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PRESENTATION

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

(foreign language) Welcome to TSMC's First Quarter 2018 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. (Operator Instructions) As this conference is being viewed by investors around the world, we will conduct this conference in English only.

The format for today's event will be as follows: first, TSMC's Senior Vice President and CFO, Ms. Lora Ho, will summarize our operations in the first quarter, followed by our guidance for the second quarter. Afterwards, Ms. Ho and TSMC's co-CEO, Dr. C.C. Wei, will jointly provide the key messages. Then, TSMC's co-CEO, Dr. Mark Liu, will host the Q&A session, where all 3 executives will entertain your questions.

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. Please also download the summary slides in relation to today's 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 actual results to differ materially from those contained in the forward-looking statements. Please refer to the safe harbor notice that appears on our press release.

And now I would like to turn the podium to our CFO, Ms. Lora Ho, for the summary of operations and current quarter guidance.

Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

Thank you, Elizabeth. Can you all hear me okay? Well, good afternoon, everyone. Thank you for joining us today.

My presentation will start with the first quarter highlights and followed by the second quarter guidance. In the first quarter, due to seasonality, our first quarter revenue in US dollars decreased 8.2% sequentially to USD 8.46 billion, which was at the middle of our guidance range. The NT dollars revenue declined 10.6%, reflecting 2.7% appreciation in NT dollar against U.S. dollar. Gross margin increased 0.3 percentage point sequentially to 50.3%, as our cost improvement efforts and inventory valuation benefit offset the lower-capacity utilization and unfavorable foreign exchange rate.

Total operating expense decreased by TWD 2.1 billion and represented 10.8% of revenue versus 10.4% in the prior quarter. Thus,



operating margin slightly decreased 0.2 percentage point to 39.0%. Overall, our first quarter EPS reached TWD 3.46, and ROE was 23% for the quarter.

Now let's take a look at wafer revenue contribution by application. During the first quarter, Communication and Industrial/Standard decreased 19% and 4% from the prior quarter, respectively, while Computer and Consumer increased by 30% and 9%, respectively.

Now let's take a look at our revenue by technologies. 10-nanometer process technology contributed 19% of our total wafer revenue in the first quarter, the combined 16/20 contribution was 22% of total wafer revenue, 28-nanometer and below advanced technologies accounted for 61% of total wafer revenue.

Moving on to the balance sheet. We ended the first quarter with cash and marketable securities of TWD 684 billion, an increase of TWD 35 billion from last quarter. On the liability side, current liabilities decreased by TWD 16 billion. On financial ratios, accounts receivable turnover days increased 2 days to 42 days. Days of inventory increased 11 days to 63 days due to an increase of raw wafer and the 10-nanometer wafer prebuild before the capacity is converted to 7-nanometer.

Now let me make a few comments on cash flow and the CapEx. During the first quarter, we generated about TWD 161 billion cash from operations and spent TWD 72 billion in capital expenditures. So our free cash flow was TWD 89 billion. We also repaid TWD 17 billion of corporate bonds and the prepaid TWD 34 billion of corporate bonds and interest. As a result, our overall cash balance increased TWD 24 billion to reach TWD 578 billion at the end of the quarter. In U.S. dollar term, our first quarter capital expenditure was \$2.45 billion.

I have finished my financial summary. Now let me turn on to the second quarter guidance. Based on current business outlook, we expect second quarter revenue to be between USD 7.8 billion and USD 7.9 billion, which is a 7% to 8% sequential decline, but a 11.2% year-over-year increase at the midpoint of my revenue guidance.

Based on the exchange rate assumption of USD 1 to TWD 29.20, our second quarter gross margin is expected to be between 47% and 49%. Our second quarter operating margin is expected to be between 35% and 37%. Also, in the second quarter, we will again need to accrue the 10% tax on the undistributed retained earnings. But due to higher accumulative translation loss as a result of NT dollar appreciation against U.S. dollars, which will reduce our retained earning tax. Therefore, our second quarter tax rate will be between 18% to 19%. The tax rate will then fall back to 10% to 11% level in the third and the fourth quarter, and a full year tax rate will be about 12%.

This concludes my remarks, and I will now make comments on capital capacity and the profitability. I will start with CapEx and capacity. At our last conference, we stated our 2018 CapEx budget to be between USD 10.5 billion to USD 11 billion. We now see our CapEx to be between USD 11.5 billion and USD 12 billion. The increase is due to: number one, we plan to spend about \$500 million more to increase our mask-making capacity to support our customers' higher tape-out activities; and to spend about \$300 million as prepayment for our high-NA EUV tools.

Going forward, we expect our annual CapEx in the next few years will be ranging between USD 10 billion and USD 12 billion. Now let me explain how we are able to support our 5% to 10% long-term growth with a similar level of annual CapEx as the follows. For the existing capacity, we are able to grow capacity through productivity improvement, that is, for the same tools, the output can increase every year through our engineering efforts and innovations. This way, without spending fresh CapEx, we are able to grow capacity to support growth. On average, we are able to grow our overall capacity by the mid-single digit each year through the productivity improvement. Our marketing strategy with respect to the existing capacities, which grow in productivity perpetually, is to seek enough demand to fill this growing capacity at all times. As for the new capacity which is mainly leading-age technologies, we are very careful in planning the right level of peak capacity, knowing that initial capacity we build will grow continuously to a larger size due to productivity improvement.

To summarize, through productivity improvement and careful planning of new capacity, we are able to support revenue growth of 5% to 10% with annual CapEx at a USD 10 billion to USD 12 billion level in the next few years.

Now let me make a comment on profitability. TSMC's profitability is determined by the following factors: leadership technology



development and ramp-up, pricing, capacity utilization, cost reduction, foreign exchange rate and technology mix.

Now I will go through the changes for our second quarter gross margin compared to second quarter '17 and first quarter '18, respectively. Compare second quarter '18 gross margin using the midpoint of the guidance I just mentioned, which will be 48%, compare that with second quarter '17 gross margin, which was 50.8%. The decline of 2.8 percentage points gross margin rate is explained by 1.3 percentage point negatively due to exchange rate. NT dollars has appreciated 3.6% from second quarter '17 to second quarter '18. In addition to that, there is a negative 1.5 percentage point due to unfavorable product mix and inventory valuation, which is resulting from a utilization change. If I compare second quarter '18 with first quarter '18, where our margin was 50.3% last quarter, the decline of 2.3 percentage point gross margin is explained mainly by the favorable 2 percentage point of inventory valuation that was embedded in the first quarter '18 gross margin, which I have explained in the last quarterly conference.

To conclude, our leadership in technology development and ramp-up remains solid. We continue to maintain our competitive price, and we are making good progress in cost reduction. We will continue to work on filling our capacity. I finished my remark.

Now let me turn the microphone to C.C. Wei for his comment.

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Thank you, Lora. Good afternoon, ladies and gentlemen. Let me start with our near-term outlook. We concluded our first quarter with revenue of TWD 248.1 billion or USD 8.46 billion in line with our guidance given 3 months ago. This result was mainly driven by a strong demand from high-performance computing such as cryptocurrency mining and increases from both automotive and IoT, but offset by seasonal decline in smartphones.

Moving into second quarter this year. Our business is expected to be affected by continued soft demand from Smartphone segment. This decline is expected to be partially mitigated by the strengths in HPC. Our revenue in US dollar is likely to grow by only about a 10% over second quarter last year. We forecast our fabless DOI to stay slightly above seasonal level, but will track seasonal pattern. For the whole year of 2018, we forecast the overall semiconductor market, excluding memory, will grow by 5%, while foundry is expected to grow by about 8%. We forecast TSMC's 2018 revenue in US dollar will be about 10%, rather than the previously indicated 10% to 15% due to the Smartphone weakness and the uncertainty in cryptocurrency mining demand.

Now let me talk about the long-term business growth driver. We are optimistic about the development of some of the industries' mega trends, particularly AI and 5G communication. We believe these 2 will help semiconductor to spread its pervasiveness to our daily lives. Both AI and 5G will create the new usage models and spur new waves of demand for both of the existing and emerging applications with the increasing silicon content. We expect TSMC to benefit from these industry mega trends in all 4 of our growth platforms. In mobile, silicon content of the smartphones will increase due to increasing functionality such as facial recognition and new usage such as AR, VR and 3D video. In HPC, we expect AI will boost the attach rate of accelerators used in data center from today's mid-teens level to about 50% by 2020. In automotive, the use of the new safety-related functionalities such as ADAS and eventually autonomous driving will drive the increasing silicon usage. In IoT, AI will proliferate into broad-based client devices across many applications, such as the smart voice assistance or electronics appliance management. These, again, will increase silicon content. We believe our 4 growth platform are well positioned to benefit from the longer-term mega trend of AI and 5G. Our leadership in advanced and specialty technologies as well as our advanced packaging solutions should enable us to capture the future growth opportunities well.

Now let me talk about the N7 ramp-up. TSMC's 7-nanometer technology in terms of performance, power and area density as well as its schedule is leading the industry. So far, we have already fabbed out more than 18 customer products with good yield and performance. More than 50 products tape-outs has been planned by end of this year from applications across mobile, server CPU, network processor, gaming, GPU, PGA, cryptocurrency, automotive and AI. Our 7-nanometer is already in volume production.

Now I'll talk about the N7+ and EUV. We believe we can extend the success of our 7-nanometer to its enhanced version N7+, which will have 20% better density and greater than 10% power reduction.

And N7+ will use a few EUV layers to replace immersion lithography process. As a result, fewer masking layer can be used. As the N7+

will use more than 90% of the same tools with the N7 and N10, where we have finetuned all the advanced equipment to their optimum condition during their ramp-up, we believe we can leverage our production learning to N7+ and enjoy the industry's best defect density among competitors of comparable technologies. Our N7+ silicon results to-date are very encouraging. Not only we have demonstrated equivalent or better performance in yield on both 256-megabit SRAM and on product-like test vehicle when compared to N7 baseline, we have also demonstrated a tighter distribution of electrical parameters in the layers where EUV is supplied. Since we maximize design rule compatibility between N7 and N7+, our customer can minimize the IP porting effect -- effort, I'm sorry. A few customers have already planned to tape out the N7+ in second half this year and more in the first half next year. Our N7+ volume production is planned in 2019, which remain unchanged. We have made ready multiple EUV scanners to support not only N7+ development, but also N5 development. At N5, with more extensive use of EUV, we have obtained consistent double-digit yield on 256-megabit SRAM as well as our larger test chip. Our silicon data has proved or the benefits we expect from process simplification with EUV. Besides the silicon development, EUV technology continues to mature toward a high volume production with the improving source power toward the 250-watts goal, which we expect to achieve in a few quarters. Good progress continues to be made in the EUV infrastructure in the last few months. They include photoresist, mask defect and yield, pellicle defects and transmission. We are confident that EUV can meet our goal of 2019 volume production for N7+ and 2020 volume production for N5.

Now let me move to 16-FinFET and 12-FinFET. We introduced our 16-FinFET in 2015 and then 12FFC in 2017. Compared with the 16-nanometer, our 12-nanometer technology delivers better density, performance and more efficient power. With continual improvement in yield, customer are gradually moving from 16-nanometer to 12-nanometer.

Among all the product tape-outs we received for this year on the 16/12 node, about 30% are for 12FFC. The application of 16/12 includes mobile, GPU, AI, networking FPGA, consumer application and automotive. Our capacity of 12/16 node is being fully loaded currently.

Now let me update on Nanjing fab. We expect to expand our business in China. Our Nanjing fab will enhance our support to local customers. Because of high demand on 16-nanometer, we had advanced the startup of Nanjing production. The production of our Nanjing plant starts this month. Both yield and performance are comparable to our 16-nanometer Taiwan fab.

Our advanced packaging -- now let me talk about the last item. Our advanced packaging technology, InFO and CoWoS, are becoming more important for our customer to reduce their product footprint, packaging thickness, while enhancing the performance. TSMC's InFO is in its third year of volume production. We have expanded its capability to cover large die size, so that we can integrate 2 or more chips together into 1 package. This is particularly useful for HPC product to obtain optimum cost performance benefit. And CoWoS, we have observed a growing number of tape-outs from HPC customers in graphic and networking segment. As a result, we are increasing our capacity now to support the demand. And thank you for your attention.

QUESTIONS AND ANSWERS

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

All right. This concludes our prepared statements. (Operator Instructions) 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 answer your question. (Operator Instructions) So Mark will host the Q&A session.

The first 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*

I want to ask the first question about the demand and pricing environment. Just first on pricing. In first quarter, the shipments were down just 1% and revenue was down 8%. I'm curious if that's mainly the mix factor, because 10 fell off, or if there's any change in pricing maybe on some of the more mature nodes? And then if you could talk a bit more on the demand change versus what you've seen in January, how much from Smartphone? And then from the crypto, you talked about uncertainty, how much is coming from that market? And what are the uncertainty factors you're seeing on the crypto market?



Mark Liu Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Yes. Lora, please.

Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

Randy, your question is about the first quarter versus fourth quarter, quantity versus pricing. It is true that the first quarter pricing was affected by the product mix because we have very high utilization on the 16- and 10-nanometer, and that's the case.

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

I think Randy also has a part of the question about the changing our forecast compared to January.

Mark Liu Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Okay. C.C., about the product mix?

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

The product mix, actually the first quarter, we just mentioned weakness of seasonality, actually. Let me say that's in Smartphones. All other segment actually continue to grow, okay, in the HPC, automotive, IoT. However, that our revenue, a lot of caution is around Smartphone. So that's why we have a mixed effect in the technology. Our smartphone use most leading-edge technology, and that's why a few percentage drop -- that's a big drop in the revenue.

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

And the second part of that question and I have -- the second question was just about the crypto, if you could talk a bit more about the uncertainties? And if you've seen that sustained? Or you're seeing more uncertainties? So just the factors you're seeing in that market. And then the second question I have is on 7-nanometer plus. If you could discuss how you're seeing that ramp in terms of steepness at this stage relative to -- we've seen steep ramps of 10 and 16 before, if you're seeing steep ramp going into 7 plus? And also just how important it is to have a steep ramp? So in terms of -- how important it is to have that steep ramp just in terms of the learning as you try to bring customers onto EUV? So how important is it to have a big volume ramp on 7 plus?

Mark Liu Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

7 plus ramp?

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

For your EUV development?

Mark Liu Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Okay. Let me answer that. It's cryptocurrency. We see a very strong demand in the first quarter from cryptocurrency and -- in the first quarter. So during this second quarter, this is start of the second quarter, we see some weakness on 28-nanometer, but the rest of the technology is still very strong on cryptocurrency. Does your second question is on the 7 plus ramp?

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

Yes. It's -- yes, 2 parts, it's how steep you're seeing? Or how much demand inflection are you seeing for 7 plus? And how important is it to TSMC to have a wide adoption in terms of the learning to move customers on 7 plus in terms of learning as you look at 5 and even against your competitors?

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

7 plus, we -- I mentioned, we are using a few layers of EUV. And the EUV's progress is very well, so our customers start to adopt it. And how important? It's important. And we expect that N7+ will start to ramp up in the second half of next year quickly. Actually, it's ramping up quickly because of Smartphone business.

Mark Liu Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

I think 7 plus, we have EUV development, as C.C. just addressed, progress smoothly, and we have demonstrated 7 plus yield equivalent to 7. So the rest is volume. But I think the volume is -- we don't need a huge volume to prove EUV because all the development is in place, and the biggest volume ramp will be in N5, which is 2020, already in 2019 have some small volume. And N7+ will slightly prelude that but we don't need as bigger volume to enable the N5. No, we just need some volume to prove that. N7+ provide better density, better performance for our N7 customer following their N7 products, either they want to stay on N7, go to N7+ or they can from N7 go to N5, depend on their product needs.

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

Next question will be coming from Deutsche Bank, Michael Chou.

Michael Chou Deutsche Bank AG, Research Division - Semiconductor Analyst

First question is regarding your revised guidance for 2018. So can we say you will still have the same 7-nanometer sales ratio target this year, 10%? 10% gross?

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Yes, around 10%.

Michael Chou Deutsche Bank AG, Research Division - Semiconductor Analyst

Around 10%.

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Yes.

Michael Chou Deutsche Bank AG, Research Division - Semiconductor Analyst

So it's still the same outlook as we -- as you expected 3 month ago?

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

It's -- as I said, Smartphone, it will be weak. So continue to be soft that we predict today. So it's -- they're all dealing -- the 7-nanometers, it's a little bit 1 point of.

Michael Chou Deutsche Bank AG, Research Division - Semiconductor Analyst

Okay. So is that fair to say 7-nanometer sales portion maybe slightly below your previous target? Or you still think this should be close to 10%?

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Very close.

Michael Chou Deutsche Bank AG, Research Division - Semiconductor Analyst

Okay. Second question is regarding your structural profitability. Do you think this year your structural profitability will improve or be the same as last year?

Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

I have said several points that associated with structural profitability: technology, pricing, cost, capacity utilization, exchange rate and product mix. On this, there are certain things we cannot control. Number one, foreign exchange, we cannot control. Product mix always go with the customers' demand. So while we have seen some weakness in the first half for the mobile and there are certain technology of our existing customer capacity maybe not so full for the whole year and that will be one factor to our overall structural profitability. But I think our objective to maintain or improve structural profitability remain unchanged, but there are market situation and some uncertainty we have to be mindful.

Michael Chou Deutsche Bank AG, Research Division - Semiconductor Analyst

So is that fair to say your biggest uncertainty will be FX rather than the other factors?

Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

FX at least explain half of the deviation of our profitability. The other fair half, I think, it's mainly utilization, product mix and other factors.

Michael Chou Deutsche Bank AG, Research Division - Semiconductor Analyst

So is that fair to say your 28-nanometer UTR slightly below your expectation? So that could lead to some margin downside?

Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

It could.

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

Next question will be coming from Sinolink's Andrew Lu.

Andrew Lu Sinolink - Analyst

(foreign language) Last time I came back, year 2010, Morris, the chairman give me 3 question to ask. Can I get this exception?

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

You have 2.

Andrew Lu Sinolink - Analyst

Okay. The second quarter guidance or full year guidance, is this factoring the ZTE recently been banned by U.S. to sale the chip to ZTE? Is this factored in into your model? That's my first question.

Mark Liu Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

The second half this year?

Andrew Lu Sinolink - Analyst

Almost second quarter.

Mark Liu Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Second quarter.

Andrew Lu Sinolink - Analyst

Second half also as well.

Mark Liu Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

No, we haven't. The news just -- we got the news just yesterday. But we think the effect is very, very minimal. Currently, we are still under study what is the impact of ZTE suppliers, but for first glance that we look at, we have a very wide customer portfolio. So ZTE depends what they're supplied from, and we have -- being everyone's foundry, we have very wide spread. So I think the impact will be softened much, much more. Much -- so we think that minimal impact on second quarter. You won't see the number change. You're going to see...

Andrew Lu Sinolink - Analyst

Which quarter, sorry?

Mark Liu Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Second quarter you're talking about. Yes.

Andrew Lu *Sinolink - Analyst*

Okay. The second question I have -- okay, in terms of cash dividend, I estimate every year, we got additional \$2 billion to \$3 billion additional cash, even though we pay a lot of cash dividend, and are we going to give a much higher payout ratio compared to in the past few years? Because even this year, by factoring the new cash dividend, we still generate additional cash. So right now, I think it's over \$20 billion on-hand cash already. So we are -- keep going out every year \$2 billion to \$3 billion. So that's my question.

Lora Ho *Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance*

We have said many times our dividend policy to be sustainable and gradually increase dividend. We haven't really tied to a payout ratio per se, but we do look at free cash flow generation next 12 months, next 24 months. We use that as a basis to decide how much more dividend we are going to gradually increase. So it's \$20 billion to date, and I have said, the CapEx will be \$10 billion to \$12 billion. We do have a capability in the future to increase a little bit more than we have been increasing in the past.

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

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

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

First question is, C.C., do you still hold a view that 10-nanometer total revenue will continue to grow this year?

C. C. Wei *Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director*

The answer is yes.

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

Okay. So for 10-nanometer to continue to grow on top of this 10% year-on-year revenue growth and 7-nanometer around 10% growth from scratch. So both 7-nanometer and 10-nanometer probably total contribute more than 10% of the total growth this year. So does that mean that for 20-nanometer and 40-nanometer and above technology that total revenue is not going to grow? Is that right?

C. C. Wei *Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director*

You are doing a very good mathematic calculation. I don't want to comment on that.

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

Okay. So what's the reason for this 28-nanometer and the 40-nanometer and above does not grow? Does that because that end demand is soft? Or is this due to the capacity constraint? Or we are losing market share to...

C. C. Wei *Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director*

I would say that a lot of 28-nanometers usage has been advancing to the more advanced node. So the utilization definitely is not what we expected last year. But all I can say is, we remain very competitive, and we are developing some derivative technology to serve all the customer. We move into the 22-nanometers to have our customer can get a very good cost performance benefit, and we are maintaining our market segment share.

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

Okay. But last year actually, we also expanded about 15% to 20% of the capacity for 28-nanometer. So is there any problem to fulfill the capacity this year?

C. C. Wei *Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director*

Last year, we increased the capacity because of a very high demand. And a lot of customer did not have enough wafer. That continue into this year's first quarter and probably half of this quarter. But at the end, they move forward faster than we thought. So that's why that we see a little bit weakness in the second half.

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

Okay. So are we going to -- how are we going to utilize this new added capacity?



C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

We have a lot of new application being developed, and trust me that one day, you will be fully loaded again. I hope, it's as quickly as possible, but technology product development takes time.

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

Okay. For -- second question is for Nanjing fab, now we have already started mass production and we have 20,000 wafer per month capacity. So is there any plan to further expand the capacity in Nanjing fab?

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

20,000 wafer per month is still our plan. We plan for this year all the way to next year. But we ramp up so quickly, actually it surprised us.

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

Okay. For the further capacity expansion in Nanjing, are we going to buy the new equipment? Or are we going to continue allocating from Taiwan?

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

We probably still at the first phase is still moving the equipment from Taiwan.

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

First phase means the 20,000? Is...

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Yes, majority of 20,000.

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

So that is ongoing? Or that is already done? Is 20,000 capacity moved...

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Okay. Let me give you an idea. We are fully loaded, so I cannot move any equipment right now. Anything we move we will lose the capacity.

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

Next question will be coming from UBS, Will Lu.

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

First question is for Lora. Lora talked about productivity improvements leading to mid-single-digit capacity increases. So 2-part question. One is, is that capacity increase pretty even across all the mature nodes? Or is it certain nodes that you're seeing bigger increase? Second part of the question is that mid-single digit going forward, what was that number in the past?

Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

I didn't hear your second question, sorry.

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

If you look at productivity improvements in the past, what has that number been?

Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

Okay. Let me elaborate about productivity. As you can imagine, when the new technology just launch, in the first few years, you have very significant productivity improvement. And then when it gets mature, we have a stable productivity improvement. But when it gets very, very old, you can have limited productivity improvement. So the 5% I was just referring to is an average for the company. So -- but it's not the same for every technology. Your second question is compare with?

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

Yes. That mid single digits per year, what has it been in the past?

Lora Ho *Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance*

Oh, very similar. We have been doing the mid single digit. Maybe some year, it's 1% more; some years, it's 1% less. But more or less, it's in the mid-single-digit range.

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

So I guess I'm not really sure why that impacts your CapEx plans then because it's always been like that, right?

Lora Ho *Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance*

It does. Because another factor other than the productivity is, we also very carefully plan the peak capacity and watch very carefully for the capacity migration. C.C. was talking about the technology we'll use 90% commonality of tools. If you remember what I said a couple of years ago, the number was at 70%, 80%. So by doing that, it actually enhance the productivity improvement, especially for the leading-edge technology. That's one contribution to that.

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

The second question is on cryptocurrency. This is pretty new to many of us, and I feel like TSMC has been pretty conservative in terms of looking at it in the short term that's the right thing to do. But if you look at it for the next couple of years, 2019, 2020 as you think about your capacity planning, as you think about what customers to support, this is a market that is changing so fast. How do you think about it strategically?

C. C. Wei *Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director*

Okay. We don't look at the cryptocurrency's market price. It can drop from USD 20,000 to -- down to right now USD 8,000. But it increased from \$1,000 to \$20,000. This kind of uncertainty that -- is what we are talking about. In terms of capacity support, unless it is sustainable demand, we will not increase the capacity because of this kind of uncertainty demand coming up, unless it's sustainable, in which I know that our customer is developing a lot of things on blockchain technology, AI. They are doing very well. And we expect that those cryptocurrency's minings, those same one slowly move to AI area.

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

So do you have an estimate for -- if you look at the crypto plus blockchain, how fast is that you may going to grow next several years?

C. C. Wei *Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director*

First, I always say uncertainty of cryptocurrency mining, so how can I put them together to give you a very good forecast? No, we don't.

Mark Liu *Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director*

Let me add. We increase our capacity in lieu of the invested capital ROIC, return on capitals. So if a demand is a spike demand, we will be very careful. But we support -- we try to support the -- our customer in every way. What cryptocurrency developing is that because of price sliding, their demand of high-end technologies increases. So the trail-end becoming not that productive for them. So this is the changing. And in one way, we try to support them with the more advanced technology as we -- quickly at time goes. And secondly, we support them on our available capacity.

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

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

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

So I actually want to follow up Bill's question on your productivity and CapEx. So first of all, can you comment on recent chatters about the EUV throughput issue? And is that related to your more volatile CapEx range? This is my first question.

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

I think Charlie is asking whether or not we can give additional color about the rumored EUV throughput problems and if that's the problem that causes our CapEx to be more volatile.

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

The EUV progress. As we said, we move smoothly and we've got encouraging result. So that's why I say we are confident that will support the N7+ volume production and the N5 volume production in 2020. Now you're asking about why we increased the CapEx? Because we want to buy a very advanced EUV, too, I call high-NA tools. And that require that we put some deposit to book the machine slot. That's why we did it. And we are happy that the high-NA machine will be ready for us to use in the future that will further improve the efficiency and hopefully that increase the productivity, lower down the cost.

Mark Liu Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Just make sure these are high numerical aperture in EUV. It's not that same EUV we're doing that. It is the next-generation EUV tools. We work with ASML to book the tool early. And those tool currently is targeting at technology beyond 3-nanometer.

Charlie Chan Morgan Stanley, Research Division - Technology Analyst

Okay. Yes. Thanks for the clarification because investors in general are a little bit nervous about this EUV progress because it's associated to so-called Moore's Law progress, right? So that rumor is that the daily throughput is now around 1,000 wafers per day, right? So it's not that economical. And my worry is that whether they can affect your 7-nanometer-plus cost structure because you still need to use EUV, but the layer of the EUV usage could be fewer than your previous extensions. So anyway, that -- the least -- what market is chattering about. And my second part of the question is about the end markets. Okay. So it's a very difficult market to predict. We understand. But can you clarify the -- your comment on the weak smartphone demand. Because I think now China's smartphone, at least, you see some seasonality, right? So why that is not reflected to your revenue guidance upside? And according to our analysis, we think some of your customers shrink die size significantly this year. Is that affect the wafer demand for you at a 16-nanometer? This is my second question.

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

The question is quite long, but let me give you some explanation. Yes. We do see China as a market start to pick up in the smartphone. But in TSMC, we -- in our smartphone market segment, some very high end smartphone is a little bit soft. So that's why we projected that is going to be continuous softness. Okay. It's not because of the China market that's -- that start to pick up slowly.

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

Now we will like to go to the lines for questions. Operator, could you please get to the first caller on the line? Thank you.

Operator

Our first question today comes from Brett Simpson from Arete Research.

Brett Simpson Arete Research Services LLP - Senior Analyst

I just had a follow-up question on crypto. For C.C. Wei, you mentioned it was a strong crypto, a strong Q1. Can you confirm if this is double-digit percent of sales or not? And then, just looking at your revised outlook for 2018, can you help us how we should think about crypto in second half? Do you expect crypto to be flat or up or down versus the first half in your revised outlook?

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

All right. Brett, let me just repeat your question again. You were asking about the cryptocurrency and where C.C. said that demand was growing in the first quarter. So you are asking if first quarter demand accounted for 10% of the total first quarter revenue. And then second half cryptocurrency demand, will that be larger or smaller than the first half cryptocurrency demand. That's your question, right?

Brett Simpson Arete Research Services LLP - Senior Analyst

Yes.

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

All right. Okay. Let me answer the question carefully because I already said the uncertainty of cryptocurrency's mining as we forecast in the future. But so far, we still think that cryptocurrency in the second half still have a higher demand than the first half. And they are using more advanced technologies. They're even moving to the 7-nanometer. That, I can share with you.

Brett Simpson Arete Research Services LLP - Senior Analyst

And can you confirm whether it was double digit or 10% of sales or north in Q1 for crypto?

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

I won't give a specific number of how much or what percentage we are in terms of the revenue. But I'll say it's increasing.

Brett Simpson Arete Research Services LLP - Senior Analyst

Okay. Okay. And just a follow-up on 22-nanometer ULP and 12-nanometer ULP. Can you give us an update on timing and whether there has been any change in how you're thinking about the ramp of 22 and 12-nanometer ULP?

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Dr. Sun, will you repeat the question?

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

Well, Brett want us to give him an update on the development of 22-nanometer ULP and 12-nanometer ULP and asked if we have any changes in the plan, such as timing, schedule, market.

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

No. We don't change the plan. It continues to be a very important technology to TSMC. And we can guarantee, we speed up the progress. That's what we are doing. And because of where our customer is moving from 28 to 22 and from 16 to 12, so we had to speed it up of all the progress.

Operator

Our next question today comes from the line of Mehdi Hosseini from SIG.

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

One is a follow-up clarification and one question. Just going back to your comment regarding days of inventory that went up in Q1. And I think Lora mentioned that they had to do with the 10-nanometer products, especially with the smartphone. Just want to make sure the weakness that you see from the smartphone market especially the premium products in the second quarter, that has to do with inventory digestion and perhaps as the new products ramp in the second half with the premium smartphone show a rebound in the second half. So in other words, is Q2 kind of a digestion, inventory digestion period? And I have a follow-up.

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

All right. Mehdi, let me try to repeat your question and see if it's correct. You are asking about the increase in our days of inventory and then you're asking if the demand of the premium smartphone picks up in the second half of the year. Does that mean that we will begin to digest inventory in the second quarter?

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

Yes.

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

Thank you.

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

Okay.



Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

The days of inventory for TSMC in second quarter was 63%. First quarter, 63 days. I explained that because we are ramping down 10-nanometer capacity, and we will massively ramp up 7-nanometer capacity. So we are in a migration period. So we, on purposely, build more inventory on 10-nanometer so we can move the equipment to 7-nanometer, so we can save the CapEx. That's the thing. You're asking whether our days of inventory will go down? Not necessarily because we are ramping our 7-nanometer, which has a much longer cycle time. So I do not expect our days of inventory will go down or will change much in second half of the year.

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

Okay. Very clear. And one other question I have regarding EUV and migration. I understand that 7-nanometer and EUV insertion, that won't really have much of a change to the design rule like a place and route, but there would be a material change at 5-nanometer. In that context, when would you be able to provide those design libraries developed for 5 to the design community so that they could better evaluate a custom benefit of EUV at 5?

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

Well, Mehdi, you are asking us if because we are using EUV, there would be some material changes at 7+ nanometer and therefore, do we provide design library or these other design ecosystem support for -- to incorporate those changes?

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Yes. We did those.

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

Yes. And just to clarify, I think, some of those changes would impact 5-nanometer more so than 7-nanometer plus?

Mark Liu Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

[While using] 7 to 7+?

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

Please repeat your question again.

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

Sure. Okay. I think as you migrate from 7 to 7+ and with the inclusion of EUV, there may not be much change to design, especially with the back end of the design place and route. But I do expect a material change at 5-nanometer. In that context, I think the design libraries developed for 5 would be very critical. It helps design community to better evaluate costs and benefit. And I want to understand -- I want to hear from management, when would those design libraries be provided so that we could further evaluate demand for 5-nanometer with increased EUV insertion? Is that clear?

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

So it is the design library with respect to N5, 5-nanometer, given 7+ and 7 are pretty much done.

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

Yes. Yes.

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

So N5.

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

Yes.

Mark Liu Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Yes. N5 technology development is well on track. And some of our customers' function block already designing. So we -- let me comment -- let me -- I captured the first question is N7 to N7+. The design porting, we have demonstrated with several customers, showing that

the porting is -- the work is relatively easy. The only major difference is if you want to increase the density, you just change the standard cells which have a tighter density. The rest is -- have -- we have porting algorithms and -- to support our N7 customers. N5 is a new design. So we thus provide the design ecosystem stuff from early. And today is -- we're on track. And we do support our customers' N5 design when they're called upon. Yes.

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

Okay. So does that mean that you have already finalized the number of layers that EUV is going to be inserted for?

Mark Liu *Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director*

Your question is that -- is EUV insertable on N7?

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

No, no. I'm -- My question is if you already have provided cell libraries, does that imply that you have already finalized the lower count for 5-nanometer that would include EUV?

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

Oh, so you are asking us if we have finalized the number of layers that we will be using EUV at N5? Have we finalized that number?

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

Yes.

Mark Liu *Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director*

Yes. It's already finalized.

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

Is that closer to 10?

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

We do not disclose that. Thank you. And we are coming back to the floor. Okay. Thanks, Mehdi. Coming back to the floor, the next question will be coming from CL Securities' Sebastian Hou.

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

My first question is to follow on the CapEx rates for this year. Lora already mentioned about the CapEx rates, half of that is driven by the -- what's that called -- by mask making because of the higher demand from customer design activities. So can you elaborate on that?

Lora Ho *Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance*

Okay. Actually, we have seen increasingly a lot, big increase in customer tapeout requirement. And we found out that masking capacity is insufficient. And those tapeout in business is very good business for TSMC. So in order to facilitate customer for their product launch, so we need to add masking capacity immediately. So that's the half billion I was referring to.

Mark Liu *Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director*

Sebastian, let me add some color on this. Okay. We do see increase of tapeouts. And we do see it increase a lot from AI, networking areas and some are from the fabless company, but some of -- from the system startups and some from the -- even the cloud service providers. So some -- in this area, the -- in AI area, we think we are casting a bigger net in accommodating more customers today. How would that turn into volume, we yet to be see. But we are very happy to see the increase of tapeout and participation of new product designs in more companies.

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

I see. Just a follow-up on that because last quarter, you offered the expanded 7-nanometer tapeout by the end of this year will be 50. And this quarter, C.C. already mentioned again you were going to be 50. So if we just -- judging from the number, it doesn't increase and -- but now, you are raising the mask making CapEx. So does that mean that -- actually, the actual numbers internally, you look at, is actually increasing, real tapeouts.

Mark Liu Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Yes. Other nodes.

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

Okay. Second question is that if I just do some calculation on the guidance revision for this year. Earlier, it was 10% to 15% and now it's about 10%. So that probably -- if we use a midpoint, probably about close to USD 1 billion of revenue decline. And remember, the last quarter, Chairman talked about the first half year-over-year is about slightly above 15%. And now if we bake in the new guidance for second quarter plus the first quarter we already know, is about 12%. So that's about like USD 600 million fall in first half. So does that mean -- and I already had mentioned about the smartphone going to be weak, and -- but which means that there were probably another USD 400 million revision -- a downward revision in second half this year. So would that be mainly driven by smartphone again or the other applications?

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

I think I just described it, is a continued weakness of the smartphone demand and the uncertainty in the cryptocurrency's mining, so we adjust that.

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

So just to follow on the uncertainty on cryptocurrency mining. So can I assume that -- even though it's hard to predict, but can I assume that you're baking in a more conservative assumption right now for second half compared to...

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Yes.

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

The next question will be coming from Goldman Sachs' Donald Lu.

Donald Lu Goldman Sachs Group Inc., Research Division - Equity Analyst

First question is what is the new guidance now for 7-nanometer and the 10-nanometer as a percent of revenues by Q4 this year? That's my first question. The second question is going back to this more tapeout activities. I think in -- previously, when you move on to a new node, the tapeout activities has been decreasing. I mean, more markets consolidation, et cetera, if I'm correct. But why suddenly, you see there's more activities from different customers? Is there a reason for that? Or is there going to be a new trend for the industry?

Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

Donald, your question regarding the revenue contribution from 7 and 10 in the fourth quarter. Is that right?

Donald Lu Goldman Sachs Group Inc., Research Division - Equity Analyst

The -- no, Q4 this year. The last...

Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

Oh, Q4 this year.

Donald Lu Goldman Sachs Group Inc., Research Division - Equity Analyst

Yes. Forecast.

Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

Q4 this year. Okay. 7-nanometer. As C.C. mentioned, for the whole year will be about 10%. But since we are ramping heavily is from third quarter through fourth quarter and we expect the 7-nanometer will contribute more than 20% in fourth quarter revenue. Meanwhile, we are ramping down 10-nanometer. 10-nanometer contribution in first quarter was 19%, and we expect that number to be single digit in the fourth quarter this year.

Mark Liu Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Well, Donald, I think it's a new trend. I think we -- earlier, we see the customer consolidating. But now, we see even smaller company doing the design and tapeouts. And that I think -- and particularly in the AI and networking area. So I think the system architecture today is much freer, much more customized for each new application than before. And therefore, the -- each system company even service provider are willing to participate in the silicon design in order to optimize their system performance or service quality.

Donald Lu Goldman Sachs Group Inc., Research Division - Equity Analyst

It -- sorry, just to follow up. Is that because the barriers to entry are lower? Or is that those system companies and startups are getting -- have too much money?

Mark Liu Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

I think both. That barrier, definitely lower because the -- all the EDA tools. And it's much more matured today. And also, the venture-capital supply of money is definitely a -- in certain segments is increasing. And -- but mostly, I think the system spec to chip specification, that currently is up to the ingenuity of the system designer not just an off-the-shelf product -- existing products.

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

All right. Next question will be coming from HSBC's Steven Pelayo.

Steven C. Pelayo HSBC, Research Division - Regional Head of Technology Research, Asia-Pacific

Just a couple of quick ones here. On 28-nanometer softness, you mentioned it was a lot of the crypto guys looking to accelerate to more advanced nodes. I'm curious beyond crypto at 28-nanometer. Is it also broader-based weakness at 28-nanometer beyond crypto?

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

We still have a -- you are talking about 20-nanometer?

Steven C. Pelayo HSBC, Research Division - Regional Head of Technology Research, Asia-Pacific

28-nanometer. You mentioned that being relatively softer...

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Oh, 28. Oh, let me give you some example. Actually, this year, we see the highest tapeout number from 28 in 28's history. This year our tapeout is still higher, okay? So that give you some color on -- as I say that some of the product moved to high-volume product. Most of them are mobile. But then all others like they move into this area. So the tapeout number is still as higher as last year. And last year is a highest number. That's a 28. So other than cryptocurrency, there's a lot of thing. We're talking about automotive, IoT and some of the ISP, those kind of thing, moving.

Steven C. Pelayo HSBC, Research Division - Regional Head of Technology Research, Asia-Pacific

Understood. I just want to make sure the breadth was still there. The other question I have is if you could talk a little bit about manufacturing cycle times going from 16 to 12 to 10 to 7. How long is this? When do you need to be starting wafers now? And I especially want you to talk about and relative to -- I know Elizabeth says we shouldn't pay attention to monthly sales, but you just did a 60% month-on-month. And that's unprecedented in my model. So how are we to look at kind of the monthly volatilities as well as the lengthening manufacturing cycle times?

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

We are improving our manufacturing cycle time from node to node. We continue to improve. So -- but yes, more layers in each technology node as they increase dramatically like from 60-some to 70-some to 80 days. And for the cycle time, we -- all of that improved quite a bit. But I won't give you the actual number.

Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

Steven, you're asking the month-to-month revenue?

Steven C. Pelayo HSBC, Research Division - Regional Head of Technology Research, Asia-Pacific

I'm just surprised with the volatility in the March monthly sales. Obviously...

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Okay. I am like Elizabeth, don't pay too much attention to it. It's -- assume it's based on customer requirement. So there's a seasonality, and it's node-to-node requirement. Different customers may be different. So it's very hard to predict monthly revenue.

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

All right. It's -- sorry, the next question will be coming from Nomura's Aaron Jeng.

Aaron Jeng Nomura Securities Co. Ltd., Research Division - Research Analyst

After the inventories discussions, I got one question which I didn't expect at the beginning of the call. Can I say that the blended ROIC per tapeout of TSMC will be coming down in the future because of the new trends that more tapeouts from the small IC designers and from system companies? But is there -- they might not be able to generate peak revenue per project. So -- but this trend is new from my understanding. It seems to be kind of a down trend versus what TSMC was seeing in the past cycle. But don't get me wrong, TSMC is still outstanding. But just compared with the volumes sold in the past, the new trends seem to be unfavorable to probably anyone in the market...

Mark Liu Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Well, if you look at our EUVs and margin and that's the -- we welcome more tapeouts just over the mask making. But of course, I think the trend we see it as more designer getting to the new product designs. Okay. They are early entrepreneurs. That's how we grow our customer base back beginning. If you look at the cryptocurrency designer, they are very smart people. And this -- the mining machine, they have a very intricated system designs. They break all the barriers, pushing the envelopes. And those designers will come into later on in -- today on cryptocurrency, later on in the AI or blockchain and so forth. That is our ecosystem, part of our ecosystem. And we are happier to see our ecosystem growth to pave way the future product innovation.

Aaron Jeng Nomura Securities Co. Ltd., Research Division - Research Analyst

Well understood. One follow-up. Another inquiry to support my judgments that you're now increasing the high end of your CapEx per year to \$12 billion versus in the past, you were -- which was USD 11 billion. But your revenue target is going to grow up by 5% to 10%, which means that you are spending more for the same target. So that's also another angle to support my judgment from the call, so that's why I've got this thought.

Mark Liu Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

The investment is for the -- yes. The EUV investment is for the future, next technology beyond 3-nanometer. And mask making is for the purpose of what I said, is possible that the -- we don't see immediate return, but that is our long-term investment target purposes.

Elizabeth Sun Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication 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

I had one question on AI, HPC, et cetera and the growth going forward. I think C.C. mentioned that you were expecting 50% of that rate for accelerators in data centers going forward. That's a pretty high number compared to probably single digit today or probably lower

double digit. So a couple of years back, you had given a guidance of 5% to 10% with half of the growth coming from mobile and half of the growth coming from HPC and other areas. Could you update the component of that guidance? Does it mean that now smartphone is probably not going to grow from here? Is that how you think about it? And almost all of the growth comes from new areas like HPC, IoT, automotive? And given the very aggressive numbers that you have put out, some of your customers like Nvidia have put out as well a couple of weeks back, what is the tipping point that you need to see to be more confident on areas like HPC?

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Okay. Mobile still is mostly important segment that we are in. However, as I had mentioned, the AI and 5G Communications that in future that's a -- this mega trend that makes the HPC is a very, very important. And so we see a stronger demand that will contribute to TSMC's revenue. Exactly, what we can expect that in the future, I would say that they are getting more and more important and that higher than we thought last year, actually. You want to add something?

Mark Liu Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Yes. The -- you questioned -- yes. We -- earlier -- the crystal ball we saw before, the smartphone going to give us, in 5 years, going to give us 50% growth dollar. Now it looks smaller, like 40%, a little bit more than 40%. But HPC used to be 25%. But it looks like it going to be close to 40%. So HPC seems stronger than we saw before and smartphone a little bit weaker than way before. In IoT and automotive, it's about the same. But to be honest, this goal has a time and even in smartphone, we look at 5G transition, that will be another industry transition. If you look at the 4G transition, it's -- the demand has changed the whole landscape. So -- but that's what we look at today. And we'll go along the -- along with this industry during the migration and update for you. Yes.

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

If I could just add -- as -- put some more perspective on this. A lot of new tapeouts increasing mask capacity feels like the beginning of another new product cycle, typically, I think. Could you compare how this looks like compared to, say, 10 years back at the beginning of your smartphone product cycle? Probably, a lot of your current big customers are very much smaller at that point in time asking for more tapeouts as well and mask capacity. Could you compare how it feels like today versus 10 years back in the beginning of the smartphone cycle?

Mark Liu Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

We don't know. We don't know. It's a -- just like smartphone, when the first smartphone came, we did not know. So it really depends on the usage model and application on those products. But we just cast a wide net and make sure we support all the innovators.

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

All right. Questions would 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

One follow-up question on the gross margin. With the midpoint at 48% in second quarter, how should we think about second half where you normally have the peak season, you're also implying at least half-on-half growth. Is it still the target? I think in the past, you've said close to 50%. Is that still kind of the range we'd get some leverage first half to second half?

Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

I think the foreign exchange rate if you compare with last year, it will be a hit for the whole year. That's number one. And the second half, we are expecting more 7-nanometer coming on the line, which will have 2 to 3 percentage point dilution to corporate margin. So these 2 factor are negative. So I think we -- you should not assume anything will be the same as 2017.

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

Okay. And then one question on the tool reuse. 7+ has a lot of reuse. For 5-nanometer where it's a bigger change with EUV. Does that change the equation, that it's a different? Or do you think you can keep that same conversion down to 5?

Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

We're not seeing the -- every generation, new migration will be utilized more than 90% of the previous generation tool, so the convertibility is pretty high even for 5-nanometer.

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

CL Securities' Sebastian has a follow-up.

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

Just one. On the inventory, turnover days increased if you compare it on the YoY perspective, increased almost 20 days. Lora already mentioned about this the -- some raw wafer inventory prebuild for the 7-nanometer. So I wondered how much of it is just prebuild for the 7-nanometer ramp? Or how much of it is because the raw wafer is more expensive today so we want to buy more now?

Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

Prebuild has higher weighting than the raw wafer. Raw wafer will be a few days. The remaining are the prebuild and the complexity in technologies. You're comparing to a long time ago, right? You see 20 days difference there.

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

So does that mean that you don't need to buy then as many wafers in the following quarters?

Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

I don't quite get your questions.

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

Because you already prepared some of the raw wafer right now for second half ramp. And does that mean that you don't need to buy as many as raw wafers in second half this year compared to first quarter.

Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

That's right. Yes.

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

A follow-up question from SinoLink's Andrew.

Andrew Lu SinoLink - Analyst

My follow-up question. First one is regarding CapEx to sales ratio. I remember last time, Dr. Chang mentioned the long-term will stay as [25%] (corrected by company after the call) to 30%. But for this year, we raised another -- so it's about 30% to 33%. And are we still staying this assumption for the next few years, [25%] (corrected by company after the call) to 30% CapEx to sales ratio?

Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

Yes. That's due to -- at 30% level, around 30%.

Andrew Lu SinoLink - Analyst

So we changed from [25%] (corrected by company after the call), 30% to 30% level?

Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

First, within 25% to 30% anyway, okay? This year, it will be higher, yes, for the reason I was just mentioning, slightly above 30%. And if you look at the couple in the years down the road will be around 30%. Some year may be lower, slightly lower than 30%, some year at 30%.

Andrew Lu SinoLink - Analyst

So more like a 25% to 30% range.

Lora Ho Taiwan Semiconductor Manufacturing Company Limited - CFO and SVP of Finance

Yes. That's still true.

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

All right. You have another question?

Andrew Lu Sinolink - Analyst

My last question is, are we really gaining back the customer we are losing on 14-nanometer and 10-nanometer for 7? I did not mention any customer name.

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

We are the only 7-nanometer provider. So you can imagine that -- the answer over your questions.

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

Well, I am just going to -- for the interest of time, only going to limit two questions. So one person each, okay? Citi's Roland first and then Deutsche Bank's Michael. One question each.

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

For C.C., now you are ramping up 16-nanometer production in China. So what are you going to do if customer need to do the InFO or CoWoS packaging there? Are you going to build the InFO or CoWoS capacity there? Or are you going to logistically -- to ship back from Taiwan? So this is about InFO and the CoWoS?

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Well, that will depend on customers' demand and customers' need. We always support them as much as possible if we can support locally, we'll do it. But not today.

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

But not today. Yes.

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Today is not in our plan yet.

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

Okay. So when? When are you going to build a CoWoS or InFO?

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Depend on customers' demand.

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

Michael?

Michael Chou Deutsche Bank AG, Research Division - Semiconductor Analyst

You mentioned the 7-nanometer will be very massive. But will most of customers shift to 5-nanometer -- or they will skip 5-nanometer and shift to 3-nanometer directly?

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

Your question is are those 7-nanometer...

Michael Chou Deutsche Bank AG, Research Division - Semiconductor Analyst

Customer. Will shift to 5-nanometer or they will -- some customer will skip 5-nanometer.

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

We've developed that technology, working with the customer to meet their product design. They have product specs and we are products performance. So whether they moved to 5 or not depend on their products nature. And so some of them, they definitely will move. Some of them probably will stay in 7, 7+.

Michael Chou Deutsche Bank AG, Research Division - Semiconductor Analyst

So in the past, 20 and 10 seems to be small nodes, right? So will we see the 5-nanometer as a small node?

C. C. Wei Taiwan Semiconductor Manufacturing Company Limited - Co-CEO, President & Additional Director

No. 5-nanometer will be a very long node and useful and very cost effective.

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

And will start in 2020.

Okay. With that, we will conclude our today's conference. Please be advised that the replay of the conference will be accessible within 3 hours from now. Transcript will become available 24 hours from now. Both of which will be available through our website at www.tsmc.com.

So thank you for joining us today. We hope you will join us again next quarter. Goodbye and have a good day.

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