Q2 2023 Earnings Call

Company Participants

- Andrew Baglino, Senior Vice President of Powertrain and Energy Engineering
- Elon Musk, Chief Executive Officer
- Karn Budhiraj, Vice President of Supply Chain
- Lars Moravy, Vice President of Vehicle Engineering
- Martin Viecha, Vice President of Investor Relations
- Zachary Kirkhorn, Chief Financial Officer

Other Participants

- Colin Rusch, Analyst, Oppenheimer
- Dan Levy, Analyst, Barclays
- Emmanuel Rosner, Analyst, Deutsche Bank
- Mark Delaney, Analyst, Goldman Sachs
- William Stein, Analyst, Truist

Presentation

Martin Viecha {BIO 17153377 <GO>}

Good afternoon, everyone, and welcome to Tesla's Second Quarter 2023 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 PM 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.

During the question-and-answer portion of today's call, please limit yourself to one question and one follow-up. Please use the raise hand button to join the question queue.

But before we jump into the Q&A, Elon has some opening remarks. Elon?

Elon Musk {BIO 1954518 <GO>}

Thank you, Martin. So just a Q2 recap. In Q2, we achieved record vehicle production and deliveries and record revenue of about $25 billion in a single quarter. And Model Y became the best-selling vehicle of any kind globally in Q1, surpassing the likes of Corolla and (inaudible). So it was the number one vehicle of anytime, including vehicles that are sold at a far lower price. This is, I think, an incredible achievement by the Tesla team and just a huge thank you to our customers for their support. So this came in spite of high interest rates and a lot of macro uncertainty and unless we managed to achieve operating margin of about 10%.

We continue to target 1.8 million vehicle deliveries this year, although we expect that Q3 production will be a little bit down, because we've got summer shutdowns to -- for a lot of factory upgrades. So just probably a slight decrease in production in Q3 for sort of global factory upgrades. In the long-term, autonomy we think is going to just drive volume through the ceiling next level. And our future robotaxi products -- the dedicated robotaxi products, we think have a quasi-infinite demand. So, the way we're going to manufacture the robotaxi is also itself a revolutionary. So it's a revolutionary sign made in a revolutionary way. It will be by far the highest units per hour of any vehicle production ever. So we're very excited about that.

With respect to Autopilot and Dojo, in order to build autonomy, we also need to train our neural net with data from millions of vehicles with a more -- I mean, this is an improvement over and over again. The more training data you have, the better the results. And I mean there were times where we see basically in a neural net, basically it is sort of at a million training examples, it barely works at 2 million, it's slightly works at 3 million. It's like, wow, okay, we're seeing something, then you get like 10 million training examples, it's like -- it becomes incredible. So, there's just no substitute for a massive amount of data. And obviously, Tesla has more vehicles on the road that are collecting this data than all other companies combined by, I think, maybe even at an order of magnitude. So, I think we might have 90% of all, a very big number.

So, the success in AI endeavors is a function of talent, sort of unique data and computer resources. And we have outstanding capabilities in all three arenas. And I really just don't know how anyone could do what we're doing, even if they had our software and had our computer if they did not have the training data.

So speaking of which our Dojo training computer is designed to significantly reduce the cost of neural net training. It is designed to -- it's not optimized for the kind of training that we need, which is a video training. So, we just see that the need for neural net training, again talking in quasi kind of things is just enormous. So, I think we expect to use both NVIDIA and Dojo to be clear. But there is -- we just see a demand for really vast training resources.

And we think we may reach in-house neural net training capability of 100 extra blocks[ph] by the end of next year. So, today, over 300 million miles have been driven using FSD beta. That 300 million mile number is going to seem small very quickly. It will soon be billions of miles, and tens of billions of miles. And that FSD will go from being as good as the human to then being vastly better than the human. We

see a clear path to full self-driving being 10 times safer than the average human driver.

So -- and between Autopilot, Dojo computer, our inference hardware in the car, which we call Hardware 3, 4, but it's really dedicated -- it's a high-efficiency inference computer that's in the car and our Optimus robot. Tesla is clearly at the cutting-edge of AI (inaudible).

We continue to build our lease candidates to the Cybertruck on our pilot production line in Austin. I'm actually here in Austin at the Gigafactory. This is the first truck that we're aware of that will have four-door, was over six-foot bed and fit into a 20-foot garage. So it's a sort of biggest on the outside, but it's even bigger on the inside. So it's a -- I think that's a -- one of the elements of good design is it should feel big on the inside than it looks on the outside. And this is no small car, but we really cared about the exterior dimensions of the Cybertruck down to the last millimeter. So just before you trying to get right in middle of the goldilocks zone, not too big, not too small and then really maximize the utility of the volume. And we can't wait to start delivering it later this year.

Some other highlights. Our global Supercharging network now stands at over 50,000 -- roughly 50,000 connectors and over 5,000 locations. As I think a lot of people are aware, the Tesla charging standard which we made open source is now called the North American charging standard. We're deeply honored that Ford, GM, Mercedes and many other OEMs have signed up to use our connector and gain access to our charging network. We strongly believe in helping other car companies to accelerate the EV revolution and just trying to do the right thing in general. So, that's (inaudible) there.

Then, if I may I think I want to emphasize like very strongly, this is a very important point is that Tesla, just as with the North American charging standard, although we're not licensing, like we're not licensing, we're just making it available, but we are very open to licensing our Full Self-Driving software and hardware to other car companies. And we are already in discussions with -- early discussions with a major OEM about using Tesla FSD. So, we're not trying to keep this to ourselves, we're more than happy to license it to others. And lastly, our new lithium refinery and cathode facility are progressing well.

In conclusion, we continue to focus on making as many cars as we can, while maintaining healthy financials. Our artificial intelligence development is, obviously, entering a new era. And we're incredibly excited about what's to come. Our other businesses such as Megapack, Supercharging service and whatnot all started to become a meaningful contributor to overall profitability this quarter. And then lastly, I'd just like to profusely thank all of our employees who are making it a lot of extra effort during uncertain times. Thank you very much for your hard work and the impact you're making.

Martin Viecha {BIO 17153377 <GO>}

Thank you very much, Elon. And I think Zach has some opening remarks as well.

Zachary Kirkhorn {BIO 20940148 <GO>}

Yeah, thanks, Martin. As Elon mentioned, Q2 was another record quarter of production and deliveries, as well as records and profit for energy and services and other businesses. Congratulations again to the Tesla team on the continued progress. As we navigate through a period of economic uncertainty, rising interest rates, volatility in consumer confidence and regulatory change, I want to comment on our financial approach.

First, the single most important priority is to ensure we are continuing to invest heavily in the core technologies that will drive the long-term value of the business. This include increasing spending on AI-related technologies such as Full Self-Driving, Optimus ad Dojo, as well as new products such as Cybertruck, our next-generation platform in the Semi as evidenced by the continued growth in our R&D spend. This also includes continuing our investments in capacity expansion, not only in our vehicle factories, but also our Supercharging network, service, internal applications and battery processes as we continue with meaningful capital expenditures to lay this foundation for the future.

Second, we continue to work towards our goals of maximizing volumes on both our vehicle and energy business. But most importantly, doing so in a way that generates the capital to continue our pace of R&D and capital investments. This requires a strong focus on per unit cost reductions in each of our key businesses, as well as working capital improvements on raw materials, work-in-process inventory and customer AR, all of which progressed appropriately in Q2.

If we look specifically at our automotive business, our gross margin showed a modest reduction and remained healthy, despite action taken to further improve vehicle affordability early in the quarter. We recognize -- we realized per unit cost improvements in nearly every category, including material cost and commodities, manufacturing costs and logistics. We're also continuing to rapidly increase the build rate in our Austin and Berlin factories. For our energy business, we improved margins and gross profit, driven by cost reductions and deal economics, particularly with Megapack.

As a reminder, storage volumes are typically volatile sequentially based on the types of projects and with specific revenue recognition milestones. As we look forward to the rest of the year, I want to reiterate Elon's comments on Q3 volumes, driven by planned downtimes for factory upgrades. These upgrades will also carry some amount of factory idle cost, however, we are working to minimize as much as possible. It's also important to keep in mind the uncertainty in the macro-environment, which can impact our execution positively or negatively in the near-term. Regardless, we continue to remain dynamic with a focus on fundamental efficiency and the long-term outlook. Congratulations again to everybody on a great quarter.

Questions And Answers

A - Martin Viecha {BIO 17153377 <GO>}

Thank you very much, Zach. And let's go to investor questions. The first question on licensing FSD, we've already answered. So let's go to the second one. The second question is, what is the status of 4680 cells? How far are you from the specs you laid out on Battery Day? When do you expect to achieve what you laid out on the Battery Day?

A - Zachary Kirkhorn {BIO 20940148 <GO>}

Yeah, first I'll just start with a little bit of a production update. So in Texas, 4680 cell production increased 80% Q2 over Q1, and the team surpassed 10 million production cells produced here in Texas. So congrats to the team for that. They're focused on yield, reduced our scrap bill by 40% quarter-over-quarter. And that resulted in a 25% reduction in cell COGS. Here in Texas, we're preparing to launch our Cybertruck cell, which is 10% higher energy density than current production. That was accomplished through process and mechanical design optimization. As we scale cyber cell production through the end of the year and early next, we should be in a comfortable place on cost per cell.

Against our battery energy density targets, the cyber cell is at our expectations on a like-for-like electrochemistry basis. We're yet to integrate silicon or in-house cathode production both reviewed on Battery Day, which do bring significant further energy density and cost improvements, but that is a topic for another day.

Lastly, it is important to remember that most of what we focused on the Battery Day was the Tesla-engineered 4680 production system and the improvements we strove to achieve on equipment, factory density, capital cost and utility cost reduction, all of which we are realizing in our Texas scale-up today.

A - Martin Viecha {BIO 17153377 <GO>}

Thank you very much. The next question is, can you talk more to the upcoming Tesla Energy products and how you're thinking has evolved on the revenue model? Given Tesla's AI capabilities, how do you see the long-term mix between hardware margin and recurring software margin from auto bidder as this segment accelerates?

A - Zachary Kirkhorn {BIO 20940148 <GO>}

We can't comment on future product roadmap. But I can provide a quick Energy Q2 update. Megapack continues to show strong demand globally with Lathrop ramping successfully to meet our contracted projects in 2023 as stated last quarter Megapack margins are in a reasonable place in-line with our vehicle target margins. The second final assembly line at Lathrop is progressing on schedule. Eventually doubling Lathrop capacity ahead of our full factory ramp in 2024. We have several exciting large projects in construction or nearing completion, putting the KES project in Hawaii, the Riverina project in Australia, several projects in California and one here Gigafactory Texas that I'll tour today actually.

We want to thank our customers, utilities and grid operators for trusting us with these projects. On the automotive question we continue to grow automotive contracts in wholesale markets like Australia, Texas, UK in California with over 6 gigawatt-hours under Tesla's dispatch next year and the UK, our projects performed best-in the industry. In Q2, auto better does have software margins and is an enabler for hardware sales, but it's a relatively small contributor to revenues, given how much deployment growth on the Megapack our side is occurring. It's important to remember that these large capital projects have lifetimes 20 years of recurring revenues on an annualized basis relative to upfront CapEx are small.

On the residential side, we have some fun things happening. We recently surpassed 0.5 million Powerwall installed. Just this week, we are launching charge on solar, which allows Tesla Powerwall and vehicle customers to charge their vehicles using excess solar and drive only on the Sunshine, it's their roof. Yesterday, we began paying customers in Texas for participating in our virtual power plant to provide credit support to ERCOT. We expect these credits to lower our medium customers annual by a third and to increase these credits over-time as ERCOT expanded market access and today, we are expanding Tesla electric enrollment to new model three owners in Texas, followed by all Texas vehicle customers over the rest of the quarter.

Unfortunately and somewhat similar to Tesla Insurance bringing Tesla, electric and DPP capabilities to our customers requires working through a fracture and regulatory environment on a jurisdiction by jurisdiction basis. In the long-run, the value of residential energy software and hardware will be driven by the level of market access that utilities market operators and regulators permit. Powerwall eligible to provide the full stack of energy services like peaker[ph] capacity and system offerings such as in Australia, we can more than double the value of ownership relative to a typical system today.

A - Martin Viecha {BIO 17153377 <GO>}

Thank you very much. The next question is, could you quantify the benefits to COGS per unit from the IRA battery manufacturing incentives and secondly battery raw-material declines year-to-date.

A - Zachary Kirkhorn {BIO 20940148 <GO>}

I can take that on the first part of the question for IRA manufacturing incentives we've provided previous guidance that we expect these to being for the course of this year in the range of $150 million to $250 million per quarter. We are staying within that boundary as we guided previously, that was the case in Q2 as well. I will note and I think we've mentioned this before that this includes the 50-50 sharing of credits for qualified cells from our long-term battery partner Panasonic.

On the commodity side, we are continuing to see improvements there as we've discussed previously. Lithium is the most notable improvement so-far I think I've commented on this on the last call because typically we see this coming about a quarter before it actually is realized in our financials. And also, just as a reminder, we're not fully exposed to the price of lithium, our supply-chain team has done a terrific job in partnership with a bunch of other companies to put in-place. Some

long-term agreements here, but we do have some exposure that moves up-and-down. That resulted in a 25% reduction in COGS. Here in Texas, we're preparing to launch our Cybertruck cell, which is 10% higher energy density than current production. That was accomplished through process and mechanical design optimization as we scale cyber cell production through the end of the year and early next, we should be in a comfortable place on cost per cell. Against our battery energy density targets the cyber sellers are our expectations on a like-for-like (inaudible) basis we're yet to integrate silicon or in-house cathode production both reviewed on Battery Day which do bring significant further energy density and cost improvements but that as a topic for another day.

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We're also seeing benefits in aluminum and steel, which I think is great. Not as large as the lithium impacts, but they contribute nonetheless. So if we add up the total impact of this in Q2 relative to prior quarter, it's about the same size and magnitude as the IRA benefits that we also received. Just to put this in context, as you look at COGS per unit sequentially from Q1 to Q2, there's two things to keep in mind there. The first is that our SX[ph] mix for deliveries increased quite a bit from Q1 to Q2. So as you think about fundamental cost reductions, it's important to adjust for that.

And then secondly, as we continue to work on reducing our Austin and Berlin cars, which we did quite a bit of that from Q1 to Q2, these factories are still slightly above Model Y production costs elsewhere. And in the quarter, our mix of Austin and Berlin

related builds increased. And so, that's something to consider as you model out the impact on -- from Q1 to Q2 in terms of COGS per unit.

I do want to ask Karn, if there's anything else on the commodity side or just more generally you want to adhere.

A - Karn Budhiraj

Yeah. As you mentioned, Zach, we've naturally been a little bit hedged from losing position because the long-term contracts we have in place, but we have seen reduction in pricing across the board for all commodities that specifically go into batteries such as nickel, cobalt and graphite. And the reductions in pricing translate into thousands of dollars when you look at it from a per vehicle impact. We're taking advantage to extend some of those fixed price contract through the end of the decade. So it's a playbook that will continue to kind of go back to as we look to the future.

A - Martin Viecha {BIO 17153377 <GO>}

Thank you. The next question on FSD. Have you considered allowing FSD transfer ability as a lever to allow existing customers to upgrade to a new Tesla instead of being locked into an existing car due to the price of FSD?

A - Elon Musk {BIO 1954518 <GO>}

Yeah, this is the question we get asked a lot. So we're excited to announce that for Q3, we will be allowing transfer of FSD. This is a one-time MSD. So this we take advantage of it in Q3, but -- or at least place the order in Q3 within reasonable delivery time frames. So, yeah, I hope this makes people happy. If we don't get there, this is a one-time thing.

A - Martin Viecha {BIO 17153377 <GO>}

All right. The next question, when will we give more information about the Cybertruck orders, estimated delivery schedules, pricing and specifications?

A - Elon Musk {BIO 1954518 <GO>}

The demand is so far (inaudible). So that's really not an issue. I do want to emphasize that the Cybertruck has a lot of new technology in it like a lot. It doesn't look like any other vehicle because it is not like any other vehicle. So -- and the production ramp will move as fast as the slowest and least like the elements of the entire supply chain and internal production. So I wouldn't expect it -- I hope it's smooth. We're certainly better production ramps. We've got a lot of experience with production ramps, but first order approximation is like 10,000 unique parts and processes in a year in the Cybertruck. And if anyone -- it will go as fast as the least lucky, least well-executed element of the 10,000. So, always very difficult to predict the ramp initially, but I think we're making them in high volume next year and we will be delivering the car this year.

A - Martin Viecha {BIO 17153377 <GO>}

Thank you. The next question is critics of Giga casting contended that process makes vehicles harder and more costly to repair, essentially pushing costs on to the customer. Can you share some details about the initial repair experience with Giga cast vehicles?

A - Elon Musk {BIO 1954518 <GO>}

That must be why everyone's copying us.

A - Lars Moravy {BIO 22525342 <GO>}

Thanks, Elon. This is Lars. That's like simply not true. There's a misconception that traditional bodies are easy to repair, but they are made of multiple materials and multiple joining methods. Spot welds and rivets have to be drilled out. Panels and structural adhesives have to be chiseled down, dried adhesive has to be removed, stain things, cut, blah, blah, blah.

A - Zachary Kirkhorn {BIO 20940148 <GO>}

It's a crazy patchwork quilt.

A - Elon Musk {BIO 1954518 <GO>}

Yeah. And so, putting that back together means time and money using an example of replacing a real cash rail in Model Y. It's a do that versus like what we replaced it with some Model 3, it's 10 times cheaper and three times faster to do it with the cash rail.

My design team works with our collision repair team since we're closed-loop on this with insurance and redesign specific parts that are making it easier and faster to repair. And we have an incentive to do that because we have our own insurance and our own body shops. We expect that we'll continue to do this, and collision repair will continue to become cheaper and faster over time. And we already made this available to all body shops through our Tesla-approved body shop training.

A - Zachary Kirkhorn {BIO 20940148 <GO>}

Yeah. Closing loop on collision repair and factoring that into design is a big deal.

A - Lars Moravy {BIO 22525342 <GO>}

It's crucial. I don't think anyone else can do it with that ecosystem that we have, so...

A - Elon Musk {BIO 1954518 <GO>}

Yeah. And we are actually able to change the details of the casting with inserts and we actually do that all the time, so -- because the answer is actually wear out and need to be replaced anyway. So we can actually make design changes to be inserts and tweak the castings. But the cancel -- the cast rear body or front body is lighter, cheaper, better noise vibration, harshness, much easier to manufacture. And it's better in every way. And that's why so many other car companies are copying us.

A - Zachary Kirkhorn {BIO 20940148 <GO>}

Probably.

A - Elon Musk {BIO 1954518 <GO>}

Well, they certainly put out lot of press releases about it. I think it's basically going to be how all cars are made in the future.

A - Martin Viecha {BIO 17153377 <GO>}

Thank you. Next question, how many Optimus bots have been made and when will they be able to start performing useful tasks?

A - Elon Musk {BIO 1954518 <GO>}

10 million. Yes, I think we're around five or six bots. There is -- we were 10, I guess, which was our -- how many are working and what phase, but, it's sort of -- yeah, there is more every month. There's a lot of interesting things about the Optimus bot. We found that there are actually no suppliers that can produce the actuators. There are no off-the-shelf actuators that work well for human robot at any price.

A - Andrew Baglino {BIO 21161872 <GO>}

Certainly not compelling unit.

A - Elon Musk {BIO 1954518 <GO>}

Yes, there's not human robot that can do some things that human can to do. So, we've actually had to design our own actuators that integrate the motor, the power electronics, the controller, the sensors and really every one of them is custom designed. So, and then of course, we'll be using the same inference hardware as the car.

So -- but we are in designing these actuators are designing them for volume productions. So they're not just lighter, tighter and more capable any other actuators that exist in the world, but it's also actually manufacturable. So we should be able to make them in volume. The first Optimus that is -- that we'll have all of the Tesla-designed actuators, so production candidate actuators. It integrated and walking should be around November-ish. So -- and then, we will start ramping up after that.

In terms of when we'll be able to see some useful things, we will first be trying to in our own factories, and is proving out as utility buy. I think we'll be able to have do something useful in our factories sometime next year. I would be -- yeah, I'm pretty confident of that. So, yeah, very well.

I should say, another core thing about Optimus is that just in the US alone, there are 2 million amputees. And I was just talking to the Neuralink team and by combining Neuralink implant and a robotic arm or leg for someone that has had their arms or legs or all arms and legs amputated. We believe we can give basically a sidewalk[ph]

body that is incredibly capable. $6 million man in real life. But it won't cost $6 million, $60,000 man. Seems that was impressive, but it will actually -- so that actually could be really -- I think would be incredible to potentially help millions of people around the world and give them a robot arm or like that is as good, maybe long-term better than a biological one.

A - Martin Viecha {BIO 17153377 <GO>}

Thank you. The next question is how has the order intake trended relatively to production levels during Q2? And how has that trended in the quarter-to-date period? Conceptually, how does Tesla beside? When do you see the appropriate reduced prices or add other sales incentives to increase demand?

A - Elon Musk {BIO 1954518 <GO>}

Yeah. I guess, demand has roughly tracked production. So -- which is what we aim for. Something that we have that really I think no other car maker has is that we have real-time demand and real-time production like so -- seven days a week. I got an email -- auto generated email, chose output from all factories and orders globally. So it's like a real-time finger on the pulse of Earth basically. And we're just course according to what the mood of the public is. Buying a new car is a big decision for the vast majority of people. So, anytime there is economic uncertainty, people generally pause on new car buying at least to see what happens.

And then obviously, another challenge is the interest rate environment. As interest rates rise, the affordability of anything bought with that decreases, so effectively increasing the price of the car. So when interest rates rise dramatically, we actually have to reduce the price of the car, because the interest payments increase the price of the car. So -- and this is at least up until recently, it was just I believe the sharpest interest rate rise in history. So we have to do something about that.

And so, (inaudible) a crystal ball for the global economy. I really appreciate it, if I could borrow that crystal ball. Yeah, exactly, (inaudible). It should be not on Twitter. So, I mean, one day, it seems like the world economy is falling apart. And the next day, everything's fine. I don't know what the hell is going on. It would be totally fine. I wish I did.

So I mean, that's why I say like I always on twitter, I posted like just really advising because I care a lot about the sort of the small shareholders, especially ones that have stuck with us through thick and thin. I love you guys. And so, we can't control these macro shocks or the thematic depressive nature of the stock market. So that's why I recommend against margin loans in times that are turbulent. If times are not that turbulent, actually margin loan can be a smart move within reason. But we're in I would call it turbulent times. Like I have very high confidence in the long-term value of Tesla. Like I see it really see a path to a 10x -- call it a 5x increase in the value of the Company, maybe a 10x.

And where things go along the way, the trials and tribulations and the mood of the markets, no one can't predict. And so, the old adage of buy and hold is right. For an investment advice, I see like identify a company whose products you love. See if they

-- does it seem like they will continue to make good products or great products. Buy that stock and hold it That's it. You all win. The reason companies exist is to make goods and services ideally great goods and services. They don't exist for any other reason, they shouldn't. So that's why you should buy the stock of the company that makes -- has a great future pipeline. It's common sense actually.

And then, generally if you see -- if you -- provided you're confident about what that company's products or services are, when the market panics buy and when the market is over the exuberant, you can sell. I'm not recommending yourself (inaudible), but yeah, buy low, sell high. Warren Buffett actually I think has a saying I'm paraphrasing him, but publicly-traded company is like imagine you're living in your house and some crazy manic depressive guy comes and stands at the outside your house and yells property prices at you. And it's a different price every day. The house is still the same house. So, this is the stock market. Credit that to Warren Buffett.

A - Martin Viecha {BIO 17153377 <GO>}

Thank you. Let's go to the next question. With the emphasis of price cuts to drive volume growth heading into automotive gross margin, can investors expect to see automotive gross margin stabilize or even rise due to efficiencies, outpacing the cuts? And if, so when?

A - Elon Musk {BIO 1954518 <GO>}

Where is that crystal ball, again? If I may, it's like look the short-term variances in gross margin and profitability really are minor relative to the long-term picture. Autonomy will make all of these numbers look silly. I'd recommend looking at ARK invest, I think their analysis is very good. The best -- and generally for Intuit or like if the finance, smart finance people on Twitter, follow their accounts, they're great. So that's in my opinion where you will get the best, the best info. So I strongly believe Tesla is a big long-term investment. And that's where when things go up and down, in fact the market panics by, if the market is a little too exuberant time, sell at the time, but just generally, I feel comfortable we will deliver long-term, but can't control short-term, so -- and it's autonomy is really where it's happening. I mean, Zach why don't you?

A - Zachary Kirkhorn {BIO 20940148 <GO>}

I fully agree with you. I think the only thing in the short-term that matters is what I said in my opening remarks, which is regenerating enough money to continue to invest. And the portfolio of products and technologies that the technical teams are investing in right now, this is intense. It's intense in terms of investment. It's intense in terms of potential

A - Elon Musk {BIO 1954518 <GO>}

Frankly, I think it's ridiculous that we have positive free cash flow in a capital-intensive business, while investing massive amounts of money in new technology. That is super hard.

A - Andrew Baglino {BIO 21161872 <GO>}

And vertical integration. It's not even just like new products, but also...

A - Elon Musk {BIO 1954518 <GO>}

Yeah. We actually make our ship. We don't -- to others, but...

A - Zachary Kirkhorn {BIO 20940148 <GO>}

And so, at least from my perspective, what matters is continuing to generate the cash to invest. That means continuing to be hyper-focused on near-term cost reduction because everything we do and near-term cost reduction provides capital to reinvest. Hyper-focused on working capital management, which we've made quite a bit of progress there on the raw materials and led side of that. We've been very focused on accounts receivables as well to ensure that we can continue to invest -- reinvest the cash. This is what we're focused on.

And so there's set of things that we control. We have a pipeline of cost reductions. We are getting tailwinds in the commodity space right now as Karn mentioned, that's helpful. Variability around average selling prices goes back to Elon's point, we don't control interest rates, we don't control macro consumer sentiment, but we have an obligation to be responsive to that to ensure that we're matching supply and demand and keeping things balanced. And so, this is how we're managing the next handful of quarters. As soon as these quarters will be behind us, they won't be part of present value of future cash flows of the business. And so, we want to make sure we keep that view and make sure that the long-term business is exactly the way that we want it to be.

A - Martin Viecha {BIO 17153377 <GO>}

All right. Thank you very much. And now let's go to analyst questions. The first question comes from Dan Levy from Barclays. Dan, feel free to unmute yourself.

Q - Dan Levy {BIO 17519730 <GO>}

Great. Good evening. Thank you. Wanted to start first with a question about your efforts in AI and Dojo. It's pretty clear it sounds like you're accelerating your focus. Can you maybe provide us with a sense of what the processes of refining a product? Is it more machines? And maybe you could give us a sense of when the payout starts to -- when you start to see the payout and what the resource outlay is? What should we expect on the OpEx front, as a result of this?

A - Elon Musk {BIO 1954518 <GO>}

Sorry, are you saying how much we can spend on Dojo or...

Q - Dan Levy {BIO 17519730 <GO>}

Yeah.

A - Andrew Baglino {BIO 21161872 <GO>}

R&D of Dojo.

Q - Dan Levy {BIO 17519730 <GO>}

Yes.

A - Elon Musk {BIO 1954518 <GO>}

Well, we're not going to be open loop on our Dojo expenditures, so -- but I mean, I think we will be spending probably worth of $1 billion over the next year on (inaudible) next year. it's well over $1 billion in Dojo. And yeah, so maybe we've got a truly staggering amount of video data to do training on. And this is another thing I like. In order to copy us, you also need to spend billions of dollars in -- on training compute. I mean, it's like -- and it's also hard too. You need the data and you need the trend computers like things like all things needed to actually achieve this at-scale to generalized solution for autonomy. This is one of the highest bonds ever.

You see a lot of AI companies doing LLMs and whatnot. And I'd say if there are so great, why can't they make a software driving car because it's harder. That's why. So, I do think that -- I think there's some great AI companies out there, but just fundamentally, the staggering amount of data we've got to process -- we've got to process somehow and custom silicon is the best way to do that. So that's what Dojo is designed to do is optimize for video training. It's not optimized for all of them. So it's optimized for video training. With video training, you have a much higher ratio of compute to memory bandwidth. So, whereas LLMs tend to be memory bandwidth choked.

So that's it. I mean -- but like I said, we're also -- we have some -- we're using a lot of NVIDIA hardware and we'll continue to -- we'll actually take NVIDIA hardware as fast as NVIDIA will deliver it to us tremendous respect for Jensen and NVIDIA. They've done an incredible job. And frankly, I don't have -- if they could deliver us enough, GPUs -- we might not need Dojo, but they can't. So, they've got so many customers. They've have been kind of up to nonetheless, prioritizing our GPU orders. But the sheer magnitude of video training -- because like I said, we're not trying to just get as good as when we want to get to 10 times better than human, maybe a 100 times than human.

Right now, I believe there is something on the order of 1 million automotive tests per year. And then if you say permanent serious injuries, I think it's probably closer to 10 million per year. And, yes, so it matters if you're twice as good as human 10 times, like 10 times better than human would still mean 100,000 deaths and 1 million severe permanent injuries. So it's like okay, we would probably be 100 times better. So there's really -- it's a march of lines and we want to achieve. That's perfect to safety as possible. And that's truly mind-boggling amounts of video and computer needed for that. So -- and then, I just do think there's other applications for Dojo, but we just desperately needed for the video training.

A - Zachary Kirkhorn {BIO 20940148 <GO>}

Just to add to what Elon mentioned, the numbers that he mentioned are between R&D spend and capital spend and this is moving quickly. And so, we provide a three-year outlook on our capital expense. We are considering these expenses in that outlook. And as that moves up and down, we'll continue to update our guidance in the queue.

A - Elon Musk {BIO 1954518 <GO>}

Yeah. I want to say the fundamental rate limiter on the progress of full self-driving is training. That's -- if we had more training compute, we will get it done faster. So, that's it.

A - Zachary Kirkhorn {BIO 20940148 <GO>}

And it's just difficult to predict how quickly we can execute on them.

A - Martin Viecha {BIO 17153377 <GO>}

Great, thank you. Just as a follow-up. I recognize there's incredible macro uncertainty right now, but you're sticking with your near-term, your volume target 50% CAGR. As we just think about sort of in the year ahead Cybertruck is going to be some contribution, there's going to be some help from further EV penetration growth. But to what extent, are you willing to sacrifice on pricing to keep that 50% volume CAGR intact? Or are you thinking differently about margins versus your prior commentary of willing to sacrifice on margins to get more share?

A - Elon Musk {BIO 1954518 <GO>}

It sounds like we're getting more share. It's just that you can think of every car that we sell or produce that has full autonomy capability as actually something that in the future may be worth as much as five times what it is today. Because average (inaudible) vehicle is doing like maybe 10 hours of driving a week. If this is 1.5 hours a day on average, that's 10 hours a week-ish. If you've got on autonomous, if the vehicle is able to operate autonomously and use either dedicated autonomous or partially autonomous like Airbnb, like maybe sometimes you allow your car to be used by others, sometimes you want to use it exclusively just like Airbnb with a room in your house. The value is just tremendous. So I think it's sort of, it would be -- I think it makes -- it does make sense to sacrifice margins in favor of making more vehicles because we think in the -- not just in the future, they will have a dramatic valuation increase. I think the Tesla fleet value increase at the point in which we can upload full self-driving and is approved by regulators will be the single biggest step change in asset value maybe in history.

A - Martin Viecha {BIO 17153377 <GO>}

Thank you. Let's go to the next analyst. The question comes from Emmanuel Rosner from Deutsche Bank.

Q - Emmanuel Rosner {BIO 16323493 <GO>}

Thank you very much. Two questions from me as well. First, following up on the autonomy. So before you start launching these dedicated robotaxi vehicles on existing vehicles, you're improving FSD incrementally. What is your latest targeted timing to essentially release a non-beta version or an eyes-off version that would trigger much higher take rates? And will Tesla benefit from lowering the price of FSD?

A - Elon Musk {BIO 1954518 <GO>}

Well, obviously, as people have sort of made fun of me and perhaps quite fairly have made fun of me, my predictions about achieving full self-driving have been optimistic in the past. The reason I've been optimistic is what -- it tends to look like is the -- we'll make rapid progress with a new version of FSD, but then, it will curve over logarithmically. So first, logarithmic curve looks like just sort of fairly straight upward line, diagonally up. And so, if you extrapolate that, then you have a great thing. But then because it's actually logarithmic, it curves over, and then there have been a series of stacked logarithmic curves.

Now I'm the boy who cried FSD, but I think we'll be better than human by the end of this year. That's not to say we're approved by regulators. And I'm saying that would be in the U.S. because we've got to focus on one market first. But I think we'll be better than human by the end of this year. I've been wrong in the past, I may be wrong this time. And the price of FSD -- so the way I think is the price of FSD is actually very low is not high. When you go back to what I say here, the value of the car increased dramatically if it is actually autonomous. $15,000 is actually a low price, not a high price. And we will offer -- and we have -- I think we do sort of offer FSD as a sort of monthly subscription, although most people don't know that. So I'd recommend like maybe trying it out as a monthly subscription, so you don't have to go with the $13,000[ph] thing. But I think yeah, obviously, if the car is worth several times its original price, $15,000 is actually a low price for FSD.

A - Martin Viecha {BIO 17153377 <GO>}

Thank you. And the next question comes from William Stein from Truist. William, go ahead and unmute.

Q - William Stein {BIO 15106707 <GO>}

Great. Thank you very much for taking my question. I'd like to ask about, to stick on this AI topic, we've read with great interest the developments in Dojo today and you spoken about FSD. But you've also, Elon, you've started this X.AI company and for investors that think that there might be quite a bit of value in the AI features and products of Tesla. It might be concerning to see you pursuing another endeavor where AI is the focus. So can you talk about how X.AI might overlap, might perhaps compete with Tesla or in other ways, perhaps it enhances the value of what Tesla does? Thanks very much.

A - Elon Musk {BIO 1954518 <GO>}

Yeah. I think it will actually enhance the value of Tesla. There were just some of the world's best AI engineers and scientists that we're willing to join a startup. But they

are not willing to join a large sort of relatively established company like Tesla, so is like that's actually how it got started. I was interviewing a few people and they're like now we want to start-up was like. And that's what -- I can convince them strain Tesla. So it's like, okay, well better to startup that (inaudible) has been done then they go work somewhere else.

That's kind of the genesis of xAI. And xAI is focused on sort of AGI. Yeah, so it's, I'd like say, I think there will be some value that xAI brings to Tesla, also some of the best for the very best people in the world, they really just want to work on interesting problem. So if you take say, a material science group, really what convinced try equivalent to leave Apple, where it's very happy and well compensated and both at -- book look. We think it's the best material science group in the world well, was that he got to work both Tesla and SpaceX, he wasn't willing to leave Apple if it was Tesla, but he is willing to do if it is Tesla and SpaceX. So sometimes you get the best talent in the world. That's kind of the thing you need to do, and that actually has been very beneficial to Tesla.

Q - William Stein {BIO 15106707 <GO>}

If I can squeeze one more mundane question in. I wonder if you think you can hit the 1.8 million unit number with current pricing, or do you anticipate needing to continue to lower prices because it seems like the trends have stabilized in the last maybe more than half? Should we expect to sort of continued decreases, or more stabilization for the rest of the year?

A - Elon Musk {BIO 1954518 <GO>}

Sure. We have sort of -- we started the referral program, which I think will be quite effective. As Zach was saying earlier, we don't control the macroeconomic conditions. So if interest rates continue to rise, that reduces the affordability of cars. And for a lot of people, they're really (inaudible) really breaking even every month. In fact, if you look at the rise in credit card debt, they are in fact not breaking even every month. Credit card debt is looking scary. So we just don't control the market conditions. If market condition is stable, I think prices will be stable. If they're not stable, then we would have lower prices, yeah.

A - Martin Viecha {BIO 17153377 <GO>}

Thank you. Let's go to Colin Rusch from Oppenheimer.

Q - Colin Rusch {BIO 15823117 <GO>}

Thanks so much, guys. As you're building out Dojo and implementing what truly is going to be highly complex set of software, if you speak to the maturity of the operating system and how much outsourced software you're expecting to use in that system?

A - Elon Musk {BIO 1954518 <GO>}

This is a custom software stack. So -- but it is designed such that you can run at a high level, PyTorch and Jax. So -- but then, we have to customize it to actually run on

a custom silicon. So the software stack is a combination of open source software and then Tesla software all the way to the bare silicon, which is the case for the inference computer in the car.

Q - Colin Rusch {BIO 15823117 <GO>}

Okay, thanks so much. That's super helpful. Then can you speak to how you're managing some of the geopolitical risks relative to your capacity expansion? Obviously, as you guys continue to grow at this rate, you're going to be putting some folks out of business. And then, there's going to be some impacts around regional economy. So just want to understand how you're thinking about that in terms of some of your CapEx plans and how you're arranging some of those relationships with different countries and regions?

A - Elon Musk {BIO 1954518 <GO>}

This is a period of unusual geopolitical risk. So, I think we're -- the best we can do is have factories in many parts of the world, such that if things get difficult in one part of the world, we can still keep things going in the rest of world.

A - Martin Viecha {BIO 17153377 <GO>}

Thank you. The next question comes from Mark Delaney from Goldman Sachs.

Q - Mark Delaney {BIO 17231530 <GO>}

Hi. Thank you very much for taking the question. Tesla has been making progress reducing cost and did so again last quarter. Can you give an update on when you think automotive COGS per vehicle could be under the historical $36,000 per vehicle level, and what are the key puts and takes to get there?

A - Andrew Baglino {BIO 21161872 <GO>}

This is -- I think I was asked this in the past. This is very difficult to forecast. There is a series of costs that we manage. There's series of costs in which we don't control. And so, particularly on the commodity side, where labor cost et cetera, it's just hard to say.

A - Elon Musk {BIO 1954518 <GO>}

Yeah. And we saw very inflationary pressures -- like strong inflationary pressures for a while last year. And now -- which obviously makes it very difficult to reduce COGS. And now we're seeing what seems to be deflationary pressures, certainly deflationary -- deflation is a pressure. But we're seeing commodity prices dropping as was mentioned, as Karn mentioned a moment ago. And I mean, what do you think? I mean, basically, the trends seem to be deflationary at the commodity level.

A - Karn Budhiraj

Definitely, there's that. And then, there's also the unit economics improve as volumes grow. That's the other thing we're seeing. As we're becoming a bigger and better part of a lot of suppliers, the economies of scale come into play. There's equipment

depreciation that comes into play, equipment that was commissioned five to seven years ago. That used to be a part of the piece price. That's completely amortized. So, we'll see situation where piece price comes down because that equipment contribution has gone away. And then, just we continue to have this mentality of continuous improvement in terms of labor, reducing labor, improving automation, and just continue to get better at what we do. So we have seen -- I think every quarter, we have seen an improvement. Of course, the commodities spiked up and down. Just in general, the trend is towards being more efficient.

A - Zachary Kirkhorn {BIO 20940148 <GO>}

Yeah. I'm totally agreeing.

A - Elon Musk {BIO 1954518 <GO>}

Lithium prices went absolutely insane there for a while.

A - Zachary Kirkhorn {BIO 20940148 <GO>}

Yeah, and they're recovering now.

A - Karn Budhiraj

(inaudible) it used to be.

A - Zachary Kirkhorn {BIO 20940148 <GO>}

And we're still early in the ramps -- well, not early in the ramp, but early in the cost down curve of Austin and Berlin. And so, it takes time to work the cost out of it. First, it's a focus on ramp, ramp it brings cost down...

A - Elon Musk {BIO 1954518 <GO>}

And quality cost.

A - Zachary Kirkhorn {BIO 20940148 <GO>}

Yeah, and then once that stabilizes, we can divert bandwidth to cost reduction. And so, Austin and Berlin saw quite a decent amount of cost reduction on a fundamental basis from Q1 to Q2. We'll continue to do that work, that would be helpful. And so, we're just going to keep chipping away at it.

A - Karn Budhiraj

Packaging is a big element to that.

A - Elon Musk {BIO 1954518 <GO>}

Yes, logistics too.

A - Zachary Kirkhorn {BIO 20940148 <GO>}

Logistics is normalizing, which is great.

A - Andrew Baglino {BIO 21161872 <GO>}

(inaudible) utilization, something that team has been very focused on. So every bit of it.

A - Zachary Kirkhorn {BIO 20940148 <GO>}

Yeah, and...

A - Elon Musk {BIO 1954518 <GO>}

Logistics is under-appreciated. Yeah, so I was (inaudible) like valves and tactics was one logistics.

A - Karn Budhiraj

And we've made tremendous improvements in cost in all fronts expect costs. We have done pre-pandemic expect cost level to, and our goal is to go further down.

A - Zachary Kirkhorn {BIO 20940148 <GO>}

Yeah, so when we look at our progress from Q1 to Q2 on cost, whether we look at internally, normalized for the impacts of mix-shift with Austin and Berlin being a higher percentage of our mix normalized for S&X being a higher percentage of our mix in Q2 versus Q1. The sequential cost reduction, it might be the largest we've had in a while. So I think it's great work on behalf of the Tesla team, and we just got to keep it up.

A - Elon Musk {BIO 1954518 <GO>}

Yeah, it's a game of pennies. So Game of Thrones with pennies.

A - Martin Viecha {BIO 17153377 <GO>}

Mark, do you have a follow-up question. I think you're muted.

Q - Mark Delaney {BIO 17231530 <GO>}

Yeah. Thank you very much for all the details on that. Maybe you could put a finer point on the downtime impact that you spoke about in your prepared comments in terms of production impact. And then also to what extent, there is a margin impact from those factory upgrades that you're planning this quarter? Thank you.

A - Zachary Kirkhorn {BIO 20940148 <GO>}

Yeah, the downtime, we don't know exactly the number of cars impacted because kind of the way that we go into downtime windows for upgrades is we set aside a period of time, but then the team is challenged to go as quickly as possible, so that we can get the factory is up and running again and minimize cost. So it's not a profound reduction. Hopefully, it's small.

A - Elon Musk {BIO 1954518 <GO>}

I think we're getting too much into the weeds here. I mean like you're asking for a level of precision that is not possible to prepare -- answer. So let's move on.

A - Martin Viecha {BIO 17153377 <GO>}

I think this is unfortunately all the time we have for today. So we'll speak to you all in the next few months. Thank you very much.

A - Elon Musk {BIO 1954518 <GO>}

Thank you.