

The background of the slide features a collage of industrial components. On the left, there is a semi-transparent version of the Ferro Tec logo and a list of services: "THERMATECH™ MICROFIL", "COMPUTER AIDED", "VACUUM FEEDTHROUGHS", "EQUIPMENT", and "EMS/Industrial Manufacturing". The central and right portions of the background show various metallic parts, including a large cylindrical component and several smaller pins or needles, set against a light blue and white background.

**Ferrotec Holdings Corporation**

**Medium-term Growth Strategy**

**/Progress Reports**

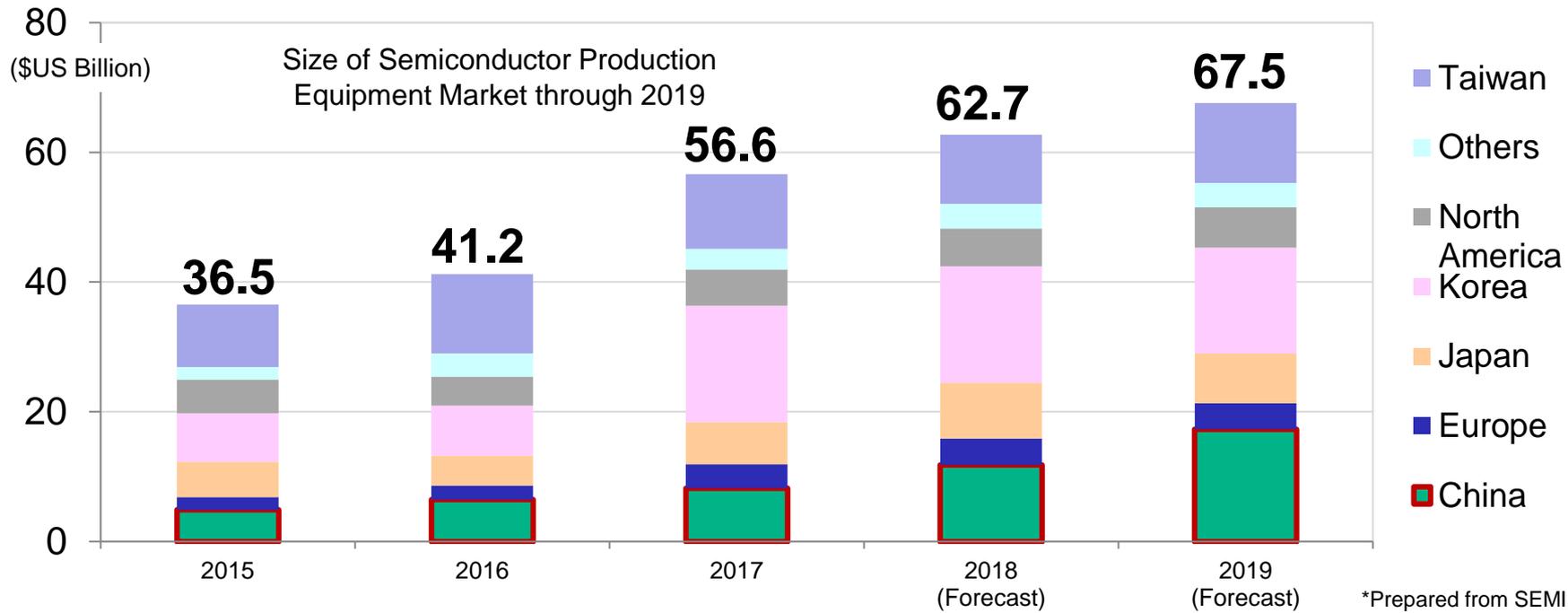
**November 27, 2018**

Due to technological innovation,  
semiconductor demand continues into the medium-to-long term

	Technological trends	Influence to semiconductor market
	IoT	Lots of different devices are being newly connected to the network ⇒ Increase in semiconductor demand (discrete, power system) in new fields
	3D-NAND	Demand for miniaturization, and for the replacement of high-speed large-capacity devices is emerging ⇒ Increase in demand for consumable supplies due to complicated process stages
	Big data	Demand for semiconductor memory increasing for enormous data analysis applications
	AI	Increase in integrated data volume due to utilization of big data ⇒ Increased demand for memory, sensors, etc.
	Automatic driving	Increase in demand for parts accompanying the addition of new functions
	Mobile communications system (5G)	High speed and large capacity, increased number of terminal connections ⇒ Increase in demand for memory for use in edge servers and for sensors
	Power semiconductor	Trend toward worldwide power saving ⇒ Expansion of demand deriving from increased adoption of inverters

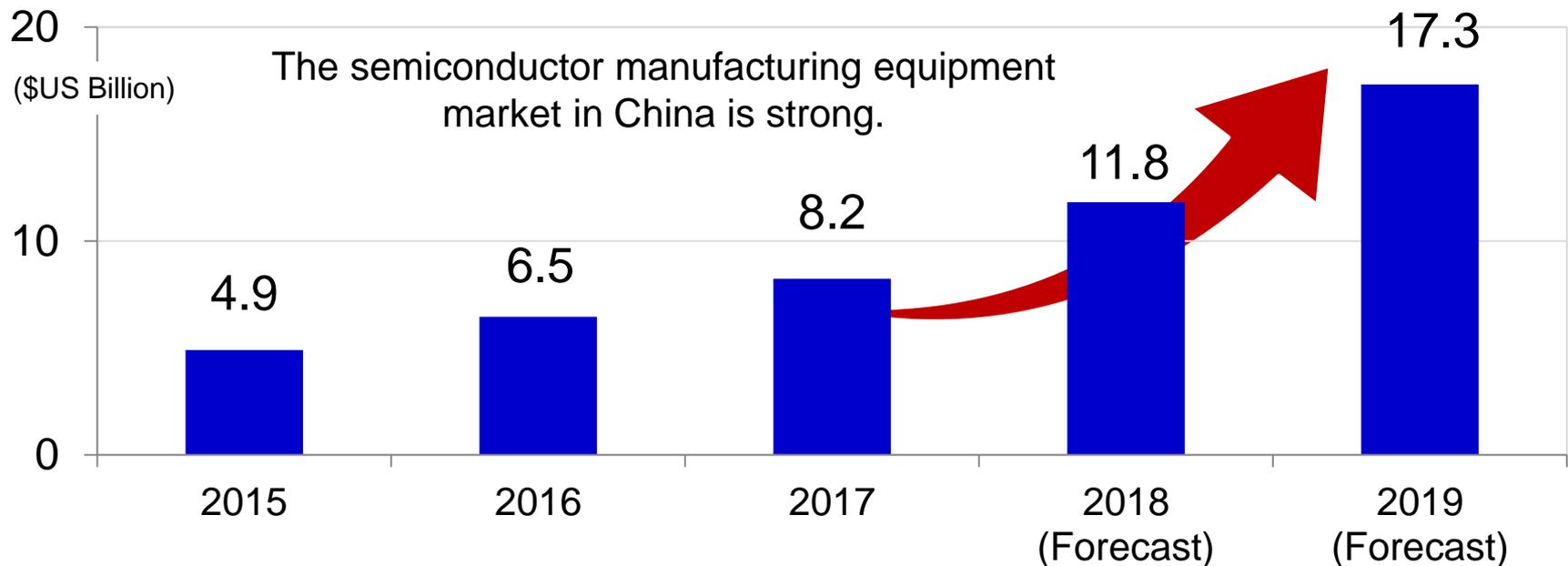
# Does semiconductor equipment market continue to grow or stagnate in 2019 ?

- The global semiconductor equipment market is expected to be around US\$63 billion in 2018
- Growth of 7.7% is expected in 2019



# Growth of China's semiconductor market will reach the world's top level

- China will become the new world's leader in semiconductor manufacturing equipment market with +47% growth next year
- Despite concerns about trade friction between the United States and China, demand is expected to be firm due to an increase in domestic production and self-sufficiency rate



No significant change from initial strategy

Continue capital investment in areas with strong demand

1. **Investing management resources into semiconductor and other equipment-related business**

- ▪ ▪ Material products, wafer products, cleaning business

2. **Structural reforms in the Photovoltaic-related business**

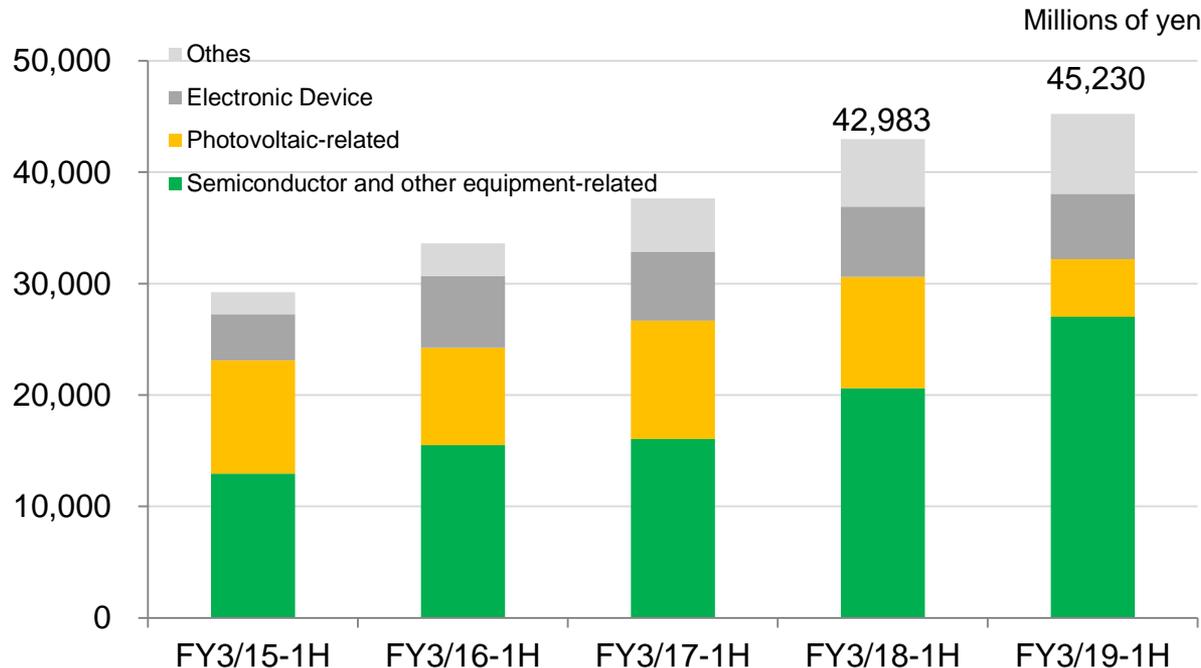
- ▪ ▪ Future direction for Converting its role to semiconductor applications

3. **Introducing applied products into the automobile industry (electric vehicles)**

- ▪ ▪ Put emphasis on applications other than automobile seats

# Focusing Management Resources on Semiconductor-Related Business

Photovoltaic-related sales ratio decreased due to focusing on semiconductor-related and other equipment with high future potential, but overall sales remained at a record-high level.

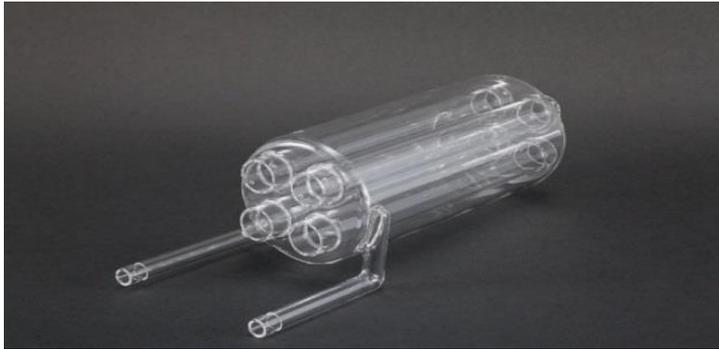


Photovoltaic-related sales decreased, while semiconductor-related sales, which we focus on, increased as planned.

	FY3/18-1H (in ¥M)	FY3/19-1H (in ¥M)	YoY
Net sales	42,983	45,230	+5.2%
Semiconductor and other equipment	20,617	27,030	+31.1%
Photovoltaic-related	9,971	5,166	△48.2%

- Eight new factories are under construction.
- Expand production capacity by expanding production lines

Quartz-product



Ceramic products



Silicon product



CVD-SiC products

The new factory in China will begin full-scale operation in 2019.  
To make a full contribution to earnings from FY3/20



New factory in China Operation schedule		(Current) CY2018	CY2019				CY2020				CY2021		...
Factory	Place	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	
8-inch wafer Second line	Hangzhou, Zhejiang Province		To be completed around Feb-Mar 2019										
Quartz-product	Changshan, Zhejiang Province Dongtai, Jiangsu Province		Completed construction in Zhejiang Province in October 2018 and Jiangsu Province in November 2018										
Ceramic products	Hangzhou, Zhejiang Province		To be completed around January 2019										
Parts cleaning	Neijiang, Sichuan Province, Tongling, Anhui Province		2 <sup>nd</sup> factory in Sichuan to be completed in December 2018 The one in Anhui to be completed in January 2019										
Substrates for power semiconductors	Dongtai, Jiangsu Province		Completed in July 2018										
Silicon crystal	Ningxia Autonomous Region Yinchuan		To be completed around March 2019										

# Introduction to New Factory Completed; Jiangsu Province

Substrates for power  
semiconductors



**Dongtai, Jiangsu Province**

Quartz products factory



**Dongtai, Jiangsu Province**

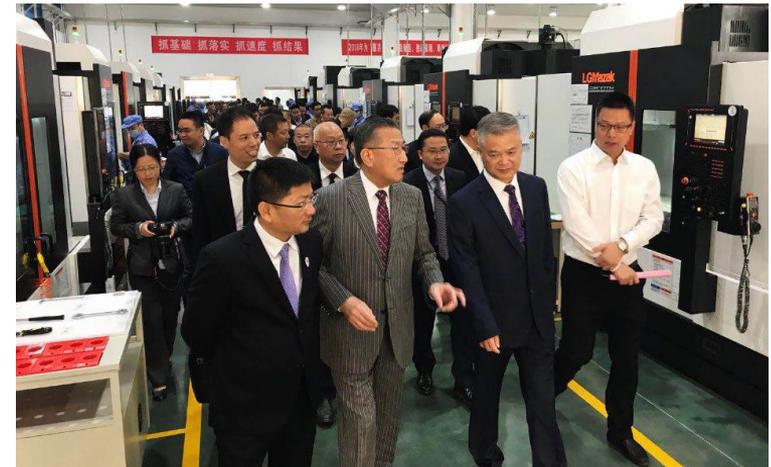
# Introduction to New Factory Completed: Zhejiang Province

Thermo-electric module factory



Changshan, Zhejiang Province

Quartz products and metal  
processing factory



Completion ceremony tour

# Relationship between material products and corporate capital investment

- Semiconductor materials are divided into consumables and products that are proportional to capital investment by manufacturers.
- Because we cover both consumables and products, **stable revenues can be secured even if capital investment peaks out.**

Linkage between semiconductor materials and capital investment

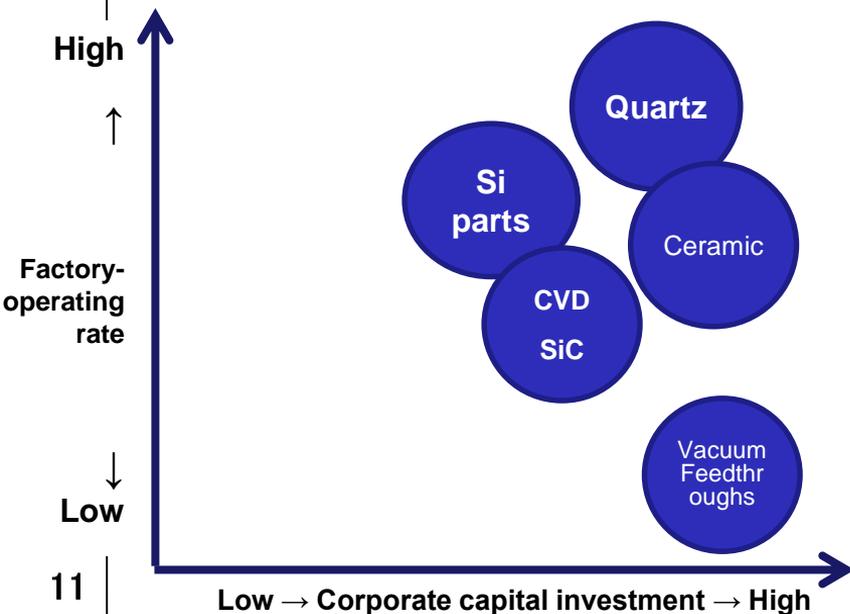
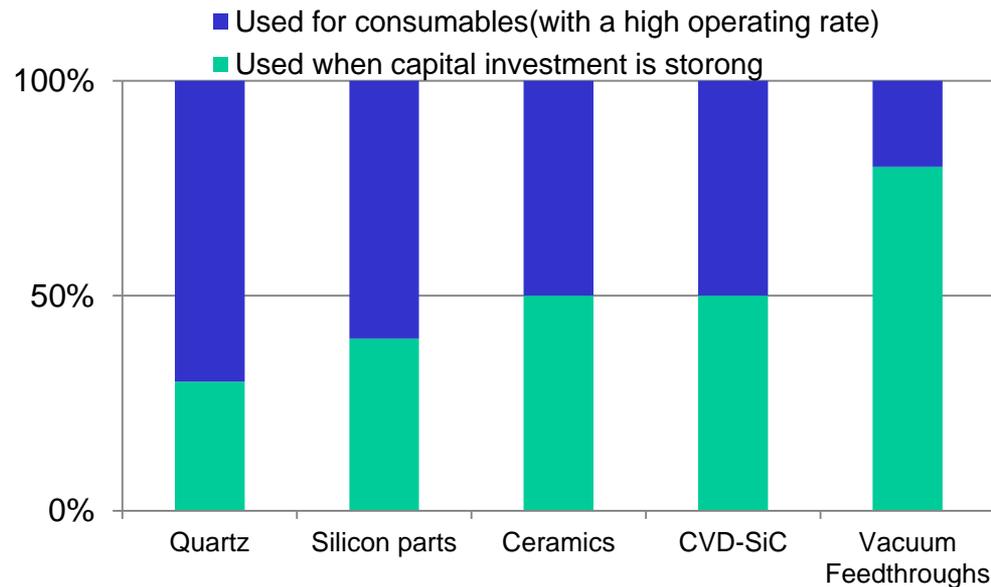


Image of sales ratio by application of each product



- Continuing to build a wafer factory in anticipation of brisk business in China
- Plan large-scale capital investment of approximately 67 billion yen including 200 mm and 300 mm wafers
- Financing channels will be disclosed as soon as they are determined.

### Details of Capital investment in China

**200mm  
Wafer**

Approx. 51 billion yen  
(Of which 24 billion have been forecasted for  
the current fiscal year)

- Ingot production line at the Yinchuan factory
- Wafer processing line in Hangzhou

**300mm  
Wafer**

Approx. 16 billion yen

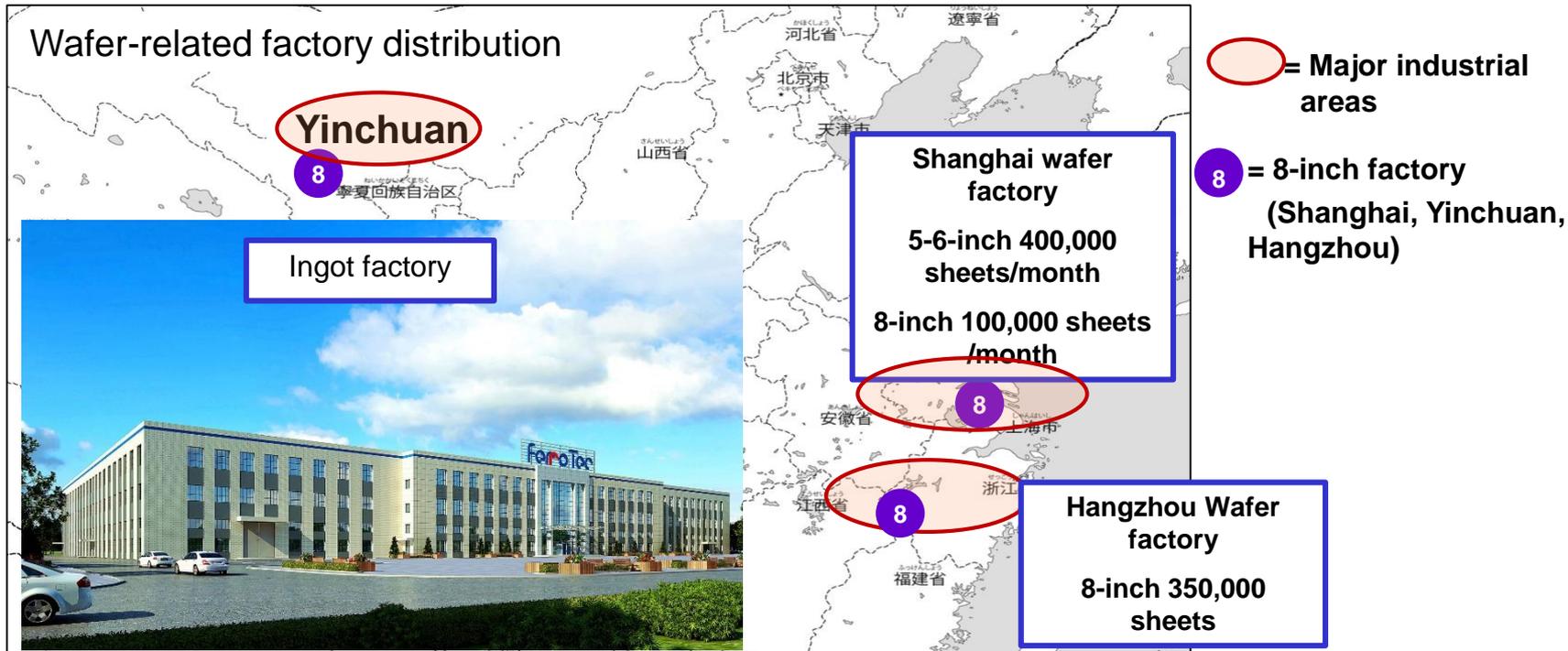
- Same as 200-mm wafer

- The Shanghai Factory completed evaluation (80,000 sheets in October) after resuming mass production of 8-inch wafers.
- The Hangzhou Factory is scheduled to be completed in January next year.

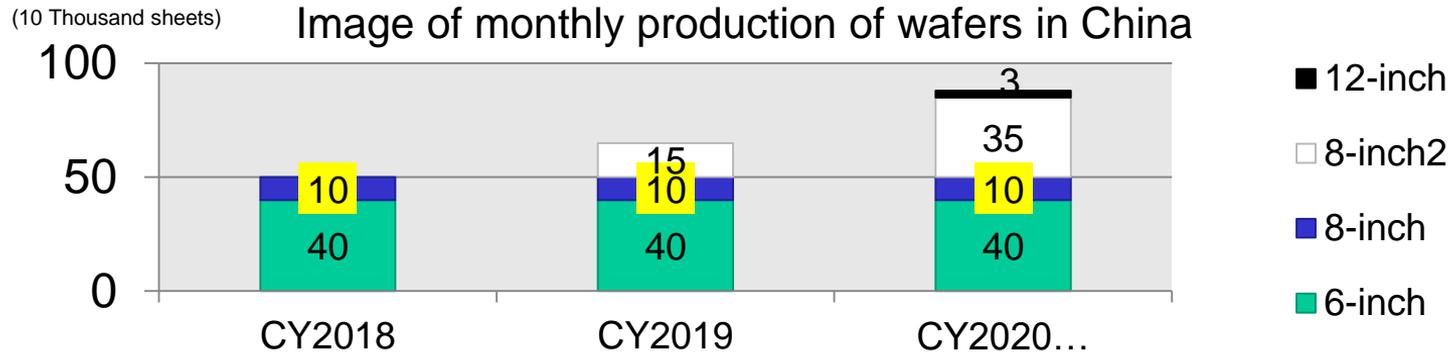


Hangzhou wafer factory

- Dividing roles to develop factories



- The image of production capacity after investment is as follows
  - Small diameter (5-6 inch) ; monthly production of 400,000 sheets (in operation)
  - Medium diameter (8 inch) ; monthly production of 100,000 sheets (in operation)
  - Medium diameter (2nd line) ; monthly production of 350,000 sheets  
(Frame of the factory will be completed early in next year, and capitals be posted in 2019)
  - Large diameter (12-inch) ; pilot line: 30,000 sheets  
(scheduled for 2020 and beyond)



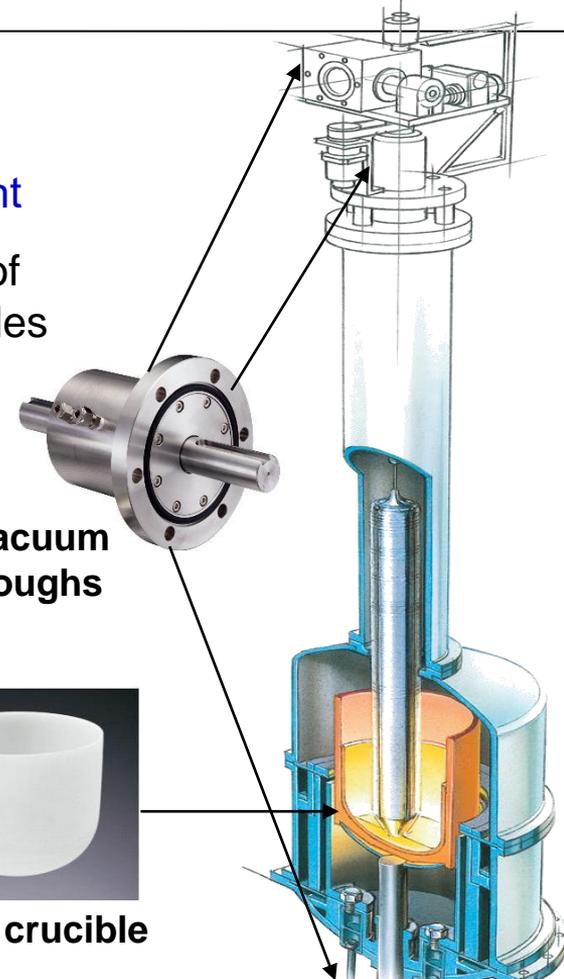
- The wafers we manufactured are sold from our partner ,Global Wafers Corporation, which is the third-largest semiconductor wafer manufacturer in the world ,to other countries



- Commencement of external sales of silicon mono-crystal manufacturing equipment  
→ Reduction of depreciation cost of wafer equipment
- Capitalizing on group synergies, including the use of vacuum feedthroughs and the sale of quartz crucibles
- With a view to selling 12-inch ingots in the future



**Three vacuum feedthroughs**



- Strong demand from semiconductor and FPD manufacturers for additional facilities
- Construction of **a fifth cleaning factory** in Anhui province scheduled for completion in January 2019

## Cleaning Factory in Tongling, Anhui Province



- Strong demand from semiconductor and FPD manufacturers for additional facilities
- Second factory in Neijiang, Sichuan province will start operation at the end of 2018

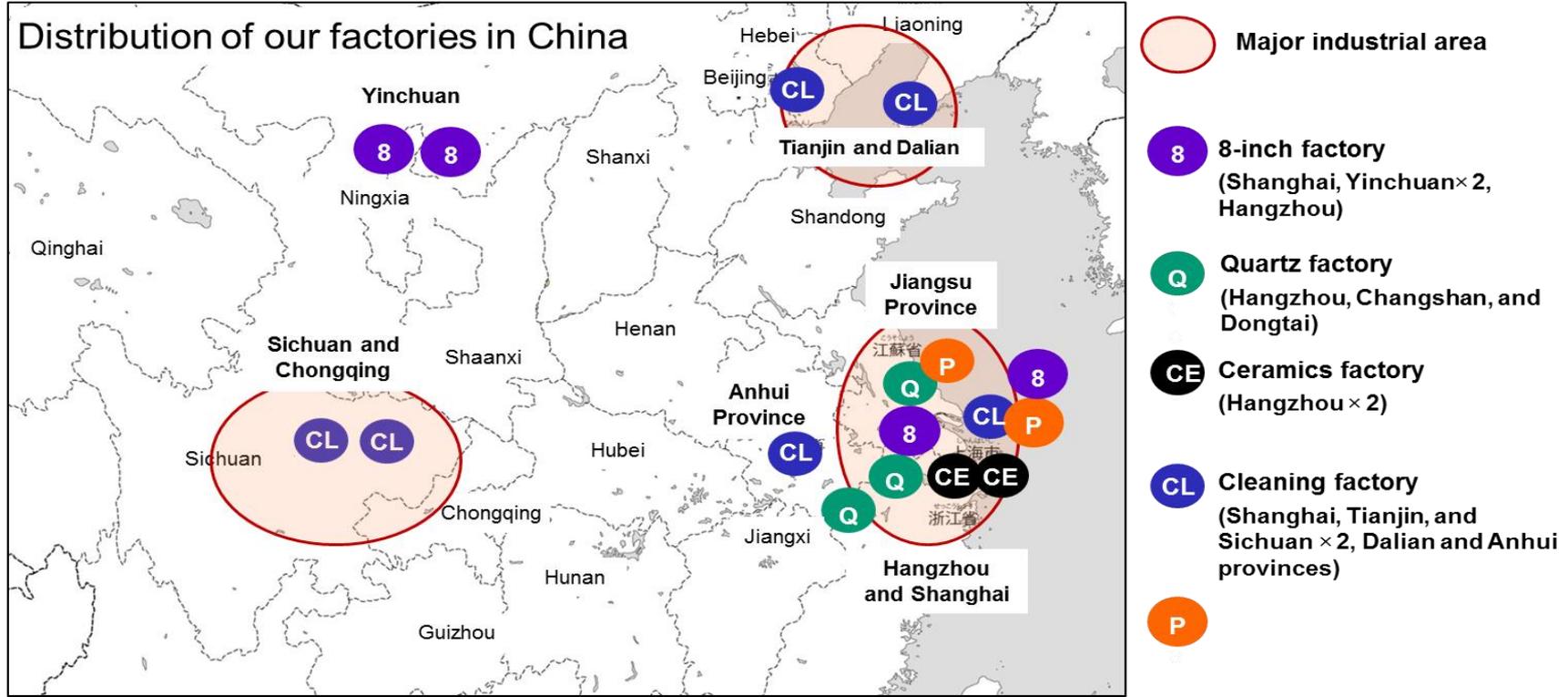
**Cleaning Factory in Neijiang, Sichuan Province**



**Second Cleaning Factory in Neijiang**

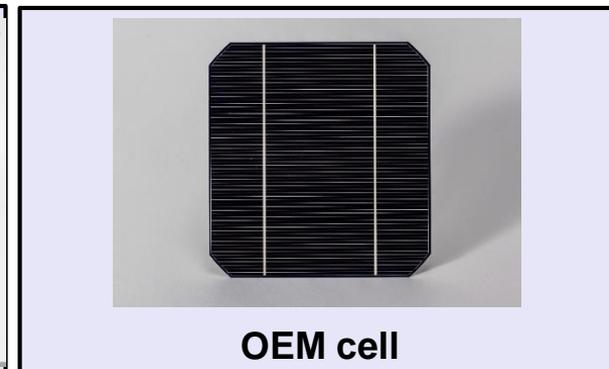
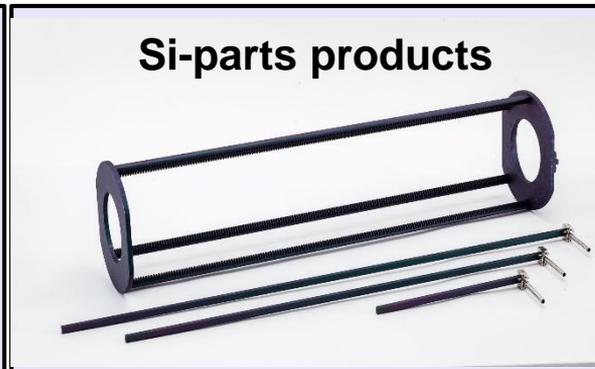


Decentralizing factories while developing factories in major areas, and so reducing business risks



# Photovoltaic-related business: Implement ongoing structural reforms

- Silicon products for solar cell
  - Specializing only in OEM customers (**withdrawing from own sales**)
  - Divert its use for structural materials for semiconductor Si-parts except for equipment for OEM applications.
- Cell products
  - Specializing in contract manufacturing or OEM production (**withdrawing from own sales**)
- Remodeling facilities and personnel restructuring (**divert to semiconductor factories**)



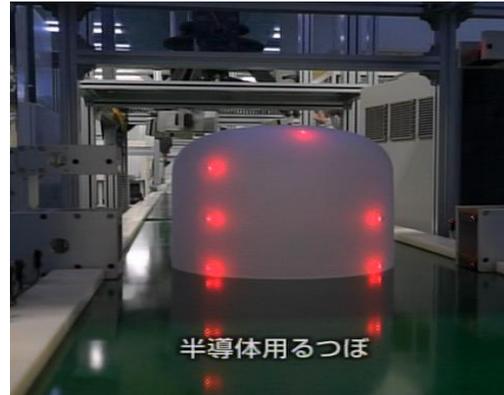
# Photovoltaic-related business: Converting its role to semiconductor applications

- Silicon mono-crystal pulling device for 8-inch, in operation
- 12-inch lifting device, during test operation
- In quartz crucibles, about 70% is for semiconductor applications
- Expansion of pulling device for semiconductor structural materials

8-inch pulling device



Quartz crucible



Si-parts material  
pulling device



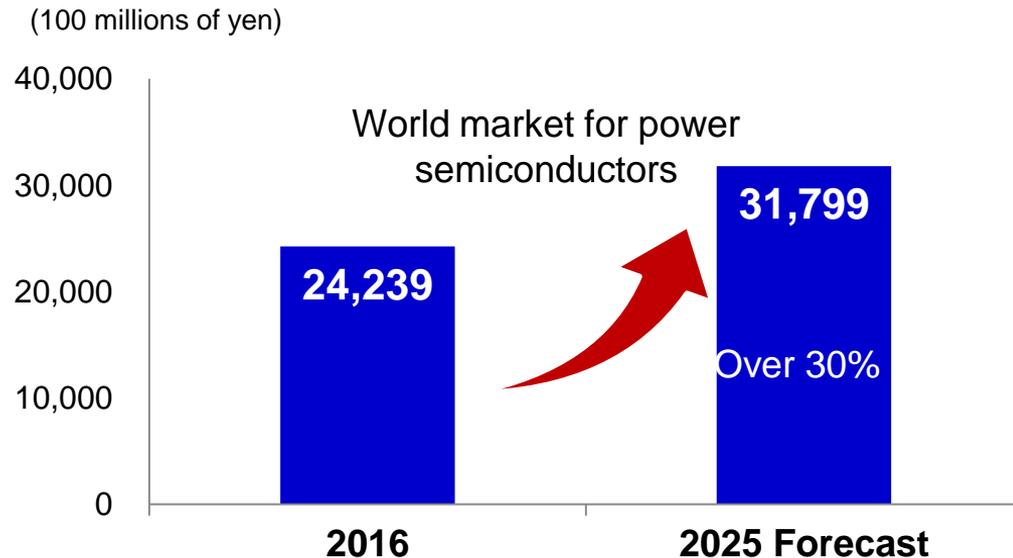
# Power semiconductor substrates; Capture the market for EV and industrial-use

- World market is expected to grow by more than 30% through 2025, with the JPY3tn market
- Demand for machine tools and automobiles also increased.
- Power semiconductor substrate factory completed in Jiangsu Province in July to triple production capacity



Electric vehicle

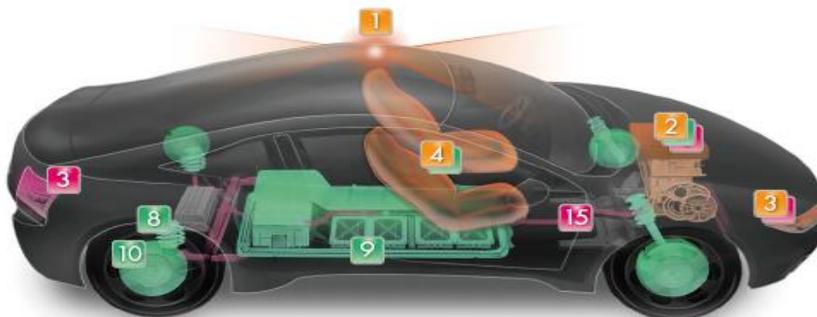
Welding robot



# Entering into the Automotive-Related Fields

## -Expansion of In-Car Products

Mainly developing thermo-modules, magnetic fluids, and power semiconductors, etc. and making proposals to in-car mounted product manufacturers



### Thermo-module application



- 1 Laser radar
- 2 Battery cooling
- 3 Laser headlights
- 4 Seat cooling system
- 5 Steering heater cooler
- 6 Cup holder
- 7 HUD (Head-up Display)

### Magnetic fluids and applications



- 2 Engine suspension
- 4 Seat suspension
- 8 Suspension around the foot
- 9 Hzero® high-precision DC sensors for monitoring SOCs
- 10 Hzero ® composite wheel in motor
- 11 Touch Panel & Center
- 12 Audio

### Power semiconductor substrates and applications



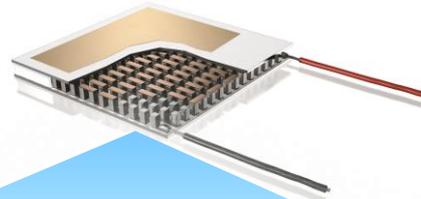
- 2 Engine
- Bodies**
- 3 Headlamp control and room lamp control
- Powertrain**
- 13 HEV motor control  
Transmission, brake and steering control

← Our core technology products support a wide range of automotive products

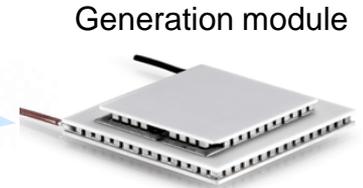
- Strengthen 5G and communications equipment business
- Expanding the scope of business in areas such as biotechnology and medical
- Development of cooling plates for semiconductors



Advanced Vehicles



Unit model



Generation module

**Expand the support area**



Mobile communication system (5G)

Medical



Commercial-off-the-shelf product



We target net sales at **100 billion yen** and operating margin at **10% level**

