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2330.TW - Q3 2019 Taiwan Semiconductor Manufacturing Co Ltd  
Earnings Call

EVENT DATE/TIME: OCTOBER 17, 2019 / 6:00AM GMT



OCTOBER 17, 2019 / 6:00AM, 2330.TW - Q3 2019 Taiwan Semiconductor Manufacturing Co Ltd Earnings Call

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**Elizabeth Sun** *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

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

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## PRESENTATION

**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

(foreign language) Welcome to TSMC's Third Quarter 2019 Earnings Conference and Conference Call. This is Elizabeth Sun, TSMC's Senior Director of Corporate Communications and your host for today.

Today's event is webcast live through TSMC's website at [www.tsmc.com](http://www.tsmc.com). If you are joining us through the conference call, your dial-in lines are in listen-only mode.

As this conference is being viewed by investors around the world, we will conduct this event in English only.

The format for today's event will be as follows: first, TSMC's Vice President and Chief Financial Officer, Mr. Wendell Huang, will summarize our operations in the third quarter 2019 followed by the guidance for the fourth quarter. Afterwards, Mr. Huang and TSMC CEO, Dr. C.C. Wei, will jointly provide company's key messages. Then we will open both the floor and the line for the Q&A.

For those participants on the call, if you do not yet have a copy of the press release, you may download it from TSMC's website at [www.tsmc.com](http://www.tsmc.com). Please also download the summary slides in relation to today's earnings conference presentation.

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 the actual results to differ from -- materially from those contained in the forward-looking statements. So please refer to the safe harbor notice that appears on our press release.

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



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

Thank you, Elizabeth. Good afternoon, everyone, and thank you for joining us today. My presentation will start with the financial highlights for the third quarter followed by the guidance for the current quarter.

Third quarter revenue increased 21.6% quarter-over-quarter to TWD 293 billion, driven by new product launches, both in premium smartphone and high-performance computing applications using TSMC's industry-leading 7-nanometer technology.

Gross margin increased by 4.6 percentage points sequentially to 47.6%, mainly due to a solid improvement in capacity utilization.

Total operating expenses accounted for 10.7% of net revenue compared to 11.2% in the second quarter due to better operating leverage.

Operating margin increased by 5.1 percentage points sequentially to 36.8%.

Overall, our third quarter EPS was TWD 3.9 and ROE was 25.7%.

Now let's take a look at revenue by technology. 7-nanometer technology saw very strong demand and accounted for 27% of wafer revenue in the third quarter. 10-nanometer was 2% and 16-nanometer was 22%.

Advanced technologies, which are defined as 16-nanometer and below, accounted for 51% of wafer revenue, up from 47% in the second quarter.

Now let's take a look at revenue contribution by platform. All 4 of our growth platforms saw demand increases in the third quarter. Smartphone increased 33% quarter-over-quarter to account for 49% of our third quarter revenue. HPC increased 10% to account for 29%. IoT increased 35% to account for 9%. And automotive increased 20% to account for 4%.

Moving on to the balance sheet. We ended the third quarter with cash and marketable securities of TWD 585 billion, a decrease of TWD 180 billion from the second quarter, mainly as we distributed TWD 207 billion of cash dividends for 2018.

On the liabilities side. Current liabilities decreased by TWD 127 billion quarter-over-quarter as we distributed 2018 cash dividend and accrued another TWD 65 billion or TWD 2.5 per share for the second quarter 2019 cash dividend and that will be paid in January of next year.

On financial ratios. Accounts receivables turnover days decreased 1 day to 41 days. Days of inventory decreased 11 days to 65 days, reflecting higher wafer shipments during the quarter.

Now let me make a few comments on cash flow and CapEx. During the third quarter, we generated about TWD 142 billion of cash from operations, spent TWD 98 billion in capital expenditures and distributed TWD 207 billion of cash dividend. As a result, our overall cash balance decreased by TWD 197 billion to TWD 452 billion at the end of the quarter. In U.S. dollar terms, our third quarter capital expenditures was \$3.14 billion.

I have finished my financial summary. Now let's turn to fourth quarter guidance. Based on the current business outlook, we expect our fourth quarter revenue to be between USD 10.2 billion and USD 10.3 billion, which is a 9% sequential increase at the midpoint.

Based on the exchange rate assumption of USD 1 to TWD 30.6, gross margin is expected to be between 48% and 50%. Operating margin is expected to be between 37% and 39%.

This concludes my financial presentation. Let me follow by making a few comments about 2019 capital expenditures and TSMC's long-term financial objectives.

I will first talk about our capital budget for this year. In TSMC, we build capacity according to our customer's demand. To forecast such demand, we take into consideration not only from each individual customer's indication, but also our own forecast based on macro as well as market segment



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outlook. Given the stronger outlook for 5G deployment next year, the demand for our 7-nanometer and 5-nanometer has increased significantly in the last few months.

We have, therefore, decided to raise our full year 2019 CapEx by USD 4 billion to meet this increased demand. We now expect our 2019 CapEx to be between USD 14 billion and USD 15 billion. About USD 1.5 billion of the USD 4 billion Capex increase is for 7-nanometer capacity and \$2.5 billion is for 5-nanometer capacity.

Although we're not able to give you a formal guidance for our next year's CapEx until next January, we currently plan next year's CapEx to be somewhat similar to our revised 2019 CapEx.

Now let me state our long-term financial objectives. As the company's new CFO, I'm happy to tell you that TSMC's long-term financial objectives remain the same. Our goal is to achieve revenue and net income CAGR in the next few years to be between 5% and 10% in U.S. dollar terms, gross margin to be about 50%, operating margin to be about 39% and ROE to be above 20%.

Regarding our cash dividend policy. We reiterate that we will distribute about 70% of free cash flow as cash dividend. More importantly, TSMC is committed to a sustainable cash dividend on both an annual and quarterly basis.

Now I will turn the microphone to C.C.

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

Thank you, Wendell. Good afternoon, ladies and gentlemen. Let me start with our near-term demand and inventory.

We conclude our third quarter just reported by CFO with revenue of TWD 293 billion or USD 9.4 billion. That is slightly above our guidance due to better demand from smartphone-related applications than our forecast 3 months ago.

Moving into fourth quarter this year, we expect demand from both smartphone- and high-performance computing-related applications will continue to increase, thanks to our industry-leading 7-nanometer technology that powers these applications.

On the inventory front, our fabless customers' overall inventory is being gradually digested throughout the third quarter. We now expect it reduce to a few days above seasonal level exiting third quarter then approach seasonal level by the end of this year.

For the full year of 2019, we forecast both the overall semiconductor market excluding memory and the foundry segment to decline by a low single-digit from the year 2018 level. However, we continue to expect TSMC to do better and achieve a slight annual growth.

Now let me talk about the progress and development of 5G. 5G will drive AI applications and bring many benefits to the market. Performance will be greatly improved with data transmission speed up to 10x faster as compared to 4G network. In addition, 5G latency will have about a 90% reduction as compared to 4G, allowing for real-time response and control. The benefit from 5G will unlock new use cases such as AR, VR, real-time translation and high-quality gaming, to name a few. We believe smartphone OEMs will come out with many more innovative applications to take advantage of the 5G infrastructure.

Since the middle of this year, we have been seeing an acceleration in the worldwide 5G development. This will speed up the introduction and deployment of 5G network and smartphone in several major market around the world, which leads to the increase of our CapEx for this year. We expect a faster ramp of 5G smartphones as compared to 4G with the penetration rate of 5G smartphones to reach mid-teens percentage of the total smartphone market in 2020.

Meanwhile, we expect the silicon content of 5G smartphones will be substantially higher than that of 4G smartphones. That is due to increasing functionalities and additional ICs for more camera, RF circuit, modem, power management IC, et cetera.

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Power efficiency, speed and ability to incorporate additional functionality are critically important to 5G smartphones, which require TSMC's leading-edge technology and will continue to fuel our growth for the next several years.

Now I will talk about our N5 and N3 status. Our N5 technology has already entered risk production with good yield. The N5 will adopt the EUV extensively and is well on track for volume production in the first half of next year. With 80%, 8-0, logic density gain and about a 20% speed gain compared with the 7-nanometer, our N5 technology is true full node stride from our N7. We believe it will be the foundry industry's most advanced solution with the best density, performance and power until our 3-nanometer arrives.

With N5, we are further expanding our customer product portfolio and increasing our addressable market. The initial ramp will be driven by both mobile and HPC applications. We are confident that 5-nanometer will have a strong ramp and be a large and long-lasting node for TSMC.

Now I will talk about the N3. We are working with customers on N3 and the technology development progress is going well. Our N3 will be another full node from our N5 with PPA gain similar to the gain from N7 to N5. We expect our 3-nanometer technology will be the most advanced foundry technology in both PPA and transistor technology when it is introduced.

Now I will talk about the ramp-up of N7, N7+ and the status of N6. Today, we are completing our second year ramp of N7. We continue to see very strong demand across a wide spectrum of products for mobile, HPC and IoT applications. Our N7+ is the industry's first commercially available EUV lithography technology.

N7+ provide 15% to 20% higher density with improved power consumption when compared to N7. That is already in high volume production with yield similar to N7. We expect the strong demand for N7+ continue into next year and are increasing Capex to meet this demand for multiple customers.

Now N6. Our N6 provide a clear migration path for the second-wave N7 product as its design rules are 100% compatible with N7 while providing 18% logic density gain with performance-to-cost advantage. The N6 uses one more EUV layer than N7+. N6 risk production is scheduled to begin in first quarter next year with volume production starting before the end of 2020.

We reaffirm 7-nanometer will contribute more than 25% of our wafer revenue in 2019 and we expect even higher percentage in 2020 due to worldwide development of 5G, accelerated demand from HPC, mobile and other application continue to grow.

Finally, I will talk about TSMC's advanced packaging business. Our advanced packaging solutions enable system integration with wafer level process, allowing seamless integration of front-end wafer process and back-end chip packaging. The solutions consist of CoWoS, InFO, System on Integrated Chips or SoIC and the Wafer on Wafer or WoW. We are seeing strong momentum for CoWoS and InFO for HPC applications as we continue to enlarge the integrated chip area to about -- to above 2 reticle size in 1 module.

We are also working with a few leading customers on SoIC, which is an industry-leading 3D-IC packaging solution. SoIC enables 3D integration of multiple chips in close proximity to deliver the best possible performance, power and form factor. We target to start production in 2021 time frame with early adoption by HPC applications.

As our industry continues to seek innovation to enhance system level performance, TSMC's differentiating advanced packaging solution will allow us to grow the business at a pace faster than corporate in the next few years. And thank you for your attention.

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**Elizabeth Sun** - Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division

This concludes our prepared statements. Before we begin the Q&A session, I would like to remind everybody to limit your questions to 2 at a time to allow all participants an opportunity to ask their questions. Questions will be taken both from the floor and from the call. Should you wish to raise your questions in Chinese, I will translate it to English before our management answers your question. (Operator Instructions) Now we begin.

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## QUESTIONS AND ANSWERS

**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

First, we will have questions coming from Crédit Suisse, Randy Abrams.

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

Good results and outlook. Wanted to ask the first question given the high CapEx for this year and next year, if you could talk about the capital requirements for 5-nanometer in EUV. Maybe how the equation with EUV coming in, how does that affect the capital intensity, or say, the CapEx per thousand wafers? And how do you see this node in terms of pricing and maintaining the same level of profitability than prior nodes?

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

Okay. So Randy, you're asking about how much EUV accounts for the capital expenditures?

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

Or how EUV changes your capital intensity or CapEx per K. If you're getting some benefits that it's actually lowering that. But given that CapEx is it still the same, you're seeing the higher CapEx per K? And then how does that translate into profitability? How you expect 5 to compare to, say, some of the prior nodes.

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

I cannot talk too much about details. But definitely, CapEx per K for 5 is certainly higher than previous nodes. However, if we combine everything together, as we said at the beginning, we're still seeing our profit -- structure profitability remains the same.

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

Okay. I'll ask one follow-up to that and then a second question. Is this year, like second half, strong demand leading-edge type the gross margin guidance for fourth quarter is still -- it's a good margin, but it's 48% to 50% and I think the target is staying at 50%. So maybe if there's still a little bit of drag on the margin?

And with next year bringing in a new node 5, if you think you can get to that 50% for next year. That's just a follow-up.

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

Okay. For the fourth quarter, it's just like we stated all along, if we're -- our structural profitability, when we reach 90% of utilization, we target to reach 50% of gross margins.

For next year, still early to say, but structural profitability -- or profitability or margins may be affected by the ramp in a 5-nanometer as at the beginning of ramping of every technology nodes, it will somehow be affected. However, if the utilization is good, then we're still expecting to see the structural profitability continues.



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

Okay. The second question I wanted to ask because you had a strong third quarter recovery, guiding another good fourth quarter, as you look to maybe an early look at next year, how should we think about seasonality? There are some concerns before 5G ramps we have a correction in 4G. And then we have if the tariffs hit, we might have had some prebuild. So how do you see kind of early year risk of, say, a correction? And can you pull in some demand, say, if capacity is tight to maybe mitigate the magnitude of correction early in the year?

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

You're talking about the seasonality of smartphone. That we observe almost every year, and so I don't expect next year to be dramatically different. However, we did see some of the 5G smartphones, the growth momentum is higher than we expected. So I would expect next year's seasonality is not so strong as we observed for this year. But it's too early to say because the market is very dynamic.

**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

Next question will be coming from JPMorgan's Gokul Hariharan.

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

So first of all, if we look at the history, whenever TSMC has had a step-up in CapEx, that is typically accompanied by a step-up in growth as well. So just wanted to kind of narrow down a little bit on the 5% to 10% growth, which is still kind of -- the kind of growth that we were expecting when we were spending TWD 10 billion to TWD 11 billion. So could you give a little bit more details or maybe narrow down the forecast a little bit more for us? Because if we say a TWD 14 billion to TWD 15 billion range of CapEx, that's closer to the high 30s or 40% capital intensity, higher than our previous range.

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

Gokul, let me answer the question carefully. Let's say that TSMC always build capacity, working closely with customer and to meet their demand. That's our number one, okay? We discuss with the customer on their demand, we make our judgment also. Now we are increasing the CapEx quite a lot, no doubt about it. But then, that's due to some of the reasons I can foresee for the future. First, the 5G's ramp-up is much faster than 4G as we expected. Second, TSMC actually is expanding our customer portfolio, and in the same times, we're also expanding our product portfolio. And so put all the factors together, we have a good reason that we increase our CapEx this year and probably next year.

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

Okay. So that basically suggests that 5% to 10% is not the growth for the next couple of years. But maybe just given the higher growth in 5G and accelerated build-out, could you talk a little bit about going into next year, do you expect 5G and smartphone to be the main growth driver? Or do you feel that HPC momentum is going to be even faster than smartphone given that some of your customers are starting to take a lot of market share?

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

To answer your question, actually it's both. We expect the smartphone to grow faster than -- I mean that's not in terms of unit, but in terms of silicon content. And HPC also grow. As I said, we are expanding our product portfolio and also our customer portfolio. So the addressable market is increased. That's all.



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

Okay. Just a follow-up question. I think at the beginning of the year, we had a more conservative view on 5-nanometer build-out. Obviously, that view has changed. So just to calibrate, should we expect now that 5-nanometer revenues next year are likely to be higher than, let's say, 7-nanometer last year, first year of ramp of 7-nanometer?

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

I don't want to say exactly what is the percentage. But let me say that now we have more optimistic than 6 months ago. Six months ago, I believe what I said is we will be very careful and a little bit conservative in building the 5-nanometer capacity. Now we changed to be more aggressive in the 5-nanometer capacity buildup because of we -- as I said, we work closely with customers in both -- all the applications like a smartphone, HPC, now even IoT and automotive.

**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

Next question will be coming from UBS, Bill Lu.

**Bill Lu** - *UBS Investment Bank, Research Division - MD and Asia Semiconductors Analyst*

First of all, Mr. Huang, congrats on the new post and looking forward to working with you. Going back to CapEx, given the big increase, can you give us some guidance for modeling depreciation?

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

Depreciation for this year will be flattish compared with last year because a big chunk of the increase happens in the fourth quarter.

As to depreciation next year, based on what I just indicated about our capital expenditures for next year, it will be higher. However, the detail number or more specifics, we plan to discuss it in January next year.

**Bill Lu** - *UBS Investment Bank, Research Division - MD and Asia Semiconductors Analyst*

So if I look at when the new capacity is going to come online, is it mostly, say, Q2, Q3? Is that the right way to think about it?

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

Well, if you look at the tools' lead time, your estimate is very good. Q2, Q3 time.

**Bill Lu** - *UBS Investment Bank, Research Division - MD and Asia Semiconductors Analyst*

Okay. Great. Dr. Wei, for 7-nanometers, obviously demand looks quite good. Can you give us some guidance for 7-nano as a percentage of revenues by end of next year?

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

Higher than this year.



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**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

Next question will be coming from Citigroup's Roland Shu.

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

First, congrats for the very good result in 3Q. And I think our first question is you talked about next year for 5G smartphone will be the key growth driver. So also you talked about not only because of unit growth, but also for the semiconductor content increase. So do you have the number for the dollar content per 5G smartphone compared to your 4G?

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

Let the CFO to answer this.

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

The answer is we don't have that number.

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

But if you compare to the 4G, where does the increase come from? Is it because from this bigger die size or because of more semiconductor silicon? Or I think you probably have an assessment more or less, right?

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

We do have some assessment, to be frank with you, because we know the die size, we know the number of the chips inside. I give you some of that -- the feeling. We are using the more advanced technologies so the die size increase on the leading edge is not so much, but it did increase because of more functionality, you can expect that people put AI application inside or those kind of things. More important, as the last time I believe I already mentioned that camera, for one example, now you can see more and more camera in smartphone, especially the high-end smartphone. And also the more resolution, the one will take silicon's real estate to -- from 12, what is that, 20 megapixel to 40 megapixel. So more camera, higher resolution, more pixel. And then also you need a lot of power management IC to control the power consumption because of 5G, they consume a lot of power. So your power management IC has to be more advanced, so you put more power management IC inside. And then you are talking about more channel in the communication, so the RF front-end, the transceiver, everything. You have not only the die size will increase actually to adopt the more channel. So it's even -- move into the higher leading-edge technology also.

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

So I guess for the high end phone, probably the dollar content will increase more, right? So for your -- the total 5G smartphone unit forecast to be about mid-teens of the total shipment. So do you have this 5G smartphone breakdown by high end, mid and low end?

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

We'll talk about it in January.

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

Okay. My second question is now we are ramping up N7+ fastly. So is N7+ gross margin going to be very different from N7 we are enjoying now?

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

It's very close.

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

Okay. And how about for N7+, is this going to take 7 to 8 quarters to bring up the gross margin to corporate average?

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

Let me take that. We look at 7, 7+ and 10 as a big node. So from that point of view, N7 nodes actually has reached corporate margins.

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

Okay. I think just a follow-up for -- I know you don't comment on the ASP, but for the same amount of the wafer shipment on N7+, is this going to contribute more revenue upside to TSMC?

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

You just mentioned we don't.

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

No, I talk about revenue. I don't talk about ASP.

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

That's the same thing.

**Elizabeth Sun** - Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division

Next question will be coming from CLSA's Sebastian Hou.

**Sebastian Hou** - CL Securities Taiwan Company Limited, Research Division - Research Analyst

My first question is to -- I want to ask about the CapEx intensity. So with the hike in this year CapEx, so apparently we can do the math that if this capex-to-sales will go up to shoot over 40% this year. So how do you see this trend into 2020?

And then is there any updated guidance on the CapEx intensity going forward versus prior guidance?



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

Okay. Yes. As you just mentioned, you can calculate the CapEx intensity this year will be over 40%. At the same time, as we indicated that next year's CapEx, although preliminary, is about the same level as this year and we also see strong demand for our business next year, our CapEx intensity will be lower next year. And what -- from what we can see at this moment, it will then gradually come down to probably between 30% or 35% level going in -- after next year.

**Sebastian Hou** - *CL Securities Taiwan Company Limited, Research Division - Research Analyst*

So we are not seeing going to 30% to 35% range in 2020 yet?

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

In a couple of years after 2020.

**Sebastian Hou** - *CL Securities Taiwan Company Limited, Research Division - Research Analyst*

But could potentially next year? You just -- you don't want to talk about that right now?

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

Right. The potential of capital intensity, you mean?

**Sebastian Hou** - *CL Securities Taiwan Company Limited, Research Division - Research Analyst*

In other words, you're mid-30s by 2020?

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

It's lower than 40%.

**Sebastian Hou** - *CL Securities Taiwan Company Limited, Research Division - Research Analyst*

Okay. Second question is on the gross profit margin. I recall that a couple of quarters or 2 quarters ago in the first half this year when TSMC pound the table saying that we are past the bottom, we are seeing the strong rebound in second half this year and also expect the gross margin will go back to 50% level second half. And indeed, now we see the utilization rate coming at -- coming back, revenue coming back in second half as expected. But it looks like the gross margin is lagging a little bit compared to if you -- yes, compared to the revenue direction. So can you explain what are these factors that driving gross margin recovery behind the revenue recovery?

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

Yes, I think you're talking about the third quarter gross margins. Whenever there's a big jump up in utilization quarter-over-quarter, there will be a negative hit on gross margins. It's called the inventory revaluation. I think -- I believe we mentioned about this some time ago. So yes, as you can imagine, the utilization in the third quarter is much higher than that in the second quarter. And therefore, there is an element of negative inventory valuation happen in the third quarter. The amount is slightly over 1 percentage point, okay? Now if utilization remains at similar level, that factor will not happen.



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**Sebastian Hou** - CL Securities Taiwan Company Limited, Research Division - Research Analyst

Okay. But when we're looking at the fourth quarter gross margin guidance, I know the high end will reach the 50%. But it still looks like the -- it's ranging between 48% to 50%. So I mean there is still a chance for coming to go back to 50%, but it looks like the midpoint doesn't reach that yet. So I think not just about 3Q, but also the fourth quarter.

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

Yes. As I mentioned earlier, I -- our structure profitability remains the same, i.e, if we reach 90% of utilization, we are targeting 50% of gross margins.

**Elizabeth Sun** - Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division

Next question will be coming from Morgan Stanley's Charlie Chan.

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

Congratulations for very good, strong results. So sorry to keep coming back to this question. So it seems you are raising kind of long-term CapEx outlook including next year. Why don't you just revise up your revenue CAGR assumption. I think 5% to 10% revenue should be too conservative. Can you comment on that part?

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

It's not about time to change that target. I would say still 5% to 10%, but it's in the upper side. Okay. I can say.

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

All right. Yes. And another on this capital intensity question is about the payback period, right? Because for me I still cannot add up why your structural profitability can remain the same whereas your capital intensity increased so much, right? So in other way, can you just comment about the payback period for your 7-nanometer and 5-nanometer investment you said becoming longer going forward?

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

I remember this topic was discussed last time and I think our answer was that we don't look at payback period. We do look at return on invested capital. And from that part, we don't see that big a difference with the advanced technologies.

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

Okay. And my next question is about the advanced packaging. I remember in the previous quarters, you commented advanced packaging should outgrow the front-end business. So first of all, is this remains the same trend? And also how about the potential margin dilution from the packaging business?

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

The forecast on the advanced packaging business, the growth is -- the growth rate is still faster than silicon growth rate. The wafer's revenues growth rate stays the same, okay? Still that statement is still valid. The gross margin, that's another consideration. The gross margin of the back-end



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business actually is lower today, still lower than the wafer margin. But we look at it whether it's a good business to go or not on 2 factors. One, we really want to support our customer to improve their system performance. So we have to do it because of TSMC is the only one company right now who can support customers' advanced packaging. Second actually is the CapEx intensity on the back end, and that's advanced packaging business, is smaller. And so the asset turnover is better. So put all in all together, we still think it's a very good business to pursue.

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

Yes. And last one, this is a quick one maybe for CFO. Because you revised up your CapEx, right, so what is the free cash flow trend in the coming quarters? I guess we want to know potential -- the next potential quarterly dividend hike. What would be the timing?

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

Let me just answer it by saying that we will not lower our dividends quarter-on-quarter basis. So investor will get at least the same amount, if not more, compared to previous quarter or compared to previous year.

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

Okay. How about the base, I mean, the free cash flow projection? Do you have the number for coming quarters?

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

Yes. We do. But I don't think that really matters to your question.

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**Elizabeth Sun** - Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division

If I may, I would like to remind Charlie that today, all our shareholders are getting the \$2 per share dividends today going into their bank account. And we have already announced that the next quarter -- quarterly dividend is going to be \$2.50. So it has already gone up.

Next question will be coming from Goldman Sachs, Bruce Lu.

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

Can I ask, what is your 5G penetration forecast about 6 months ago? 5G smartphone penetration forecast 6 months ago.

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

Six months ago, we don't see the 5G smartphone will be any significant amount for this year. And so...

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

No. I mean, 6 months ago, what's your forecast for 5G smartphone shipment in 2020?

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

Oh, single digit.



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

So basically, you increase it from single digit to mid-teens?

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

Mid-teens. Yes.

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

For the past 6 months?

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

Yes.

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

Can you tell us what is the rationale behind your changes? Because for the past 6 months, we still have a lot of concern for the 5G smartphone such as NSA/SA that the specs not finalized, the cost structure is getting a lot higher, global telcos they are not as aggressive. So can you -- because from single-digit to mid-teens, which is the big changes.

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

Right. It's a big change. And all I can say is whether it's NSA, SA or those kind of 5G's base station installation, we work with our customer. Actually, we listen to them. And they also have their own customer to consider. And so some of the areas in the world, they accelerated 5G's deployment and that's why its result as compared with 6 months ago, we did not see this momentum. But then in these 6 months, the momentum has grown bigger and bigger and so that's why we -- I cannot give you the specific number of which country or which region, but we can see the momentum continue to grow. And now our own estimate had almost doubled.

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

But the concern is still there from a lot of investors, such as the NSA or SA because you still cannot see the clear indication from -- at the end of the day from the telcos, right? So that's why we are a bit surprised to see these kind of meaningful changes, right?

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

Yes. I have no way to comment on the carrier how they think about this kind of 5G deployment. But they are moving ahead and -- for the 5G application, especially some of the big countries. That's what we see.

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

Okay. My next question is that we always rely on management to comment about the fabless inventories. I mean you always talk about that. But moving forward, your top 2 customer, it might account for 30%, 40% of your business pretty soon. And they might account for 70%, 80% of your



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advanced geometry and they don't really report their inventory anyway. So how -- can you give us something -- some other indicator for us to judge the industry growth or judge the inventory level for the industry?

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

Judge for the industry level, we -- the fabless company is still one of the big factor that we consider. As for my customers, actually for TSMC more importantly, we really work with our customers closely, so I'm not going to give you the exact number of my big customers' inventory, but we work with them. Believe me, we very closely work together so we understand their strategy and their inventory.

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

That's why I wanted you to give us some hint, right? We cannot just tell my investors that we have to trust TSMC. Even though I say that all the time but...

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

You can trust TSMC. No doubt about it.

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**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

All right. I think this is probably about the right time that we go to the lines for questions. I think there are quite a few analysts waiting on the line for questions. So operator, could you please go to the first person on the line? Thank you.

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**Operator**

Yes. We have questions from Brett Simpson from Arete Research.

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

I had a question really on China. I guess in the last couple of years, we've seen the business double with Chinese customers. I guess at the moment, it's pretty clear you're going through a very healthy inflection point in the Chinese customers at the moment. So can you talk about how you see this part of the business evolving over the next 1 or 2 years?

And then I guess from a planning perspective, are you concerned that the rise of your China business comes at the sacrifice of other customers, particularly U.S. companies?

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

Can you repeat the question?

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**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

Brett, your question is with respect to the business we derive from China as you have observed that our business has doubled in the last couple of years from China. And you would like to see the outlook for our business in China in the next 1 to 2 years. And also the strong growth coming from China, whether it is coming at the expense of our other customers in other regions.





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

Well, we did see the strong growth from China because that's a very big market, especially in the semiconductor area. And we are happy to see that growth, and TSMC is offering the most leading-edge technology to support our customer in China. And so to be exact, we are going to grow with the China market. At the expense of other customer, the answer is no because we support all the customer with all our strength and our capacity.

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

Okay. And maybe just a follow-up on 5-nanometer specifically. I guess maybe you can talk about whether you think the ramp of the 5-nanometer will be similar to prior nodes in wafer terms or revenue. How should we think about the ramp-up, particularly as you get through into the second half of 2020?

And on your CapEx increase, I think you've said in the past you want to -- you plan to grow -- you've been quite consistent. You want to grow your top line 5% to 10%, but your capital intensity to support that growth would be around about 30 or maybe even low 40s as a percent of sales. Now you're stepping up your capital intensity significantly, but you're not changing your growth outlook. Can you perhaps just explain the thinking there?

**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

So first part of the question is with respect to 5-nanometer ramp, whether the ramp profile next year will be similar to our prior nodes' ramp profile.

The second question is related to the substantial increase in the CapEx. Because in the past, TSMC has indeed said that we could have \$10 billion to \$12 billion CapEx to support a 5% to 10% CAGR. Now our CapEx is substantially higher than the \$10 billion to \$12 billion. And therefore, does that mean that it's going to support a much higher CAGR on the revenue growth?

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

Well, let me answer the first question first, the 5-nanometer's ramp for next year. Certainly as compared with 6 months ago, we are right now more aggressive and more optimistic about it. And hopefully, because we spend big money, hopefully, that it will ramp up much in terms of revenue, be much faster than 7-nanometer. In next January, we are going to talk about it more.

And so that also answers the second question, that we spend -- we increased the CapEx quite a lot, of course, from \$10 billion to \$11 billion to about \$14 billion to \$15 billion. With that money, we spend to buy the tools to prepare everything. We do expect that our growth will go beyond 5% to 10%. But right now, we are not ready to change that long-term 5-year's target yet. However, we are working on that.

**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

Operator, please go to the next caller on the line.

**Operator**

Your question comes from the line of Mehdi Hosseini from SIG.



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

A couple of follow-ups. When you made the reference to 5G, how should we think about opportunities from the networking, specifically base station?

Thanks for the detailed color on the smartphone units, you expect a mid-teen penetration. But how would you quantify opportunities from the networking, specifically base station? And I have a couple of follow-ups.

**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

So Mehdi, your question is that although we have talked about 5G smartphone units for next year, but you would like for our management to talk about the 5G base station business next year.

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

Actually, the networking is fundamental for the 5G's infrastructure. And because of its shorter wavelength, so that you can expect that the base station will be much more than 4G's base station under SA or even the -- for the NSA's implement. So we expect the networking processor will be much higher. The opportunity will dramatically increase. Whether it is exactly for the number, we don't have an exact number right now.

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

Is networking included in the HPC category?

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

Yes.

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

Okay. So the reason I ask this question is if your customers are building specifically a 5G smartphone, could opportunities in networking actually help offset any downside risk to excess inventory built on the smartphone?

**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

I think, Mehdi, you are asking whether or not the increasing demand in the networking side will offset the higher inventory or the inventory correction on the smartphone side. Is that your question?

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

Yes. If there is an inventory, I'm trying to understand how networking could offset any risk of inventory built.

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

I did not catch what you say. The relation between the networking or the base stations are set up with the 5G smartphones inventory.



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

Sorry, let me clarify. I think one of the concerns among the investment community is, yes, there is a very strong build plans for the 5G smartphone, but the risk is these phones are too expensive and perhaps there is a risk that your customers' build plans are too aggressive. In that context, could opportunities on the networking side be large enough for TSMC to help alleviate any downside risk on the phone -- or excess inventory on the phone side?

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

Oh, I see. Okay. Let me repeat your questions. You say that my customers are making the smartphone quite a large number. If the base station or networking did not catch up, is that smartphone going to be inventory? The answer is no because of the 5G's application will be implemented. And you bought a 5G smartphone, you still can use 4G's functionality, by the way. So it won't be a kind of inventory as you mentioned about it provided you have just not enough 5G's base station.

**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

So Mehdi, I think what C.C. is saying is that you don't have to worry too much about 5G smartphone inventory because there will be sufficient demand to take up those products.

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

Yes. And then just a real quick follow-up. In the past, you have talked about advanced packaging accounting for high single digit of overall revenue in 2019 and that mix would grow into the teens in the next decade. Are those targets remain intact?

**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

Advanced packaging used to account for about high single-digit percent of TSMC's revenue. Mehdi's question is, will that continue to increase to maybe high teens of TSMC's revenue?

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

It will continue to increase, but it's not a high teens. It's still the high single digit, but the growth rate is higher than the silicon wafer's growth rate.

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

Okay. And is cryptocurrency stable? Should we be concerned that maybe some of this growth is driven by crypto? Or do you see crypto as pretty stable and minimal downside risk?

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

All right. You are talking about cryptocurrency mining. We did see the Bitcoin's prices increase starting from this year until now. However, let me state TSMC's policy and strategy. We will support cryptocurrency mining as a business with available capacity. That's what we will say. We are not going to be adding more CapEx for that.

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**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

Operator, could you please go to the next caller on the line?

**Operator**

Your next question comes from the line of Sangam Iyer from Consilium.

**Sangam Iyer** - *Consilium Investment Management*

I just want to understand, given the different developments that are happening in Hong Kong and the elections that you're having in Taiwan next semester -- next calendar year, do you see that you might have to revisit the CapEx plan given the trade war and the intensity of the trade wars that are increasing?

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

You think about the trade war between the 2 big countries, is that going to affect TSMC's CapEx plan? We...

**Sangam Iyer** - *Consilium Investment Management*

Yes, in terms of...

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

In terms of Hong Kong situation or what do you think about it? Let me say again, TSMC builds capacity working closely with customer to meet customers' demand and our own judgment. We did not put that kind of trade tension in the world into consideration, although we think that any trade tension or trade war between any countries will have a negative impact to the semiconductor industry. Did I answer your question?

**Sangam Iyer** - *Consilium Investment Management*

Right. But I mean there's no -- so hypothetically, if you were to believe that in the election that comes in -- presidential election in January, if things were to go towards the party that's in more favor of a one-state kind of thing, would that have an incremental impact in terms of how the trade war is seen from TSMC's perspective?

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

No, we don't think so. Even we have general election in the next January, that won't affect TSMC's strategy. That will -- because of -- we can -- we do the business according to the demand, according to the market situation and have very little impact from the politics in Taiwan. Did I answer the question?

**Sangam Iyer** - *Consilium Investment Management*

Good to hear that. And sir, finally -- yes. Yes. Yes. To a large extent, yes. That was helpful.

And so one more thing, sir. In terms of the 5G CapEx that we have been talking about, so there have been -- on the high-speed HPC segment, there have been delays in terms of the next node coming through from your last customer. When you see that your 5G rollout is moving pretty strong



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and also the HPC demand pick up strongly, is there any indication from the customers that the launch on the next node is going to be pretty soon? What gives us visibility here?

**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

Let me try to see if I understand your question. You are asking us about the visibility of our customers' demand for our next node technology, how much visibility we have with respect to seeing the demand from them for the next node.

**Sangam Iyer** - *Consilium Investment Management*

Right.

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

Next node, you're mentioning about 5-nanometer and 3-nanometer?

**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

5-nanometer.

**Sangam Iyer** - *Consilium Investment Management*

5-nanometer for now.

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

Let's say 5-nanometer. Judging from we increased the CapEx for the 5-nanometer, you know our position and you know our forecast on the 5-nanometer's business. So it will be good. And I cannot tell you how many percentage more, but I think the 5-nanometer, TSMC is going to do a very good job and going to have a high market share.

**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

Operator, let's move to the next caller on the line.

**Operator**

Your next question comes from the line of [Susie Chu] from S&P Global.

**Susie Chu** - *S&P Global*

I just have a brief question for -- on the China issue. I was wondering, is there any change in the numbers of your Chinese clients in recent years, especially in this year? And if it is possible that we can get a number of the Chinese customers or the percentage of the Chinese customers as of the total clients.



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

The number of customers in China actually is more than 100. So it changes -- some of them changes all the time. Of course, there are some bigger ones and smaller ones. I'm not sure if this is your question.

**Susie Chu** - *S&P Global*

Yes. Sure. Just is there any change on this number in this year?

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

The number of customers generally increases.

**Susie Chu** - *S&P Global*

It increases. And may we know the portion of the Chinese customers in terms of your overall customers or the percentage?

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

Oh, you mean the revenue or number of customers?

**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

The number of customers. The number of customers.

**Susie Chu** - *S&P Global*

The number of customers.

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

Oh, we have over 400 active customers globally. And if you look at China, if it's somewhere over 100, that gives you an idea. Does that answer your question?

**Susie Chu** - *S&P Global*

Yes. Yes. Very helpful. Yes, that's all my questions.

**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

Okay. Thank you. Do we have any questions on the floor? Okay, let me come back to the floor.

First of all, we will have a follow-up question from Citigroup's Roland Shu.



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

I would like to follow up on the inventory question. However, this is for your own inventory. I look at in 3Q, your inventory level actually have decreased to 97 billion even though we had a very strong revenue in 3Q and a very upbeat guidance in 4Q. So the wafer in process should increase. However, overall inventory decreased a lot. So does that mean that our finished goods and also even for our materials like the wafer, inventory had decreased a lot?

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

And you are right. Actually, let me -- suppose that the process actually enlarged, the total inventory should increase, but it decreased. It's because of some of the wafer, we worked with our customer at the beginning of this year. We produced it in early stage to make sure that we don't have a wafer crowded at the end of this year and then we ship it out. And so the inventory actually decreased quite a lot because of that.

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

Being the finished goods?

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

Yes, finished goods.

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

Okay. Yes. How about for the wafers? I mean for the raw wafer inventory.

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

The raw wafer almost stayed the same because we prepare -- TSMC's business is increasing. So actually, the raw wafer, we require a lot of amount in preparation for the good business. So it stays the same in terms of percentage -- in terms of days, I'm sorry.

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

Okay. And for the very upbeat outlook next year for the 7-nanometer and 5-nanometer, are we securing all of these wafers for our production next year?

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

You bet.

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

Okay. Okay. And the second question is you announced that your EUV tools have been reached potentially maturity, but how about for the infrastructure? It means that for other component like photoresist, pellicle, photomask or even for this inspection tools, chemical and materials. So yes, we have -- going to have a very fast ramp on 5-nanometer because of very strong demand from a customer, but are there any gating items for this EUV infrastructure will be potentially a risk?





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

So far we do not see any gating item. All the infrastructure, actually TSMC, we are prepared. We have a -- we produce our own pellicle. We have a large number of masking capacity and everything. So even photoresist, those kind of thing, we have been taking into account. So we are ready for the -- actually, we are in a high-volume production for the EUV lithography technology. For next year, you have big -- even higher volume, and I can assure you that we are all prepared.

**Elizabeth Sun** - Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division

Next coming -- next question will be coming from Crédit Suisse, Randy Abrams.

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

Yes. I want to ask because you kind of hinted the utilization still below 90%. So to get to 50%, you need to get utilization up. Could you talk about the 28 node prospects, how you see that? And then also 16 and 12, some of the applications, like we move on, some of the mobile and graphics. So your view on utilization and backfill to hold up that technology node.

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

Let me answer that question. On 28-nanometers, this technology node right now, I believe, in the industry is overcapacity. And so the utilization is very low, not up to TSMC's expectation. So we prepare a lot of derivative technologies -- specialty technology, let me say that. And we expect 2 years later from now, it will be again in the high utilization, but not today. It takes time to work with a customer and to utilize that capacity.

For 16 and 12 node, today we are still in a very healthy utilization, but we are prepared. And if our competitor is -- continue to increase the capacity just like 28-nanometer's node, we expect a couple of years later, something like that, it will be overcapacity again. So right now, we are prepared all the specialty technology like RF, like even some of the ISP or something like that. So it won't happen to TSMC.

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

Okay. The second question, just to ask about the segment revenue. I think into third quarter, mobile and HPC were both going to be strong. The HPC was good, but it wasn't quite as strong. So I'm curious just in that mix, maybe factor for HPC. And then IoT was quite strong. So maybe some of the things you're seeing in that. And then if you could extend to give an outlook for fourth quarter by segment.

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

In the fourth quarter, of course, every segment is increased. The HPC itself consists a lot of different market segments that's including network processor, including GPU, including accelerator, including all the cryptocurrency mining. And we expect that HPC will grow significantly in the fourth quarter.

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

Could you give the other segments? I guess do you -- so any lagging and any picking up strongly?



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

Let me give you -- okay. Now IoT, this quarter -- the third quarter of the IoT increased quite a bit. So in the fourth quarter probably it will level off or slightly decrease. While our all other segments will continue to grow.

**Elizabeth Sun** - Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division

Next question will be coming from UBS, Bill Lu.

**Bill Lu** - UBS Investment Bank, Research Division - MD and Asia Semiconductors Analyst

Yes. If you look at the foundry industry historically, what we typically see is a big node followed by a smaller node, right? And now essentially what you're saying is a big 7 and a big 5. Can you maybe just discuss what you're seeing that is different now versus before? Clearly, TSMC is addressing new markets. I think the demand drivers are different now versus before. But I'm curious as to what you're seeing that is different now.

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

You mentioned, big and then followed by a small node. I don't really catch what you mean. But let me say that TSMC introduced a 16-nanometer and then 12 and then 10 and then 7 and then 5.

Now let's talk about 7 and 5. We are looking at the new market in the 5G because the 5G's requirement on the speed and the power consumption reduction is quite a lot. It's not the same experience that we have before. And so that after the 7-nanometer, all the customers asked us to develop the technology to meet their requirement with higher speed, lower power consumption. So it will be a full node kind of improvement. It's not, say, that a 10% improvement will be good enough.

Now look at our 7-nanometer. We have a 7-nanometer, we have 5 and then we have a 6-nanometer. The 6-nanometer being introduced as kind of for second wave products. But the leading wave of products always at a full node and marching ahead with about a 2 years cadence than we expect.

**Elizabeth Sun** - Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division

Next question will be coming from JPMorgan's Gokul.

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

So if we compare the change in expectations in the last 6 months, would you characterize almost all of it as market growth -- faster market growth of 5G HPC? Or is there any meaningful change that -- in your market share expectation for some of your future nodes as well?

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

Well, compared with 6 months ago, we are a little bit kind of conservative at the time because of our 7-nanometer's utilization is quite low. So we become conservative. But then in these 6 months, a lot of things changed. Let me say that, first, the 5G's momentum is larger than we expected. The second one is we also at the same time, because of our technology offer to the customer, we expand our customers' portfolio. And because of the performance, again, we also expand to new product portfolio. And so now we look at the future, we are more optimistic than 6 months ago, much more.



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

Any increase in market share that you expect compared to 6 months back?

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

I cannot comment on that. But it will be increased, right? If you expect.

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

Okay. Quickly on the breadth of customers on N5. I think around this time 1 year or 9 months before N7 ramp-up, you were talking about roughly I think 50 to 100 tape-outs on N7. Could we talk about what is the breadth of number of customers or number of tape-outs on N5 and how do you expect that to progress? And I know that number of tape-outs is not equal to the number of -- or revenue or wafer volume, but I just wanted to understand the breadth of the customer base.

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

Whenever you say that, tape-out is one thing that see that how popular it is, but the more important is high volume products at tape-out. And right now, we have many high-volume products at tape-out. And that is the main reason why we increase our CapEx, high volume. And also in addition to smartphone, there are more market segments that we entered at the end.

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

Okay. Just one quick follow-up. If you think about N7 family, N7, N7+, N6, is it your expectation that pretty much most of the N7 current customers will eventually end up using N6, N7+? Will most of your capacity eventually be EUV-enabled for N7 as well? Or it will still be some EUV, some still using the current N7?

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

We still expect some using the EUV and some will still stay in the N7. Because for those customer in the N7, in the 2-year cadence, they moved to N5 already. So they have no reason to go back to use N6. However, as I said, for the second wave of the product, they're using N6 with the benefit of lower die cost and better performance.

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

So we should expect eventually majority will be N6?

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

Yes.

**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

Next follow-up question will be coming from Morgan Stanley's Charlie Chan.



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

So first of all, I want to follow up Bill's question on the future technology. C.C., you mentioned that there are lots of benefit from power consumption, from performance from 5-nanometer, et cetera. So how about the per transistor cost, right? I remember some of your customers talking about they don't see the benefit from the transistor cost-saving going forward. Do you think that is a true statement?

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

I still believe the per transistor cost is decreasing because right now, geometry is smaller and smaller. Although for TSMC, we more pay attention to what customer need, right? Because if they need speed, we give them speed. If they need the power -- lower power consumption, we give them the lower power consumption. But higher density is always the one that we are moving into the next-generation technology. So per transistor wise, I did not do a very detailed calculation, but I still think the transistor as a cost is lower.

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

Okay. And you also mentioned that for those new tape-out, actually volume is quite big. Can I interpret it in another way? Meaning those smaller customers, they cannot really afford those future technology unless they have a very big volume. You said the right thinking.

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

Not really. I mean that depend on their product. Your last question about transistor's cost, let me give you some kind of taste. We improved the logic density by 80%, but I did not charge my customer 80% more. So you know that per transistor cost is lower. And again, in the market, I will say that a product to be successful is more important than you really calculate this improvement, this cost, that cost. Product has to be competitive in the market and so that people will give them the price that they deserve, okay? So not the small customer cannot afford it. Actually some of the small customer, they are working on the CPU kind of performance. They need a very high performance technology that they are working with TSMC.

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

Okay. And next is on EUV, all right? So over the past 3 years, there were some kind of challenge in terms of power, throughput, pellicle, et cetera. So now do you see any kind of new issues, new challenge for EUV? Or from now on it's like a blue sky?

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

Okay. In TSMC, EUV lithography technology is now in the production stage. But are we happy with that? Not yet. We are still improving availability. We have output power of 250 watts, as we expected. Now we can operate the tool with 250 watts consistently. However, there's still something that we need to improve so that we can improve the throughput, we can improve the availability so you can reduce the cost, continue to improve.

**Elizabeth Sun** - Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division

So in the interest of time, we will just have the last question that will be coming from CLSA's Sebastian Hou.

**Sebastian Hou** - CL Securities Taiwan Company Limited, Research Division - Research Analyst

I want to follow up. The first one is I want to follow up on EUV. Because overnight, ASML seems to talk about some supply constraints on the EUV tool -- the new EUV tool. So it looks like this guidance -- preliminary expectation for next year EUV unit growth and this seems to be like amazing

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either. So I wonder what would that impact TSMC? And has TSMC secured what you need for this \$14 billion to \$15 billion CapEx this year and next year?

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

The answer is yes, we secure whatever we need. We work with ASML very closely and we are ordering all the tools that we need.

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**Sebastian Hou** - *CL Securities Taiwan Company Limited, Research Division - Research Analyst*

Okay. So which means that the supply constraints could affect someone else but not us more?

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

I don't want to comment on that.

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**Sebastian Hou** - *CL Securities Taiwan Company Limited, Research Division - Research Analyst*

Okay. My second question is that on the -- it looks like there's CapEx step-up this year or next year. When you think about that, the 28-nanometer also saw very strong demand, we continue to build the capacity, but then a couple of years later it turns into the underutilization, overcapacity, although there's some factors that because of the competition and laggards catching up. But how do you see this risk going forward for 7 and 5? And have you considered that whether there will be strong enough second wave or third wave of a demand to backfill this capacity when your current customers migrate into 3 or 2 or whatever it is 3 years from now?

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

To answer your second question first, we do have confidence that a lot of products will fill up TSMC's capacity. Now a few years later, if you compare with the 28-nanometer to 7 to 5, it's not a good comparison because 7 and 5 with EUV, that technology barrier is much, much, much higher than you can expect from the high-K metal gate. And so they are -- anyway, I don't want to comment on my competitor.

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**Sebastian Hou** - *CL Securities Taiwan Company Limited, Research Division - Research Analyst*

Right. Okay. Just last one. It's the last one, I promise, last one. The -- when we look at the CapEx step-up this time, it looks like the company has been staying around like \$10 billion on the CapEx, plus/minus \$1 billion to \$2 billion for a few years right now. If we go back to look at in 2010, when we walked out of the downturn in 2009 and also we -- there's a huge step-up of your CapEx from 2010 in -- or 2009 to 2010, and then we know what happened to TSMC, it's a golden era for TSMC for a couple of years. So now we have another step-up out of the semi downturn in the past 12 months. Do you think there's similarity now or there's been and when you make this bold CapEx decision at this time?

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

I know what you ask, but let me say that TSMC is getting smarter, definitely. And by the way, that technology barrier is much higher than -- as I said, much higher than 28-nanometer. So we have confidence that the capacity we build is closely -- is a result we closely worked with our customer. And so we decided to increase the capacity at this time with a lot of detailed analysis. And I certainly -- I have confidence that we won't repeat the same kind of error that we did.



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**Sebastian Hou** - *CL Securities Taiwan Company Limited, Research Division - Research Analyst*

Actually, not means error. I will say that, that was a very bright and bold decision, capital increase in 2010.

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

Oh, thank you. 2010? Yes. I'm sorry. Yes. Those are the 28-nanometer. It's the golden years. Very good, yes.

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**Sebastian Hou** - *CL Securities Taiwan Company Limited, Research Division - Research Analyst*

Yes. So I was asking whether we could see another view of golden years after this.

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

Oh, you say that for -- of course. What do you expect?

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

Yes. Well, before we conclude our conference, ladies and gentlemen, I would like to announce that important news that the beautiful lady sitting right beside me, Elizabeth, had decided to retire from the company at the end of this year. As you all know, Elizabeth has been with TSMC as Head of Investor Relations for 17 years. 17, that's a long time, isn't it? She's also the head of our public relations for 10 years. And well, the beautiful lady had been called in the public, say, the face of TSMC. TSMC is beautiful also.

In her IR role, Elizabeth has won numerous awards and recognitions all over the world, as an IR -- the best IR Officer. That's in Taiwan, in Asia and in the world. So many of you had been in frequent contact with her, I believe, so you know that she is a brilliant and enthusiastic and energetic lady. And you can definitely sense how much she loves TSMC. In the last many years, she has built a world-class IR team and developed successfully a competent successor who is sitting right there.

On behalf of TSMC, I would like to thank her for all her dedication and contribution to the company's success and wish her the best for her retirement.

Now ladies and gentlemen, let's ask Elizabeth to give us a few words.

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**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

Thank you, and thank you very much, C.C. I'm very privileged to have been able to work for TSMC in the last almost 17 years. Under the leadership of our Founder, Dr. Morris Chang, and the current management team, I have witnessed how this company is able to move from strength to strength and still remains true to its mission and its value. I have been blessed with the opportunity to represent this company that I deeply admire in front of the investment community and the press. I have enjoyed every minute of it, and I hope I have served the company well.

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

You did.

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**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

With all my heart to the investors, to the analysts and to the press, I want to thank you for your friendship and trust. I very much enjoyed our interactions, communications and discussions in the past. And I do hope that you will extend your goodwill to my IR successor, Jeff Su, who has been working closely with me in the last 4 years, and many of you are already familiar with Jeff.

I have had the most wonderful, exciting and rewarding time in my career at TSMC. I'm leaving the company at a time when its future is brighter than ever, and I'm confident that you will continue to derive handsome returns from owning our shares. So with that, let me wish you good fortune and good health, and we will conclude today's conference here.

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

Thank you.

**Elizabeth Sun** - *Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communications Division*

Thank you.

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