

# RS Technologies

**3445**

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FISCO Ltd. Analyst

**Hiroyuki Asakawa**



FISCO Ltd.

<http://www.fisco.co.jp>

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## ■ Summary

### **Making steady progress in the new prime wafer plant initiative Solidifying operations to drive growth with two businesses – reclaimed wafer and prime wafer businesses**

RS Technologies <3445> (hereafter, also “the Company”) is a top reclaim service provider for silicon wafers, a major material for semiconductor chips. It has factories in Japan and Taiwan and wants to be a global production share of approximately 40% in mainstay reclaimed 12-inch wafers (300mm). In 2018, the Company entered the integrated manufacturing business of prime wafers in China to aim for the acceleration of growth with two pillars including reclaimed wafers.

#### **1. Sizable YoY income growth recorded due to improvement of ingot production yield**

The Company entered the prime wafer manufacturing and sales business in China in January 2018. This established a framework to pursue longer-term growth with two main businesses – reclaimed wafers (the Company’s founding business) and prime wafers. Local manufacturing subsidiary GRITEK has production capacity for 270,000 wafers per month, including 8-inch (200mm) wafers (70,000 wafers per month) and 6-inch and 5-inch wafers. We think it has been manufacturing at full capacity since 2018. GRITEK is an integrated manufacturer that handles production from upstream-process silicon ingots. However, it also relies on procurement from outside sources because of low yields in ingot production. GRITEK significantly improved yield in 1H FY12/19 and achieved a steep increase in profits by reducing its manufacturing costs.

#### **2. Announced a plan for full-fledged plant construction in China and making steady progress toward completion in September 2020**

The Company aims to achieve longer-term growth by expanding production capacity and securing market share with drivers from China’s national policy to raise the domestic production share in prime wafer business and expansion of global semiconductor output volume in reclaimed wafer business. In prime wafer business, the Company is building a new plant in Dezhou (Shandong) slated for completion in September 2020. After finishing this plant, it plans to move existing facilities from GRITEK’s Beijing plant and establish 8-inch wafer output capacity of 220,000 wafers per month during FY12/21 with the aim of capturing growing domestic demand in China. In reclaimed wafer business, the Company is implementing capital investments to strengthen refurbishment capacities for 12-inch wafers, the main product, by 20,000 wafers per month at the Sanbongi plant and 30,000 wafers per months at the Tainan plant. Both plants are slated to steadily ramp up these facilities from summer 2019. The Company plans to reinforce capacity at the Sanbongi plant by another 30,000 wafers per month through 2021.

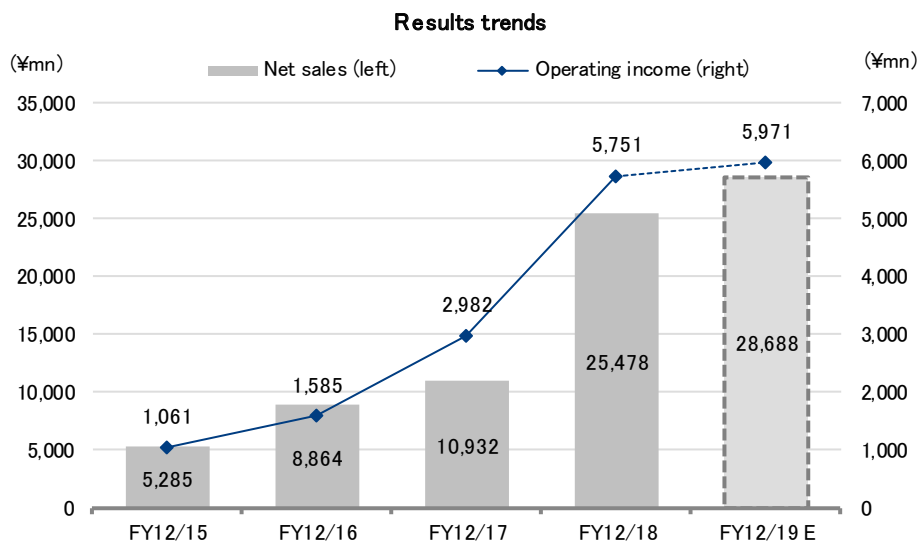
Summary

3. Retaining initial goals in the medium-term business plan (covering four years)

With healthy progress in new plant construction, the Company is retaining existing medium-term plan goals for the four-year period (FY12/19-22). It targets ¥33,800mn in sales and ¥8,300mn in operating income in FY12/22. We believe it has potential to deliver results that exceed medium-term plan goals if current investments in additional capacity are ready and begin operating as planned and intend to monitor progress for the time being. Recent results have been upbeat with profits beating guidance in 1H FY12/19. The Company wants to sustain high plant operating levels for the full year as well and thereby fulfill period-start guidance. Impact from US-China trade friction has been limited thus far. Nevertheless, we think it is important to closely watch trends because of the possibility of increased indirect impact depending on China's domestic economic trends.

Key Points

- Targeting sustainable growth with two businesses – reclaimed wafers and prime wafers
- Building a new prime wafer plant with an 8-inch wafer output capacity of 220,000 wafers per month\* with completion scheduled in September 2020
- \* Monthly wafer volume combines output capacity from newly installed facilities and facilities transferred from the existing plant
- Strengthening capacity in the reclaimed wafer business too with steady ramp-up from summer 2019



Note: FY12/15-17 values are revised values announced on March 5, 2019.

Source: Prepared by FISCO from the Company's financial results, results briefing materials, press releases

## ■ Overview of growth strategy

### Pursuing growth with two business engines – reclaimed wafers and prime wafers

While the Company's original business is wafer refurbishment processing, it entered the prime silicon wafer production and sales business in FY12/18 and hence is pursuing growth with two businesses (reclaimed wafers and prime wafers).

#### 1. Growth strategy for the reclaimed wafer business

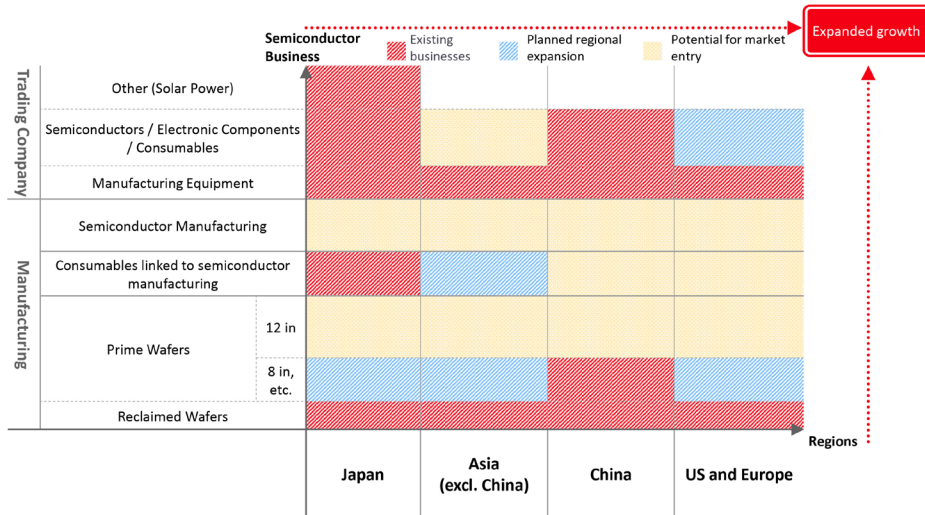
Growth strategy for the reclaimed wafers business has not changed. Semiconductor production is clearly moving along an expansion trajectory over the long term, despite cyclical fluctuations. This means steady growth in reclaimed wafer demand too. Nevertheless, additions to wafer refurbishment capacity are not a simple decision for anyone because it is not always possible to generate enough return depending on price movements and operational skills. The Company steadily generates profits in reclaimed wafers business thanks to having world-leading capacity and a high facility utilization rate supported by robust refurbishment processing technology. Its growth strategy aims to realize high profitability and stable growth through expansion of production capacity leveraging corporate wherewithal and solidification of a No.1 global share position.

#### 2. Growth strategy for prime wafer business

Prime wafer business has the potential to become a major growth engine. The Company launched this business with the acquisition of an existing prime wafer manufacturer in January 2018. It plans to raise profitability by refining technology and expand business scale with additions to production capacity. It announced construction of a new plant in Dezhou (Shandong) and has already established a new company and is building the plant. The Company's current prime wafer business focuses on 8-inch (200mm) diameter wafers as the wafer size. This is one generation before the current most advanced and mainstream 12-inch (300mm) wafers. Since 12-inch prime wafer production requires significantly more technology and funding, we think the Company is likely to wait until after 8-inch wafer production ramps up smoothly at the new Shandong plant to make a decision on 12-inch wafers. During the interim, it might conduct a second round of new capacity investment for 8-inch wafers. We expect the Company's prime wafer strategy to be long-lived.

Overview of growth strategy

Vision targeted by the Company



Source: Prepared by FISCO from the Company's results briefing materials

## Current status and outlook for prime wafer business

### Five firms supplying 8-inch wafers in China

#### 1. Conditions in Chinese silicon wafer market

##### (1) Status of main players

The Chinese market has grown to the point where it consumes 40% of global chip supplies, but only 10% of the output is produced by Chinese companies. This means a large majority of semiconductor chips are imported from overseas and the domestic production still remains small.

Therefore, the market for silicon wafers, a major material used in semiconductor production, also resembles the structure described above. Many sizes of silicon wafers, with the largest being 12 inches, are used for semiconductor production. The largest and most advanced wafers being produced in China are 8-inch wafers. While some Chinese chipmakers use 12-inch wafers, nearly all 12-inch wafers for materials are imported from overseas (including Japan).

We understand there are currently just over 10 silicon wafer manufacturers in China and roughly five (including the Company's consolidated subsidiary, GRITEK) can supply 8-inch wafers (however, this information is about 1.5 years ago and currently it is possible that there are more players). We estimate that each of these five companies has a monthly production capacity of between 50,000 and 100,000 wafers, making the total monthly capacity roughly 300,000 wafers. Though not all of these manufacturers are necessarily shipping at full nominal capacity, GRITEK is one of the few companies producing 8-inch wafers above nominal capacity (GRITEK increases production capacity by removing the bottlenecks, details of which are discussed below).

Current status and outlook for prime wafer business

All of these companies are planning aggressive production capacity increases. While the capacity increase schedule is different for each company and the details are not clear, we expect Chinese 8-inch wafer monthly production capacity to more than triple from its current level of 300,000 wafers to over 1 million wafers by 2020–2021.

**Production capacity and expansion plans of Chinese 8-inch wafer manufacturers**

Company name	Affiliation	Current capacity (wafers/month)	Planned expansion (wafers/month)	Remark
GRITEK	Chinese company	50,000	150,000	Consolidated subsidiary of the Company
Tianjin ZHONGHUAN Semiconductor Joint-STOCK Co, Ltd.	Chinese company	50,000	100,000	
Ferrotec Holdings	Overseas company (Japan)	100,000	450,000	Two plants (Hangzhou and Shanghai)
Wafer Works	Overseas company (Taiwan)	100,000	100,000	
MCL Electronic Materials Ltd. (MCL)	Overseas company (US)	50,000	100,000	
<b>Total of five companies</b>		<b>350,000</b>	<b>900,000</b>	

Source: Prepared by FISCO from interviews

**(2) Conditions in the Chinese market**

The reason behind these companies' plans to aggressively invest in capacity increase is that the market is highly likely to expand rapidly in China due to the supports from the national and local governments. We understand China's current total monthly production capacity for 8-inch wafers is 500,000. Some market observers forecast that this will rise to 1 million by 2021–2022. The 'Made in China 2025' project announced by the Chinese government in May 2015 targets integrated circuit (IC) self-sufficiency of 40% by 2020 and 70% by 2025. If these targets come true, the Chinese domestic demand for silicon wafers will rise sharply and the demand for 8-inch wafers will likely far outstrip 1 million per month\*.

\* The demand outlook described above was prior to worsening of trade tensions between the US and China. We think increased friction over trade for the two countries could move China toward accelerating its efforts to raise self-supply levels across the entire range of products from silicon wafers and other materials to semiconductor chips. This might imply upward revision of the demand outlook for silicon wafers too.

Silicon wafers produced in China are mainly shipped to Chinese semiconductor plants for several types of semiconductor chips. Since the wafers made in China are only 8-inch wafers, they are not used for memory chips or CPUs which uses 12-inch wafers. The main customers are manufactures for logic ICs, application-specific integrated circuits (ASICs), and power ICs.

The manufacture of silicon wafers requires polycrystal silicon (direct raw material), various types of production equipment (such as single-crystal pulling machines, dicers, and polishers), and key parts and materials (such as quartz crucible, polishing compounds (polishing powder) and polishing cloth). It is important to develop a supply chain for these materials to increase output. We understand that polycrystal silicon for semiconductor is sufficiently available in China. The same is true for quartz crucibles. Production equipment is obtained from manufacturers in South Korea, Japan, China, and other countries. These conditions indicate that while not all materials in the supply chain can be obtained in China, a substantial portion is available in China and remaining items are imported from South Korea or Japan. Silicon wafers hence can be manufactured in China without difficulty.

Current status and outlook for prime wafer business

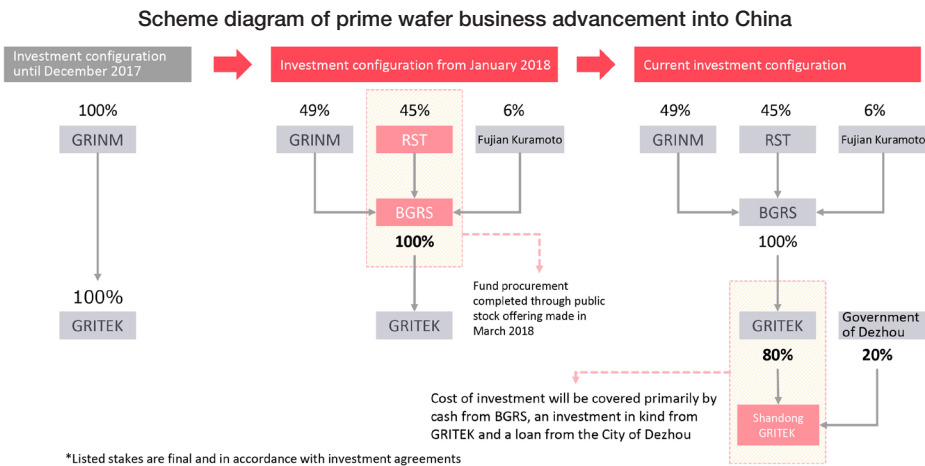
## Manufactures prime wafers in various sizes as an integrated producer with 8-inch wafers as the main category, improved ingot yield likely to boost profitability

### 2. Current prime wafer business

#### (1) Developments up to now

In December 2017, the Company concluded a joint venture contract with Chinese central government-owned company General Research Institute for Nonferrous Metals (now Grinm Advanced Materials; below, GRINM) and Fujian Kuramoto and entered the prime wafer production and sales business in January 2018. The joint venture Beijing GRINM RS Semiconductor Materials Co., Ltd. (BGRS) was formed with an ownership arrangement of GRINM (49% ownership), RS Technologies (45%), and Fujian Kuramoto (6%) and controls GRITEK, which actually manufactures prime wafers and is a wholly owned subsidiary of BGRS. (The contract specifies three installments for the Company's investment (45%) of 60% initially, 25% after a year, and 15% after two years.)

The most important point of this scheme is the ownership stakes of the three investors in the joint venture. Since Fujian Kuramoto is a Chinese company based in Fujian province, the Chinese-side stake (including GRINM) comes to a total of 55% and BGRS and GRITEK hence are treated as Chinese companies. Being considered a Chinese company makes GRITEK eligible for subsidies from the Chinese central government and local governments and gives it sizable advantages over foreign companies in terms of capital investment and business operations. Meanwhile, Fujian Kuramoto is owned by a member of RS Technologies President Nagayoshi Ho's Chinese family, giving the Company's side a 51% stake and effective control and making GRITEK a consolidated subsidiary of the Company.



#### (2) GRITEK operations

GRITEK is a direct subsidiary of GRINM and has been known for its robust technology capabilities. In fact, it is a rare case as a prime wafer manufacturer of having production technology that enables it to realize output volume in line with (or even exceeding in some cases) nominal production capacity.



Current status and outlook for prime wafer business

GRITEK's prime silicon wafer production covers 8-inch wafers and also 5-inch and 6-inch wafers. It has combined output capacity for these various sizes (using a simple calculation) of 250,000 wafers a month (at the time of becoming a subsidiary in January 2018) and 6-inch wafers appear to account for a majority. While capacity for 8-inch wafers, the largest size (and main source of income) at GRITEK, was 50,000 wafers per month initially, it has risen to 70,000 wafers per month since fall 2018 thanks to debottlenecking (bottleneck removal) after coming under the Company's control.

Production activity is healthy, and we think facilities have been steadily running at close to full-capacity output since January 2018.

GRITEK is an integrated manufacturer that covers from silicon ingot pulling to silicon wafer processing at its Beijing plant. It possesses silicon ingot production capacity of 17 tons per month and makes ingots using FZ and CZ methods. It consumes some of the ingot output itself for processing and sale as silicon wafers and sells some externally. However, GRITEK does not manufacture all of the silicon ingots required for its wafer production. Pulling 8-inch silicon ingots involves difficult technology, and we think it previously processed ingots acquired externally into wafers for a substantial portion of this business. While GRITEK is technically an integrated manufacturer because it handles both silicon ingot pulling and wafer processing, this is not necessarily accurate in terms of the flow from raw material to final products. Nevertheless, it indicates that GRITEK has large room to improve profitability and is capable of significantly raising profit margin if it genuinely conducts integrated production of highly profitable 8-inch wafers. As explained below, the Company's 1H FY12/19 results confirmed clear progress for this point.

The Company reports GRITEK results under the "prime silicon wafer manufacturing and sales business" segment. Besides integrated production of prime silicon wafers, GRITEK manufactures and sells consumable parts and materials used in semiconductor production equipment. We think rough sales breakdown is two-thirds for the prime wafer business and one-third for consumable parts and materials business.

## Currently building a new plant in Shandong with a monthly 8-inch wafer output capacity of 220,000 wafers slated for completion in September 2020

### 3. New plant construction project

The Company announced plans for increasing GRITEK's production capacity when it disclosed the plan to make GRITEK a consolidated subsidiary in December 2017. It initially spoke about new capital investments in Tangshan (Hebei), but subsequently reassessed details of the new capex initiative and officially decided and announced construction of a new plant in Shandong in August 2018.

The Company cites a number of reasons for the decision to switch the plant location from Tangshan (Hebei) to Dezhou (Shandong) – 1) benefits in product transport to customers, 2) low infrastructure costs, 3) an advantage in human resource hiring, 4) availability of to expand the location, and 5) incentives provided by Shandong. Besides these points, we believe a major benefit is the plan to newly construct the plant building in Shandong versus installing equipment in an existing structure in the Hebei case. This increases flexibility in designing the production line and should enable realization of a more efficient plant.

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Current status and outlook for prime wafer business

The business plan for the Shandong plant involves establishment of Shandong GRITEK, a new company, as a joint venture between GRITEK and Dezhou City and operation of the business by this company. Investment stakes are GRITEK at 80% and Dezhou City at 20%. The Company's President Nagayoshi Ho will serve as Chairman and GRITEK's CEO will jointly handle CEO duties at the new company.

Shandong GRITEK has CNY1.5bn in capital (about ¥24bn), and the Company's group is investing CNY1.2bn, or 80%. These funds include CNY500mn (about ¥8bn) in cash from BGRS (utilizing proceeds from the public-subscription capital increase in March 2017) and the other CNY700mn in payment-in-kind investment from GRITEK (as explained below, GRITEK plans to move production facilities from the Beijing plant to the new plant and consolidate operations at the new Dezhou plant). Dezhou City, meanwhile, will invest CNY300mn, or 20%, in cash.

The new plant's location has roughly 200,000sqm of land (it can be expanded to 500,000sqm depending on the circumstances). Shandong GRITEK is currently building a plant at the site with an aim of completion ceremony in September 2020. It intends to begin installation of new facilities in March 2020 while working on building construction and have volume production operations ready by plant completion ceremony in September. It also intends to start moving existing facilities at GRITEK's Beijing plant in May 2020. Since GRITEK wants to incrementally move facilities while sustaining product supply, it needs some time to complete the transfer and aims to finish the move in February 2021.

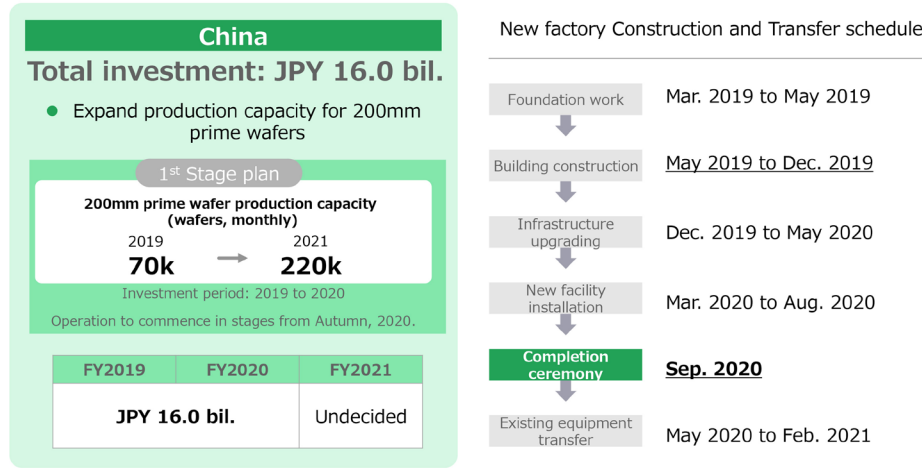
As production capacity, GRITEK currently possesses capacity of 70,000 wafers per month for core 8-inch wafers at the Beijing plant and intends to install new facilities for 150,000 wafers per month. Total capacity hence comes to 220,000 wafers. GRITEK also has 6-inch and 5-inch wafer production facilities (simple total of 200,000 wafers per month) and plans to move these lines to the new plant as well.

The production outlook, meanwhile, is unclear because many uncertainties still exist. In FY12/20, despite planned completion of the new plant (adding new capacity) during the period, we expect 8-inch wafer output at the same level as FY12/19 at 70,000 wafers per month. This stance reflects the difficulty of presenting an output increase plan in light of temporary suspension of output at income-driver GRITEK to move facilities and uncertainty about ramp-up of new facilities. We think it is safer to forecast net increase in production volume on the addition of new facilities to GRITEK's existing facilities in FY12/21.

The Company is currently implementing its first-phase facility addition plan, but is also looking ahead to a second reinforcement (adding 150,000 wafers per month) from FY12/21 to accommodate rapid growth in China's silicon wafer demand. If this is added too, the Company could reach 370,000 wafers per month in 8-inch wafer capacity. However, the Company has not decided the schedule, location, funding, or other details of a second capacity addition plan at this point. It might also consider entry into the 12-inch wafer segment. We think many aspects are still fluid at this point and thus intend to focus on developments related to the first-phase capacity addition plan for the time being.

Current status and outlook for prime wafer business

Prime wafer's new plant construction, move schedule and production capacity



Source: Prepared by FISCO from the Company's results briefing materials

**We expect the Company's prime wafer business to be successful due to Chinese market advancement potential and its strong technology capabilities and do not see much impact from trade tensions between the US and China.**

4. Our view of the prime wafer business and focus points going forward

We initially took a cautious view of the Company's prime wafer business because of the difference in technology hurdles for the wafer refurbishment processing business and prime wafer business. Judging from FY12/18 and 1H FY12/19 results, however, we think our concerns have not materialized.

The focus at this point is ramp-up of the new plant at Shandong GRITEK. Progress thus far indicates that the new plant launch is likely to succeed. The Company's extensive preparations have played an important role in smoother ramp-up of the prime wafer business than we anticipated. While it has not given details, the Company hired multiple engineers with abundant experience in Japan and dispatched them to China to review and prepare for prime wafer business in China. We think these engineers carefully assessed trends in the Chinese market and at partner firms and contributed substantially to the choice of GRINM/GRITEK as the ideal partner and subsequent stable operations. Our current outlook for success in ramping up the new plant at Shandong GRITEK factors in utilization of knowhow obtained in these processes.

We are not very concerned about business risk on the sales side. The main reason is that the Company's prime wafer business has the support of the Chinese national government as a "domestic-funded company." China grants subsidies equal to 20-30% of the wafer price to domestic corporations as part of efforts to raise its self-sufficiency ratio in semiconductor production. We believe this will directly improve the price competitiveness of GRITEK's products. In addition, GRITEK already has a solid customer base. GRITEK currently has roughly 90 customers, including some with close ties to Chinese semiconductor manufacturers. Owing to the outlook for strong growth in wafer demand in the Chinese market, we see little risk on the sales side if production goes smoothly.

Current status and outlook for prime wafer business

We are not concerned about trade tensions between the US and China. As explained above, heightened tensions might result in acceleration of China's efforts to raise its self-supply ratio for semiconductors. While GRITEK directly exports consumable parts and materials used in semiconductor production equipment to the US market and the business is feeling an impact in this area, we believe it can sufficiently offset this pressure with growth in the prime wafer business. If US-China trade friction severely affects China's domestic economy, however, the Company could not avoid some downside and this aspect should be closely monitored. Nevertheless, we think the Company should retain its relatively advantageous position.

## ■ Growth strategy and progress in reclaimed wafer business

### Reclaimed wafers remain the core earnings source and a growth engine, pursuing growth through expansion of production capacity

#### 1. Reclaimed wafers as the core business

Importance of the reclaimed wafer business is unchanged even with the Company's entry into prime wafer business. It is a growth engine along with prime wafers. Reclaimed wafer business generates much higher profitability than the prime wafer business, including support from business expansion while curtailing investments. Reclaimed wafers should firmly remain in the position of top earnings source for the time being.

We believe the Company has a two-part growth strategy for its reclaimed wafer business. The first part is growth through expansion of the Company's production capacity. The Company's quantitative target in this area is to capture and maintain 40% of the global market share. The second part is development of untapped markets, in other words, growth through creation of new markets. The key to achieve this objective is the Company's proprietary metal film removal technologies.

The Company announced plans to strengthen output capacity on December 28, 2017 and is currently making steady progress with these investments (refer below for details).

Meanwhile, the Company disclosed that it obtained certification of metal film removal technology at some customers during FY12/17. While we thought this meant actual orders could begin in FY12/18, the Company has not reported detailed progress thus far. The Company does not seem to have abandoned plans for commercializing the technology, but we believe it is focusing on capacity additions in the reclaimed wafers business at this point.

## Adding 12-inch wafer refurbishment processing capacities (per month) of 20,000 wafers at the Sanbongi plant and 30,000 wafers at the Tainan plant Expecting steady ramp-up of new capacity from summer 2019 as planned

### 2. Plan to increase reclaimed wafer production capacity

In December 2017, the Company announced plans to increase reclaimed wafer production capacity at the Sanbongi Factory and the Tainan Factory. The Company mainly handles 12-inch reclaimed wafers and the additional production capacity will also be for 12-inch wafers.

The Company possesses facilities for 12-inch wafer refurbishment processing capacity of 300,000 wafers per month through 2017 with 200,000 wafers at the Sanbongi plant and 100,000 wafers at the Tainan plant. It subsequently implemented debottlenecking at both plants and lifted respective capacities to 220,000 wafers per month and 120,000 wafers per month in 2018. Nevertheless, the Company determined that it needed further capacity additions to address continuous increase in wafer refurbishment processing demand and moved forward with facility reinforcement investments this time (2019).

The new capacity addition investments provide 20,000 wafers per month at the Sanbongi plant and 30,000 wafers at the Tainan plant at a cost of ¥700mn each. The Company is making steady progress with equipment installations and intends to steadily ramp up new facilities at the two plants from summer 2019 (3Q) as planned.

12-inch reclaimed wafer production capacity

Factory	Size	Monthly production capacity at term-end					
		2016	2017	2018	2019	End of 2020	2021
Sanbongi Factory	12-inch wafer 8 inches or less	180,000	200,000	220,000	240,000	→	270,000
Tainan Factory	12-inch	100,000	100,000	120,000	150,000	→	→

Source: Prepared by FISCO from the Company material

We view the scale and timing of this production capacity increase as appropriate. Both the Sanbongi and Tainan factories have been operating at full capacity and are finding it increasingly difficult to keep up with demand from customers. Meanwhile, reinforcement investments involve incremental additions to output capacity and result in temporary decline in the facility utilization rate and lower profitability. We think, however, a monthly capacity increase of 20,000 to 30,000 wafers strikes a favorable balance between responding to customers' needs and maintaining profitability.

Capacity addition investments in 2019, however, are just a passing point, and the Company aims to boost capacity by another 30,000 wafers to a total of 270,000 wafers a month on combined investment of ¥1.4bn over two years in 2020 and 2021 at the Sanbongi plant with extra space at its building. We attribute lower investment efficiency than in the capacity addition investment from 2019 (boosting capacity by 20,000 wafers for ¥700mn) to decline in efficiency of debottlenecking investments.

Growth strategy and progress in reclaimed wafer business

Reclaimed wafer demand corresponds to roughly 20-25% of the total volume of silicon wafers used in global semiconductor production. With 12-inch wafer global demand at 5-5.2mn wafers per month in around 2017, reclaimed wafer refurbishment processing demand was reportedly 1-1.2mn wafers, or roughly 20%. In 2019, meanwhile, 12-inch wafer global demand has risen to 6mn wafers and reclaimed wafer demand is also headed upward to 1.2-1.5mn wafers. While the Company has been targeting a 40% global share for some time, overall wafer market expansion means that it must strengthen capacity in order to sustain a 40% global share.

Even after the Sanbongi plant reaches operations with monthly output capacity of 270,000 wafers (420,000 wafers on a companywide basis together with the Tainan plant) in 2021, as explained above, the Company might still need to consider full-fledged capacity additions.

## Medium-term management plan

### Retained the existing medium-term business plan Conservative goals, considering large weight of new-plant prime wafer business

The Company retained its existing medium-term plan goals in light of progress through 2Q FY12/19.

In results value, the Company expects flat sales in FY12/20 (vs. FY12/19). This reflects a scheduling impact, as explained above, of new plant completion in September 2020 and finalization of equipment transfers in February 2021. We think the Company has factored in the prospect of limited increase in output volume from the current level during these two years. Subsequent sales growth targets of 5.5% in FY12/21 and 10.5% in FY12/22 assume attainment of operations with output capacity of 220,000 wafers per month in the prime wafer business in FY12/21 and full-year contribution of the 220,000-wafer capacity in FY12/22.

The Company expects flat operating income in FY12/19 and FY12/20 and then steep gains of 8.2% in FY12/21 and 25.8% in FY12/22.

#### Medium-term management plan (4 years)

	FY12/18 Results	FY12/19			FY12/20			FY12/21			FY12/22	
		Previous plan	New plan	YoY	Previous plan	New plan	YoY	Previous plan	New plan	YoY	New plan	YoY
Net sales	25,478	21,000	28,688	12.6%	25,000	29,000	1.1%	29,000	30,600	5.5%	33,800	10.5%
Operating income	5,751	3,600	5,971	3.8%	4,800	6,100	2.2%	6,300	6,600	8.2%	8,300	25.8%
Operating income margin	22.6%	17.1%	20.8%	-	19.2%	21.0%	-	21.7%	21.6%	-	24.6%	-
Ordinary income	6,141	3,900	6,151	0.2%	4,700	6,300	2.4%	6,200	6,600	4.8%	8,400	27.3%
Ordinary income margin	24.1%	18.6%	21.4%	-	18.8%	21.7%	-	21.3%	21.6%	-	24.9%	-
Profit attributable to owners of parent company	3,620	2,500	3,621	0.0%	2,900	3,700	2.2%	3,800	3,900	5.4%	4,700	20.5%
Earnings per share	294.80	195.00	282.72	-	226.00	288.89	-	296.00	304.50	-	366.97	-

Source: Prepared by FISCO from the Company's results briefing materials

Medium-term management plan

We think the medium-term business plan sets conservative targets. In particular, it seems to assume a fairly cautious pace of new plant ramp-up from FY12/21. While we obviously cannot render judgments lightly due to uncertainties about the price assumption for mainstay 8-inch wafers and output yields for silicon ingots that are vital in determining production costs, this is our impression given GRITEK results up to now. The Company targets also do not seem to be factoring in growth in the reclaimed wafers business. The plan might reflect increase in depreciation costs from added facilities in 2019 and impact from planned capacity addition of 30,000 wafers a month at the Sanbongi plant (2020-21) but we think the sales outlook could incorporate large contributions from the capacity addition effect. In any case, we think it is necessary to wait until the Shandong plant is ready because of the very large presence of the prime wafer business in the plan.

## Earnings trends and outlook

### Steep rise in prime wafer business profits on improved silicon ingot yield

#### 1. Overview of 2Q FY12/19 financial results

The Company's 1H FY12/19 results were ¥12,515mn in net sales (+8.7% YoY), ¥2.755mn in operating income (+22.3%), ¥2,920mn in ordinary income (+24.4%), and ¥1,723mn in net income attributable to parent shareholders (+19.8%), delivering higher sales and profits.

Compared to period-start guidance, net sales missed by 5.5% (¥730mn), while operating income overshoot by 2.9% (¥77mn) and ordinary income had 9.5% (¥253mn) in upside.

#### Overview of 2Q FY12/19 financial results

	FY12/18 2Q Results	FY12/19 2Q					(¥mn)
		Forecast	Results	YoY	Versus forecast	Progress	
Net sales	11,516	13,246	12,515	8.7%	-5.5%	43.6%	
Gross profit	3,470	-	4,348	25.3%	-	-	
Gross profit margin	30.1%	-	34.7%				
SG&A expenses	1,216	-	1,593	30.9%	-	-	
Operating income	2,253	2,678	2,755	22.3%	2.9%	46.1%	
Operating income margin	19.6%	20.2%	22.0%	-	-	-	
Ordinary income	2,347	2,667	2,920	24.4%	9.5%	47.5%	
Profit attributable to owners of parent company (quarterly)	1,438	1,565	1,723	19.8%	10.1%	47.6%	

Source: Prepared by FISCO from the Company's financial results

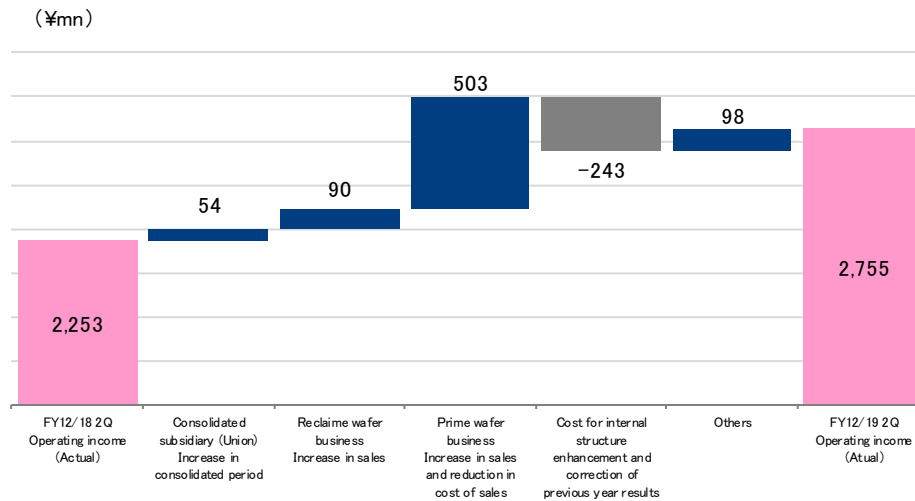
While sales increased YoY in all segments, the overall result missed guidance mainly due to slower growth in the prime wafer business under pressure from indirect impact by trade tensions between the US and China and less favorable product mix in reclaimed wafer business.

In earnings, the Company posted sharply higher operating income (YoY) and beat initial guidance by 2.9% as profit boosts from unit cost reduction in prime wafer business and sales growth in reclaimed wafer business more than offset setbacks, such as past fiscal-year cost revisions and higher costs to reinforce internal operations.

Earnings trends and outlook

In non-operating income, the Company booked bad credit allowance reversal profit (¥96mn) from collecting credits provisioned in the bad credit allowance as non-operating income related to past fiscal-year revisions. Ordinary income hence rose 24.4% YoY and exceeded initial guidance by an even larger 9.5%.

**Factors for change in operating profit**



Source: Prepared by FISCO from the Company's results briefing materials

Below we review segment trends.

The wafer business segment, which covers reclaimed wafers, reported ¥5,284mn in net sales (+1.5% YoY) and ¥1,925mn in operating income (+9.0%) in 1H FY12/19. Sales rose slightly because of limited output increase leeway due to operating at full capacity since the previous fiscal year amid robust reclaimed wafer demand and impact from change in product mix. Profits, meanwhile, climbed by almost double digits thanks to a positive impact on unit costs from measures to expand output volume even slightly (for example, shortening polishing time, conveyance time, and waiting time) amid limited increase room. Operating margin increased 2.5ppt from 33.9% in the previous year to 36.4% in 1H FY12/19.

The prime silicon wafer manufacturing and sales segment posted ¥5,736mn in net sales (+4.9% YoY) and ¥1,268mn in operating income (+84.9%), an increase in sales and sharply higher profits. In sales, sustained robust prime wafer output throughout 1H lifted sales versus the previous year with low production volume in Jan-Mar and gradual transition to full production thereafter. Nevertheless, the sales increase was just 4.9% because of impact from US-China trade friction on consumable parts and materials for semiconductor production equipment. Profits, meanwhile, rose sharply on contribution to lower unit costs from improved production yield for mainstay 8-inch wafer silicon ingots that enabled some conversion from external purchases to internal production.

The semiconductor related equipment, materials, etc. segment booked ¥1,662mn in sales (+67.5% YoY) and ¥78mn in operating income (-45.9%), a decline in profits on higher sales. Sales climbed sharply on the impact of adding DG Technologies, Inc. as a consolidated subsidiary in January 2019. Profit fell on increase in high-volume business with relatively low profitability.



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Earnings trends and outlook

Earnings by business segment

		FY12/18			FY12/19			(¥mn)
		1H	2H	Full-year	1Q	2Q	1H	YoY
Net sales	Wafer business	5,207	5,766	10,973	2,522	2,761	5,284	1.5%
	Manufacturing and sales business of prime silicon wafers	5,466	6,452	11,918	3,046	2,690	5,736	4.9%
	Semiconductor related equipment, materials, etc. segment	992	1,925	2,918	816	845	1,662	67.5%
	Other business	31	30	61	11	22	34	8.5%
	Subtotal	11,698	14,173	25,872	6,397	6,320	12,718	8.7%
	Adjustments	-182	-211	-393	-86	-116	-203	-
Total		11,516	13,962	25,478	6,311	6,203	12,515	8.7%
Operating income	Wafer business	1,767	2,244	4,011	908	1,017	1,925	9.0%
	Manufacturing and sales business of prime silicon wafers	686	1,362	2,048	730	537	1,268	84.9%
	Semiconductor related equipment, materials, etc. segment	145	220	366	37	41	78	-45.9%
	Other business	18	-15	2	5	16	21	13.8%
	Subtotal	2,617	3,812	6,429	1,682	1,612	3,294	25.8%
	Adjustments	-364	-314	-678	-267	-271	-539	-
Total		2,253	3,497	5,751	1,414	1,340	2,755	22.3%
Operating income margin	Wafer business	33.9%	38.9%	36.6%	36.0%	36.8%	36.4%	-
	Manufacturing and sales business of prime silicon wafers	12.6%	21.1%	17.2%	24.0%	20.0%	22.1%	-
	Semiconductor related equipment, materials, etc. segment	14.7%	11.4%	12.6%	4.6%	4.9%	4.7%	-
	Total	19.6%	25.1%	22.6%	22.4%	21.6%	22.0%	-

Source: Prepared by FISCO from the Company's financial results and quarterly securities report

## While sales might miss the plan, we think profits are capable of attaining guidance.

### 2. Full-year forecast for FY12/19

The Company's full year forecast for FY12/19 remains the same as its initial forecast even after 2Q, with net sales of ¥28,688mn (up 12.6% YoY), operating income of ¥5,971mn (up 3.8%), ordinary income of ¥6,151mn (up 0.2%), and net income attributable to owners of the parent of ¥3,621mn (up 0.0%).

Full-year forecast for FY12/19

		FY12/18			FY12/19				(¥mn)
		1H	2H	Full year	1H	2H (E)	YoY	Full year (E)	YoY
Net sales		11,516	13,962	25,478	12,515	16,172	15.8%	28,688	12.6%
Operating income		2,253	3,497	5,751	2,755	3,215	-8.1%	5,971	3.8%
Operating income margin		19.6%	25.1%	22.6%	22.0%	19.9%	-	20.8%	-
Ordinary income		2,347	3,794	6,141	2,920	3,230	-14.9%	6,151	0.2%
Profit attributable to owners of parent company		1,438	2,182	3,620	1,723	1,897	-13.0%	3,621	0.0%

Note: The 2H FY12/19 (outlook) values are obtained by subtracting 1H results from full-year guidance and are not the company targets

Source: Prepared by FISCO from the Company's financial results

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Earnings trends and outlook

The 2H results needed to attain FY12/19 guidance are ¥16,172mn in net sales (+15.8% YoY) and ¥3,215mn in operating income (-8.1%). The Company faces an increased 2H sales burden because 1H sales missed guidance as explained earlier. Compared to the 1H result, the Company needs a 29.2% sales increase (¥3,657mn) in 2H.

Contribution from addition output capacity in reclaimed wafer business is a factor that boosts sales HoH in 2H. The Company expects to operate these facilities at Sanbongi and Tainan plants from fall 2019. We estimate an HoH rise in output volume of 10% assuming a four-month contribution period in 2H with operation starting in September. This increase could add about ¥500mn in sales if the average sales price is unchanged.

We think the prime wafer business should sustain strong operations in 2H too. However, attention should be given to the extent of indirect impact on GRITEK's SPE consumable parts and materials from the Chinese economy due to pressure from US-China trade tensions in light of the vulnerability of this business to economic fluctuations. If Chinese economy activity recovers quickly, the Company's shipments to domestic semiconductor manufacturers might increase.

We think the semiconductor related equipment, materials, etc. business should realize roughly ¥100mn HoH and ¥600mn YoY sales increases due to new consolidation of DG Technologies.

As seen above, it will not be easy for the Company to attain the full-year sales target. We even think there is a possibility of the sales shortfall expanding to about ¥1bn on a full-year basis due to missing the period-start target in 2H too. While product mix could improve sharply and average price might rise in reclaimed wafer business if the Company deviates from guidance in a positive direction, but this scenario is currently not reflected in our forecast.

In profits, meanwhile, the Company needs a 16.7% (¥460mn) HoH increase in 2H operating income to reach FY12/19 guidance. This appears to be a tough hurdle. Compared to sales, however, we think it is within reach.

The first reason is improvement of the cost structure in the prime wafer business. Upstream-process silicon ingot production costs account for a large percentage of prime wafer integrated output. We think the Company still has considerable room to switch from external procurement to internal output and thereby lower costs in this portion and expect progress in 2H as well. The second reason is non-recurrence in 2H of one-time costs related to internal operation reinforcement and past fiscal-year revisions from 1H. We also expect profit contributions from increased output on ramping up new facilities in the reclaimed wafer business even after deducting the impact of higher depreciation costs. Given these points, we expect higher operating income in 2H, versus 1H results, and believe the Company is capable of attaining the full-year outlook.

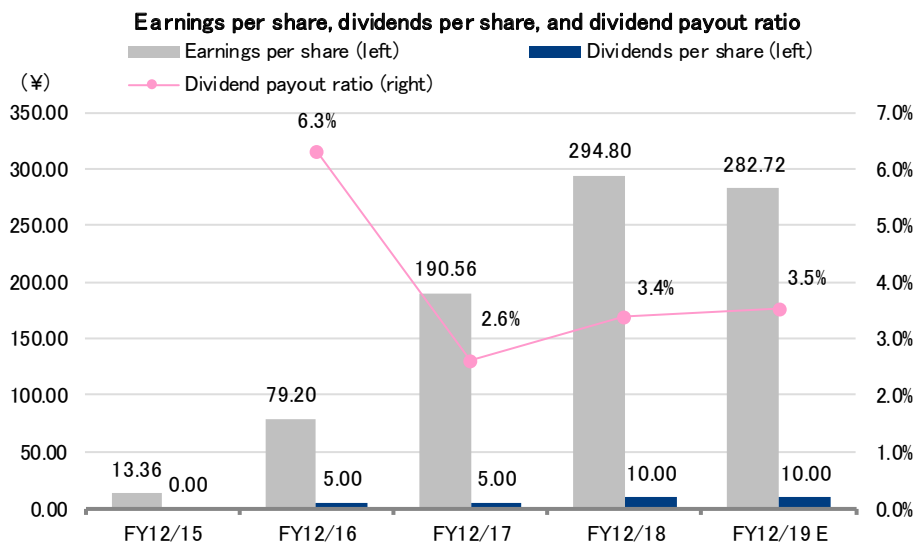
## Shareholder return

### The FY12/19 dividends per share will be unchanged YoY at ¥10.0

The Company considers returning profits to shareholders to be an important management issue and its basic policy is to do so through the payment of dividends. The Company decides on its dividends after considering a comprehensive range of factors, including current profits, the targets of its medium-term management plan, and its financial strength.

The Company raised the dividend by ¥5 YoY to ¥10 (with a ¥10 period-end dividend) in FY12/18. This worked out a 3.4% dividend payout ratio based on ¥294.80 EPS. For FY12/19, the Company disclosed a flat (YoY) dividend target of ¥10 (with a ¥10 period-end dividend), a 3.5% payout ratio in light of ¥282.72 EPS guidance.

The Company has a shareholder benefits system. The Company will present shareholders holding 100 shares or more as of December 31, the end of the Company's fiscal year, with a QUO card worth ¥3,000.



Source: Prepared by FISCO from the Company's financial results



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■ For inquiry, please contact: ■

FISCO Ltd.

5-11-9 Minami Aoyama, Minato-ku, Tokyo, Japan 107-0062

Phone: 03-5774-2443 (Financial information Dept.)

Email: [support@fisco.co.jp](mailto:support@fisco.co.jp)