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Taiwan Semiconductor Manufacturing Co., Ltd. (TSM)

Q3 2020 Earnings Call

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MANAGEMENT DISCUSSION SECTION

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

[Foreign Language] (00:00:01-00:00:28)

Good afternoon, everyone. Welcome to TSMC's Third Quarter 2020 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. 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 third quarter 2020, followed by our guidance for the fourth quarter 2020. Afterwards, TSMC's CEO, Dr. C.C. Wei, and Mr. Huang 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 in 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

Chief Financial Officer, Vice President-Finance & Spokesperson, Taiwan Semiconductor Manufacturing Co., Ltd.

Thank you, Jeff. Good afternoon, everyone. Third quarter revenue increased 14.7% sequentially in NT dollars or 16.9% in US dollars as we saw strong demand for our advanced technologies especially with technology solutions driven by 5G smartphones, HPC, and IoT-related applications. Gross margin increased 0.4 percentage points sequentially to 53.4%, mainly thanks to a much higher level of utilization, partially offset by the margin dilution from 5-nanometer ramp and an unfavorable exchange rate.

The operating expenses increased by TWD 7.4 billion mainly attributable to a higher level of development activities for N4 and N3 technologies and one-time expenses to facilitate our expansion in Hsinchu. Therefore, operating margin slightly declined by 0.1 percentage points sequentially to 42.1%. Overall, our third quarter EPS was TWD 5.3 and ROE was 31.3%.

Now let's move on to the revenue by technology. 5-nanometer process technology contributed 8% of wafer revenue in the third quarter while 7-nanometer and 16-nanometer contributed 35% and 18% respectively. Advanced technologies, defined as 16-nanometer and below, accounted for 61% of wafer revenue.

In terms of revenue contribution by platform, smartphone increased 12% quarter-over-quarter to account for 46% of our third quarter revenue. HPC increased 25% to account for 37%. IoT increased 24% to account for 9%. Automotive decreased 23% to account for 2%. Digital consumer electronics decreased 24% to account for 3%.

Moving on to the balance sheet, we ended the third quarter with cash and marketable securities of TWD 742 billion. On the liabilities side, current liabilities decreased by TWD 27 billion mainly due to the decrease of short-term loans and the decrease of current portion of bonds payable. Long-term interest-bearing debt increased by TWD 146 billion, mainly as we raised TWD 145 billion of corporate bonds during the quarter. On financial ratios, accounts receivable turnover days decreased 4 days to 40 days while days of inventory increased 3 days to 58 days primarily due to N5 ramp.

Regarding cash flow and CapEx, during the third quarter, we generated about TWD 190 billion in cash from operations, spent TWD 99 billion in CapEx and distributed TWD 65 billion for fourth quarter 2019 cash dividend. Short-term loan decreased by TWD 17 billion while bonds payable increased by TWD 136 billion mainly due to the bond issuances. Overall, our cash balance increased TWD 137 billion to TWD 604 billion at the end of the quarter. In US dollar terms, our third quarter capital expenditures totaled \$3.4 billion.

I have finished my financial summary. Now, let's turn to our fourth quarter guidance. Based on the current business outlook, we expect our fourth quarter revenue to be between \$12.4 billion and \$12.7 billion, representing a 3.4% sequential increase at the midpoint. Based on the exchange rate assumption of \$1 to TWD 28.75, gross margin is expected to be between 51.5% and 53.5%, operating margin between 40.5% and 42.5%.

Now, I will hand over the call to C.C. for his key messages.

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

Thank you, Wendell. Good afternoon, everyone. We hope everybody is staying safe and healthy during this time. Now, let me start with our near-term demand and inventory. We concluded our third quarter with revenue of TWD 356.4 billion or \$12.1 billion, which was above our guidance mainly due to better demand across all our platforms in our forecast three months ago.

Moving into fourth quarter 2020, we expect our sequential growth to be supported by strong demand for our industry-leading 5-nanometer technology driven by 5G smartphone launches and HPC-related applications. On the inventory front, we forecast our fabless customers' overall inventory to exit the year above the seasonal level as the supply chain continues to make efforts to ensure supply chain security and actively prepare for the new 5G smartphone launches. Looking ahead, we expect our customers' overall inventory to remain above their historical seasonal level for longer period of time given the industry's continued need to ensure supply chain security amid the lingering uncertainties.

For the whole year of 2020, although COVID-19 continued to bring some level of impact to the global economies, we also observed COVID-19 is accelerating digital transformation, while 5G and HPC-related applications continue to provide semiconductor content enrichment. We now forecast the overall semiconductor market, excluding memory, to increase mid-single digit percentage, while foundry industry growth is expected to be close to 20% year-over-year.

For TSMC, our technology leadership position enable us to capture the industry megatrend of 5G and HPC, we expect to outperform the foundry revenue growth and grow by about 30% in 2020 in US dollar terms.

Next, let me talk about our N5 ramp-up and N4 progress. TSMC's N5 is the foundry industry's the most advanced solution with the best PPA. N5 is already in volume production with good yield while we continue to improve the productivity and performance of the EUV tools to further enhance our leadership in EUV technology. Due to the

robust demand from 5G smartphones and HPC applications, we reaffirm N5 will contribute about 8% of our wafer revenue in 2020, and we expect even a higher percentage 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 5-nanometer products. N4 risk production is targeted for 4Q 2021 and volume production in 2022. With our continuous technology enhancement, we expect our 5-nanometer family to be a large and long-lasting node for TSMC.

Now, I will talk about our N3 status. N3 will be another full node stride from our N5, with up to 70% logic density gain, up to 15% performance gain and up to 30% power reduction as compared with N5. We have chosen FinFET transistor structure for our N3 technology to deliver the best technology maturity, performance and cost for our customers. Our N3 technology development is on track with good progress. N3 will offer complete platform support for both mobile and HPC applications. Risk production is scheduled in 2021 and 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 when it is introduced. Thus, we are confident our 3-nanometer will be another large and long-lasting node for TSMC.

Finally, I'll talk about the TSMC 3DFabric. TSMC has developed an industry leading comprehensive wafer-level 3D IC technology road map to enhance system level performance. Our differentiated chiplets and heterogeneous integration technologies drive better power efficient and smaller form factor benefits for our customers, while shortening their time to market. These technologies including chip stacking solutions, such as SoIC, as well as advanced packaging solution, such as InFO and CoWoS. We are consolidating this offering under one umbrella and naming it TSMC 3DFabric.

As the industry continue to seek innovations to enhance system-level performance, 3DFabric will complement our advanced technology to unleash our customers' innovation. We expect revenue from our backend services, which including both advanced packaging and testing to grow at a rate slightly above the corporate average in the next few years.

Now let me turn the microphone over to Wendell.

Wendell Huang

Chief Financial Officer, Vice President-Finance & Spokesperson, Taiwan Semiconductor Manufacturing Co., Ltd.

Thank you, C.C. Let me start by making some comments on our profitability. Our third quarter gross margin exceeded the high-end of our guidance to reach 53.4%, mainly as we saw a much higher than expected overall capacity utilization rate in the third quarter. That helped to offset the margin dilution from the initial ramp-up of our 5-nanometer technology.

We have just guided fourth quarter gross margin to decline by 0.9 percentage point sequentially to 52.5% at the midpoint, primarily due to the margin dilution from continued steep ramp-up of our 5-nanometer, and the less favorable foreign exchange rate in the fourth quarter.

Looking to 2021, we expect a strong ramp of N5 to contribute a higher percentage of revenue as compared to 2020. The yield rate of N5 continues to improve. Similar to prior nodes, we forecast N5's gross margin to take

seven or eight quarters to reach the corporate average level. Thus, N5 is expected to dilute our gross margin by about 2 to 3 percentage points for the full year of 2021.

As a reminder, the following six factors determine TSMC's profitability: leadership technology development and ramp-up, pricing, cost reduction, capacity utilization, technology mix, as well as foreign exchange rate. Taking all these factors into consideration, we believe a long-term gross margin of ~~above~~ 50% is achievable.

about

Now let me talk about our capital budget for this year. Our business outlook is supported by strong demand for our industry-leading advanced technologies and specialty technology solutions driven by the industry megatrends of 5G and HPC-related applications. In order to meet this demand and support our customers' capacity need, we now expect our full-year 2020 CapEx to be about \$17 billion.

Now I will make some comments on our corporate bond issuances and capital structure. The multiyear megatrends of 5G related and HPC applications are expected to continue to drive strong demand for our advanced technologies in the next several years. Given the macroeconomic uncertainties this year, a current low interest rate environment, and ability to diversify our funding sources, TSMC's board of directors had so far approved the issuance of TWD 120 billion in NT dollar denominated corporate bonds and \$4 billion in US dollar denominated corporate bonds. Year-to-date, we have issued TWD 89.5 billion in NT dollar denominated and \$4 billion in US dollar denominated corporate bonds with favorable pricing terms.

With our solid financial performance, strong balance sheet, and cash position and capacity to take on debt, we are able to aggressively invest in our future to enhance our technologies and capabilities. This enables us to continue to outgrow the semiconductor industry through the cycles. With our disciplined capital management, we remain committed to a sustainable cash dividend on both an annual and quarterly basis.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

Thank you, Wendell. This concludes our prepared statement. Before we begin the Q&A session, I would like to remind everybody to please limit your questions to two at a time to allow all participants an opportunity to ask questions. Should you wish to raise your question in Chinese, I will translate it to English before our management answers your question. [Operator Instructions]

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

QUESTION AND ANSWER SECTION

Operator: First caller on the line is Gokul Hariharan, JPMorgan. Go ahead, please.

Gokul Hariharan

Analyst, JPMorgan Chase & Co.

Q

Congratulations on a great quarter and thanks for taking my question. My first question is on CapEx and capital intensity. Looks like this year we will come in around 36%, 37% capital intensity. Could you talk a little bit about how we should think about capital intensity and absolute CapEx as well looking forward at least on a directional basis? It seems like the investment cycle is still going to pretty much intact going into next year, also looking across the financial options in terms of bond raising, etcetera, that TSMC has undertaken. That is my first question.

My second question is on N5. I think in previous calls we had indicated that while N5 will be a long and large node, it may not have the same number of tape-outs as N7 has had, which is probably a historical high. Is our view changing on N5? Could we talk a little bit about will N5 exceed N7 in terms of wafer capacity, as well as wafer revenue in the next two years or so? Thank you.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay, Gokul. Thank you very much. We'll take your questions one by one. Please allow me to summarize your question. Your first question relates to our CapEx and capital intensity. You point out that with the guidance that our capital intensity this year, in your estimation, is probably around 36% to 37%. So, your question is, how should we think about CapEx and capital intensity in the next few years?

If we cannot give a quantitative number directionally, how do we see CapEx and capital intensity? And how does this tie in with our recent things like such as bond issuances and fundraising, how does that factor in? That's the first question. Maybe CFO, Wendell, can address.

Wendell Huang

Chief Financial Officer, Vice President-Finance & Spokesperson, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Yes. Gokul, our capital intensity, so you are right, this year will be lower than 40%. And in the next several years, longer term, we expect the capital intensity to be around mid-30 percentage points. However, having said that, there may be years where capital intensity is higher if we see the strong demand for our technologies or capacity and we decided to invest. Okay?

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

And then, your second question, Gokul, please allow me to summarize again. It's regarding to our 5 nanometer that we have said that is a long and large node. But that we – the number of tape-outs of N5 versus N7 may be lower. So your question is, can N5 exceed N7? Do we believe 5-nanometer can be a bigger node than N7 in terms of revenue and capacity?

C.C. Wei*Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Well, let me say that we don't comment on how many tape-outs so far, but we continue to see strong tape-out activities at N5 from both HPC and smartphone applications. And the revenue for this year we just mentioned is 8% of wafer revenue and next year it will be even higher than – close to 20%, something like that. The exact number we are still not able to comment, but I can assure you that our 5-nanometer family will be another big and long-lasting node for TSMC.

Jeff Su*Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Okay. Thank you, Gokul. Operator, can we move on to the next caller, please?

Operator: Next one we have Randy Abrams, Credit Suisse.

Randy Abrams*Analyst, Credit Suisse AG (Taiwan)*

Q

Okay. Yes, thank you. My first question I wanted to ask on when you raised the gross margin, originally it was 50%. Could you discuss now where you're saying it could be above 50%, the factors driving that change? And could you clarify on the 2 to 3-point impact on 5-nanometer? I think you already have that impact. So does that imply for next year pretty similar to the type of gross margin you're running now or potentially even better?

Jeff Su*Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Okay. Randy, I'll summarize your question. Your first question is in regards to, I believe, our gross margin and long-term gross margin. I think you are asking that we raised our target. But I think, as Wendell said, 50% is achievable for us. But you are also asking as part of that, the dilution from 5-nanometer, how will that impact our gross margin next year and where should we, I guess, be thinking about gross margin for 2021?

Wendell Huang*Chief Financial Officer, Vice President-Finance & Spokesperson, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Okay. Randy, let me answer this like this. We have a very high gross margins in the third quarter and we believe we will continue to have a pretty high margin in the fourth quarter. And main reason is that we are enjoying a very high utilization across almost all the nodes at this moment. But this very high utilization may not continue forever. So, our long-term growth target, our long-term goal for our gross margin continues to be about 50%.

In terms of dilution from N5, we are seeing the dilution of N5 for next year to be around 2 to 3 percentage points, similar to previous nodes. And remember that the N5 will account for a much bigger percentage of our revenue next year. So, as we ramp up quickly, the dilution will continue to exist. However, we are still expecting that it will reach the corporate margin in seven to eight quarters.

Randy Abrams*Analyst, Credit Suisse AG (Taiwan)*

Q

Okay. No, great. Thanks. I misunderstood. I thought I heard the word above prospective. Thanks for the clarification. Second question on the recent US restriction of SMIC. I'm curious if you're seeing any additional diversification or increase for business? And given they're more on the mature nodes, how are you positioned if you are seeing those to take on business on the mature nodes?

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay, Randy. Let me just summarize your second question. Your second question is regards to the recent restrictions on SMIC. And Randy is wondering whether we are seeing any type of diversification or inquiries from customers in regards to business, and especially at the mature nodes.

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Well, Randy, let me answer the question. Actually, yeah, we are still evaluating the impact to the semiconductor industry due to the ban on SMIC. But let me say that our capacity planning in all our CapEx will continue based on the long-term demand profile. That is underpinned by the industry megatrend, such as 5G-related and HPC application. All right? Does that answer your question?

Randy Abrams

Analyst, Credit Suisse AG (Taiwan)

Q

Yeah. Or maybe just one quick, for the mature node, which are running tight across the industry, just if there's an incremental surge, how well could you handle incremental business from, say, this type of piece if it were to come through?

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

So, Randy is asking if we were to see a surge in demand at the mature node, how ready or do we have capacity to take on or handle this type of surge demand?

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Well, we continue to work with our customer dynamically and we try our best to meet their demand, and that's all I can say today.

Randy Abrams

Analyst, Credit Suisse AG (Taiwan)

Q

Okay. Great. No, thank you.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. Thank you, Randy. Operator, can we move on to the next caller, please?

Operator: The next one is Sebastian Hou from CLSA.

Sebastian Hou

Analyst, CLSA Ltd.

Q

Thank you. Good afternoon, gentlemen. My first question is I think besides the higher than usual inventory, which may be the new norm because of this supply chain disruption. I'm wondering, I'm curious about how does TSMC assess customers overbooking or pull-in behavior and the magnitude. In particular, based on the recent smartphone OEMs' aggressive procurement are now assuming Huawei's going to be dead next year, how will you

assess that kind of potential overbuild inventory risk may potentially lead to destocking correction sometime next year? This is my first question. Thank you.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay, Sebastian. Let me repeat or try to summarize your question. Your question is basically related to the inventory, and you want to ask how does TSMC assess the risk that there is overbooking in light of the restrictions on Huawei? And therefore, what type of levels or magnitude of inventory overbuild is there and does this create the risk of inventory correction sometime next year?

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Let me share with you our view on this inventory-related issues. First, I want to say that due to the pandemic, actually, the digital transformation has been accelerated. And that create a demand on 5G and HPC-related products. And so, for the longer-term basis, we do expect our customers' overall inventory to remain above the seasonal level for a longer period of time, majority partly because of they have some concern on industry's supply chain security and due to the uncertainties. And so, the inventory, high-level inventory will sustain – continue for a longer period of time. That we can say that.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. Sebastian, do you have a second...

Sebastian Hou

Analyst, CLSA Ltd.

Q

Yeah. All right. Yes. Okay. All right. Anyway, but that isn't actually what I'm looking for. But anyway, I mean, thank you for that, C.C. And my second question is, on the HPC business, apparently I think, C.C., you mentioned in the prepared remarks that you see a lot of growth this quarter and also continue to trend next quarter. And driven by the accelerating digital transformation you just said led by the pandemic and work-from-home demand like to stay for longer, and also continue market share gain on TSMC against IDM. And when do you expect your HPC revenue exposure to crossover with smartphone revenue percentage possible to see that by end of next year or 2022? Thank you.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. Sebastian, let me just summarize your question with regards to our HPC platform business. You point out that there's the trends of the accelerating digital transformation and the work-from-home, and also market share gains versus IDM. So, you want to know when do we see our HPC platform revenue crossing over with the smartphone, others to become the primary.

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. Let me answer the question. We do see HPC platform's growth rate is higher among our four platform, which is smartphone, HPC, automotive, and IoT. And in the next few years, we'll continue to expect what we forecast that HPC's growth rate will be higher than the corporate level. When you crossover, I don't make any comment right now.

Sebastian Hou

Analyst, CLSA Ltd.

Okay. Thank you.

Q

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

Thank you, Sebastian. Operator, can we have the next caller, please?

A

Operator: Next one, we have Bruce Lu from Goldman Sachs. Go ahead, please.

Bruce Lu

Analyst, Goldman Sachs (Asia) LLC

Hi. Good afternoon. So, I want to ask about the 5G penetration rate. So, what is the latest forecast for the total smartphone growth and 5G penetration rate in 2020, and maybe a little bit color on 2021 as well? So, we also see that some of the telco is slowing down their 5G base installation, what kind of impact we see at this moment.

Q

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

Okay, Bruce. Your question is regards to 5G and smartphones. You want to know what is the smartphone growth and 5G penetration rate for 2020 as well 2021, and then in light of the telecoms potentially slowing down the deployment.

A

Bruce Lu

Analyst, Goldman Sachs (Asia) LLC

Yes.

Q

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

Correct?

A

Bruce Lu

Analyst, Goldman Sachs (Asia) LLC

Yes. Thank you.

Q

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

So, let me answer the question. We continue to expect faster penetration of 5G smartphone as compared to 4G. And for this year, we still forecast a high-teens penetration rate and next year even higher, much higher, let me say that, and that's all we have today.

A

Bruce Lu

Analyst, Goldman Sachs (Asia) LLC

Oh. And any impact on the telco business as well?

Q

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Oh, I think all countries and all regions are preparing to build up the infrastructure right now. And I believe next year, even not 100% completed, but all the regions or the countries [indiscernible] (00:33:52) have a lot of 5G phone being introduced. And that create a higher percentage penetration rate.

Bruce Lu

Analyst, Goldman Sachs (Asia) LLC

Q

Okay. Understand. My next question is that I'm a little bit surprised that China revenue contribution only increased slightly from 22% to 23% in third quarter. So which region will we see the strongest growth in the fourth quarter?

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. Bruce, your question is regards to our revenue by geography, and you want to know for the fourth quarter which region will contribute the most growth in the fourth quarter.

Wendell Huang

Chief Financial Officer, Vice President-Finance & Spokesperson, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay, Bruce. We're not prepared to comment on geographic allocation of our revenues in the fourth quarter. I can share with you that we expect the platforms that we'll grow in fourth quarter will be smartphone and automotive, and the other two will likely to be down.

Bruce Lu

Analyst, Goldman Sachs (Asia) LLC

Q

Understand that. Thank you.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

All right. Thank you, Bruce. Operator, can we move onto the next caller, please?

Operator: Next one we have Sunny Lin from UBS.

Sunny Lin

Analyst, UBS Securities Pte Ltd. (Taiwan)

Q

Hi. Good afternoon. Thank you for taking my question. So my first question is on 5-nanometer demand. So into next two to three years, what do you think revenue split could be by smartphone, HPC, etcetera? And do you think that the mix could be a bit different from 7-nanometer?

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Sorry. Can you repeat your question, Sunny? You broke up a little bit.

Sunny Lin

Analyst, UBS Securities Pte Ltd. (Taiwan)

Q

Sure. Sure. No problem. Sorry about that. So, I wonder for 5-nanometer demand into next two to three years, what does the management think of the revenue mix could be by smartphone, HPC, etcetera? And would the product mix be a bit different from 7-nanometer?

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. All right. Let me summarize. Thank you, Sunny. Your question is regards to 5-nanometer, and then when we look out over the next three years, how do we see the demand of 5-nanometer, the mix changing in terms of smartphone, HPC, different platforms, and then how does this compare to 7-nanometer, correct?

Sunny Lin

Analyst, UBS Securities Pte Ltd. (Taiwan)

Q

That's right. Thank you, Jeff.

Wendell Huang

Chief Financial Officer, Vice President-Finance & Spokesperson, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Hi. We don't break it down or disclose the platform mix of certain nodes, but we can share with you, as C.C. just mentioned, in the next several years we expect HPC to be the largest contributor of our growth. So that should give you some idea and these guys use advanced technologies.

Sunny Lin

Analyst, UBS Securities Pte Ltd. (Taiwan)

Q

Sure. Got it. And my second question is that for this year a key part of your growth in smartphones is driven by higher silicon content for 5G and your share gain. So, I wonder if you could walk us through how your average silicon content in smartphone may trend to 2021 and 2022. Thank you very much.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. So, Sunny, your second question is regards to the silicon content in 5G phones. The silicon content increase in 5G phone along with share gains is contributing to smartphone growth this year. So, she wants to know what is the silicon content outlook for 2021 and 2022.

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

This is pretty hard for me to answer, because I cannot release all the information [ph] like data (00:37:46) from our customer. But let me say that, on the average, the 5G phone have about 30% to 40% more silicon content as compared with 4G. Did that give you some kind of idea?

Sunny Lin

Analyst, UBS Securities Pte Ltd. (Taiwan)

Q

Sure. So, I have a very quick follow-up. I wonder if you could give us some color regarding your expectation for your market share for smartphone in the next two to three years.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

So, Sunny is asking whether we can give some comment on the market share – our market share in 5G phones in the next two to three years.

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

No. It's not very appropriate for me to give some kind of estimate right now. But let me say that as long as we have a technology leadership position, we are very confident that we're going to have high market share.

Sunny Lin

Analyst, UBS Securities Pte Ltd. (Taiwan)

Q

Okay. Got it. Thank you very much.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Thank you, Sunny. All right. Let's move. Operator, can we move on to the next call on the line, please?

Operator: Next we have Roland Shu from Citigroup.

Roland Shu

Analyst, Citigroup Global Markets Taiwan Securities Co., Ltd.

Q

Hi. Good afternoon. My first question is, can you update the status of your license applications for shipment to Huawei? When do you expect to receive the approval from US government? And also does your 4Q revenue forecast include any wafer shipment to Huawei? This is my first question. Thanks.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay, Roland. So, your question is regards to – he wants an update of our license application status regarding Huawei. And he also wants to know, does our fourth quarter guidance includes any shipments to Huawei.

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Roland, we are complying fully with the regulation. And we also notice that there is a report saying that the TSMC got the license. We are not going to comment on this unfounded speculation. And we also don't want to comment on our status right now. For the 4Q shipment to Huawei, no, you know, the ban, the regulation already say that after September [ph] 17, (00:40:16) zero. September 15? Okay.

Roland Shu

Analyst, Citigroup Global Markets Taiwan Securities Co., Ltd.

Q

Okay. Okay. Thank you. Okay. My second question is, how is the price pressure across all technology nodes so far? Some of your foundry peers are considering to raise wafer ASP, given a very high utilization of 8-inch fabs. So, were you considering to follow to raise the pricing on 8-inch or on other mature technology node? Thanks.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay, Roland. Thank you. So, your second question is regards to pricing structure. Your note is that some of foundry peers are considering to raise the 8-inch wafer price. So, you want to know, does TSMC plan to raise our 8-inch wafer pricing or also raise our pricing on the mature nodes.

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Let me answer the question. The big answer is no. We continue to work with customers and customers are our partner. So, for short-term supply shortage, definitely we are not using this kind of opportunity to raise our price – our wafer price. We are selling our values, our service to our customers that including the technology, delivery, quality, everything. Certainly, TSMC is working with all customers and viewing them as partners. And so, we don't using this opportunity to raise our wafer price. Did I answer your question?

Roland Shu

Analyst, Citigroup Global Markets Taiwan Securities Co., Ltd.

Q

Yes. Thank you.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. Thank you, Roland. Let's move on, operator, to the next caller.

Operator: Yes. Next, we're having Brett Simpson from Arete Research. Go ahead, please.

Brett Simpson

Analyst, Arete Research Services LLP

Q

Thanks very much. Just had a question on your long-term capacity planning and you've laid out the view that we're going to see some structural tightness for the next couple years and foundries potentially. And I'm just wondering if you see – you have a very strong growth position in HPC but you still have a very [ph] low (00:42:29) market share in like X86 or PC and servers broadly.

I'm just wondering if we do see Intel looking to outsource major CPU lines to foundry, it could be a large onetime boost to the industry – to the foundry industry. So would TSMC be in a meaningful – would you be able to meaningfully support Intel's needs if there was a big onetime outsourcing and would you be prepared to take capital intensity to much higher levels should the opportunity arise? Thank you.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay, Brett. Let me try to summarize your question. Your question basically is premised around our long-term capacity planning and pointing out that there's a structural tightness in foundry and we – TSMC has a strong growth position. So, your question specifically relates to X86 and Intel. If Intel were to outsource in onetime – to foundry, your premise is that this could be a onetime big outsourcing opportunity and so how would we prepare or handle for this?

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Well, let me say that, we do not comment on the specific customers nor on the specific product. But let me say, our CapEx and capacity planning is based on the long-term demand profile that is underpinned by the industry's

megatrend to meet our customers' demand. And Intel is one of our important customers and we continue to work with them.

Brett Simpson

Analyst, Arete Research Services LLP

Q

Okay. Thank you. And maybe just a follow-up regarding your capacity plans over the near term. Are you planning to add any capacity at the mature nodes, maybe not so much 8-inch but certainly sort of 28-nanometer or even 16-nanometer? And do you foresee putting any customers on allocation given the backdrop with tightness at the moment? Thank you.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. So, Brett, your second question is regards to our capacity plans in the near term specifically at some of the mature nodes like 28-nanometer and 16-nanometer, are we planning to add capacity and with the tightness are customers on allocation.

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Well, again, let me say that we plan our capacity to meet customers' demand, whether it's leading edge or mature node or specialty. We always work with our customer dynamically and also work with them closely so to plan our capacity. And definitely today there is some shortage, but we are doing our best to serve our customers.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. Thank you, Brett.

Brett Simpson

Analyst, Arete Research Services LLP

Q

Thanks so much. Thank you.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Thanks a lot, Brett. All right. Operator, can we move on to the next caller on the line please?

Operator: Next one to ask question, Charlie Chan from Morgan Stanley. Go ahead please.

Charlie Chan

Analyst, Morgan Stanley Taiwan Ltd.

Q

Thanks and good afternoon, gentlemen. My first question is about your 2-nanometer progression because I think a couple weeks ago, there was a news talking about you may see the 2-nanometer in mass production in 2024. So just want to get your clarification about your progress here, maybe your technology roadmap and that realistic timing for the mass production? Thank you.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. So, Charlie, first question is in regards to our 2-nanometer. He says, according to news reports that the production is going to begin in 2024. Well, he wants to know whether we can share the technology roadmap, requirement, and the timing of our 2-nanometer.

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Charlie, let me say frankly, we are not ready to make any comment on the 2-nanometer yet, right?

Charlie Chan

Analyst, Morgan Stanley Taiwan Ltd.

Q

Okay. Yeah. But there seems to be some comment from your technology forum. So any reason why you can't disclose that to the investors' society yet?

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

No. I think, Charlie, all we have disclosed about our 2-nanometer is the location, which will be in Hsinchu, have not commented on the technology specifications, the timing or anything beyond that. So, that is, as you said, according to your reading the news, that is not TSMC's comment. And as C.C. said, we are not prepared to comment on 2-nanometer.

Charlie Chan

Analyst, Morgan Stanley Taiwan Ltd.

Q

Okay. Okay. No problem at all. And my second question is maybe to Wendell about the gross margin trend follow-up. So, based on your current depreciation table, when do you think depreciation is going to peak in the coming years or coming quarters, at what point?

And also, I think you mentioned that the new node ramp is a key factor due to gross margin dilution. But I think 4-nanometer is a part of the 5-nanometer family, right? So, can we expect that in 2022 there is not going to be any margin dilution from the 4-nanometer? Thank you.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

All right. So, Charlie, your second question is regards to depreciation and gross margin. Charlie wants to know when do we expect depreciation to peak up on a quarterly or an annual basis. And he also wants to know that would we expect dilution from 4-nanometer in 2022 given that 4-nanometer is an extension of our 5-nanometer so therefore, not a dilution from 4-nanometer.

Wendell Huang

Chief Financial Officer, Vice President-Finance & Spokesperson, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay, Charlie. The first question, really difficult to answer because if you continue to invest, you may not have a peak in depreciation. Just as if you continue to have strong growth, you may not have a peak in your revenue. So, the second question, yes we still expect that N5 family, the gross margin to reach corporate average in about seven or eight quarters which is sometime in 2022.

Charlie Chan

Analyst, Morgan Stanley Taiwan Ltd.

Q

Great. Okay. That's very helpful. Thank you.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Thank you, Charlie. Operator, let's move on to the next caller on the line please.

Operator: Right now we're having Laura Chen from KGI. Go ahead, please.

Laura Chen

Analyst, KGI Securities Investment Advisory Co. Ltd.

Q

Hi. Thank you for taking my question and congratulation for the good result. My first question is regarding the 3-nanometer, can you give us update on the current engagement? And we know that, C.C. just mentioned, we will have a risk production next year and mass production probably on the second half 2020. I'm just wondering will it be smartphone or HPC to go first. Thanks. That's my first question. Thanks.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. So, Laura, your first question is regards to our 3-nanometer. She wants to know what is the current engagement with customers? And then with the volume production targeted for second half 2022, is it going to be smartphone or HPC driven?

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

All right. Let me answer the question first on the engagement with customers. We are engaging with more customers at N3 as compared with N5 and N7 at a similar stage. Okay? So, there's a lot of customers that are working with us. And now, which one in the second half of 2022, which [indiscernible] (00:50:56) actually in smartphone and HPC application, both.

Laura Chen

Analyst, KGI Securities Investment Advisory Co. Ltd.

Q

Okay. Thanks. And my second question is about our supply chain and equipment procurement plans. I think, given our positive outlook and continuous CapEx, so do we plan to evaluate more local suppliers? I think given TSMC's leading position in the global foundry space, I think that give a good position to lead the localization in equipment.

So, can you give us some color about what's your view on the – buying more equipments from the Taiwanese supplier or current status as a total procurement percentage per year from Taiwanese vendors something like that.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay, Laura. So, your second question is regards to our vendor and supply chain procurement strategy. Your question is really, are we considering – will we consider to use more local Taiwan suppliers? Do we have any type of percentage breakdown or anything like that, all right?

Laura Chen

Analyst, KGI Securities Investment Advisory Co. Ltd.

Q

Yes. Yeah. Right. Thanks.

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. We develop the technology, or we maintain the technology and manufacturing based on best performance and the best cost structure. So, we did not put the – where it came from. Well, we did not put the regions into consideration to be frank with you. So, the best technology, the best manufacturing cost is what we count. And so we don't have any certain percentage stratification on which area the equipment came from. All right?

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. Does that answer your question, Laura? Okay. Thank you. Operator, let's move on to the next caller, please.

Operator: Next one we have Krish Sankar, Cowen and Company. Go ahead, please.

Krish Sankar

Analyst, Cowen & Co. LLC

Q

Yeah. Hi. Thanks for taking my questions. I have two of them. First one is on the mature nodes, i.e., 28-nanometer and above. Not currently but over the next few years, how do you expect the revenue and wafer starts to trend on the mature nodes especially as some of your customers start migrating to the leading edge?

And then my second question is, in the past you spoke about converting from 28-nanometer-plus capacity to 20-nanometer or so for IoT and other applications. Can you provide us an update on how this transition is going?

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. Thank you, Krish. Let me try to summarize your questions. Maybe I'll summarize the first one and then we can summarize the second. Your first question is regards to our mature nodes, specifically 28-nanometer and above. You want to know in the next few years what is the revenue outlook and also the demand or wafer starts outlook over the next few years especially as customers may start to migrate to more leading nodes, what do we do at the 28-nanometer and above, what is the outlook.

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Well, let me answer specifically on the 28-nanometer. We continue to improve the technology and now we offer 22 nanometers ultra-low power and that's for IoT applications and we also work with the customer to migrate their product from 65-nanometer/55-nanometer, to 45-nanometer, to 28-nanometer and to 22-nanometer. Today, the loading is not perfect yet but we expect in the one or two years and then we expect the loading will greatly improved. And so, to answer your question, on all the mature node, we still are improving our technology, and we still expect the growth.

Jeff Su*Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Okay. And I think, Krish, just to clarify your second question was in regards to 28-nanometer and your question was conversion to 20-nanometer, but as C.C. said, we're converting 28-nanometer to 22-nanometer. So, hopefully, that also addressed your second question.

Krish Sankar*Analyst, Cowen & Co. LLC*

Q

Indeed it does. Thank you, Jeff.

Jeff Su*Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

All right.

Krish Sankar*Analyst, Cowen & Co. LLC*

Q

Thank you, C.C.

Jeff Su*Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Sure, Krish. Thank you very much. All right. Let's move on, operator, to the next caller, please.

Operator: Next one, we're having Rick Hsu from Daiwa Securities. Go ahead, please.

Rick Hsu*Analyst, Daiwa-Cathay Capital Markets Co. Ltd.*

Q

Yeah. Hi. Good afternoon, guys. Okay. My first question is I just want to make a little clarification about your CapEx for this year. I think Wendell said about it's going to be around \$17 billion or it's going to be over \$17 billion. Can you clarify on this? And also give us a little bit color about the CapEx for next year, please?

Jeff Su*Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

So, your first question, to clarify our 2020 CapEx. What is, is it about or above \$17 billion?

Wendell Huang*Chief Financial Officer, Vice President-Finance & Spokesperson, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

It is about \$17 billion.

Rick Hsu*Analyst, Daiwa-Cathay Capital Markets Co. Ltd.*

Q

Okay.

Wendell Huang*Chief Financial Officer, Vice President-Finance & Spokesperson, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Yeah. For 2021 – I'm sorry.

Rick Hsu*Analyst, Daiwa-Cathay Capital Markets Co. Ltd.*

Q

Yeah. Please go ahead.

Wendell Huang*Chief Financial Officer, Vice President-Finance & Spokesperson, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Yeah. Your second question is about 2021 CapEx. It's too early to discuss the 2021 CapEx at this moment, but if we see strong demand, we will make the investments because the CapEx investment this year is always for the demand in the following years. So, if we see the following years have strong demand, we will invest.

Rick Hsu*Analyst, Daiwa-Cathay Capital Markets Co. Ltd.*

Q

All right. Thank you so much. I presume it's not a second question to just follow-up, right? Can I ask one more?

Jeff Su*Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Sure. Your second question, please.

Rick Hsu*Analyst, Daiwa-Cathay Capital Markets Co. Ltd.*

Q

Okay. So, the second question is about the inventory. I think C.C. did mention that right now because of the macro uncertainty with COVID-19, et cetera, so customers intend to keep the inventories above seasonal for a longer period of time. But what if – because unless uncertainty remains structural and it goes on forever, otherwise one day when uncertainty are removed, you worry about your customers unwind the inventory and cause some business correction?

Jeff Su*Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Okay. Rick, so your second question is with regards to inventory. Although there's macro uncertainty and COVID-19, but someday this will be over. So, this worry us what we see a sudden sharp correction or inventory drop as a result.

C.C. Wei*Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Okay. Let me share with you again our view on inventory. In fact we don't worry too much about it because of the – as I said, now, because of a pandemic, the digital transformation has been accelerated and that created a lot of new demand, let me say that. Looks like, taken for example, now, work from home, so now everybody buy a PC, every kid had to buy a PC. And then just look at again on the 5G smartphone's benefit, the advantage on bandwidth and the speed and low latency, The advantage on bandwidth and the speed and low latency, everything [ph] contributed to the needs (00:59:07) in this digital transformation. And so even right now is that we expect inventory is higher than historical high level, but the demand will pick up and in the next year or 2022 we are confident that demand will pick up, and so that minimize or mitigate the impact of the inventory correction that everybody has a doubt on their mind.

Rick Hsu

Analyst, Daiwa-Cathay Capital Markets Co. Ltd.

Okay. Great. Thank you so much.

Q

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

Sure. Thank you, Rick. Operator, let's move on to the next caller please.

A

Operator: Next one is Mehdi Hosseini from SIG.

Mehdi Hosseini

Analyst, Susquehanna Financial Group LLLP

Yes. Thanks for taking my question. First one, if your customers are willing to have inventories above this average trend line, should we assume that the wafer shipment in the first half of 2021, specifically Q1, would also follow a better than seasonal trend? And I have a follow-up.

Q

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

Okay. So, Mehdi's first question is regarding to basically our first quarter. If customers are willing to hold a higher level of inventory, should we assume that wafer shipments in the first quarter will also be much better?

A

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

We are going to share with you in the first investor conference, all right? Right now we are not ready to make any comment on 2021, especially the first quarter.

A

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

Okay. Your question, Mehdi?

A

Mehdi Hosseini

Analyst, Susquehanna Financial Group LLLP

Sure. Can you please remind us how we should think about tape-out activity, specifically the N4 and N5 and how does it compare to N7? [ph] Any thought on that (01:01:06) would be great.

Q

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

So your question is the tape-out activity at N4 and N5 as compared to N7.

A

Mehdi Hosseini

Analyst, Susquehanna Financial Group LLLP

[indiscernible] (01:01:18)

Q

C.C. Wei*Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Okay. The demand is very strong in N4, N5. We are engaging many customers. So the [ph] exact (01:01:30) number of the tape-outs right now is all in our planning but I can share with you that customer demand is very strong and will continue to be strong for the next couple of years.

Jeff Su*Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Okay. All right. Thank you, Mehdi. Operator, can we move on to the next caller, please?

Operator: Right now, we have Gokul Hariharan from JPMorgan.

Gokul Hariharan*Analyst, JPMorgan Chase & Co.*

Q

Starting from the first question, there has been a lot of discussion on market share on leading edge. So, C.C., could you comment a little bit on how do we think about TSMC market share in N7, which I think is probably at 85%, 88% or even higher, and compare that with what are we expecting for the N5 family if we include N5 and N4. And I have a second question. Thank you.

Jeff Su*Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

All right. Gokul's first follow-up question is in terms of market share. He wants to ask C.C. what do we see in terms of our market share at 7-nanometer and what is our expectation or outlook at the 5-nanometer family.

C.C. Wei*Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Gokul, since I will continue to say we have technology leadership, so I can share with you that we have very high percentage of market share. But what exactly the number is not appropriate to announce it because it's all our own estimates. Again, the most important thing is not market share, the most important thing for us is continue to maintain the technology leadership. Again, we are focused on that.

Jeff Su*Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Okay.

Gokul Hariharan*Analyst, JPMorgan Chase & Co.*

Q

Okay. Just a follow-up question on that. Could we say, at least directionally, if N5 market share [ph] in our own (01:03:30) estimates higher than N7 or similar to N7?

Jeff Su*Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Okay. So the second question Gokul wants to ask still on market share, if we see directionally, will N5 market share be higher than that of N7?

C.C. Wei*Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Yeah. Very similar because we are always the technology leader. When we introduced the N7, we are the technology leader. And when we introduced the N5 this year into mass production, we'll continue to be the technology leader. So, yeah, very similar.

Jeff Su*Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Okay.

Gokul Hariharan*Analyst, JPMorgan Chase & Co.*

Q

Understood.

Jeff Su*Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Thank you.

Gokul Hariharan*Analyst, JPMorgan Chase & Co.*

Q

Yeah.

C.C. Wei*Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Thanks, Gokul.

Gokul Hariharan*Analyst, JPMorgan Chase & Co.*

Q

Can I ask one more question?

Jeff Su*Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

I think, Gokul, sorry. That's two. So I would – sorry, I would like to ask you to get back in the queue because we still have quite a few.

Gokul Hariharan*Analyst, JPMorgan Chase & Co.*

Q

Okay. All right.

Jeff Su*Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Thank you. All right. Operator, let's move on to the next caller please.

Operator: Let's move on, we have Randy Abrams from Credit Suisse.

Randy Abrams*Analyst, Credit Suisse AG (Taiwan)*

Q

Okay. Thanks for the follow-up. I wanted to ask on the R&D, it stepped up faster during the quarter. From this higher level, could you discuss the investment rate that you're expecting for R&D, say, as a percent of sales? And would the new advanced nodes and packaging investments start to increase the R&D intensity?

Jeff Su*Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Okay. So, Randy's first question is that he noticed or points out actually that our R&D has increased or stepped up in the third quarter this year. So he wants to know, given advanced packaging and continued technology leadership, what is the R&D percentage of sales outlook that we should expect?

Wendell Huang*Chief Financial Officer, Vice President-Finance & Spokesperson, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Randy, let me share with you that in the third quarter, the R&D expenses are higher because of our development activities in N4 and N3. Longer term, we're still expecting the R&D expense to be about 8% or slightly higher than 8% of our revenue.

Randy Abrams*Analyst, Credit Suisse AG (Taiwan)*

Q

Okay. Great. Appreciate that. And then second follow-up question I had just on a couple of segments. Auto, I think you mentioned earlier about coming back. It was soft in the quarter. Could you discuss now like the growth driver from a low base if you're finally seeing some of those content drivers for the next one or two years, there could be a meaningful pickup even without auto but from a content. And the other side on consumer, which was quite weak despite a lot of work from home and consumer electronics coming through. So if you could give color maybe on something happening in the consumer segment.

Jeff Su*Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

Okay. So, Randy's second question is really a little bit split into two. But he wants to know with the automotive business seeming to bottom out, how do we view our automotive platform as a growth driver or outlook over the next few years. And then similarly, he also is asking about digital consumer.

C.C. Wei*Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.*

A

All right. [ph] Actually, (01:06:38) let me comment on the automobile platform. Actually, the COVID-19 has a major impact on the automotive market and supply chain this year have all been affected, but we are seeing the sign of recovery in 4Q. In the longer term, the trend towards safer, greener and smarter vehicle will continue to drive silicon content increase as well as the demand for advanced and specialty technology. And again, I want to emphasize with our technology leadership, we are well positioned to capture the opportunities.

On the growth rate, the growth rate will continue to pick up, but still behind the HPC's growth rate. And for the digital consumer, it's kind of flat or a little bit growth that I can see to-date. Did that answer your question, Randy?

Randy Abrams*Analyst, Credit Suisse AG (Taiwan)*

Q

Yes. Yeah, just maybe the near term, I was surprised that it was as much down factoring in [ph] the (01:07:52) stay at home consumer electronics demand, but I know, if anything, just [indiscernible] (01:07:55) short term in nature on that.

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. Actually some of the product because of stay at home or the work from home, some of the product we put into the HPC's category.

Randy Abrams

Analyst, Credit Suisse AG (Taiwan)

Q

Okay. All right. Great. Thank you.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. Thank you, Randy. Operator, let's move on to the next caller, please.

Operator: Next one is Sebastian Hou, CLSA.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Hello, Sebastian, you may need to unmute.

Sebastian Hou

Analyst, CLSA Ltd.

Q

Right. Exactly. Thank you. Thank you, Jeff. So let me – first question, let me try to overbook in inventory question in another way again, if I may. So I understand the higher inventory is structural led by COVID-19, but how about higher inventory if that's led by customers' fear of foundry's capacity tightness, which is now undersupply almost everywhere from leading edge to trailing edge. Based on the past cycles experience, the tighter the supply of any components, the higher the risk of supply chain overbooking. And hence, I'm curious whether TSMC is seeing any gap between customers ordering volume and your internal forecast of end demand, or if it's not a concern at all, as all the strong orders are just a reflection of the real demand. Thank you.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. So, Sebastian's question is around the inventory, and while his view, some of the inventory maybe related to COVID-19 and more structural or linger for a while. He wants to know, is there a concern – does TSMC have a concern that because the foundry is tight and therefore their customers are doing a lot of overbooking or so-called double booking. And also, therefore, does this create a concern for TSMC when we look at our internal forecast for the end demand market versus customers' booking? And there is a large gap and risk of shortfall.

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Well, Sebastian, actually in TSMC's view, all my customers are our partners. So we work with them very closely. And so to basically to minimize and the feel of overbooking because they don't have to be afraid of capacity shortage and then to do the over booking to TSMC. No, we work with them as a partner and we – both parties are

the – all my customer work with TSMC and share their view on the market and we share our view of the market with them also. So this one minimize all – a lot of the possibility of overbooking. And that's the way that TSMC working with our customers. They are all our partners. Did that answer your question, Sebastian?

Sebastian Hou

Analyst, CLSA Ltd.

Q

Great. Thank you. Yes, yes. That's a very, very great answer. Thank you, C.C. My second follow-up question is that we've seen the rising cross straight relationship risk in the recent months. So wondering if TSMC or your customers are concerned or discussed with you about the potential risk in production operation as most of your staffs are located in Taiwan. And in such a heightened risk continue for longer than just once, will TSMC consider to keep most of the fab below in Taiwan or increase investment in other regions? Thank you.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay, Sebastian, thank you. Let me summarize your second. Your question is regarding that you observed a rising or growing risk in the cross-straight relationships and so forth. Therefore, for our customers, do they feel there's a heightened risk and thus if there a need for TSMC to, I guess, paraphrase and expand our manufacturing footprint into other locations given the state of cross-straight relations in the next few years.

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. Sebastian. In fact, TSMC will continue to focus on Taiwan. I mean that's our center of R&D and majority of our production fabs what continue to be located in Taiwan regardless of all the geopolitical tension or any kind of disruption. Did that answer your question?

Sebastian Hou

Analyst, CLSA Ltd.

Q

Yes, yes. That's great. Thanks, C.C., and thank you, Jeff.

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Sure. Thank you, Sebastian. All right, operator, let's move on to the next caller, please.

Operator: Next one we have Bruce Lu from Goldman Sachs.

Bruce Lu

Analyst, Goldman Sachs (Asia) LLC

Q

Okay. So the question is for the advanced packaging. What is the revenue growth for the advanced packaging in 2020? The growth rate seems very strong while the management also only guided for the future growth for the advanced packaging is only slightly higher than the corporate average. This is much lower than what we have in the past 3 years. Any reasons behind that? And what's the profitability for the advanced packaging right now?

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. So, Bruce, your first question is with regards to our advanced packaging business. You want to know what is the growth of the advanced packaging business in 2020 and also what is the profitability of the advanced packaging.

Wendell Huang

Chief Financial Officer, Vice President-Finance & Spokesperson, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Yeah, Bruce, the growth of our advanced packaging in this year is close to the corporate, but not as high. In the next several years, we do expect that on CAGR basis, it will be faster – it will grow faster than the corporate average. And in terms of margins, its margin is lower than the corporate; however, its investment intensity, capital intensity is lower. Therefore, on a return basis, ROIC basis, it is acceptable to us.

Bruce Lu

Analyst, Goldman Sachs (Asia) LLC

Q

Okay. The next question is for the 28-nanometer, I want to clarify something. In the fourth quarter 2019, I think the management showed a very high confidence that 28-nanometer utilization rate will back to the corporate average driven by the more applications, such as CMOS image sensor et cetera. However, if my understanding is correct, management still expect anywhere below than the corporate average in the coming years in terms of utilization rate? Is that the right understanding right now?

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. So your second question, Bruce, is regarding our 28-nanometer. I mean...

Bruce Lu

Analyst, Goldman Sachs (Asia) LLC

Q

Correct.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

I'm sorry.

Bruce Lu

Analyst, Goldman Sachs (Asia) LLC

Q

I'm sorry. 28 nanometer.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

28.

Bruce Lu

Analyst, Goldman Sachs (Asia) LLC

Q

Yes.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Yes. 28-nanometer and that you said that we had commented in the fourth quarter 2019 earnings result January this year that our 28-nanometer utilization would improve in one to two years' time and to the corporate average and now your question is that statement still holds true?

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Bruce, let me say that the progress is a little bit slow than we expected, but still in one to two years, the utilization rate of the 28-nanometer actually we advanced it to 22-nanometer will be reached in the corporate average.

Bruce Lu

Analyst, Goldman Sachs (Asia) LLC

Q

I see. Thank you.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. All right. Thank you, Bruce. All right. In the interest of time, we will take the question from the last caller or last participant, please.

Operator: The last one to ask a question is Roland Shu from Citigroup. Go ahead, please.

Roland Shu

Analyst, Citigroup Global Markets Taiwan Securities Co., Ltd.

Q

Yes. Your N6 technology is with one more EUV layer insertion than N7+, but N4 is with reduced mask layers for N5 and is with a simplified process. So can you elaborate your technology development logic of N6 and N4 and also the target market for N6 and N4? And how will N6 and N4 contribute to your business respectively going forward?

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. Roland, so your question is regards to N6 versus N4 positioning. You point out technology-wise, N6 has one more EUV layer than N7+. But N4 may have reduced mask layers versus N5 and with simplified process. So you really want – you're asking that N4 served the same group or target the same group of customers as N6 or are they separate markets – or targeting separate customers and applications?

Roland Shu

Analyst, Citigroup Global Markets Taiwan Securities Co., Ltd.

Q

Correct. Thanks.

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Roland, it's actually very hard to answer your question whether the N6 is the same kind group of N4. Let me give you some kind of idea. N6 is kind of development, continue enhancement of the N7 or N7+. And so all the second wave of customer will use N6 when they want to enter the 7-nanometer family and because of that, they offer the better density, better performance and better power consumption.

Now, similar to N6, N4 is also – we continue to improve the N5 and we also observe that we can reduce the mask count we can improve the defect density, we can improve the cycle time and we also, at the same time, also offer the better density, better performance, et cetera, et cetera. And so are they the same group? I cannot answer this question. But in the same purpose, we offer N6 to be the second wave of the N7 customer. We offer the N4 also to offer to the second wave of the customer of N5.

Roland Shu

Analyst, Citigroup Global Markets Taiwan Securities Co., Ltd.

Q

Okay. Thank you. Yeah, it's a little bit complicated, yeah, because for N4, is there any performance enhancement to N5 because at least with the simplified process and you feel there is – I actually understand a little bit the improvement on defect, but the impact on this production cycle time, but how is it from the performance point of view? Is there going to be an enhancement in N5?

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Okay. So your second question, Roland, continues to ask about the 4-nanometer. Well, for N4, does it carry any performance enhancement or PPA improvement as compared to N5?

C.C. Wei

Chief Executive Officer & Vice Chairman, Taiwan Semiconductor Manufacturing Co., Ltd.

A

Yes. The short answer is yes. We improved the density, we improved the performance including the transistor performance.

Roland Shu

Analyst, Citigroup Global Markets Taiwan Securities Co., Ltd.

Q

Okay. Thank you.

Jeff Su

Investor Relations Director, Taiwan Semiconductor Manufacturing Co., Ltd.

Okay. Thank you, Roland. Thank you very much. All right. 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 four hours from now. The transcript will become available 24 hours from now. Both of them are going to be available through TSMC's website at www.tsmc.com.

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

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