasdaqGS:TSLA

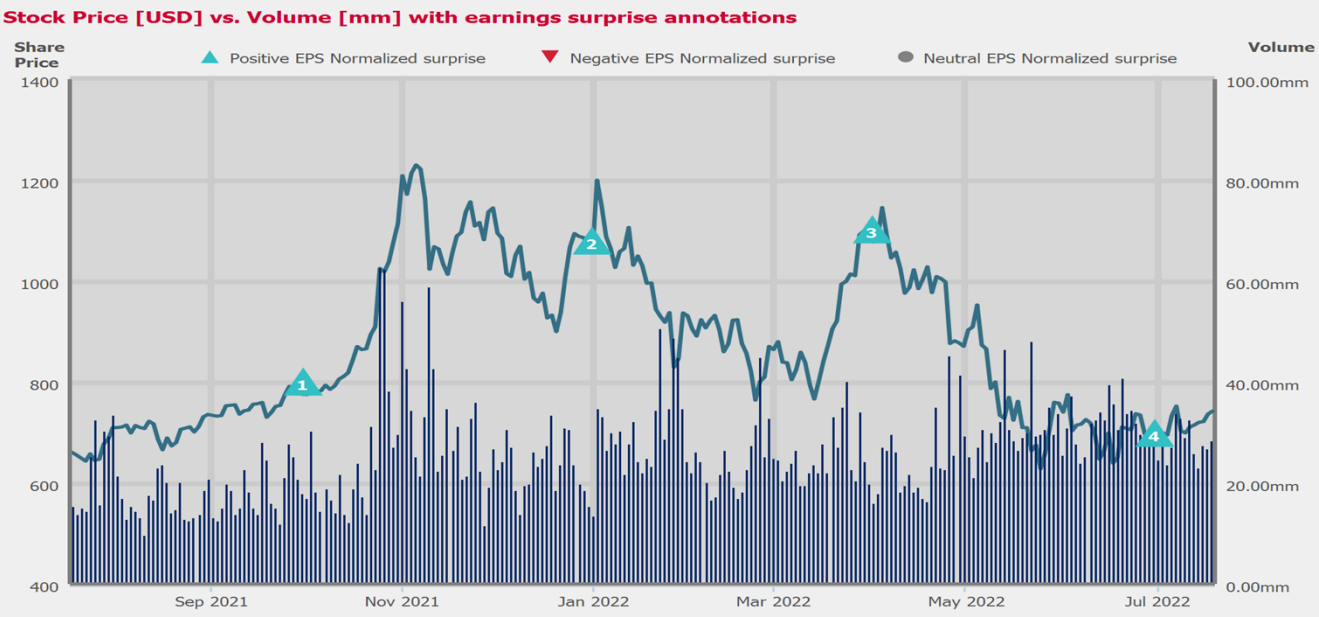
FQ2 2022 Earnings Call Transcripts

Wednesday, July 20, 2022 9:30 PM GMT

S&P Global Market Intelligence Estimates

	-FQ2 2022-			-FQ3 2022-	-FY 2022-	-FY 2023-
	CONSENSUS	ACTUAL	SURPRISE	CONSENSUS	CONSENSUS	CONSENSUS
EPS Normalized	1.79	2.27	26.82	3.11	11.78	NA
Revenue (mm)	16931.95	16934.00	0.01	22499.89	84868.95	NA

Currency: USD
Consensus as of Jul-20-2022 2:18 AM GMT



- EPS NORMALIZED -

	CONSENSUS	ACTUAL	SURPRISE
FQ3 2021	1.61	1.86	1 15.53 %
FQ4 2021	2.38	2.54	2 6.72 %
FQ1 2022	2.26	3.22	3 42.48 %
FQ2 2022	1.79	2.27	4 26.82 %

Table of Contents

Call Participants

EXECUTIVES

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

Elon R. Musk
Technoking of Tesla, CEO & Director

Lars Moravy
Vice President of Vehicle Engineering

Martin Viecha
Senior Director for Investor Relations

Unknown Executive

Zachary John Planell Kirkhorn
Master of Coin & CFO

ANALYSTS

A.M. Sacconaghi
Sanford C. Bernstein & Co., LLC., Research Division

Colin William Rusch
Oppenheimer & Co. Inc., Research Division

Emmanuel Rosner
Deutsche Bank AG, Research Division

Pierre C. Ferragu
New Street Research LLP

William Stein
Truist Securities, Inc., Research Division

Presentation

Martin Viecha
Senior Director for Investor Relations

Good afternoon, everyone, and welcome to Tesla's Second Quarter 2022 Q&A Webcast. My name is Martin Viecha, VP of Investor Relations; and I'm joined today by Elon Musk, Zachary Kirkhorn and a number of other executives. Our Q2 results were announced at about 3:00 p.m. Central 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 or 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

Thank you, Martin. So just as a Q2 recap, Q2 was a unique quarter for Tesla due to a prolonged shutdown of our Shanghai factory. But in spite of all these challenges, it was one of the strongest quarters in our history. Most importantly, in June, we achieved production records in both Fremont and Shanghai. And as a result, we have the potential for a record-breaking second half of the year.

I do want to emphasize this is obviously subject to force majeure, things outside of our control. The past few years have been quite a few force majeures, and it's been kind of supply chain hell for several years. Credit to our awesome Tesla supply chain team for overcoming in saving difficult challenges. And huge thanks to the Tesla Shanghai factory team who sacrificed a lot to get the factory back up and running in June and achieve a record output.

So also making good progress with production ramp with Berlin. We achieved an important milestone of 1,000 cars a week in June. And we're expecting -- sorry, our Giga Texas to exceed the 1,000-vehicle per week milestone and hopefully in the next few months.

To be clear, we're currently making the cars with the 2170 cells, and Drew Baglino will address some of the 4680 questions later in this call. But it is worth emphasizing that we have enough 2170 cells to satisfy all vehicle production for the remainder of the year. So we're not dependent on 4680. 4680 will be important next year but it is not important for this year.

That said, we have installed the second generation of manufacturing equipment for 4680 cells in Texas. And even at our established factories like Fremont and Shanghai, we continue to expand capacity.

Regarding Autopilot, we have now deployed our FSD Beta with City Streets driving capability to over 100,000 owners. They're very happy with the capability of the system and we'll continue to improve it every week. We've now driven over 35 million miles with FSD Beta. That's more autonomous miles than any company we're aware of, I think probably more than -- it might be more than any -- all other companies combined. So -- and that mileage is growing exponentially.

With regard to manufacturing and technology, about 5 or 6 years ago, we said we wanted to become the best manufacturer in the world and that is somewhat counterintuitively, to some people, will actually be, I think, our strongest competitive advantage. We're super pro-manufacturing here at Tesla. And in general, we want to encourage other companies to be super pro-manufacturing. And in general, I think it is a very important thing to do. We need to make stuff and make it efficiently and that's manufacturing.

So we've made a lot of advancements in manufacturing processes. As we now show in the shareholder deck, thanks to our -- the large castings, we make the world's largest castings. We reduced body welding robot count by 70% per unit of capacity in Austin and Berlin. So that's, call it, roughly a body shop that is roughly 3x smaller than would normally be the case. And I should say it's also lighter, cheaper and has superior noise vibration harshness. So it's good on every level.

But this journey is not over. We'll bring another level of simplicity and manufacturing improvements with Cybertruck and future products that we're not quite ready to talk about now but I think will be very exciting to unveil in the future.

Our safety team also introduced a feature that tension seat builds, if the vision system detects imminent collision, which has never been done before. So you can imagine that if you have a seatbelt that only tensions upon impact, you have very little time to tension the seatbelt. If you've got to be -- the car has got to be crunching to trigger the seatbelt tensioner. But because we have vision, we can actually see that a collision is about to occur with 100% probability before it actually happens.

And so we can tension the seat belts, and we can even adjust the airbag deployment because we can see, not just feel. This is a fundamental safety advantage that Teslas are now able to offer. And there's also an over-the-air update, so this is something that will be in place in all cars that have at least AP3 hardware.

In conclusion, we exited Q2 with a strong production rate than ever before. Our team continues to focus on Cybertruck production readiness and some future platform design. We are expecting to be -- still expecting to be in production with the Cybertruck in the middle of next year. And we're very, very excited about that product. I think it might actually be our best product ever.

Let's see. FSD Beta is on track to be released for all of North American customers before the end of this year. And hopefully, if we get regulatory approval, we'll also be releasing it hopefully in Europe and some other parts of the world.

We're hosting our AI Day in a few months. I think people will be amazed at what we're able to show off in AI Day. So basically, there's a tremendous amount to look forward to in the second half of this year. And I want to thank all of our employees and suppliers for their super hard work during these challenging times. Super appreciate it. Thank you.

Martin Viecha
Senior Director for Investor Relations

Thank you very much. And Zach has some opening remarks as well.

Zachary John Planell Kirkhorn
Master of Coin & CFO

Yes. Thanks, Martin. I want to start by congratulating the Tesla team on an excellent execution during the second quarter. Although our production volume reduced sequentially due to COVID-related shutdowns in Shanghai, we made substantial progress in nearly every area of the business, and in particular, our global vehicle production rate as we exited the quarter.

Our Fremont factory, supported by our Reno team, reached new production records. The Shanghai factory resumed full production, and our new factories in Austin and Berlin are progressing well through their initial ramps.

Additionally, our energy business achieved record gross profit with the highest solar volumes in many years. I want to personally thank the entire Tesla team, as I know many of you are listening. You've embodied a remarkable and relentless pursuit of excellence in support of our mission. I also want to thank our suppliers for their support during another complicated quarter.

On GAAP automotive gross margin, it declined sequentially to 27.9%. The temporary decline in Shanghai production volume meaningfully impacted margin, including idle capacity and factory restart costs and also had implications on the mix of regional deliveries.

Additionally, as discussed on previous calls, we are working through the ramp inefficiencies of our new factories, which are progressing well but have had an impact on margin as those factories come online. While we continue to see a benefit from higher pricing flowing through, which experienced some foreign exchange-related headwinds, our cost structure continues to experience cost increases from inflation, commodities and logistics.

The energy business progressed well in Q2, aided by alternate solar supply coming online and progress on unit economics. Our storage business remains component-constrained on both Powerwall and Megapack, which we hope will alleviate to some extent in the second half of the year. We are greatly appreciative of the patience and flexibility shown by our customers while we work through these challenges.

Within operating expenses, Boston and Berlin-related start-up costs have wound down as these factories have moved into production and their costs are now reflected in automotive COGS. Additionally, we converted a majority of our Bitcoin holdings to fiat for a realized gain, offset by impairment charges on the remainder of our holdings, netting a $106 million

cost to the P&L included within restructuring and other. We also incurred restructuring charges related to targeted staffing reductions.

Elon R. Musk
Technoking of Tesla, CEO & Director

Yes, actually, it should be mentioned that the reason we sold a bunch of our Bitcoin holdings was that we were uncertain as to when the COVID lockdowns in China would alleviate. So it was important for us to maximize our cash position, given the uncertainty of the COVID lockdowns in China.

We are certainly open to increasing our Bitcoin holdings in future, so this should not be taken as some verdict on Bitcoin. It's just that we were concerned about overall liquidity for the company, given COVID shutdowns in China. And we have not sold any of our Dogecoin.

Zachary John Planell Kirkhorn
Master of Coin & CFO

We still have it.

Elon R. Musk
Technoking of Tesla, CEO & Director

We still have our Dogecoin.

Zachary John Planell Kirkhorn
Master of Coin & CFO

Despite these challenges, we were still able to achieve one of our strongest operating margins of 14.6%. Our free cash flows were impacted by working capital related to the Shanghai factory shutdown. However, we expect this will show as a benefit in Q3 as our working capital-related cash flows restabilize.

As we look ahead and as Elon mentioned, we are positioned for a record-breaking second half of the year. We're quite excited about this. A couple of things to keep in mind as we progress. Austin and Berlin ramp inefficiencies will continue to weigh on our margins for the balance of the year. However, the impact should reduce as we increase ramp.

Second, as we've mentioned before, we expect to continue to see recognized global pricing to increase as our backlog flows through. However, macroeconomic-related cost increases will also continue to be part of our story.

And finally, despite losing more builds in Q3 than expected, we're still pushing to reach 50% growth this year. This target has become more difficult but it remains possible with strong execution. And as Elon mentioned, no more force majeure events for the balance of the year.

Elon R. Musk
Technoking of Tesla, CEO & Director

Yes, a lot of force majeure in the last several years, that's for sure.

Zachary John Planell Kirkhorn
Master of Coin & CFO
Thank you.

Question and Answer

Martin Viecha
Senior Director for Investor Relations

Thank you very much. And now let's go to the questions from investors. And the first question is, Chinese EV manufacturers seem to be doing a better job than their Western competitors, excluding Tesla, at innovating in software and design. How can Tesla make sure the company is staying ahead of those manufacturers, both within China and outside of China?

Elon R. Musk
Technoking of Tesla, CEO & Director

Well, the -- right now, the best Chinese EV manufacturer is Tesla train. We're actually doing the best, thanks to our incredible team in China. But I have a lot of respect for the Chinese, our manufacturers and EV manufacturers in particular. I think they will be a force to be reckoned with worldwide. They're very -- they're smart and they're hardworking. And I think anyone who is not -- any company that's not as competitive as them will obviously suffer a share decline. So obviously, we have a lot of respect for the current companies in China and then their capabilities, yes.

Martin Viecha
Senior Director for Investor Relations

Thank you. The next question is, when will Tesla have a unified vector space for both static and moving object network? Will this be a V11 or later version? If the latter, can you explain what makes it a difficult problem in layman terms?

Elon R. Musk
Technoking of Tesla, CEO & Director

Okay. This answer will be understood by 0.01% of the audience, I think. I suppose people want to find out what a unified factory space would actually mean. It essentially would be if you can take -- if instead of netting together static and dynamic objects in C++, if they could be net together at the neural net level, then you don't need to reconcile them within C++ heuristics.

That is an architecturally better way to -- that's the most desirable outcome. It's -- I think it's probably not necessary to achieve full self-driving, but it would be a slight improvement in the efficiency of the self-driving. And it's certainly something we want to get to. Yes. The sort of nirvana situation is you have surround video/auto labeling of all static and dynamic objects. And you have then surround video inference with spatial memory as well.

Then that's -- I mean, I think we're almost certainly there before the end of the year. Yes, I'm not sure how many you would understand that. But I should say also, we are also confident of improving the frame rate and as we some of the legacy neural nets, we think we might be able to get to the frame rate of what the -- only cameras is maybe up to 36 fps, which is actually a lot of frames, considering it cameras. It's certainly comfortably above 24 frames, which is basically the movie -- frame rate of movies.

Martin Viecha
Senior Director for Investor Relations

Thank you. The next question is Elon recently tweeted about lowering prices once inflation cools down. Can you elaborate on what do you mean by cooling down and how aggressively the company will lower prices? More broadly, how do you think about the auto pricing long term?

Elon R. Musk
Technoking of Tesla, CEO & Director

Yes. So since we have -- there's a quite a long wait when somebody orders in a car, in some cases, 6 months; in some cases, it could be up to a year. We have to anticipate what the probable inflation rate is over that period of time. So that's what we're trying to do. When we -- when or if we see indications that the inflation rate is declining, then we would not need to increase our car prices. It's possible that there could be a slight decrease in car prices, but this is fundamentally dependent on macroeconomic inflation. It's not something we control.

If I were to guess, and I would take this with a grain of salt, I think inflation will decline towards the end of this year. We're certainly seeing prices of commodities trending lower. Yes. But take it with a grain of salt. This is -- making economic prognostication is fraught with error. I don't know if you guys want to -- do you want to say anything about...

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

Yes. We're certainly seeing, I mean, it's kind of a whole spectrum. On the battery metal side, for example, the price of lithium has really shot up. We used to be $11 a kilogram to more than $80 a kilogram. But it's -- not every situation is that bad so it's kind of a spectrum.

Unknown Executive

Carbon steel, aluminum, [indiscernible] carbon steel and aluminum has started trending down. We will see the benefits of it only probably later part of this year or early next year.

Elon R. Musk
Technoking of Tesla, CEO & Director

Yes. But I think that's just like for most commodities, we're seeing a downward trend towards the end of this year or next year. Some commodities, the pricing of lithium is insane. I would like to, once again, urge entrepreneurs to enter the lithium refining business. The mining is relatively easy. The refining is much harder.

So lithium is actually a very common -- sort of very -- like lithium pretty much everywhere. But you have to refine the lithium into battery-grade lithium carbonate and lithium hydroxide, which has to be extremely high purity. So it is basically like minting money right now. There's like software margins in lithium processing right now. So I would really like to encourage, once again, entrepreneurs to enter the lithium refining business. You can't lose. It's a license to print money.

Martin Viecha
Senior Director for Investor Relations

Thank you. The next question is you made the right economic call before most on inflation when you diversified into Bitcoin. It has since shown it's not much of a hedge in the real-world test the last few months. How do you think about it as an asset over long term? And what do you need to see to change your view?

Elon R. Musk
Technoking of Tesla, CEO & Director

Well, Tesla is -- Tesla's goal is to accelerate the advent of sustainable energy. We're not really -- cryptocurrency is a sideshow to the sideshow. We're not a -- cryptocurrency is not something we think about a lot. We think a lot about scaling production and accelerating the advent of sustainable energy, which the record heat waves around Earth, so to emphasize the urgency of that transition.

So that is what we're trying to do is make electric vehicles and solar and stationary storage battery packs. But the 3 pillars of a sustainable energy future, which is like solar and wind for energy generation, stationary battery packs for storage of the solar energy because of its intermittency and then electric vehicles, the third pillar. And if those 3 things are solved, we have a sustainable future for civilization.

And the fundamental good of Tesla and the reason we're doing this, so certainly, my primary motivation here is to have the day of sustainable energy comes sooner. That's our goal. We're neither here nor there on cryptocurrency.

Martin Viecha
Senior Director for Investor Relations

Thank you. The next question on 4680. Elon noted that 4680 plus structural pack is not yet optimized. Can you please share the general path of 4680 in structural packs in terms of cost efficiencies when compared to the traditional 2170 pack? Will cost improvements be mostly due to scale or do we need to solve some technical issues?

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

Yes, do you want to do the architecture?

Elon R. Musk
Technoking of Tesla, CEO & Director

Yes. So structural pack where we get dual use of the battery cells as structure and as energy storage in the same way that an aircraft gets dual use of the wing as a fuel tank and as a wing is, I think, unequivocally, from a physics standpoint, the superior architecture. It's the A architecture.

Now because it is new, we'll start off getting, I don't know, aspirationally a C within an A architecture. But the potential is there for to get radically better and then unequivocally better than a battery pack, which is carried like a sack of potatoes.

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

Yes. And we've gained the perspective through putting our first structural pack in production that it is actually the A architecture. Like before we did that, it was a hypothesis that was backed with -- I got a lot of modeling and first principles analysis. And now we've actually built and are more confident in that assertion.

Elon R. Musk
Technoking of Tesla, CEO & Director

Yes. So exactly. So the structural pack, even the C and the A architecture is beating the nonstructural pack. And so over time, it will, with further refinement, be substantially superior to a car that is carrying a battery pack as though it is cargo. And this is like -- it's very much very analogous to the early days of aviation where fuel tanks were initially carried like cargo until they realized actually, you should get dual use of a fuel tank as a wing and as fuel tank. And that makes the planes lighter and better. And the same is true of electric vehicles.

Martin Viecha
Senior Director for Investor Relations

And on cost improvements, are they due to scale or about solving technical issues?

Elon R. Musk
Technoking of Tesla, CEO & Director

Yes. Yes. I mean really, the 2 things that improve costs are economies of scale and tech and core technology.

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

Yes. I think technical issue is not the right.

Elon R. Musk
Technoking of Tesla, CEO & Director

Technical issues like...

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

Getting to the optimal design, right? Like you always start with some access. Some people might call it that, but that's not really what you think it is initially. It's that you don't know how early you can get it until you've done it a couple of times.

Elon R. Musk
Technoking of Tesla, CEO & Director

Yes. I mean there's some platonic ideal of the perfect product where the atoms -- you have exactly the right atoms and they're in exactly the right position, and you asymptotically approach this platonic ideal. But it takes a lot of effort over time to figure out actually what is the platonic ideal and then actually gradually approach that.

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

Yes. I mean, you might need to create a new alloy. Then you need to figure out how to cast it, then you need to ramp the casting machine with the new alloy.

Elon R. Musk
Technoking of Tesla, CEO & Director

We did.

Lars Moravy
Vice President of Vehicle Engineering

We've done it for -- We've done it castings. Yes. But those take time.

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

On improvement is something we're used to here, and it's something like we've done with their vehicles and our design since the beginning. I mean, even we're talking a couple of weeks ago, like the first version of the front casting that we made that went into the early vehicles is like...

Elon R. Musk
Technoking of Tesla, CEO & Director

I mean, Model S stage.

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

No, I'm talking about like first Model Ys. Since we've ordered more dies because bringing more dies for more production, we've saved like 4 or 5 kilos of mass with just die iteration. And that's something we do at Tesla like quite regularly and we'll continue to do. So we're not happy with a C, like maybe we're at a C-plus now because I think we got to keep going to B-minus.

Elon R. Musk
Technoking of Tesla, CEO & Director

On the rear casting. But this will transfer for improvement with the casting. So the casting is already way better than the rare body casting is already way better than the -- on the way is done in the past where you've got 120 different parts that are welded together or bonded together with different alloys and then you have to put sealant in between all the various parts for water ingress and noise.

So we're already way better than that with current casting, but there's still a lot of opportunities to reduce the master casting and also extend the casting to include more parts as well as adapt the rest of the vehicle for the fact that there's a cast A.

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

Yes, I was going to say the same thing, right? Like we're not just evaluating the pack and insulation either. It's the pack plus the body, the integration, do we have mass in the right places, we have the cost in the right places and only just the right amount. And I think we've gone through 1 iteration. We're going to do another 1 with Cybertruck. I mean, we're taking the learnings and doing. The next version hopefully is a B-plus in A architecture. That's certainly a target.

Martin Viecha
Senior Director for Investor Relations

Thank you. The next question is, how do you feel the progress of FSD is going? And does Andrej Karpathy is leaving, have any significant impact on time lines or potential progress?

Elon R. Musk
Technoking of Tesla, CEO & Director

Well, since Andrej was writing all the code by himself, naturally, things have come to a grinding halt. And so irony. So Andrej was also in which we have transparent respect for Andrej. He's decided to -- I think he wants to contribute more to, I think, core AI at an academic level and get back to coding individually.

But we've got a team of about 120 people in our software AI group that are extremely talented. And I think we will have -- I'm highly confident we will solve full self-driving and it still seems to be this year. I know people are like says that. But it does seem to be epic. It does seem as though we are converging on full self-driving this year.

Martin Viecha
Senior Director for Investor Relations

Thank you. The next question is, how is the 4680 ramp going? And is Giga Texas producing cells yet?

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

Yes. So we are making progress on 4680. But right now, as Elon mentioned, we are leveraging supplier cells, which we have in sufficient quantity to ramp Texas and Berlin. We expect to ramp total 4680 production to exceed 1,000 per week by the end of the year, hopefully before -- well before.

In Q2, at Kato we fully automated [indiscernible] for the dry anode-electrode tool there, unlocking major increases in production and improvements in yields. Since March because of that, Kato output has grown about 35% month-over-month each month since, and yields throughout the factory are already at targets in most areas and trending in that direction and a few others.

We did feed learnings from Fremont cell and pack lines to Texas and Berlin there, a carbon copy. Cell design was revved to unlock higher performance and manufacturing simplicity. Manufacturing lines were further integrated and we in-sourced additional content. For these reasons, there are some new ramp challenges to overcome in Texas and Berlin.

Specific to Texas last quarter, cell equipment was fully installed and commissioned and we produced our first commissioning car sets of cells through the end of the line. Our target for Texas is to begin production this quarter and aim for Texas to be capable of exceeding Kato weekly output before the end of this year.

Martin Viecha
Senior Director for Investor Relations

Thank you very much. The next question is on 4680 as well, but I think Andrew has covered everything that was in the next question.

So the following question is with regards to the ramp of production in Austin and Berlin. How is the situation with regards to supply of semiconductors, battery cells and other components? How about cost inflation impacting profitability of these other plants?

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

I can take that. So Tesla procures about 1,600 unique pieces of silicon from 43 semiconductor companies. So with a portfolio of that size, there are always challenges. Things are more stable on the latest generation chips. We still see some tightness in the older generation semiconductors, especially in the analog and mixed signal space. But we have line of sight to solve for the volumes being contemplated for both Austin and Berlin.

And on the cell front, like Elon mentioned, we have a comfortable margin, thanks to record output from our partners and have line of sight that matches the planned output from both factories. We've grown cell production significantly on a 12-month rolling basis and have long-term contracts with all our partners for key battery metals. So we don't see any major problems for the components, of course, barring unforeseen COVID-related shutdowns.

Zachary John Planell Kirkhorn
Master of Coin & CFO

Just to add on the profitability part of the question. Q2 was our largest increase yet over the last handful of quarters on inflation and commodity-related increases to our cars. It's fairly evenly spread across the factories, given common suppliers or common issues that impact the broad supply chain.

So I think I had mentioned before that we have been seeing increases over the course of last year. It ticked up in Q1 and then it ticked up again at the rate of increase was more in Q2. So as we look through to the end of the year, what we're seeing is we don't think the inflation-related increases in Q3 will be as big as Q2. But as Elon has mentioned, there is uncertainty on pricing here.

And we don't have full exposure, as [Karen] had just mentioned, on every component of cost because we do have some contracts in place. But there are some spot buys as well and some contracts being renegotiated. So we're managing it with pricing and in partnership with our suppliers but it does continue to be something that is impacting our financials.

Martin Viecha
Senior Director for Investor Relations

Thank you very much. And the last question is, when will the Cybertruck be officially available?

Elon R. Musk
Technoking of Tesla, CEO & Director

We're hoping to start delivering them in the middle of next year.

Martin Viecha
Senior Director for Investor Relations

Great. Thank you very much. And now let's go to analyst questions. The first question comes from Pierre Ferragu from New Street Research. Pierre, feel free to unmute yourself.

Pierre C. Ferragu
New Street Research LLP

I'd like to ask like a question on 4680 and the structural battery pack. And I'd love to understand where you stand on the technology and efficiency and energy density road map that you described at the Battery Day. So what I'm trying to understand is where do you stand on the architecture of the battery cell itself? How much silicon do you have in it? How much energy improvement have you achieved already so far?

And the reason why I'm asking that is because you have like very smart guys on Twitter who shared experience about trying to fully empty a Model Y from Texas from Austin and noticing behaviors and like recharging behavior that suggested that maybe these cars had like very, very high mileage, very high range, and were like artificially limited in range in software. So I'm just kind of trying to understand how much of an edge you're building at the moment with the 4680 and the battery back on range.

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

Yes. Let me just try to provide like a super straightforward answer. Like as Elon mentioned before, our priority was really on simplicity and scale during the initial 4680 and structural battery ramp. So we weren't like putting all the bells and whistles in from day 1 because if so, we would be sort of suffering under a string of serious miracles that we would need to achieve to get going.

But as we attain the manufacturing goals that we've stated at the ramp that we need to hit next year, we are certainly planning to layer in new material technologies and higher-range structural packs, like we're not like holding back goodies for some rainy day or something like that.

Elon R. Musk
Technoking of Tesla, CEO & Director

Yes. Maybe another way of putting it is that the -- our focus right now is on the dozens of little issues that inhibit the production ramp of the 4680. Some of the more challenging ones have been feeding the anode-cathode material because

we're using this revolutionary dry electrode process. But when something is revolutionary, it's a lot of unknowns that have to be resolved.

So we're confident of resolving those unknowns but it's very, very difficult. It's -- yes, we're making rapid progress on that point. So the first order of business is really get the basics right, get to high volume and high reliability and then very rapidly iterate within that to enhance the energy density and reduce the cost of the cell.

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

Totally agree, yes.

Elon R. Musk
Technoking of Tesla, CEO & Director

I'd say we are highly confident of a good outcome. It's the exact counterpoint of that is perhaps is of some debate but the outcome is not.

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

Yes. Specific to the dry process, we made a major advance this past quarter in Kato that the team is really excited about, and congrats to the team for achieving that.

Elon R. Musk
Technoking of Tesla, CEO & Director

But I should also emphasize that it is not as though Tesla intends to displace our suppliers of battery cells. The Tesla battery cell production is in addition to what our suppliers can do. And we want our suppliers to grow their battery output as fast as they possibly can, and that goes for the entire supply chain.

The fundamental rate limiter for both transitioning to sustainable energy is how fast can you grow with the amount of battery output per year? This is the fundamental rate limiter for transition to sustainability because you need the batteries for 2 of the pillars of sustainability, the stationary storage and for vehicles. So yes.

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

Yes, I just want to stress that a lot of these higher energy density technologies are not necessarily scalable. I mean, most of them are not scalable from what I've seen. And so like focusing on them is a distraction from the mission, like it really is how do we scale as fast as possible?

And we're taking these risks that we've discussed at Battery Day. And our plan is as we derisk them and they are successful, we want to bring them back to our partners so that they can go faster, too, because that's all on the mission, right, like how do we accelerate.

Elon R. Musk
Technoking of Tesla, CEO & Director

People often ask me, if you often ask me, is some breakthrough needed in battery technology for the world to transition to sustainability? The answer is no. Even if there was 0 technology breakthroughs, so it literally 0 from where the technology is right now, we could fully transition Earth to sustainable energy. The issue is very much the rate at which the entire supply chain from mining to refining to cell production. How fast can that grow? It's growing fast with the faster it grows, the faster we transition to a sustainable energy economy.

Pierre C. Ferragu
New Street Research LLP

This is actually a great -- exactly where my follow-up is. So Elon, you always mention this 50% per annum sustainable growth target that you guys have. And so my question here is when we see like the difficulty regarding the commodities, raw materials, swinging prices, I'm kind of wondering, as you are planning for this 50% per annum growth, if we stand

today over the next 5 to 10 years, how much of that do you feel you've secured through your work at entering into long-term contracts and things like that? And you were calling for entrepreneurs to go into the lithium business.

So does that mean you don't have enough lithium secured to grow 50% per annum over multiple years? And what's -- how much of that is secured today? And how fast can you improve that basically?

Elon R. Musk
Technoking of Tesla, CEO & Director

Well, I think it's kind of very difficult to predict anything 10 years from now. I hope civilization is still around, frankly. I don't count that as a win.

Pierre C. Ferragu
New Street Research LLP

Not that fun.

Elon R. Musk
Technoking of Tesla, CEO & Director

Yes, exactly. Hopefully, we haven't had World War III by then. So the -- we do see constraints in refining of the materials necessary for lithium ion batteries. I do want to emphasize this as -- it is not due to a scarcity of the raw material. In the case of lithium, lithium is one of the most common elements on Earth. It's pretty much everywhere.

But refining of the lithium into ultra-high purity battery-grade lithium hydroxide, lithium carbonate is quite difficult and requires a massive amount of machinery and it's a hard thing to scale. As it was also difficult to create the anode and cathode.

I think -- my guess is maybe 2/3 of batteries will be iron phosphate or maybe iron phosphate with some manganese. And there's plenty of -- there's a ridiculous amount of iron. In fact, Earth is -- a little bit of trivia. says, what is Earth made of more than anything else? Iron. Iron is the #1 ingredient of Earth by mass. Number 2 is oxygen, which is wild.

Yes. Basically rust. Actually, we're stuck together. We're a rust ball. That's roughly -- that's almost 2/3 of Earth, I think, is rust. We are like a rusty ball bearing with a little bit of other stuff. So -- but plenty of lithium. So anyway, there's not like a shortage of materials.

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

But the other thing on the LFP thing is that it isn't just that there's more access to material that way. The actual refining process is less capital intensive to make a good LFP cathode. And so there's -- it's not just scalable on the resource side, it's scalable on the refining side.

Elon R. Musk
Technoking of Tesla, CEO & Director

Absolutely. To clear, there's no fundamental barrier here. It's simply a rate question. Like at what rate can you scale production? And I think we're seeing a very rapid increase in battery production and in the whole supply chain. If you were to say today, what are concerns appears down the road? I would say one of the concerns is the machinery to refine the -- the critical ingredients of lithium ion cells. So the lithium itself and then the cathode, which I said like I said, will be mostly iron phosphate, partially some manganese.

I think almost all stationary storage will be iron phosphate and then you really just need nickel chemistry for long-range vehicles and like aircraft and that kind of thing.

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

Yes. The other thing I would say is -- we are working with our suppliers to ramp their capability as quickly as possible. And it's not like we have a problem in the next year or 2 to -- specifically to your question. But when we look 10 years out, yes, we need to do more to accelerate the growth. And that is why we are making our own investments, like we are building a facility here in Texas. The steel is going up, you can see it in the flyovers.

We're working on a lithium refining activity as well ourselves because the best way to learn how to accelerate something is to do it yourself. So these are the things we're doing to move it all forward.

Elon R. Musk
Technoking of Tesla, CEO & Director

Yes. If our suppliers don't solve these problems, then we will.

Martin Viecha
Senior Director for Investor Relations

Thank you. The next question comes from Emmanuel Rosner from Deutsche Bank.

Emmanuel Rosner
Deutsche Bank AG, Research Division

Yes. I have a question on your vehicle demand and then a quick follow-up on supply. First, on the demand side. Are you seeing any sort of pressure in the order book or the pace of new order or any sort of like slowdown as a result of the pressures that the consumer is experiencing? Are you worried about it in light of your view of the risks to the economy that I think you expressed, Elon?

Elon R. Musk
Technoking of Tesla, CEO & Director

Well, right now, our problem is very much production. So we've long leads on -- as anyone can tell, if they order our car, you order Model Y, it'll arrive sometime next year. So this is clearly not an issue for many months for us. Our problem is overwhelmingly that of production. So yes.

Zachary John Planell Kirkhorn
Master of Coin & CFO

Okay. Maybe just 2 things to add. Specifically on your question, are we seeing a macroeconomic impact on our demand? Not that I can tell. Maybe a little.

Elon R. Musk
Technoking of Tesla, CEO & Director

Some maybe.

Zachary John Planell Kirkhorn
Master of Coin & CFO

But it's not material. The second thing to Elon's point about backlogs, we have a very long runway with very long lead times here. I mean, certainly, the world is uncertain, and we'll have to see where things go with commodity prices, how quickly we're ramping production, what the state of the road looks like at some point next year. But the demand is not something we spend really any time talking about.

Elon R. Musk
Technoking of Tesla, CEO & Director

Yes. I think it's -- maybe just 1 thing worth mentioning the -- that there is surface between value for money and fundamental affordability because sometimes people say, "Well, if you got all this demand. Why don't you just raise the price to some -- double the price or something?" And this is usually expressed by somebody who's rich.

But there's -- even if you rail value for money to infinity, if somebody does concerns, do not have enough money to buy it, even a product where the desirability is rail to infinity, they basically cannot buy it. So this is why you kind of just raise prices to some arbitrarily high level because you pass the affordability boundary and then the demand falls off a cliff.

So I do feel like we've raised our prices or we raise the price quite a few times. They're frankly at embarrassing levels. But we've also had a lot of supply chain and production trucks and as we've got crazy inflation. So I'm hopeful, this is not a promise or anything, but I'm hopeful that at some point, we can reduce the prices a little bit.

Martin Viecha

Senior Director for Investor Relations

Thank you. Emmanuel, do you have a follow-up?

Emmanuel Rosner
Deutsche Bank AG, Research Division

Yes. My follow-up was actually on the supply side. So it was very encouraging to see that you're quantifying your current installed capacity at basically already in excess of 1.9 million units installed currently. How quickly do you think that you can fill that capacity?

Elon R. Musk
Technoking of Tesla, CEO & Director

Well, I mean, we -- I think we've got a good chance of exiting this year at 40,000 vehicles a week.

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

Yes. I mean our internal plans are to have the capacity utilized by the end of the year. It takes time to ramp there. It will be a challenge. There's a lot that needs to happen to get there but that's what we're working on.

Elon R. Musk
Technoking of Tesla, CEO & Director

Yes. We've had many 30,000-car weeks already, so I think a 40,000-car week is within reach by the end of this year.

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

Shanghai and Fremont, as we said last month for record production and they're really fire to better doing really well. But then also Berlin are coming on strong. Theoretically, they also had record quarters, last quarter. And if we ramp them to the capacity shown in the deck by the end of this year, we'll be at that rate.

Elon R. Musk
Technoking of Tesla, CEO & Director

There's always a lot of uncertainty like the production looks like S-curve, and that intermediate part of S-curve the difficult to bridge that with high certainty. But the end part of the S-curve, you can say, I think you can have a lot more certainty. And so that's why I'm confident we'll get to 5,000 cars a week at -- in Austin and Berlin by the end of this year or early next year and probably but not certainly, 10,000 cars a week at both locations by the end of next year.

Martin Viecha
Senior Director for Investor Relations

Thank you. The next question comes from Colin Rusch from Oppenheimer.

Colin William Rusch
Oppenheimer & Co. Inc., Research Division

Could you talk a little bit about the pricing strategy around FSD, and as you get closer to this full functionality rolling out and the increased cycle times, how you see that evolving through the balance of this year and into 2023?

Elon R. Musk
Technoking of Tesla, CEO & Director

Yes, we will increase the price of FSD sometime later this year. I think probably just before we go to quiet beta or beta is anyone who wants to use the beta software with all the caveats associated with that can use it, then it would make sense to increase the price of FSD. The value of FSD is, I think, extremely high and not well understood by most people. It is basically currently ridiculously cheap, assuming FSD materializes, which is well.

Colin William Rusch
Oppenheimer & Co. Inc., Research Division

Great. And then sorry to belabor a little bit on battery materials side. But in terms of some of the suppliers and the contaminants, can you be a little bit more specific around some of the elements that you guys see in some of your supply chain that can prove troublesome yields for the 4680s, particularly around lithium and potential contaminants in either oxides, the carbonates that you guys end up seeing real issues with as you move into production?

Zachary John Planell Kirkhorn
Master of Coin & CFO

Yes. I don't really think we have anything to comment on, yes, the purity specs of lithium on this call right now, yes.

Elon R. Musk
Technoking of Tesla, CEO & Director

Yes. The contaminants from the 4680 are not a factor, which is not an issue.

Martin Viecha
Senior Director for Investor Relations

Thank you very much. The next question comes from Toni Sacconaghi from Bernstein.

A.M. Sacconaghi
Sanford C. Bernstein & Co., LLC., Research Division

Yes. I have two as well. In response to the question around demand, I think, Zach, you said maybe a little, and Elon, you said maybe some indication that you might see some pressure on demand. And I'm wondering if that is really just speculation or whether there's any empirical data that you saw in the last month, whether it be cancellations or order lead times that led you to make that comment.

I think anecdotally, if you squint, the lead times have gotten a little lower over the last 4 months in both China and the U.S. That's really the only visibility investors have. So I'm wondering if you could maybe elaborate on whether that's really just you're sort of anticipating there could be some impact because of high prices or whether they're something anecdotally or quantitatively that you could point to, please?

Elon R. Musk
Technoking of Tesla, CEO & Director

No. I mean, I think we've said this now for many years, I know has proven true. Tesla does not have a demand problem, we have a production problem. And we've almost always had it's a very rare exception it's always been a production problem. I think that will remain the case.

A.M. Sacconaghi
Sanford C. Bernstein & Co., LLC., Research Division

So there's a denominator and a numerator and like, you increase production?

Elon R. Musk
Technoking of Tesla, CEO & Director

Yes, absolutely. As we increase production, more demand is needed obviously.

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

No, it's more just like you can't look at the backlog and state much about demand because we're doing a lot on the other side to change the production.

Elon R. Musk
Technoking of Tesla, CEO & Director

We're trying to make the backlog lower, not longer.

Unknown Executive

Building factories and building...

Elon R. Musk
Technoking of Tesla, CEO & Director

We don't want a long backlog. That's annoying. It'd be like go to a restaurant and you order a burger and you have to wait 3 hours and like, that's annoying. You want to get your burger right away. Same with the car. So we want that lead times to reduce.

A.M. Sacconaghi
Sanford C. Bernstein & Co., LLC., Research Division

Okay. Now I was just trying to follow up on the fact that you both said that maybe we're seeing demand be impacted a little bit, and that was the spirit of the question.

Elon R. Musk
Technoking of Tesla, CEO & Director

We don't have like -- like because we see daily orders from around the world for our cars, it's actually -- it is like a mood barometer of people's confidence in the economy. But one can't read too much into it because things can vary a great deal from 1 day to the next. Consumer sentiment is all over the map. So it's -- manage price, frankly. But we have so much excess demand. That is really just not an issue for us. It might be an issue for some other companies but it is not an issue for us.

A.M. Sacconaghi
Sanford C. Bernstein & Co., LLC., Research Division

Okay. Elon, I'm just wondering, a question for you. Tesla's obviously changed dramatically in the last 3 years from near life or death to a company with consistent cash flow and industry-leading margins. I'm wondering if you can comment on your personal role in the company and whether you see that changing in terms of your role, your commitment and time spent at the company over the next 3 or 4 years.

I think you said a few calls ago, you wouldn't be on calls unless there's something unusual and you've been on every call since then. I'm wondering.

Elon R. Musk
Technoking of Tesla, CEO & Director

I do a lot of unusual things, let's face it. Basically, if there's only good news, I won't be on the call. But if you have like a tough situation like COVID shutdowns in China, then I think I'll be on the call -- relatively speaking, if there's bad news. And we have this good news, then I won't be on the call.

But I'm committed to the long -- I mean, I'll work at Tesla as long as I can usefully advance the cause of sustainability and autonomy.

Martin Viecha
Senior Director for Investor Relations

Fantastic. Thank you very much. The next question comes from William Stein.

William Stein
Truist Securities, Inc., Research Division

Elon, in the past, you've given some assessment as to the likelihood that you can achieve success in some of the more interesting AI-oriented efforts, not only FSD but also Dojo and Optimus. Perhaps you can give an updated view on those.

Elon R. Musk
Technoking of Tesla, CEO & Director

Well, I don't want to steal thunder from AI Day. So I think we'll have some exciting news on AI Day that I think will be further ahead than probably most people think. But I don't want to -- I'd love to answer you but I think we'll leave that excitement for AI Day.

William Stein

Truist Securities, Inc., Research Division

Okay. And perhaps a follow-up if I can. We've heard a lot from others and certainly to some degree from you all about the shortages in semiconductors, in particular. We have seen some big, important customers of that type of product decide to sort of leverage the ecosystems that exist to make some of their own in those categories.

I'm wondering to what degree you're doing that. That's outside of Dojo in terms of the -- I guess, on the inference side, you're certainly doing that in the car, but what about sort of the more mundane areas like microcontrollers and the like? Is there any internal effort to improve supply chain and maybe improve other performance aspects?

Elon R. Musk
Technoking of Tesla, CEO & Director

Well, there's we've done -- we've been working with our suppliers side. We don't currently intend to make chips ourselves. We don't think there will be a need to make chips, but we have been working closely with a number of suppliers. Actually just met with one of our key supplier's CEOs right before this call. We had a great meeting. They're going to make major investments in some of the critical chips and components that we need in the car.

And I'd actually like to take a moment to thank our key suppliers once again for supporting us through difficult times. And they really went above and beyond to support us. So to all our suppliers out there, thanks very much.

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

Yes. And I guess just maybe we don't talk about it very often, but we do have a lot of custom silicon in the vehicle already. Microcontrollers, yes, some battery management, yes, some power electronics, yes, some. So we try to go after where there's actually a technical advantage. And in the future, I think we're going to look at where there's a supplier...

Elon R. Musk
Technoking of Tesla, CEO & Director

[indiscernible] even now where the supply chain issues with our Tier 1s and Tier 2s, get into it with us on the engineering side when we find solutions, whether it's alternative chips or changing the entire structure of this pack to make it work. And I think that's an advantage we have that many other OEs just simply cannot.

I think Tesla is as much a software company as it is a hardware company. And so one of the ways that we've been able to address supply chain issues on the chip front is by rewriting of software to be able to use different chips or, in some cases, achieve dual use of a single chip, which is even better. And actually, quite frankly, the chip shortage has served as a forcing function for us to reduce the number of chips in the car. Yes, it turns out we had more chips than we needed.

But that's a testament to our software team that we're able to roll a new chip into the car, write a whole new patch of software for that chip and -- without interrupting production.

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

Yes. And our goal is as we mature and scale the platforms is to integrate more functionality into fewer chips, like that is the way that it's gone with laptops and phones. It's going that way in cars. And we're trying to do that wherever it makes sense to do it as quickly as we can.

Elon R. Musk
Technoking of Tesla, CEO & Director

From a supply chain standpoint, do we -- what do you think about the chips and whatnot?

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

Yes. I think -- I mean, from a high level, instead of designing and building our own microcontrollers, we're partnering with key partners that understand the architectural requirements and they'll take the specs and design something for us. We've done that, to your point, the battery sensing space. We've got some application-specific ICs. But yes, integrating, reducing

the number of components, it's a mix of supply chain but it also makes the reliability of the end product better because there's less failure points. So that's always been the mantra.

Lars Moravy
Vice President of Vehicle Engineering

And at times, we've also got the wafer level and try to consume less to achieve the same functionality. So that's something also that we've been looking at in some of the constrained modules that we have faced in the last 6 months.

Martin Viecha
Senior Director for Investor Relations

Fantastic. Well, thank you very much. I appreciate all of your questions. Unfortunately, this is all the time we have this quarter, and we will speak to you again in 3 months' time. Thank you very much, and goodbye.

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