[Aoyama Gakuin Univ.] Student Research

[Electronic]

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Ferrotec Corporation

Date
10.27.2011

Ticker: JASDAQ 6890
Price: 1,024 JPY

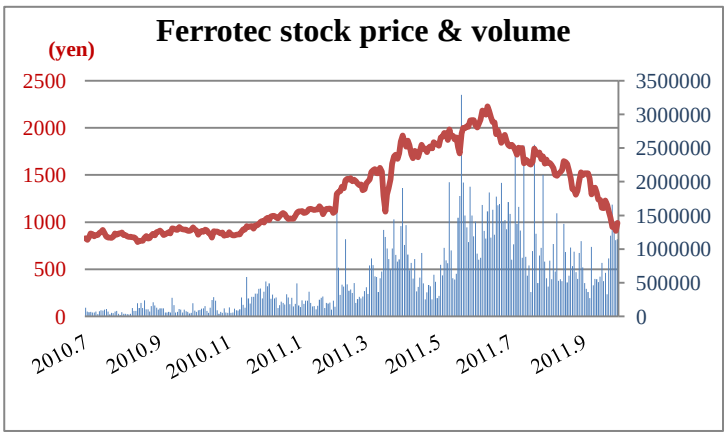
Recommendation: BUY
Price Target: 2,017 JPY

Earnings/Share (JPY)

	Mar.	Jun.	Sept.	Dec.	Year	P/E Ratio
2008A	26.87	14.08	38.40	-44.96	34.39	31.90
2009A	-9.16	-10.12	7.92	17.78	6.58	163.83
2010A	26.52	27.70	52.73	73.68	180.63	10.30
2011E	60.25	-	-	-	249.44	8.08

Highlights

- **Discounted Cash Flow model indicates Buy:** Ferrotec Corporation's share is currently undervalued according to our DCF model and comparable multiples. These valuations point to a price target of 2,017 yen, a 97.0% premium over the current share price. Although the Mid-Term Management Plan is too difficult to achieve because of the too bullish sales target, we concluded that Ferrotec will take advantages in Asia and expand sales in the long term.
- **Growth in China with High Quality Products:** 20 years ago, Ferrotec extended its business to China which has a large demand for Photovoltaic (PV), much earlier than other competitors and established sales network as a pioneer. High quality PV furnaces and Quartz crucibles created the advantages against competitor's products. We expect Ferrotec to increase revenues from Asia in FY 2013(E) and Ferrotec's performance will be buoyed as the PV market grows in the future.
- **Expanding Sales by World Energy Policies and Declining PV Costs:** We expect Ferrotec will expand sales owing to the strong demands for electricity in developing countries and the world's renewable energy policies that facilitate to introduce PV generation systems in each country. In addition, PV generation system is suitable to large countries because it enables them to produce and consume electricity regionally without long cables to deliver electricity. Improving performance and reducing prices of the PV-related products will prompt declining costs of PV generation at large. This is also strong tailwind for Ferrotec.
- **Effective Strategies:** The president of Ferrotec is a man of vision and his investment in the semiconductor (SEMI), LED, and PV businesses in the past is paying off at present. Entry into various markets has pre-empted the damages from the silicon cycle. Especially, participation to the market of the Vacuum deposition equipments has tempered the impact of the silicon cycle to the sales.



Market Profile	
52 Week Price Range	835 - 2,246 JPY
Average Daily Volume	698,277
Beta	1.15
Dividend Yield (Estimated)	1.95%
Shares Outstanding	30.309M
Market Capitalization	310.37 M JPY
Institutional Holdings	38%
Insider Holdings	3.22%
Book Value per Share	986.6 JPY
Debt to Total Capital	56.02%
Return on Equity	18.310%

Figure 1: Sales trends in each region (in million yen)

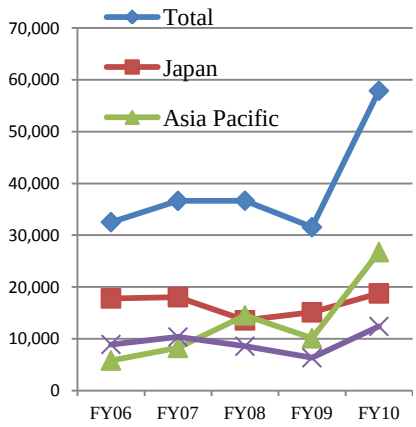
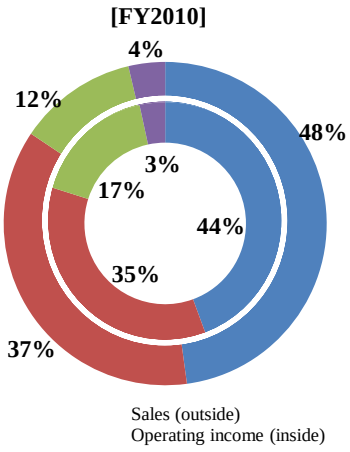


Figure 2: Sales and Operating income



- Thermo-electric Modules
- Ferrofluid

- Ferrofluidic vacuum feedthroughs
- Quartzware
- Fine and machinable ceramics
- SEMI wafers
- Electron beam evaporation guns (EB-Guns)
- Vacuum deposition equipments

- PV furnaces
- Qurtz crucibles
- Solar silicon

Business Description

Ferrotec Corporation is a diversified technology company based in Nihonbashi (Tokyo, Japan), founded in 1980 as a subsidiary of Ferrofluids, a US technology company (Later, in 2000, Ferrofluids was acquired by Ferrotec Corporation and changed its name to Ferrotec (USA)). Ferrotec offers high quality products and service globally, mainly to new energy and electronic industries. In FY2010, the group earned 57.88 billion yen in revenues (+83.51% YoY), and 6.93 billion yen in operating income (+886.06%), and had 6,424 employees (+46.90%). **Ferrotec's core competency is the technology of Ferrofluid magnetic liquid, and its principal products are Ferrofluidic vacuum feedthroughs and Thermo-electric Modules. Especially, Ferrotec is the largest manufacturer of vacuum feedthroughs with a 70% share of the world market.** The company has expanded its business and diversified its product portfolio by entering other peripheral products and service markets in the world, offering mainly to PV, SEMI and automotive industries. And it operates in 11 countries, mainly in Europe, North America, Asia Pacific and Japan.

Business Units: The company conducts its operations in the following three main units.

Equipment-related segment:
This segment is a core business for Ferrotec, accounting for 47.85% of revenues in FY2010. It primarily comprises Ferrofluidc vacuum feedthroughs, Quartzware, Ceramics, Vacuum deposition equipments and SEMI wafers, which are used in the process of SEMI, FPD and LED manufacturing. Revenues in this segment tend to fluctuate depending on capital investment trends in industries mentioned above.
-Ferrofluidic vacuum feedthroughs (accounting for 28.0% of segment revenues in FY2010): This product is a rotary sealing solution for vacuum environments. And this is one of the principal products of Ferrotec, using ferrofluid as part of an applied solution. The company has been the industry leader, with a 70% market share in the world.
-Quartzware (23.5%), Ceramics (13.8%): Both are used as consumables in the manufacturing process mentioned above, and have a feature of being resistant to heat and chemical attack.
-EB-Guns, Vacuum deposition equip. (14.9%): The former is used in the manufacturing process mentioned above, and the later is used in that of LED. Ferrotec took over Temescal (Vacuum deposition equip. business) from Edwards Vacuum Inc. in January 2010 and started full-scale operation in the LED market, which is expected to expand with high growth rate. The company regards Vacuum deposition equip. as one of the main growth drivers in the Mid-Term Management Plan.
-SEMI wafers (16.8%): Ferrotec also manufactures semiconductor discrete wafers at the Shanghai plant. The company used to be the original equipment manufacturer (OEM) for Covalent Material Corp., but in FY2010, it launched its own Ferrotec brand products.

Electronic-device segment:
In this segment, Ferrotec develops ferrofluid technology (Exhibit: A-4) and manufactures Thermo-electric Modules. The revenues in this segment, contributing to 11.95% of total revenues in FY2010, tend to fluctuate depending on capital investment trend in the automotive industry.
-Thermo-electric Modules (accounting for 93.1% of segment revenues in FY2010): Thermo-electric Modules are efficient temperature controllers, converting electric voltage to temperature differences and vice versa. Ferrotec is recognized as a world-leading manufacturer of thermo-electric modules for its exceptional quality and performance, offering them mainly to automotive industry.

PV-related segment:
This segment is also a core business for Ferrotec, accounting for 36.54% of revenues in FY2010. It primarily comprises PV furnaces, Quartz crucibles and Solar silicon, offered to PV manufacturers. **Now, PV is one of the world's fastest-growing energy technologies, and the PV industry, being expected to have high growth potential, has been growing substantially in recent years.** Ferrotec also regards this segment as one of the main growth drivers in the Mid-Term Management Plan. And the revenues in this segment tend to fluctuate depending on cost of PV, each country's energy policy and the inventory status of solar panel.
-PV furnaces (accounting for 46.34% of segment revenues in FY2010): This is a future principal product of Ferrotec, including Single-crystal silicon furnace and Polycrystalline silicon furnace. Single-crystal silicon has the property of higher conversion efficiency of sunlight to electricity (about 20%) compared to other products. Polycrystalline silicon has the property of good cost-performance ratio, although its conversion efficiency (about 16%) is lower than that of single-crystal silicon.
-Solar silicon (29.24%): This is a raw material from which PV cells, modules and arrays are made. This product includes single-crystal ingot, polycrystalline ingot and PV wafer.
-Quartz crucibles (17.27%): This includes Quartz crucibles and Square crucibles, and both are critical consumables for PV furnaces. The former is used for Single-crystal silicon furnace and the latter is used for Polycrystalline silicon furnace.

Industry Overview and Competitive Positioning

Total rating: POSITIVE

Ferrotec has two important strengths in the market. One is a competitive advantage that has been established by patented Frerrofluidc vacuum feedthroughs and applied products. The other is a positive attitude and effective strategies to enter into many potential markets. Ferrotec's position is influenced by the World's economy including China, but Ferrotec can be differentiated from rival companies and will strengthen its competitiveness in Asia. Therefore, we give it POSITIVE as a total rating.

Strengths: POSITIVE

- Ferrofluidic vacuum feedthoughts with a 70 % global share
- Only offers Thermo-electric modules for luxury car
- Big market share of PV furnaces
- Combination of PV furnaces and consumables

○Common features in three segments

Preceding benefits in China

Ferrotec has benefited from establishing production bases and sales networks in China, prior to rival companies. Especially in Equipment-related and PV-rerated segments, Ferrotec has expanded sales steadily. In addition, Ferrotec has also focused on increasing cost competitiveness by automation and electricity cost reduction by constructing plants inland (half costs of coastal areas). Therefore, Ferrotec has lower COGS than other competitors in the industry.

◆Equipment-related segment

Frerrofluidc vacuum feedthroughs has a 70% global market share and is a source of differentiation. Ferrotec launched this product in the first half of 80s, and accumulation of advanced technologies has become an entry barrier in this market. Recently, it developed a new type of vacuum feedthroughs, by using unique patented technology, "improved acid resistance ferrofluid". In this way, Ferrotec has been differentiated itself steadily. There are competitors of vacuum feedthroughs like "Eagle industry Co., Ltd." and "NOK Corporation". Though taking account of its protection by patents (Exhibit: A-5), we believe Ferrotec will maintain high global market share in the future.

◆Electronic-device segment

Now, Ferrotec is the only company to produce and sell Thermo-electric modules for car in Japan. Before, it aligned with Amerigon Corporation and had a 100% market share for luxury car in the U.S and Asia (Exhibit: B-12). Today, this alliance has expired, but Ferrotec still has strengths characterized by its high-grade products and years of experience.

◆PV-related segment

Ferrotec's Single-crystal PV furnace holds 15% market share in China (Exhibit: D-1). And we estimate that high-grade products have the biggest market share in China. In addition, Ferrotec is the world's only company offering furnaces and consumables totally, according to IR information. Another strength is that Ferrotec employs capable people locally and let them control local production bases, like vice-president Mr. Ga in China.

Weakness: NEUTRAL

- Impact of the silicon cycle
- As small scale as competitors

◆Equipment-related segment

There are a lot of products showing high correlation with the silicon cycle. Actually, sales of this segment are influenced greatly by SEMI capital investment trend. However, Ferrotec is willing to shift its focused business to PV-related segment. Therefore, we expect the influence of the silicon cycle will weaken gradually.

◆PV-related segment

Taking into account sales performance of PV furnaces, the scale of production and the number of clients are behind its competitors in our judgment.

Opportunities: POSITIVE

- Rapid growth of the LED market
- Demand for energy-saving products
- Expansion of PV subsidies in Asia
- Growth of the PV market

◆Equipment-related segment

LED Chip manufacturers are making prior investment aggressively (Exhibit: B-4), because it is expected that LED market will expand rapidly by positive trends of energy-saving and environment-friendly products in the future. To catch this trend, Ferrotec has expanded sales of Quantzwares and vacuum feedthroughs to the LED market, and it gains a 50% global market share of Quartzwares for LED (according to annual report). But, if this market continues to expand, competitors like Shin-Etsu Chemical Co., which has a big market of Quartzwares for semiconductor, may enter this market.

◆Electronic-device segment

In FY2010, the sales of Thermo-electric for consumer modules increased six times as large as the previous fiscal year, accounting for 22% of segment revenues (6% in FY2009). This increase is due to rush-in demand caused by the end of subsidy program for energy-saving consumer electronics products. So, it won't continue in the future, but this suggests there is room to develop a new market for energy-saving products.

◆PV-related segment

The several countries Governments have positively taken the FIT and subsidy programs (Exhibit: D-2) in order to contribute to environmental protection, reliable energy supply and global economic growth. Also PV markets have increased in size in the world, especially in Asia (Exhibit: D-13). This is because the demand for electricity has been expanded by the economic growth in developing countries. In addition, there is a trend to set a high valuation on high quality products, providing high electrical efficiency. These conditions are likely to give positive impacts on Ferrotec's sale in the future.

Threats: NEGATIVE

- Over investment on LED equip.
- New competitors in Thermo-electric module market
- Decrease in PV subsidies in Europe
- Overproduction of PV panel
- Low-price of Chinese goods

○Common features in three segments

Concerns over China's inflation and global recession

Currently, major countries have high unemployment rates and tight financial conditions (Exhibit: D-15-17). In addition, China, where Ferrotec's production bases are located, has decreased a growth of imports and exports (Exhibit: D-18). Moreover, the inflation in China is increasing, with higher general prices, distribution costs and wage costs, which make Ferrotec face higher operation costs.

◆Equipment-related segment

Now, LED manufacturers are suffering from overproduction due to a backdrop of subsidy programs in China for MOCVD equipments, used for pre-process of Vacuum deposition equipments, and expectation that LED will become one of the new economic drivers in the future (Exhibit: B-4). Therefore, although the LED lighting market is expected to increase rapidly after CY2013, we expect that the investment on Vacuum deposition equipments will reduce until CY2013. However, in Japan, ULVAC, Inc. is the only company to compete with Ferrotec in this business. Although ULVAC is trying to develop LED equipments business according to its growth strategy in its annual report, no keen competition is expected. After the investment reduction on LED equipments, we expect Ferrotec will expand its sales steadily.

◆Electronic-device segment

Ferrotec was aligned with Amerigon Corporation, which offers the thermo-electric module products for luxury cars, but this cooperation has expired. Therefore, there is a possibility that some new competitors enter this market. However, Ferrotec still has competitiveness because of the advanced technologies and many years of trust by customers. Ferrotec is the only manufacturer of the thermo-electric modules for car in Japan today.

◆PV-related segment

The Asian markets have been growing because of the expansion of the FIT and subsidy programs for the PV, but the European markets are expected to shrink significantly because such programs has shrinking trends in Europe (Exhibit: D-13). we expect negative impacts from excessive stock and overproduction of solar panels due to the rapid market expansion in the first half of CY2011 (Exhibit: D-4). Therefore, the global market of the PV is expected to become half in CY2012. If stagnation of this market is prolonged, the sales of the company's related products may also decrease in CY2012 and after. At the same time, there is possibility that low-cost products from China will give negative impacts on the sales of the company (Exhibit: D-5).

Investment Summary

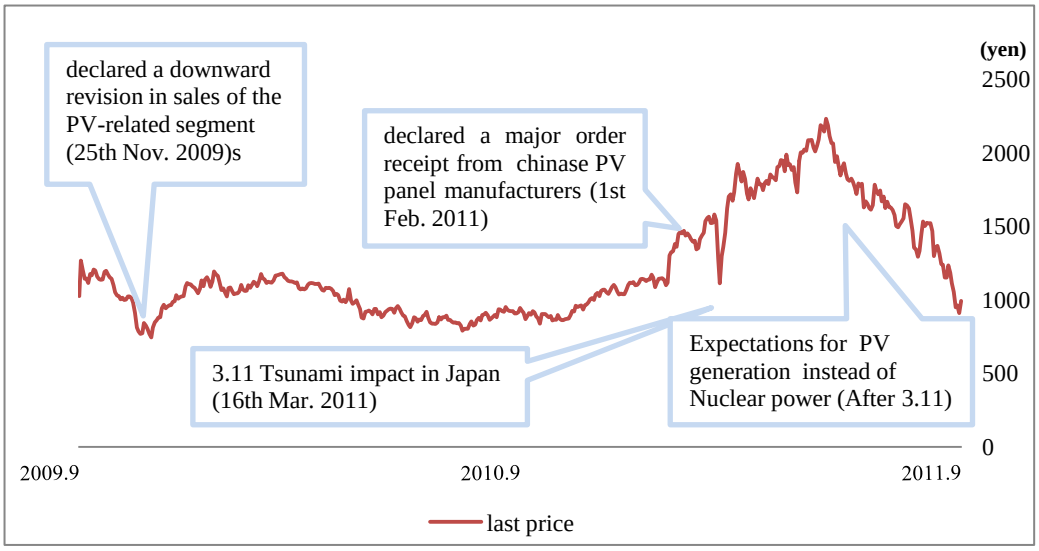
BUY recommendation is based on tailwind for the company: Our price target of 2,017 yen, offering a 97.0% upside from current stock price, is supported by a valuation of DCF and comparable multiples. Ferrotec Corporation has a stable sales network for PV-related, Equipment-related and Electronic-device products in Asia. Although we expect the sales contraction of PV-related products in CY2012 and CY2013, the sales will turn around as the global PV market grows rapidly after CY2013, and an increase in sales of Equipment-related and Electronic devices will remain on track. We see the firm well positioned to benefit from these products in the long term.

Business strategy: Ferrotec Corporation produces higher quality goods than competitors, and has been the only company that supplies Quartz crucibles and PV furnaces as a set. This enables the company to make a deal with customers continuously. Once the customers purchase the PV furnaces for PV silicon, they continuously buy Quartz crucibles which are consumable supplies. Further, the PV-related is going to drive sales hereafter.

Status quo: The firm has extended the scale of business with a management policy that defer to the environmental protection and the vacuum technology granted by a patent. Additionally, it is critically important that the firm manufactures various products which large companies do not make. Ferrotec has established bases of business in China and Japan. The position of the company is buoyed by the Asia's economic growth. Main risks are connected to the instability of China's economy. The economic environments may be changed by the regime change in CY2012. And the benefit from China may recede when China's housing bubble collapses. On the other hand, we believe the technological innovation to make the superior Li-ion battery will drive the sales upside.

Financial status and prospects: Though the Mid-Term Management Plan is too difficult to achieve, Ferrotec will realize the sales of 78 billion yen in FY2016 (E) mainly thanks to PV market expansion. Moreover, the company's operating profit margin is 2~6% higher and COGS is 4~8% lower than competitors. This allows Ferrotec to keep the positive momentum in the market.

Figure 3: Ferrotec stock price



Source: Yahoo! finance

Valuation

We calculated the theoretical price target of the company by using the enterprise DCF (Discounted Cash Flow) model from the forecast of future sales and cash flow. After that, we confirmed that the theoretical price target was within the proper range suggested by comparable multiples.

The calculation of the theoretical price target by DCF model: we took three steps to calculate the theoretical price target by DCF model.

① First, we calculated the future sales of the three segments (Equipment-related, Electronic device, PV-related) until the end of FY2015.
② Secondly, we made the calculation of Profit and Loss statement and Balance Sheet, and calculated NOPLAT and Free Cash flow (FCF).
③ Finally, we discounted FCF by the weighted average cost of capital (WACC) calculated in advance, then calculated the theoretical price target.

First, We calculated the sales forecast of the three segments.

・Equipment-related segment

Ferrofluidic vacuum feedthroughs, Quartzware, Ceramic products, EB-Guns: We found each product to be highly correlated with the Front-end SEMI Equip. market. Therefore, we predicted the market size of the Front-end SEMI Equip. market at first (Exhibit: B-1). Second, we counted the ratio between each product's sales and the Front-end SEMI Equip. market, to get the future ratios. Third, we got the sales forecasts of each product by multiplying the ratios by the predicted market size of the Front-end SEMI Equip. market (Exhibit: B-6, 7, 8, 9).

SEMI wafers: We found SEMI wafer to be highly correlated with Asian semiconductor market. Therefore, firstly we counted the ratio between the sales of SEMI wafer and Asian semiconductor market. Then, we calculated the ratios in the future. Finally, we calculated the sales forecasts of SEMI wafer by multiplying the ratios by the predicted market size of the Asian semiconductor markets (Exhibit: B-10).

Vacuum deposition equip.: It is difficult for us to obtain the data about Vacuum deposition equip. We assumed that the sales of Vacuum deposition equip. should be correlated with the market of MOCVD equipments, used in the previous step of Vacuum deposition equip. Then, we used data on MOCVD equip. to calculate the sales forecasts of Vacuum deposition equipments (Exhibit: B-9).

SEMI silicon: The sales of SEMI silicon is small compared to the sales of the other products (= three segments - SEMI silicon) with the rate between two of 1.54% in the previous year. We supposed the rate should not change much in the future, and estimated the sales of SEMI silicon (Exhibit: B-11).

・Electronic-device segment

Thermo-electric Modules: Picked up macro data which were highly correlated with the sales of each product. We found that Thermo-electric modules for car were highly correlated with the production unit numbers of six partner car makers, and other products were highly correlated with real global GDP (Exhibit: B-12 Figure: 2). Based on the Mid-term Management Plan, we don't expect that Electronic-device segment will have big structural changes in the future. So, we forecasted the sales by multiple regression analysis, using the above correlation (Exhibit: B-12).

Other products (magnetic fluid, FFB, etc): We assumed other products would maintain the present situation in the future. So, the future sales were set at the same level as FY2010 (Exhibit: B-12).

・PV-related segment

PV furnaces: Referring to Book-to-Bill Ratio, we expected the ratio of the company's sales to the global market will remain the same (Exhibit: B-13). The future sales will be influenced greatly by the global market.

Quartz crucibles: We forecasted the sales Based on the growth of production capacity by new investment, and the growth rate of the solar silicon market in the world. (Exhibit: B-14).

Solar Silicon: We calculated the sales forecast based on the growth of the world market of solar silicon. We expect the market will grow steadily (Exhibit: B-15).

We made the financial statements based on the above sales forecasts, and calculated NOPLAT and FCF. We added discounted FCF by WACC to the present value of the terminal value and assets for non-business, then calculated the theoretical price target by subtracting interest-bearing debt. All other main figures, except for the sales used to calculate the theoretical price target, are as follows (Table: 1).

Table: 1

Index	Value
Risk-free rate	**1.032%**
Market-risk premium	**2.96%**
β	**1.15**
Cost of equity	**4.4360%**
Debt cost	**2.6615%**
Effective rate of duty	**40.07%**
WACC	**3.5766%**
Perpetual growth rate	**1.0%**

Debt	**58.43%**
Equity	**41.57%**

- **Risk-free rate:** 10-year government bond yield of September 30th 2011 (From the website of The Treasury) (Exhibit: C-4)
- **Market-risk premium:** ="Rate of return of the TSE from 1986～2010" – " risk-free rate" (Exhibit: C-4)
- **β :** Approximate value of the historical β obtained by weekly and monthly regression analysis of the ROI (Exhibit: C-5)
- **Cost of equity:** Cost of equity = risk-free rate + β ×market risk premium
- **Debt cost:** = interest paid of FY2010 ÷Average interest-bearing liabilities during the FY2010
- **Effective rate of duty:** Financial report of FY2010
- **WACC:** The calculation by the above values
- **Perpetual growth rate:** Predicted value of Japanese GDP in FY2016 (IMF data base) (Exhibit: C-6)

- **Debt:** 35,935 million yen (FY2011)
- **Equity:** 25,564 million yen (FY2011)

Scenario analysis: In addition to the above sales forecasts (neutral condition), we also made sales forecasts in a good business condition and in a bad business condition. Then, we calculated the theoretical price target for each scenario (Exhibit: C-7). Overview of each scenario is as follow.

Scenario 1 (neutral): The sales forecasts are the same as the above. The theoretical price target is **1,924 yen**.
Scenario 2 (good): More rapid demand growth for solar-related products the market demand by lower cost of solar power generation or more supporting policies by each country. We also expected sales expansion of Thermo-electric modules. We calculated the theoretical price target as **2,787 yen**.
Scenario 3 (Bad): Under the assumption that European economic crisis will realize in the future, we expected the sales of the Equipment-related segment and Electronic-device segment would be influenced as much negatively as case after the Lehman Shock, and expected that the growth of the market for PV-related segment will slow down. Under such conditions, theoretical price target was calculated as **1,131 yen**.

After the above procedures, we calculated the theoretical price target by taking weighted average of each scenario by using the following possibility:
neutral : good : bad = 7:2:1

In this way, we got the price target of **2,017 yen.**

Multiple analysis: To confirm that the above price target is reasonable, we also calculated the proper range of the share price by multiple analysis. We chose PER, PBR and PSR as index based on share price. We also used EV/EBIT ratio and EV/EBIDA ratio, as index based on enterprise value (Exhibit: C-8-1). We chose the following comparable companies (Exhibit: C-8-3).

- Manufacturers of vacuum throughs
  - ・NOK Corporation
  - ・Eagle Industry Co. Ltd
- Manufacturers of Thin film PV, LED equipment
  - ・ULVAC KIKO. Inc
- Manufacturers of raw material silicon
  - ・Tokuyama Corporation
- Companies in the same industries as Ferrotec
  - ・Dainippon Screen MFG.co.ltd
  - ・Shibaura Mechatronics Corporation

According to the analysis using the above six companies, the maximum value of the price target was 2,924 yen, and the minimum value was 955 yen (Exhibit: C-8-2). The theoretical price target calculated by DCF model was within the range, so we confirmed that it was a reliable estimate.

Figure 4: Transition of Achievement (in million yen)

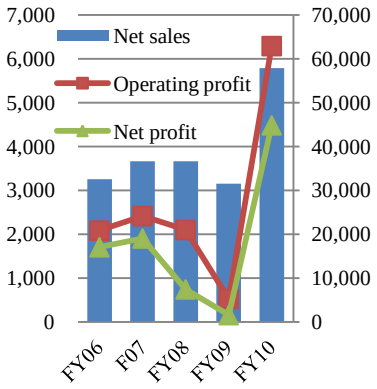


Figure 5: Transition of ROE

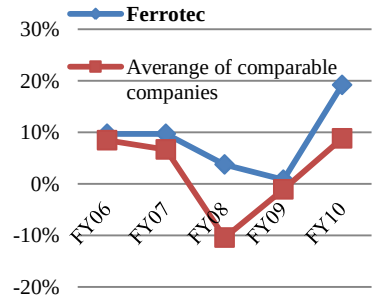


Figure 6: Operation profit ratio

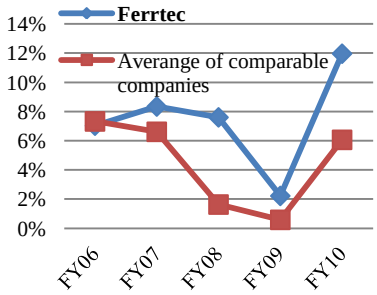
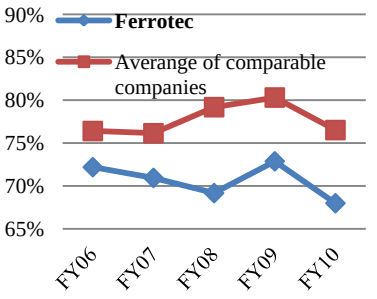


Figure 7: Sales cost ratio



Financial Analysis

Revenues Analysis: The sales , the operating profit ,and the net profit for FY2010 were 57,880 million yen, 6,990 million yen and 4,480 million yen, and these figures were the best in the past (Figure 4). Also, in the same year, ROE ratio of Ferrotec increased dramatically, with more than 10% higher than that of other companies (Figure 5).

We found that the high ROE came from high profit margins on sales by using Du Pont decomposition. Ferrotec's operating profit ratio was higher than that of other comparable companies in most years, showing that Ferrotec has kept high profitability (Figure 6). Ferrotec also has a low cost structure as shown by low outsourcing costs, which enables it to keep lower sales cost ratio (Figure 7). We can say the company manufactures products with lower costs than competitors.

Safety Analysis (Exhibit: C-9**):** There were no big differences from the comparable companies in capital-to-asset ratio and ratio of fixed assets to equity capital. But Ferrotec has financed by loan capital for expansion of production facilities in PV-related segment, so current ratio and current rate were lower than other companies. However, we don't think the balance sheet is unhealthy, as Ferrotec will grow greatly in PV-related segment in the future.

Cash flow Analysis (Exhibit: C-3**):** Each term FCF has changed a lot, with a negative FCF in FY2010. The main reason was active investment. As mentioned in safety analysis, we noticed Ferrotec has invested mainly in overseas market. In FY2010, they invested for a subsidiary company in HangZhou and bought up the US subsidiary company (IMI). According to the Mid-Term Management Plan, Ferrotec will invest 190 billion yen during the three years from FY2011 to FY2013. We expected the company to continue to invest actively.

Analysis (Exhibit: C-9**):** For efficiency analysis, we focused on the turnover rate of tangible fixed asset and turnover period of inventories. Tangible fixed assets increased form FY2006 to FY2009, so Ferrotec operated in a low turnover rate, but in the last term, the turnover rate increased to the similar level as other comparable companies. We thought that it was seen as a return of active investment. As for turnover period of inventories, we found that Ferrotec produced PV furnaces after receiving orders. So, Ferrotec had a shorter turnover period of inventories than other comparable companies.

Forecast B/S and P/L (Exhibit: C-1, 2**):** We made a balance sheet and a profit-and–loss statement from the past results of the company. Because we couldn't get appropriate ratios by the averaging the figures from FY2006 to FY2010, we mainly used the ratios in FY2010.

Other Headings Relevant to Company

New production bases for PV-related products: In September 2010, Ferrotec founded a manufacturing company, named Hangzhou Solartec Co., Ltd.($20 million of capital), together with its Chinese subsidiary company and Covalent Materials Company in order to produce Quartz crucibles for the Polycrystalline furnace. Also, in April 2010, two subsidiary companies in Shanghai and Hangzhou respectively established new plants for silicon in Yinchuan, China (100 million yuan / 50 million yuan of capital). The capital expenditures were made at the aim of meeting the expanding demand for PV-related products in China. Ferrotec says the increase in production volume will pave the way to obtain a pole position in the market.

Publication of the Mid-Term Management Plan: In March 2010, Ferrotec released the Mid-Term Management Plan, "Challenge 1000" (Exhibit: A-4). In the announcement, the company declared to focus on the field of the renewable energies. Thus, PV-related and LED products which are eco-friendly were regarded as main growth drivers for the firm. The company also aims to raise sales to 100 billion yen (+72.77%, compared with FY2011) and operating profit margin to 10%~12% (-16.50% ~ +0.20%, compared with FY2011) by FY2014.

The Little impact from 3.11 Tsunami in Japan Disaster on Ferrotec: On 3.11 2011, one factory which had manufactured Ferrofluidic vacuum feedthoughs in Iwate prefecture was damaged by the earthquake and Tsunami. Therefore, in March, another factory in Chiba prefecture began to make the products and there was really little impact caused by the 3.11 disaster.

China PV Industry was accused of dumping solar panels in the US: In October 2011 SolarWorld Industry America Inc., the largest US solar manufacturer filed the trade petition with the International Trade Commission (ITC) and US Commerce Department. The petition asserts that Chinese PV manufacturers receive a lot of subsidies from China administration and sell solar panels in low price illegally. Ferrotec also provides PV-related products for these Chinese PV producers. On the other hand, Ferrotec's executive said it

is not so harmful for the firm because these Chinese companies could found corporations inside the US and continue to produce solar panels for the US market.

Public Stock Offering and Allocation of new stock to a third party: On July 11th 2011 the board of directors filed for public offering and allocation of new stock to a third party. Consequently, as of on August 19th, the number of shares issued and outstanding increased 4,263,139 compared to June 30th and the total amounts to 30,309,585. The firm obtained 6,090 million yen by the offering and the funds is to spent as follows: 5,050 million yen for capital expenditure for PV-related products, 1,000 million yen for capex in Equipment-related segment, and 40 million yen for repayment of short term debts.

Investment Risks

In this section, we point out some risks that could affect the price target.

Strategic risks:

Getting old fashioned of Ferrotec's technology: Technology innovation happens day by day in the 21st century and older technologies or products would give way to new ones. Therefore, if newly-developed technologies appear, Ferrofluid and Thermo-electric modules which are Ferrotec's core products would give way to the newer ones. As a result, Ferrotec could lose the source of differentiation and it would make a dent in the revenue of the company. Actually, Ferrotec used to occupy 100% of the world market of HDD seals in the past. But, in CY2007, the firm ended manufacturing the products because of new alternative products of a competitor. And if an alternative energy other than PV generation is put into use, the expansion of the PV market could be put a damper on (Exhibit: D-6).

Decreasing cost of PV generation fuels expansion of the market: Geothermal, hydro, wind, and nuclear power generation are of lower costs, PV generation is comparatively of higher costs at present. Hereafter, the PV market will expand as conversion efficiency of PV generation gets better and PV-related products price become lower. In addition, realizing Grid Parity, which means people can obtain electricity at lower price than electricity suppliers, will expand the PV market and sales of Ferrotec (Exhibit: D-7, 8, 9, 11).

The thin film PV expansion is actually not bad: In the long run, new type of PV panel, for example thin film panel, CIGS panel and CIS panel will appear and increase in sales in the market. However, we regard those panels as less competitive because they are more expensive or with lower conversion efficiency now. And even spreading thin film PV encourages sales of Frrofluidic vacuum feedthoughs of the company because it is installed in thin film PV furnace as well (Exhibit: D-10, 14).

The overconcentration in China: Concentration in China has enabled Ferrotec to make products at low cost. On the other hand, overconcentration in one region also makes several risks, for instance, political, economic, and disaster risks. Moreover, it is often said that operating business in China holds a high risk of collection of bills. And it is possible that Ferrotec also suffers from the risk in the future.

Operating risks:

Vulnerability to price competition: Ferrotec is based in China and accounts for 15% of China's Single-crystal furnace market. The company is subject to price competition with other companies. Although Ferrotec sells high quality and performance products, its sales are still vulnerable to price competition (Exhibit: D-1, 5).

R&D could be in the doldrums: Business alliances between Ferrotec and some other companies have realized cost reduction and improved services for customers so far. If the alliances between Mitsubishi Cable Industry, Ltd., AlionTec and KSM Corporation have expired, R&D could be in the doldrums.

Depending heavily on the board of directors: Ferrotec heavily relies on the current board of directors, especially on Mr. Ga, a vice-president of Ferrotec. He is from China and managing subsidiaries in China. If he quits his career, sales could decrease.

Raising capital: Ferrotec says it will not file for public offering in the near future because they did it in FY2011, but we expected that it could invest a few times in the long term as the global PV market expands. Therefore, we point out that the company could raise capital in the future.

-Appendix-

Exhibit A-1: Balance Sheet

Balance sheet (in million yen)	FY06	FY07	FY08	FY09	FY10	FY11
Assets						
Current assets						
Cash and cash equivalents	4,109	3,226	5,462	7,675	7,345	7,310
Trade notes and accounts receivable	5,067	6,726	6,962	7,899	10,129	15,426
Securities	299	-	-	-	-	-
Inventories	3,505	3,822	4,432	5,968	5,797	9,312
Deferred tax assets	123	128	194	220	340	555
Other current assets	1,504	2,191	1,949	2,446	2,161	3,663
Allowance for bad debt	-141	-131	-92	-64	-153	-136
Current assets	14,466	15,962	18,906	24,148	25,622	36,133
Fixed assets						
Tangible fixed assets						
Buildings and structures(net amount)	4,092	5,497	5,426	5,271	5,076	4,538
Machinery(net amount)	4,603	5,804	5,661	5,513	5,348	6,319
Equipment(net amount)	1,175	1,589	2,262	2,594	2,570	3,352
Land	2,552	2,590	2,580	2,817	2,803	2,792
Lease assets(net amount)	-	-	-	24	13	16
Construction in progress	1,397	796	398	1,054	1,130	2,184
Tangible fixed assets	13,819	16,276	16,327	17,274	16,943	19,204
Intangible fixed assets	3,403	3,474	3,074	3,425	2,928	2,812
Investments and other assets						
Investment securities	1,591	1,437	1,136	582	925	1,032
Long-term loans	828	52	40	39	42	34
Deferred tax assets	64	51	106	155	95	120
Other investments and other assets	1,548	1,458	1,426	1,374	1,452	2,501
Allowance for bad debt	-681	-53	-41	-47	-47	-339
Investments and other assets	3,351	2,944	2,666	2,103	2,469	3,349
Fixed assets	20,574	22,695	22,067	22,803	22,341	25,365
Total assets	35,040	38,657	40,974	46,951	47,963	61,499

Balance sheet (in million yen)	FY06	FY07	FY08	FY09	FY10	FY11
Lliabilities						
Current liabilities						
Notes and accounts payable	3,087	3,668	4,147	5,386	4,988	8,708
Short-term borrowings	3,256	3,772	3,333	8,886	6,904	7,081
Long-term borrowings	2,550	2,249	2,930	3,480	3,199	3,753
Bonds payable and convertible debt	-	1,658	-	-	-	-
Lease obligations	-	-	-	47	60	62
Income taxes payable	470	131	704	189	114	557
Deferred tax liabilities	10	8	6	8	-	-
Accrued bonuses	150	383	173	93	191	456
Other current liabilities	1,999	3,000	2,961	2,940	3,780	5,104
Current liabilities	11,521	14,867	14,253	21,034	19,239	25,848
Fixed liabilities						
Bonds payable	-	-	100	100	150	150
Convertible debt	1,777	-	-	-	-	1,800
Long-term borrowings	3,913	4,509	4,299	5,918	5,000	6,305
Lease obligations	-	-	-	139	132	78
Reserve for retirement allowance	23	25	29	47	65	87
Deferred tax liabilities	335	346	174	3	135	102
Asset retirement obligations	-	-	-	-	-	93
Other fixed liabilities	322	637	616	776	810	1,621
Fixed liabilities	6,369	5,516	5,219	6,883	6,142	10,086
Total liabilities	17,890	20,383	19,472	27,917	25,382	35,935
Net assets						
Capital	6,910	6,910	7,320	7,547	9,134	9,234
Capital surplus	7,784	7,751	7,922	8,149	9,736	9,836
Retained earnings	1,301	2,800	4,413	4,296	4,192	8,377
Treasury stock at lost	-160	-1,179	-86	-86	-86	-86
Valuation difference on available-for-sale securities	501	448	242	-68	215	210
Foreign currency translation adjustment	749	1,323	1,484	-1,256	-1,061	-2,912
Minority interests	65	216	207	451	451	903
Total net assets	17,150	18,270	21,501	19,034	22,581	25,564
Total liabilities and net assets	35,040	38,657	40,974	46,951	47,963	61,499

Source: Company data

Exhibit A-2: Profit and Loss Statement

Profit and loss statement (in million yen)	FY06	FY07	FY08	FY09	FY10	FY11
Net sales	23,946	32,517	36,625	36,653	31,541	57,880
Cost of sales	17,023	23,476	25,985	25,357	22,987	39,359
Gross profit	6,924	9,041	10,641	11,295	8,553	18,520
Employment cost	1,981	2,007	2,351	2,541	2,089	2,799
Other	3,732	4,745	5,232	5,964	5,761	8,789
Selling, general and administrative expenses	5,713	6,752	7,583	8,505	7,850	11,588
Operating income	1,211	2,289	3,057	2,790	703	6,931
Non-operating income						
Interest income	81	116	116	102	103	111
Dividends earned	6	2	22	4	5	10
Rental income	63	60	65	58	24	22
Commission earned	-	86	52	147	33	9
Foreign currency transaction gain	228	50	-	-	66	-
Other	95	78	64	84	171	303
Non-operating income	474	394	320	396	403	457
Non-operating expense						
Interest expenses	338	411	437	403	421	457
Foreign currency transaction loss	-	-	238	461	-	486
Other	306	190	287	225	160	154
Non-operating expense	644	601	963	1,090	582	1,098
Ordinary profit	1,041	2,082	2,414	2,097	524	6,290
Special profit						
Gain on sale of investment securities	149	427	342	135	9	47
Gains from sale of fixed assets	98	56	14	11	54	8
Reversal of allowance for doubtful accounts	79	-	40	8	-	38
Other	603	7	403	79	54	120
Special profit	929	490	799	234	119	215
Special loss						
Loss on sale of investment securities	-	-	-	-	11	-
Loss on revaluation of investments in securities	-	-	-	35	98	3
Capital loss	4	193	61	113	126	78
Loss on impairment of property, plant and equipment and intangible assets	44	72	-	-	108	82
Loss from natural disasters	-	-	-	-	-	479
Other	603	117	262	512	38	70
Special loss	651	382	323	662	381	712
Income before income taxes	1,319	2,190	2,890	1,669	261	5,792
Income taxes	616	473	991	906	77	1,224
Minority interest	-5	13	-5	19	28	84
Net income	709	1,703	1,904	743	156	4,483

Source: Company data

Exhibit A-3: Cash Flow Statements

Cash flow statements (in million yen)	FY06	FY07	FY08	FY09	FY10	FY11
Cash flows from operating activities						
Income before income taxes	1,319	2,190	2,890	1,669	261	5,792
Depreciation expense	1,670	1,807	2,145	2,421	2,605	2,655
Impairment loss	44	72	-	-	107	81
Amortization of goodwill	81	87	269	170	315	421
Increase in accrued pension and severance costs	(7)	2	4	9	18	22
Increase (decrease) in accrued employees' bonuses	11	232	(210)	(100)	98	280
Increase (decrease) in allowance for doubtful accounts	499	(641)	(51)	(6)	89	304
Interest and dividend income	(87)	(118)	(138)	(106)	(108)	(121)
Interest expenses	338	411	438	403	421	457
Foreign exchange loss (gain)	(247)	(118)	(58)	359	19	251
Gain on sales of investment securities	(149)	(427)	(342)	(135)	1	(47)
Profit or loss from valuation of investment securities	-	1	-	35	97	(12)
Gain on sales on tangible fixed assets	(94)	136	47	102	71	69
Increase in trade notes and accounts receivable	520	(1,529)	(218)	(496)	(2,201)	(7,363)
Increase in inventories	(194)	(214)	(592)	(1,156)	216	(3,787)
Increase in notes and accounts payable	899	437	453	1,506	(458)	4,309
Other	32	859	629	(275)	1,315	(271)
subtotal	4,635	3,189	5,268	4,401	2,872	3,205
Receipts from interst and dividends	80	118	141	97	110	120
Interest paid	(337)	(412)	(437)	(398)	(423)	(438)
Income taxes	(244)	(845)	(558)	(1,401)	(184)	(1,054)
Cash flows from operating activities	4,134	2,050	4,414	2,699	2,374	1,832
Cash flows from investing activities						
Increase (decrease) in fixed deposit	-	-	-	(2,264)	829	1,413
Payment for purchase of property, plant and equipment	(3,139)	(3,264)	(2,449)	(3,178)	(2,386)	(5,036)
Proceeds from sale of property, plant and equipment	267	88	250	73	183	116
Payment for purchase of investment securities	(71)	(199)	(128)	(152)	(26)	(123)
Proceeds from sale of investment securities	401	598	428	185	59	88
Payment for purchase of subsidiary	(499)	(3)	(2)	(3,087)	(5)	(584)
Payment for loans	(35)	-	-	(25)	(60)	(2)
Collection on loans	1	121	-	-	12	30
Other	(468)	(7)	(202)	(242)	(126)	(322)
Cash flows from investing activities	(3,542)	(2,666)	(2,104)	(8,692)	(1,521)	-4,419
Cash flows from financing activities						
Increase (decrease) in short-term borrowings	(147)	400	(511)	4,139	(2,078)	455
Increase (decrease) in long-term borrowings	3,162	3,525	3,145	5,653	2,900	5,576
Repayment for long-term borrowings	(2,683)	(3,229)	(2,689)	(3,551)	(4,130)	(3,539)
Issue of bonds payable	-	-	100	-	50	1,987
Issue of shares	-	-	4	448	3,119	-
Payment for Collection on own shares	-	(1,170)	21	-	-	-
Dividends paid	(160)	(159)	(227)	(254)	(259)	(297)
Other	(10)	144	(17)	250	(61)	325
Cash flows from financing activities	163	(487)	(175)	6,686	(459)	4,505
Effect of exchange rate changes on cash and cash equivales	186	220	101	(743)	63	(475)
Net increase in cash and cash equivalents	941	(883)	2,236	(51)	457	1,443
Cash and cash equivalents at beginning of year	3,189	4,109	3,226	5,461	5,410	5,867
Effect of change in other	(21)	-	-	-	-	-
Cash and cash equivalents at end of year	4,109	3,226	5,462	5,410	5,867	7,310

Source: Company data

Exhibit A-4: Mid-Term Management Plan "Challenge 1000"

In this Mid-Term Management Plan "Challenge 1000", Ferrotec sets the following numerical targets, and regards PV-related segment and Vacuum deposition equipment as the main growth drivers. This is because PV and LED market are expected to have high, long-term growth potential, triggered by the increase in environmental awareness like reducing CO2 emission and the trends in each country's clean energy policy.

But, at the present time, PV and LED market are in excess supply, and expected that capital investment in both will decrease temporarily. Moreover, there is possibility that new substitute products for Ferrotec's products, like thin-film solar cell, will be developed in the near future.

Considering these facts, there is doubt about whether Ferrotec can achieve numerical targets below.

<Numerical Targets during the "challenge 1000">

(in billion yen)	FY10	FY11(E)	FY12(E)	FY13(E)
Sales	579	700	750～800	900～1,000
Operating margin	12.0%	10.7%	10～12%	10～12%

<Capital investment plan during the "challenge 1000">

(in billion yen)	FY10	FY11(E)-FY13(E)
Capital investment	50	about 190

<Ferrotec's Business Direction>

	Field	Direction
PV-related segment	PV manufacturing equip.	Expand product lineup; improve functions including additional charging function
	Quartz crucibles	Improve market share; Quality improvement leading to the upgrading of finished products performance
	Solar silicon	Increase supply capacity due to construction of new plant
Equipment-related segment	Ferrofluidic vacuum feedthroughs	Introduce new high-value added products; raise market share in Korea and China
	Quartzware	Expand PV sales in China; expand LED sales
	Ceramics	Expand sales in overseas market; develop differentiated products including high purity alumina parts
	SEMI wafers	Own independent sales of discrete wafers in Japan, Taiwan, China and America
	Vacuum deposition equip.	Expand sales of TEMESCAL vacuum deposition equip.
Electronic-device segment	Thermo-electric Modules	Expand sales of optical communication and high-end products; enter the power device substrate market
	Ferrofluid	Seek to use in the environmental industry

Source: Company data (Challenge 1000)

Exhibit A-5: About Ferrofluid Magnetic Liquid

Ferrofluid magnetic liquid reacts on magnetic force and was developed by NASA during Space Project in early 1960's. Ferrotec have researched and produced this liquid since it established. Thus this technology is one of unique the technologies for Ferrotec. It is transformed into various forms by magnetic force and applied various products. Especially, Ferrofluid magnetic feedthroughs that applied this technology has the largest share in the market and has a good competitiveness. Additionally, these products are protected by patent (as a right Figure). Therefore we expected that this advantage will continue in the future.

After this, we also expected to develop new other applications, for example waste liquid disposal etc.

Patent Number	Technique Description
3983843	Ferrofludic make-up
3451359	Ferrofludic technique
3455804	Ferrofludic seal device
3413556	Ferrofludic seal device

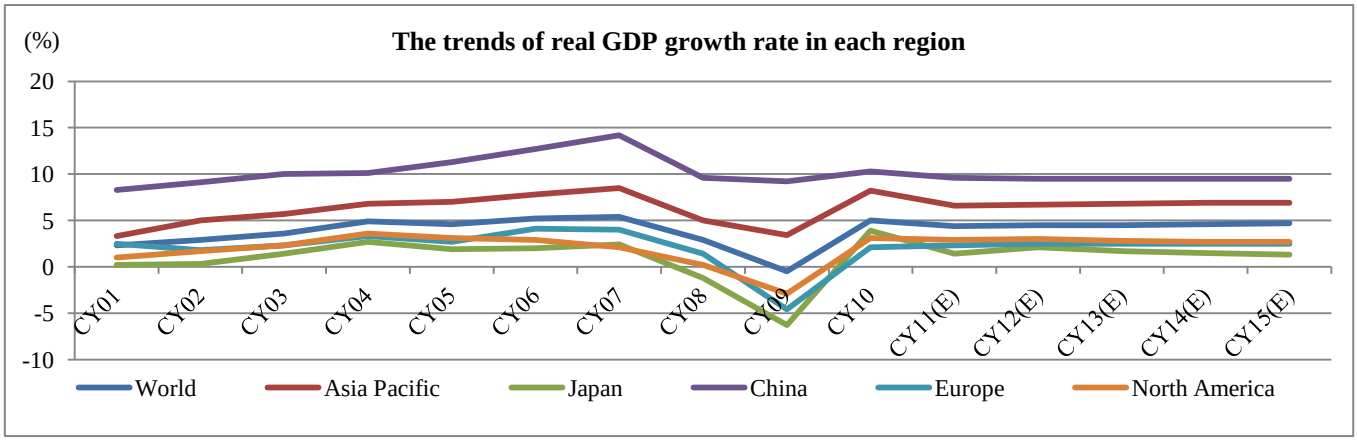
Source: Company data

Exhibit A-6: The Trends of Real GDP Growth Rate in each region

(in percent)	CY01	CY02	CY03	CY04	CY05	CY06	CY07	CY08	CY09	CY10	CY11(E)	CY12(E)	CY13(E)	CY14(E)	CY15(E)
World	2.3	2.9	3.6	4.9	4.6	5.2	5.4	2.9	-0.5	5.0	4.4	4.5	4.5	4.6	4.7
Asia Pacific	3.8	5.1	5.6	6.6	6.9	8.0	9.1	5.2	3.5	8.3	6.9	7.1	7.1	7.1	7.2
Japan	0.2	0.3	1.4	2.7	1.9	2.0	2.4	-1.2	-6.3	3.9	1.4	2.1	1.7	1.5	1.3
Europe	2.5	1.8	2.3	3.3	2.7	4.1	4.0	1.4	-4.6	2.1	2.3	2.5	2.5	2.5	2.5
North America	1.0	1.7	2.3	3.6	3.1	2.9	2.1	0.2	-2.9	3.1	2.9	3.0	2.8	2.7	2.7
China	8.3	9.1	10.0	10.1	11.3	12.7	14.2	9.6	9.2	10.3	9.6	9.5	9.5	9.5	9.5

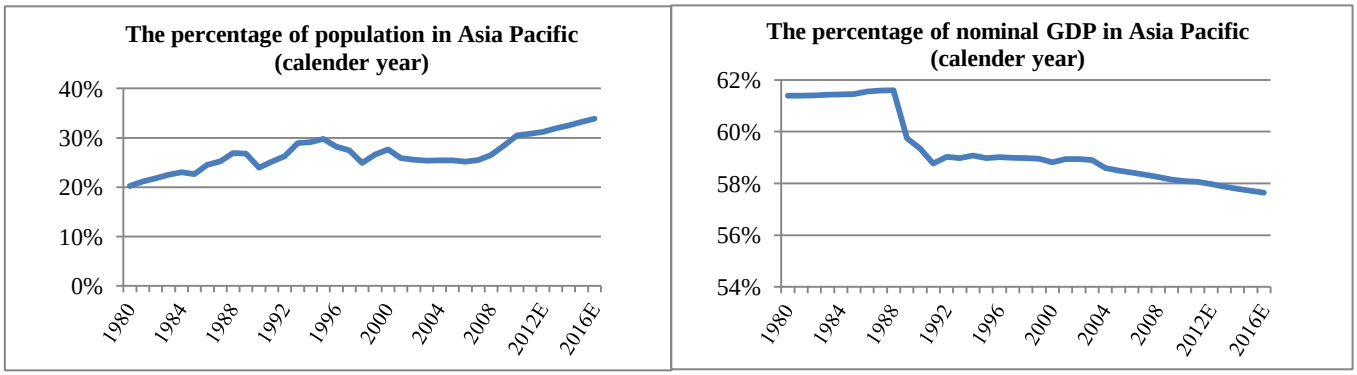
The table below shows the percent change of world real GDP growth rate from the base year CY00.

	CY01	CY02	CY03	CY04	CY05	CY06	CY07	CY08	CY09	CY10	CY11(E)	CY12(E)	CY13(E)	CY14(E)	CY15(E)
Trend	1.023	1.053	1.091	1.144	1.197	1.259	1.327	1.365	1.358	1.426	1.489	1.556	1.626	1.701	1.781



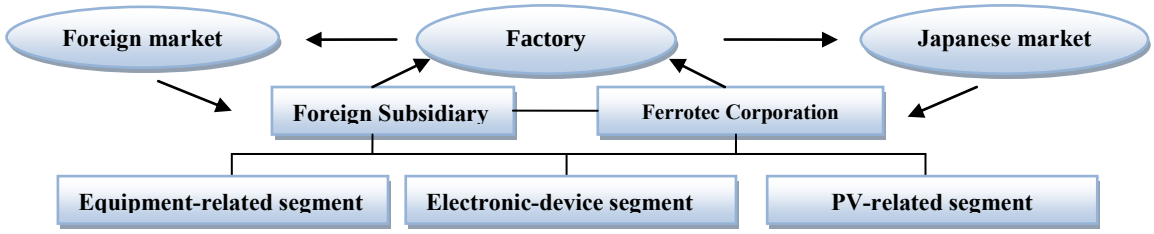
Source: IMF (World Economic Outlook)

Exhibit A-7: The Percentage of Population and Nominal GDP in Asia Pacific



Source: IMF (World Economic Outlook)

Exhibit A-8: Business Model

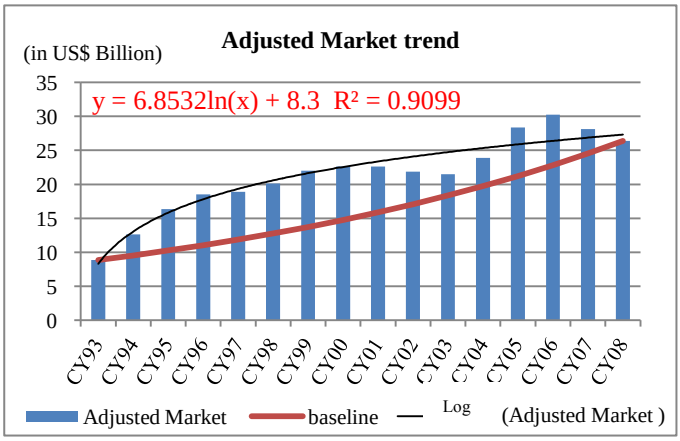


Source: Company data

Exhibit B-1: Front-end SEMI Equip. Market Estimate

Step 1

- First of all, adopting 4-period Moving Average Method, we estimated adjusted Front-end SEMI Equip. Market trend, removing the effect of the silicon cycle with a period of four years (hereafter, Adjusted Market). Then, as you can see from the right chart, we can find out that Adjusted Market growth rate has been slowing down. So, taking into consideration the collapse of the dot-com bubble etc, we used data only after CY01.
- Secondly, we calculated CAGR of Adjusted Market during CY01-CY08 (2.22%), and estimated Adjusted Market trend under the assumption of growing 2.22% CAGR during the same period (hereafter, Baseline).
- Thirdly, we calculated deviation rates of Front-end SEMI Equip. Market from Baseline in each year. And based on these rates, we estimated future deviation rates of Front-end SEMI Equip. Market from Baseline (the table below).



(in US$ Billion)	CY01	CY02	CY03	CY04	CY05	CY06	CY07	CY08
Front-end SEMI Equip. Market	24	16	17	28	26	33	36	24
Adjusted Market	22.63	21.88	21.50	23.88	28.38	30.25	28.13	26.38
Baseline (growth rate: 2.22%)	22.63	23.13	23.65	24.17	24.71	25.26	25.82	26.39
Deviation rate of Front-end SEMI Equip. Market from Baseline	6.05%	-30.83%	-28.11%	15.84%	5.23%	30.66%	39.44%	-9.06%

Data about Front-end SEMI Equip. Market is cited from Tokyo Electron Limited's data (Fact Book 2011).

Future deviation rate of Front-end SEMI Equip. Market from Baseline	
AVG of deviation rate (CY01-CY08)	3.65%
SD of deviation rate (CY01-CY08)	25.43%
Deviation rate when Silicon cycle is at peak (AVG+SD)	29.09%
Deviation rate when Silicon cycle is at bottom (AVG-SD)	-21.78%

AVG: average, SD: standard deviation

- Namely, in our analytic period (CY11-CY15), we assumed that deviation rate of Front-end SEMI Equip. Market from Baseline will fluctuate on a four-year cycle: 3.65%→29.09%→3.65%→-21.78%→3.65%.

Step 2

- Next, we estimated CAGR of Baseline in our analytic period in the following steps.
- First, using the historical data about real GDP growth rate (Exhibit A-6), we calculated CAGR of World real GDP during CY01-CY08 (4.21%).
- Secondly, we calculated the difference between CAGR of World real GDP and that of Adjusted Market during CY01-CY08 (4.21% - 2.22% = 1.99%). Then, we found out that Adjusted Market had grown with 1.99% lower CAGR compared with that of World real GDP.
- And, considering that capital investment by semiconductor manufacturers will increase in the future (Exhibit B-2), we can assume this gap (1.99%) will remain in our analytic period.
- But, when we see the semiconductor market trends in each region (Exhibit B-3), we notice that the market has been concentrating in particular region, especially in Asia Pacific. With this in mind, in our analytic period, we used CAGR of weighted-average real GDP growth rate, according to the percentage of SEMI Market in each region (4.65%).
- As a result, we used 2.66% (= 4.65% - 1.99%) CAGR of Baseline in our analytic period.

	CAGR		
Adjusted Market (CY01-CY08)	2.22%	Calculation process	
World real GDP growth rate (CY01-CY08)	4.21%	4.21% - 2.22% = 1.99%	**CAGR of Baseline in our analytic period**
Weighted-average real GDP growth rate (CY08-CY15) (Asia Pacific : North America : Europe : Japan = 6 : 2 : 1 : 1)	4.65%	4.65% - 1.99% = 2.66%	**2.66%**

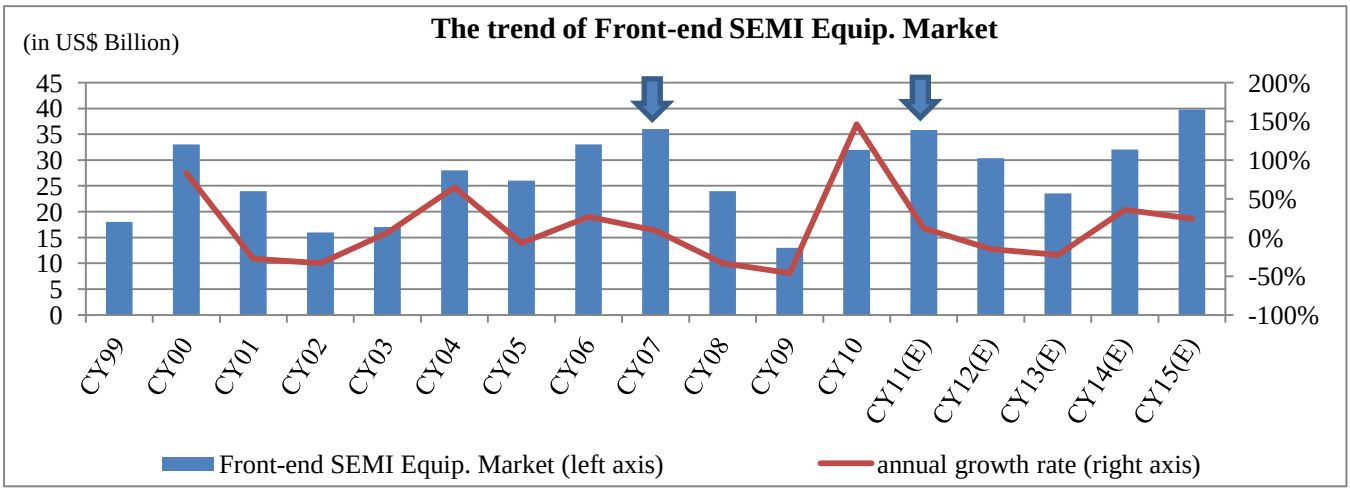
Data about real GDP growth rate is cited from IMF database (World Economic Outlook).

Result

The result of our estimate of Front-end SEMI Equip. Market is the following.

(in US$ Billion)	CY08	CY09	CY10	CY11(E)	CY12(E)	CY13(E)	CY14(E)	CY15(E)
Baseline	26.39	27.09	27.81	28.55	29.31	30.09	30.89	31.71
(annual growth rate)	2.22%	2.66%	2.66%	2.66%	2.66%	2.66%	2.66%	2.66%
Deviation rate of Front-end SEMI Equip. Market from Baseline	-9.06%	-52.01%	15.06%	29.09%	3.65%	-21.78%	3.65%	29.09%
Front-end SEMI Equip. Market	**24**	**13**	**32**	**36**	**30**	**24**	**32**	**40**
(annual growth rate)	-33.33%	-45.83%	146.15%	11.92%	-15.17%	-22.53%	36.04%	24.23%

Because the last peak of Silicon cycle came in CY07, we assumed next peak will come in four years later CY11.

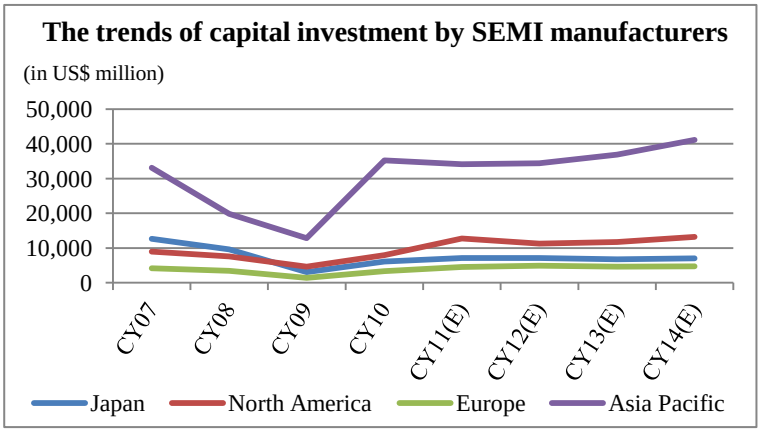


Source: The data from Tokyo Electron Limited (Fact Book 2011), IMF (World Economic Outlook), Student Estimates

Exhibit B-2: The Trends of Capital Investment by Semiconductor Manufacturers in each region

After Lehman's fall, capital investment by semiconductor manufacturers decreased significantly due to the global depression. But, after CY09, it has recovered thanks to the economic growth in developing countries, especially in Asia Pacific.

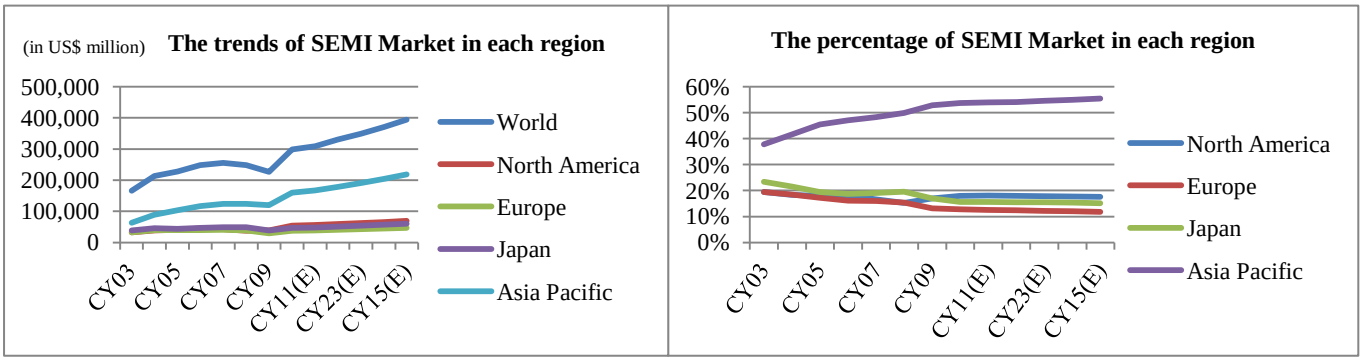
Considering the high percentage of population and nominal GDP in Asia Pacific (Exhibit A-7), the large scale of Asia SEMI Market (Exhibit B-3), and high real GDP growth rate in the region (Exhibit A-6), it seems that the world semiconductor market will grow centered on Asia Pacific region.



(in US$ million)	CY07	CY08	CY09	CY10	CY11(E)	CY12(E)	CY13(E)	CY14(E)
World	58,893	40,445	21,993	52,741	58,543	57,719	60,031	66,192
(annual growth rate)		-31.32%	-45.62%	139.81%	11.00%	-1.41%	4.01%	10.26%
Asia Pacific	33,096	19,816	12,855	35,288	34,104	34,414	36,892	41,134
(annual growth rate)		-40.13%	-35.13%	174.51%	-3.36%	0.91%	7.20%	11.50%
Japan	12,704	9,583	3,089	6,153	7,121	7,159	6,736	7,060
(annual growth rate)		-24.57%	-67.77%	99.19%	15.73%	0.53%	-5.91%	4.81%
Europe	4,151	3,432	1,397	3,369	4,575	4,895	4,645	4,748
(annual growth rate)		-17.32%	-59.29%	141.16%	35.80%	6.99%	-5.11%	2.22%
North America	8,942	7,614	4,652	7,931	12,743	11,251	11,757	13,250
(annual growth rate)		-14.85%	-38.90%	70.49%	60.67%	-11.71%	4.50%	12.70%

Source: 2011 Semiconductor Data Book (Electronic Journal, Inc.)

Exhibit B-3: The Trends of Semiconductor Market in each region



<The trends of SEMI Market in each region>

(in US$ million)	CY08	CY09	CY10	CY11(E)	CY12(E)	C Y13(E)	CY14(E)	CY15(E)
World	248,603	226,313	298,315	309,068	330,426	348,825	370,675	393,879
(annual growth rate)		-8.97%	31.82%	3.60%	6.91%	5.57%	6.26%	6.26%
Asia Pacific	123,975	119,628	160,025	166,692	178,783	190,266	203,732	218,156
(annual growth rate)		-3.51%	33.77%	4.17%	7.25%	6.42%	7.08%	7.08%
Japan	48,498	38,300	46,561	48,070	51,317	53,836	56,728	59,774
(annual growth rate)		-21.03%	21.57%	3.24%	6.75%	4.91%	5.37%	5.37%
Europe	38,249	29,865	38,054	38,558	40,971	42,569	44,557	46,638
(annual growth rate)		-21.92%	27.42%	1.32%	6.26%	3.90%	4.67%	4.67%
North America	37,881	38,520	53,675	55,747	59,356	62,154	65,658	69,361
(annual growth rate)		1.69%	39.34%	3.86%	6.47%	4.71%	5.64%	5.64%

We assumed CY15 growth rate is the same as that of CY14.

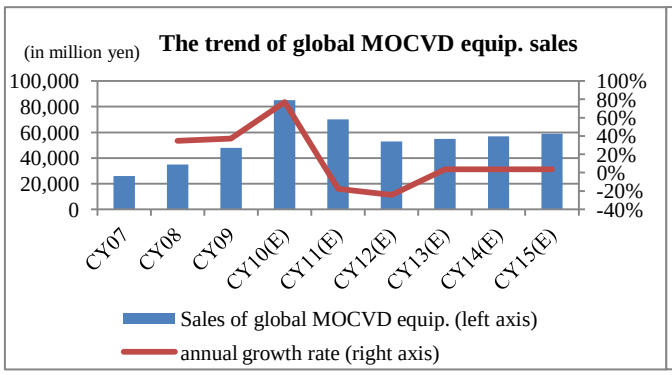
<The percentage of SEMI Market in each region>

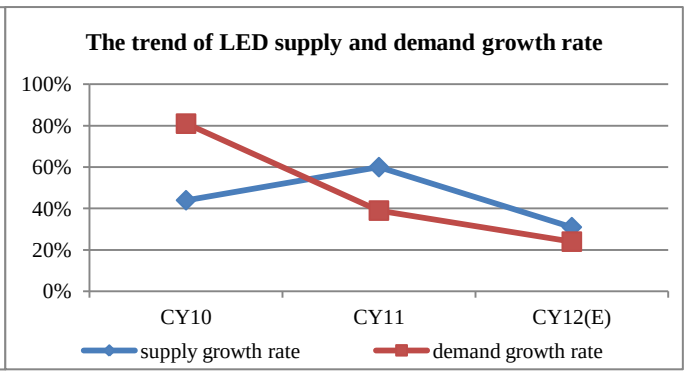
(in percent)	CY08	CY09	CY10	CY11(E)	CY12(E)	CY13(E)	CY14(E)	CY15(E)
Asia Pacific	49.87	52.86	53.64	53.93	54.11	54.54	54.96	55.39
Japan	19.51	16.92	15.61	15.55	15.53	15.43	15.30	15.18
Europe	15.39	13.20	12.76	12.48	12.40	12.20	12.02	11.84
North America	15.24	17.02	17.99	18.04	17.96	17.82	17.71	17.61

Source: 2011 Semiconductor Data Book (Electronic Journal, Inc.), WSTS Press Release

Exhibit B-4: The Trend of Global MOCVD Equip. Sales

Recently, LED manufacturers have invested aggressively in LED manufacturing equipment, in anticipation of the LED market expansion in the future. At the same time, China, under the fear of energy crisis, has expanded investment in MOCVD equipment with a subsidy policy, for the purpose of improving self-sufficiency rate of LED. Consequently, LED is now in excess supply, and supply growth rate overcomed demand growth rate by 21% in CY11 (the chart below). So, it seems that investment in LED manufacturing equipment will decrease temporarily in the near future. But, according to SEMI Japan, it will increase again after CY13, thanks for the rapid expansion of LED lamp.





(in million yen)	CY07	CY08	CY09	CY10(E)	CY11(E)	CY12(E)	CY13(E)	CY14(E)	CY15(E)
Global MOCVD equip. sales	26,000	35,000	48,000	85,000	70,000	53,000	54,929	56,928	59,000
(annual growth rate)		34.62%	37.14%	77.08%	-17.65%	-24.29%	3.64%	3.64%	3.64%

CY07-CY09: real values
CY10-CY12, CY15: values predicted by Electronic Journal, Inc.
CY13, CY14: predicted values under the assumption of growing at the same rate during this period

Source: Electronic Journal, Inc. (2011 Semiconductor Data Book), SEMI Japan,

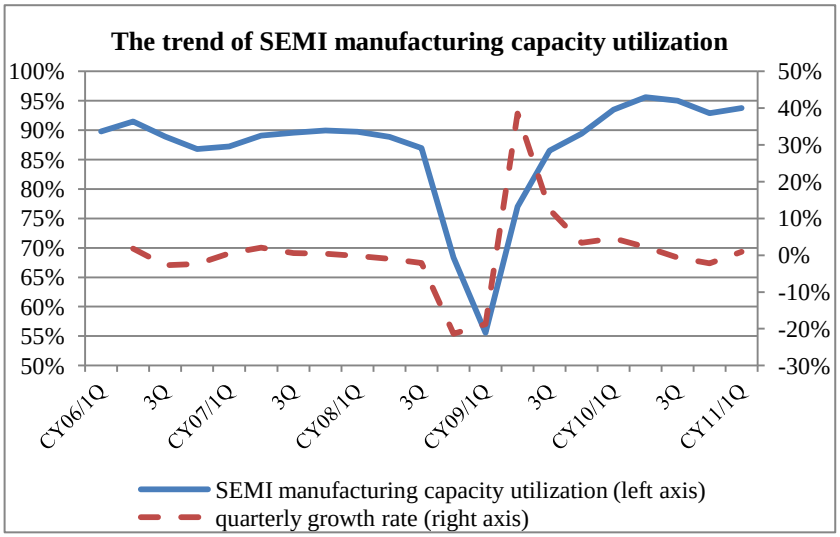
Exhibit B-5: The Trend of SEMI Manufacturing Capacity Utilization

During CY08/4Q-CY09/2Q, semiconductor manufacturing capacity utilization decreased significantly due to the global depression, triggered by Lehman's fall. But, in the other period, it has kept the high level of about 90%.

Therefore, we assumed this utilization keeps the level about 90% also in the future, and took no thought for it when forecasting product sales.

	SEMI manufacturing capacity utilization
Average	90.26%
Mean	89.61%
Standard Deviation	2.82%

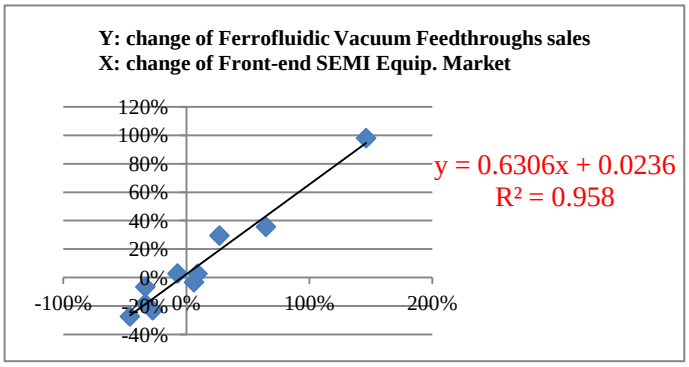
We isolated values during CY08/4Q-CY09/2Q from calculation process as statistical outliers.



Source: JEITA (Semiconductor International Capacity Statistics)

Exhibit B-6: The Sales of Ferrofluidic Vacuum Feedthroughs

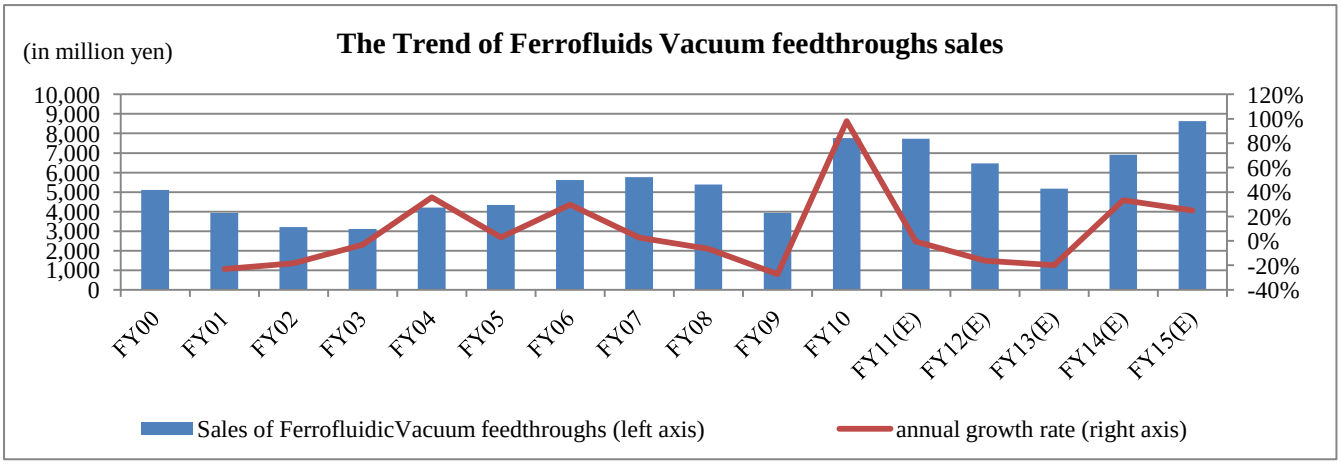
- First, we found out that the sales of Ferrofluidic Vacuum Feedthroughs has a high correlation with the Front-end SEMI Equip. Market (R: 0.98, $\mathbf{R^2}$:0.96). So, we forecasted this product sales based on this Market trend.
- Next, we calculated the ratio of this product sales to the Front-end SEMI Equip. Market size in each year with the following steps.
  - First, we calculated the Market size in million yen, multiplying that in billion dollar by USD/JPY rate at the end of fiscal year periods.
  - Then, we calculated the ratio, dividing the product sales by the Market size in million yen.

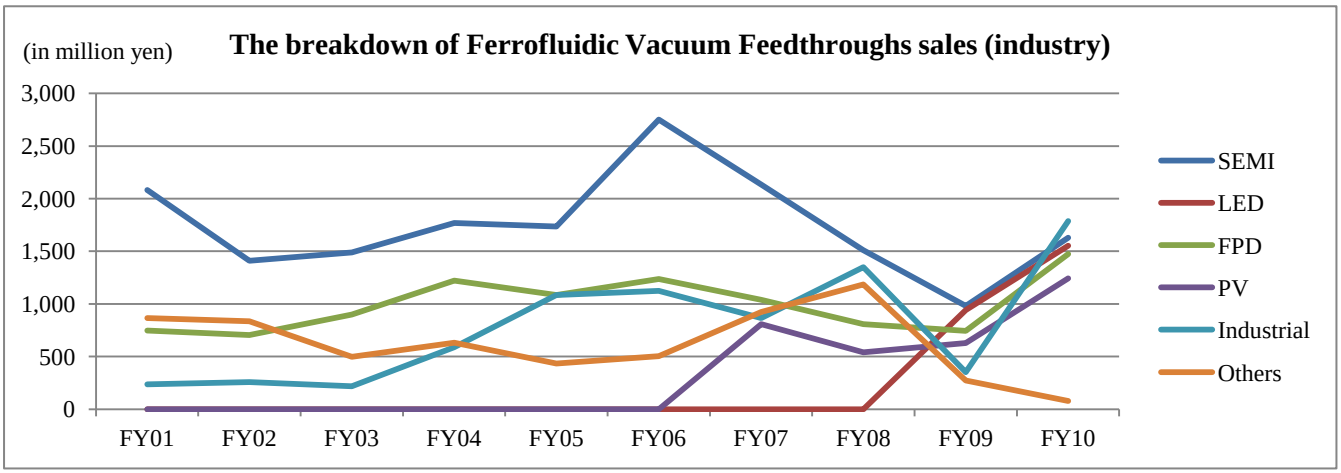


	CY00	CY01	CY02	CY03	CY04	CY05	CY06	CY07	CY08	CY09	CY10
Front-end SEMI Equip. Market (in US$ billion)	33	24	16	17	28	26	33	36	24	13	32
	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10
USD/JPY rate (end of the period)	123.90	133.25	120.20	105.69	107.39	117.47	118.05	100.19	98.23	93.04	83.80
Front-end SEMI Equip. Market (in million yen)	4,088,700	3,198,000	1,923,200	1,796,730	3,006,920	3,054,220	3,895,650	3,606,840	2,357,520	1,209,520	2,681,600
Sales of Ferrofluidic Vacuum Feedthroughs (in million yen)	5,100	3,931	3,208	3,105	4,214	4,335	5,616	5,768	5,393	3,921	7,764
The ratio of the product sales to the Market size	0.125%	0.123%	0.167%	0.173%	0.140%	0.142%	0.144%	0.160%	0.229%	0.324%	0.290%

- Then, we estimated the ratio in the next five years as 0.28%. The reason is as follows.
  - First, considering that the company has expanded this product sales to PV and LED industries since FY07, we calculated average of the ratio during FY07 – FY10 (0.28%).
  - Next, with consideration for the Mid-Term Management Plan (Exhibit A-4) and competitive advantages for this product ("Strength of Equipment-related segment", p3), we assumed this ratio keeps the level 0.28% in the next five years.
- Finally, we forecasted this product sales, multiplying Front-end SEMI Equip. Market estimates by USD/JPY rate, and in turn, by the above calculated value (0.28%). Then, because of the difficulty of forecasting USD/JPY rate, we applied the rate at September 30th in our analytic period.
- The result of our estimate of Ferrofluidic Vacuum Feedthroughs sales is the following.

	CY08	CY09	CY10	CY11(E)	CY12(E)	CY13(E)	CY14(E)	CY15(E)
Front-end SEMI Equip. Market (in US$ billion)	24	13	32	36	30	24	32	40
	FY08	FY09	FY10	FY11(E)	FY12(E)	FY13(E)	FY14(E)	FY15(E)
USD/JPY rate (end of the period)	98.23	93.04	83.80	77.04	77.04	77.04	77.04	77.04
Front-end SEMI Equip. Market (in million yen)	2,357,520	1,209,520	2,681,600	2,758,032	2,311,200	1,848,960	2,465,280	3,081,600
The ratio of the sales to the Market size	0.229%	0.324%	0.290%	0.28%	0.28%	0.28%	0.28%	0.28%
The sales of Ferrofluidic Vacuum Feedthroughs (in million yen)	5,393	3,921	7,764	7,722	6,471	5,177	6,903	8,628
(annual growth rate)	-6.50%	-27.29%	98.01%	-0.53%	-16.20%	-20.00%	33.33%	25.00%

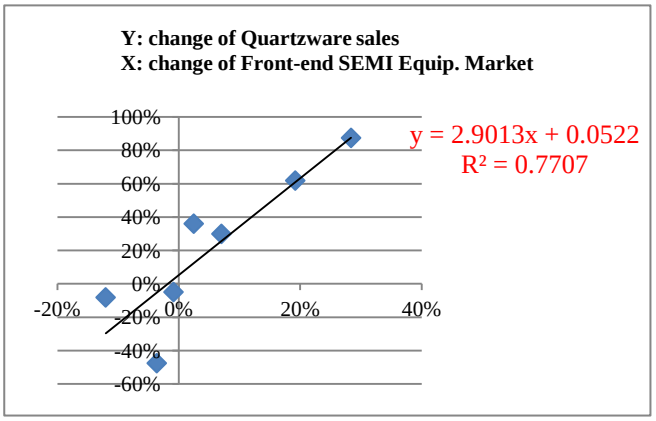




Source: The data from The Tokyo Electron Limited, Yahoo! Finance, Student Estimates

Exhibit B-7: The Sales of Quartzware

- First, we found out that the sales of Quartzware has a high correlation with the Front-end SEMI Equip. Market (R: 0.92, $\mathbf{R^2}$:0.84). So, we forecasted this product sales based on this Market trend.
- Next, because the sales to PV and LED has been increasing in recent years, we divided Quartzware sales into two parts: "SEMI" and "PV and LED". Then, we forecasted sales of each part respectively.

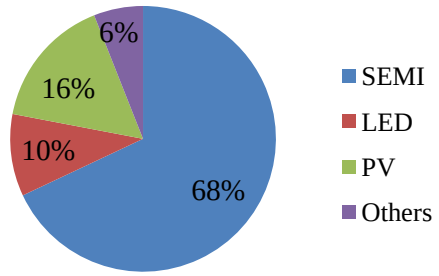


- **Quartzware sales to SEMI**
  - First, we calculated Front-end SEMI Equip. Market size in million yen, following the same steps as Ferrofluidic Vacuum Feedthroughs sales estimate.

	CY00	CY01	CY02	CY03	CY04	CY05	CY06	CY07	CY08	CY09	CY10
Front-end SEMI Equip. Market (in US$ billion)	33	24	16	17	28	26	33	36	24	13	32
	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10
USD/JPY rate (end of the period)	123.90	133.25	120.20	105.69	107.39	117.47	118.05	100.19	98.23	93.04	83.80
Front-end SEMI Equip. Market (in million yen)	4,088,700	3,198,000	1,923,200	1,796,730	3,006,920	3,054,220	3,895,650	3,606,840	2,357,520	1,209,520	2,681,600

- Then, we estimated the ratio of the sales to the Front-end SEMI Equip. Market size in the next five years as 0.179%. The reason is as follows.
  - ✧ The data about Quartzware sales breakdown by industry is available only in FY10. So, we adopted the ratio in FY10 (0.179%) as the base.
  - ✧ And, we assumed this ratio keeps the level 0.179% in the next five years, although there are giant companies like Shin-Etsu Chemical Co., Ltd. This is because Ferrotec has adopted a policy of being uncompetitive with such giant companies.
- Finally, we forecasted Quartzware sales to SEMI, multiplying Front-end SEMI Equip. Market estimates by USD/JPY rate, and in turn, by the above calculated value (0.179%). Then, we applied the rate at September 30th in our analytic period for the reasons mentioned at "The Sales of Ferrofluidic Vacuum Feedthroughs".

Quartzware sales breakdown in FY10 (industry)

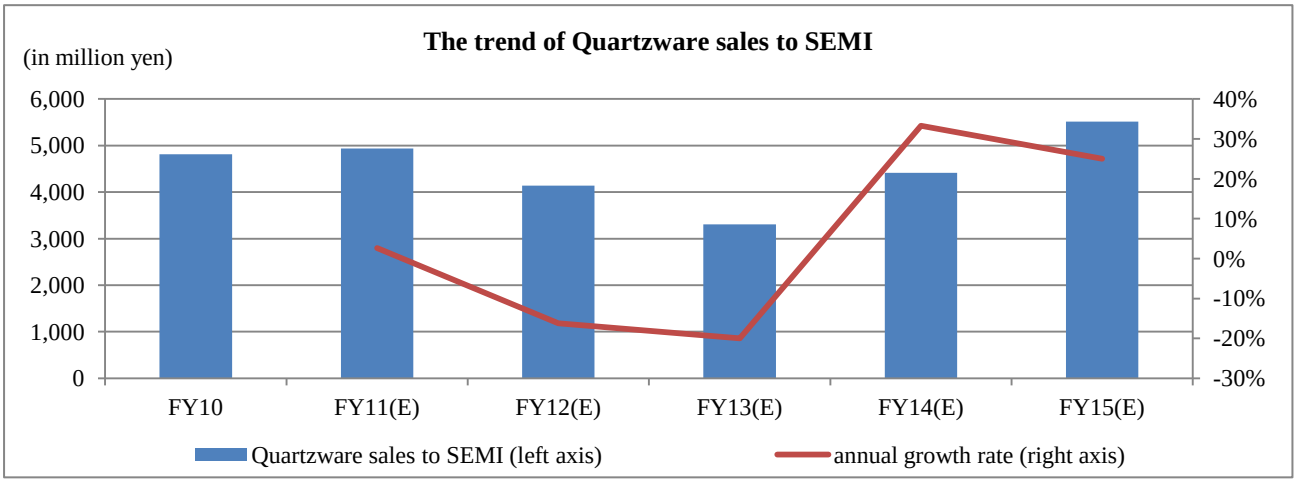


We estimated this product sales including "Others" in "SEMI".

- The result of our estimate of Quartzware sales to SEMI is the following.

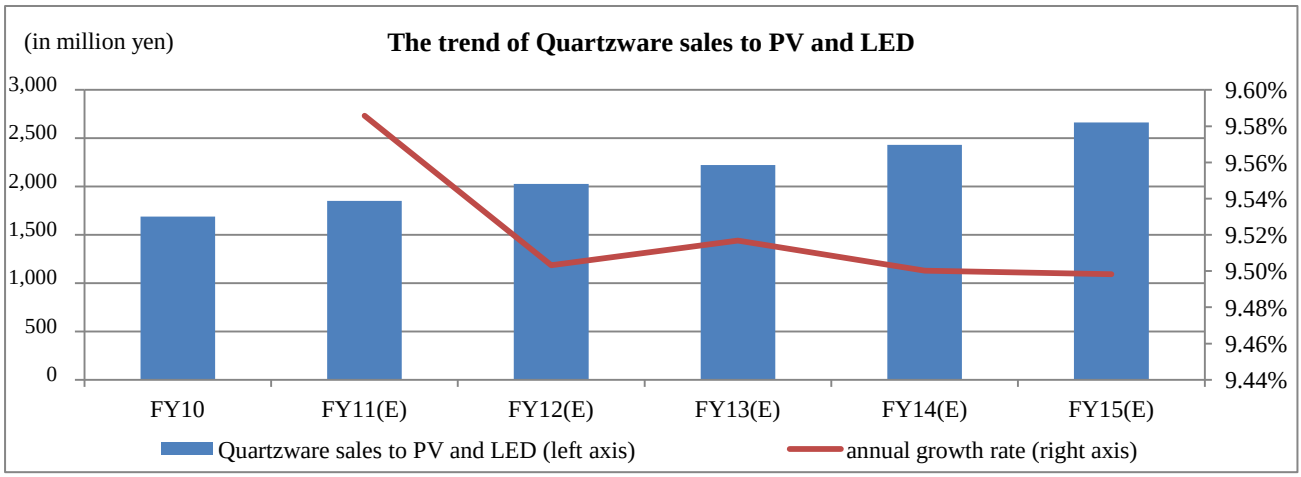
	CY10	CY11(E)	CY12(E)	CY13(E)	CY14(E)	CY15(E)
Front-end SEMI Equip. Market (in US$ billion)	32	36	30	24	32	40
	FY10	FY11(E)	FY12(E)	FY13(E)	FY14(E)	FY15(E)
USD/JPY rate (end of the period)	83.80	77.04	77.04	77.04	77.04	77.04
Front-end SEMI Equip. Market (in million yen)	2,681,600	2,758,032	2,311,200	1,848,960	2,465,280	3,081,600
The ratio of the sales to the Market size	0.179%	0.179%	0.179%	0.179%	0.179%	0.179%
Quartzwares sales to SEMI (in million yen)	4,811	4,937	4,137	3,310	4,413	5,516
(annual growth rate)		2.62%	-16.20%	-20.00%	33.33%	25.00%

The trend of Quartzware sales to SEMI



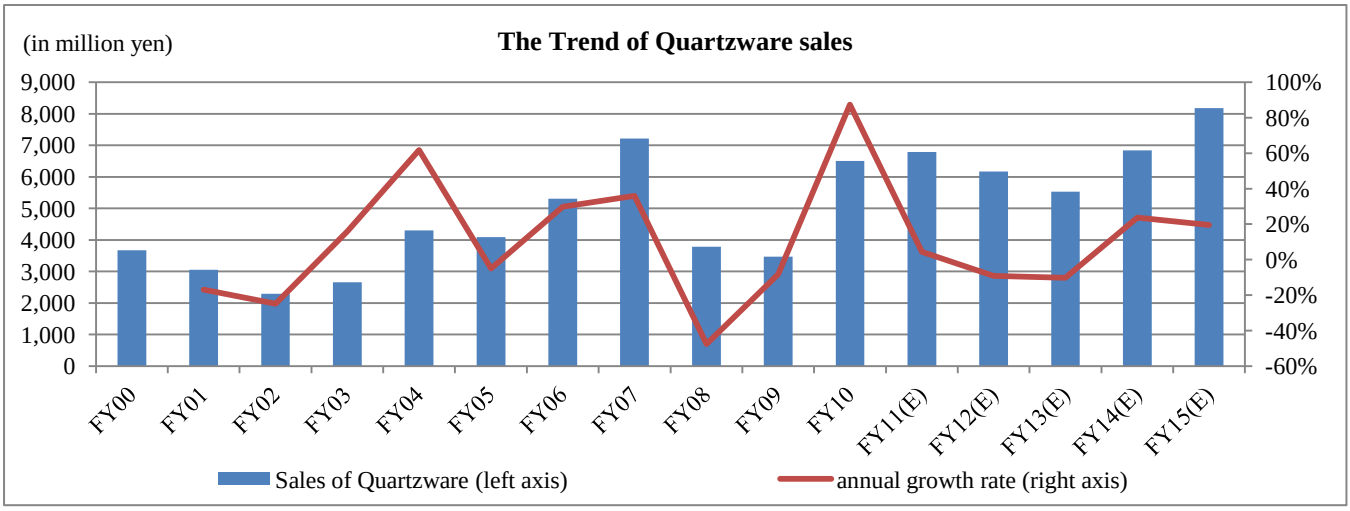
- **Quartzware sales to PV and LED**
  - Now, the demand for solar cell in China is very strong, and this boom is going to continue in the future. Together with this, in the Mid-Term Management Plan, Ferrotec has set out a policy to expand Quartzware sales to PV industry in china. Meanwhile, implementing a subsidy policy, China has been investing aggressively in MOCVD equipment, which is used in the first process of LED chip manufacture. As a result, China is expected to be the world #1 MOCVD equipment capacity country in CY12.
  - But, if Quartzware market to PV and LED will continue to expand in the future, it is possible for giant companies like Shin-Etsu Chemical Co., Ltd. to enter this market. So, we considered Quartzware sales to PV and LED wouldn't grow at the same rate as PV or LED industry in China. Specifically, we considered its growth rate is the same as China's real GDP growth rate (Exhibit A-6).
  - The result of our estimate of Quartzware sales to PV and LED is the following.

(in million yen)	FY10	FY11(E)	FY12(E)	FY13(E)	FY14(E)	FY15(E)
Quartzware sales to PV and LED	1,690	1,852	2,028	2,221	2,432	2,663
(annual growth rate)		9.60%	9.50%	9.50%	9.50%	9.50%



- And the result of our estimate of Quartzware sales is the following.

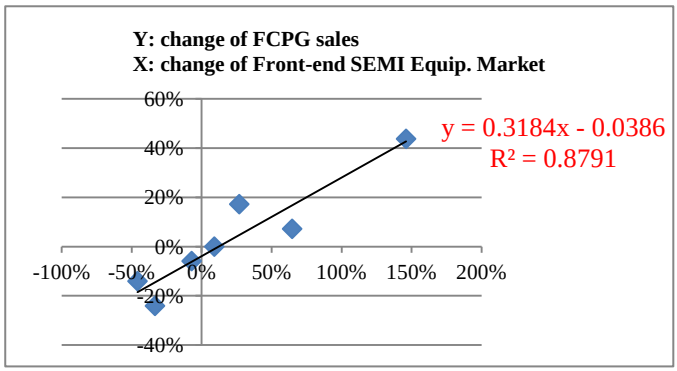
(in million yen)	FY08	FY09	FY10	FY11(E)	FY12(E)	FY13(E)	FY14(E)	FY15(E)
The sales of Quartzware	3,780	3,470	6,501	6,789	6,165	5,531	6,845	8,179
(annual growth rate)	-47.60%	-8.20%	87.35%	4.43%	-9.19%	-10.29%	23.76%	19.49%

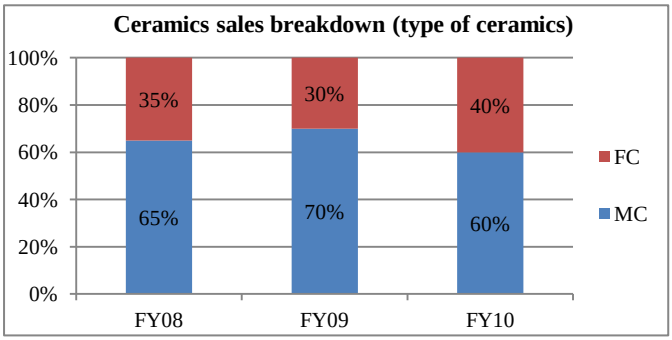


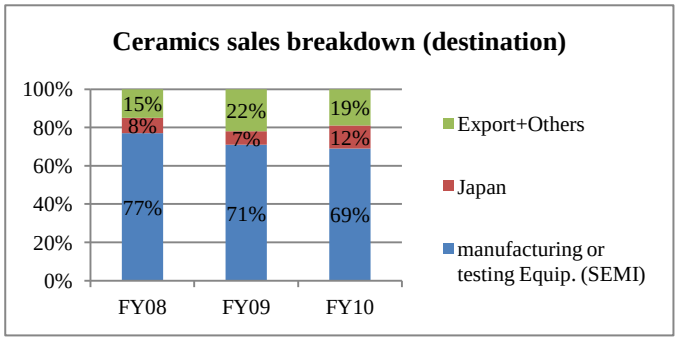
Source: Student Estimates, Company data

Exhibit B-8: The Sales of Ceramics

- First, we tried to find out the Market which has a high correlation with the trend of Ceramics sales. But, because Ferrotec has started selling it since FY09, there is little available data about Ceramics sales. So, as a preliminary step, we sought an appropriate benchmark for the trend of its sales.
- As a result, we choose "Fine Ceramics Parts Group" in KYOCERA (hereafter, FCPG) as a benchmark. The reason is as follows.
  - Many products in FCPG have a similarity to Ferrotec's Ceramics in use, like SEMI equip., FPD equip., or general industry.
  - While Ferrotec has earned more profit from machinable ceramics (hereafter, MC) than fine ceramics (hereafter, FC), Ceramics sales to semiconductor industry accounts for about 70% of the total, and FCPG also offers mainly to the same industry. With this in mind, we considered FCPG as an appropriate benchmark.





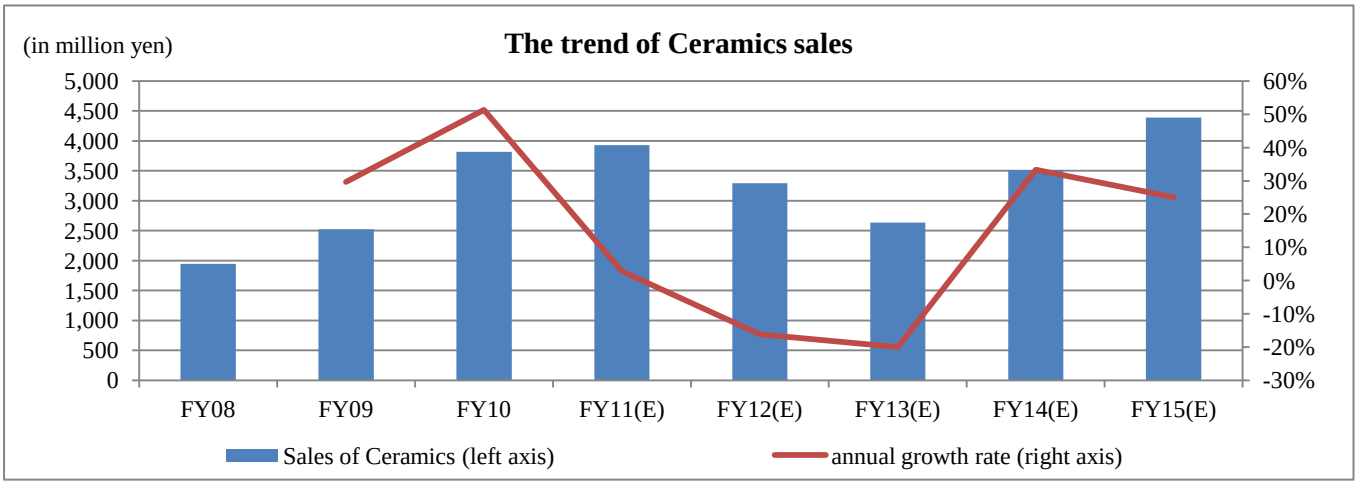


- Secondly, we found out that FCPG sales has a high correlation with the Front-end SEMI Equip. Market (R: 0.94, $\mathbf{R^2}$:0.88). So, we forecasted Ceramics sales based on this Market trend.
- Thirdly, we calculated the ratio of Ceramics sales to the Front-end SEMI equip. Market size, following the same steps as Ferrofluidic Vacuum Feedthroughs sales estimate.
- Then, based on the calculated values, we estimated the ratio in the next five years as 0.1424%. The reason is as follows.
  - In the Mid-Term Management Plan, aiming to boost its market shares, Ferrotec has set out a policy about Ceramics to expand sales in overseas markets and to produce differentiated products including high purity alumina parts.
  - But, there are large companies like KYOSERA or NGK Insulators, Ltd. Also, Ferrotec has planned to shift its core business to PV-related segment.
  - Therefore, considering the above, we assumed this ratio keeps the latest level 0.1424% in the next five years.

	CY08	CY09	CY10
Front-end SEMI Equip. Market (in US$ billion)	24	13	32
	FY08	FY09	FY10
USD/JPY rate (end of the period)	98.23	93.04	83.80
Front-end SEMI Equip. Market (in million yen)	2,357,520	1,209,520	2,681,600
The sales of Ceramics (in million yen)	1,947	2,524	3,819
The ratio of the sales to the Market size	0.0826%	0.2087%	0.1424%

- Finally, we forecasted Ceramics sales, multiplying Front-end SEMI Equip. Market estimates by USD/JPY rate, and in turn, by the above calculated value (0.1424%). Then, we applied the rate at September 30th in our analytic period for the reasons mentioned at "The Sales of Ferrofluidic Vacuum Feedthroughs".
- The result of our estimate of Ceramics sales is the following.

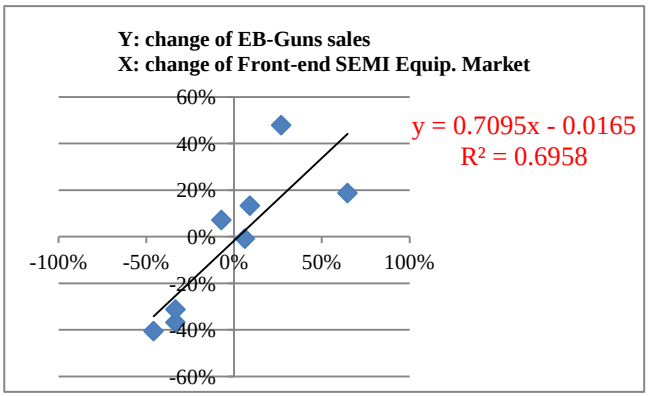
	CY08	CY09	CY10	CY11(E)	CY12(E)	CY13(E)	CY14(E)	CY15(E)
Front-end SEMI Equip. Market (in US$ billion)	24	13	32	36	30	24	32	40
	FY08	FY09	FY10	FY11(E)	FY12(E)	FY13(E)	FY14(E)	FY15(E)
USD/JPY rate (end of the period)	98.23	93.04	83.80	77.04	77.04	77.04	77.04	77.04
Front-end SEMI Equip. Market (in million yen)	2,357,520	1,209,520	2,681,600	2,758,032	2,311,200	1,848,960	2,465,280	3,081,600
The ratio of the sales to the Market size	0.0826%	0.2087%	0.1424%	0.1424%	0.1424%	0.1424%	0.1424%	0.1424%
The sales of Ceramics (in million yen)	1,947	2,524	3,819	3,927	3,291	2,633	3,511	4,388
(annual growth rate)		29.64%	51.31%	2.84%	-16.20%	-20.00%	33.33%	25.00%



Source: Student Estimates, Company data, financial report of KYOCERA Corporation

Exhibit B-9: The Sales of EB-Guns and Vacuum Deposition Equip.

- Ferrotec has started selling Vacuum deposition equip. from January 2010, while it has selling EB-Guns since long ago. So, we forecasted sales of EB-Guns and Vacuum deposition equip. respectively.
- **The sales of EB-Guns**
  - First, we found out that the sales of EB-Guns has a high correlation with the Front-end SEMI Equip. Market (R:0.92, $\mathbf{R^2}$:0.84). So, we forecasted this product sales based on this Market trend.
  - Next, we calculated the ratio of EB-Guns sales to the Front-end SEMI equip. Market size in each year, following the same steps as Ferrofluidic Vacuum Feedthroughs sales estimate.

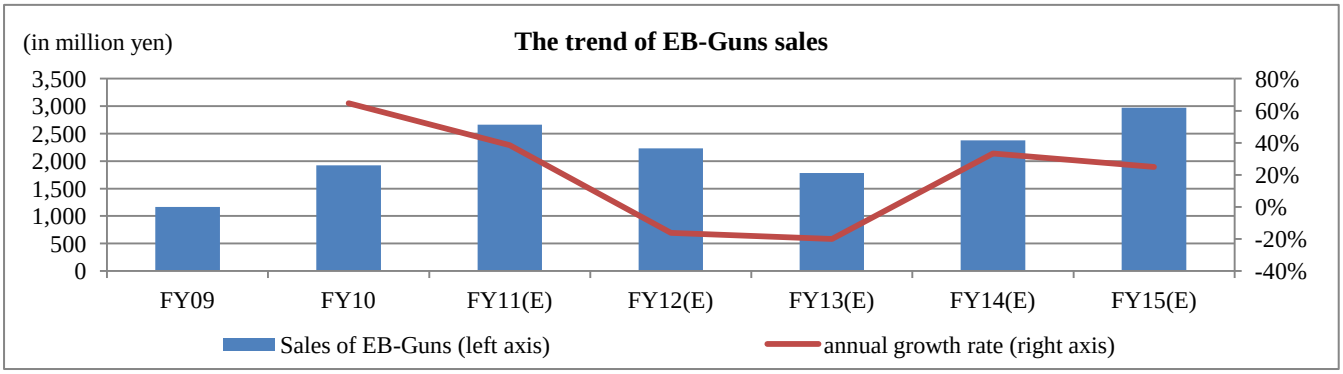


	CY02	CY03	CY04	CY05	CY06	CY07	CY08	CY09	CY10
Front-end SEMI Equip. Market (in US$ billion)	16	17	28	26	33	36	24	13	32
	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10
USD/JPY rate (end of the period)	120.20	105.69	107.39	117.47	118.05	100.19	98.23	93.04	83.80
Front-end SEMI Equip. Market (in million yen)	1,923,200	1,796,730	3,006,920	3,054,220	3,895,650	3,606,840	2,357,520	1,209,520	2,681,600
The sales of EB-Guns (in million yen)	1,349	1,338	1,589	1,703	2,519	2,855	1,963	1,167	1922
The ratio of EB-Guns sales to the Market size	0.0701%	0.0745%	0.0528%	0.0558%	0.0647%	0.0792%	0.0833%	0.0965%	0.0717%

- Then, based on the calculated values, we estimated the ratio in the next five years as 0.0965%. The reason is as follows.
  - Although Ferrotec has not set out a policy about EB-Guns in the Mid-Term Management Plan, the ratio of EB-Guns sales to the Market size had been increasing during FY04-FY09.
  - So, with in mind the synergy effect of entering Vacuum deposition equip. market, we assumed this ratio keeps the latest high level 0.0965% in the next five years.

- Finally, we forecasted EB-Guns sales, multiplying Front-end SEMI Equip. Market estimates by USD/JPY rate, and in turn, by the above calculated value (0.0965%). Then, we applied the rate at September 30th in our analytic period for the reasons mentioned at "The Sales of Ferrofluidic Vacuum Feedthroughs".
- The result of our estimate of EB-Guns sales is the following.

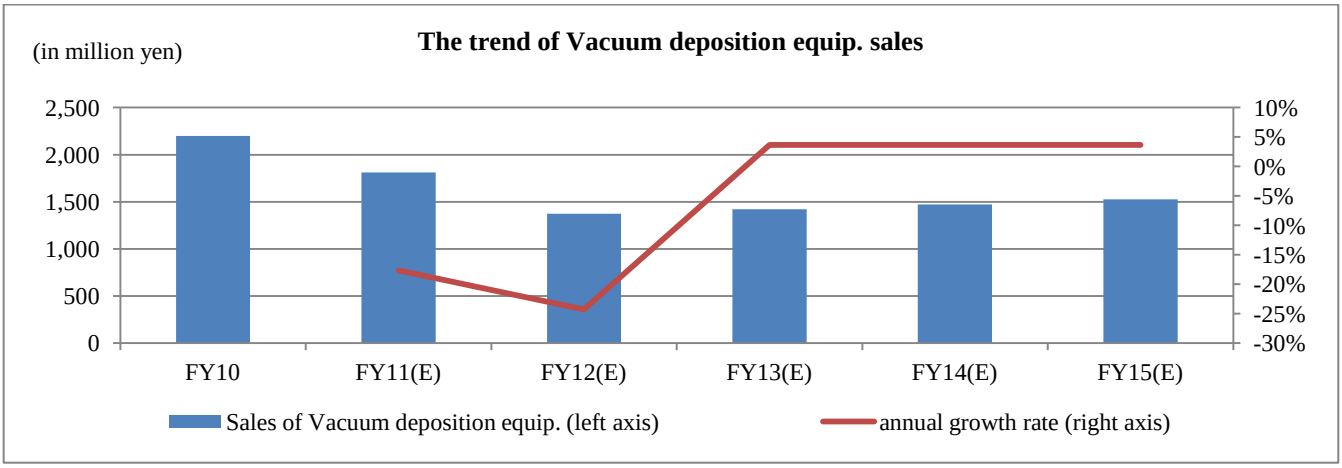
	CY08	CY09	CY10	CY11(E)	CY12(E)	CY13(E)	CY14(E)	CY15(E)
Front-end SEMI Equip. Market (in US$ billion)	24	13	32	36	30	24	32	40
	FY08	FY09	FY10	FY11(E)	FY12(E)	FY13(E)	FY14(E)	FY15(E)
USD/JPY rate (end of the period)	98.23	93.04	83.80	77.04	77.04	77.04	77.04	77.04
Front-end SEMI Equip. Market (in million yen)	2,357,520	1,209,520	2,681,600	2,758,032	2,311,200	1,848,960	2,465,280	3,081,600
The ratio of EB-Guns sales to the Market size	0.0833%	0.0965%	0.0717%	0.0965%	0.0965%	0.0965%	0.0965%	0.0965%
The sales of EB-Guns (in million yen)	1,963	1,167	1,922	2,662	2,230	1,784	2,379	2,974
(annual growth rate)	-31.24%	-40.55%	64.70%	38.48%	-16.20%	-20.00%	33.33%	25.00%



- **<u>The sales of Vacuum deposition equip.</u>**
  - First, because there is little available data about Vacuum deposition equip., we forecasted this product sales based on the trend of global MOCVD equip. sales, which is used in the first process of LED chip manufacture. The reason is as follows.
    - Because MOCVD equip. is used at a stage prior to Vacuum deposition equip., we considered there is a high degree of positive correlation between both of them.
    - To improve self-sufficiency rate of LED, China has been investing aggressively in MOCVD equipment with a subsidy policy. As a result, China is expected to be the world #1 MOCVD equipment capacity country in CY12. And at the same time, in the Mid-Term Management Plan, Ferrotec has set out a policy to sell low cost type of Vacuum deposition equip. to China. Therefore, with those in mind, we considered it is appropriate to forecast this product sales based on the trend of global MOCVD equip. sales.
  - Specifically, we assumed that its sales will grow at the same rate as that of global MOCVD equip. sales (Exhibit B-4).

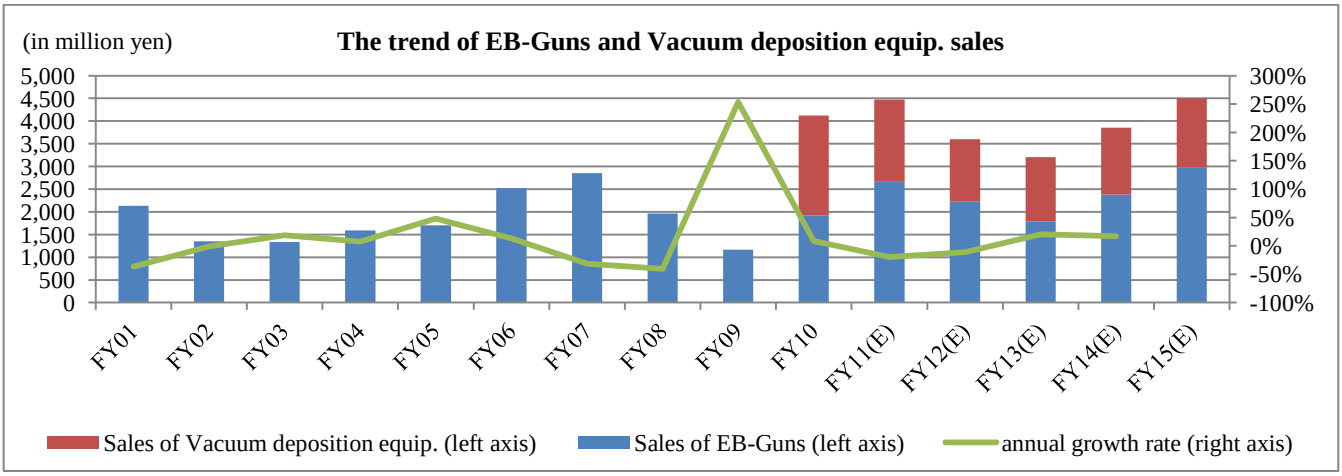
➢ The result of our estimate of Vacuum deposition equip. sales is the following.

(in million yen)	FY10	FY11(E)	FY12(E)	FY13(E)	FY14(E)	FY15(E)
The sales of Vacuum deposition equip.	2,200	1,812	1,372	1,422	1,473	1,527
(annual growth rate)		-17.65%	-24.29%	3.64%	3.64%	3.64%



● And the result of our estimate of EB-Guns and Vacuum deposition equip. sales is the following.

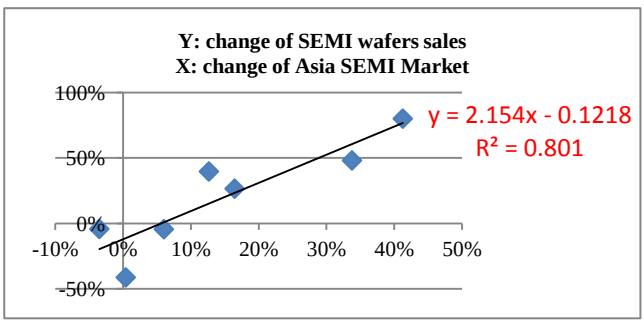
(in million yen)	FY09	FY10	FY11(E)	FY12(E)	FY13(E)	FY14(E)	FY15(E)
The sales of EB-Guns and Vacuum deposition equip.	1,167	4,122	4,474	3,602	3,206	3,852	4,501
(annual growth rate)	-40.55%	253.21%	8.53%	-19.49%	-11.00%	20.18%	16.84%



Source: Student Estimates, Company data

Exhibit B-10: The Sales of SEMI Wafers

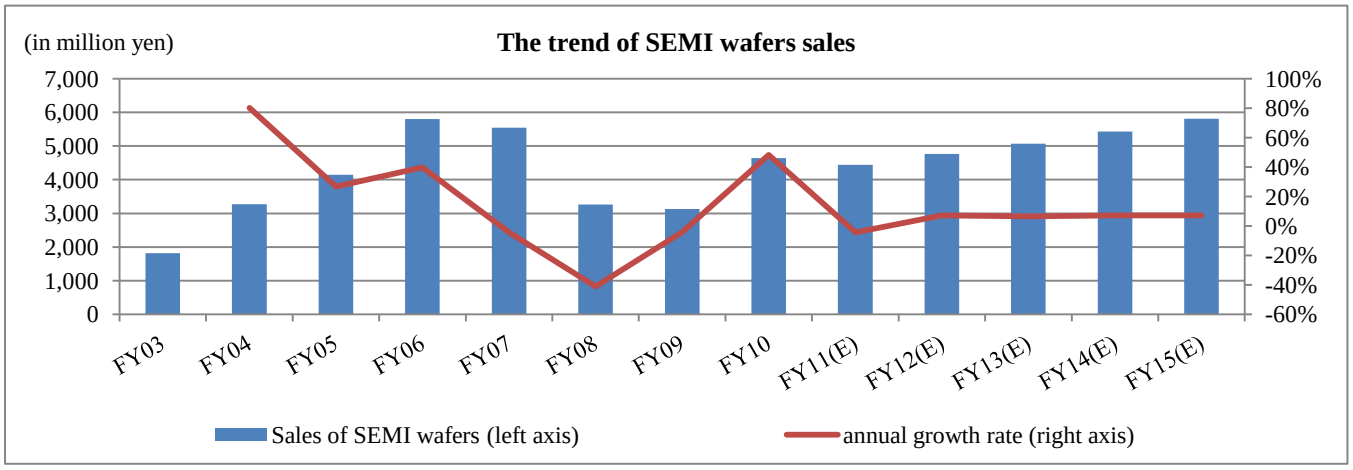
- First, we found out that the sales of SEMI wafers has a high correlation with Asia SEMI Market (R:0.90, $\mathbf{R^2}$:0.80). We can understand this high correlation from the large scale of Asia SEMI Market (Exhibit B-3) and the fact that SEMI wafers are manufactured at the Shanghai plant. So, we forecasted this product sales based on this Market trend.
- Next, we calculated the ratio of SEMI wafers sales to Asia SEMI Market size in each year, following the same steps as Ferrofluidic Vacuum Feedthroughs sales estimate.



	CY03	CY04	CY05	CY06	CY07	CY08	CY09	CY10
Asia SEMI Market (in US$ billion)	62,843	88,781	103,391	116,482	123,492	123,975	119,628	160,025
	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10
USD/JPY rate (end of the period)	105.69	107.39	117.47	118.05	100.19	98.23	93.04	83.80
Asia SEMI Market (in million yen)	6,641,877	9,534,192	12,145,341	13,750,700	12,372,663	12,178,064	11,130,189	13,410,095
The sales of SEMI wafers (in million yen)	1,817	3,274	4,147	5,798	5,547	3,265	3,130	4,641
The ratio of SEMI wafers sales to Asia SEMI Market size	0.0274%	0.0343%	0.0341%	0.0422%	0.0448%	0.0268%	0.0281%	0.0346%

- Then, we estimated the ratio of the sales to Asia SEMI Market size in the next five years as 0.0346%. The reason is as follows.
  - Thanks for Ferrotec own brand products launched in FY10, the ratio increased from 0.0281% in FY09 to 0.0346% in FY10. So, we adopted the ratio in FY10 (0.0346%) as the base.
  - And, considering outside environment that SEMI manufacturers in China have promoted outsourcing of wafer production, we assumed this ratio keeps the level 0.0346% in the next five years.
- Finally, we forecasted SEMI wafers sales, multiplying Asia SEMI Market estimates by USD/JPY rate, and in turn, by the above calculated value (0.0346%). Then, we applied the rate at September 30th in our analytic period for the reasons mentioned at "The Sales of Ferrofluidic Vacuum Feedthroughs".
- The result of our estimate of SEMI wafers sales is the following.

	CY08	CY09	CY10	CY11(E)	CY12(E)	CY13(E)	CY14(E)	CY15(E)
Asia SEMI Market (in US$ billion)	123,975	119,628	160,025	166,692	178,783	190,266	203,732	218,156
	FY08	FY09	FY10	FY11(E)	FY12(E)	FY13(E)	FY14(E)	FY15(E)
USD/JPY rate (end of the period)	98.23	93.04	83.80	77.04	77.04	77.04	77.04	77.04
Asia SEMI Market (in million yen)	12,178,064	11,130,189	13,410,095	12,841,952	13,773,442	14,658,093	15,695,513	16,806,738
The ratio of SEMI wafers sales to Asia SEMI Market size	0.0268%	0.0281%	0.0346%	0.0346%	0.0346%	0.0346%	0.0346%	0.0346%
The sales of SEMI wafers (in million yen)	3,265	3,130	4,641	4,443	4,766	5,072	5,431	5,815
(annual growth rate)	-41.14%	-4.13%	48.27%	-4.26%	7.25%	6.42%	7.08%	7.08%



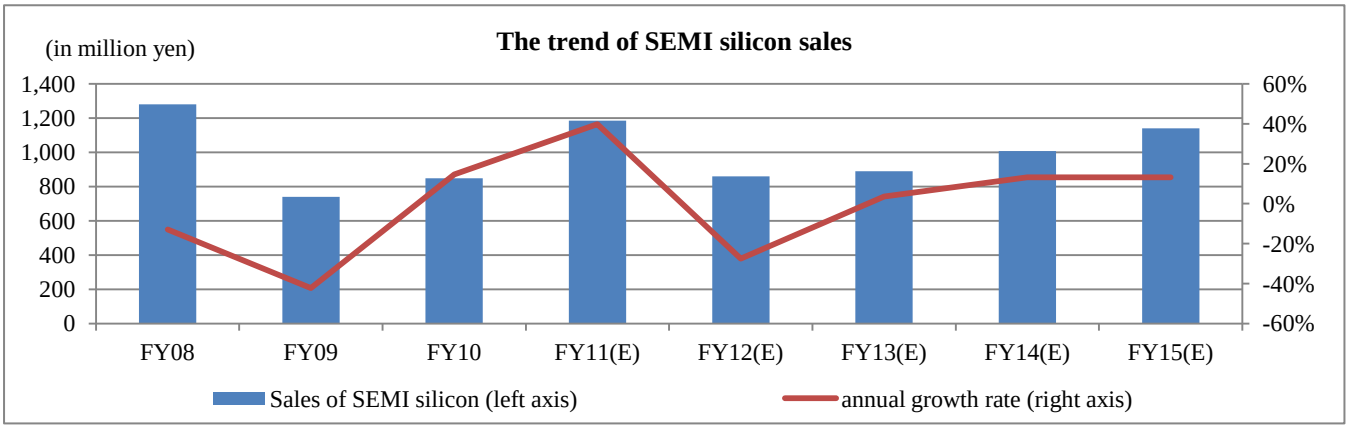
Source: Student Estimates, Company data

Exhibit B-11: The Sales of SEMI Silicon

- The ratio of SEMI silicon sales to total sales is low, and has been decreasing in recent years. So, we didn't forecast this product sales in detail.
- Specifically, we calculated the latest ratio of SEMI silicon sales to "Three main segments – SEMI silicon" sales (1.54%), and applied this ratio to our analytic period.
- The result of our estimate of SEMI silicon sales is the following.

(in million yen)	FY08	FY09	FY10
The sales of SEMI silicon	1,280	740	848
Total sales of Ferrotec	36,653	31,541	57,880
The sales of "Three main segments - SEMI silicon"	28,352	25,411	54,915
The ratio of SEMI silicon sales to total sales	3.49%	2.35%	1.47%
The ratio to "Three main segments - SEMI silicon" sales	4.51%	2.91%	1.54%

(in million yen)	FY08	FY09	FY10	FY11(E)	FY12(E)	FY13(E)	FY14(E)	FY15(E)
The sales of SEMI silicon	1,280	740	848	1,185	859	889	1,007	1,140
(annual growth rate)	-12.87%	-42.19%	14.59%	39.80%	-27.55%	3.51%	13.27%	13.18%



Source: Student Estimates, Company data

Exhibit B-12: The Sales of Electric-Device (ED) Segment

In FY10, the revenue of Electric-device segment was 6.917 billion yen, accounting for 11.95% of total. This segment has three core solutions which are Thermo-electric modules, Ferrofluid magnetic liquid and the other products (FFB, HDD related etc.). Almost all the revenue of this segment is earned by Thermo-electric modules (accounting for 93.1% in FY10).

(in million yen)	FY	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10
Electric-Device(ED) segment	Sales	6,162	4,990	4,270	3,619	3,578	3,409	5,286	5,609	4,355	3,750	6,917
Thermo-electric modules	Sales	1,150	893	1,110	1,577	2,054	2,624	4,586	5,031	3,914	3,407	6,442
	(Component ratio of ED)	18.7%	17.9%	26.0%	43.6%	57.4%	77.0%	86.8%	89.7%	89.9%	90.9%	93.1%
Ferrofluid magnetic liquid	Sales	1,547	1,421	1,243	680	512	650	637	529	374	343	409
	(Component ratio of ED)	25.1%	28.5%	29.1%	18.8%	14.3%	19.1%	12.1%	9.4%	8.6%	9.1%	5.9%
FFB,HDD related	Sales	3,465	2,676	1,917	1,363	1,012	135	63	49	67	0	66
	(Component ratio of ED)	56.2%	53.6%	44.9%	37.7%	28.3%	4.0%	1.2%	0.9%	1.5%	0	-

【Thermo-electric modules】

First of all, we divided the sales of Thermo-electric modules (hereinafter, TM) into each product, according to data from annual reports. Before FY14, a part of TM products was divided into "For The Other" because of a lack of data.

(in million yen)	FY	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10
TM total	Sales	1,150	893	1,110	1,577	2,054	2,624	4,586	5,031	3,914	3,407	6,442
For Car	Sales	-	196.5	366.3	867.4	965.4	1,521.9	2,659.9	3,471.4	2,348.4	2,282.7	2,770.1
	(Component)	-	22%	33%	55%	47%	58%	58%	69%	60%	67%	43%
For SEMI	Sales	-	89.3	122.1	205.0	369.7	314.9	412.7	402.5	313.1	102.2	322.1
	(Component)	-	10%	11%	13%	18%	12%	9%	8%	8%	3%	5%
For Optics	Sales	-	116.1	122.1	141.9	184.9	209.9	412.7	251.6	274.0	272.6	515.4
	(Component)	-	13%	11%	9%	9%	8%	9%	5%	7%	8%	8%
For Biotechnology	Sales	-	0	0	0	102.7	183.7	229.3	251.6	313.1	238.5	450.9
	(Component)	-	0%	0%	0%	5%	7%	5%	5%	8%	7%	7%
For Optical Communication	Sales	-	0	0	0	61.7	78.7	91.7	201.2	195.7	34.1	257.7
	(Component)	-	0%	0%	0%	3%	3%	2%	4%	5%	1%	4%
For Chemical	Sales	-	0	0	0	82.2	105.0	137.6	150.9	156.6	136.3	257.7
	(Component)	-	0%	0%	0%	4%	4%	3%	3%	4%	4%	4%
For Consumer	Sales	-	223.3	166.5	47.3	41.1	105.0	137.6	100.6	156.6	238.5	1,546.1
	(Component)	-	25%	15%	3%	2%	4%	3%	2%	4%	7%	24%
For The Other	Sales	-	267.9	333	315.4	246.5	105.0	504.6	201.2	156.6	102.2	322.1
	(Component)	-	30%	30%	20%	12%	4%	11%	4%	4%	3%	5%

・We see that the core product of this solution is TM for car (hereinafter, TMC), accounting for about 60% of TM total .

・As mentioned above, in our sales forecast, we divined TM into core business (TMC) and the rest (for SEMI, for consumer etc.).

・In FY10, the sales of TM for consumer expanded greatly owing to rush-in demand caused by the end of a subsidy program for energy-saving consumer electronics products. So, we don't expect that it will continue in the future. Therefore, we concluded that it is outlier.

- **The sales of Thermo-electric modules for car (TMC)**

Since CY01, Ferrotec aligned with Amerigon Corporation which offers TM applied products for a luxury car in U.S and Asia and has a 100% market share. This product name is Climate Control Seat (CCS). Amerigon produces and sells CCS for following six car manufacturers (Figure 1). We used Tata Motors' production unit numbers, because Jaguar/Land Rover is a subsidiary company of Tata Motors.

We calculated the sale forecast of TMC in the following steps.

① First, we analyzed the production unit numbers of the six car manufacturers that are offered CCS by Amerigon, according to annual report.

② Secondly, we found that there is high correlation between each production unit number and global real GDP (Exhibit A-6). And we calculated the forecast of the each production unit number based on the above correlation.

③ Finally, we calculated correlation coefficient between the each production unit number and the sales of TMC. And we forecasted the sales by multiple regression analysis by using the above correlation.

Amerigon the sales of CCS (in thousand $) **(Figure 1)**

Manufacturer	FY08	FY09	FY10
Ford Motor Company	16,514	23,644	35,734
General Motors	15,879	13,337	24,567
Nissan	13,338	9,700	18,983
Hyundai	1,905	6,062	17,867
Toyota Motor Corporation	11,432	4,243	5,583
Jaguar/Land Rover	4,446	3,637	8,933
Total	63,516	60,626	111,669

As shown in Figure 1, there is high correlation between each production unit number and global real GDP. Therefore we forecasted the each production unit number based on global real GDP growth rate (Exhibit A-6). However, the correlation about FORD Motor is shown a negative number (Figure 2). So we forecasted the production unit number of FORD based on its average growth rate.

Next, we calculated the correlation coefficient between the sales of TMC and the each production unit number (figure 4), and forecasted the sales by multiple regression analysis. With respect to this, because the correlation coefficient of FORD is shown a negative number, we made two series of data for this analysis. One is total production unit numbers contained TOYOTA, GM, HYUNDAI, NISSAN and TATA (without FORD). The other is the unit number of FORD.

Correlation coefficient between the each production unit number (in ten thousand) and global real GDP **(Figure 2)**												
CY	CY 00	CY01	CY02	CY03	CY04	CY05	CY06	CY07	CY08	CY09	CY10	Correlation coefficient between global real GDP
TOYOTA	468	502	556	537	587	616	680	721	777	723	727	0.97089287
FORD	404	370	361	332	350	351	396	357	335	469	296	-0.102376705
GM	527	466	490	468	450	566	578	626	602	646	627	0.865410445
HYUNDAI	202	209	219	228	238	273	200	229	244	465	525	0.668992844
NISSAN	205	197	216	236	242	270	251	265	279	274	314	0.941072205
TATA	9	5	8	14	18	16	24	24	49	67	58	0.880634703
Total	1,814	1,749	1,849	1,815	1,885	2,092	2,129	2,222	2,284	2,644	2,546	0.93248716

The forecast of each production unit number **(figure 3)**							
	CY10	CY11(E)	CY12(E)	CY13(E)	CY14(E)	CY15(E)	CY16(E)
TOYOTA	727	759	793	829	867	907	950
FORD	296	292	288	284	280	277	273
GM	627	654	684	714	747	782	819
HYUNDAI	525	548	572	598	626	655	686
NISSAN	314	328	343	358	375	392	411
TATA	58	60	63	66	69	72	76
Total without FORD	2,251	2,349	2,455	2,565	2,684	2,808	2,942
Total	2,546	2,641	2,743	2,850	2,964	3,086	3,215

Correlation coefficient between TMC and unit number **(Figure 4)**	
TOYOTA	0.89843883
FORD	-0.08406645
GM	0.88653505
HYUNDAI	0.3854577
NISSAN	0.78585209
TATA	0.63906755
Total	0.77694300
Total without FORD	0.79162050

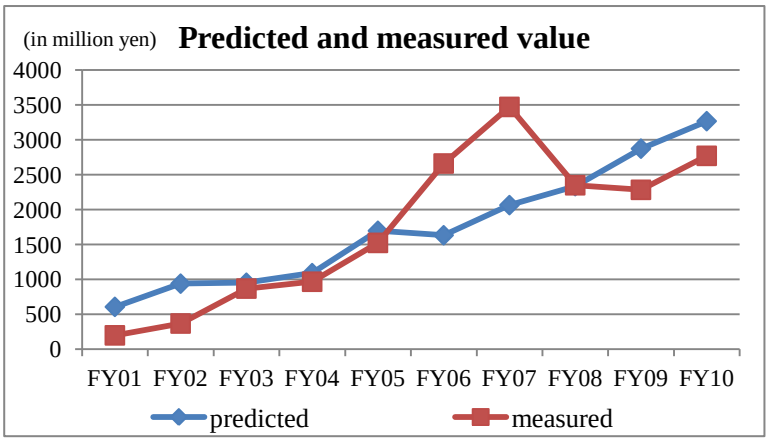
Based on above, we formulated the multiple regression analysis. The explanatory variables are the two series of data, and the explained variable is the sales of Thermo-electric modules for car.

The sales of TMC = -3125.06 + (2.97188*Total without FORD)
+ (-0.99784*FORD)
(R^2 = 0.628)

The transition of predicted and measured value are as a right figure. Outliers in FY06-07 were caused by expansion of demand for a luxury car in Japan and Europe. After that, measured value was lower than predicted influenced by 'Lehman Shock' and decrease of demand. Because the sales of Thermo-electric modules had entered into a trend of recovery, we thought that our sales forecast (predicted value) would nearly correspond with measured value in the future.

Finally, based on above, we forecasted the sales of TMC from FY11 to FY15 based on the formula of multiple regression analysis and the forecast of the each production unit number of six car manufacturers.

The result is a below chart.



(in million yen)	FY05	FY06	FY07	FY08	FY09	FY10	FY11(E)	FY12(E)	FY13(E)	FY14(E)	FY15(E)
TM For Cars	1,521	2,659	3,471	2,348	2,282	2,770	3,566	3,884	4,216	4,571	4,949

- **The sales of the rest products**

We calculated the sales forecast of the rest in the following steps.

① First, we calculated a correlation between the sales of the rest and global real GDP (Exhibit A-6), and divided the rest into correlative products or not.

② Secondly, with respect to the correlative products, we calculated that the sales based on global real GDP. However, with respect to the sales of TM for biotechnology, for optical communication and for chemical which data are discontinuity before and after FY04, we divided these into "For The Other". Therefore we calculated correlation coefficients between the sales and global real GDP after FY04. And with respect to the sales forecast of "For The Other" without these three products, we didn't calculate a correlation and simply forecast it based on global real GDP because of lack of data.

③ Finally, we forecasted the sales of TM for consumer and SEMI by other ways, because these products didn't show a significant correlation between global real GDP.

A) TM for consumer

We had to remove an influence of rush-in demand in FY10 from our sale forecast. Therefore, we used a data before FY10 for calculation.

(in million yen)	FY04	FY09	FY10※	FY11(E)	FY12(E)	FY13(E)	FY14(E)	FY15(E)
For Consumer	41.08	238.49	339.03	482	685	974	1,386	1,968
	6years average growth rate **42.157%**							

An average growth rate in FY04-09 is 42.157%. So we forecasted the sales by using 42.157% on and after FY10. We consider that these forecasted sales are without influence of rush-in demand. Therefore, comparing FY10 (calculated) and FY10 (measured), we infer that the influence of rush-in demand was about 1,207 billion yen.

B) TM for SEMI

With respect to TM for SEMI, the sales had increased steadily. And a correlation coefficient between real GDP is about 0.8, but in FY09, the sales was decreased by a reduction trend of investment in SEMI in FY09. After FY09, the investment and the sales showed a recovery trend. Therefore we forecasted the sales based on correlation between real GDP.

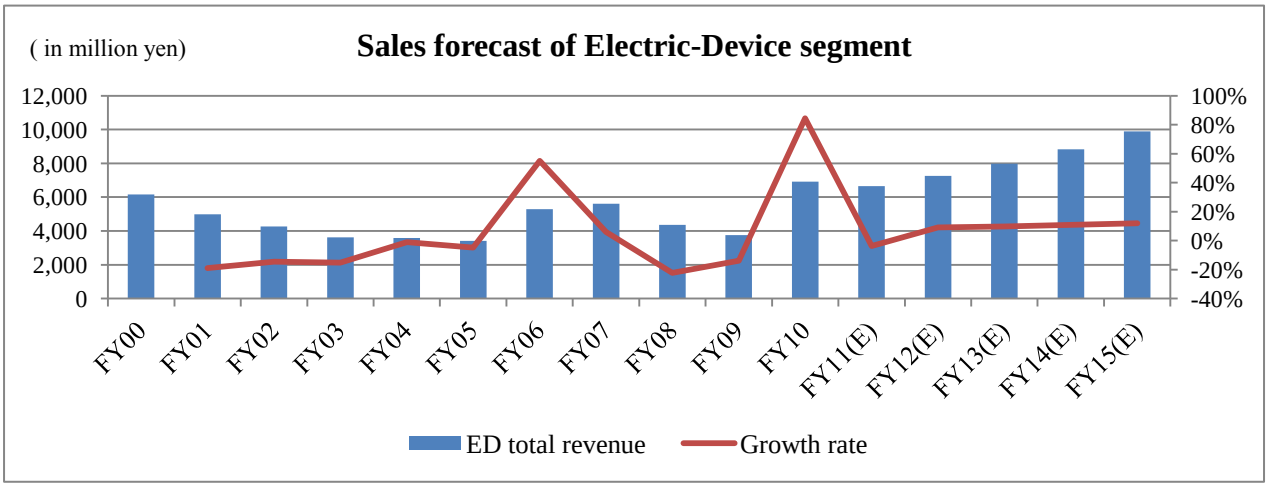
(in million yen)	FY08	FY09	FY10	FY11(E)	FY12(E)	FY13(E)	FY14(E)	FY15(E)
For SEMI	313.12	102.21	322.10	336	351	367	384	402

【Ferrofluid magnetic liquid】【FFB, HDD related】

In German, for example, Ferrotec produces and sells a Ferrofluid magnetic liquid for disposing waste liquid with heavy metals. But Ferrotec doesn't have a specific plan to expand this solution. And with a technological innovation, FFB and HDD related products aren't expected to change its sales in the future. Therefore we estimated that sales of these products will set at a same level as FY10.

(in million yen)	FY08	FY09	FY10	FY11(E)	FY12(E)	FY13(E)	FY14(E)	FY15(E)
Ferrofluid magnetic liquid	374	343	409	409	409	409	409	409
FFB, HDD related	67	0	66	66	66	66	66	66

【Evaluation of Electric-Device Segment sales forecast】

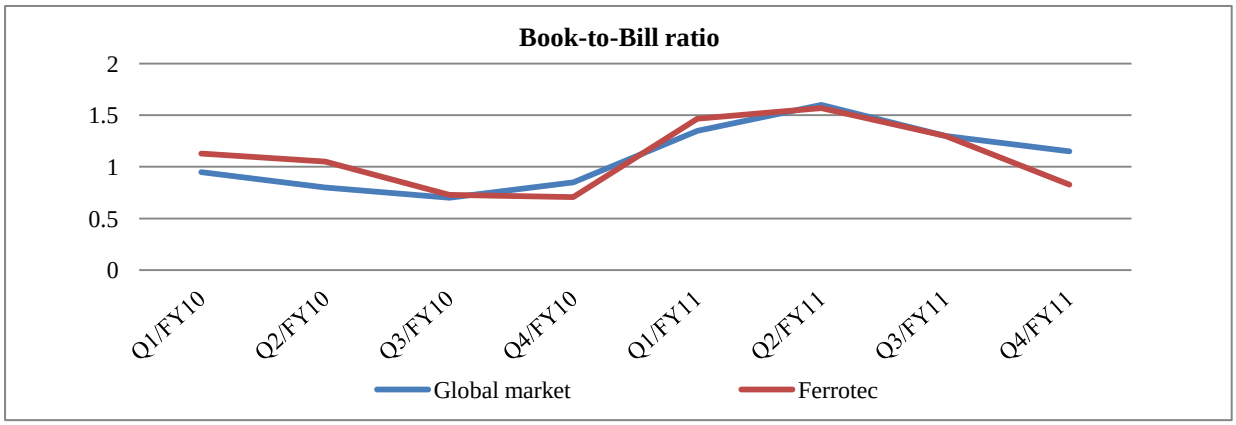


(in million yen)	FY	FY07	FY08	FY09	FY10	FY11(E)	FY12(E)	FY13(E)	FY14(E)	FY15(E)
TM total revenue		5,031	3,914	3,407	6,442	6,186	6,792	7,502	8,361	9,425
	For Car	3,471.4	,2348.4	2,282.7	2,770.1	3,566	3,884	4,216	4,570	4,949
	For SEMI	402.5	313.1	102.2	322.1	336	351	367	384	402
	For Optics.	251.6	274.0	272.6	515.4	538	562	588	615	643
	For biotechnology	251.6	313.1	238.5	450.9	471	492	514	538	563
	For optical comm.	201.2	195.7	34.1	257.7	269	281	294	307	322
	For Chemical	150.9	156.6	136.3	257.7	269	281	294	307	322
	For Consumer	100.6	156.6	238.5	1,546.1	482	685	974	1,385	1,968
	For The Other	201.2	156.6	102.2	322.1	255	255	255	255	255
	Sum without Cars	1,559.6	1,565.6	1,124.3	3,671.9	2,621	2,908	3,286	3,791	4,476
Ferrofluid magnetic liquid		529	374	343	409	409	409	409	409	409
FFB, HDD related		49	67	0	66	66	66	66	66	66
ED total revenue		5,609	4,355	3,750	6,917	6,661	7,267	7,977	8,836	9,900

Source: the data from Ferrotec IR, Amerigon IR, OICA, JAMA, Student Estimates

Exhibit B-13: The Sales of PV Furnaces (manufacturing equipment for PV silicon)

- First, according to our estimates, the Book-to-Bill ratio of PV-related products in the global market (PV furnaces, PV silicon) is highly correlated with it of Ferrotec (PV furnaces, PV silicon, and Quartz crusibles): R=0.84, $\mathbf{R^2}$=0.71. And we compared the Book-to-Bill ratio from Q1/FY10 to Q4/FY11, because FY10 is the first year Ferrotec launched PV-related segment. Therefore, we forecasted sales of this product based on this Market trend. Further, we emphasis on the importance of the global trend, because the end products of the industry sells all over the world.



- Next, we calculated the size of the global market in the next five years, following the same steps as Ferrofluidic Vacuum Feedthroughs sales estimate. And we found out the ratio of this product sales to the global market size in the next five years. The result of our estimates is as follows:
  - We calculated the ratio of this product sales to the global market size in the past three years. And we applied the average ratio (1.27%) as the Ferrotec's market share in our analytic period.

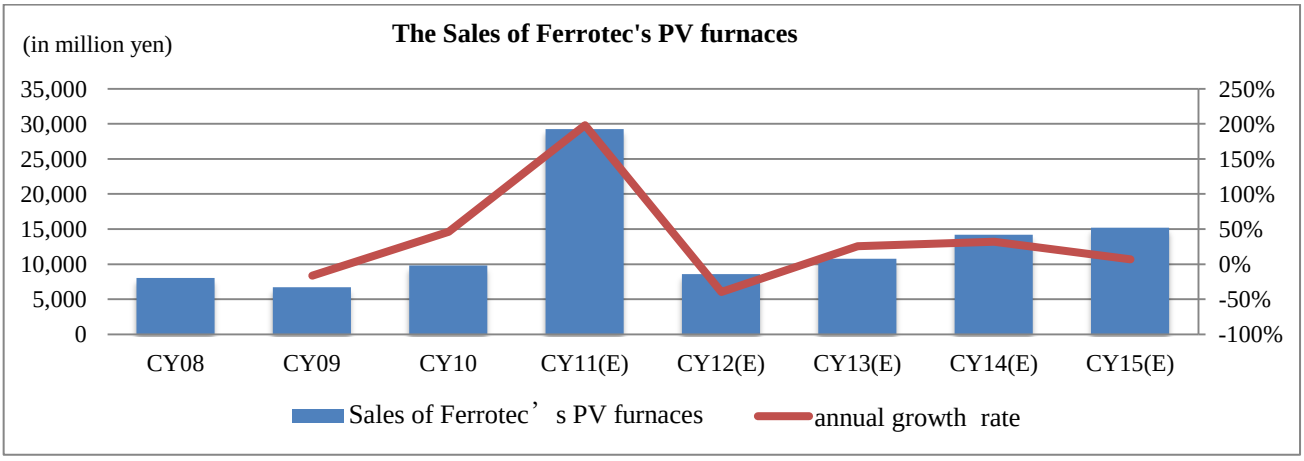
	CY08	CY09	CY10
PV furnaces (in US$ million)	6,250	5,400	10,000
	FY09	FY10	FY11
USD/JPY rate (end of the period)	98.23	93.04	83.8
PV furnaces (in million yen)	613,937.5	502,416	838,000
The sales of Ferrotec's PV furnaces (in million yen)	8,023	6,699	9,801
The ratio of the sales to the global market	1.307%	1.333%	1.170%

- Next, taking into consideration the SWOT analysis and the Mid-Term Management Plan (Exhibit A-4), we estimated that Ferrotec will hold the market share of 1.27% in the next five years,

- Then, we forecasted the sales of this product, multiplying USD/JPY rate and market share of 1.27% .We applied USD/JPY rate at September 30th in our analytic period for the reasons mentioned at "The Sales of Ferrofluidic Vacuum Feedthroughs".
- In addition, we just added the major order from Chinese PV panel manufacturers to the sales in FY12 (E), recognizing it as unexpected and unsustainable. Further, the details of the major order are as follows: Single-crystal silicon furnace is 800s in 0.2 million dollars, Polycrystalline silicon furnace is 70s in 0.5 million dollars. And the total order amounts to 15.023 million yen.
- The result is as follows.

	CY08	CY09	CY10	CY11(E)	CY12(E)	CY13(E)	CY14(E)	CY15(E)
PV furnaces (in US$ million)	6,250	5,400	10,000	14,500	8,750	11,000	14,500	15,500
	FY09	FY10	FY11	FY12(E)	FY13(E)	FY14(E)	FY15(E)	FY16(E)
USD/JPY rate (end of the period)	98.23	93.04	83.8	77.04	77.04	77.04	77.04	77.04
PV furnaces (in million yen)	613,937.5	502,416	838,000	1,117,080	674,100	847,440	1,117,080	1,194,120
Ferrotec's PV furnaces	1.307%	1.333%	1.170%	1.27% (2.61%)	1.27%	1.27%	1.27%	1.27%
The sales of Ferrotec's PV furnaces (in million yen)	8,023	6,699	9,801	14,187 (29,210)	8,561	10,762	14,187	15,165
(annual growth rate)		-16.50%	46.31%	44.75% (198.03%)	-39.66%	25.71%	31.82%	6.90%

inside the ( ) is the number including the major order from China

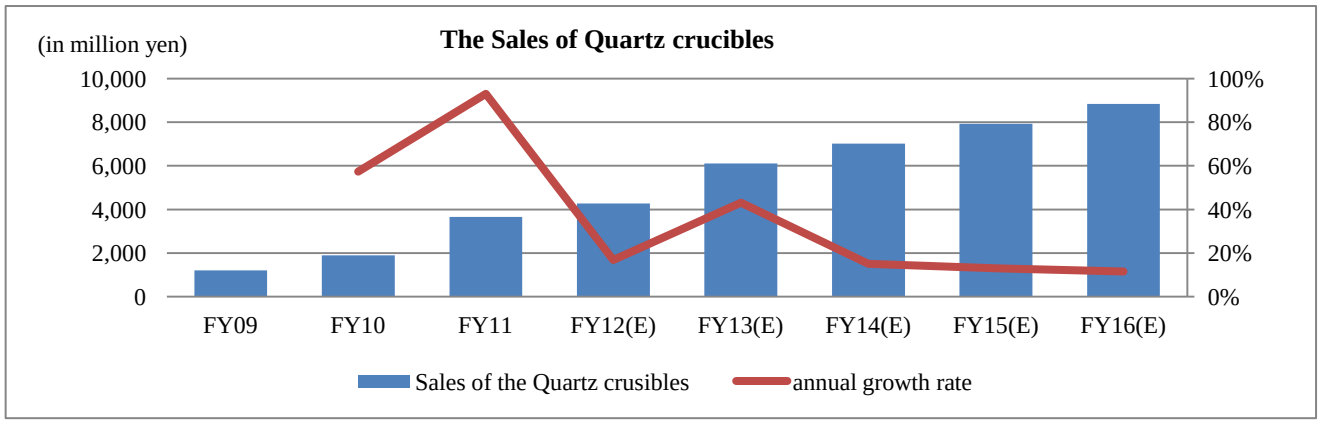


Source: Solarbuzz

Exhibit B-14: The Sales of Quartz Crucibles

- We calculated the sales of the Quartz crucibles, taking into consideration the productive capacity which is going to be established in CY11.
  - First, the Mid-Term Management Plan professed that the productive capacity is going to be enlarged from 18 thousands/month to 30 thousands/month. And we assumed that the enlargement will be completed by the end of CY11. That is, Ferrotec manufactures 18 thousands Quartz crucibles a month from Q1/FY12 to Q3/FY12, and 30 thousands a month in the 4th .
  - We estimated that, after FY13, the sales of this product increase at the same rate as silicon, because Quartz crucible is used to produce silicon. And the result is as follows.

(in million yen)	FY09	FY10	FY11	FY12(E)	FY13(E)	FY14(E)	FY15(E)	FY16(E)
The sales of the Quartz crucibles	1,203	1,893	3,654	4,266	6,102	7,016	7,930	8,845
(annual growth rate)		57.36%	93.03%	16.75%	43.04%	14.98%	13.03%	11.53%

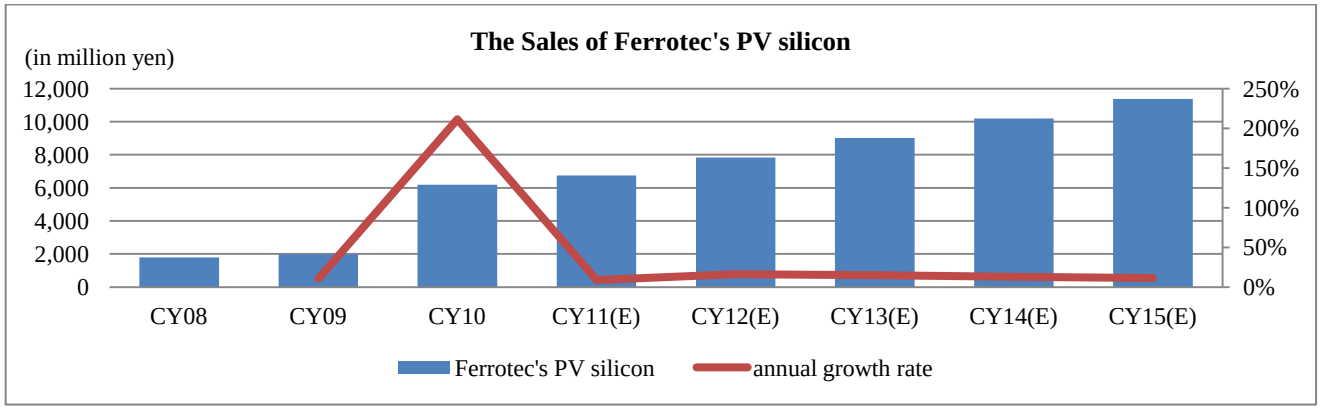


Source: IR, The Mid-Term Management Plan

Exhibit B-15: The Sales of Single-crystal & Polycrystalline PV Silicon

- We calculated the sales of the PV silicon based on the Book-to-Bill ratio of the PV-related products for the reason mentioned in "The Sales of PV furnaces".
- We calculated the growth rate of the global market of the PV silicon, using the size of the global PV silicon market. And we applied the growth rate as the sales growth rate of Ferrotec's silicon. In addition, *The PV data book 2011* says that supply and demand of PV silicon is controlled to some extent under the contract, because it has relatively less quality than for semiconductor, and they are not alternative each other. On one hand, the Si-purity of PV silicon is 99.999%, and on the other hand, that of silicon for semiconductor is 99.999999999%.
- **The results is as follows**:

(in million yen)	CY08	CY09	CY10	CY11(E)	CY12(E)	CY13(E)	CY14(E)	CY15(E)
Single-crystal silicon(ingot & wafer)	648,000	420,000	450,000	500,000	580,000	686,700	793,400	900,000
polycrystalline silicon(ingot & wafer)	770,000	440,000	440,000	470,000	548,000	610,300	672,600	735,000
	FY09	FY10	FY11	FY12(E)	FY13(E)	FY14(E)	FY15(E)	FY16(E)
PV silicon (annual growth rate)	1,418,000	860,000 -39.35%	890,000 3.49%	970,000 8.99%	1,128,000 16.29%	1,297,000 14.98%	1,466,000 13.03%	1,635,000 11.53%
Ferrotec's PV silicon	1,793	1,987	6,185	6,741	7,839	9,013	10,188	11,362
(annual growth rate)		10.82%	211.27%	8.99%	16.29%	14.98%	13.03%	11.53%



Source: The PV data book 2011

Exhibit B-16: The Sales of The Others

- We calculated the sales of the others, assuming that the ratio of the others to PV-related products (PV furnaces, Quartz crucibles, and PV silicon) is stable in 7.69%.
- The result is as follows.

(in million yen)	FY11	FY12(E)	FY13(E)	FY14(E)	FY15(E)	FY16(E)
PV-related products except for the other	19,640	40,217	21,768	24,395	26,875	29,991
The ratio of the others to PV-related products	7.69%	7.69%	7.69%	7.69%	7.69%	7.69%
the others	1,510	3,093	1,674	1,876	2,067	2,306
(annual growth rate)		104.77%	-45.87%	12.07%	10.17%	11.59%

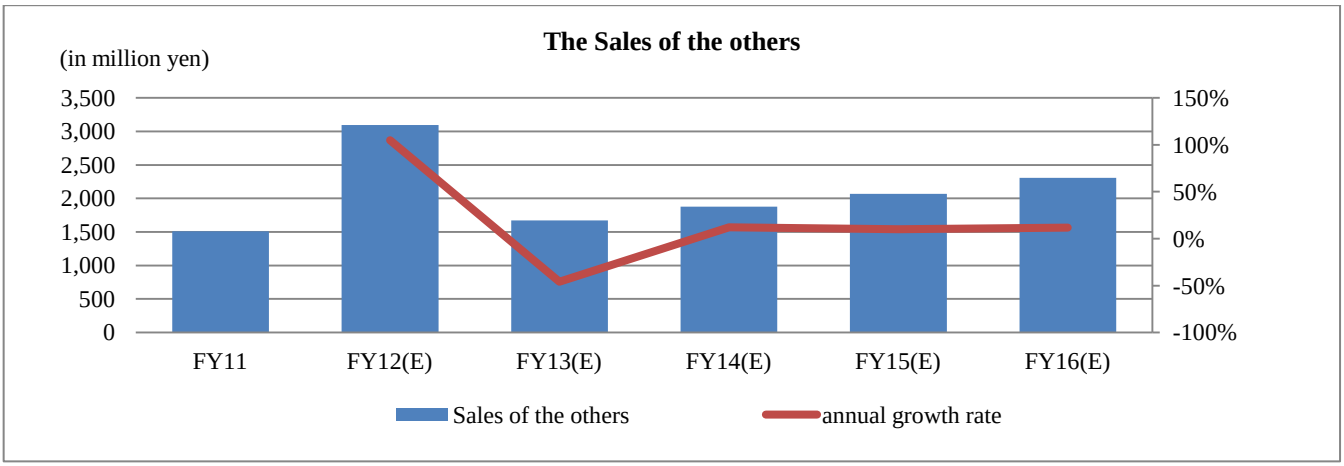


Exhibit C-1: Forecast Balance Sheet

Forecast balance sheet (in million yen)	FY11	FYE12	FYE13	FYE14	FYE15	FYE16
Assets						
Current assets						
Cash and cash equivalents	7,310	10,026	10,533	10,448	9,620	8,701
Trade notes and accounts receivable	15,426	21,692	15,430	15,672	18,044	20,677
Securities	-	-	-	-	-	-
Inventories	9,312	13,023	9,263	9,408	10,832	12,413
Deferred tax assets	555	1,001	713	724	833	954
Other current assets	3,663	5,128	3,647	3,705	4,265	4,888
Allowance for bad debt	-136	-191	-136	-138	-159	-182
Current assets	36,133	50,678	39,450	39,819	43,435	47,451
Fixed assets						
Tangible fixed assets						
Buildings and structures(net amount)	4,538	6,381	4,539	4,610	5,308	6,083
Machinery(net amount)	6,319	8,886	6,321	6,420	7,391	8,470
Equipment(net amount)	3,352	4,714	3,353	3,405	3,921	4,493
Land	2,792	2,792	2,792	2,792	2,792	2,792
Lease assets(net amount)	16	16	16	16	16	16
Tangible fixed assets	19,204	22,789	17,021	17,243	19,428	21,854
Intangible fixed assets	2,812	3,318	2,811	2,831	3,023	3,236
Investments and other assets						
Investment securities	1,032	1,451	1,032	1,048	1,207	1,383
Long-term loans	34	34	34	34	34	34
Deferred tax assets	120	216	154	157	180	206
Other investments and other assets	2,501	3,517	2,502	2,541	2,925	3,352
Allowance for bad debt	-399	-477	-339	-344	-397	-454
Investments and other assets	3,349	4,742	3,383	3,435	3,950	4,522
Construction in progress	25,365	30,849	23,215	23,510	26,401	29,611
Total assets	61,499	81,526	62,665	63,329	69,836	77,062

Forecast balance sheet (in million yen)	FY11	FYE12	FYE13	FYE14	FYE15	FYE16
Liabilities						
Current liabilities						
Notes and accounts payable	8,708	12,245	8,710	8,847	10,186	11,672
Short-term borrowings	7,081	9,957	7,083	7,194	8,283	9,491
Long-term borrowings	3,753	5,277	3,754	3,813	4,390	5,030
Bonds payable and convertible debt	-	1,679	-	-	-	-
Income taxes payable	557	837	596	606	697	798
Other current liabilities	5,749	8,084	5,751	5,841	6,725	7,706
Current liabilities	25,848	38,080	25,894	26,300	30,279	34,698
Fixed liabilities						
Bonds payable	150	150	150	150	150	150
Convertible debt	1,800	-	-	-	-	-
Long-term borrowings	6,305	8,866	6,307	6,405	7,375	8,451
Lease obligations	78	78	78	78	78	78
Deferred tax liabilities	102	153	109	111	128	146
Other fixed liabilities	1,651	2,322	1,651	1,677	1,931	2,213
Fixed liabilities	10,086	11,569	8,295	8,422	9,662	11,038
Total liabilities	35,935	49,649	34,189	34,721	39,941	45,736
Capital	9,234	9,234	9,234	9,234	9,234	9,234
Capital surplus	9,836	9,836	9,836	9,836	9,836	9,836
Retained earnings	8,377	11,780	8,379	8,511	9,798	11,228
Treasury stock at lost	-86	-86	-86	-86	-86	-86
Valuation difference on available-for-sale securities	210	210	210	210	210	210
Foreign currency translation adjustment	-2,912	-	-	-	-	-
Minority interests	903	903	903	903	903	903
Total net assets	25,564	31,877	28,476	28,608	29,895	31,325
Total liabilities and net assets	61,499	81,526	62,665	63,329	69,836	77,062

Source: Company data, Student Estimates

Exhibit C-2: Forecast Profit and Loss Statement

Forecast profit and loss statement (in million yen)	FY11	FYE12	FYE13	FYE14	FYE15	FYE16
Net sales	57,880	81,391	57,895	58,802	67,701	77,582
Cost of sales	39,359	56,160	39,948	40,574	46,714	53,531
Gross profit	18,520	25,231	17,947	18,229	20,987	24,050
Employment cost	2,799	3,936	2,800	2,844	3,274	3,752
Other	8,789	12,359	8,791	8,929	10,280	11,781
Selling, general and administrative expenses	11,588	16,295	11,591	11,773	13,554	15,532
Operating income	6,931	8,936	6,356	6,456	7,433	8,518
Non-operating income						
Interest income	111	156	111	113	130	149
Dividends earned	10	14	10	10	12	13
Rental income	22	22	22	22	22	22
Commission earned	9	9	9	9	9	9
Other	303	426	303	308	354	406
Non-operating income	457	627	455	462	527	599
Non-operating expense						
Interest expenses	457	643	457	464	535	613
Foreign currency transaction loss	486	-	-	-	-	-
Other	154	217	154	156	180	206
Non-operating expense	1,098	859	611	621	715	819
Ordinary profit	6,290	8,704	6,200	6,297	7,245	8,298
Special profit	215	-	-	-	-	-
Special loss	712	-	-	-	-	-
Income before income taxes	5,792	8,704	6,200	6,297	7,245	8,298
Income taxes	1,469	2,208	1,573	1,597	1,838	2,105
Minority interest	84	84	84	84	84	84
Net income	4,483	6,497	4,628	4,700	5,408	6,194

Source: Company data, Student Estimates

Exhibit C-3: Forecast Free Cash Flow

Calculation for NOPLAT (in million Yen)	FY11	FYE12	FYE13	FYE14	FYE15	FYE16
Net sales	57,880	82,642	60,607	63,426	75,768	85,657
Cost of sales	39,359	57,023	41,819	43,764	52,280	59,103
Employment cost	2,799	3,936	2,800	2,844	3,274	3,752
Other	8,789	12,359	8,791	8,929	10,280	11,781
EBITA	6,931	8,936	6,356	6,456	7,433	8,518
corporate income tax	1,463	1,936	1,419	1,485	1,775	2,006
Tax avoidance of interest expenses	96	136	96	98	113	129
Tax of interest income	(23)	(33)	(23)	(24)	(27)	(31)
Tax of dividends earned	(2)	(3)	(2)	(2)	(2)	(3)
Tax of non-operating income	(64)	(90)	(64)	(65)	(75)	(86)
Tax avoidance of non-operating expense	32	46	33	33	38	44
Tax of special profit	(45)	-	-	-	-	-
Tax avoidance of special loss	150	-	-	-	-	-
Tax of EBITA	1,607	1,991	1,459	1,525	1,821	2,059
NOPLAT	5,324	6,945	4,897	4,931	5,612	6,459

Calculation for FCF (in million Yen)	FY11	FYE12	FYE13	FYE14	FYE15	FYE16
NOPLAT	5,324	6,945	4,897	4,931	5,612	6,459
Depreciation expense	2,384	3,592	4,145	4,709	4,925	4,788
Gross cash flow	7,708	10,537	9,042	9,640	10,537	11,247
Cash for operating	1,158	1,628	1,158	1,176	1,354	1,552
Inventories	9,312	13,836	9,842	9,996	11,509	13,189
Trade notes and accounts receivable	15,426	21,692	15,430	15,672	18,044	20,677
Other current assets	3,663	3,663	3,663	3,663	3,663	3,663
Operating for current assets	29,559	40,819	30,093	30,507	34,570	39,081
Total current liabilities	25,848	30,038	24,584	24,729	26,159	27,747
Short-term borrowings	7,081	5,771	7,083	7,194	8,283	9,491
Long-term borrowings	3,753	5,277	3,754	3,813	4,390	5,030
Convertible debt	-	1,679	-	-	-	-
Operating for current liabilities	15,014	17,311	13,747	13,722	13,487	13,225
Increase(decrease) in working capital	4,963	6,439	(6,951)	268	2,632	2,923
Increase (decrease) in tangible fixed assets	2,261	1,458	2,227	1,875	(948)	(798)
Depreciation expense	2,655	3,355	3,774	4,125	3,948	3,798
Increase in other assets	(116)	(380)	(287)	(217)	(165)	(125)
Overhead investments	9,763	9,872	(1,273)	6,051	7,468	8,798
FCF	(2,055)	655	7,806	3,589	3,070	2,449

Source: Company data, Student Estimates

Exhibit C-4: Risk Premium

First, we found out risk premium of 3.964% in the Tokyo stock exchange 1st section by substracted risk free rate from an earning rate. Secondly, we subtracted survivorship bias of 1% from the result and finally found risk premium of 2.964%. We used the latest long term government bonds yield of 1.032% as risk free rate, not the average of long term government bonds yield. This is because the long-term government bonds yield raised by hope of inflation **in the past** is not suitable to analyze the value of company **in the future**. And the capital asset pricing model (CAPM) is formed, considering the stock market consist of various types of shares. Thus we calculated each index from the Tokyo stock exchange 1st section which consists of various types of stocks, not from the JASDAQ which Ferrotec is listed on.

(calendar year)	**An Earning Rate in the Tokyo stock exchange 1st section**	**Risk free rate**	**Risk premium**
2005	17.10%	—	—
2006	30.50%		
2007	4.50%		
2008	-26.20%		
2009	-20.80%		
2010	4.40%		
Average of 1986～2010	**4.996%**	**1.032%(not average)**	**3.964%**
		Risk premium (subtracting survivorship bias)	
		2.96%	

Source: Japan Securities Research Institute, Japan's Ministry of Finance

Exhibit C-5: β (beta)

First, we calculated historical β (beta) by using the weekly and monthly earning rate of TOPIX and Ferrotec's shares. Secondly, we recognized the approximations of the result as β of 1.15%. And we used TOPIX, not the JASDAQ index as above-mentioned.

	β (beta)	
Weekly earning rate	1.050646	**β (we used)**
Monthly earning rate	1.257924	**1.15%**
average	**1.154285**	

Source: Student Estimate based on Yahoo! Finance

Exhibit C-6: Terminal Value

We expected Terminal value equal to Japan's GDP growth rate of 1.0%, a constant growth rate at the end of our forecast period.

Terminal Value
1.0%

Source: Student Estimate based on IMF website

Exhibit C-7: Theoretical Stock Price for Each Scenario

	Scenario 1 Neutral	Scenario 2 Good	Scenario 3 Bad
PV of FCF in forecast horizon (million yen)	15,383	15,869	16,997
Going concern value (million yen)	65,367	95,988	34,701
PV of going concern value (million yen)	54,834	80,521	29,109
Non-business assets (million yen)	7,184	7,184	7,184
Interest-bearing debt (million yen)	19,090	19,090	19,090
Outstanding shares	30,309,585	30,309,585	30,309,585
Theoretical EPS (yen)	1,924	2,787	1,128

Source: Student Estimate

Exhibit C-8: Multiple Analysis

1. Multiple for comparable companies

No	Company's name	PER	PBR	PSR	EV/EBIT	EV/EBITA
1	NOK	10.99	1	0.48	14.41	12.40
2	Eagle Industry	7.7	1.18	0.43	9.96	4.53
3	ULVAC	18.02	0.63	0.24	-	67.73
4	Tokuyama	10.02	0.42	0.32	10.63	3.21
5	Dainippon Screen	6.52	1.57	0.53	6.95	5.09
6	Shibaura Mechatronics	12.63	0.65	0.22	18.93	7.10
Average		10.98	0.91	0.37	12.18	6.47

EV/EBITA for ULVA was so high that we didn't use it for analyzing.

2. Price calculation for target stock

	Predicted data for FY12 (in thousands)	Average	EV (in thousands)	Net Debt (in thousands)	Market Capitalization	Outstanding Shares	Target Stock Price
PER	Net profit (6,466,000)	10.98	-	-	709,996,680,000	30,309,585	2,342
PBR	Net assets (31,824,000)	0.91	-	-	28,959,840,000	30,309,585	955
PSR	Sales (81,025,000)	0.37	-	-	29,979,250,000	30,309,585	989
EV/EBIT	Operating profit (8,896,000)	12.18	108,353,280	19,732,000	88,621,280,000	30,309,585	2,924
EV/EBITDA	EBITDA (12,613,000)	6.47	81,606,110	19,732,000	61,874,110,000	30,309,585	2,041

3. Comparable companies

NOK Corporation	
Stock price (yen)	1,474
Outstanding shares	173,138,537
Market capitalization (million yen)	255,206
Interest-bearing debt (")	105,544
Cash equivalents (")	86,703
Net debt (")	18,841
EV (")	293,233
Net assets (")	264,484

NOK Corporation	Forecast FY11	Forecast FY12
Sales (million yen)	540,000	580,000
Operating profit (")	37,000	45,000
Depreciation (")	33,500	33,500
EBITDA (")	70,500	78,500
After-tax profit (")	23,500	29,000
EPS (yen)	137	169

Eagle Industry	
Stock price (yen)	881
Outstanding shares	49,757,821
Market capitalization (million yen)	43,837
Interest-bearing debt (")	32,454
Cash equivalents (")	17,469
Net debt (")	14,985
EV (")	66,085
Net assets (")	40,991

Eagle Industry	Forecast FY11	Forecast FY12
Sales (million yen)	102,000	110,000
Operating profit (")	10,000	10,800
Depreciation (")	5,000	5,000
EBITDA (")	15,000	15,800
After-tax profit (")	6,100	6,500
EPS (yen)	125	134

ULVAC Kiko.Inc	
Stock price (yen)	1,973
Outstanding shares	49,355,938
Market capitalization (million yen)	97,379
Interest-bearing debt (")	105,079
Cash equivalents (")	36,259
Net debt (")	68,820
EV (")	174,449
Net assets (")	92,023

ULVAC Kiko.Inc	Forecast FY11	Forecast FY12
Sales (million yen)	235,000	240,000
Operating profit (")	7,000	8,500
Depreciation (")	11,400	11,400
EBITDA (")	18,400	19,900
After-tax profit (")	3,100	3,700
EPS (yen)	63	75

Tokuyama Corporation	
Stock price (yen)	444
Outstanding shares	349,671,876
Market capitalization(million yen)	155,254
Interest-bearing debt (")	125,439
Cash equivalents (")	29,308
Net debt (")	25,577
EV (")	187,307
Net assets (")	247,656

Tokuyama	Forecast FY11	Forecast FY12
Sales (million yen)	310,000	325,000
Operating profit (")	21,000	23,000
Depreciation (")	28,500	28,500
EBITDA (")	49,500	51,500
After-tax profit (")	10,500	11,500
EPS (yen)	30	33

Dainippon Screen	
Stock price (yen)	872
Outstanding shares	253,974,333
Market capitalization(million yen)	221,466
Interest-bearing debt (")	48,693
Cash equivalents (")	39,985
Net debt (")	8,708
EV (")	223,126
Net assets (")	87,600

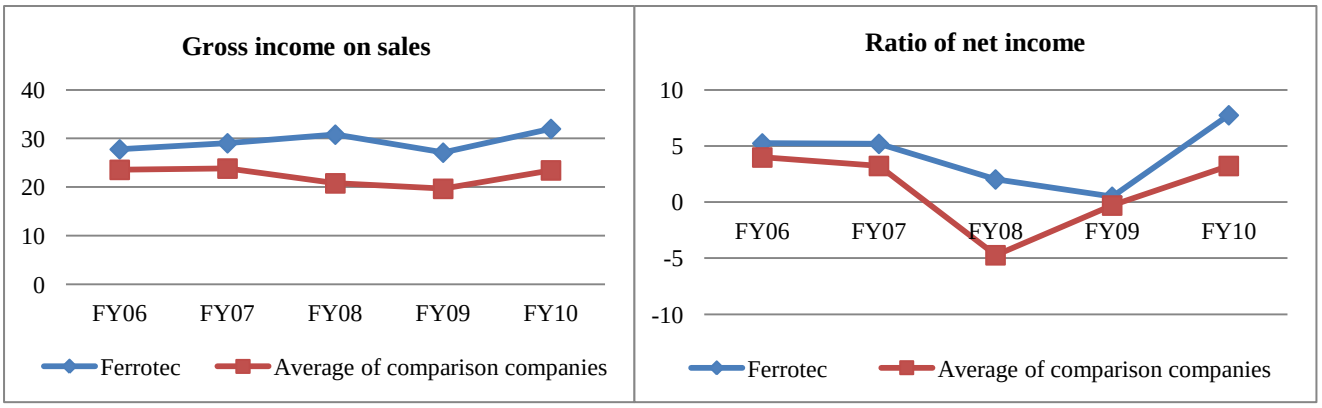
Dainippon Screen	Forecast FY11	Forecast FY12
Sales (million yen)	274,000	28,000
Operating profit (")	24,000	25,000
Depreciation (")	62,000	62,000
EBITDA (")	86,000	87,000
After-tax profit (")	21,000	17,000
EPS (yen)	89	72

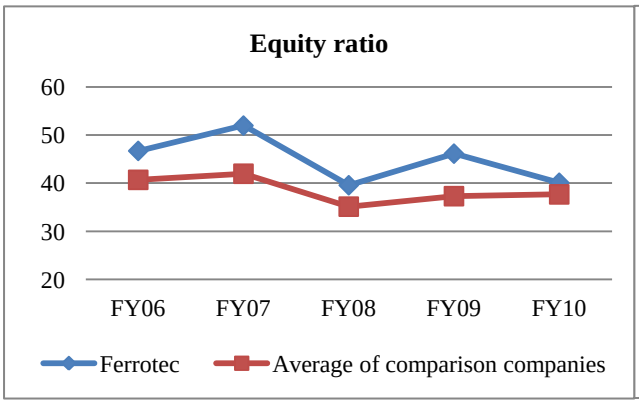
Shibaura Mechatronics	
Stock price (yen)	264
Outstanding shares	51,926,194
Market capitalization(million yen)	13,709
Interest-bearing debt (")	11,405
Cash equivalents (")	3,390
Net debt (")	8,015
EV (")	21,880
Net assets (")	17,492

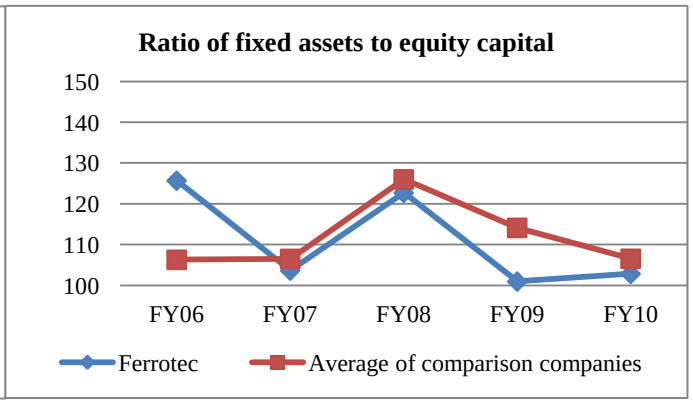
Shibaura Mechatronics	Forecast FY11	Forecast FY12
Sales (million yen)	50,000	54,000
Operating profit (")	1,000	1,300
Depreciation (")	2,200	2,200
EBITDA (")	3,200	3,500
After-tax profit (")	700	900
EPS (yen)	14	18

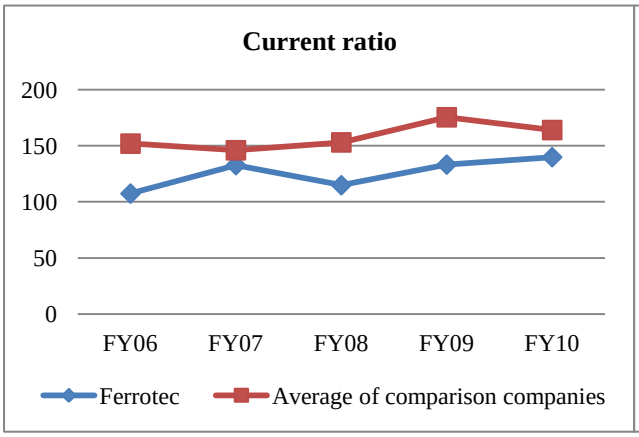
Source: Student Estimate

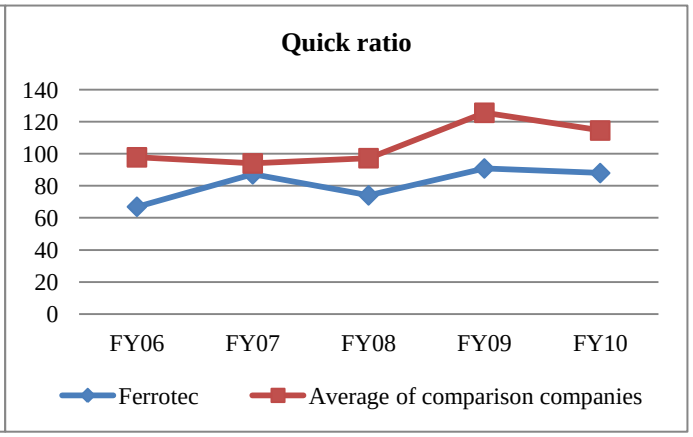
Exhibit C-9: Indexes

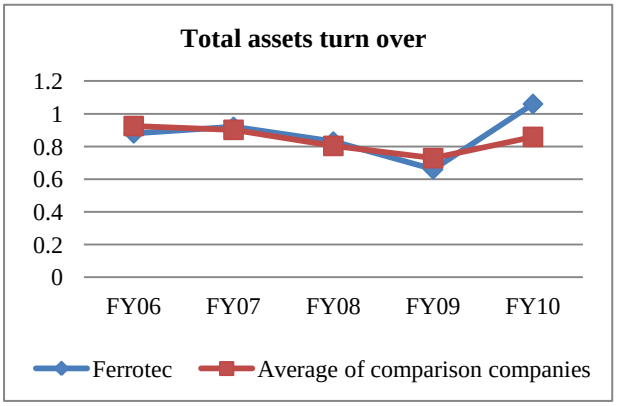






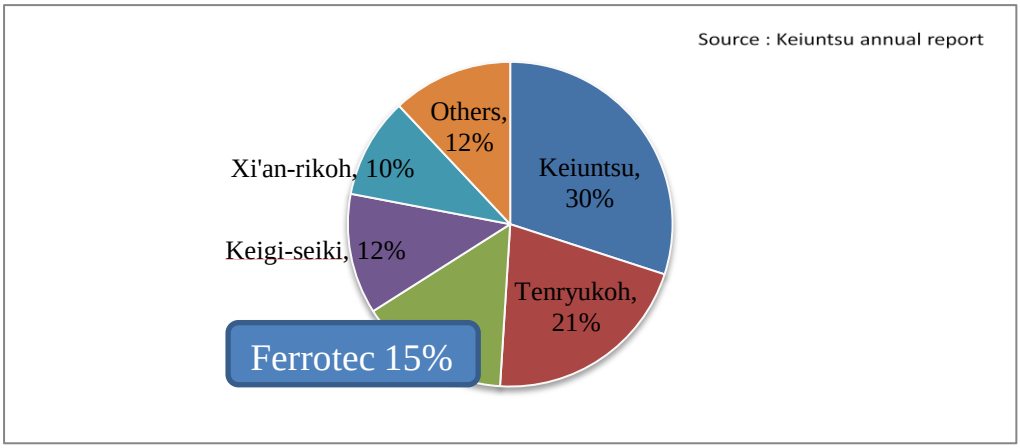






Source: Student Estimate

Exhibit D-1: Market Share of the Ferrotec's Single-crystal Silicon Furnace in China



- Although there are some competitors, Ferrotec accounts for market share of 15% in China Single-crystal PV furnace market.

Source: Keiuntsu annual report

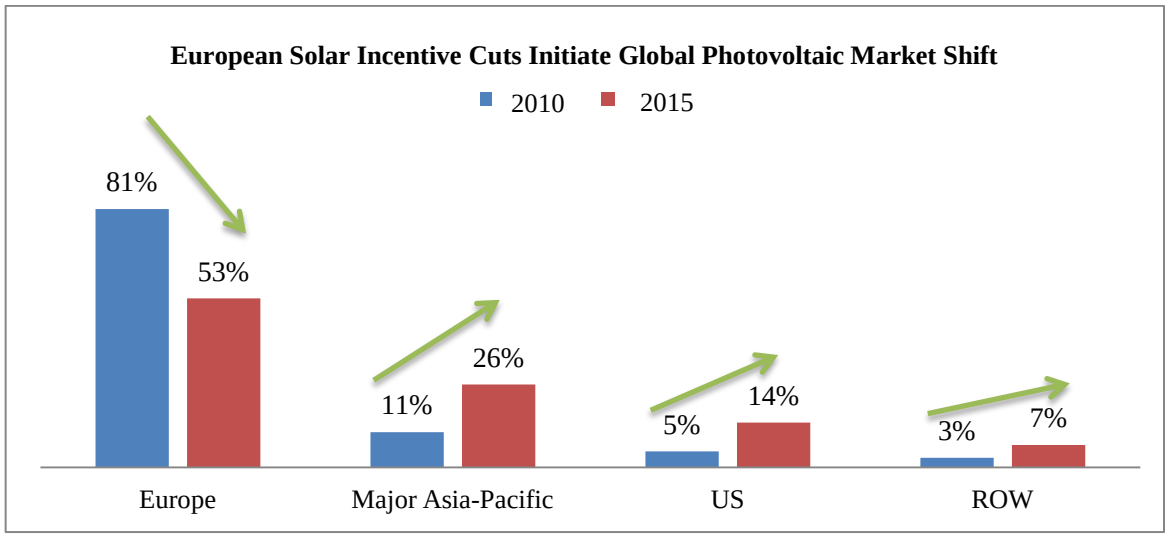
Exhibit D-2: Renewable Energy Policy

Country	Policy	Judgment	notes
JAPAN	Subsidies/FIT	○	Act on special measures concerning renewable energy (effective in July 2012)
CHINA	Subsidies	◎	Install 50GW by 2020 ,50% of the setting-up cost is provided Solar Power On The Roof Project: 20 ～ 15yuan/kWh is provided Golden Sun Project: 50～70% of the setting-up cost is provided FIT system
INDIA	FIT	◎	Install 20GW by 2022 , FIT is going to continue for 25 years
US	Subsidies	○	30% of the setting-up cost is provided
GERMANY	FIT	△	The exercise price of electricity is decreased from 0.47Euro/kWh (2000) to 0.3Euro/kWh (2010)
SPAIN	FIT	×	The exercise price of electricity is going to be decreased (on-the-ground: 45%,on-the-roof (large): 25%,on-the-roof (small): 5%)
ITALY	FIT	△	The exercise price of electricity is going to be decreased
FRANCE	FIT	×	The exercise price of electricity was decreased twice in 2010, the FIT system had been suspended for 3 months in 2010
UK	FIT	△	The exercise price of electricity is going to be decreased from 29.3pence/kWh to 8.5pence/kWh

- ◎> ○ > △ > ×
- PV industry would expand in the near future owing to the positive PV policies in Asia

Source: The European Photovoltaic Industry Association (EPIA), SankeiBiz

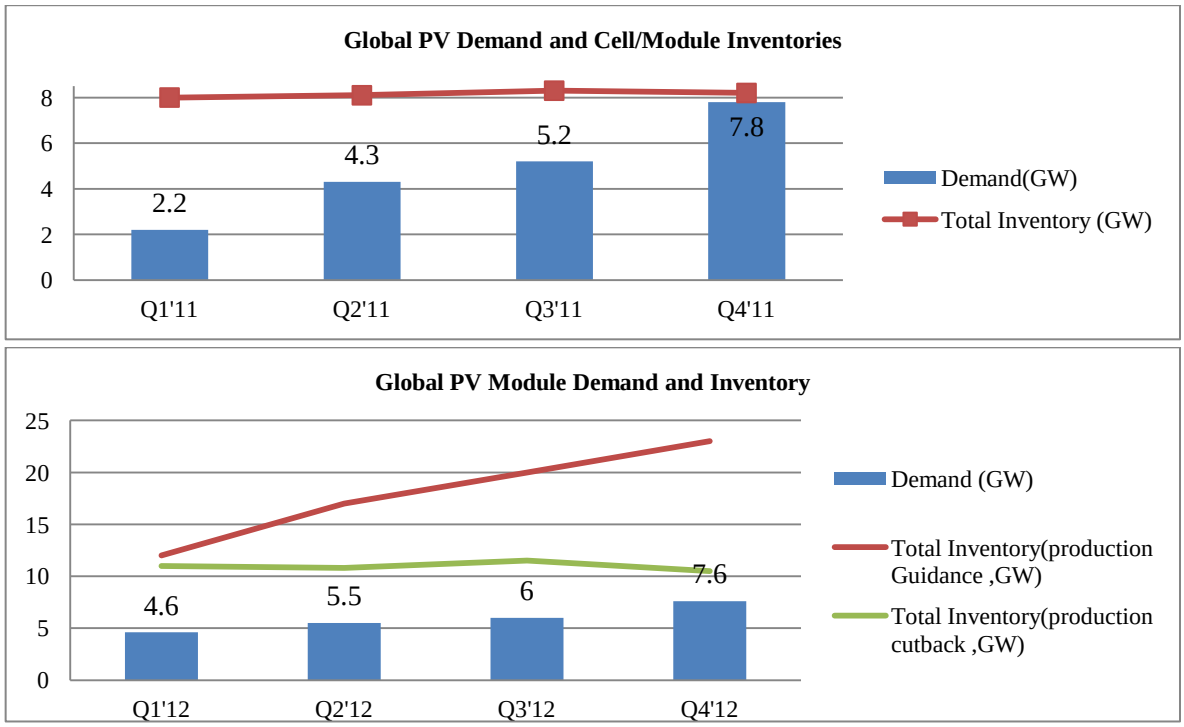
Exhibit D-3: Photovoltaic (PV) Market Shift



- Despite a reduction in market share of Europe, Asia and US market will flourish by CY15. This is because demand for electricity will rise in developing countries and PV industry will contribute to meet the demand.

Source: Solarbuzz

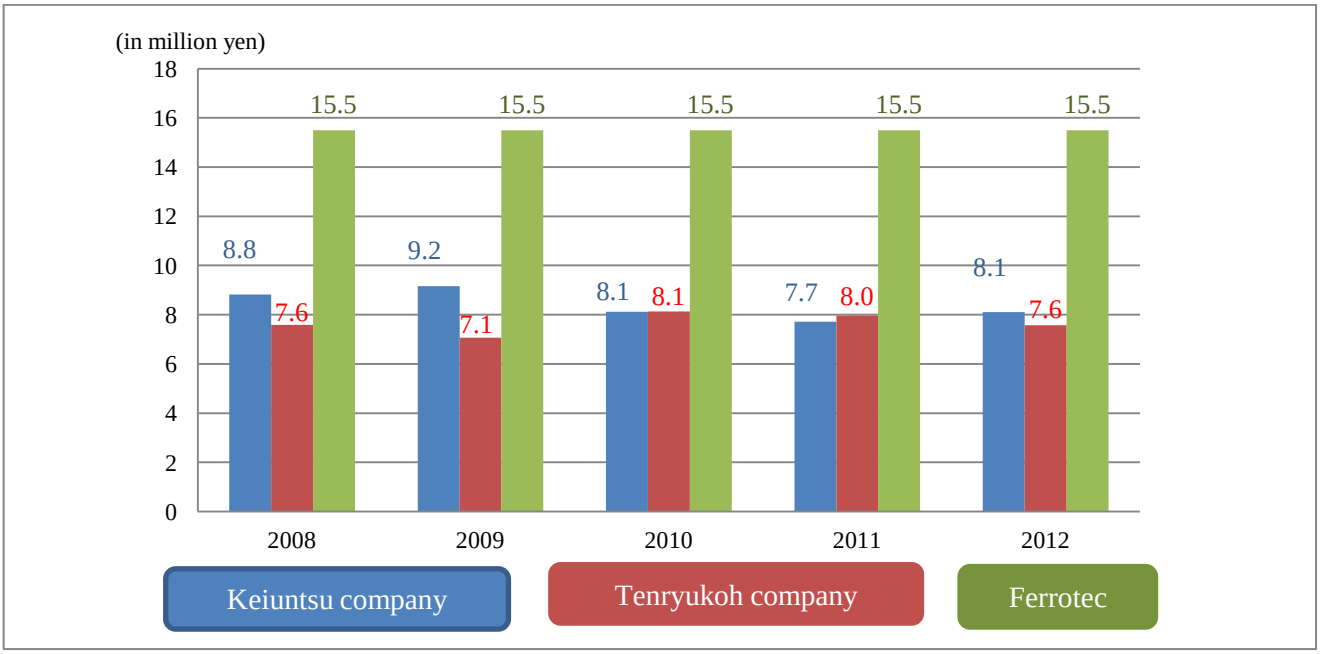
Exhibit D-4: Supply & Demand of the PV



- PV panel inventory surpasses the demand and the market will shrink in the short-term. The contraction of the market could affect the sales of Ferrotec. But we forecasted the market will recover after 2012, according to the Solarbuzz survey.

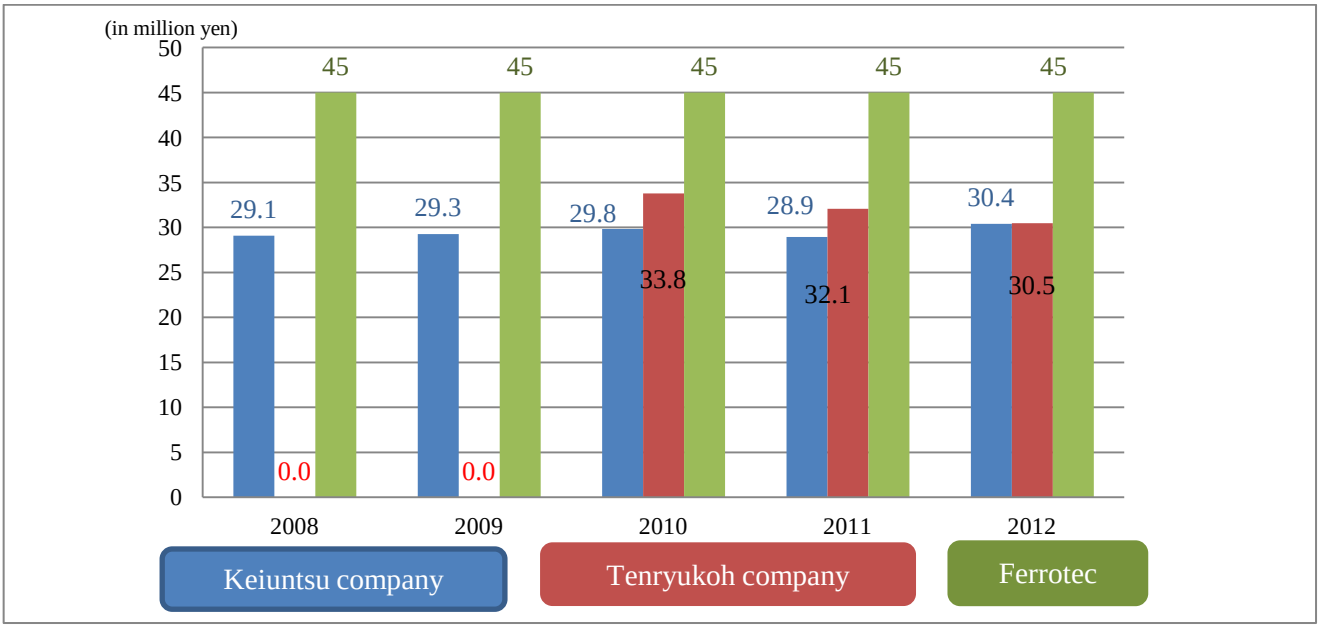
Source: Solarbuzz

Exhibit D-5: The Price of the Single-crystal Furnace in China Market



(in million yen)	2008	2009	2010	2011	2012
Keiuntsu(China)	8.8	9.2	8.1	7.7	8.1
Tenryukoh(China)	7.6	7.1	8.1	8.0	7.6
Ferrotec	15.5	15.5	15.5	15.5	15.5

1 yuen = 12.06 yen (Trade Statistics of Japan)



(in million yen)	2008	2009	2010	2011	2012
Keiuntsu(China)	29.1	29.3	30.0	29.0	30.4
Tenryukoh(China)	0	0	33.8	32.1	30.5
Ferrotec	45	45	45	45	45

There is no data about Tenryukoh in CY08 and CY09.

- Ferrotec's PV furnaces are more expensive than competitors'. Further, Ferrotec accounts for the largest market share in the high-end products market.

Source: IR of each company

Exhibit D-6: Discoveries of New Energy Other Than PV Generation

Although it is still in study phase, scientists found Methane hydrate exists in the bottom of the ocean. And US Geological Survey says that it amounts to 404 trillion m^2, which is equal to the amount of natural gas. Thus this is regarded as an effective energy in the future. In addition, the US and Japan try to dig out Methane Hydrate in Alaska in January 2012.

Source: The Nikkei

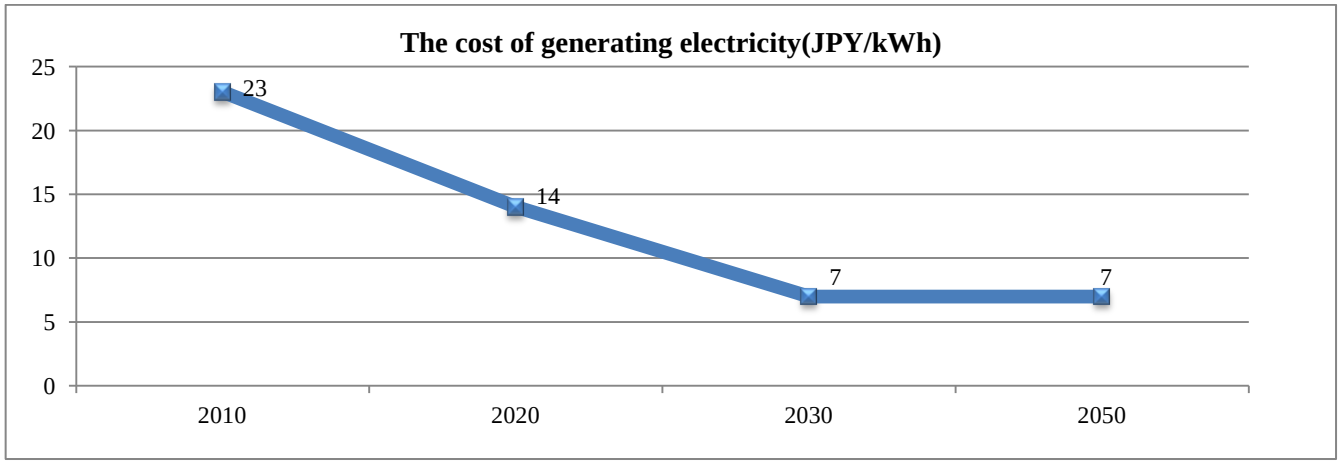
Exhibit D-7: Grid Parity Forecast

GRID PARITY FORRECAST		By tekuno-associates
	Silicon crystalline	Dye-sensitized
JAPAN	2013	2022
EUROPE	2016	2016
US	2019	2019

Silicon crystalline is sum of the Single-crystal & polycrystalline silicon Dye-sensitized silicon is one of the new type PV silicones which has high conversion efficiency.

Source: Techno-associates Inc.

Exhibit D-8: The Way to Grid Parity

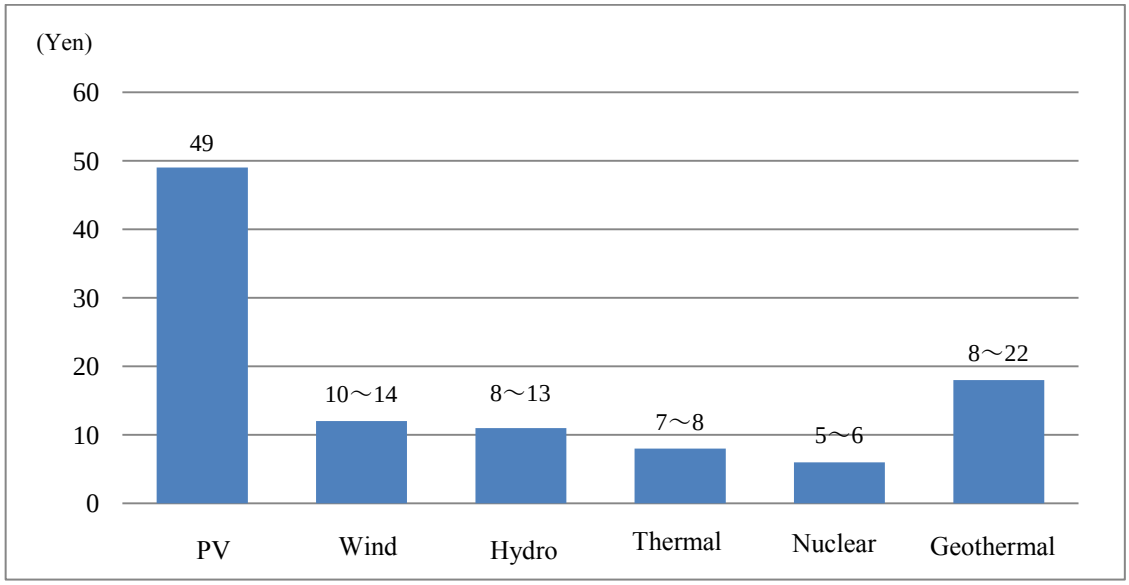


/kWh	Since 2010	2020	2030	2050
Cost of PV generation	23 yen	14 yen	7 yen	Less than 7 yen

- NEDO says PV generation cost will decrease and it could bring about sales expansion of Ferrotec.

Source: New Energy and Industrial Technology Development Organization (NEDO)

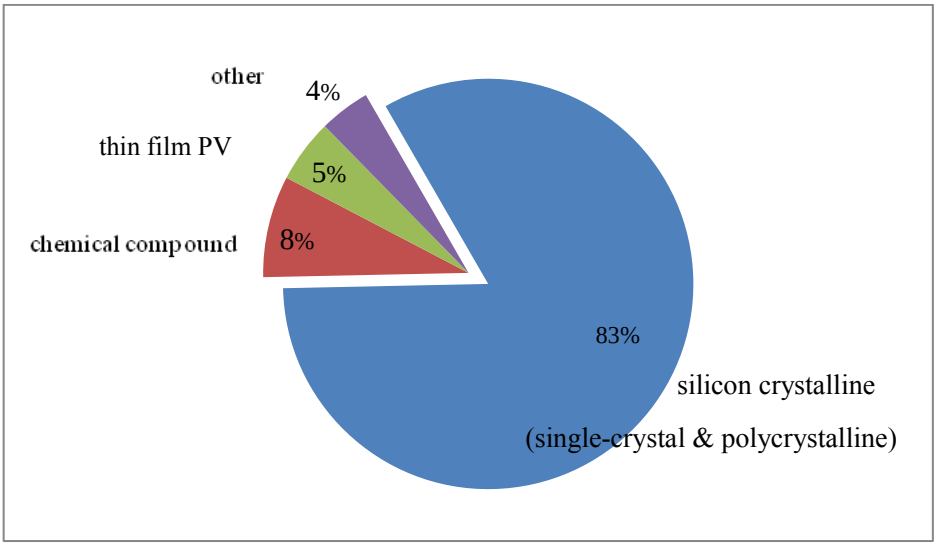
Exhibit D-9: Power Costs



- Although PV generation cost is still higher than the others, innovation of Li-ion battery promotes reduction of the cost. This could be strong tailwind for Ferrotec.

Source: Japan Government Issue on energy 2010

Exhibit D-10: Cell Production 2010 in the World



- Type of Silicon-crystalline PV accounts for 83% of the global market and Ferrotec's furnaces are used to produce the silicon.

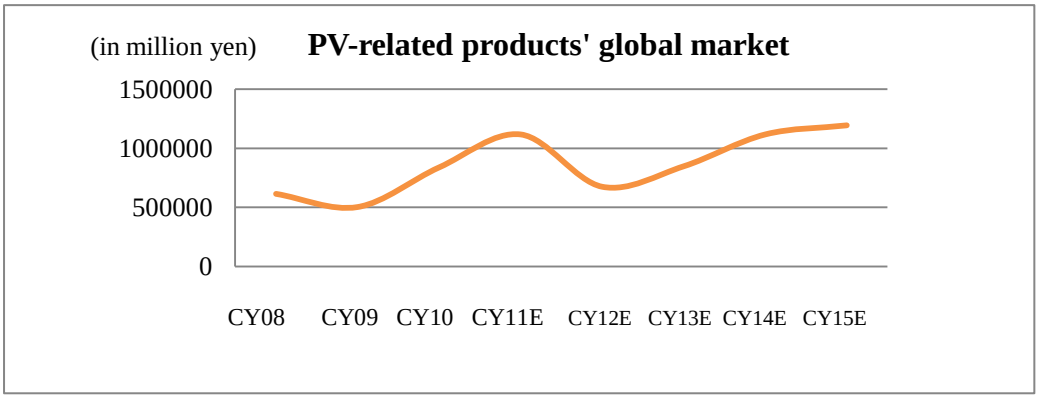
Source: PV news May 2011

Exhibit D-11: Innovation of Li-ion Battery

Nature Materials (UK) says Osaka University and Osaka City Univ. (Japan) have been succeeded in making a superior battery in 2011. The capacity is twice as much as previous ones and the price is cheaper because they used carbon as raw materials in spite of the rare metals. The battery could make the PV generation system better and expand the PV market.

Source: Nature Materials

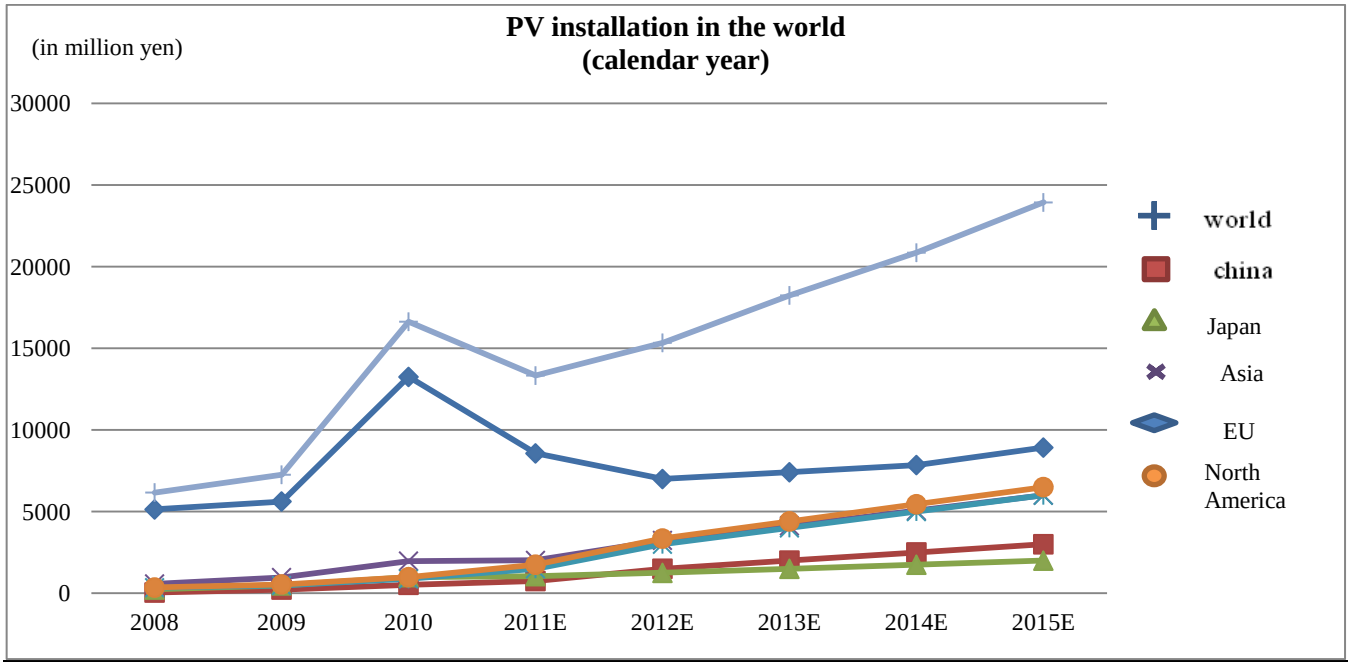
Exhibit D-12: PV Global Market



- Although PV global market will contract in CY12, it will recover after the year according to the Solarbuzz's survey. And we forecasted the sales of the Ferrotec will change like the global market.

Source: Solarbuzz

Exhibit D-13: PV Installation in the World



Although PV installation in Europe will decrease, Asia and North America drive the expansion of it and the total will increase in the future.

Source: The European Photovoltaic Industry Association (EPIA) (moderate scenario)

Exhibit D-14: Types of PV Panel

Single-crystal silicon PV	Conversion efficiency: approximately 20% / easy-to-use
Polycrystalline silicon PV	Conversion efficiency: approximately 14~16% / easier-to-make than Single-crystal silicon PV
Thin film silicon PV	Conversion efficiency: approximately 7~10% / lower cost than crystalline silicon PV and it expands sales in the near future. Ferrotec also produces vacuum seals for Thin film silicon PV furnace

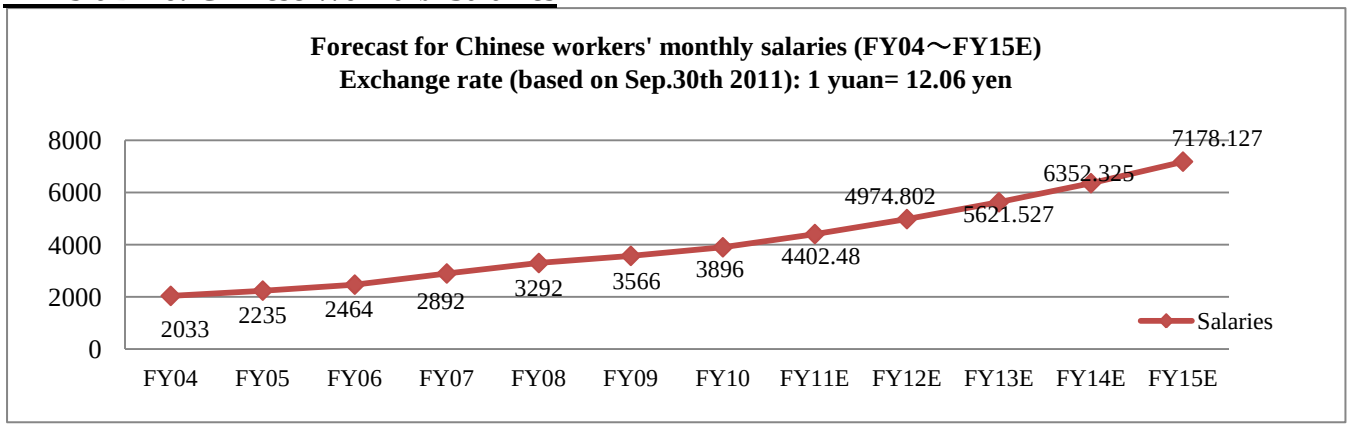
Source: SHARP Website, Fuji economics 2010

Exhibit D-15: List of Countries by Inflation Rate

Unit:%	List of countries by inflation rate (FY03～FY11)								
	CY03	CY04	CY05	CY06	CY07	CY08	CY09	CY10	CY11
Japan	-0.40%	0.20%	-0.40%	0.30%	0.70%	0.40%	-1.67%	-0.40%	-0.28%
China	2.72%	3.23%	1.37%	2.03%	6.63%	2.53%	0.67%	4.70%	5.10%
USA	1.91%	3.21%	3.68%	2.19%	4.09%	0.70%	1.92%	1.69%	2.47%
British	1.35%	1.44%	2.13%	2.78%	2.03%	3.88%	2.10%	3.39%	4.51%
German	1.04%	2.27%	2.12%	1.38%	3.12%	1.13%	0.84%	1.85%	2.24%
France	2.17%	2.34%	1.90%	1.91%	1.61%	3.16%	0.10%	1.74%	2.15%

Source: IMF (World economy outlook)

Exhibit D-16: Chinese Workers' Salaries



Year	FY04	FY05	FY06	FY07	FY08	FY09
Salaries	2,033	2,235	2,464	2,892	3,292	3,566
Growth rate	10.10%	9.90%	10.20%	17.40%	13.80%	8.30%
	FY10	FY11(E)	FY12(E)	FY13(E)	FY14(E)	FY15(E)
	3,896	4,402.48	4,974.802	5,621.527	6,352.325	7,178.127
	9.30%	13.00%	13.00%	13.00%	13.00%	13.00%

Based on Shanghai inhabitants' basic salaries, "China increase income plan"
It is possible for profitability from each segment to be impacted by the China`s inflation.

Source: "Operating conditions about Japanese companies in Asia" (FY10 research) Japanese External Trade Organization

Exhibit D-17: Principal Countries Financial Indicator & Unemployment Rate

Financial indicators							
	Japan	USA	German	France	British	EU	Korean
FY07	-2.4%	-2.9%	0.3%	-2.7%	-2.8%	-0.7%	4.7%
FY08	-2.2%	-6.3%	0.1%	-3.3%	-4.8%	-2.1%	3.0%
FY09	-8.7%	-11.3%	-3.0%	-7.5%	-10.8%	-6,3%	-1.1%
FY10	-8.1%	-10.6%	-3.3%	-7.0%	-10.3%	-6.0%	0.0%
FY11E	-8.9%	-10.1%	-2.1%	-5.6%	-8.7%	-4.2%	0.5%
FY12E	-8.2%	-9.1%	-1.2%	-4.6%	-7.1%	-3.0%	1.3%

Unemployment rate							
	Japan	USA	German	France	British	EU	Korean
FY07	4.1%	4.6%	10.3%	9.2%	5.4%	8.5%	8.3%
FY08	3.8%	4.6%	8.7%	8.4%	5.3%	7.6%	7.2%
FY09	4.0%	5.8%	7.5%	7.8%	5.6%	7.6%	7.1%
FY10	5.0%	9.3%	7.8%	9.5%	7.6%	9.6%	9.0%
FY11E	5.1%	9.6%	7.1%	9.8%	7.8%	10.1%	9.7%

According the above index, principal countries' business situations are becoming worse. We expected that the situation would give a bigger impact on Ferrotec`s business.

Source: IMF (World economy outlook)

Exhibit D-18: China Imports and Exports (2011.6~2011.9)

Billions dollars		China imports and exports (2011.6～2011.9)				
		This month	Accumulating totals	This month		Accumulating totals
				Month to month basis	Compare to last year	Compare to last year
June	Total	3,016.89	17,036.67	0.2%	18.5%	25.8%
	imports	1,619.81	8,742.99	3.1%	17.9%	24.0%
	exports	1,397.08	8,293.69	-3.0%	19.3%	27.6%
July	Total	3,187.72	20,225.47	5.7%	21.5%	25.1%
	imports	1,751.28	10,493.78	8.1%	20.4%	25.1%
	exports	1,436.44	9,731.69	2.8%	22.9%	26.9%
August	Total	3,288.72	23,535.31	2.8%	24.5%	25.4%
	imports	1,733.16	12,226.29	-1.1%	24.5%	23.6%
	exports	1,555.57	11,299.02	7.5%	30.2%	27.5%
September	Total	3,248.32	26,774.41	-1.2%	18.9%	24.6%
	imports	1,696.73	13,922.70	-2.1%	17.1%	22.7%
	exports	1,551.59	12,851.72	-0.2%	20.9%	26.7%

Source: General Administration of Customs of the People's Republic of China

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