Company Name: Tesla
Company Ticker: TSLA US
Date: 2018-02-07
Event Description: Q4 2017 Earnings Call

Market Cap: 54,080.99
Current PX: 318.51
YTD Change($): +7.16
YTD Change(%): +2.300

Bloomberg Estimates - EPS
Current Quarter: -2.757
Current Year: -7.000
Bloomberg Estimates - Sales
Current Quarter: 4107.167
Current Year: 19596.538

Q4 2017 Earnings Call

Company Participants

- Elon Reeve Musk
- Jeffrey B. Straubel
- Deepak Ahuja
- Doug Field

Other Participants

- Rod Lache
- Adam Michael Jonas
- Tyler Charles Frank
- David Tamberrino
- Romit Jitendra Shah
- Ryan Brinkman
- Antonio M. Sacconaghi
- Philippe Jean Houchois
- Brian A. Johnson
- John Murphy
- James J. Albertine

MANAGEMENT DISCUSSION SECTION

Elon Reeve Musk

Business Review

Model 3 Launch

- 2017 was obviously a big year for Tesla
- We launched the Model 3, which is our first mass-production vehicle, and it’s a huge step change for Tesla
- Lot of challenges, but I think we made tremendous progress on that front

Installation of Largest Battery in Australia

- We also designed and installed and brought into operation the world’s largest battery in Australia, that’s largest battery by a significant margin, and that battery is exceeding its performance target significantly

New Product Launches

- We also unveiled the Tesla Semi, which is a super heavy-duty truck, maximum load Semi truck, and the next-gen Roadster, which we believe will exceed gasoline sports cars on every dimension

Model S and X

- And we also achieved record production and deliveries of Model S and X
- And overall, I think, while there were challenges associated with Model 3 ramp, we were in a deeper level of health than we expected, so a few levels deeper than we'd like to be, but swiftly exiting, I think
    - And so it was really, I think, on balance, a phenomenal year

Recognition

- And I'd like to thank everyone at Tesla, who should be very proud of the work they've done
    - This is incredibly difficult
- And I'd like to thank everyone for their hard work and contribution to 2017 being, I think, a really great year for Tesla
- I also want to thank our suppliers, particularly those involved in the Model 3, as they've shared the very difficult struggle we've had in ramping up production
- And they've really burned the midnight oil, spent weekends and taken a lot of risks and suffered alongside us in the challenges associated with the ramp
- So I'd like to thank them for supporting us through this difficult time with Model 3
    - As well, our customers and Model 3 reservation holders, you're going to love your cars, and we're working to get them to you as quickly as we possibly can

Model 3 Production Update

- As for Model 3 production, we continue to make significant progress every day, and we're targeting a weekly production rate of 2,500 vehicles by the end of March and 5,000 by the end of Q2
- And as you've seen in the letter, the q-over-q production of Model 3 is rising exponentially
    - So I'm hopeful that people think that if we can send a Roadster to the asteroid belt, we could probably solve Model 3 production
- It's just a matter of time, and really error bars on the timing are really quite small in the grand scheme of things

Business Outlook

So 2018 is likely to be a very big year for us

At some point in 2018, we expect to begin generating positive quarterly operating income on a sustained basis, operating 5,000 per week of Model 3 production

- And I am cautiously optimistic that we will be GAAP profitable

It's not certain, but I'm cautiously optimistic that we will actually be GAAP profitable with no asterisk

QUESTION AND ANSWER SECTION

<Q - Rod Lache>: Congratulations on the launch yesterday. Wanted to just ask a couple of questions. One is just to get a little bit more color from you on Model 3, what the production run rate is at the moment. Maybe if you can just

provide us a little more color on where the challenges are at this point?

On the last call you talked about I think two of the four zones at Gigafactory that were still kind of an issue in manual operation. Have those been resolved? And once you get to 2,500, is the ramp to 5,000 – does that just merely involve increasing line speeds?

<A - Elon Reeve Musk>: Sure. I'll try to give you as much color as possible. I am reminded of – I think it may have been Churchill's line about sausage. If you like sausage and respect the law, you should watch neither being made, and to some degree that is true of our production ramp.

So, I wouldn't read too much into the day-to-day battles of this or that. But I'll give you the color, but don't read too much into it. Yes. There are four zones in module production. Module production is fundamentally the limiting factor on Model 3 output, which is ironic since battery modules really should be the thing we're best at.

And I think in part we were probably a little over-confident, a little complacent in thinking that this is something we know and understand. And put a lot of attention on other things and just got too comfortable with our ability to do battery modules because we've been doing that since the start of the company.

And of the four zones, two of them, of which are subcontracted to – the production systems are subcontracted to other companies, flat out didn't work, it turns out like, I mean, we promised they would work and it just didn't work. So, we had to do what would normally be maybe an 18-month development cycle for a production system of that scale and complexity, and try to do that in basically six months or maybe little, six to nine months.

And we've tackled that on multiple levels, so we have a design that is nearing completion for a new automated system for Zone 1 and 2 that is being led by our Tesla Grohmann team. It's an excellent design. All the other work that they've done has performed to spec, and we expect a single Tesla Grohmann line to be equivalent to three, if not four, of the current lines that we have and be smaller, which is kind of amazing.

And then we have what we call a semi-automatic line, which is a series of small automated stations manned by people and they've actually been remarkably effective. It has to some degree renewed my faith in humanity that the rapid evolution of progress and the ability of people to adapt rapidly is quite remarkable.

Our semi-automatic – our sort of semi-manual, semi-automatic line is exceeding all three of the automatic lines right now. So – and that is something that we're able to scale quite rapidly.

I mean, JB, is there additional color you'd like to – on that?

<A - Jeffrey B. Straubel>: Sure. That's a great summary of it. I think much has been made about the manual production of modules, but it's really not very accurate. These are – these are, as Elon said, semi-auto lines where we have people that are moving materials, perhaps between the machines, that are actually performing the operations. But there is still a degree of automation doing the operation.

<A - Elon Reeve Musk>: It's not artisanal.

<A - Jeffrey B. Straubel>: Exactly. This is what has been ramping quite effectively in the last – in H1 – first part of this year.

<A - Elon Reeve Musk>: Yeah.

<A - Jeffrey B. Straubel>: So, we're continuing to expand that, those semi-auto lines, and that is effectively bridging the gap as we re-design the full automation and bring that online.

<A - Elon Reeve Musk>: Yes, actually I think it's probably worth providing some tours for investors that are interested, so you can actually see it first-hand. I think part of it is like, if you see it firsthand you'll understand exactly what's going on.

And so I think let's arrange for some tours for investors that are interested because I think you can really get a feel for what it is. Otherwise, it's just some words that are kind of hard to put – hard to imagine.

<A - Jeffrey B. Straubel>: I also just want to add. I think it's fair to say that this maybe degree of complacency that happened at the end of last year has been thoroughly replaced by an intense focus from a huge portion of the Tesla team and there are a lot of different initiatives and teams, whole teams, targeted at this area. So, as Elon opened with, it's not a question of if we will get to the production rate, it's just a question of the matter of time.

<A - Elon Reeve Musk>: Yes. Absolutely.

<Q - Rod Lache>: If I could just clarify. What's the run rate now with semi-automation and when are you expecting the fully automated line to come on?

<A - Jeffrey B. Straubel>: Well, it's probably a level of granularity that is not productive to dive into in terms of exactly what is coming from which operation. But we do expect the new automated lines to be landing and starting up at the Gigafactory in just the next – landing in sight within this quarter.

<Q - Rod Lache>: Okay.

<A - Elon Reeve Musk>: Yes. We expect the new automated lines to arrive next month in March, and then it's already – it's been – it's working in Germany. So, that's got to be disassembled, brought over to the Gigafactory, and re-assembled and then brought into operation at the Gigafactory. It's not a question of whether it works or not. It's just a question of disassembly, transport, and reassembly.

<A - Jeffrey B. Straubel>: Exactly.

<A - Elon Reeve Musk>: So, yes. So, we expect to alleviate that constraint. That – with alleviating that constraint, that's what gets us to the roughly 2,000 to 2,500 unit per week production rate. The next constraint would be material conveyance at our Fremont vehicle plant, so there's a very sophisticated automated parts conveyance system. We think it's probably the most sophisticated in the world, or at least we're not aware of one that is more so, and the software for that is quite complex. So that would be the next constraint on production to get to 5,000 is the conveyance system in Fremont. So that also appears to be on track. So, we feel like the error bars around the unit volume predictions are getting smaller with each passing week.

<Q - Adam Michael Jonas>: I also want to add my congrats for the launch yesterday. That twin Falcon landing was probably the sickest thing I've ever seen in my life on...

<A - Elon Reeve Musk>: Thanks.

<Q - Adam Michael Jonas>: First question's for – yes, it was just nutty. Totally nutty.

<A - Elon Reeve Musk>: Nutty. Yes.

<Q - Adam Michael Jonas>: Deepak, a question for you. Given the negative trade cycle, your negative working cap, some of the modeling analysts are doing kind of simulating when you get to 2,500 or 5,000 or maybe somewhere in between that, that some of the arrangements you made with your suppliers who have been very helpful, that you might temporarily run enough negative working cap to even have operating cash flow exceed CapEx. Is that something that's possible? Or, again, I know there's execution behind that clearly, but is that something out of question, temporarily even?

<A - Deepak Ahuja>: We got to look at it from a full quarter perspective. The negative working cycle is amplified by the rate at which we ramp our production, given our present plans of getting to 5,000 by end of Q2. It's a fairly gradual – it's exponential from where we started, but it's not going to create a situation where our cash flow from operations will exceed CapEx.

<Q - Adam Michael Jonas>: Okay. Thanks for confirming that. And just as a follow up, Elon, your kind of long-term compensation plan obviously got a lot of attention and raised some questions, however, long-term from now on succession. Just wanted to ask, do you see your successor as CEO of Tesla someone currently within the company right now, or from outside the company, kind of how do you see that? Thanks.

<A - Elon Reeve Musk>: I think that there's no active search going on. There's not even – active or passive search going on for a new CEO of Tesla. I expect to remain CEO for the foreseeable future.

But at some point if there's somebody really spectacular inside or outside the company who could take on that role and who would want to have that title and that role, and that would be fine with me, and I would focus on product development, which is design and engineering, which is what I like doing best. So, there are no plans to make a change at this time.

<Q - Tyler Charles Frank>: guess Elon, bigger picture in looking out a few years, you had mentioned a couple of quarters ago that the 1mm car target for 2020 was still there. And that you would need to introduce the Model Y by then. How do we connect from where we are today to getting to 1mm units a year? And what should we look for this year in terms of ramping production or building a facility for the Model Y?

<A - Elon Reeve Musk>: We are going to make some capital investments towards the end of this year related to Model Y. I don't want to jump the gun on those, but I think we've got a good plan. I'm pretty excited about how we're designing Model Y. It's really taking a lot of lessons learned from Model 3 and saying how do we design something to be easy to manufacture instead of how to manufacture or difficult, really.

So, I think it's going to be – I really think it's going to be pretty great and pretty scalable for Model Y. But we are going to, as you suspect, need to make some capital investments in H2 this year, really late Q3, Q4 for Model Y. But I think we want to wait probably three to six months before announcing any definitive plans on production location and the details associated with that.

<Q - Tyler Charles Frank>: And is that 1mm unit target still in play?

<A - Elon Reeve Musk>: Yes.

<Q - Tyler Charles Frank>: Perfect. And then just one quick follow up. How should we think about the Tesla Semi and investments needed there? And what do you guys think you can hit from an annual run rate in the next let's say two to four years?

<A - Elon Reeve Musk>: Well, there's big difference between two and four years. Tesla – and I've said, I think, even a few years ago, I think Tesla is going to grow at an average of roughly 30% a year, which is a crazy average growth rate for a company manufacturing a complex product at scale. So, two vs. four is a huge difference.

But if you say – and it's much easier to predict, especially these productions curves, they look like an S-curve, where you have an initial exponential, which if the exponential appears – since people naturally tend to extrapolate on a straight-line basis, an exponential when it appears, the predictions are conservative in the beginning. And then the exponential takes off and it becomes linear and then it becomes logarithmic.

So it's easier to predict – far easier to predict the endpoint or the steady state of the S-curve than anywhere on that exponential or log curve. So if you take four years, I think, 100,000 units a year is a reasonable expectation. Maybe more, but that's the right – roughly the right number, I think.

<Q - Tyler Charles Frank>: For the Tesla Semi?

<A - Elon Reeve Musk>: Yes.

<Q - Tyler Charles Frank>: Perfect.

<A - Elon Reeve Musk>: Yes. I think we might be able to exceed the specs that we unveiled last year too, which is pretty exciting. Another speculation that we might not meet them, but I think we're going to exceed them. And I made this comment before, [indiscernible] (20:24) over these comments, but I really take these to heart.

The competitive strength of Tesla long-term is not going to be the car; it's going to be the factory. We're going to productize the factory. And really, this is a lesson that is kind of obvious in history because the Model T wasn't the product, it was River Rouge. The Model T was a very simple car. Anybody could have made that car, but not anyone

could make River Rouge, and that's really what will ultimate – what will be Tesla's long-term competitive advantage.

We'll have a great product. So a great design, great engineering the products itself in the vehicles and autonomy and all that sort of stuff. But the factory is going to be the product that has the long-term sustained competitive advantage, in my opinion.

<Q - David Tamberrino>: Elon, on your autonomous vehicle strategy, why do you believe that your current hardware set of only camera plus radar is going to be able to get you to fully-validated autonomous vehicle system? Most of your competitors noted that they need redundancy from lidar hardware to given the robustness of the 3D point cloud and the data that's generated. What are they missing in their software stack and their algorithms that Tesla is able to obtain from just the camera and plus radar?

Further, what would be your response if the regulatory bodies required that level of redundancy is really needed from an incremental lidar hardware?

<A - Elon Reeve Musk>: Yes. Well, first of all, I should say there's actually three sensor systems. There are cameras, [indiscernible] (22:25) redundant forward cameras, there's the forward radar, and there are the ultrasonics for near field. So, the third is also – the third set is also important for near-field stuff, just as it is for human.

But I think it's pretty obvious that the road system is geared towards passive optical. We have to solve passive optical image recognition, extremely well in order to be able to drive in any given environment and the changing environment. We must solve passive optical image recognition. We must solve it extremely well.

At the point at which you have solved it extremely well, what is the point in having active optical, meaning lidar, which does not – which cannot read signs; it's just giving you – in my view, it is a crutch that will drive companies to a local maximum that they will find very difficult to get out of.

If you take the hard path of a sophisticated neural net that's capable of advanced image recognition, then I think you achieve the goal maximum. And you combine that with increasingly sophisticated radar and if you're going to pick active proton generator, doing so in 400 nanometer to 700 nanometer wavelength is pretty silly, since you're getting that passively.

You would want to do active photon generation in the radar frequencies of approximately around 4 millimeters because that is occlusion penetrating. And you can essentially see through snow, rain, dust, fog, anything. So, it's just I find it quite puzzling that companies would choose to do an active proton system in the wrong wavelength. They're going to have a whole bunch of expensive equipment, most of which makes the car expensive, ugly and unnecessary. And I think they will find themselves at a competitive disadvantage.

Now perhaps I am wrong. In which case, I'll look like a fool. But I am quite certain that I am not.

<Q - David Tamberrino>: Understood. And as a follow up, if I may, can we talk about the trajectory for the Model S and X margins. Q3 2017 I think the company was saying you were in the low 20% range. I think it took another step down per the report today. So I'm assuming it's probably at 20%. What's the path to recovery from here and can you frame us through how you're going to get to that margin expansion?

<A - Deepak Ahuja>: We feel very good about the recovery of S and X gross margin in 2018 to a level which we have seen in the past, and it's a combination of a variety of things. It's increasing the mix of the larger batteries, the higher option content, and then also we have a very good and a robust manufacturing cost reduction road map. We will achieve a lot of manufacturing efficiencies, which continue to occur on S and X. So, we feel really good about it.

<A - Elon Reeve Musk>: Yes, and we – our internal plan, whether we meet this or not, I don't know, but I think we will – our internal plan calls for somewhere around a 30% to 32% cash gross margin on S and X by the end of the year and probably 25%, maybe 26% GAAP gross margin on S and X towards the end of this year, and then Model 3, maybe not by the end of this year, but not far behind it.

<A - Deepak Ahuja>: Right. And this is, as Elon said, internal road map, an internal plan. Things sometimes get delayed, they don't work out exactly. But I think you get a sense that we feel really good about the improvement that's ahead.

<A - Elon Reeve Musk>: Yes. We have a clear path to that goal.

<A - Deepak Ahuja>: Yes.

<Q - Romit Jitendra Shah>: It sounds like from the letter that you could do more than 100,000 S and X in 2018, but you're constrained by the 18650s. And I'm just curious what would it take to see the 2170 cells in these vehicles?

<A - Elon Reeve Musk>: Yeah.

<A - Jeffrey B. Straubel>: Well, this is JB. It's something we've of course contemplated, but it's quite a large change to the architecture of the module and the battery pack overall. And while the 18650 supply is somewhat of a cap at about 100,000 units per year, even just a few months ago we didn't feel that expanding and making some long-term bets on expanding that supply with Panasonic in Japan was really the right risk. It's something we could consider, but right now we're pretty happy with that balance and it matches our other production capabilities and our other investments.

<A - Elon Reeve Musk>: Yes. It's also like for any given complex manufactured item, in order to go past the total capacity you really need to move the whole supply chain in cadence.

<A - Jeffrey B. Straubel>: Exactly.

<A - Elon Reeve Musk>: So, you really have to then shift everything to say, okay, if you want to make 20% more S and X, everyone has to make 20% more.

There have to be investments in new lines or it's going to require over time, which negatively affects gross margin. Kind of design the manufacturing machines [ph] are to create (28:43), and then you'd have to redesign the machine or go redline. And so I think we feel pretty good about the 100,000 a year for S and X, and we want to focus on just improving the efficiency of production and gross margin [indiscernible] (29:04).

<Q - Romit Jitendra Shah>: Thank you. Okay. Yes, it makes sense.

<A - Jeffrey B. Straubel>: We are keeping the course on Model 3. I mean, that's really where the majority of the effort is.

<A - Elon Reeve Musk>: Yes, okay. Exactly.

<Q - Romit Jitendra Shah>: Okay. The other thing you guys mentioned was upcoming autonomous coast-to-coast drive, which we're really looking forward to. Could you give a little bit more color on timeframe, when something like that would be available for customers?

<A - Elon Reeve Musk>: Yes, so we actually – I've been meaning to address this because obviously I missed the mark on that front. Our focus is very much on Model 3 production, so everything else kind of took a second place to that. But we could have done the coast-to-coast drive, but it would have required too much specialized code to effectively game it or make it somewhat brittle and that it would work for one particular route, but not the general solution. So I think we would be able to repeat it, but if it's just not any other route, which is not really a true solution.

I am pretty excited about how much progress we're making on the neural net front. And it's a little – it's also one of those things that's kind of exponential where the progress doesn't seem – it doesn't seem like much progress, it doesn't seem like much progress, and suddenly wow. That's been my observation generally with AI stuff.

And you look at say something like what Google DeepMind did with AlphaGo. It went from not being able to beat even a pretty good Go player to something that could beat the European champion, then it could beat the world champion, then it could thrash the world champion, then it could thrash everyone simultaneously. Then they made AlphaZero, which could thrash AlphaGo, and where it's just learning against itself, was better than all the world's

human experts.

It's going to kind of be like that for self-driving. It will feel like well this is a lame driver, lame driver. Like okay, that's a pretty good driver. Like holy cow, this driver's good. It'll be like that. I mean, timing-wise, I think we could probably do a coast-to-coast drive in three months, six months at the outside.

<Q - Romit Jitendra Shah>: And then is it available for customers immediately? Or is there a lag?

<A - Elon Reeve Musk>: Yes, that would be something that's available for customers.

<Q - Ryan Brinkman>: As you put solutions in place one by one to unclog Model 3 production bottlenecks in Fremont or at the battery module line in Reno, are you finding that the ultimate solution is more or less expensive to implement than your original plans, which called for 25% gross margin on the vehicle? Do you feel any differently now about the cost to manufacture the Model 3 or its gross margin potential vs. prior to the start of production last July?

<A - Elon Reeve Musk>: I think we feel good about that. I think like – I think we probably are, we're probably able to exceed that next year, probably. Like our understanding of manufacturing has improved dramatically. We can think of a huge number of ways to make it far better, far more efficient. I'm really excited about how much we're learning about manufacturing. That's why I said I think long-term strength of Tesla will be the manufacturing plants, potentially productizing the Gigafactory, which is like the world's biggest product basically. Make it like – make a [ph] nuclear Echo carrier (33:22) look pretty small by comparison.

<A - Jeffrey B. Straubel>: Yes, maybe just to add to that. I mean, the products' bill of materials cost and the embedded labor cost is, I think that's where there's opportunities. And we are simplifying and we're finding ways to improve the design incrementally as we go through the ramp. If there's some small increases in CapEx that doesn't directly – it will be overwhelmed by the improvements and simplicity and some cost savings in the product itself.

<Q - Ryan Brinkman>: Okay.

<A - Elon Reeve Musk>: Yeah. I think the bottom line is we feel really optimistic about the long-term potential for gross margin on Model 3 and especially Model Y.

<A - Deepak Ahuja>: We haven't seen anything that currently changes our view.

<Q - Ryan Brinkman>: That's very helpful. Thanks. And then just – yes. And then for my follow up, I see the guidance in the letter about the quarterly operating income turning positive at some point in 2018. That's great. I'm just curious what your thoughts are with regard to when you also might generate FCF. Is that less of a medium-term focus as you prefer to invest operating cash flows from the Model 3 into the Semi truck, the Roadster, and Model Y?

<A - Elon Reeve Musk>: Yes. We could be positive cash flow, like I think pretty significant positive cash flow probably in like third quarter, which is like maybe four, five months from now. But we think it makes sense to invest in Model Y and – yeah.

<A - Deepak Ahuja>: Future growth of our energy products, Model 3, future growth of that, so.

<A - Elon Reeve Musk>: Our energy products, yeah. The opportunities we see are – we see really good opportunities there.

<A - Deepak Ahuja>: Makes good business case, good business sense to invest.

<A - Elon Reeve Musk>: Yes. Super bullish [indiscernible] (35:08). What I find sort of interesting is that our competitors – the car industry thinks they're really good at manufacturing. And actually they are quite good at manufacturing, but they just don't realize just how much potential there is for improvement. It's way more than they think.

I went through this math I think on a prior earnings call, but like it sounds like some of the fastest car factories produce a car maybe every 25 seconds. That sounds fast. But if you think of a 5-meter long car, including gap, and a 4.5 meter car with a half meter gap or something, that's only 0.2 meters per second. Like grandma with a walker can exceed the

speed of the fastest production line we're in, so really no that fast. Walking speed is one meter per second, so five times faster than the fastest production line on earth.

<A - Deepak Ahuja>: That's interesting comment.

<A - Elon Reeve Musk>: Why shouldn't it at least be jogging speed? I mean in the limit, companies should start caring about the aero drag in the factory, which that's maybe around 20 miles or 30 miles an hour, or call it 30 kilometers an hour, 40 kilometers an hour. It's like, stuff should be moving at that speed.

<Q - Antonio M. Sacconaghi>: You commented in the shareholder letter that CapExs for 2018 were expected to be a bit higher than 2017. I'm wondering if you could tell us what exactly is in that, call it roughly, $3.5B. Are you going to get to full like 10,000 car per week capacity? Is that in the $3.5B? What will Gigafactory production be? And in the slightly more than $3.4B, is that also including the investments, Elon, that you mentioned on Model Y? So where exactly is this level of capital spending going to take us in 2018? And I have a follow-up, please.

<A - Deepak Ahuja>: Sure. I mean, our biggest – our very high level, sort of breakdown, our biggest investment is obviously in the Model 3. And that includes completion of the payments that we still have to make on the capacity we are putting in place now as well as significant investment in our required up front for the next phase of Model 3 production to 10,000 plus per week. So that's, I would say, overall more than 50%. Way more than 50% is Model 3, and the rest is all the many other things we talked about, whether it's energy storage, whether it's -

<A - Elon Reeve Musk>: Primarily Y and energy storage.

<A - Deepak Ahuja>: And then our infrastructure spend, superchargers, stores, service centers, we want to significantly increase the service capacity, we want to significantly increase our supercharging capacity.

<A - Elon Reeve Musk>: Yeah.

<A - Deepak Ahuja>: So all of those pieces then add up to the total spend.

<A - Elon Reeve Musk>: Yeah. Just to give some sort of flavor for optimism on Model Y for a minute. I think – Model Y, I think, we might aim for something like maybe capacity of 1mm units a year, something like that, just for Model Y alone. And I think we'll be able to do that for CapEx that is less than the Model 3 CapEx at the $0.5mm. So probably – I think we can probably improve CapEx by a factor of 2. Not a promise, but that's my gut feel on Model Y CapEx, just to give you a flavor for my level of optimism on improvements on the manufacturing front.

<Q - Antonio M. Sacconaghi>: Thank you. That's helpful. So is the – $3.5B and the greater than 50% to Model 3, is that going to complete all the required equipment to get us to 10,000 a week at the end of the year or are we still going to have incremental CapExs? And then, separately on my second question, around Model 3 gross margins, I think you had said that you expected them to be breakeven this quarter. Obviously, volume was lower and so you didn't get there. But for next quarter you're suggesting that they're going to be negative, again, despite the fact that I think Q1 volumes are much higher than what you would have anticipated originally for Q4 when you thought that margins would be breakeven. So can you help reconcile the apparent enthusiasm you have about the gross margin trajectory with the fact that your guidance around gross margins in the near-term actually appears more cautious than it was [ph] early this year (40:38).

<A - Deepak Ahuja>: Yes. Always. Yes. To sort of finish off your first thought or question, no, we will still have further investments in 10,000 per week capacity of Model 3 happening next year, as a lot of that will be concluded next year. There's always a lag in our cash outflow, and while we continue to test the equipment and verify it. So that'll continue in 2019.

And then, in terms of the Model 3 gross margin, our expectations earlier were off a much steeper ramp than what we are projecting here. We were targeting, as you well know, at one point hitting 5,000 by the end of 2017, and now that's six months later. So at that slower ramp, we just know we'll have inefficiencies. We have the full capacity, sort of depreciation of all that equipment, and the operating costs are hitting, while we're not producing as many cars. It's actually pretty simple, and it's only temporary.

<A - Elon Reeve Musk>: Yeah. Yeah.

<A - Deepak Ahuja>: It doesn't imply anything fundamental.

<A - Elon Reeve Musk>: Yeah. Exactly. So the problem is like when you've got a machine, where most of that machine – I mean that overall production and supply chain machine is at a 5,000 unit capacity, but then 10% or 15% of it isn't, then you've got this massive load on a small – on a way smaller production volume. And as that production volume – as you fix the remaining 10% or 15% of the production machine, you're able to get to that target production and then things improve dramatically.

<A - Deepak Ahuja>: Right.

<A - Elon Reeve Musk>: It's sort of like having a car that's operating at a fraction of its – let's use a gasoline analogy. You got a four-cylinder car operating on one cylinder, it's like, okay, [indiscernible] (43:01) it's just like a big machine actually. Yeah.

<Q - Philippe Jean Houchois>: I have a – slightly non-related to earnings, about the electric truck, the Semi. In the past, Mr. Musk, you have spoken about a supercapacitor as a way of generating energy or storing energy. Particularly in the application of heavy trucks, I would expect that the surge of energy in slowing down or braking in the truck would be too much for battery to absorb. Are you considering supercapacitor as an application for the Semi or what is your kind of general thought on that technology and the implications to make that industrially viable?

<A - Elon Reeve Musk>: Yeah. I mean ages ago, I was going to do basically an applied physical control science degree – a Ph.D in capacitors, so I'm a big fan of capacitors. I just don't think – I think the lithium-ion chemistry is so good at this point that capacitors will not be needed. There's a certain power to energy ratio, and once you have a huge amount of energy, which is needed for range, then you automatically have the power you need for absorbing – being able to do rapid acceleration and braking.

<A - Jeffrey B. Straubel>: Yeah. It's maybe not intuitive – this is JB – but the power to energy demand on the battery in the heavy truck is actually generally less than in our performance vehicles. It's definitely less also in most cases than even the high rate of discharge energy products. As Elon said, you have you a lot of energy, so you end up with a lot of power, actually more than you need.

<A - Elon Reeve Musk>: Yeah. And the way the chemistry works is that you're able to actually extract – for short periods of time – extract very high power from lithium-ion cells, as you sort of have ion migration right on surface. And then the sustained power for lithium-ion is certainly less than the power over, say, the course of several seconds, or a minute. But the several seconds power for lithium-ion is remarkably good because you're essentially using ion migration from the outer surface. It's like if you have a parking lot, all the cars in the front of the parking lot can just exit, but once you start getting cars from deep in the parking lot, it takes a while for them to wind their way out.

<Q - Brian A. Johnson>: Yes. I'd like to talk, follow up a little bit on the first question around some of the manufacturing roadblocks as well as the comment about building a machine to build the machine, which I believe was the title of a 1990 MIT book about Toyota. Could you maybe give us some more discussion really on the managerial culture, the process level? How you would benchmark yourself for example against a Toyota factory, which seems to be able to launch a new product in about three or four months to ramp up? Or at the other extreme, because I know Mr. Field came from there, kind of what Foxconn does in its goal to replace humans? But in particular, you talk about the managerial processes, not so much the robots you're putting into place.

<A - Elon Reeve Musk>: Well, I'm pretty sure Toyota cannot ramp up a new product in three months. In fact, I'm 100% certain about that. Deepak spent many years at Ford before joining Tesla.

<A - Deepak Ahuja>: Yes. Generally, companies including Toyota take anywhere from six months to a year when they come up with an all new product.

<A - Elon Reeve Musk>: And old news like that's – they are still, it's not really – the amount of technology that changes is not that much.

<A - Deepak Ahuja>: It's a major platform, so it's not all new as a Model S or an X that we've done. So it is longer.

<A - Elon Reeve Musk>: Right. They're not fundamentally new technologies.

<A - Deepak Ahuja>: Yes.

<Q - Brian A. Johnson>: Okay. But within that then what are the differences though in the way you're going to be managing the factory?

<A - Elon Reeve Musk>: The most fundamental difference is thinking about the factory really as a product, as a quite vertically integrated product.

<A - Jeffrey B. Straubel>: It's treating it as more of an engineering and a technical problem as well.

<A - Elon Reeve Musk>: Yes.

<A - Jeffrey B. Straubel>: Instead of...

<Q - Brian A. Johnson>: Right, which is the Toyota Production System.

<A - Elon Reeve Musk>: Yeah. We don't think so.

<A - Jeffrey B. Straubel>: I think that generally it's more of an optimized operational problem, being extremely lean and really managing the flows of materials and the supply chain. They're great at it, but this is I think a different approach, looking at it really from a deep technical lens in terms of automation, robotics, process.

<A - Elon Reeve Musk>: Yeah. Imagine like if the Model S was a – the way you design a Model S, design in factory like it's a car. You still have a lot of workers, you still have a lot of people, and it's just like with the Model S, say, we have a large service organization that has scheduled maintenance, that has things that break, there are crashes that need to be repaired, there's technology upgrades. But you don't actually ship people with the Model S. That would be weird. It's not like tiny people in the car. So you have – we expect that the Tesla factory has a lot of people around the factory, but very few people in it.

<A - Doug Field>: I also think that the degree with which we have – this is Doug – the degree with which we have product development and manufacturing development integrated is unique. And Model 3 already is a dramatically simpler car to build than the Model S and even many people in operations who have worked their career in volume manufacturers say the Model 3 is a huge step forward from anything that they've built. So as we go forward, Elon mentioned Model Y, a big part of our manufacturing capability is going to come from how simple we make our products.

<A - Jeffrey B. Straubel>: You may want...

<Q - Brian A. Johnson>: How do you manage the people in the interim?

<A - Elon Reeve Musk>: Yeah. Doug didn't come from Foxconn. He came from Apple and then Ford – Ford and then Apple.

<A - Doug Field>: The model at Foxconn was very different where very quick product ramps and very high scale was achieved through manual processing of also what is fundamentally a product whose simplicity is orders of magnitude below ours. An iPad is less complicated than our center screen in many ways. So it's a very different order of magnitude in terms of the kind of product you're building and it's extremely manual because that is the way that you have to ramp very quickly, and then end the life of a product and bring up a new one.

<Q - Brian A. Johnson>: Okay. Thanks.

<A - Elon Reeve Musk>: Actually, one thing we forgot to mention is John McNeill, who is heading up our sales and service group is departing the company. We wish him well in his future career. And going forward, I will be having the sales and service report directly to me. There are no plans to search for a replacement.

<Q - John Murphy>: Shockingly, I want to follow up on the production of the Model 3. So seems like that's going to remain a hot topic here. Do you have enough experience with production of the Model 3 outside of the issues you're facing in the Gigafactory that you're confident once those problems are solved you can get up and running? Or is there sort of a contingency here that once you get that worked out, you'll be ramping up in Fremont and there might be other hurdles that are discovered? I'm just trying to understand if there's any incremental kinks that might come in the production process as you ramp up.

And then also, as we think about the step from 5,000 to 10,000, is that something that can be done inside the Fremont factory? It sounds like you're confident that your density is much higher than what even Toyota and GM were producing out there potentially on capacity, but just curious how those two [indiscernible] (52:16).

<A - Elon Reeve Musk>: There's really – there are only two things that I'm aware of that are constraints in production of varying significance. The module being the most significant, and then the parts conveyance, basically the automated conveyance system that brings parts to the lines. The way that the Fremont factory is set up is that there's actually, on the ground floor we actually created two levels. The bottom level is all parts conveyance, parts coming from the warehouse where the parts are sort of automatically stored and then are transferred to an automated conveyance system all the way to the line, the conveyance system being on the ground floor and then raised up to the line which is actually on kind of an artificial mezzanine.

And I think we can get 10,000 vehicles a week out of Fremont without a significant – without creating really any new buildings of significance in the existing space. We will need to bring up the south paint shop, which is what we actually were using for S and X paint, and so we upgraded north paint to do S, X and 3. But with relatively small CapEx, like way less than we spent on north paint, we're confident we can bring south paint up to achieve the approximately 600,000 vehicle per year rate. It's a combined 100,000 S and X; 500,000 3, which would be 20% to 30% more than Toyota and GM produced in the same facilities. I mean, we're a lot more vertically integrated as well.

<Q - John Murphy>: Literally and figuratively, right?

<A - Elon Reeve Musk>: Yeah.

<Q - John Murphy>: As we think about that, though, Elon, [indiscernible] (54:22) product limit in that plant? Or based on what you're really talking about here, could you get more out of that plant? Or as we look at the Model Y and its million-unit's capacity, we're definitively looking at a new facility?

<A - Elon Reeve Musk>: I'm pretty excited about the Model Y stuff, and I think I want to present that in a more cohesive fashion. It's probably not the next earnings call, but call it six months from now. But I'm really excited about the Model Y manufacturing and the design for manufacturing, like potentially how do we design out all the pain that we're currently going through. We do not want to experience it again. There's really a lot of pain. I would have to say, the pain level is extremely high. I mean, I was in the factory, I was in the Gigafactory on Thanksgiving Day, as were many other Tesla people. It's hardcore, okay? Seven days a week. [ph] You are on a (55:24) vacation. So we don't want to repeat that.

<Q - John Murphy>: Okay.

<A - Jeffrey B. Straubel>: [indiscernible] (55:30)

<Q - John Murphy>: And then if I...

<A - Jeffrey B. Straubel>: The material flow delivery that Elon mentioned, as we develop very high density and velocity lines, the limit starts to become how we get material to that line. We'll solve that for the Model 3 line, but eventually within three months, the limit to production may be how many trucks we can get in how quickly, both material [indiscernible] (55:51).

<A - Elon Reeve Musk>: Look, we use the Hyperloop for that.

<A - Jeffrey B. Straubel>: Yes. Actually...

<A - Elon Reeve Musk>: We are looking at building tunnels, [ph] using The Boring Company's thing (56:04), because we have, for example, our seats production is at a separate building on Page. And we have a bunch of trucks moving seats back and forth between both the primary Fremont production and the seat factory. And we actually get constrained on how many trucks can we dock and undock at the seat factory, which is only, I don't know, half a mile or a mile away from the vehicle plant. So it'll be pretty easy to just have a tunnel, do an automated conveyance from seats to the factory.

And there are things we can do, where we can build sub-systems and then transport sub-systems to Fremont. These things get increasingly difficult, but they're all doable. But I can see a path where we get to say 600,000 Model 3 production and 100,000 S and X, so maybe 700,000, which should be like almost 50% more than GM or Toyota got out of the plant. I mean that seems achievable.

<Q - John Murphy>: Can I sneak one in for Deepak? Apologies, Deepak. You did a great job with working capital in the quarter. I mean, I think some of us might kind of throw stones and say it might not be repeatable, but you did it and you got the cash in the door. So it's done and it was like that's some pretty good work here. How repeatable do you think the benefit from working capital is going forward? I mean, is this really just the benefit of negative working capital, and as you ramp up you'll get this cash inflow? And then also as we look at the customer deposits and the ZEV credits, those were two, I think, apparently large cash inflows. I mean, how repeatable do you think those are in the future as well?

<A - Deepak Ahuja>: Yeah. Some of those are not repeatable. We significantly reduced the finished goods inventory of S and X in Q4, which will not repeat itself going forward. And that was a huge impact on working capital. Customer deposits may not be as well, as you've pointed out. However, as the Model 3 ramp continues, the negative working capital needs for that, which essentially create extra cash for us will be repeatable. And we'll continue to keep very tight controls on our accounts receivables and everything else we do to manage cash, to make sure we are being efficient.

<Q - James J. Albertine>: A topic doesn't get asked I think a lot or as much as it should, but we believe is maybe one of the reasons why the Model S and X demand remains so high after many years of production is sort of the over-the-air updatability of these vehicles. I'm just wondering, it had been several quarters ago, kind of pre-Model 3 questions we were hearing more about software you were rolling out to existing customers. Just wondering if you can give us some color on what level of uptake you're seeing. And I would imagine we're not seeing that in the upfront Model S and X margins, but potentially the some sort of – those are vehicles that are earning assets for you in the future of sort of the customer ownership. So if you could kind of talk a little about what trends you're seeing there or elaborate a little on that, that would be helpful.

<A - Elon Reeve Musk>: Yes, I think probably the biggest item is as we get the software right, people upgrading to full self-driving capability of some S and X, and anything with Hardware 2, which is the eight cameras and more advanced ultrasonics and improved compute capability, I think will be capable of the full self-driving. The full self-driving, the Hardware 2 type is also capable of doing easy swap out of the computer, so if it turns out we need additional computing capability to meet the regulatory standards for self-driving, particularly if it's – like we think with the current computer hardware we can get to better than human, but the standard for regulators may be that you need to be five times better than human or something like that. But we believe that is solvable purely with computer hardware. And it would be a relatively minor expense to do that. So I think probably that's the biggest opportunity.

<A - Deepak Ahuja>: And along the same lines, not all customers take our enhanced Autopilot tool.

<A - Elon Reeve Musk>: Yeah.

<A - Deepak Ahuja>: And as people hear more, we can see even an uptick on that. So but it's all around Autopilot, to your point.

<A - Elon Reeve Musk>: Yes, exactly. And that's assuming the sort of semi-automated driving doesn't definitely require any hardware upgrades. And that's $5,000 of – that's potentially a software product provided with zero marginal cost and 100% margin. And then when full self-driving is available, we think probably that's more than $3,000 increment. I think maybe $5,000 increment or something like that.

<Q - James J. Albertine>: Is there any data you can provide us though today in terms of the percentage of consumers that are upgrading or opting in, just to get a sense of kind of the order of magnitude, what that business could look like over time?

<A - Elon Reeve Musk>: Yes, that's – well...

<A - Deepak Ahuja>: Not many people are opting in at this time.

<A - Elon Reeve Musk>: For the full self-driving since it doesn't actually work, essentially, people are buying an option on it, on it working in the future.

<A - Deepak Ahuja>: Right.

<A - Elon Reeve Musk>: So that's a [indiscernible] (01:02:23) like trailer. There's also as I mentioned prior things that we expect operate at kind of a shared autonomy fleet where Tesla's kind of like a combination of Uber or Lyft and Airbnb, I guess, like where you can opt to have your car enter a shared fleet or not, and then Tesla can also operate its own fleet in places where there's not enough people sharing their vehicles. So that's a pretty significant opportunity.