



Electronics Materials Information



TECHCET CMC: Associate Members Monthly Meeting

Diane Scott

June 2017
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Introductions

 CMC-A Facilitator

 Diane Scott

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Agenda

- Hot topics (to discuss later)
- CMC-A Updates
- 20 min presentation by TECHCET Analyst Mike Walden
 - Mike Walden, TECHCET's Sr. Analyst for silicon wafers, will be providing an update regarding the status of this key material. As you know, silicon is the foundation for the vast majority of semiconductor device fabrication. The update will focus on market drivers, supply-chain risks and S/D balance, providing highlights of TECHCET's recently published Critical Material Report (CMR™) Advisory entitled "Silicon Wafers Market & Supply-Chain For Semiconductor Device Process Applications". Please let your colleagues know about this beneficial opportunity and forward the meeting invitation as applicable.
- CMC Joint Session Review
 - Survey Results
- CMC conference Review
- Live Demo of Alerts Portal
- Working Group Potential- Solvents for leading edge lithography

CMC-A Updates

- TECHCET at Semicon West
 - Holding meetings July 11-13
 - Appt only meeting opportunity to meet TECHCET Analyst(s)
 - Micro Reception
 - Wed July 12 5:15pm
 - Park Central Hotel at 50 3rd St, San Francisco
- New offering for members
 - 35% discount on additional reports
- Renewal Drive through July 31st
 - Early renewal discounts available
 - Contact us for details (dscott@techcet.com)

Mike Walden

Mike Walden – Director and Sr. Technology Analyst of TECHCET

Mike is an expert in silicon covering the silicon wafer industry and related technologies. He has over 20 years of experience in the silicon supply-chain for high volume manufacturing, including both consumption and supply sides. He spent more than a decade each at IBM and SUMCO, serving in a variety of business development and senior / executive management roles and was an active leader in the National and International Technology Roadmap for Semiconductors programs (NTRS / ITRS) during that tenure. He holds a M.S. in electrical engineering from Virginia Tech, and a B.S. double major in physics and mathematics from Morehead State University.





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Techcet Critical Materials Overview

Mike Walden – Silicon Wafers for Semiconductors

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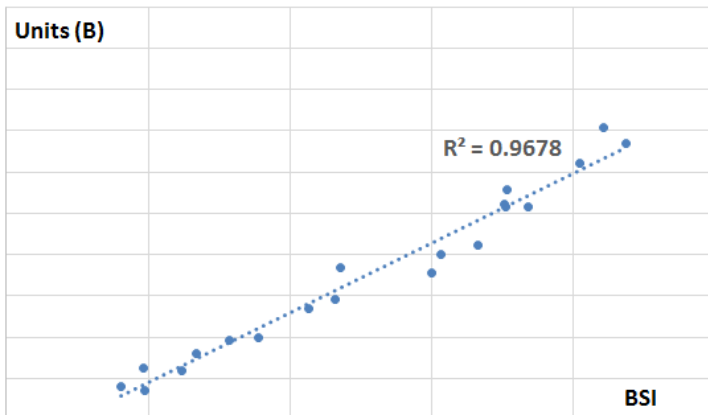
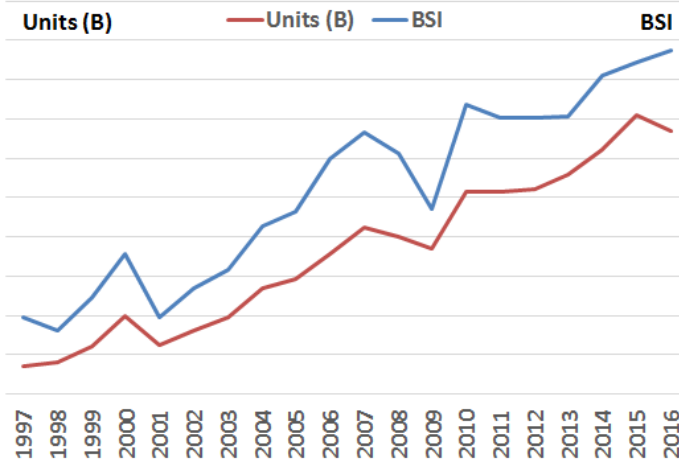


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Importance of Silicon

- 🌐 Largest material spend for semiconductor device fabrication (> \$7.2 B USD in 2016)
- 🌐 Accounts for a higher purchase than gases, photomasks and targets combined (> 30% of total fab material spend)
- 🌐 As such, always at the forefront of frontend procurement priorities
- 🌐 Represents a harbinger of the semiconductor industry
 - 🌐 Used to forecast other materials
 - 🌐 Tightness of supply can curtail growth of materials

Silicon MSI vs. Semi Units



- 🌐 Semi units = devices (billions)
- 🌐 Silicon units = BSI (billions of square inches)
- 🌐 Both units trend closely over an extended period of time
- 🌐 A solid correlation exists between Semi units and Silicon units

Source: IC Insights, Semi SMG, TECHCET

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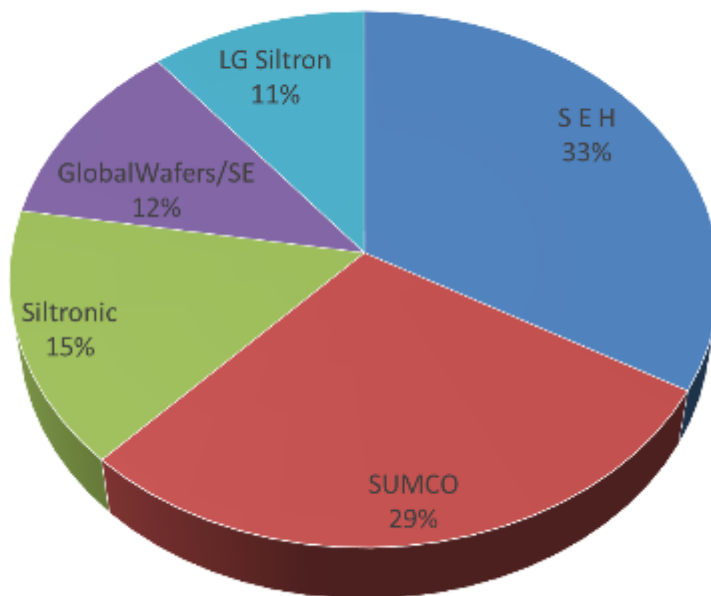
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Top 5 Market Leaders

Supplier Market Share of Top 5 - 2016 Revenue



LG Siltron did not present 16'Q4 results - TECHCET estimates are based upon top 3 supplier sales trends for 2016 and LG Siltron's 16'Q1 – 16'Q3 reports



SunEdison Semi also did not present but GlobalWafers reported consolidated results – no surprise but the combined entity failed to maintain pre-acquisition share



The rest of the market represented about 7 percent of the total revenue reported by SEMI SMG

Source: Company reports – LG Siltron 16'4Q estimate by TECHCET

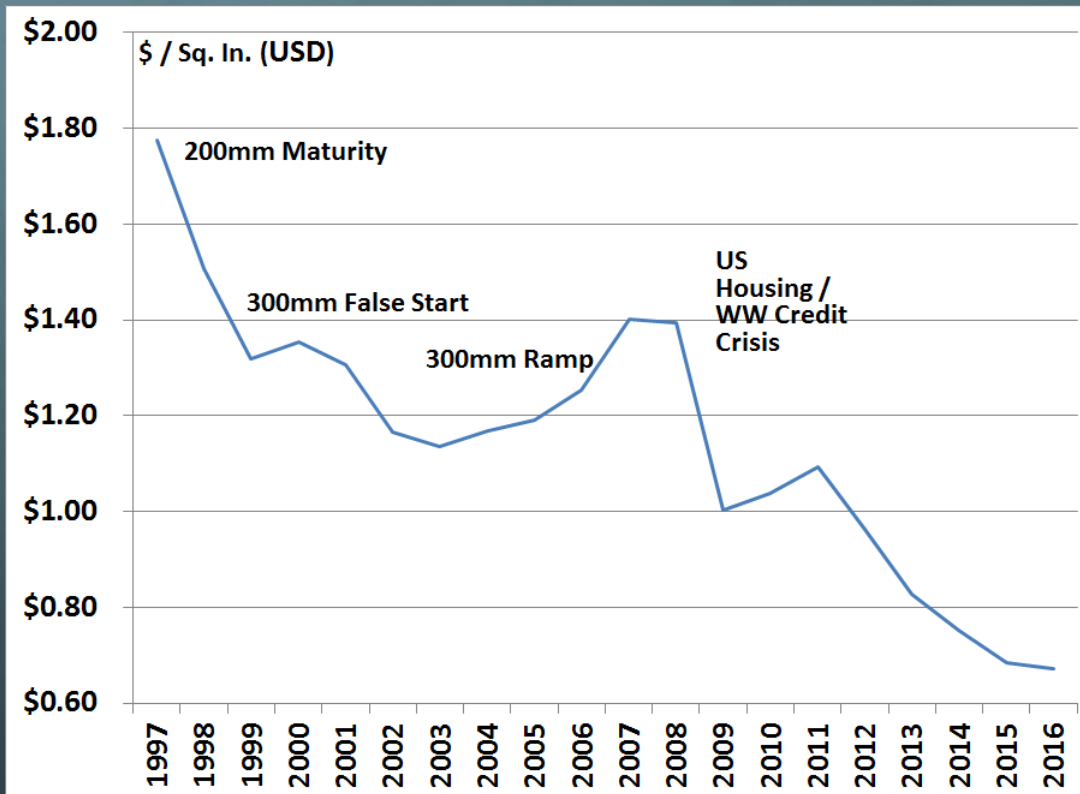
Risks to the Silicon Supply-Chain

- 🌐 Polysilicon market environment
- 🌐 Silicon wafer pricing
- 🌐 China
- 🌐 Supply / demand balance of silicon

Polysilicon Market Environment

- 🌐 More than 90% of worldwide polysilicon consumption is for photovoltaic use
- 🌐 A protracted and significant oversupply has led to predatory pricing in the market
- 🌐 Even though price stabilization is occurring (particularly within China), viability remains a concern for many

Silicon Wafer Pricing



🌐 Silicon wafer pricing per square inch has declined appreciably from 1997

🌐 Although prices appreciated during the 30mm ramp, these were short-lived

🌐 The US housing / WW credit crisis of 2008 – 2009 marked another long decline

🌐 Tightness in supply, particularly for 300mm, has led to stable / increasing pricing

Source: Semi SMG, TECHCET

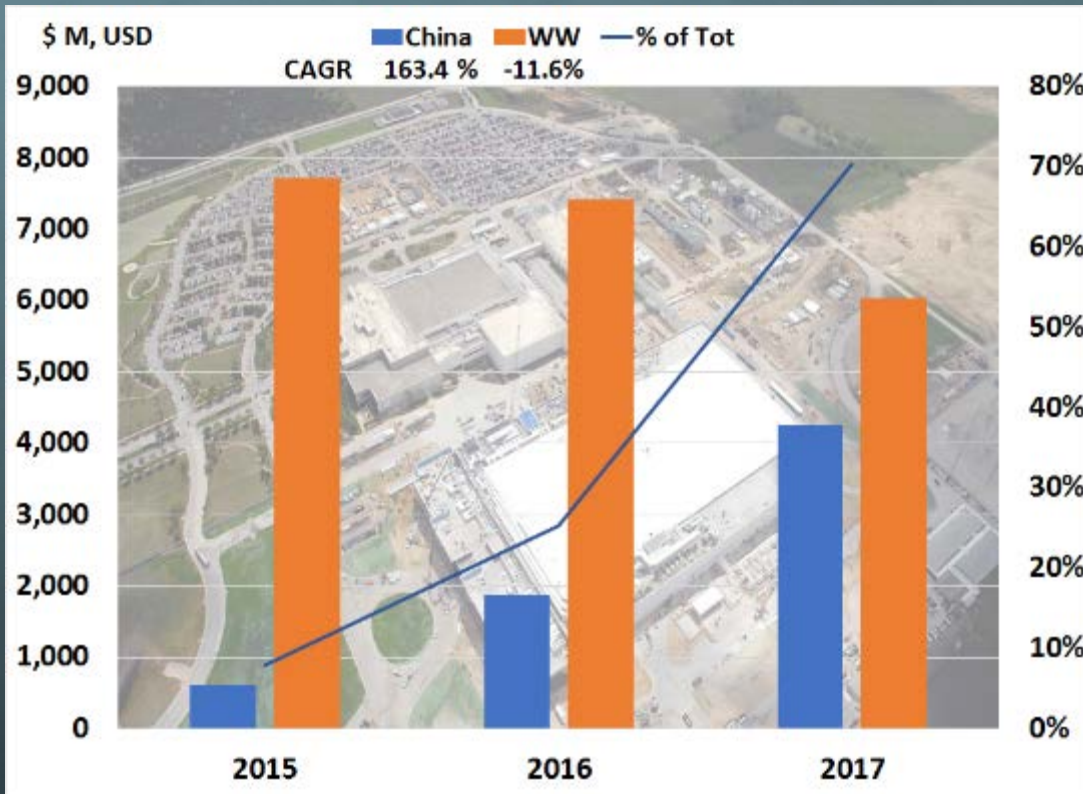
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China



China central government has openly announced a thrust to reduce external reliance on semiconductors



Approximately \$120B USD is available to strengthen the semiconductor supply-chain



This could be appreciably disruptive to semi producers outside of China as the country currently consumes more than 50% of WW total



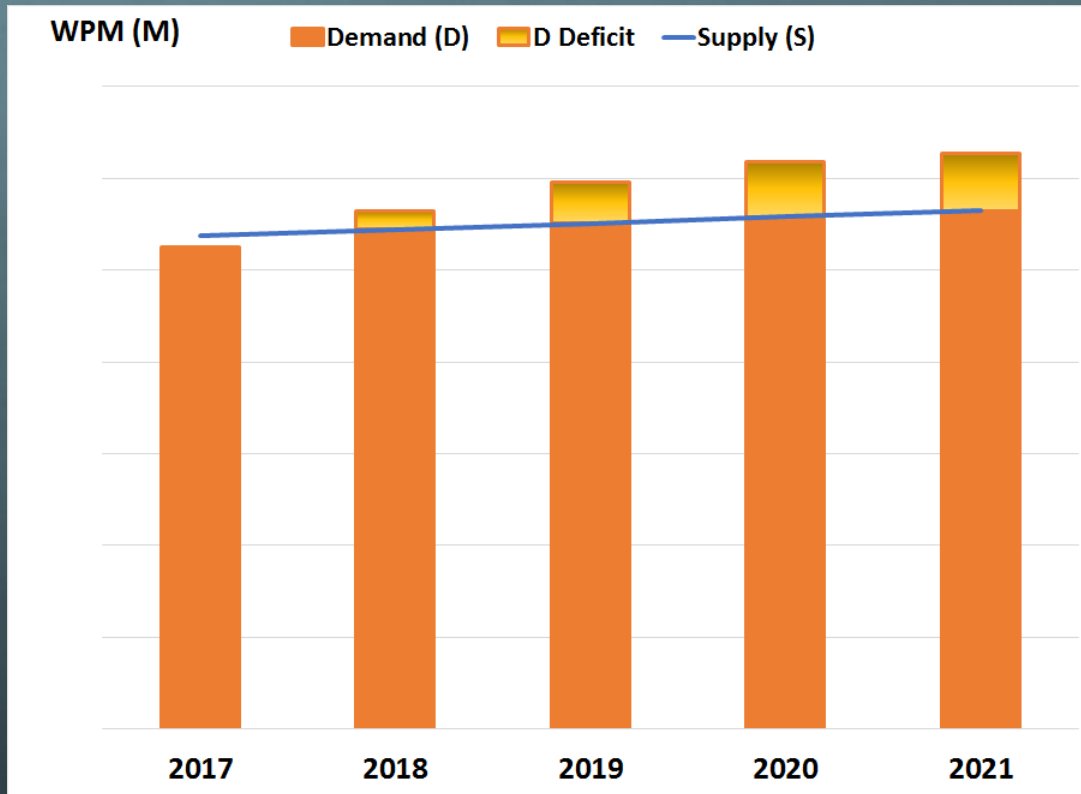
China's front-end construction spend (figure) has recently far outpaced the worldwide totals

Source: Semi, TECHCET

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Supply / Demand Balance of Si



Source: TECHCET

- Supply of silicon is tight but not expected to be in a deficit this year
- However, 2018 onward indicates a worsening imbalance
- Several scenarios can be considered
- Assuming major suppliers do not expand, Zing will help but not fully cover this gap

For More Details - Now Available!



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Fully revised for 2017 – published in June



35% off for CMC Associate members

Thank You!
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May 2017 CMC-A Joint Meeting & Conference

- **Joint Session-Networking with Fabs + access to materials information**
 - 5 CMC-A Members
 - 19 CMC Fab Members
- **CMC Meeting Highlights**
 - **Presentations at joint session**
 - Positive feedback about Analyst Presentations
 - Direct interaction with CMC Fab people
 - Private Networking Reception
 - Roundtable Session organized by CMC-A members
 - Tom Moser and Mark Raynor (ALD topic)
 - Matt Donelon and David Xu (equipment)

October 2017 CMC-A Joint Meeting & Seminar

- CMC Seminar-late October 2017/early November
 - In Asia
 - Joint Session CMC and CMC-A
 - Seminar
 - Volunteers wanted to support the committee
 - Private dinner sponsor opportunities
 - Seminar sponsorship opportunities

LIVE DEMO/ Portal Access



Access to Alerts Portal

- Live Demo
- www.techcet.com
 - Click the ALERTS from the dashboard
 - Login
 - Browse Alerts
- Learn to create and share your own alerts

Working Group Kick-off

- 🌐 Topic : Solvents for leading edge lithography
 - 🌐 Poll CMC fabs first
 - 🌐 Notify CMC-A of outcome

Plans for Next Meeting

- Monthly meeting schedule
 - SemiCon July 11-13th
 - August 17th
 - Next F2F in Asia
 - Late October/early November

AR List for Next Meeting

What	Who	When
Schedule next meeting	Diane Scott/TEHCET	August 17 th ?

Hot Topics Discussion

 10-15 min group discussion

David Xu from Momentive, mentioned that he wanted to discuss more about the fact that the Semi market was strong and he wanted to know/discuss how long it will last. Mike's slides briefly touched on this topic showing the increased demand for Si wafer with a tightness in the market and a potential for a deficit in 2018.

Thank You!
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