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PRESENTATION

Jeff Su - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

(foreign language) Good afternoon, everyone, and welcome to TSMC's First Quarter 2021 Earnings Conference Call. This is Jeff Su, TSMC's Director of Investor Relations and your host for today.

To prevent the spread of COVID-19, TSMC is hosting our earnings conference call live via live audio webcast through the company's website at www.tsmc.com, where you can also download the earnings release materials. If you are joining us through the conference call, your dial-in lines are in listen-only mode.

The format for today's event will be as follows. First, TSMC's Vice President and CFO, Mr. Wendell Huang, will summarize our operations in the first quarter 2021 followed by our guidance for the second quarter 2021. Afterwards, Mr. Huang and TSMC's CEO, Dr. C.C. Wei, will jointly provide the company's key messages. Then we will open the line for Q&A.

As usual, I would like to remind everybody that today's discussions may contain forward-looking statements that are subject to significant risks and uncertainties, which could cause actual results to differ materially from those contained in the forward-looking statements. Please refer to the safe harbor notice that appears on our press release.

And now I would like to turn the call over to TSMC's CFO, Mr. Wendell Huang, for the summary of operations and current quarter guidance.

Wendell Huang - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

Thank you, Jeff. Good afternoon, everyone. Thank you for joining us today. My presentation will start with financial highlights for the first quarter 2021. After that, I will provide the guidance for the second quarter 2021.

First quarter revenue increased 0.2% sequentially in NT dollars or 1.9% in U.S. dollars. Our first quarter business was supported by HPC-related demand, balanced by a milder smartphone seasonality than in recent years. Gross margin decreased 1.6 percentage points sequentially to 52.4%, mainly due to relatively lower level of capacity utilization and an unfavorable foreign exchange rate.

Total operating expenses slightly increased by TWD 0.8 billion, mainly due to higher level of R&D activities for the N5 family. Therefore, operating margin decreased by 2 percentage points sequentially to 41.5%.

Overall, our first quarter EPS was TWD 5.39, and ROE was 29.5%.

Now let's move on to revenue by technology. 5-nanometer process technology contributed 14% of wafer revenue in the first quarter, while 7-nanometer accounted for 35%. Advanced technologies, which we now define as 7-nanometer and below, accounted for 49% of wafer revenue.

Now moving on to revenue by platform. Smartphone decreased 11% quarter-over-quarter to account for 45% of our first quarter revenue. HPC increased [14% to account for 35%. IoT increased 10% to account for 9%. Automotive increased 31% to account for 4%. DCE increased 11%] (corrected by company after the call) to account for 4%.

Moving on to the balance sheet. We ended the first quarter with cash and marketable securities of TWD 797 billion.

On the liability side, current liabilities increased by TWD 45 billion, mainly due to the increase of TWD 49 billion in short-term loans, an increase of TWD 50 billion in accrued liabilities and others, partially offset by the decrease of TWD 51 billion in accounts payable.

Long-term interest-bearing debt increased by TWD 23 billion, mainly as we raised TWD 21.1 billion of corporate bonds during the quarter.

On financial ratios, accounts receivable turnover days increased 1 day to 40 days. Days of inventory increased 10 days to 83 days, primarily due to N5 wafer prebuild.

Now let me make a few comments on cash flow and CapEx. During the first quarter, we generated about TWD 228 billion in cash from operations, spent TWD 248 billion in CapEx and distributed TWD 65 billion for second quarter 2020 cash dividend.

Short-term loans increased by TWD 52 billion, while bonds payable increased by TWD 18.5 billion due to the bond issuance.

Overall, our cash balance increased TWD 4.6 billion to TWD 665 billion at the end of the quarter.

In U.S. dollar terms, our first quarter capital expenditures totaled \$8.8 billion.

I have finished my financial summary. Now let's turn to our second quarter guidance. Based on the current business outlook, we expect our second quarter revenue to be between USD 12.9 billion and USD 13.2 billion, which represents a 1% sequential increase at the midpoint. This revenue guidance includes the minor impact from the power outage that occurred yesterday at our Fab 14 in Tainan.

Based on the exchange rate assumption of USD 1 to TWD 28.4, gross margin is expected to be between 49.5% and 51.5%, operating margin between 38.5% and 40.5%. The sequential decline in second quarter gross margin is mainly due to the margin dilution from higher 5-nanometer contribution, the slower rate of cost improvement as our fabs continue to run at a very high level of utilization and the absence of positive inventory revaluation.

This concludes my financial presentation. Now let me turn to our key messages. I will start with our near-term demand and inventory. We concluded our first quarter with revenue of TWD 362.4 billion or USD 12.9 billion, which was in line with our guidance. The slight sequential increase was mainly driven by HPC-related demand, balanced by a milder smartphone seasonality than in recent years.

Moving into second quarter 2021, we expect our revenue to be flattish as HPC-related demand will continue to grow, offset by smartphone seasonality.

On the inventory front, our fabless customers' overall inventory was healthy exiting fourth quarter of 2020. Amidst the lingering macro and supply uncertainties, we expect our customers and the supply chain to gradually prepare higher levels of inventory throughout the year as compared to the historical seasonal level. We expect this to persist for a period of time given the industry's continued need to ensure supply security.

Looking ahead to the second half of the year, we expect our capacity to remain tight throughout the year supported by strong demand for our industry-leading advanced and special technology.

For the full year of 2021, we now forecast the overall semiconductor market, excluding memory, to grow about 12% while foundry industry growth is forecast to be about 16%. For TSMC, we are confident we can outperform the foundry revenue growth and grow by around 20% in 2021 in U.S. dollar terms.

Next, let me talk about our capital budget for this year. Every year, our CapEx is spent in anticipation of the growth that will follow in future years. As we enter a period of higher growth underpinned by the multi-year structural megatrends of 5G-related and HPC applications, we believe a higher level of capital investment is necessary to capture the future growth opportunities.

In order to meet the increasing demand for our advanced and specialty technologies in the next several years, we have decided to raise our full year 2021 CapEx to be around USD 30 billion. About 80% of the 2021 capital budget will be allocated for advanced process technologies, including 3-nanometer, 5-nanometer and 7-nanometer. About 10% will be spent for advanced packaging and mask making, and about 10% will be spent for specialty technologies.

Now let me turn the microphone over to C.C.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

Thank you, Wendell. We hope everybody is staying safe and healthy during this time.

First, let me talk about the capacity shortage and demand outlook. Our customers are currently facing challenges from the industry-wide semiconductor capacity shortage, which is driven by both a structural increase in long-term demand as well as short-term imbalance in the supply chain. We are witnessing a structural increase in underlying semiconductor demand as a multi-year megatrend of 5G and HPC-related applications are expected to fuel strong demand for our advanced technologies in the next several years. COVID-19 has also fundamentally accelerated the digital transformation, making semiconductors more pervasive and essential in people's life.

In addition, the need to ensure supply security is creating short-term imbalance in the supply chain, driven by supply chain disruption due to COVID-19 and uncertainties brought about by geopolitical tensions.

Now let me talk about TSMC's investment plan and disciplines. TSMC's mission is to be the trusted technology and capacity provider for the global logical IC industry for years to come. In order to support our customers' growth, TSMC is taking several actions to help address the capacity shortage for our customers. We are working hard to increase our productivity, to drive more output, to help support our customers for the near term.

To address the structural increase in the long-term demand profile, we are working closely with our customers and investing to support their demand. We have acquired land and equipment and started the construction of new facilities. We are hiring thousands of employees and expanding

our capacity at multiple sites. TSMC expect to invest about USD 100 billion through the next 3 years to increase capacity, to support the manufacturing and R&D of leading-edge and specialty technologies.

Increased capacity is expected to improve supply certainty for our customers and help strengthen confidence in global supply chains that rely on semiconductors.

Our capital investment decisions are based on 4 disciplines: technology leadership, flexible and responsive manufacturing, retaining customers' trust and earning the proper return. At the same time, we face manufacturing cost challenges due to increasing process complexity at leading nodes, new investment in mature nodes and rising material costs. Therefore, we will continue to work closely with customers to sell our value. Our value includes the value of our technology, the value of our service and the value of our capacity support to customers. We will look to firm up our wafer pricing to a reasonable level. We will continue to work diligently with our suppliers to deliver on cost improvement.

By taking such actions, we believe we can continue to earn a proper return that enable us to invest to support our customers' growth and fulfill our mission as trusted foundry partner. With our technology leadership, manufacturing excellence and customer trust, we are well positioned to capture the growth from the favorable industry megatrend.

We reiterate our long-term revenue to be 10% to 15% CAGR from 2020 to 2025 in U.S. dollar terms.

Next, let me talk about the automotive supply update. The automotive market has been soft since 2018. Entering 2020, COVID-19 further impact the automotive market. The automotive supply chain was affected throughout the year, and our customers continued to reduce their demand throughout the third quarter of 2020. We only began to see sudden recovery in the fourth quarter of 2020.

However, the automotive supply chain is long and complex with its own inventory management practices. From chip production to car production, it takes at least 6 months with several tiers of suppliers in between. TSMC is doing its part to address the chip supply challenges for our customers.

In January of this year, TSMC announced that capacity support for automotive customers is our top priority. Since then, we have worked dynamically with our other customers to reallocate our wafer capacity to support worldwide automotive industry. However, the shortage further deteriorated due to the unexpected snowstorm in Texas and the fab manufacturing disruption in Japan. Together with our productivity improvement, we expect the automotive component shortage from semiconductor to be greatly reduced for TSMC's customer by the next quarter.

Now I will talk about Taiwan water supply update. The water supply in Taiwan is currently tight due to the lack of rainfall in the past year. We have been prepared for this. TSMC has a long-established enterprise risk management system in place, which covers water supply risk as well. Through our existing water-conservation measures, we are able to manage the current water usage reduction requirement from the government with no impact on our operations. We also have detailed response procedure to handle water shortage at different stages. We will continue our collaborative effort with the government and the private sectors on water conservation and new water sources. With our comprehensive enterprise risk management system, we do not expect to see any material impact to our operations.

Finally, I will talk about the N5 and N3 status. TSMC's N5 is the foundry industry's most advanced solution with the best PPA. N5 is already in its second year of volume production with yield better than our original plan. N5 demand continues to be strong, driven by smartphone and HPC applications, and we expect N5 to contribute around 20% of our wafer revenue in 2021.

N4 will leverage the strong foundation of N5 to further extend our 5-nanometer family. N4 is a straightforward migration from N5 with compatible design rules while providing further performance, power and density enhancement for the next wave of 5-nanometer products. N4 risk production is targeted for second half this year and volume production in 2022. Thus, we expect demand for our N5 family to continue to grow in the next several years, driven by the robust demand for smartphone and HPC applications.

N3 will be another full node stride from our N5 and will use FinFET transistor structure to deliver the best technology maturity, performance and cost for our customers. Our N3 technology development is on track with good progress. We continue to see a much higher level of customer

engagement for both HPC and smartphone applications at N3 as compared with N5 and [N7] (corrected by company after the call) at a similar stage.

Risk production is scheduled in 2021. The volume production is targeted in second half of 2022. Our 3-nanometer technology will be the most advanced foundry technology in both PPA and transistor technology, which it is introduced -- when it is introduced, I'm sorry. Thus, we are confident that both our 5-nanometer and 3-nanometer will be large and long-lasting nodes for TSMC.

This is concluding our key message. Thank you for your attention.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Thank you, C.C. This concludes our prepared statements. (Operator Instructions) Should you wish to raise your question in Chinese, I will translate it to English before our management answers your question. (Operator Instructions)

Now let's begin the Q&A session. Operator, can you please proceed with the first caller on the line?

QUESTIONS AND ANSWERS

Operator

The first one to ask question, Randy Abrams, Crédit Suisse.

Randy Abrams - *Crédit Suisse AG, Research Division - MD and Head of Taiwan Research in the Equity Research Department*

Okay. Yes. And I wanted to ask the first question just about Intel. They did announce their plans to reengage in the foundry sector and also, I think making it clear, their goals are to get back to manufacturing leadership. So could you discuss how you're viewing them now as a customer and also the assurances you're getting in business sustainability and how you're managing the potential risk if they improve manufacturing and pull back on some of the outsourcing plans?

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Randy, let me summarize your first question. Randy's first question relates to Intel and their recent announcement to reengage on foundry and get back to a manufacturing leadership position. So Randy's question is how does TSMC view Intel as a customer? What kind of business assurances are we getting on the sustainability of the business? And how do we manage any of the potential risks?

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

Randy, let me start with TSMC is everyone's foundry and support all our customers openly and fairly. Intel is an important customer, and we will collaborate in some areas and compete in other area. And we always work with our customer to develop the necessary technology to support their products.

Now let me comment a little bit on the competition. As a leading pure-play foundry, TSMC has never been short on competition in our 30-plus-year history, yet we know how to compete. We are -- we will continue to focus on delivering technology leadership, manufacturing excellence and earning our customers' trust. The last point, customers' trust, is fairly important because we do not have internal products that compete with our customer. So we can be the trusted technology and capacity provider and for years to come.

And if you ask other comment, how we support Intel, we support them as an important customer. And we plan our capacity for the long-term industry megatrend also. It's not for the short-term demand.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Does that answer your first question, Randy?

Randy Abrams - *Crédit Suisse AG, Research Division - MD and Head of Taiwan Research in the Equity Research Department*

Yes. No, that's good on the first question. The second question and topic I wanted to discuss, you mentioned in your prepared remarks about the -- there is a bit more geopolitical pressure with particularly U.S. but also Europe and China. They all are being aggressive about domestic capacity. If you could give an updated view on your strategy, if any shifts at the margin where you've traditionally run at the high scale in Taiwan.

I'm curious for U.S. with the big land, just any plans to accelerate positioning with the potential eventually to do mega fab?

If you could give an update on Nanjing, if there's plans to expand from the current -- I think you're at 20,000.

And, if from a customer level, you're seeing shifts where more customers are starting to consider geographic location in the foundry consideration.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Randy, let me try to summarize your second question. I think there's quite a few parts. I think first, Randy's question is on looking at sort of the geopolitical landscape and looking at this talk of fabs in different countries. So I think Randy, first, wants to know what is our progress or how do we see particularly U.S manufacturing; secondly, in other areas; and then thirdly, he would like an update on the Nanjing expansion; and lastly, how do customers feel about the need to manufacture in different countries. Is that correct, Randy?

Randy Abrams - *Crédit Suisse AG, Research Division - MD and Head of Taiwan Research in the Equity Research Department*

Yes. That's correct. Yes.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

Randy, that's a lot of questions.

Randy Abrams - *Crédit Suisse AG, Research Division - MD and Head of Taiwan Research in the Equity Research Department*

Sorry. You only gave us 2.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

Let me try to answer. The first one, actually, I would like to say TSMC have been a global company. We have a lot of manufacturing sites outside Taiwan, U.S., Mainland China, Singapore.

But let me comment on the U.S. first. We have been in the U.S. for a long time, though. We set up WaferTech, that's an 8-inch fab located in upstate Washington back in 1996 and has continued to operate the manufacture of chips for our customers today. And now we are increasing our presence

in the U.S. with an advanced 12-inch semiconductor fab in Arizona and the progress is executing to our plan. And we are happy that we joined the effort to support semiconductor manufacturing in the U.S.

You also asked about our status in Nanjing. Did -- that you asked?

Randy Abrams - *Crédit Suisse AG, Research Division - MD and Head of Taiwan Research in the Equity Research Department*

Yes. Yes.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

The fab in Nanjing is progressing well. We already completed the first phase of 20,000-wafers capacity installation, and actually, it's in production for a while. And we are -- we also have a plan. Depend on the customers' demand and depends on the economics, we have a plan to expand the capacity also, okay?

And other question in Taiwan, why we...

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Also, 2 others. One, Randy is asking with other regions also.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

We never rule out any possibility with other region. But today, we already announced plan. We currently have no further fab expansion plan in other areas such as Europe. But we did not rule out any possibility.

However, I want to emphasize, Taiwan will continue to be the main focus for TSMC. Our center of R&D and majority of production line will continue to be located in Taiwan, okay? Did that answer your questions?

Randy Abrams - *Crédit Suisse AG, Research Division - MD and Head of Taiwan Research in the Equity Research Department*

Yes. That's clear. And maybe if you can clarify, for customer decisions, just that approach with Taiwan, is there -- are you starting to see it get raised a bit more about customers choosing location? Or are they still focused on the traditional just getting the best PPA, the best cost and delivery time?

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Right. So Randy's -- the last part of his question is, from a customer's perspective, is there a push by customers for this geographic diversification. Or what do customers want?

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

Well, our customer welcome we establish a new fab in Arizona state. Let me say that. However, the most important one to them is technology, is the manufacturing, it's the efficiency that TSMC provides, okay? Actually, that's the most important one other than the consideration of geopolitical locations.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay, Randy? Thank you, Randy. All right.

Operator

Next one on the line, Gokul Hariharan, JPMorgan.

Gokul Hariharan - *JPMorgan Chase & Co, Research Division - Head of Taiwan Equity Research and Senior Tech Analyst*

My first question, could we talk a little bit about the \$100 billion capacity plan for the next 3 years? Is that primarily a CapEx number? Just as you -- just seeing that this year already, we are spending about \$30 billion. Should we be assuming that our CapEx is going to run around these levels or even higher in the next 2 years as well? So just wanted to clarify because there was some confusion whether that's a CapEx number or a CapEx plus R&D number.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. So I think, Gokul, your first question is that we intend to spend USD 100 billion in the next 3 years. Is that a CapEx number? And then also, what does that mean for the spending of the CapEx in the next 2 years?

Wendell Huang - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

Gokul, this is Wendell. Yes, \$100 billion is CapEx number. Now we've already guided that this year will be \$30 billion, but we're not going into the linearity in the next 2 years. You can actually have a feeling about what we will be spending in the next 2 years.

Gokul Hariharan - *JPMorgan Chase & Co, Research Division - Head of Taiwan Equity Research and Senior Tech Analyst*

Got it. That's very clear. My second question is on the inventory cycle and a lot of the capacity expansion that we are seeing in older technologies. TSMC also is spending about roughly \$3 billion based on the new guidance on specialty technologies as well. The industry also seems to be spending quite a bit of capacity there.

What is TSMC's stake in terms of when we are going to see a bit more normalization in some of the older capacity? Does TSMC also subscribe to the view that even in 2022, we are likely to see some degree of capacity tightness or capacity shortage or TSMC feels that we will likely resolve this towards the end of this year or early next year?

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay, Gokul, thank you. Let me try to summarize your second question. Your second question is looking -- asking about the inventory cycle and particularly on the mature nodes, looking at the expansion in the mature nodes. And Gokul wants to know, I think, that on the mature nodes, could we see some type of overcapacity and can the tightness continue to persist? Or will we start to see some kind of overcapacity or oversupply towards the end of this year or in 2022? Is that correct, Gokul?

Gokul Hariharan - *JPMorgan Chase & Co, Research Division - Head of Taiwan Equity Research and Senior Tech Analyst*

Yes. Just to highlight, I think many of your competitors are talking about 2022 also being undersupplied in many of these process nodes. Just wanted to hear TSMC's view on that.

C. C. Wei - Taiwan Semiconductor Manufacturing Company Limited - President & CEO

Well, Gokul, let me answer the question carefully because of -- we cannot rule out the possibility of an inventory correction or overbooking, something like that. But actually, we expect the structural demand to continue and we will work with our customer closely actually to develop some technology solution to meet customers' requirement and create differentiation and long-lasting value to our customer.

As a result, actually we see the demand continue to be high. And the shortage will continue throughout this year and may be extended into 2022 also. Did that answer your questions?

Gokul Hariharan - JPMorgan Chase & Co, Research Division - Head of Taiwan Equity Research and Senior Tech Analyst

Okay. So do you also feel that customers will continue to hold down to a higher level of inventory for quite some period of time? Is that the way you think about inventory as well?

C. C. Wei - Taiwan Semiconductor Manufacturing Company Limited - President & CEO

Yes. We expect the customer, almost all of them, to prepare a higher level of inventory. That is because of, today, geopolitical tension continue to persist. Even the COVID-19 will recede sometimes, we hope as soon as possible, but it will continue for a while. And put 2 factor together and we do expect them to prepare a higher level of inventory, and I believe Wendell already said that.

Jeff Su - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Yes. Okay, Gokul? Does that answer your second question?

Gokul Hariharan - JPMorgan Chase & Co, Research Division - Head of Taiwan Equity Research and Senior Tech Analyst

Thank you.

Operator

Now we have Sebastian Hou from CLSA.

Sebastian Hou - CLSA Limited, Research Division - Research Analyst

So first one is on the pricing strategy. So I remember, 6 months ago, the company talked about sticking to the principle of respecting long-term partnership with customers. And the company doesn't seem to want to change the pricing on the mature technology nodes, which I mean 28-nanometers above. So I'm wondering if that's still the case now or if the company now considers some upward adjustment. And if it's the latter, what has changed versus 6 months ago?

Jeff Su - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay, Sebastian. So Sebastian's first question is regards to pricing. And he says that we always talk about long-term partnership with our customers. And he's saying, in particular, on the older nodes, 28-nanometer and such, we -- would we raise the price. So he's asking sort of what is the pricing strategy today and what has changed versus previously.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

Sebastian, let me answer that. For more than 30 years, TSMC has provided stable and predictable pricing and we have refrained from opportunistic or short-term actions.

But now as I said in my statement, the cost structure start to change, structural change, because of -- we have to invest on the leading-edge technology, which is more complex than ever. And we also increased the mature technology node capacity, which a lot of them already been fully depreciated and now we have to invest on the new tools.

So we refrain from opportunistic and short-term action, but we also had to sell our value. So we are working with our customer closely, and we want to firm up our wafer pricing to a reasonable level. And we also work with our supplier to deliver the cost reduction, and we want to earn a proper return that enable us to continue to invest to support our customers' growth. And in today's term, capacity support is the most important one they are looking for. Okay.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay.

Sebastian Hou - *CLSA Limited, Research Division - Research Analyst*

Got it. That's fair. And my...

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Do you have a second question? Yes, sorry, go ahead.

Sebastian Hou - *CLSA Limited, Research Division - Research Analyst*

Yes. I do have a second question. I think we're -- for many reasons, we have seen in many countries globally, they plan or they want to increase their -- build their own semiconductor fabrication capacity domestically. We're also seeing some IDM, they are forced to increase their in-sourcing or add some internal capacity because of the chip crunch. So my question is that IDM outsourcing has been one favorable driver for the foundry industry and TSMC growth in the past 3 decades and how TSMC see this trend evolving in coming years. And would you be concerning this could lead to some overcapacity in a few years even if some of those may not be effective? That is my second question.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Sebastian, let me summarize your question. Your observation that countries are pushing for more domestic manufacturing and IDMs are also looking at expanding capacity. So Sebastian's question is looking at IDM outsourcing. Do we see this trend slowing down? Or how do we see it in the next coming few years? And could this result, this capacity that's being built, result in excess capacity?

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

Well, Sebastian, let me say that in our long-term forecast, we continue to see the IDMs outsourcing continue to increase. And so we prepare the capacity for that also. And we don't think that IDM tried to expand their own capacity will result in overcapacity situation because of we -- technology is the most important thing, let me say that. And we expand our capacity based on the customers' need. And we saw the technology leadership

that provided their product to be very competitive in the market. So they are all happy to work with TSMC in developing their products for now, for the future. And so as a result, we continue to see the increased outsourcing from IDMs.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Sebastian, does that answer your second question?

Sebastian Hou - *CLSA Limited, Research Division - Research Analyst*

Yes. Yes, it does.

Operator

Next one to ask question, Charlie Chan from Morgan Stanley.

Charlie Chan - *Morgan Stanley, Research Division - Technology Analyst*

So first of all, can I ask about the change of the 2021 revenue guidance? Can you explain where is the upside coming from, I mean, by applications will be great. And does that include some pricing adjustments for those revised up revenue guidance?

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

All right. I think Charlie's first question is relating to our 2021 revenue guidance from now of around 20% to say what has changed versus last time. And he also wants to know, can we talk about, by application, what is driving this change.

And what was the last part of the question, Charlie? Sorry.

Charlie Chan - *Morgan Stanley, Research Division - Technology Analyst*

Actually, that's it. And does that include -- capture some price hike as well?

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

So his question is what is driving the change in the growth guidance for this year. And he would like to know which applications are driving it. And does it include some price increases in this guidance?

Wendell Huang - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

Okay. Charlie, first of all, we don't comment on price. I can share with you that we're everyone's foundry, our CapEx and capacity planning are based on the long-term demand profile underpinned by the industry megatrends, not short-term cyclical factors. We are seeing stronger engagements with more customers on 5-nanometer and 3-nanometer as compared to 3 months ago. And we work closely with our customers to plan the capacity, and we'll continue to focus our investments on advanced and specialty technology to support our customers' structural growth.

Now this year, we expect -- in terms of platform, we expect that HPC and automotive platform growth will be higher than the corporate average, and the smartphone and IoT will be close to the corporate average.

Charlie Chan - *Morgan Stanley, Research Division - Technology Analyst*

Okay. Understood. So it seems like the upside coming cross-border or just some specific application. I know that HPC automotive are growing better. But just compared to last guidance, what was driving the upside?

Wendell Huang - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

Okay. Actually, all the platforms have upside compared to 3 months ago.

Charlie Chan - *Morgan Stanley, Research Division - Technology Analyst*

Okay. Got you. And then my next question is about your capital intensity in the long term. I mean I think 1 or 2 quarters ago, company updated capital intensity, and at some point, can flow back to like 35% capital intensity. I'm not sure if that's the case for the coming 3 years.

And also, linked to that, what does that mean to the long-term gross margin trend? Because in today's conference call, I keep hearing some comments about structural cost increase. I'm not sure you said about the chemicals or equipment price. But would that kind of impact company's long-term gross margin trend?

Wendell Huang - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

Sure. Charlie, let me share with you. Capital -- I'm sorry. Go ahead.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Yes. It's okay. Yes, I think, Charlie, your question is on capital intensity, looking at what is the capital intensity looking like the next few years. And how does this correlate with our stated long-term capital intensity of kind of mid-30s range? And then he also -- on the back of that, what does this mean for the long-term gross margin trend?

Wendell Huang - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

Okay. Charlie, in terms of capital intensity, I've actually given out several points already. First of all, if you look at -- we're saying in the next 3 years, we'll be spending USD 100 billion and this year will be \$30 billion. We also say that in the next 5 years, we expect to grow between 10% to 15% revenue CAGR. So if you do math, you probably will have a good idea about where our capital intensity will be in the next 3 years. Now at this moment, we still expect that the capital intensity will go back to mid-30 level in the longer term. That's the capital intensity.

In terms of gross margins, I think as C.C. has already mentioned, we see some challenges from manufacturing costs due to the increasing complexity of leading nodes, the new investment in mature nodes and some rising material costs. And therefore, we are taking actions to ensure that we earn a proper return by firming up our price, working with the supplier to drive the cost improvement. We expect that the 50% gross margin remains our target and is achievable.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay?

Charlie Chan - Morgan Stanley, Research Division - Technology Analyst

Okay. Yes. That's a very, very quick -- so can I assume part of that \$100 billion CapEx also associated to a cost increase? And if that's the case, how much of that is due to the cost increase versus the demand?

Jeff Su - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

This is -- I think the last part of this question is that then out of the \$100 billion and this higher capital intensity, how much is due to the cost versus the demand.

Charlie Chan - Morgan Stanley, Research Division - Technology Analyst

Yes. Exactly.

Wendell Huang - Taiwan Semiconductor Manufacturing Company Limited - VP & CFO

Okay. Charlie, basically, we're seeing more engagement of our demand in the next few years. So I would say most of the CapEx come from the strong demand for our advanced technology and specialty technology, especially 5 and 3 nanometers.

Jeff Su - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Thank you, Charlie.

Operator

Next one to ask questions, Bruce Lu from Goldman Sachs.

Bruce Lu - Goldman Sachs Group, Inc., Research Division - Research Analyst

My question I'll just stick with the \$100 billion CapEx. I mean this is the first time for TSMC to announce a multi-year CapEx. I think this suggests a very, very strong growth even beyond 2023, over 2025. So can you give us a little bit more color about like what kind of application demand, which is strong enough to give the company such as high confidence for the CapEx? I mean we've seen through several cycles, but how can we have confidence just for the demand, like 3 to 5 years down the road?

Also, assuming TSMC mostly invests in advanced nodes, do you foresee the mature node capacity tightness continue and how and when this can be resolved?

Jeff Su - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. So Bruce has 2 questions. Both -- first is related to our CapEx. With such a high level of spending, what is giving us the confidence that we see out over the next several years to spend -- an intention to spend this \$100 billion?

And then his second -- well, maybe we'll go that first and then second question.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

Okay. Let me answer that one first. In fact, we are seeing stronger engagement with more customers on 5-nanometer and 3-nanometer. And the engagement is so strong that we have to really prepare the capacity for it. And that's the main reason. So what is the second?

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

And then his second question is then looking at our CapEx, with the majority of our CapEx being on advanced nodes, on the mature nodes then, will the, I think, the supply-demand gap in mature nodes further widen?

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

We did see the gap that mature node capacity not enough to support all the products in the market. So we are working with our customer closely to analyze the gap and we are also preparing to invest on the mature node, as I said in my statement. But most important, we are developing the technology, specialty technology, with the mature node to support our customers' need so their product can be very competitive in the market. And so we can have demand secured for the next few years and we decide to invest on the mature node capacity.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Bruce, does that answer your 2 questions?

Bruce Lu - *Goldman Sachs Group, Inc., Research Division - Research Analyst*

Okay. Can I take one?

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

We have to limit to 2, sorry. There's a lot of people still waiting. Thank you.

Operator

Next one to ask questions, Robert Sanders from Deutsche Bank.

Robert Sanders - *Deutsche Bank AG, Research Division - Director*

Yes. My first question is regarding your CapEx rising up to the mid-30s by 2023. Are you asking customers to commit earlier than normal on that capacity? And are you considering asking customers for prepayments? How do you derisk those capacity plans? And are you seeing an increased willingness to single source?

My second question was how far are you actually booked out on capacity? And at which node is the biggest gap between demand and your capacity?

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Robert, we'll take your questions one at a time. So his first question is looking at our CapEx for the next few years. With this level of spending, do we see customer commitments that are earlier than normal? Are we looking for things like prepayments from customers to secure their commitments? This is the first question.

Wendell Huang - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

Okay. Robert, let me answer this first. The \$100 billion of CapEx is decided because we see the fundamental structure demand increase from the megatrend, multi-year megatrend and the acceleration of the digital transformations.

Now we cannot disclose the detail of our commercial terms with our customers. However, for us to make the investment decision will definitely require proper returns and secure customer commitments.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. And then Robert's second question is how far are we booked in advance in terms of our demand and which nodes do we see the biggest gap between what customers may want.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

Well, I cannot comment on which node because almost all the nodes are in -- today in a high demand. However, let me stress again that our investment in the capacities for the future, many years to come because we work with customer closely to plan for the next few years' capacity support to them. And the customer talking to TSMC and lay out their product plan for the next few years and it is 3 to 4 years, and we plan the capacity for that.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Thank you. Thank you, C.C. Thank you, Robert.

Operator

Now we have Brett Simpson from Arete Research.

Brett Simpson - *Arete Research Services LLP - Senior Analyst*

Yes. I had a question on the crypto activity at TSMC. I guess we've seen record hash rate expansion around Bitcoin ASICs and GPU mining in the last couple of quarters. So can you maybe share with us what portion of sales -- HPC sales is crypto at the moment? And then as we get into the second half of the year, should we expect this to decline?

And I wanted to get your perspective. A couple of years ago, we had extreme volatility around crypto. Bitcoin is now \$1 trillion market cap. Is this good business for TSMC? Do you think this time will be different? I just wanted to get your perspective on this.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. So let me repeat your first question, Brett. He's asking about -- within HPC, looking at cryptocurrency, and he's asking what is the contribution we're seeing from cryptocurrency -- or crypto mining, I should say, to our revenue. And do we expect this -- how do we expect this to go in the second half of this year?

And then a longer-term question, which is how do we view this business.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

Let me answer the question. TSMC's technology is a leading technology, and that's why even cryptocurrencies mining using TSMC technology a lot. But I don't -- and I cannot comment on what is the percentage or how much of this particular market sector to our revenue. However, I can say that cryptocurrency mining today is more mature than it was 2 or 3 years ago. And it remains a volatile market. However, we will continue to work closely with our customers in this field.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay, Brett? And do you have a second question?

Brett Simpson - *Arete Research Services LLP - Senior Analyst*

Yes, I did.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Yes. I'm sorry.

Brett Simpson - *Arete Research Services LLP - Senior Analyst*

Yes. I wanted -- yes. I wanted to talk about the inventory levels at TSMC at present. It grew quite significantly. And I think you mentioned that it was N5 related. Now many of your smartphone customers are saying they have shortages at leading edge and you're building inventories at 5-nanometer. So how do we reconcile that?

And then just looking at Q2, would you expect inventories to rise again in the June quarter?

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Brett, so you're asking about TSMC's inventory days, right? And so Brett is asking what is leading to the increase in the inventory days at the end of first quarter. And then how do we expect this to trend in the second quarter?

Wendell Huang - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

Okay, Brett. We prebuild for our customers during seasonal low level as we did before. Now when we start to ramp in the higher season, the inventory usually come down naturally as before.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Does that answer your question?

Brett Simpson - *Arete Research Services LLP - Senior Analyst*

Yes.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Great. Perfect. Thanks, Brett.

Operator

Now please welcome Roland Shu from Citigroup.

Roland Shu - *Citigroup Inc., Research Division - Director & Head of Regional Semiconductor Research*

My first question is also for this \$100 billion CapEx. Can you clarify, is this year's CapEx of \$30 billion included in this \$100 billion or not?

And also, I use your long-term capital intensity target. Last time, you said long-term is 3 to 5 years. And then I used this about \$30 billion CapEx maybe in 2024. Then it implies your revenue in 2024 will likely to exceed \$90 billion or even bigger, which is more than double than 2020's level.

So my question is, are there any challenges to you to recruit and train up enough amount of the talents to support such a fast growth for you going forward?

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Let me summarize your questions, Roland. So first, Roland is asking this \$100 billion CapEx. Does this include 2021 of around \$30 billion?

And then he's asking about if we look at the longer-term capital intensity, what does this kind of imply for 2024 and '25 CapEx and capital intensity?

And then another part is that with this pace of growth, how do we recruit the talent to support our operations?

Wendell Huang - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

Roland, yes, \$100 billion include this year's CapEx. And we've talked about the 3-year, \$100 billion, '21, '22 and '23. The capital intensity, I think, as I said earlier, you can probably do some calculation and have a feeling about the capital intensity in those 3 years. Longer term, we do see that the capital intensity will go back to about mid-30s level at this moment.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

And his second question is then how do we recruit talent to support our growth.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

Roland, this is a very good question. Very good question. The talent people recruiting is one of our top priorities in recent years. And fortunately, we have communicated with the government and get Taiwan government's strong support. So they are now pushing for a new program to hire -- not to hire, to actually to allure the students to be in the semiconductor area, major in this area.

And internally, TSMC also have a very robust system. Right now, we just established to train all the newcomer and all the new engineer to be more -- they can grow faster.

So externally, we got the help from government. Internally, we do our own part also to enhance the training. And that's the way that we try to meet the requirement of enough talent people inside TSMC.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Thank you, Roland. I think that was...

Roland Shu - *Citigroup Inc., Research Division - Director & Head of Regional Semiconductor Research*

Yes. This actually is one question.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

That's 2 questions, Roland, okay. Roland, we're happy to have you get back in the queue.

Operator

Next one for question is Andrew Lu from Sinolink Securities.

Andrew Lu - *Sinolink Securities Co., Ltd., Research Division - Semiconductor Analyst*

Yes. My first question is can we know what kind of percentage capacity increase on 8-inch specialty foundry and 12-inch mature -- 12-inch advanced for the next 3 years? Maybe just the average will be fine.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. So Andrew's first question is on the capacity increase. He wants to know, in the next 3 years, how much capacity are we increasing on 8-inch and then how much capacity are we increasing on the 12-inch.

Wendell Huang - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

Andrew, let me share with you, we don't disclose that kind of details. But basically, 80% of the CapEx will be spent in advanced technology, about 10% in advanced packaging and mask making and another 10% in specialty technologies.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

In the next 3 years.

Wendell Huang - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

In the next 3 years.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Andrew, do you have a second question?

Andrew Lu - *Sinolink Securities Co., Ltd., Research Division - Semiconductor Analyst*

Yes. I do have the second question, but the first question doesn't really answer. So can I have 2 more?

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

No. We do not comment on the capacity by 8-inch or 12-inch, I think, Wendell has just said.

Andrew Lu - *Sinolink Securities Co., Ltd., Research Division - Semiconductor Analyst*

Okay. Okay. Then second question is not related to price. Assuming the next year, our rebate to the customer has been removed. What kind of percentage -- additional growth we should factor into our model?

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. So Andrew's second question is assuming next year that the rebates have been removed, how much will this drive additional growth in next year and how should he factor this into his model.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

What is kind of pricing is strictly confidential between TSMC and TSMC's customer. So I don't think that we can comment on that one, whether it's rebate, whether it's any other activities.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Thank you. Thank you.

Operator

Next one to ask question, Sunny Lin from UBS.

Sunny Lin - *UBS Investment Bank, Research Division - Director & Associate Analyst*

So my first question is also on CapEx. So when you plan for CapEx for this year and next few years, do you think the equipment supply could be a potential bottleneck in terms of the additional upside that you can spend? Well, I think several equipment makers have mentioned that based on this year's industry CapEx, they are already -- extreme supply tightness, especially for EUV. So any color would be appreciated.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. So Sunny's first question is that with our CapEx plan, do we see or face any equipment bottlenecks in terms of securing the tools and equipment. And I think part of your question is also particularly with regards to EUV.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

Well, let me answer the question. In fact, when we plan \$100 billion CapEx, we also work closely with our suppliers and -- to prepare in advance. So we don't expect -- certainly, we don't expect any bottleneck, whether it is EUV or not and actually we work closely with them.

Sunny Lin - *UBS Investment Bank, Research Division - Director & Associate Analyst*

Got it. Right. So would it be fair to assume that when you announced this \$100 billion CapEx for next 3 years, it's already -- you already have a commitment from your suppliers?

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

The answer is yes.

Sunny Lin - *UBS Investment Bank, Research Division - Director & Associate Analyst*

Got it. My second question is 3-nanometer. Now we are just about a year before the mass production in second half of 2022. So at this point, how should we think about the revenue contribution in its first year of commercial production? I think for 5- and 7-nanometer, they could get to high single digit of revenue or even close to 10% in first year. So just want to get your thought on that.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. So Sunny's second question is looking at 3-nanometer. And with the schedule for production, how should we think about the revenue contribution from 3-nanometer in its first year?

Wendell Huang - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

Sunny, that's too far to talk about that. We will update you later on. That is about 2 or 3 years away, yes. But we do expect it's big and long-lasting nodes, just like the former N5.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Thank you, Sunny.

Operator

Right now, we have Laura Chen from KGI.

Laura Chen - *KGI Securities Co. Ltd., Research Division - Research Analyst*

Yes. My first question is still same -- similar to previous question about inventory days and inventory level. I think both Wendell and C.C. mentioned already that high inventory probably will proceed for a while. But in what level we may start to worry about that? Or what would be the checking point? Because so far, we all know that the demand outlook and TSMC's -- and particularly in the advanced node are quite tight. But what would be the checking point we closely follow? That's my first question.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. So Laura's first question is with regards to inventory and inventory levels. She understands the demand is tight. But do we worry about the inventory levels? What are the type of checking points that we would look at.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

Well, let me answer that question. Yes, I did say that our customer want to secure the supply, actually, at this moment. That's due to some imbalance in the supply chain. And they are preparing for the future also.

But how we are going to do to test this, what is the checking point, actually let me say that we are working with our customer closely. It's not daily, it's at least that we check very often. And we make sure that all the demand to TSMC has been secured, and we prepare the capacity for that.

Laura Chen - *KGI Securities Co. Ltd., Research Division - Research Analyst*

Okay. And my second question is also about the mature node. I think C.C. mentioned about some specialty design, special technology for mature node. I recall you mentioned before about the CIS progress and also the gallium nitride progress. Can you give me more update or some special technology you are working now with the mature node, which may be the expansion in the next few years?

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. So Laura's second question is looking at the mature nodes and that C.C. mentioned that our strategy is to work with customers to develop specialty technologies at those mature nodes. So she is wondering if we can give little more examples of what types of specialty technologies. Is that correct, Laura?

Laura Chen - *KGI Securities Co. Ltd., Research Division - Research Analyst*

Yes. And also FD-SOI as well, if it's possible.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

And FD-SOI in other areas.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

Well, let me answer the last one first. We don't work on the FD-SOI per se. But we develop the specialty technology for CMOS image sensor, as I mentioned previously, and the technology continue to improve because if you look at the application of the CMOS image sensor in the smartphone, in the automotive, there are a lot, okay? And we also -- in fact, the most important one also is ultra-low power that we develop the technology to meet the requirement of the mobile world. I mean that everything is portable. So ultra-low power is very important.

Gallium nitride, all those kind of specialty, we continue to work with our customer, and for the future, high-frequency application or the high-voltage applications.

We also work on the RF technology. Radio frequencies is important because of 5G's era. The RF become fairly, fairly important in application in the WiFi communication area and a lot of them.

Laura Chen - *KGI Securities Co. Ltd., Research Division - Research Analyst*

So following that question, do we have space or any capacity to further expand those technology here in Taiwan?

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

So Laura is asking then will space be a constraint or limitation for the specialty.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

Good question. We are working with our customer to expand our capacity whenever necessary.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Okay. Right. Thank you, Laura.

Operator

Next on the line is Rick Hsu from Daiwa Securities.

Rick Hsu - *Daiwa Securities Co. Ltd., Research Division - Head of Regional Technology & Head of Taiwan Research*

Yes. I just got one question here. I think your top -- regarding your second quarter guidance. The revenue is going to grow sequentially in U.S. dollar terms. And also, if I don't remember wrong, Wendell did say that your inventory increase in Q1 was mainly because your customers prebuilt inventory for 5-nanometer. So that assumes that your 5-nanometer contribution will also increase in second quarter.

So -- and also the exchange rate, also not getting worse, right?

So against the backdrop of these 3 positive factors, right, revenue increase, 5-nanometer increase and favorable exchange rate, why your gross margin guidance for the second quarter is below your first quarter.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. So Rick's question is looking at the second quarter and looking at the gross margin guidance. Why is it basically lower than the first quarter or is sequential declining if you use the midpoint?

Wendell Huang - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

Okay. Rick, let me explain to you. The sequential decline is mainly due to mix as the contribution from N5 will increase, but it still carries a dilutive effect. And secondly, we see a slower rate of cost improvement as our fabs continue to run at a very high level of utilization, leaving last time to do cost-improvement activities. And lastly, a more technical thing is the absence of a positive inventory revaluation in the quarter.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Thank you, Rick.

Operator

Next one to ask questions is Aaron Jeng from Nomura Securities.

Aaron Jeng - *Nomura Securities Co. Ltd., Research Division - Lead Sector Analyst for Greater China Semiconductor Research & Head of Taiwan Equity Research*

This question was not asked before, so I wish to ask before end of the call. You state customers' engagement on N3 and N5 are stronger than what you saw 3 months ago, which drives your \$100 billion CapEx for the next 3 years, okay?

Then let's ask in this way: compared with 3 months ago, are you now projecting a bigger market share gain potential over the next 3 years as pure foundry market and your widening technology leadership at the best now? This is my only question.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay, Aaron. So Aaron's question is looking at the fact that we said customer engagement at 5-nanometer and 3-nanometer are stronger than what we saw a few months ago. So does this mean that we're going to -- expect to gain bigger or larger market share as a result. Is that correct, Aaron?

Aaron Jeng - *Nomura Securities Co. Ltd., Research Division - Lead Sector Analyst for Greater China Semiconductor Research & Head of Taiwan Equity Research*

Yes. And a bigger market share than expected 3 months ago.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Versus 3 months ago.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

Okay. Let me answer that question. Certainly, as compared with 3 months ago, we have some progress in engaging with the customer to get their commitment to work with TSMC on 5-nanometer and 3-nanometer. And whether this one is the indication of TSMC's technology leadership, I would happily to say yes. We are continuing -- but the most important thing actually is that we are continuing to work with customer to develop the technology they need for their product. Each customer has a different kind of preference and we always can meet their demand.

Jeff Su - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Thank you, Aaron.

Operator

Next one to ask question, Mehdi Hosseini, SIG.

Mehdi Hosseini - Susquehanna Financial Group, LLLP, Research Division - Senior Analyst

Yes. My first question has to do with some of the comparisons that you provided during last earnings conference call, you were comparing the capital intensity and a growth prospect to the period of 2010 and 2015.

In that context, my question has to do with depreciation. Back then during the period of 2010 through 2015, depreciation increased at a growth rate of 20%. How do you see that growth rate changing in the period of 2020 and 2025? And I have a follow-up.

Jeff Su - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. So Mehdi's first question is looking at, I think, basically, looking at depreciation and looking at as we enter a higher period of growth, what does our depreciation look like. And also, he is asking about the depreciation growth or increase. Given that we expect to grow between 10% to 15% in 2020 to '25 CAGR period, what does the depreciation growth look like this year and then beyond?

Wendell Huang - Taiwan Semiconductor Manufacturing Company Limited - VP & CFO

Okay. I can share with you that the depreciation this year will be around 30% higher than last year. And we are not ready to share with you the rest of the 5-year period depreciation at this moment.

Jeff Su - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Do you have a second question, Mehdi?

Mehdi Hosseini - Susquehanna Financial Group, LLLP, Research Division - Senior Analyst

Okay. Sure. Yes, I have a second question. You raised your CapEx spending, given the increased demand by your customer. But your revenue growth target remains the same at 10% to 15%. Why aren't you raising the revenue target as you're raising the CapEx?

Jeff Su - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. So I think Mehdi is asking that we raised the CapEx spending. And so why -- what is our view of the growth target, 10% to 15%? Why are we not raising that as well?

Wendell Huang - Taiwan Semiconductor Manufacturing Company Limited - VP & CFO

Mehdi, actually, if you think about this 10% to 15% 5-year CAGR, it's a pretty big range. From what we currently forecast, the revenue target is still within that range, maybe higher to the -- closer to the higher end than last time.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Thank you, Mehdi. Thank you.

Operator

Now we have Randy Abrams from Crédit Suisse.

Randy Abrams - *Crédit Suisse AG, Research Division - MD and Head of Taiwan Research in the Equity Research Department*

Okay. Yes. The first one on the back end, that's keeping pace. Could you give an update on the spending and momentum you're seeing for the new SolC and then also how the CoWoS and InFO are progressing?

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. So Randy's first question is on our advanced packaging solutions. He wants to know -- want an update on how SolC is progressing as well as CoWoS and the other solutions. Is that right, Randy?

Randy Abrams - *Crédit Suisse AG, Research Division - MD and Head of Taiwan Research in the Equity Research Department*

Yes. That's correct.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

Okay. Let me comment on the SolC first. This is the most advanced back-end technology, I think, that we offer to our customer. And it will start to small volume production in 2022. And it's also actually adopted by very high-performance HPC applications.

As for InFO and CoWoS, we continue to expand our customer portfolio. And I expect that the business from InFO and CoWoS will start to -- will continue to increase in the next several years.

Randy Abrams - *Crédit Suisse AG, Research Division - MD and Head of Taiwan Research in the Equity Research Department*

Okay. Great. And just I have one quick one on that. You mentioned very high-performance applications. SolC, in a couple of years, as it ramps, should that be a big -- like also, do you expect a pretty big ramp like we saw in the past for InFO or it should be a good volume runner for TSMC?

And then I wanted to ask a second question. Just a couple of clarification on gross margin in second half. 5 will be getting more mature. So I'm curious, factoring your depreciation guidance, 5 getting more mature, if your view is 50% gross margin or if you're running very tight utilization, we may be able to stay a bit above the long-term range in the second half.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. So a quick one. He wants -- Randy wants to know SoIC, will it be a large contributor? How large can it be in a few years' time? And then also on gross margin, the gross margin outlook for second half.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

We hope that SoIC going to be adopted by all those HPC applications customer. But I cannot nail down what is the specific revenue number in the future. But we do expect our back-end service will continue to grow. And the rate -- the growth rate will be a little bit higher than the corporate average.

Wendell Huang - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

Okay. Randy, about second half gross margin, it's a bit too early to give details on that. However, you've already mentioned several things. N5 will become bigger in contribution to the revenue. It still has -- carries a negative or dilutive effect on the margins, about 2 to 3 percentage points. Utilization is pretty -- still pretty tight. And we continue trying to improve our cost under this very high-utilization environment. So that's all the things we can share with you at this moment.

Randy Abrams - *Crédit Suisse AG, Research Division - MD and Head of Taiwan Research in the Equity Research Department*

Okay. And if I can fit in...

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Sorry, Randy. I'm sorry, that's 2 questions because we're -- yes, thank you.

Operator

Okay. The next one will be Gokul Hariharan from JPMorgan.

Gokul Hariharan - *JPMorgan Chase & Co, Research Division - Head of Taiwan Equity Research and Senior Tech Analyst*

My first question is how should we think about HPC in terms of the demand cadence for second and third wave? I think when smartphone was our big growth driver in the last 10 years, we had leading-edge growth from processors, et cetera, but we also had a lot of other ICs in smartphones as well as our applications, which drove the second, third, fourth wave of demand for any process node.

So now that HPC seems to be one of the key drivers for growth, how do we think about second-, third-wave demand? Would it keep up with the first and second wave for N5, N3, et cetera? Or should we think about TSMC will be doing more capacity conversion compared to in the past? That's my first question.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. So Gokul's first question is looking at HPC and looking at how HPC is also, along with smartphone, becoming the first-wave adopters of our leading-edge nodes. He's wondering then, though, for the second and additional waves of demand, will HPC -- how do we see HPC driving additional waves of demand or will we convert capacity.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

Let me make some comment. Actually, the HPC application includes many different subsegment such as CPU, GPU, networking, FPGA, AI-accelerator, video gaming, et cetera, et cetera. And each one will have their own migration path and product life cycle also.

So we expect to see HPC, not only in the first wave, but in additional waves of demand to support our leading node in the future, actually. Did that answer your questions?

Gokul Hariharan - *JPMorgan Chase & Co, Research Division - Head of Taiwan Equity Research and Senior Tech Analyst*

Okay. That's clear.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Do you have a second question?

Gokul Hariharan - *JPMorgan Chase & Co, Research Division - Head of Taiwan Equity Research and Senior Tech Analyst*

Second question, just wanted to -- yes. Just wanted to follow up on any thoughts from TSMC on the Arizona fab capacity. I think you've already announced 20,000 of wafers per month of 5-nanometer coming up in 2024. What has been your discussion with customers regarding any potential upside to this capacity? Are customers asking for more capacity there?

Do you feel that we -- right now, this seems more like an n-1 cadence because 5-nano started in Taiwan in 2020 already. Do we feel that we will move to a more -- shorter or a quicker cadence for leading edge in, let's say, Arizona or U.S. capacity? I just wanted to understand how TSMC is thinking about this right now.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Gokul's second question is on our U.S. manufacturing and our fab in Arizona. He wants to know that our customer is asking for more capacity or more production.

And also, we start with N5, I guess your question is what about the future plans for bringing additional technologies there and the cadence.

C. C. Wei - *Taiwan Semiconductor Manufacturing Company Limited - President & CEO*

Okay. We are executing our plan in Arizona according to the schedule and construction will start this year. Phase 1 production, as you said, we are starting 2024 with a 20,000 wafer per month 5-nanometer technology. But in fact, we have acquired a large piece of land in Arizona to provide flexibility. So further expansion is possible, but we will ramp up to Phase 1 first, then based on the operation efficiency and cost economics and also the customers' demand to decide what the next steps we are going to do.

Our customers welcome us to build capacity in the U.S., and our fab in Arizona will be available to support all our customers from around the world and just like other -- all the TSMC's fab, no matter where they are and no matter where they're located.

Jeff Su - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Thank you.

Operator

Yes. The last one to ask question, Sebastian Hou, CLSA.

Sebastian Hou - CLSA Limited, Research Division - Research Analyst

Yes. I only have one question. So just a follow-up on C.C.'s comments earlier, that C.C. mentioned that TSMC has been working closely with the customer to analyze the gap between capacity and demand on the trailing-edge nodes.

So wondering if you could share some color with us. If we exclude the overbooking portion and based on your best analysis, does the demand still significantly exceed supply? And how big is the gap, if you have any rough number that can be shared?

Furthermore, based on the CapEx you and your peers are investing in the capacity expansion lead time, when do you think the tightness can be eased or the whole shortage situation can be removed? That's the only question I have.

Jeff Su - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Let me try to summarize your question, Sebastian. You're asking, on the mature nodes, the fact that TSMC works with our customers very closely, but also in looking at the supply/demand of those older nodes. So with the additional capacity added, will -- when and will we eventually see an easing of the supply tightness at the mature nodes? Is that correct, Sebastian?

Sebastian Hou - CLSA Limited, Research Division - Research Analyst

Yes. And also, if you can, if we exclude the overbooking part, with your best estimate, whether the demand is still exceeding supply right now.

C. C. Wei - Taiwan Semiconductor Manufacturing Company Limited - President & CEO

All right. To be frank with you, as I said, we work with customer closely. And so the overbooking is not in our calculation, although we did not exclude it out of this possibility. But we do the very detailed analysis internally, and as I said, work with customer closely. And so we prepare the mature node capacity for them.

However, building a fab from a green fab start and also to install the capacity, it won't be available until 2023. And so this year and next year, I still expect the capacity tightness will continue and probably also next year. 2023, I hope that we can offer more capacity to support our customers. And at that time, we start to see the supply chains tightness will release a little bit.

Jeff Su - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Sebastian, does that answer your question?

Sebastian Hou - CLSA Limited, Research Division - Research Analyst

Yes. So is it fair for us to conclude that in the next 18 months, it is very safe to assume that we will still be in the supply tight situation, is that right?

C. C. Wei - Taiwan Semiconductor Manufacturing Company Limited - President & CEO

For our customers, we are working with them, let me say that. But it's still very tight. Yes, you are right.

Jeff Su - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Thank you, Sebastian. This concludes our Q&A session. Before we conclude today's conference, please be advised that the replay of the conference will be accessible within 4 hours from now and the transcript will become available 24 hours from now, both of which are going to be available through TSMC's website at www.tsmc.com.

So thank you for joining us today. We hope everyone continues to stay healthy and safe, and we hope you will join us again next quarter. Goodbye, and have a good day.

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