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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 Second Quarter 2022 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 via live audio webcast through the company's website at www.tsmc.com, where you can also download the earnings release materials. (Operator Instructions)

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 second quarter 2022, followed by our guidance for the third quarter 2022. Afterwards, Mr. Huang and TSMC's CEO, Dr. C.C. Wei, will jointly provide the company's key messages. Then TSMC's Chairman, Dr. Mark Liu, will host the Q&A session, where all 3 executives will entertain your questions.

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 the current quarter guidance.

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

Thank you, Jeff. Good afternoon, everyone, and thank you for joining us today. My presentation will start with financial highlights for the second quarter 2022. After that, I will provide the guidance for the third quarter.

Second quarter revenue increased 8.8% sequentially in NT or 3.4% in U.S. dollars, as our second quarter business was supported by strong HPC, IoT and automotive-related demand. Second quarter gross margin increased 3.5 percentage points sequentially to 59.1%, slightly ahead of our guidance, as we enjoyed a more favorable foreign exchange rate, cost improvement and value selling. Likewise, operating margin increased 3.5 percentage points sequentially to 49.1%, in line with our gross margin increase. Overall, our second quarter EPS was TWD 9.14 and ROE was 39.4%.

Now let's move on to revenue by technology. 5-nanometer process technology contributed 21% of wafer revenue in the second quarter while 7-nanometer accounted for 30%. Advanced technologies, which are defined as 7-nanometer and below, accounted for 51% of wafer revenue.

Moving on to revenue contribution by platform. All 6 platforms increased in the second quarter. Smartphone increased 3% quarter-over-quarter to account for 38% of our second quarter revenue. HPC increased 13% to account for 43%. IoT increased 14% to account for 8%. Automotive increased 14% to account for 5%. And digital consumer electronics increased 5% to account for 3%.

Moving on to the balance sheet. We ended the second quarter with cash and marketable securities of TWD 1.4 trillion. On the liability side, current liabilities increased by TWD 22 billion, mainly due to the increase of TWD 47 billion in accounts payable, partially offset by the decrease of TWD 29 billion in short-term loans. Long-term interest-bearing debts increased by TWD 124 billion, mainly as we raised TWD 109 billion of corporate bonds during the quarter. On financial ratios, accounts receivable turnover days decreased 1 day to 37 days while days of inventory increased 7 days to 95 days as we prebuild N5 wafers and increased raw materials inventory.

Now let me make a few comments on cash flow and CapEx. During the second quarter, we generated about TWD 339 billion in cash from operations, spent TWD 218 billion in CapEx and distributed TWD 71 billion for third quarter '21 cash dividend. Bonds payable increased by TWD 109 billion as a result of this quarter's bond issuances. Overall, our cash balance increased by TWD 102 billion to TWD 1.3 trillion at the end of the quarter. In U.S. dollar terms, our second quarter capital expenditures totaled \$7.34 billion.

I have finished my financial summary. Now let's turn to our current quarter guidance. Based on the current business outlook, we expect our third quarter revenue to be between USD 19.8 billion and USD 20.6 billion, which represents a 11.2% sequential increase at the midpoint. Based on the exchange rate assumption of USD 1 to TWD 29.7, gross margin is expected to be between 57.5% and 59.5%, operating margin between 47% and 49%.

This concludes my financial presentation.

Now let me turn to our key messages. I will start by making some comments on our second quarter and third quarter profitability.

As a reminder, 6 factors determine TSMC's profitability: leadership technology development and ramp up, pricing, cost, capacity utilization, technology mix and foreign exchange rate.

Compared to first quarter, our second quarter gross margin increased by 350 basis points sequentially to 59.1%, mainly due to a more favorable foreign exchange rate, cost improvement and value selling. Compared to our second quarter guidance, our actual gross margins exceeded the high end of the range provided 3 months ago as our guidance was based on exchange rate assumption of \$1 to TWD 28.8, whereas the actual second quarter exchange rate was \$1 to TWD 29.42. This created about 90 basis point difference in our actual second quarter gross margin versus our original guidance. We have just guided our third quarter gross margin to decline 60 basis points sequentially to 58.5% at the midpoint, as a slightly more favorable exchange rate assumption will be more than offset by higher inflationary costs, including higher raw material and electricity costs.

Looking ahead on our profitability, we will face challenges from rising inflationary costs from raw materials, utilities and tools, increasing process complexity of leading nodes, new investments in mature nodes and overseas fab expansions. Despite the manufacturing cost challenges, and

excluding the impact of foreign exchange rate, of which we have no control over, taking the other 5 factors into consideration, we continue to believe a long-term gross margin of 53% and higher is achievable.

Next, let me talk about our effective tax rate. For 2022, we expect our tax rate to be between 10% and 11%. Starting in 2023, we will see the expiration of certain tax exemptions in Taiwan, and our effective tax rate will increase. However, Taiwan government is in the process of drafting certain new tax exemption regulations and is currently in the comment period. Therefore, we will provide a further update on the outlook of our tax rate in 2023 and beyond when more details become available.

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

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

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

First, let me start with our near-term growth outlook. We concluded our second quarter with revenue of TWD 534 billion or USD 18.2 billion, supported by HPC, IoT and automotive-related demand. Moving into third quarter 2022, we expect our business to be supported by continued demand for our industry-leading 5-nanometer and 7-nanometer technologies.

On the inventory side, due to the softening device momentum in smartphone, PC and consumer end market segments, we observe the supply chain is already taking action and expect inventory level to reduce throughout the second half 2022. After 2 years of pandemic-driven stay-at-home demand, this type of adjustment is reasonable, in our view. Our expectation is for the excess inventory in the semiconductor supply chain to take a few quarters to rebalance to a healthier level. We believe the current semiconductor cycle will be more similar to a typical cycle, with a few quarters of inventory adjustment, likely through first half 2023. We have also internally modeled and prepared ourselves for various different scenarios, in case it is necessary.

On the demand side, while we observe softness in consumer end market segments, other end market segments such as data center and automotive-related remain steady. And we are able to reallocate our capacity to support these areas. Despite the ongoing inventory correction, our customers' demand continue to exceed our ability to supply. We expect our capacity to remain tight throughout 2022 and our full year growth to be mid-30% in U.S. dollar terms.

Three key factors in supporting TSMC's strong structural demand are our technology leadership and differentiation, our strong portfolio in high-performance computing and our strategic relationship with customers. All of these factors are TSMC's strength in the foundry industry.

First, on technology leadership and differentiation. TSMC's technology position is much stronger today as compared to previous years. Looking ahead to 2023, we are working diligently to provide the industry's most advanced technologies and making it available to all the product innovators. With the successful ramp of N5, N4P, N4X, and the upcoming ramp-up of N3, we will expand our customer product portfolio and increase our addressable market. The macroeconomic uncertainty may persist into 2023, our technology leadership will continue to advance and support our growth.

Secondly, the massive structural increase in the demand of computation, underpinned by the industry megatrend, continues to fuel greater need for performance and energy-efficient computing, which require use of leading-edge technologies. Through our comprehensive IP ecosystem and optimized process technology, we are able to address and capture the structural demand and build a strong portfolio in high-performance computing. We expect HPC to be the main engine of TSMC's long-term growth and the largest contributor in terms of our incremental revenue growth in the next several years.

Third, our strategic relationships with our customers are long term in nature, developed and built through many years of collaboration and investment to enable customers' success in their end markets. We continue to work closely with our customers on technology development, capacity planning and pricing, to support their long-term demand and growth.

With all these 3 differentiating factors, we expect our capacity utilization to remain healthy in 2023, and our business to be less volatile and more resilient, supported by the strong demand for our differentiated and leading advanced and specialty technologies.

Now let me talk about TSMC's long-term growth outlook. While macroeconomic headwinds bring near-term uncertainties that may persist, we believe the fundamental structural growth trajectory in the long-term semiconductor demand remains firmly in place. We continue to observe silicon content increase across many end devices, fueled by process technology migration and increased functionality. For example, the number of CPUs, GPUs and AI accelerators in the data center are increasing. 5G smartphone carries substantially higher silicon content as compared to 4G smartphone. The amount of silicon content in today's car continue to rise. While the device unit growth of many electronic devices may be flattish to low single-digit percentage range, in the next several years, the silicon content growth will be higher, in the mid- to high single-digit percentage range and support the long-term structural semiconductor demand and increase our addressable wafer demand.

TSMC's CapEx and capacity planning are always based on the long-term structural market demand profile, not near-term factors. We are working closely with our customers to plan our long-term capacity and investing in leading edge and specialty technology to support their growth. We will manage our business prudently through the near-term uncertainties, and we remain highly confident in our long-term growth outlook. With our technology leadership, manufacturing and capacity support and customers' trust, TSMC is well positioned to capture the strong multiyear growth from the favorable structural megatrend of 5G and HPC-related applications and deliver profitable growth for our shareholders. We reiterate our long-term revenues to be between 15 and 20 CAGR over the next several years in U.S. dollar terms.

Next, let me talk about the tool delivery update. As a major player in the global semiconductor supply chain, TSMC works closely with all our tool suppliers to plan our CapEx and capacity in advance. However, like many other industries, our suppliers have been facing greater challenges in their supply chains, which are extending tool delivery lead times for both advanced and mature nodes. As a result, we expect some of our CapEx this year to be pushed out into 2023.

TSMC is actively doing its part to help our tool suppliers address the supply chain challenges. In April, we said that we have increased regular high-level communications to trace the progress and send several teams on site to support our suppliers. Since then, we have worked closely to identify critical chips that are gauging toward delivery. We are working dynamically with our customers and prioritize our wafer capacity to support these critical chips to help mitigate the chip constraint issues.

While challenges remain, the situation is improving. We do not expect any impact to our 2022 capacity plan. And we are able to pull in the delivery schedule for certain amount of tools for our 2023 capacity. We have been working closely with our customers for 2023 so that we can support their demand.

Now let me talk about the N3 and N3E status. Our N3 is on track for volume production in second half of this year with good yield. We expect revenue contribution starting first half of 2023, with a smooth ramp in 2023, driven by both HPC and smartphone applications. N3E will further extend our N3 family with enhanced performance, power and yield. N3E will offer complete platform support for both smartphone and HPC applications. We observed a high level of customer engagement at N3E, and volume production is scheduled for around 1 year after N3. Our 3-nanometer technology will be the most advanced semiconductor technology in both PPA and transistor technology when it is introduced. Thus, we are confident that our N3 family will be another large and long-lasting node for TSMC.

Finally, let me talk about the N2 status. Our N2 technology development is on track and progressing well to our expectation, with risk production schedule in 2024 and volume production in 2025. After careful evaluation and extensive period of development, our 2-nanometer technology will adopt nanosheet transistor structure to provide our customers with best performance, cost and technology maturity. N2 deliver full node performance and power benefits to address the increasing need for energy-efficient computing, with 10 to 15 speed improvement at the same power or 20% to 30% power improvement at the same speed and logic density of more than 20% increase as compared with N3E. Our 2-nanometer technology will be the most advanced semiconductor technology in the industry in both density and energy-efficiency when it is introduced, and will further extend our leadership position well into the future.

This concludes our key messages, and thank you for your attention.

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

Thank you, C.C. This concludes our prepared remarks. (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. Our Chairman, Dr. Mark Liu, will be the host.

Mark Liu - *Taiwan Semiconductor Manufacturing Company Limited - Chairman*

Hello, everyone. Thank you for coming to this conference. I wish you all healthy and well. I think the -- we hope the above reports already answered some of your questions. But it definitely shows -- we -- this company stands on firm ground. And we will be prepared prudently going through this near-term uncertainty. In the meantime, we will be also confident and well prepared for our next growth period.

So now the floor is open for your question.

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

Thank you, Chairman. Operator, please proceed with the first caller on the line.

QUESTIONS AND ANSWERS

Operator

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

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

Congratulations on the good outlook. My first question, I wanted to ask on your view on the business cycle. You raised your outlook to 35% in the strong third quarter. Could -- with that strong outlook, wanted to see what is driving your expectation for inventory drawdown in second half? And how broad you're seeing the inventory drawdown? And the follow-up question I wanted to ask to that is, what is your view on the first half? With your view customers will be drawing down through the first half, do you see under-utilization? And how severe do you expect that correction?

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

Okay. Randy, please allow me to summarize your first question. So I think, Randy the first part -- his first question is in looking at TSMC's third quarter guidance and also looking at our full year growth to be mid-30s. He's wondering, I believe, Randy, how to reconcile this with our expectation of the inventory adjustment in the second half and also into the first half next year. So how do we reconcile our view on the inventory cycle against our own business? 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. Just an initial view on first half. How much correction you're aiming for in your business?

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

Randy, this is C.C. Wei. Let me answer your question. Yes, we do have mid-30s growth in this year. But we also expect our customers start to take action to decrease their inventory level. How far? We expect that a few quarters, at least into the first half of 2023, they will continue to do the inventory correction. And will that lead to TSMC's [under-utilization?] (corrected by company after the call) Let me say that - despite ongoing inventory adjustment and macro uncertainties, the structural growth trajectory in the long-term semiconductor demand remained firm. With our leading and differentiated advanced and specialty technologies and a strong HPC portfolio and strategic customer relationships, we expect our capacity remain tight and our business to be more resilient. And we are confident in both our near-term and long-term growth outlook. Did that answer your question?

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

Yes. I mean, to clarify, do you expect even through first half to remain tight, factoring in your tech position and some of the projects you have?

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

Yes. It remain.

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

So I think Randy wants to ask, in the first half of next year, do we expect -- how do we see our capacity utilization given the ongoing inventory adjustment?

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

I cannot give you exactly the number that we are talking about, but let me say, it's healthy. Okay.

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

Okay. Great. My second question, on the CapEx, 2 parts. Just want to understand the push-outs, a little more what it's affecting the 3-nanometer. How much ramp the 5-nanometer or mature nodes? And if you could also discuss the framework for next year's CapEx. I think you've made comments about we could be above \$40 billion. If you could give a framework for how you're thinking about next year CapEx.

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

Okay. So Randy's second question is on the CapEx. He wants to know, with some of the tool delivery issues, the CapEx pushout, is this more for 3-nanometer? Is this for 5-nanometer? Or is this more on the mature node side? And he also wants to know how does this impact our CapEx for 2023. As we said before, that 2023 could be \$40 billion or higher.

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

Okay. Randy, this is Wendell. The first question, as C.C. said in his prepared remarks, that the schedule, the tool delivery schedule changes currently as -- in both the advanced and the mature nodes. Okay. And your second question is about next year's CapEx. It's too early to talk about next year's CapEx. But as we always said, we invest the CapEx in the year for the future opportunities. So as long as the -- the outlook, the future outlook is good, we will continue to invest, but of course, in a disciplined manner.

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

Okay. And just for this year, with the pushout, what's your expectation for how much this year would be? And that's my final question.

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

I think next year will be too early. But I can tell you that this year, it will be closer to the lower end of our previous guidance.

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

So closer to the lower end of the guidance of \$40 billion to \$44 billion, Randy.

Operator

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

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

Congratulations for the great result. I think maybe have said that the next few years, the revenue growth will still at the 15% to 20% growth, and it is driven by -- of the compound -- dollar content growth. Can you -- this is actually the most difficult part for the investor or the biggest discrepancy when we talk to the investor, how much is driven by the dollar content growth? Because investors do not really see that. So for example, by [15%] (corrected by company after the call) to 20% growth for the next few years, how much is driven by dollar content growth? How much is driven by shipment? Or how much is driven by the ASP or product mix improvement?

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

Okay. Let me -- Bruce, thank you. Let me summarize your first question. So Bruce is really looking at our long-term growth. We said that between -- we will grow between 15% to 20% CAGR in the next several years. He wants to know, out of this 15% to 20%, how much is driven by silicon content? How much is driven by, Bruce, I think you said shipment? How much is driven by ASP?

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

Bruce, let me answer the question. But exactly the number, I cannot share with you because it's confidential. But let me say that. The content increase actually is at least mid- to high single digit for our edge devices. And then even all the electronics devices, even the growth is flattish or some kind of a low single-digit. It's still growing. It's still growing. And combined with all these and our value selling with our customer, so we are confident to say 15% to 20% CAGR is achievable. Okay.

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

Okay. So to my next question is for the mature node and the specialty capacity expansion. I think Chairman recently commented that you will expand your mature node that specialized capacity by 50%, 5-0, in the next 3 years. I mean, this number looks a bit big. I mean can you tell us how do you achieve this 50% capacity expansion by the new capacity or conversion? And where are those demand? How do you see the mature node supply and the demand in the coming few years?

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

Okay. Bruce, let me summarize your second question, please. All right. So Bruce's second question is on mature node and specialty capacity expansion. He is looking to say TSMC expanding our mature node specialty capacity by 50%. That looks very big. Is that all new capacity expansion? Is some of this also coming from logic conversion to specialty? And then also, what applications are driving this?

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

Well, let me answer the question. 50% increase, we mean that 50% is in specialty technologies capacity. It doesn't mean the overall capacity increase. Okay. We did this because of our customers' need, and we work closely to support their growth. So it's not a 50% increase in the logic capacity, no. It's specialties.

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

And if I may add a little bit. The expansion also includes both the new capacity and conversion of existing capacity.

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

So how confident you are, I mean, in terms of this kind of capacity expansion, what kind of application which will give you confidence to -- for this kind of increase? So because in the past like 20 years, your capacity expansion is mostly in the advanced node?

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

So Bruce wants to know what is keeping TSMC confident to have such expansion on the specialty technologies as most of our expansion in the past has been focused on the advanced nodes.

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

Bruce, you are right. In the past years, TSMC always increased the leading-edge capacity. We did not increase any specialties in the past few years, except a few upgrade from logic to specialty. But this time, it's different. First, because we can see the silicon content continue to increase on all the edge devices. It's not -- it's included on the demand on the leading-edge capacity. It also requires the specialties content inside. And so at the urge of our customers' request, TSMC closely work with our customer and to expand our specialty capacities. Okay. How confident? Very, very confident.

Operator

Next one to ask question, Sunny Lin from UBS.

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

Congrats on the strong results. So my first question is on the semi cycle, earlier, that you have done some scenario analysis on the semi cycle for 2023. So I just wonder what your current base case for semi growth for 2023. Do you think it will be like a typical down cycle like in 2015, 2019? Or would it be a more meaningful correction?

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

Okay. Sunny's first question is on the semiconductor cycle. She wants to know what is TSMC's base case for 2023. Do we think it will be more of a typical cycle such as in 2015 or 2019? Or it will be more of a meaningful correction, I believe, are her words.

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

Yes. Sunny, yes, our base case is a typical -- more of a typical down cycle. The inventory correction maybe go for a few quarters, through the first half of 2023. It's not like a big down cycle back in 2008 or something like that.

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

Got it. And so my second question is on 3-nanometer. As we are ramping up the technology in second half, how should we think about the revenue contribution into 2023? In terms of profitability, will the 3-nanometer ramp-up have any impact into Q4 or if the impact will be mostly from Q1 next year?

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

Okay. So Sunny's second question is on 3-nanometer. With the ramp, she wants to know what type of revenue contribution from N3 in 2023. And also, with the ramp of N3, what would be the impact to profitability? When should we see it? And what type of impact from N3. Thank you. That's correct, right, Sunny?

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

That's right.

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

Okay, Sunny. In terms of revenue contribution from N3, I have to say that, nowadays, it's less meaningful to talk about the revenue contribution of a leading node at the very beginning when we start to ramp it compared to the -- in the past because the total pie is increasing and we believe it will continue to increase. Dollar amount-wise, it's certainly bigger than the previous nodes at the very beginning stage. This is your first question. In terms of profitability dilution, we expect that it will impact between 2 to 3 percentage points in gross margins in 20 -- in the first year, 2023. Thank you.

Operator

Now let's turn for Gokul Hariharan, JPMorgan.

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

Sorry. My first question is on the...

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

Gokul, sorry, you're breaking up. Can you try again? Repeat your question, please.

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

Yes. Sure. So my first question -- inventory cycle.

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

Gokul, so sorry. Okay. Let's try one more time because you continue to break up. Let's try one more time. If not, I will have to ask you to dial back in. Sorry. Please repeat your question again.

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

Sure. Can you hear me now?

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

Yes.

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

Okay. My first is inventory impact. Could you talk us a bit about what is your expectation...

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

Okay. Gokul, I'm sorry. I'm sorry. Your line is very unstable. So I will ask you to please try to get back into the queue, and we'll address your question. Okay.

Operator

Next one to ask question, Brett Simpson, Arete Research.

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

I had a question on the inventory burden off that you were signaling potentially for first half '23. Can you talk more broadly about fabless days of inventory today and how you see this trending in the second half of the year? And then in terms of your outlook for the overall semi industry, what is your current view for 2022 growth and 2023 growth? And has your view changed in the last 3 months?

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

Okay. So Brett's first question is looking at inventory and the overall industry. So his first question is about the inventory adjustment. We have said that it will likely be through first half 2023. So what do we see for the fabless DOI trending in second half of this year?

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

Yes. Yes, Brett. We expect the fabless DOI to come down in the second half of the year gradually. And your second question?

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

Come down throughout second half of this year. Correct.

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

Yes, yes.

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

And then the second part of his question is -- Brett, sorry, again, your second part is looking at the industry, what is our current view on the semiconductor industry for 2022 and 2023? And how has our forecast changed or not?

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

That's right.

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

Well, let me answer the question. Our forecast for the semiconductor exclude memory and the forecast on the foundry growth in 2022 remain the same as we projected earlier. For 2023, it's too early to forecast. But as we said, the inventory correction will continue to go on. And for TSMC, because our technology position is much stronger today and we also have a very strong portfolio in HPC and we have a long-term strategic relationship with customer, so we see 2023, even just inventory correction, is still a growth year for TSMC.

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

Okay. Jeff, can I just have a second question? Is that possible?

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

Sure. One more second question. Yes.

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

So we've been hearing from some other leading-edge chip manufacturers that they are looking at the opportunity to work with project financing companies when it comes to new fab builds. I think companies as Brookfield has been mentioned. How does TSMC view this trend? And is there a fab rental model or a way to reduce the free cash flow burden in this industry as you bring on new fabs?

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

All right. So Brett second question is, he wants to know what is TSMC's view. His observation is other companies in the industry are using project financing to build new fabs, this new fab rental model. So what is TSMC's view on this?

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

Brett, we are not considering project financing now. Normally, project financing entails stringent, stricter terms and higher costs. We will finance the expansion mainly from our operating cash flow and borrowing using our strong balance sheet. That's our current policy.

Operator

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

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

And also, congratulations for great results. So my first question is about your HPC and high end smartphone demand, because our view is that the macro slowdown or recession should impact the core CapEx and the high consumption. So management, do you think that the so-called inventory digestion will sooner or later apply to your data center semi customers and the high-end smartphone customers' order in the coming quarters?

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

Okay. So Charlie's first question is looking at the inventory adjustment in light of the macro slowdown. He wants to know, do we believe or see impact to cloud service provider CapEx or high-end smartphone sort of to have inventory adjustment next? Is that correct, Charlie?

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

Yes.

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

Charlie, this is C.C. Wei. I think to answer your question, you might think they have too much of inventory in the HPC area. But as we said, that in our life, there are so many edge devices continue to create data. And those data need to be processed. And with sufficient speed and efficient power consumption, and that require our leading-edge technology to provide the solution. So even there's a inventory correction or something like that, we expect our business to be less volatile and more resilient through the near-term uncertainties. And also, we are highly confident in our long-term growth outlook.

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

Yes. Yes. So how about the high-end smartphone inventory correction? Do you expect that top brand inventory -- smartphone inventory to see correction as well on the semiconductor demand?

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

So Charlie also wants to know, do we expect high-end smartphone inventory correction on the semi demand?

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

To be frank with you, we did not see too much of inventory on the high-end smartphone buildup. So, no.

Charlie Chan - Morgan Stanley, Research Division - Technology Analyst

Okay. Great. That's very helpful. And my second question is about your future technology demand fulfillment, right? So either Mark or C.C., can you please help me. So this is the first time you've disclosed the N2 GAA logic density improvement. I think more than 20% logic density increased still better than market [chatters] (corrected by company after the call). But compared to the previous node, there's a significant slowdown. So do you think -- first of all, N2 is a full node migration. And do you think that there is a kind of a significant slowdown of Moore's law? And what does that mean to your CapEx per K for N2 versus N3? And lastly, backside power via, right? So I'm very interested in your kind of N2, what it means to your long-term technology and also CapEx.

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

Okay. Maybe I'll summarize Charlie's second question into few different parts. His first question is on N2 technology. And he notes that the logic density gain is more than 20%. But does this represent a significant slowdown, especially in the context of Moore's Law? And what does this mean for technology as a whole? Maybe Chairman can address.

Mark Liu - Taiwan Semiconductor Manufacturing Company Limited - Chairman

Let me answer your question. First of all, C.C. just mentioned, our N2 will be the most advanced semiconductor technology in the industry when it is introduced. Because this technology, we work closely with our customers, and about -- regarding the scaling factor included. But Charlie, we -- from now on, we have to look at the technology in a platform fashion. The N2 technology is not just the wafer scaling. The N2 technology include transistor scaling, but also include the new power line structure and also include a new chiplet technology to allow the more architectural innovation in our customers.

So this is a whole set of technology offering composed to be N2 nanometer. The scaling factor is smaller, but we really know the customers' needs is -- today is really about the power efficiency. And this will be a full node power efficiency migration. And to control the cost, that is the reason we control the scaling factor while maintain the same value for the new generation of technology. So that's my report, yes.

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

Great. And also Charlie is asking about the backside power on N2.

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

Okay. Let me add some viewpoint. On the backside power delivery, actually, we call the super power rail, is part of our N2 platform offering. And at the proper time, who are introduced to the market whenever our customers need it.

Charlie Chan - Morgan Stanley, Research Division - Technology Analyst

Yes. So if you put that together, right, it seems like lower -- you have this power via -- what does that mean to your CapEx burden in the coming years?

Operator

Next one to ask questions, Laura Chen from Citigroup.

Laura Chen - Citigroup Inc., Research Division - Research Analyst

Congrats for the good result. My first question is about your view on the key applications. Actually, starting from the last quarter, we already see that high computing PC has been the key categories for TSMC. So I'm just wondering your view from on the -- from various architectures, like ARM-based or X86, can you share with our view that what will be the key driver for TSMC for the next few years? Do you see there will be more from the ARM-based CPU or more upside from X86?

And also, on the smartphone space, I recall that in the previous analyst call, you mentioned that penetration rate for the 5G, do you expect there will be about like 50%. But given the weak demand growth, well, what's your latest view on the 5G smartphone penetration? That's my first question.

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

Okay. So Laura's first question. First, she wants to know on HPC. She notes HPC has become the largest contributor by platform to our revenue. So she wants to know what -- when we look out over the next several years, how do we see HPC? Is this driven by ARM-based or -- versus x86. I think that's the first part of her first question.

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

Laura, our HPC definitely is growing healthily. And since TSMC is everybody's foundry, so we support both X86 and ARM-based for what you say for the high-performance computing, both. And both are significantly growing in TSMC.

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

And then she also wants to -- sorry?

Laura Chen - Citigroup Inc., Research Division - Research Analyst

Yes. It seems like TSMC already has a very high exposure on the ARM base. So can we expect the next few years the growth driver to more come from the X86?

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

Can I answer this question? We have very high exposure to X86 also.

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

Laura, I think we have said numerous times and it still remains -- holds true that HPC will be the largest contributor and increasingly the main driver of TSMC's growth over the next several years.

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

Yes. And Laura, your second question is the 5G smartphone penetration rate. We're still looking at about 50% at this moment.

Laura Chen - Citigroup Inc., Research Division - Research Analyst

Okay. And if I can add the second question about the gross margin outlook. I think 59% is really amazing. And considering your CapEx discipline and the consistent delivery in advanced node or maybe price hike as well, can we expect that will have more upside to your current 53% gross margin target?

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

So Laura's second question is on the gross margin. She notes that gross margin for second quarter, 59.1%, is very high. So is there upside to our long-term gross margin target of 53% and higher?

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

Laura, as we mentioned before, there are 6 factors that affect our profitability every year. Excluding the foreign exchange rate, of which we do not have any control on, the other factors taking into consideration, we are confident that a long-term gross margin of 53% and higher is achievable. And we certainly -- we'll try to work hard to deliver better than that.

Operator

Next one, we have Gokul Hariharan from JPMorgan.

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

Let me try again. My first question is on the U.S. expansion. There have been a lot of commentary around very high cost for U.S. expansion. I think Founder, Chairman -- the U.S. perhaps compared to Taiwan. Could you talk a little bit about the U.S. expansion and how they are going? What kind of cost differential is TSMC seeing? And what is your negotiations with the Arizona government as well as customers in terms of filling up the cost differential? That's my first.

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

Okay. Gokul, I have to say again, you're breaking in and out. Let me try to summarize your question, make sure I -- we got it right. So Gokul's first question is about our U.S. fab. He notes that the cost is higher. Our founder has recently said this as well. So Gokul, I think your question, again, you broke up, I think your question is about how do we manage the -- how will we manage the cost gap and close the cost gap? Is that your question?

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

What is your discussions and negotiation with customers and governments regarding higher cost as well as subsidies?

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

So okay. Thank you, Gokul. So Gokul wants to know, with the higher cost, how are negotiations and discussions with governments? How are negotiations and discussions with customers about this cost differential?

Mark Liu - Taiwan Semiconductor Manufacturing Company Limited - Chairman

Okay. Gokul, yes. Yes, I did mention that the cost in the fab in the U.S. is higher than we expected. We are still in the construction stage of the fab. And during this past 2 years, we found that the labor cost in the States is higher than we planned. And also, some of the COVID supply chain interruption also was unexpected. And thus -- we did confer this information to the government at the location, give them a full perspective of the cost gap.

But Gokul, it is indeed the -- our customer in U.S., they all want to load that fab. I mean, this is the needs from our customers. And we also believe there is ample -- amplify our business opportunity there. So the cost is increasing, but cost is not the only factors. And we are still working on the government subsidy and we'll continue working on the cost reduction. And every company have different ways to reduce the cost. So that is the work in the process.

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

My second question, would the TSMC consider any kind of a joint venture fab in the U.S. with potential large customers? Historically, TSMC has done this with some of the customers like Altera and NXP long back. Would you consider any kind of joint venture fabs potentially with any of the customers in the U.S. if the outsourcing opportunity is big enough?

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

Okay. So Gokul's second question is, again, would TSMC consider any type of joint venture fab in the U.S. for outsourcing? He notes we have done certain JVs in the past. So is this something we will consider in the U.S. for outsourcing opportunities?

Mark Liu - Taiwan Semiconductor Manufacturing Company Limited - Chairman

Yes. Let me answer this question again. This -- our -- yes, TSMC indeed has some joint venture arrangement maybe 20 years ago within U.S. But right now, we understand -- with that experience, we understand, our customers' demand will go up and down. And we don't -- and also, we don't want to limit this fab into a specific set of customers. It's open to our all customers base to utilize. So no, at this point, we do not plan to have a joint venture arrangement in the U.S.

Operator

Next one to ask question, Charles Shi from Needham and Company.

Charles Shi - Needham & Company, LLC, Research Division - Senior Analyst

I want to go back, a quick clarification about N3 gross margin. You kind of mentioned, probably first time quantified how much dilution you're expecting, 2% to 3%? Can you let us know dilution relative to which number because there is one long-term gross margin number of [53%] (corrected by company after the call) and higher, and there is another one which is where your gross margin is tracking. That's a few points above your long-term target. This is kind of a little bit moving target here. So can you clarify with us?

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

So Charles is asking if we can clarify our gross margin target. His question, well, I think, again, when we talk about N3 diluting 2% to 3%, it is for the first year, right, which is 2023. And so he's wondering I think -- Charles, your question is, does this dilution continue? Does this change our long-term gross margin target? And more -- maybe more, I think he is thinking about what are the gross -- yes, sorry, let me stop there. Is that your question, Charles?

Charles Shi - *Needham & Company, LLC, Research Division - Senior Analyst*

No. No. The 2% to 3% dilution relative to what, is my question. Is it relative to your long-term growth target, 2% to 3% and higher, or where you're tracking, which is 59%, 58%, yes, that's my question.

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

So Charles is asking, when we talk about 2% to 3% dilution, are we looking at 53% diluting from there? Or are we looking at 59% diluting from here?

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

Charles, it's diluting from next year's gross margin as we forecast. It's neither 53% nor 59%. Bear in mind that when we talk about 53% and higher, it already included the dilution effects from the N3 dilutions.

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

Okay, Charles? Do you have a second question?

Charles Shi - *Needham & Company, LLC, Research Division - Senior Analyst*

I do. I have a more long-term question. Thank you, Chairman, for mentioning N2's full package, which that includes chiplets. I want to specifically ask you about chiplets. I think you recently talked about expanding SoIC capacity by 20x through 2026. That's quite a big amount of capacity application. I think one year ago, you sort of mentioned SoIC is something you're targeting for high-performance computing application. But given the amount of capacity increases you're planning, any updated thoughts on whether that can be a technology possibly at N2 and use for smartphone platform? Any other color you can give us would be great.

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

Okay. So Charles second question is on 3DIC. He notes that, in particular, we are talking about SoIC and also expanding the capacity there. We have said in the past, this is primarily adopted by HPC applications. His question is, with such capacity expansion, do we also expect smartphone customers to adopt 3DIC solutions like SoIC at some point in the future? Is that correct, Charles?

Charles Shi - *Needham & Company, LLC, Research Division - Senior Analyst*

Yes.

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

Okay. Let me answer this question, Charles. So far, the SoIC is primarily adopted by the HPC applications, okay. Because of -- that it's very fit for their high-speed and power efficient. But for mobile adoption, it will depend on their chiplet's architecture, interconnect density requirement, thermal or other requirement. And we will have other solution to address the mobile requirement.

Operator

Next one to ask question, Mehdi Hosseini from Susquehanna International.

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

I just want to go back to the CapEx. I think the Chairman has guided back in 2021, Chairman guided to \$100 billion of CapEx during the 2021 through 2023 period. And now this morning, you're highlighting the fact that CapEx this year could be \$40 billion. So if I was to use the \$100 billion, the bogie suggests to me that your CapEx could be down by as much as 8% to 10% in 2023, unless you are really that \$100 billion guide. I just want to get some color on this, and I have a follow-up.

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

Okay. So Mehdi's first question is on our CapEx. He notes back in April of 2021, we had guided for \$100 billion CapEx in the next 3 years. And so now he's adding the math up for last year and this year, and wondering, does that apply -- sorry, imply a decline in our CapEx for 2023? Or do we have a new revised guidance for the CapEx spend?

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

Mehdi, let me answer this. We're not going to talk about the \$100 billion today. We're not going to comment CapEx beyond 2022. We've already given the guidance range of 2022. Now as we mentioned before, every year, when we invest in CapEx, it is for the future growth opportunities. So as long as there -- we believe the future outlook is good, we will continue to invest in a disciplined manner.

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

Got it. And just a quick follow-up here. Despite the fact that CapEx was up 76% last year, 2021, the depreciation so far has been tracking flattish. It was flat in Q1, down 2% in Q2. Should I expect a big step-up in depreciation going forward?

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

Okay. So Mehdi also wants to follow up to ask about depreciation. Despite the increase in CapEx, why is the depreciation growth pretty flattish or low so far this year? And then should we expect a step-up in depreciation for 2023?

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

Mehdi, every year, there are new depreciation coming in. But at the same time, there are depreciation getting out of the depreciation table. So some comes in, some goes out. This year, we expect that depreciation will grow above mid single-digits from last year. It is slower -- lower than when we guided at the beginning of the year because of some tool delivery schedule change, as C.C. mentioned earlier. Now for next year, the -- it's too early to give a specific number, but the depreciation will be much higher than this year.

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

Okay. And Jeff, since everyone had more than second question, may I squeeze one quick follow-up?

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

Well, you have 1.5. I'll let you another half question, please, Mehdi, because we still have a few people on the line. Yes.

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

Sure. I'll make it very quick. When I look at your customers, their inventories are at a 25-year high. And I think everyone is going to take a look at the seasonality in the second half. And I'm just curious, what are the key variables? What are the key metrics? Or what are the key strategies that you have in place that could mitigate the gross margin balance by this, if your customers become more aggressive in inventory correction into next year?

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

Okay. So Mehdi's question is noting customer inventory at customers are very high. So what would be the key variables or metrics for TSMC to mitigate our gross margin downside or risk, if customers were to adjust their inventory further? Is that correct, Mehdi?

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

Yes. If they become more aggressive in inventory correction into first half of next year.

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

If they were customers were to become more aggressive on their inventory correction into first half next year.

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

Well, let me answer the question. As I stated in the remark, our customers are doing the inventory correction. But I said that customers demand still exceed the TSMC's capability to support for this year. So even they do their inventory adjustment, what I say that they decrease their demand versus their original number, TSMC's capacity is still very tight and will remain very healthy in the utilization. So that's why we can keep our gross margin intact. Did I answer your question?

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

I see.

Operator

Next one to ask question is, Brad Lin from Bank of America.

Brad Lin - BofA Securities, Research Division - Research Analyst

So firstly, our congratulations once again on the strong earnings. And my first question is about advanced packaging. We learned the advanced packaging is very, very important for TSMC's long-term growth and TSMC has a great variety of offering to provide higher value to customers. So would you please share your insights on what are the key barriers are for wider adoption by clients? And would you expect the contribution mix to increase gradually? Or if there is a point to see an explosive growth from the advanced packaging? And by the way, we saw the news about the 3DIC recently in Japan and how will that accelerate their progress.

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

Okay. So Brad's question is on advanced packaging. I believe, if I heard you correctly, what are the key barriers for wider adoption of our packaging solutions by customers? What is the long-term revenue growth outlook of advanced packaging? Is it going to be explosive growth or growth similar to the corporate average and also the role of our 3DIC center in Japan in developing advanced packaging solutions.

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

Okay. That's a very long question, but let me answer one by one. First, we developed a very advanced packaging technology to meet the customers' demand. So far today, 3DIC or SoIC, we develop for the high-speed performance, HPC applications first. And the other one, mostly starting to be adopted by all HPC customers starting from today. So we expect it gradually will ramp up. And until that's 2-nanometer, I think I have much more demand in that technology node for the 3DIC. That's what we expect. And we expect the growth of this 3DIC business will be healthy, probably a little bit ahead of TSMC's growth forecast. Now let me turn to the 3DIC center in Japan. We established 3DIC center because of Japan has a fundamental advantage on the raw material also on the packaging area. For example, the substrate. They are the #1 in the world. And we need that one technology to complement the TSMC's 3DIC technology so we can serve our customer better. And that's why we established a 3DIC center -- technology development center over there. Did I answer your question?

Brad Lin - BofA Securities, Research Division - Research Analyst

Yes. Yes. Very clear. So maybe another follow-up, that's also about the IC substrate. So ABF actually substrate currently plays a very important role in advance packaging, of course, especially for CoWoS and the substrate area demand potentially in largest was the increasing advanced packaging penetration. So with the rising integration level of a chip, do you expect new material to potentially replace ABF? And any plan to secure substrate supply or upgrade the designs for TSMC for future requirements? And maybe one last follow-up is that, if we compare 2.5D and 3D, would you need more substrate for 3D?

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

Okay. Well, Brad's second question is on substrates. He wants to know, with the development of substrates and the adoption, do we see further developments in terms of new materials? Will we see more substrates used in 3DIC versus 2.5D? And will we -- how do we secure the substrate supply?

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

Well, this one we are working with the substrate partner. And your question is the 2D, 2.5D or 3D, both. Both are important. But let me tell you one further step. We're only interested in the very advanced technology. We are not going to develop any commodity of the substrate technology to compete in the market. No. We are developing for the very high performance computing or very large substrate to support TSMC's customer. That's our purpose.

Operator

Next one to ask question, Krish Sankar from Cowen & Company.

Krish Sankar - Cowen and Company, LLC, Research Division - MD & Senior Research Analyst

I have 2 of them. The first one is, when I look at your full year guidance of 35% revenue growth, it looks like calendar 4Q or the December quarter is going to be sequentially down more than 10%. And that hasn't happened in a long time. So I'm kind of curious, how much of that is driven by

demand versus FX? And then the second question, a follow-up is, if I look at your CapEx run rate, the first half is running at about \$17 billion, which is below the lower end of your full year guidance. So I'm kind of curious, what are the tool delays that's causing the pushout of CapEx into next year? Is it like EUV? Is it like depth etch tools? Any color on that would be super helpful.

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

Okay. So Krish has 2 questions. First is looking at our full year guidance to grow mid-30s, and he says, this implies a decline in the fourth quarter?

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

No. I don't think so. We did the calculation. Maybe you can do that again. It's at least up.

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

Yes. Krish, I would note that when we talk about mid-30s guidance, as C.C. said, that is in U.S. dollar terms. Okay?

And then his second question is on CapEx and sort of looking at the CapEx. His question is, we have already said it will be closer to the lower end of the range. He wants to know what is driving the CapEx? Is it tool delays? Is it EUV? What types of equipment?

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

No. I don't think we can go into that kind of details. But some of them got pushed out to next year, as C.C. mentioned. And every year, the CapEx profile can be different quarter-by-quarter.

Operator

The next one to ask questions, Frank Lee from HSBC.

Frank Lee - *HSBC, Research Division - Head of Technology Research for Asia*

I wanted to just ask a question on, I guess, the overall profitability and also pricing. It seems like this year, we start to see a foundry price increase and a bit unusual for TSMC. And going into next year, it looks like there's some manifestation of further price increases. But at the same time, we're also seeing potentially inventory correction. So just trying to understand the pricing strategy itself, is this more of a reflection of perhaps the structural profitability for this cycle being different than the past? Or are there any kind of cost that we're seeing this time that we haven't seen in past cycles.

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

Okay. So Frank's first question is on pricing. He wants to know what is driving our pricing strategy. How do the cost inflation or factors play into it? And really what drives TSMC's pricing?

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

Yes. We do not comment on our pricing details. These are the private discussion between us and our customers. Having said that, our pricing is strategic and value-driven, not opportunistic or cost plus. We work closely with our customers to provide our value. And we will continue to ensure that our pricing reflects our value creations, including technology, ecosystem, and services and capacity support.

By taking all these actions, we believe we can achieve a long-term gross margin of 53% and higher. We do face manufacturing cost challenges. As we mentioned, rising raw materials, utilities and tool costs, et cetera. But having said that, we still think that the 53% long-term gross margin is achievable, and 53% and higher.

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

Okay. Frank, do you have a second question?

Frank Lee - *HSBC, Research Division - Head of Technology Research for Asia*

Yes, sorry. My second question is, I understand I guess the overall view on that. But given what you guys just talked about the overall cycle, I know you still have some -- the leadership in the [demand] (corrected by company after the call) side and everything else. But is there a potential effect where, your customers could see a stronger second half this year in anticipation of price increases? And with the adjustment going into next year, that we see some more weakness in the first half more than anticipated in the first half?

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

Okay. Well, Frank's second question is with pricing, will -- could there be a situation where customers, I guess, will pull in more of their business to second half of this year, and thus, we would see a weaker first half next year.

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

No, we did not see that. We are actually -- we are working with our customers and we try our best to support our customers. As I said, even right now, our capacity remains very tight. So the switching between the next year's first quarter and this year's second half, no. We did not see that to simply put it.

Operator

The last one to ask questions, Robert Sanders from Deutsche Bank.

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

Yes. I just have 2. The first one is just, if you could just discuss how much of next year's revenue is under LTA. The reason I'm asking is because there are some people in the market thinking that customers may be fearful of pushing out wafers because they may be jeopardizing agreements for next year. And then the second question would be just to on the chiplet question. I was just wondering what percentage of 2-nanometer HPC designs will be using a chiplet architecture. Is it the majority? What's the adoption rate?

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

Okay. So Robert's first question is, he wants to know how much percentage of revenue do long-term agreements with customers represent for TSMC. Maybe Wendell can address this question.

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

Yes. Robert, we don't discuss the details like that. We work very diligently and closely with the customers to plan the capacity, including receiving the prepayments for capacity support. And we will continue to work with them to decide to determine the best way to support them going forward.

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

Okay. And then his second question is on N2. He wants to know, for HPC applications on N2, what is the percentage or that may adopt a chiplet architecture approach?

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

I cannot release the number. But let me assure you that the number of the customers using the chiplet in the N2 or the 2-nanometer technology will start to increase and that will become a major approach in the 2-nanometer and the following technologies.

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

Okay? Thank you, C.C. Thank you, Robert. And thank you, everyone. 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 one hour from now. And the transcript will become available 24 hours from now. Both of which you can find 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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