Tamagawa Holdings / 6838

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How to read a Shared Research report: This report begins with the trends and outlook section, which discusses the company's most recent earnings. First-time readers should start at the business section later in the report.

Key financial data

Income statement (JPYmn)	FY03/10 Cons.	FY03/11 Cons.	FY03/12 Cons.	FY03/13 Cons.	FY03/14 Cons.	FY03/15 Cons.	FY03/16 Cons.	FY03/17 Cons.	FY03/18 Est.
Total sales	**2,803**	**2,640**	**3,106**	**3,672**	**4,171**	**5,095**	**7,260**	**4,443**	**4,237**
YoY	-34.8%	-5.8%	17.7%	18.2%	13.6%	22.1%	42.5%	-38.8%	-4.6%
Gross profit	**392**	**326**	**590**	**1,049**	**1,198**	**1,479**	**1,550**	**1,292**	
YoY	-58.8%	-16.8%	81.1%	77.8%	14.3%	23.4%	4.8%	-16.6%	
GPM	14.0%	12.3%	19.0%	28.6%	28.7%	29.0%	21.3%	29.1%	
Operating profit	**-227**	**-286**	**-30**	**373**	**477**	**531**	**280**	**189**	**203**
YoY	-	-	-	-	27.8%	11.3%	-47.4%	-32.3%	7.2%
OPM	-8.1%	-10.8%	-1.0%	10.2%	11.4%	10.4%	3.9%	4.3%	4.8%
Recurring profit	**-224**	**-284**	**-24**	**375**	**478**	**514**	**211**	**107**	**107**
YoY	-	-	-	-	27.6%	7.5%	-58.9%	-49.6%	0.9%
RPM	-8.0%	-10.8%	-0.8%	10.2%	11.5%	10.1%	2.9%	2.4%	2.5%
Net income	**-570**	**-351**	**-37**	**340**	**436**	**427**	**165**	**45**	**57**
YoY	-	-	-	-	28.5%	-2.2%	-61.3%	-73.0%	28.1%
Net margin	-20.3%	-13.3%	-1.2%	9.3%	10.5%	8.4%	2.3%	1.0%	1.3%
Per share data									
Shares issued ('000, year end)	6,774	6,774	6,774	10,753	41,259	42,031	42,598	42,598	
EPS	-35.1	-17.8	-1.9	15.7	11.7	10.4	4.0	1.1	1.4
EPS (fully diluted)	-	-	-	14.8	10.6	10.2	3.9	1.1	
Dividend per share	-	-	-	-	-	1.0	1.5	1.0	1.0-3.0
Book value per share	58.9	40.6	38.6	54.3	64.8	75.4	78.1	77.6	
Balance sheet(JPYmn)									
Cash and cash equivalents	665	493	56	390	1,764	1,524	2,737	2,155	
Total current assets	**1,918**	**1,530**	**1,293**	**2,114**	**3,421**	**3,606**	**4,221**	**4,088**	
Tangible fixed assets	295	205	133	564	718	2,410	2,464	2,584	
Other fixed assets	89	30	18	27	38	154	169	476	
Intangible fixed assets	39	-	-	1	31	194	309	279	
Total assets	**2,341**	**1,766**	**1,445**	**2,709**	**4,210**	**6,376**	**7,164**	**7,446**	
Accounts payable	443	430	364	386	474	620	321	524	
Short-term debt	433	203	30	40	323	300	1,395	986	
Total current liabilities	**1,026**	**884**	**598**	**708**	**1,130**	**1,481**	**2,049**	**2,041**	
Long-term debt	67	-	-	151	294	539	612	614	
Total fixed liabilities	**153**	**83**	**85**	**251**	**442**	**1,733**	**1,820**	**2,144**	
Total liabilities	**1,179**	**967**	**683**	**959**	**1,572**	**3,215**	**3,869**	**4,185**	
Net assets	**1,162**	**799**	**761**	**1,751**	**2,638**	**3,161**	**3,295**	**3,261**	
Total interest-bearing debt	500	203	30	192	618	839	2,007	1,600	
Cash flow statement(JPYmn)									
Cash flows from operating activities	-1	68	-332	36	764	387	1,614	102	
Cash flows from investing activities	12	93	77	-454	-265	-865	-392	-628	
Cash flows from financing activities	-82	-299	-168	783	875	238	-2	-57	
Financial ratios									
ROA	-8.4%	-13.8%	-1.5%	18.0%	13.8%	9.7%	3.1%	1.5%	
ROE	-43.4%	-35.8%	-4.7%	27.4%	20.1%	14.8%	5.2%	1.4%	
Equity ratio	49.6%	45.3%	52.7%	64.6%	62.7%	49.6%	46.0%	43.8%	

Source: Shared Research based on company data
Note: Figures may differ from company materials due to differences in rounding methods.

Recent updates

Highlights

On **June 5, 2017**, Tamagawa Holdings Co., Ltd. announced that it has delivered a prototype of a solid state power amplifier (SSPA) for use in satellite communication.

The company's subsidiary, Tamagawa Electronics Co., Ltd., delivered a self-designed prototype SSPA for a test model transmitter developed by NEC Network and Sensor Systems, Ltd. The latter company is seeking to have Japan Aerospace Exploration Agency (JAXA) adopt this transmitter for application in X-band frequency communications at the Ground Station for Deep Space Exploration and Telecommunication (GREAT, large-scale parabolic antenna) that is slated to begin operation in 2019. The attributes of Tamagawa's SSPA are high power, high efficiency, and high reliability and the company expects to see SSPA demand rise for application in radar and satellite communication transmitters.

Ground Station for Deep Space Exploration and Telecommunication (GREAT): Deep space is defined as the universe more than two million kilometers away from the earth. An X-band transmitter sends out command data to control satellites. At GREAT, JAXA plans to use the transmitter for satellite communication with Hayabusa 2 (JAXA's asteroid explorer), currently on its way to asteroid Ryugu. JAXA's Usuda Deep Space Center has a 64 meter parabolic antenna, but since it has been in operation for over 30 years, the agency launched a project to develop and build a new ground station for deep space exploration.

On **May 12, 2017**, the company announced earnings results for full-year FY03/17 and declared a dividend of surplus; see the results section for details.

Dividend of surplus
The company declared an annual dividend of surplus of JPY1.0 per share for FY03/17 (vs. JPY1.5 per share in FY03/16).

On **April 3, 2017,** the company announced that its Kasumigaura solar power plant (Ibaraki Prefecture) has begun operation to sell electricity.

The company began electricity sales for its Kasumigaura (Ibaraki Prefecture) solar power plant with a generating capacity of about 2.4MW, upon completion of grid connection with Tokyo Electric Power Company.

Overview of the Kasumigaura solar power plant

▷ Location:	Kasumigaura, Ibaraki Prefecture
▷ Operator:	GP Energy B LLC
	(a subsidiary of Tamagawa's wholly-owned subsidiary)
▷ Total area:	Approx. 40,354m^2
▷ Capacity:	Approx. 2.4MW
▷ Feed-in tariff:	JPY36/kWh before tax (fixed for 20 years)
▷ Generation revenue:	JPY105mn/year (planned)
▷ First year generation volume:	Approx. 2,900,000kWh (planned)

Kasumigaura solar power plant in Ibaraki Prefecture


Source: Company data.

On **March 31, 2017,** Shared Research updated the report following interviews with the company.

On **March 13, 2017,** the company announced that its Misawa solar power plant (Aomori Prefecture) has begun selling electricity through partial operation of the plant.

The Misawa plant, which the company constructed jointly with Etrion Japan K.K. and Hitachi High-Technologies Corporation, constitutes of four separate plots and has a generating capacity of about 10.0MW. The plant began electricity sales upon completion of grid connection with Tohoku Electric Power on two of the four plots, allowing total output of about 5.0MW.

Overview of the Misawa solar power plant

- ▷ Location: Misawa City, Aomori Prefecture
- ▷ Operator: Etrion 5 LLC (30% owned by Tamagawa)
- ▷ Total area: Approx. 163,000m^2
- ▷ Capacity: Approx. 9.5MW
- ▷ Feed-in tariff: JPY36/kWh (fixed for 20 years)
- ▷ First year generation volume: Approx. 10,740,000kWh (planned)

Misawa solar power plant in Aomori Prefecture


Source: Company data.

For corporate releases over three months old, see the News and topics section.

Trends and outlook

Quarterly trends and results

Cumulative	FY03/16				FY03/17				FY03/17	
(JPYmn)	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	% of FY	FY Est.
Sales	682	1,108	3,341	7,260	476	1,814	2,538	4,443	100.4%	4,424
YoY	-18.3%	-42.4%	7.7%	42.5%	-30.2%	63.7%	-24.0%	-38.8%		-39.1%
Gross profit	225	353	776	1,550	132	526	744	1,292		
YoY	-13.8%	-42.7%	-22.1%	4.8%	-41.1%	48.8%	-4.1%	-16.6%		
GPM	33.0%	31.9%	23.2%	21.3%	27.8%	29.0%	29.3%	29.1%		
SG&A expenses	247	514	866	1,270	237	522	788	1,103		
YoY	21.4%	27.1%	38.8%	34.0%	-4.1%	1.6%	-9.1%	-13.2%		
SG&A-to-sales ratio	36.2%	46.4%	25.9%	17.5%	49.7%	28.8%	31.0%	24.8%		
Operating profit	-22	-161	-90	280	-104	3	-43	189	142.3%	133
YoY	-	-	-	-47.4%	-	-	-	-32.3%		-52.4%
OPM	-	-	-	3.9%	-	0.2%	-	4.3%		3.0%
Recurring profit	-32	-190	-138	211	-129	-43	-103	107	208.8%	51
YoY	-	-	-	-58.9%	-	-	-	-49.6%		-75.9%
RPM	-	-	-	2.9%	-	-	-	2.4%		1.2%
Net income	-38	-249	-180	165	-90	-4	-88	45	372.0%	12
YoY	-	-	-	-61.3%	-	-	-	-73.0%		-92.7%
Net margin	-	-	-	2.3%	-	-	-	1.0%		0.3%

Quarterly	FY03/16				FY03/17			
(JPYmn)	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Sales	682	426	2,233	3,919	476	1,338	724	1,905
YoY	-18.3%	-60.9%	89.6%	96.6%	-30.2%	214.0%	-67.6%	-51.4%
Gross profit	225	128	423	774	132	393	219	548
YoY	-13.8%	-63.9%	11.4%	60.4%	-41.1%	206.1%	-48.3%	-29.2%
GPM	33.0%	30.2%	18.9%	19.7%	27.8%	29.4%	30.2%	28.7%
SG&A expenses	247	267	352	404	237	285	265	315
YoY	21.4%	33.0%	60.4%	24.8%	-4.1%	6.8%	-24.7%	-21.9%
SG&A-to-sales ratio	36.2%	62.7%	15.8%	10.3%	49.7%	21.3%	36.6%	16.5%
Operating profit	-22	-139	71	370	-104	108	-47	233
YoY	-	-	-55.9%	132.6%	-	-	-	-
OPM	-	-	3.2%	9.4%	-	8.1%	-	12.2%
Recurring profit	-32	-158	53	349	-129	86	-60	209
YoY	-	-	-66.0%	133.2%	-	-	-	-
RPM	-	-	2.4%	8.9%	-	6.4%	-	11.0%
Net income	-38	-211	69	346	-90	86	-84	133
YoY	-	-	-51.1%	108.1%	-	-	-	-
Net margin	-	-	3.1%	8.8%	-	6.5%	-	7.0%

Source: Shared Research based on company data
Figures may differ from company materials due to differences in rounding methods.
Net income is net income attributable to the parent company shareholders.

Segment breakdown (cumulative)	FY03/16				FY03/17			
(JPYmn)	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Sales	682	1,108	3,341	7,260	476	1,814	2,538	4,443
YoY	-18.3%	-42.4%	7.7%	42.5%	-30.2%	63.7%	-24.0%	-38.8%
Electronic and Communication Device	594	946	1,374	2,091	402	948	1,474	2,605
YoY	-23.5%	-45.7%	-50.0%	-38.5%	-32.4%	0.2%	7.3%	24.6%
Renewable Energy System Sales	17	27	1,786	4,938	8	735	891	1,610
YoY	-47.2%	-80.1%	509.0%	207.5%	-56.4%	-	-50.1%	-67.4%
Solar Power Plant	71	135	180	230	67	131	173	228
YoY	179.8%	197.9%	202.7%	161.8%	-5.0%	-2.8%	-4.1%	-1.1%
Geothermal Power Plant	-	-	-	-	-	-	-	-
Operating profit	-22	-161	-90	280	-104	3	-43	189
YoY	-138.6%	-175.8%	-124.3%	-47.4%	372.0%	-102.1%	-52.0%	-32.3%
Electronic and Communication Device	5	-90	-102	-12	-22	6	58	246
YoY	-95.0%	-	-	-	-	-	-	-
Renewable Energy System Sales	-46	-109	-28	287	-64	81	34	111
YoY	-	-	-	155.9%	-	-	-	-61.3%
Solar Power Plant	29	51	56	57	29	55	56	73
YoY	179.3%	217.1%	258.6%	155.2%	-1.9%	7.4%	-0.7%	28.7%
Geothermal Power Plant	-0	-0	-0	-21	-	-	-0	-1
Adjustments	-10	-12	-16	-31	-46	-139	-191	-240

Segment breakdown (quarterly)	FY03/16				FY03/17			
(JPYmn)	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Sales	682	426	2,233	3,919	476	1,338	724	1,905
YoY	-18.3%	-60.9%	89.6%	96.6%	-30.2%	214.0%	-67.6%	-51.4%
Electronic and Communication Device	594	351	428	717	402	546	527	1,131
YoY	-23.5%	-63.6%	-57.4%	9.9%	-32.4%	55.4%	22.9%	57.8%
Renewable Energy System Sales	17	10	1,759	3,152	8	727	156	719
YoY	-47.2%	-90.4%	-	140.1%	-56.4%	-	-91.1%	-77.2%
Solar Power Plant	71	65	45	50	67	64	41	55
YoY	179.8%	220.5%	218.4%	76.0%	-5.0%	-0.5%	-7.9%	9.8%
Geothermal Power Plant	-	-	-	-	-	-	-	-
Operating profit	-22	-139	71	370	-104	108	-47	233
YoY	-	-	-	-	-	-	-	-37.1%
Electronic and Communication Device	5	-95	-12	91	-22	29	51	188
YoY	-95.0%	-	-	-	-	-	-	107.3%
Renewable Energy System Sales	-46	-63	82	314	-64	145	-47	77
YoY	-	-	-	140.6%	-	-	-	-75.6%
Solar Power Plant	29	22	5	1	29	26	1	17
YoY	179.3%	287.6%	-	-91.8%	-1.9%	19.9%	-78.5%	-
Geothermal Power Plant	-0	-0	-0	-21	-	-	-0	-0
Adjustments	-10	-2	-4	-15	-46	-93	-52	-49

Source: Shared Research based on company data
Note: Figures may differ from company materials due to differences in rounding methods.

As of Q1 FY03/15, Tamagawa's reporting segments comprised Electronic and Communication Device Business, Solar System Sales Business, Solar Power Plant Business, and Geothermal Power Plant Business, but from Q1 FY03/16, the Solar System Sales segment has been renamed Renewable Energy System Sales.

Full-year FY03/17 results

Sales: JPY4.4bn (-38.8% YoY)
Operating profit: JPY189mn (-32.3% YoY)
Recurring profit: JPY107mn (-49.6%)
Net profit*: JPY45mn (-73.0%)
*Net loss refers to net loss attributable to parent company's shareholders.

Electronics and Telecoms Equipment

Orders: JPY2.7bn (+26.9% YoY)
Sales: JPY2.6bn (+24.6% YoY)
Operating profit: JPY246mn (operating loss of JPY12mn in FY03/16)

The company achieved higher sales and profits owing to gradual recovery from 2H of capital investment on countermeasures against radio wave interference, growth in orders in the public and government sectors, as well as shrinking costs from streamlining operations.

Renewable Energy System Sales

Orders:	JPY1.6bn (-67.1% YoY)
Sales:	JPY1.6bn (-67.4% YoY)
Operating profit:	JPY111mn (-61.3% YoY)

The company decided to own a solar power plant within the group, instead of selling it to another operator. In addition, sales activities for gaining new contracts were less successful than expected. These led to lower sales and higher profit.

Solar Power Plant Operations

Sales:	JPY228mn (-1.1% YoY)
Operating profit:	JPY73mn (+28.7% YoY)

The segment booked electricity sales from mega solar power plants in Shimonoseki, Tateyama, and Sodegaura. A review of SG&A expenses and working to increase profitability resulted in higher operating profit.

Geothermal Power Plant Operations

No sales were booked. Operating loss was zero due to expenses (vs. operating loss of JPY20mn in FY03/16).

For details on previous quarterly and annual results, see the Historical financial statements section.

Full-year company forecasts

(JPYmn)	FY03/17 FY Act.	FY03/18 FY Est.	YoY
Sales	**4,443**	**4,237**	-4.6%
CoGS	3,151		
Gross profit	**1,292**		
GPM	29.1%		
SG&A expenses	1,103		
SG&A-to-sales ratio	24.8%		
Operating profit	**189**	**203**	7.2%
OPM	4.3%	4.8%	
Recurring profit	**107**	**107**	0.9%
RPM	2.4%	2.5%	
Net income	**45**	**57**	28.1%
Net margin	1.0%	1.3%	

Source: Shared Research based on company data
Note: Figures may differ from company materials due to differences in rounding methods.

FY03/18 forecasts

- ▷ Sales: JPY4.2bn (-4.6% YoY)
- ▷ Operating profit: JPY203mn (+7.2% YoY)
- ▷ Recurring profit: JPY107mn (+0.9% YoY)
- ▷ Net income*: JPY57mn (+28.1%YoY)

*Net income refers to net income attributable to parent company's shareholders.

- ▷ At the Electronics and Telecoms Equipment Business, Tamagawa has been expanding operations, using high-frequency wireless technology as its core technology since its founding, and with the development and manufacture of devices, components and measurement devices for high-frequency wireless communication devices as a business pillar. Recently, in markets related to disaster countermeasures, commercial wireless communications, and monitoring systems, demand for optical transmission systems and digital signal processors is growing, despite stagnant capital investment in the mobile communication market. In view of this, the company looks to enhance existing operations and actively advance development and manufacture of fiber optics-related products, millimeterwave products, and digital/software-related products as well as its mainstay product, high-frequency devices.
- ▷ At the Renewable Energy System Sales Business, it plans to sell power generation systems utilizing renewable energy other than solar power generation systems. Aiming for higher revenue, it aims to restructure organizations and further strengthens sales activities to expand sales channels all over Japan.
- ▷ At the Solar Power Plant Business and Geothermal Power Plant Business, it plans to establish an integrated management system covering processes from site acquisition to selling power to electric power companies in order to facilitate development of community-based solar/geothermal power plants.

Medium-term outlook

Medium-term business plan (FY03/17–FY03/20)

In June 2016, Tamagawa announced its medium-term plan for FY03/17–FY03/20. Targets for FY03/20 are sales of JPY10.1bn and operating profit of JPY1.1bn. Goals by segment are as shown in the table below.

Medium-term plan sales and profit targets by segment

Long-term outlook (JPYmn)	FY03/16 Act.	FY03/17 Plan	vs. FY03/16 Changes	FY03/20 Plan	vs. FY03/16 Changes
Sales	7,259	6,633	-8.6%	10,140	39.7%
Electronic and Communication Device	2,091	2,600	24.3%	3,500	67.4%
Renewable Energy System Sales	4,938	3,787	-23.3%	5,100	3.3%
Solar Power Plant	230	246	7.0%	1,190	417.4%
New businesses	-	-	-	350	-
Operating Profit	279	354	26.9%	1,090	290.7%
Electronic and Communication Device	-11	214	-	350	-
Renewable Energy System Sales	286	223	-22.0%	370	29.4%
Solar Power Plant	56	61	8.9%	335	498.2%
New businesses	-	-	-	35	-

Source: Shared Research based on company data
Note: Figures may differ from company materials due to differences in rounding methods.

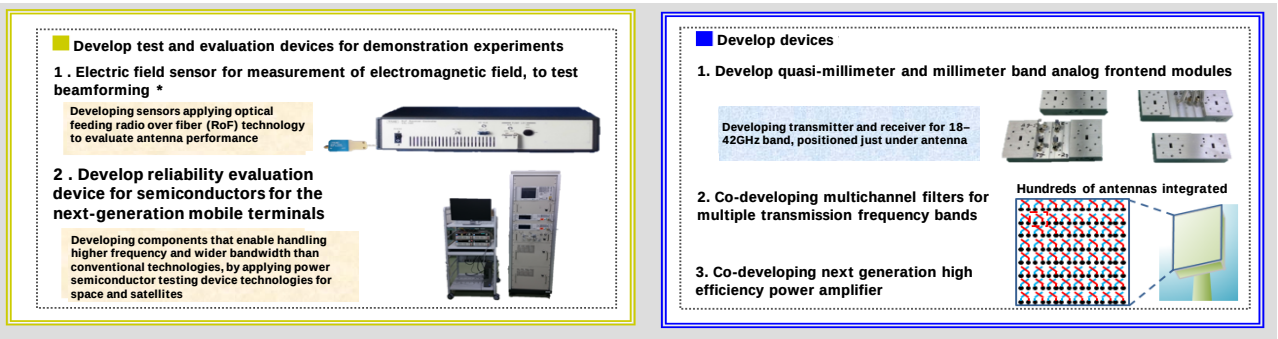
Electronic and Communication Device Business

Under the medium-term plan, Tamagawa will aim for sales of JPY3.5bn (+67.4% versus FY03/16) and operating profit of JPY350mn (operating loss of JPY11mn in FY03/16) in FY03/20.

Since Masanori Kobayashi—CEO of Tamagawa Electronics—became a director at Tamagawa Holdings in June 2011, the plan has been to exit unprofitable projects, strengthen R&D, and launch new products to expand sales, while stepping up sales of more profitable Tamagawa-brand products.

In FY03/16, sales decreased due to lower sales to mobile telecoms companies, which lowered their spending on base stations. Defense related sales also decreased due to fizzling demand for facility renewal. However, to cope with YoY declines in sales, Tamagawa worked to restrain fixed costs and R&D expenses from the July–September quarter onward. According to the company, acquisition has been steady during FY03/16 for contracts of public works projects in mobile telecoms and broadcasting. As a result, although sales dipped in FY03/16, these are forecast to be covered by higher sales and profits in FY03/17 and beyond, driven by confirmed orders in FY03/16 for optical transmission equipment for trains and testing equipment for power semiconductors.

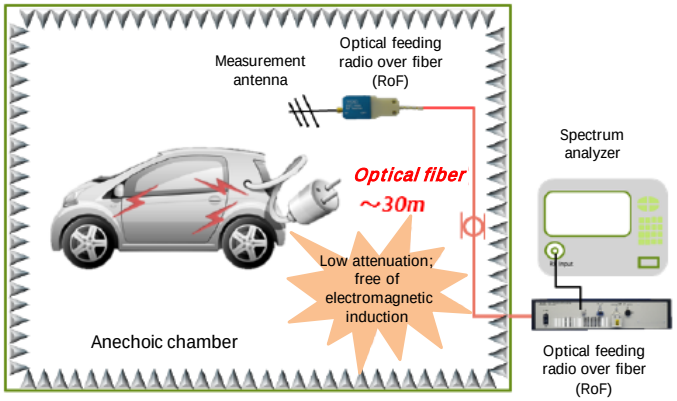
- For 5G (Fifth-Generation Mobile Communications System), technologies such as the SHF band, submillimeter and millimeter waves, carrier aggregation, massive-MIMO, beam forming, and NOMA are scheduled to be implemented in order to reach transmission speeds of up to 100 times those that are currently available, and the company is moving forward with development to meet these technological needs.



* Beamforming refers to a technology to amplify wireless signals by concentrating radio waves into a selected direction
Source: Shared Research based on company data

- In terms of optical transmission equipment for trains, Tamagawa in FY03/16 has increased efforts to win contracts for telecoms and broadcasting-related public works projects to minimize the impact of restrained capex spending on the mobile-phone infrastructure market. As a result, the company has won an order. According to Tamagawa, it is analog optical transmission equipment. One of its benefits is the cost effectiveness due to system simplification: They enable wireless signals that are the same as radio waves to be directly converted to optical signals and transmitted. Further, compared to coaxial cables, optical fiber is suitable for transmitting wireless signals over long distances because of its high frequency characteristics, in addition to fewer signal losses. The wireless systems for trains that make use of this technology are expected to contribute to sales over the next three years.
- Since FY03/14, the company has increased investments in R&D for products of its own brand. It started sales of testing equipment for power semiconductors and a high-definition-image monitoring system in FY03/15. For the medium term, Tamagawa has been developing new products for electric noise resistance testing in the automotive sector. Because noise resistance test equipment had all previously used electric cords, the resulting electromagnetic induction and attenuation made it difficult to measure very small signals. To solve this problem, the company applied its technology for converting the signals from the noise resistance test equipment into optical signals that could be sent via fiber-optic cables, thereby enhancing the sensitivity of the test equipment and expanding the range of signals that could be measured. This new noise resistance test equipment received an honorable mention in the 33rd Kanagawa High-Tech Grand-Prix in October 2016.

Electrical noise testing



Radio over fiber (RoF) unit

Source: Shared Research based on company data

- In March 2015, Tamagawa established a second-tier subsidiary in Vietnam, Tamagawa Electronics Vietnam Co., Ltd. The subsidiary began operation in October 2015. Following its launch, the company began production of high-quality, high-frequency passive components for use in telecoms and broadcasting, as well as mobile base stations, geared toward the Japanese market. Reduced costs through increased local procurement are planned to lead to improvements in price competitiveness, yielding an increase in orders. Before long, the company aims to expand business into Southeast Asia and the Middle East, focusing on capturing orders for overseas mobile infrastructure devices via low-cost proposals.
- In other areas, the medium-term plan calls for acquiring orders via product proposals in the areas of AM/FM rebroadcasting equipment for dead zones and subsystems for next-generation digital terrestrial broadcasting equipment ahead of the Tokyo Olympics. Expansion of business via M&A in related areas is also a possibility.

Renewable Energy System Sales Business

Under the medium-term plan, Tamagawa will aim for sales of JPY5.1bn (+3.3% versus FY03/16) and operating profit of JPY370mn (+29.4% versus FY03/16) in FY03/20. The company plans for contributions from sales of small-scale wind power generation equipment and development contracting fees in large mega solar power plant development.

Selling solar power plant equipment

In FY03/15, Tamagawa obtained certain rights to sites for solar power plants and the Feed-in Tariff (FIT) scheme, and after the construction of solar power plants started sales of solar power plant equipment. The company reported sales of JPY1.1bn from selling 2.2MW equipment in FY03/15, and in FY03/16, sales of JPY5.0bn were booked through the sale of 10.2MW equipment.

When tax incentives for promoting investments in facilities to improve productivity, under which a solar power producer can immediately have related facilities fully depreciated, expired at the end of March 2016, the percentage of deprecation l fell to 50% from April onward. While Tamagawa still believes that it will be able to promote the selling of solar power plant equipment as a lucrative business in FY03/17, the company is anticipating a sales decline. Being proactive, however, it plans to offset the sales decline by adding the sale of small-scale wind power generation equipment (see below for details) to its portfolio from FY03/18 onward. Entering the market for secondhand solar power generation plants is also included in the medium-term plan.

Selling small-scale wind power generation equipment

Tamagawa will start selling small-scale wind power generation equipment, with projected sales of about 100 units (= approx. JPY3.0bn) over the medium term.

Small-scale wind power generation refers to wind power generation equipment producing less than 20kW of electricity. As of February 2016, the purchase period for a wind power generation equipment of less than 20kW is 20 years, at the price of JPY55/kWh. Provided that wind speeds are sufficient, wind power generation can generate electricity during the night, differentiating it from solar power generation.

In order to demonstrate the reliability and functionality of this product, the company plans to construct and operate Small-scale Wind Power Generator Facility No. 1 (power output: 19.5kW) on grounds available at its Tateyama plant (power output: approx. 2,000kW).

Small-scale wind power generation equipment (Tateyama plant)

Source: Company data

The unit price of Tamagawa's small-scale wind power generation equipment is about JPY30mn.

Development contracting fees in mega solar power plant development

For large-scale solar power generation projects with capacity of about 10MW or more, the company has a policy of securing funding through joint development. During joint development of mega solar power generation facilities, in addition to generating revenue from selling power, the company also derives sales in the form of development contracting fees, which include fees received on disposal of land ownership rights and for the preparation of requisite legal documentation. The company received such fees from the Misawa plant (power output of 9.5MW), scheduled to begin operation in FY03/17.

As of June 2016, the company estimates that there is latent demand for solar power generation projects—much like the Misawa plant—equivalent to about 100MW of output. By being involved in development of latent projects over the medium term, Tamagawa aims to acquire development contracting fees. In June 2016, with the intent of establishing a proprietary project financing system for the development of renewable energy power generation plants, the company newly established a dedicated project financing office.

Solar and Geothermal Power Plant Businesses

Under the medium-term plan, Tamagawa will aim for sales of JPY1.2bn (+417.4% versus FY03/16) and operating profit of JPY335mn (+498.2% versus FY03/16) in FY03/20. Plans call for combined power output of solar, geothermal, and small-scale wind power generation to grow from 4.8MW in FY03/16 to 20.0MW in FY03/19. The company also plans to consider renewable power generation businesses within Asia during the medium-term plan.

Power output under the medium-term plan

	FY03/16	FY03/19
Solar power plants	4.8MW	16.2MW
Geothermal power plants	-	850kW (equivalent to 6.8MW of solar power)
Small-scale wind power plants	-	351kW (equivalent to 2.8MW of solar power)

Source: Shared Research based on company data

Generating capacity of solar power plants

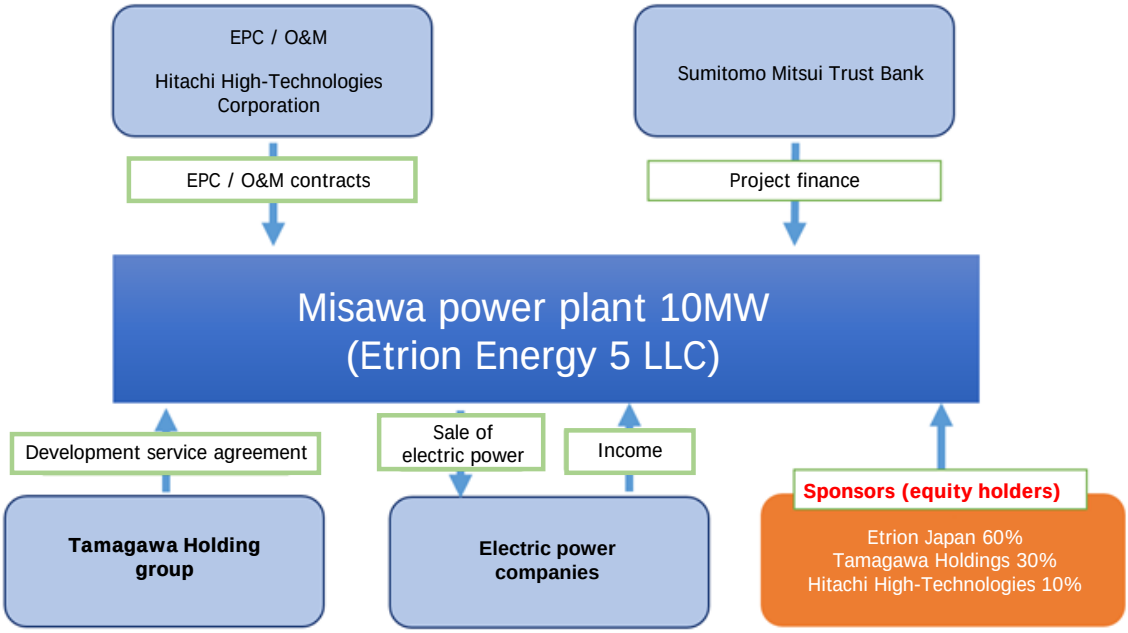
As of February 2017, the company's solar power facilities, including those already in operation and those planned for construction, had a combined generating capacity of 13.8MW (see "Solar power plant generation in the Business section"), in addition to total output of 4.8MW from solar power plants. Land and rights to develop have already been secured to meet 18.6MW in generating capacity, exceeding the company's goal of 16.2MW set forth for FY03/19 under the medium-term plan.

In the development of solar power generation facilities, the company utilized its own funds in the development of the solar power generation plant at Shimonoseki—its first venture—but from the Tateyama plant onward, Tamagawa has made use of leases and joint development initiatives to secure funding for facilities development. If a solar power plant is constructed under a leasing arrangement, the internal rate of return (IRR) is improved; compared with an IRR of 7.5% for the Shimonoseki plant, the Tateyama plant achieved an IRR of 16.5%.

For large-scale solar power generation plants with generating capacity of about 10.0MW or more, the company has as its policy to acquire funding via joint development. In June 2015, Tamagawa established an SPC (Etrion Energy 5 LLC) via joint investment with Etrion Japan for development of the Misawa plant (Aomori Prefecture), with Tamagawa holding a 30% stake. The Misawa plant is scheduled to begin operation in February 2017 with power generating capacity of about 9.5MW (Tamagawa will hold 3.0MW), and it is expected to generate approximately JPY390mn per year in revenue. Earnings from the plant, to be booked as investment income from an equity-method subsidiary, are expected to start making contributions from 2H FY03/17 onward.

The company also reports that it is currently in discussions to build eight more utility-scale solar power plants with combined generating capacity of 248MW.

Outline of Etrion Energy 5 LLC



Source: Company materials
*EPC refers to businesses comprehensively undertaking construction projects across the fields of engineering, procurement, and construction
*O&M refers to businesses that undertake operation and maintenance of facilities after construction is complete

Geothermal power generation business

Under the medium-term plan, Tamagawa will aim for geothermal power generation of 850kW (equivalent to 6.8MW of solar power) in FY03/19.

As of September 2016, the company was in discussions for a total of three geothermal power generation plants with combined power generating capacity of 1,130kW (about the same amount of electricity as a 9.0MW solar power plant).

Geothermal power generation

Geothermal power generation involves using steam and hot water produced under the earth's surface to drive steam turbines connected to electricity generators. This type of generation produces less carbon dioxide than thermal power stations. Another advantage is that geothermal generation is not affected by the depletion or rising prices of fuel, and it can be used in perpetuity. Geothermal generation also provides stable power; it is not affected by the weather, seasons, or day/night fluctuations like other major renewable energy sources such as solar and wind power.

According to the company, the Japanese government mulled over next-generation energy sources during the oil shocks in the 1970s and determined nuclear power as a core source of electricity in Japan. However, due to the New Energy and Industrial Technology Development Organization (NEDO)'s accumulation of data on geothermal power generation, it is now considered a source of energy with high potential in Japan.

The two main methods of geothermal power generation are steam and binary generation.

Steam generation: With this method, turbines are driven directly by natural steam at temperatures of 200–300C or more. Subterranean water at high temperatures and pressures is dominated by either steam or hot water. With the former, moisture can be easily removed and the dry steam routed to turbines to generate electricity. If the source is dominated by hot water, the fluid is first run through a flasher, which separates the steam from the hot water. In a double-flash cycle, turbines are driven by both high- and low-pressure steam.

Binary generation: This method is used when hot water and steam temperatures are 150C or less, and thus cannot drive turbines directly. Heat is exchanged from the geothermal fluid to a medium that has a lower boiling point than water (such as a water/ammonia mixture), and steam from that medium drives turbines to generate electricity.

Feed-in tariff system for geothermal power generation

Under the FY2016 feed-in tariff system, the price for electricity produced by solar power plants is JPY24/kWh and the purchase period is 20 years (for 10kW or more; excluding tax). In contrast, the price for electricity produced by geothermal power plants is JPY40/kWh and the purchase period is 15 years (for less than15,000kW; excluding tax).

According to the company, a wholly owned 1MW solar power plant requiring an investment of JPY301mn (assuming the site is rented) would generate annual electricity sales of JPY29mn (on assumption of an average daily quantity of solar radiation of 3.7kWh/sqm), annual operating profit of JPY3mn, and an average yield of 6.3%, for a payout period of 15.7 years. In contrast, a 125kW geothermal plant (which generates electricity roughly equivalent to a 1MW solar power plant) needs capital spending worth JPY205mn (the site on rent) and generates annual sales of JPY41mn, annual operating profit of JPY18mn, and an average yield of 15.5% for an expected payout period of 6.4 years.

Sale of Beppu geothermal power plants

In January 2015, the company announced that it planned to build a total of seven geothermal power plants, and to this end acquired a total of seven separate plots of land. The company moved forward on construction at two of the seven sites but changed its plan in December 2015. The company sold the two plants currently under construction to a third-party and sold back the sites acquired for the five other geothermal power plants to their original owners.

Against risks of drilling springs, the company is apparently considering using its own drilling methods, which will have no direct effect on the company's business results but will enable the company to secure preferential rights to springs.

Other business

Hydrogen power

In January 2016, Tamagawa announced that it would establish in internal division to prepare for future developments in hydrogen power. Plans call for research and exploration of methods to store power generated via hydrogen.

In the renewable energy field, limitations imposed by the impact of weather conditions on systems such as solar power and wind power generation are an ongoing concern. Hydrogen power storage systems produce hydrogen from excess power generated by solar and wind power generation systems, and store this hydrogen for future use. The stored hydrogen is then combined with fuel cells, to release power as needed. Conventional batteries lose charge over time, but hydrogen—stored in tanks—can be stored for much greater lengths of time, allowing for efficient energy storage. This stored energy can then be provided to various areas on an as-needed basis.

Business strategy/long-term outlook

Tamagawa says its aim is to be a company that contributes to the development of social infrastructure, operating its Electronic and Communication Device business as a telecommunication infrastructure business and its Renewable Energy System Sales, Solar Power Plant, and Geothermal Power Plant Businesses as electric power infrastructure businesses.

Under its medium-term business plan (covering FY03/17 through FY03/20), the company is looking to expand sales and increase the profitability of its Electronic and Communication Device business, strengthening existing businesses while expanding sales of its new optical wireless communications equipment for trains. In the area of electric power infrastructure (Renewable Energy System Sales, Solar Power Plant, and Geothermal Power Plant Businesses), plans call for aggressive investing and further business expansion. Tamagawa also plans to continue looking at ways to develop power businesses using renewable energy systems other than solar power and geothermal energy (such as biomass, small-scale wind turbines, and small-scale hydro-electric generation). While electric power infrastructure business requires a substantial initial investment, it is our understanding that the company can count on a stable and continuous stream of revenues, earnings, and cash flow thereafter.

Looking further ahead, after the period covered by the current medium-term business plan, the company is looking to take the money generated by its renewable energy businesses and invest in areas with large growth potential, including testing equipment for power semiconductors and 5G and IoT-related businesses.

Business

Business description

Tamagawa has three business segments: 1) Electronic and Communication Device business, which it has been involved in since the founding of consolidated subsidiary Tamagawa Electronics Co., Ltd. in 1968; 2) Solar business, launched in FY03/12; and 3) Geothermal Power Generation business, launched in FY03/15.

Earnings by segment (JPYmn)	FY03/09 Act.	FY03/10 Act.	FY03/11 Act.	FY03/12 Act.	FY03/13 Act.	FY03/14 Act.	FY03/15 Act.	FY03/16 Act.
Sales	4,299	2,803	2,640	3,106	3,672	4,171	5,095	7,260
YoY	7.1%	-34.8%	-5.8%	17.7%	18.2%	13.6%	22.1%	42.5%
Electronic and Communication Device	3,248	2,709	2,390	2,406	3,156	3,230	3,401	2,091
YoY	-14.2%	-16.6%	-11.8%	0.7%	31.2%	2.3%	5.3%	-38.5%
% of total	75.6%	96.6%	90.5%	77.5%	85.9%	77.4%	66.7%	28.8%
Renewable Energy System Sales	-	-	-	19	441	890	1,606	4,938
YoY	-	-	-	-	-	101.8%	80.4%	207.5%
% of total	-	-	-	0.6%	12.0%	21.3%	31.5%	68.0%
Solar Power Plant	-	-	-	-	-	52	88	230
YoY	-	-	-	-	-	-	70.7%	161.8%
% of total	-	-	-	-	-	1.2%	1.7%	3.2%
Geothermal Power Plant	-	-	-	-	-	-	-	-
YoY	-	-	-	-	-	-	-	-
Operating profit	-68	-227	-286	-30	373	477	531	280
YoY	-	-	-	-	-	27.8%	11.3%	-47.4%
Electronic and Communication Device	-162	-292	-236	63	375	480	467	-12
YoY	-	-	-	-	497.4%	28.1%	-2.7%	-102.5%
% of total	-	-	-	-	100.4%	100.7%	88.0%	-4.2%
Renewable Energy System Sales	-	-	-	-24	54	51	112	287
YoY	-	-	-	-	-	-5.5%	118.6%	155.9%
% of total	-	-	-	-	14.5%	10.7%	21.1%	102.5%
Solar Power Plant	-	-	-	-	-12	-20	22	57
YoY	-	-	-	-	-	-	-	155.2%
% of total	-	-	-	-	-3.3%	-4.1%	4.2%	20.3%
Geothermal Power Plant	-	-	-	-	-	-	0	-21
YoY	-	-	-	-	-	-	-	-

Source: Shared Research based on company data
Note: Figures may differ from company materials due to differences in rounding methods.
Note: In FY03/14, the company changed segments to include Solar System Sales and Solar Power Plant Business. Then in FY03/16, the Solar System Sales segment was changed to the Renewable Energy System Sales Business.

Electronic and Communication Device Business

(28.8% of FY03/16 sales)

Since the founding of consolidated subsidiary Tamagawa Electronics in 1968, Tamagawa has used its high-frequency wireless technology to develop, manufacture and sell high-frequency devices (amplifiers, attenuators, filters, distributors and frequency synthesizers). These products act as components in the wireless equipment used in mobile telecoms base stations, as well as in broadcasting, disaster prevention, and firefighting systems. High-frequency devices (circuits and measuring instruments) support an antenna's radio wave transmissions by screening radio waves and adjusting signal intensity.

Tamagawa Electronics products: Components for LTE-Advanced mobile telecom base stations (left); Universal FPGA board with high-frequency frontend circuit (middle); and RoF system for optical power feeding (right)



Source: Company data

According to Tamagawa, high-frequency wireless is useful for data and video transmission as it uses wide-band radio waves, enabling fast transmission. In recent years, the usage of digital technology in telecoms and broadcasting equipment has been rising. However, digital technology is still not suitable for use in parts intended to directly trade high-frequency signals with front-end parts, being unable to process these signals. As a result, these parts often make use of high-frequency analog technology, which Tamagawa holds as its specialization. While many vendors, including Tamagawa, are able to provide digital technology, few companies specialize in making high-frequency analog technology products. Tamagawa thus occupies a niche with high market share, with its market share in parts intended for mobile telecoms base stations standing at around 15%.

Mobile telecoms base stations: Mobile telecoms networks are built around wireless base stations, which have large antennas connected to wireless telecoms equipment joined to each other by fiber-optic and other cables. As mobile phone signals will only transmit over a limited range, operators create a honeycomb shaped network by installing a large number of base stations throughout a service area. As of March 2015 Japan had 710,000 base stations (Source: The Ministry of Internal Affairs and Communications, SR Inc.).

During FY03/16, approximately 23% of Electronic and Communication Device sales come from devices for mobile telecoms base stations, about 33% from defense system-related sales, and 44% from devices for such areas as government services, disaster prevention and terrestrial digital broadcasting. Tamagawa's main devices for mobile telecom base stations are high-frequency filters, distributors, synthesizers and attenuators, which identify radio waves of certain frequencies from among the diverse range of radio waves both transmitted and received by the antenna and amplify those specific radio waves.

Electronic and Communication Device sales by industry

(JPYmn)	FY03/13 Act.	FY03/14 Act.	FY03/15 Act.	FY03/16 Act.
Total	3,155	3,233	3,400	2,108
YoY	-	2.5%	5.2%	-38.0%
Mobile telecoms	1,924	1,422	1,404	486
YoY	-	-26.1%	-1.3%	-65.4%
% of total	-	44.0%	41.3%	23.1%
Defense	504	905	1,026	688
YoY	-	79.6%	13.4%	-32.9%
% of total	-	28.0%	30.2%	32.6%
Others (public sector, etc.)	727	906	969	934
YoY	-	24.6%	7.0%	-3.6%
% of total	-	28.0%	28.5%	44.3%

Source: Shared Research based on company data

Renewable Energy System Sales Business

(68.0% of FY03/16 sales; 102.5% of FY03/16 operating profit)

This segment sells solar power modules and solar power equipment. During FY03/16, the main contributor to this segment was sales of solar power equipment. From FY03/17 onward, revenue from development contracting fees is expected to be booked in this segment.

Selling solar modules

In July 2011 Tamagawa entered an exclusive agreement to sell the solar modules of GPPV Solar Pte Ltd (GPPV below), and began selling GPPV solar systems (The exclusive selling agreement was changed to a selling agreement in February 2014, in order to further the growth of both companies' businesses).
Through sales agencies the company provides customers with photovoltaic (PV) modules and power conditioners. Where necessary the company also negotiates with electric utilities on behalf of customers and assists with loan applications to financial institutions.

Sales activities are conducted by consolidated subsidiary Tamagawa Energy.

In Japan contracts under the Feed-in Tariff (FIT, for details see later in report) scheme of the Ministry of Economy, Trade and Industry (METI) oblige electric utilities to buy electricity generated using 10-kilowatt or more solar power plants at a fixed price for 20 years. Prices and durations are revised every year. In 2014 (April 2013 – March 2014) the price of solar electricity was JPY36/kWh (excluding tax) for 20 years. Prices for 2015 (April 2014 – March 2015) have been lowered to JPY32/kWh (excluding tax). Prices for 2016 are JPY29/kWh (excluding tax) when contracts with utilities are done by June 2015 and JPY27/kWh (excluding tax) for contracts struck in July and later. The figure was later further reduced to JPY24 (excluding tax) for contracts made during FY2016 (April 2016 to March 2017). Generation facilities must obtain FIT certifications from METI. If a solar power producer applies for Green Investment Tax Incentives, related facilities can be fully depreciated immediately. The government also has similar regulations in place for wind, hydroelectric, geothermal, and biomass generation.

Selling solar power plant equipment

The company began selling solar power plant equipment from FY03/15. Under this business, the company obtains certain rights to sites for solar power plants and the FIT scheme from land and rights owners, then makes sales to outside customers. By selling 2.3MW equipment, it reported sales of JPY1.1bn in FY03/15. In FY03/16, sales were JPY5.0bn, the result of sales of 10.2MW in equipment.

The company sells equipment for solar systems for about JPY400,000 per kW of installed capacity. Sales are determined by multiplying installed generating capacity (kW) by the price per kWh of installed capacity. The solar system's gross profit margin is about 15%.

Development contracting fees in solar power plant development

For large-scale solar power generation projects with capacity of about 10.0MW or more, the company has a policy of securing funding through joint development. During joint development of mega solar power generation facilities, the company generates revenue not only from selling power, but by transferring ownership of the land to be used for the plant. Sales also come in the form of development contracting fees, which include fees received on disposal of land ownership rights and for the preparation of requisite legal documentation.

The company plans to receive such fees from the Misawa plant (power output of 9.5MW), scheduled to begin operation in FY03/17.

Solar Power Plant Business

(3.2% of FY03/16 sales; 20.3% of FY03/16 operating profit)

The solar power plant operation business also includes the operation of mega solar (power generation solar parks) from FY03/14.

What is mega solar?

Mega solar refers to solar power stations of 1MW-plus. Since the start of the FIT scheme for renewable energy in July 2012 it has been easier to secure profits, and a number of players from different sectors have joined the fray. There is also a trend for local governments and private-sector businesses to join forces and build mega solar businesses on vacant land. While output varies with the location and amount of sunlight, a 1MW mega solar plant generates a minimum of 1,000,000kWh per year. A typical four-person household uses 5,500kWh per year; a 1MW mega solar plant can supply about 300 households. Mega solar plants need land: a 1MW plant covers about 15,000sqm (Tokyo Dome: 47,000sqm).

To take advantage of the FIT scheme first the operator needs METI approval to certify that the generation facilities comply with the law. The purchase price for power generated in the scheme depends on when the facilities were certified rather than when operations started (In April 2015 and onward, the purchase price to be applied is that at the time when connection contracts with utilities are struck after the facilities are certified). Other than gaining licenses for the generating facilities and equipment, operators face no special requirements to qualify to sell all the renewable power they generate under FIT. While it is necessary to appoint a chief electrical engineer company operators do not need to have electricity business experience.

Tamagawa's solar power plant operating business

When Tamagawa was considering entering the mega solar business, in June 2012 it set up a planning office and in September that year set up subsidiary GP Energy. Its first project—Shimonoseki power plant in Shimonoseki, Yamaguchi prefecture—began operations in June 2013.

Tamagawa operates mega solar power plants in this subsegment, forming special-purpose companies (SPC). The SPC buys or leases land on which it builds and runs solar power plants of 1MW-plus capacity. The SPC scheme enables separate project financing, i.e., finance based on expected revenues for a particular project.

The company said upfront investment in mega solar plants—covering PV modules, supporting structures, electrical facilities and labor—runs to JPY260–320mn per MW.

Electricity is sold to electric utilities. Revenue is selling price per kWh multiplied by total amount of electricity sold. FIT defines electric utilities' purchase prices as JPY40.0 (excluding tax) per kWh for electricity generated at facilities that were FIT-certified in 2012, JPY36.0 (excluding tax) for those certified in 2013, and JPY32.0 (excluding tax) for those certified in 2014. In 2015, the purchase prices are JPY29 (excluding tax) per kWh for contracts between FIT-certified facilities and power utilities struck by June 2015 and JPY27 (excluding tax) per kWh for contracts done in July and later. The figure was later reduced again to JPY24 (excluding tax) for FY 2016 (April 2016 to March 2017), and purchase duration is fixed at 20 years. However, the company received approval for its solar power generation plants in FY 2014 and before, and its average sale price of electricity appears to be at least JPY32.0 (excluding tax) per kWh.

If a solar plant generating 1.0GWh to 1.4GWh of electricity per year was FIT-certified in 2012, electric utilities will buy electricity for JPY40 (excluding tax) per kWh—implying revenues of JPY40mn. Weather and other factors impact the amount of power generated. Panel aging cuts output by 0.25-0.75% per year. The main costs are depreciation, land rent, maintenance fees and insurance. Gross profit margins hover around 50% and the unlevered internal rate of return could be 9%.

Tamagawa's solar power plants

As of February 2017, the company's solar power facilities, including those already in operation and those planned for construction, had a combined generating capacity of 13.8MW (see "Solar power plant generation in the Business section"), in addition to total output of 4.8MW from solar power plants. Land and rights to develop have already been secured to meet 18.6MW in generating capacity, exceeding the company's goal of 16.2MW set forth for FY03/19 under the medium-term plan.

In the development of solar power generation facilities, the company utilized its own funds in the development of the solar power generation plant at Shimonoseki—its first venture—but from the Tateyama plant onward, Tamagawa has made use of leases and joint development initiatives to secure funding for facilities development. If a solar power plant is constructed under a leasing arrangement, the internal rate of return (IRR) is improved; compared with an IRR of 7.5% for the Shimonoseki plant, the Tateyama plant achieved an IRR of 16.5%.

Shimonoseki Solar Power Plant

Source: Shared Research based on company data

Tamagawa Holdings solar power plants

Solar parks	Location	Feed-in-tariff (JPY/kWh)	Output (MW)	Operation start	Sales (JPYmn; Shared Research estimates)
Shimonoseki	Shimonoseki, Yamaguchi	40.0	1.6MW	Q1 FY03/13	77
Tateyama mega solar	Tateyama, Chiba	40.0	1.9MW	Q4 FY03/15	91
Sodegaura mega solar	Sodegaura, Chiba	36.0	1.3MW	Q4 FY03/15	56
Noboribetsu	Noboribetsu, Hokkaido	40.0	2.0MW	Q4 FY03/17	96
Kasumigaura mega solar	Kasumigaura, Ibaraki	36.0	2.4MW	Q4 FY03/17	150
Misawa	Misawa, Aomori	36.0	3.0MW	Q4 FY03/18	130
Goto	Goto, Nagasaki	36.0	5.3MW	Q1 FY03/19	250
Minamishimabara	Minamishimabara, Nagasaki	40.0	1.0MW	Q2 FY03/19	48
Total	-	-	18.6MW	-	802

Source: Shared Research based on company data
Shared Research estimate for sales, based on annual electricity sales of 1,200MWh per 1MW solar power facility.

Joint development with Etrion Japan

For large-scale solar power generation plants with generating capacity of about 10.0MW or more, the company has as its policy to acquire funding via joint development. In June 2015, Tamagawa established an SPC via joint investment with Etrion Japan for development of the Misawa plant (Aomori Prefecture), with Tamagawa holding a 30% stake. The Misawa plant is scheduled to begin operation in February 2017 with power generating capacity of about 9.5MW (Tamagawa will hold 3.0MW), and it is expected to generate approximately JPY390mn per year in revenue. Earnings from the plant, to be booked as equity-method investment income, are expected to start making contributions from 2H FY03/17 onward.

The Misawa plant is to be developed and operated by Etrion 5 LLC, owned 30% by Tamagawa, 60% by Etrion, and 10% by Hitachi High-Technologies Corporation. The EPC will be operated by Hitachi High-Technologies, and capital expenditures of JPY3.4bn will be covered by investments from the LLC and project financing from Sumitomo Mitsui Trust Bank Ltd.

According to the company, the alliance with Etrion Japan enables Tamagawa to expand valuation for business development, including fund procurement, and to build large solar parks. As of June 2016, the company estimates that there are latent solar power generation projects—much like the Misawa plant—equivalent to about 100MW of output. By being involved in development of latent projects over the medium term, Tamagawa aims to gain development contracting fees. In June 2016, with the intent of establishing a proprietary project financing system for the development of renewable energy power generation plants, the company newly established a project financing office.

Etrion Japan KK is part of the Etrion Group under parent company Etrion Corporation, which constructs, owns, and operates full-scale solar power plants. It is an independent power producer (IPP) with solar power plants totaling 139MW in output in Italy and Chile, and is listed on the Toronto and Stockholm stock exchanges. Etrion is also a part of the Lundin Group, an acclaimed resource group in the oil, gas, mining, and energy sectors. The

Lundin Group is composed of 11 group companies and has operations in 25 countries worldwide. The top shareholder in Etrion is the Lundin Group, owning about 24%. Etrion has become the most significant renewable energy company within the group.

Misawa power plant details

Solar parks	Location	Feed-in-tariff (JPY /kWh)	Output (MW)	Area (sqm)	Operation start	Investment (JPYbn)	Sales (JPYmn; Shared Research estimates)
Misawa	Misawa, Aomori	36.0	9.5	153,000	FY03/17	3.4	390

Source: Shared Research based on company data
Shared Research estimate for sales, based on annual electricity sales of 1,200MWh per 1MW solar power facility.

Fundraising in solar power generation business

For the five years from FY03/08 Tamagawa posted back-to-back net losses, making debt funding difficult. To launch the Shimonoseki solar power plant, it raised JPY901mn (assuming all options exercised) via share placement and share option issuance in January 2013. The company is trying different operating models.

According to Tamagawa Holdings, it has an increasing number of financing options, owing to its three consecutive years of profitability as of FY03/15, and earnings results at the three solar power plants.

The 1.9MW solar power plant in Tateyama, Chiba Prefecture, has been operating since February 2015. For solar power generation systems being used at this facility, the company has entered into a lease agreement with Ricoh Leasing in the amount of JPY901mn.

Strengths and weaknesses

Strengths

- **Benefiting from stable demand the electronics business has regained competitiveness**: The company said it has regained its competitive edge in high-frequency devices. Selling higher value-added products via original equipment manufacturer (OEM) channels and measures to cope with new product development and public (defense and disaster prevention) demand has borne fruit. In public demand a preference for Japanese suppliers lends Tamagawa an advantage over overseas rivals. Restarting R&D and selling under its own brand should enhance earnings.
- **Finished and pending projects in solar power:** Building up its solar power generation business from scratch, Tamagawa has acquired experience in everything from solar panel installation to project financing. As of September 2016, the company was in discussions to build more utility-scale solar power plants with combined generating capacity of roughly 248MW, as well as several more geothermal power plants with combined capacity of 1,130kW (which would generate about the same amount of electricity as a 9.0MW solar power plant). With the completion of these projects the company expects to see further growth in revenues and earnings.
- **Entrepreneurial management wants to rekindle investor trust:** Shared Research flags a resolve to get it right this time. It has entrepreneurial energy although is aware of investor skepticism. Liaising with investors and partners, Tamagawa wants to rebuild its image. According to the company, investors appreciate its full disclosure.

Weaknesses

- **Reputation**: Tamagawa has a history of business failures. CEO Toru Masuzawa is the subject of controversy. Masuzawa has been a defendant in a number of civil lawsuits relating to his time at J Bridge, but asserts that he was a victim of circumstance, and will rebuild his reputation and prove his management acumen. In addition to developing procedures to deal with reputational risk, in February 2014, the company established a compliance committee, and contracts with an outside legal firm for advisory services.
- **Shortage of manpower in Renewable energy-related business**: The renewable energy-related businesses had a staff of 11 as of September 2016. The complexity of projects requires personnel with high entrepreneurship, strong motivation and expansive knowledge from fundraising to electrical engineering. However, efforts to hire appropriate personnel quickly may block sound corporate growth. Considering the downtrend in the feed-in-tariffs of renewable energy and limited business opportunities, this lack of human resources is concerning.
- **Potential rate cuts for fixed-rate feed-in tariffs**: The fixed FIT rate has been lowered each consecutive year, and it is likely that demand for solar power generation construction will decline in the medium term and that the expected profitability of new solar parks will decrease. According to the company, it will combat these issues by improving power conversion efficiency of its solar cells and other components in an effort to continue providing benefits to consumers. Tamagawa is also developing businesses using renewable energy sources other than solar power.

Group companies

At the end-June 2016, the group comprised Tamagawa Holdings Co., Ltd. and 14 consolidated subsidiaries.

- Tamagawa Electronics Co., Ltd. (100%): Electronic and Communication Device Business.
- Tamagawa Electronics Vietnam Co., Ltd. (100%): subsidiary of Tamagawa Electronics, manufacture and sale of components for communication devices.
- Tamagawa Energy Co., Ltd. (100%): Renewable Energy System Sales Business.
- GP Energy Co., Ltd., and other GP Energy companies (all 100%): Solar Power Plant Business, Geothermal Power Plant Business.

Market and value chain

Market overview

Wireless telecoms infrastructure

Smartphones and tablets are revolutionizing the wireless telecoms market. Smartphones generate 10-20x as much data traffic as traditional mobile phones. As bandwidth-hungry content mushrooms, data volumes swell. Dealing with the traffic surge is a pressing issue, creating demand for network infrastructure that can handle serious data volumes and speeds. Telecoms operators have rolled out high-speed mobile services like LTE and WiMAX. Spectrum reallocation is helping too. There is also a nationwide trend toward data offloading—using wi-fi and the like to funnel data through the fixed-line network.

Mobile data traffic in Japan is accelerating rapidly alongside the proliferation of smartphones. However, according to projections published in the Cisco Visual Networking Index, this trend is likely to continue, and mobile data traffic within Japan during 2019 is projected to reach 1.5 exabytes per month, an increase of 5.3x versus the 282 petabytes per month seen during 2014. It remains uncertain whether network infrastructure will keep up.

Capex trends at telecoms carriers

Actual investment trends at telecoms carriers are on an upward swing amid efforts to expand capacity and improve service, with focus on new technologies and new frequency bands. For example, in investment for LTE—the latest communications technology—the number of LTE base stations operated by NTT DoCoMo, Inc. (TSE1: 9437) was about 24,400 as of end March 2013, but this number grew to 55,300 at end March 2014, 97,400 at end March 2015, and 138,100 LTE base stations at end March 2016.

As the nationwide rollout of LTE is generally complete, capex at the various carriers declined during FY03/16. Total capex by NTT DoCoMo during FY03/16 was down 10.1% YoY, to JPY595.2bn, and LTE-related capex was JPY365.4bn, also down 10.2%. Mobile telecom capex at KDDI during FY03/16 was JPY365.4bn, down 29.5% YoY, with a particular decline in LTE-related investment. However, capex ahead of the rollout of next-generation LTE-advanced technology is projected to increase from FY03/17 onward, as equipment must be updated to support new frequency bands.

Capex by company (JPYbn)	FY03/08 Act.	FY03/09 Act.	FY03/10 Act.	FY03/11 Act.	FY03/12 Act.	FY03/13 Act.	FY03/14 Act.	FY03/15 Act.	FY03/16 Act.	FY03/17 Planned
NTT Docomo	758.7	737.6	686.5	668.5	726.8	753.7	703.1	661.8	595.2	585.0
YoY	-18.8%	-2.8%	-6.9%	-2.6%	8.7%	3.7%	-6.7%	-5.9%	-10.1%	-1.7%
LTE	-	-	-	26.0	92.3	218.9	331.1	406.7	365.4	339.0
YoY	-	-	-	-	255.0%	137.2%	51.3%	22.8%	-10.2%	-7.2%
KDDI	501.3	575.1	518.0	441.8	421.6	467.0	571.8	667.7	531.4	560.0
YoY	20.2%	14.7%	-9.9%	-14.7%	-4.6%	10.8%	22.4%	-	-20.4%	5.4%
Mobile	391.7	432.1	376.8	338.7	304.2	338.2	374.0	479.1	338.0	350.0
YoY	19.1%	10.3%	-12.8%	-10.1%	-10.2%	11.2%	10.6%	-	-29.5%	3.6%
Others	109.6	140.6	138.7	103.1	115.6	128.8	197.8	188.6	193.4	210.0
YoY	24.5%	28.3%	-1.4%	-25.7%	12.1%	11.4%	53.6%	-	2.5%	8.6%
SoftBank	293.7	259.1	222.9	392.6	474.1	631.6	712.5	583.7	412.6	-
YoY	-24.7%	-11.8%	-14.0%	76.1%	20.8%	33.2%	12.8%	-18.1%	-29.3%	-

Source: Shared Research based on data from respective companies
Note: Capex at KDDI from FY03/15 onward includes portions consolidated from UQ Communications.
Note: SoftBank figures only include group telecoms companies within Japan

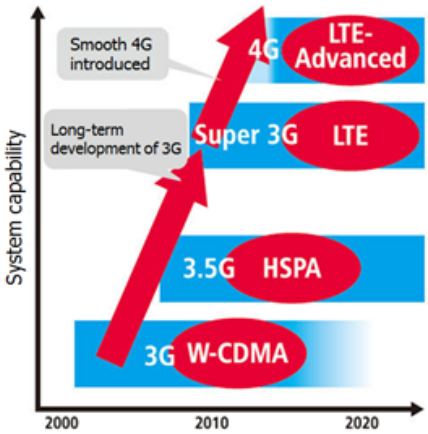
LTE Advanced

NTT DoCoMo, Inc. (TSE1: 9437) launched a new telecoms service in March 2015 using LTE-Advanced, the next-generation mobile telecoms standard following LTE, paving the way for speedier data transmission. NTT DoCoMo began with urban areas in 22 prefectures and expanded the service to major cities nationwide during FY2015. KDDI also began providing its LTE-Advanced service during FY2015.

LTE Advanced is a fourth generation mobile telecoms standard recognized by the International Telecommunication Union (ITU)*, offering higher speeds than LTE which has spread globally. Under development, it aims at providing speeds of up to 1Gbps when the user is stationary and up to 100Mbps when moving on a train.

* In mobile and electronic telecoms the ITU aims to establish standards and regulations between countries. Main activities: standardization, allocation of mobile spectrum and coordinating connections between countries to enable international telephone calls.

Evolution of Telecommunications Technology



Source: Shared Research based on various data

Faster speeds under LTE Advanced will be attained by adding technical elements to existing LTE technology. Two elements are key: upgrading the multiple-input and multiple-output (MIMO) technology used in spatial multiplexing, and carrier aggregation to enable bandwidth expansion.

> MIMO technology is used to increase the volume of data that can be handled at any one time by sending different data packets and separating the mixed signals once received. In addition to the currently prescribed 2x2 MIMO and 4x4 MIMO, under LTE Advanced it will be possible to implement 8x8 MIMO using eight pairs of antennas. The upshot: higher maximum transmission speeds. Under current LTE technology where MIMO is not installed on the uplink side (sending data from the mobile device) it is handled by 2x2 MIMO and 4x4 MIMO.

It is Shared Research's understanding that NTT DoCoMo's current LTE network is composed mostly of 3G base stations that have been updated with LTE components. In contrast, new frequency allocations are planned for the introduction of LTE Advanced, and this will require changes to base stations, including the antennas. In the long term, it is reasonable to think that demand for capital investment in mobile telecom equipment will increase, with NTT DoCoMo leading the way for implementation of LTE Advanced.

New frequency bands for LTE-Advanced

In December 2014, the Ministry of Internal Affairs and Communications announced the allocation of 3.5GHz bandwidth for the LTE-Advanced 4G mobile communications system to three companies: NTT DoCoMo, KDDI and SoftBank Mobile. KDDI plans to begin service in the 3,520–3,560MHz band, NTT DoCoMo plans on 3,480–3,520MHz, and SoftBank Mobile on 3,560–3,600MHz. According to documentation submitted to the Ministry of Internal Affairs and Communications by each company, NTT DoCoMo plans to begin service in October 2016, KDDI in June 2016, and SoftBank Mobile in December 2016.

Solar power market

Japan's policies to promote solar power

The Act on Special Measures Concerning Procurement of Renewable Electric Energy by Operators of Electric Utilities (abbreviated to FIT Act) was enacted in August 2011 and implemented in July 2012, and became fully eligible for the FIT scheme.

Feed-in Tariff (FIT) scheme

Under the FIT scheme, to promote the use of renewables, electric utilities are required to buy all the power generated by five types of renewable energy sources, including solar and wind. Solar power was popular in Spain and Germany owing to a similar system. A high tariff is designed to stimulate the development of renewables. As of May 2016, surplus power from solar generated from sub 10kW systems is bought under FIT and all power from solar power generated from systems over 10kW is bought under FIT.

For less than 10kW solar power generated systems, the FIT scheme is applied, and surplus solar power generated by households is sold to electric utility companies. When the scheme was launched in 2009, the feed-in tariff for surplus power was JPY48/kWh

(including tax). The tariff remains fixed for 10 years from installation of the solar power system. The scheme envisages annually lowering the tariff for newly installed generating capacity. For FY2016 (from April 2016 to March 2017), the FIT for new installations was JPY31/kWh (for facilities not obliged to install output control equipment, excluding tax), JPY33/kWh (for facilities obliged to install output control equipment, excluding tax), JPY27/kWh (for facilities combining multiple systems, such as solar power generation, residential fuel cells, and gas engine power generation; including tax), and JPY29/kWh (for facilities that are required to have equipment that limits output; including tax).

> Installation of output control equipment is obliged at solar power facilities whose applications for grid connection contracts are approved on April 1, 2015 and later in regions related to supply-and-demand control plans of Hokkaido Electric Power Co., Inc., Tohoku Electric Power Co., Inc., Hokuriku Electric Power Company, Chugoku Electric Power Co., Inc., Shikoku Electric Power Co., Inc., Kyushu Electric Power Co., Inc., and Okinawa Electric Power Company, Incorporated.

Separate from the surplus power FIT scheme (net metering), a different scheme covering all power generated by a renewable electricity producer has also been established. This scheme enables producers to sell all power generated regardless of their own consumption. In Japan, a FIT scheme for over 10kW capacity was launched in July 2012. FIT tariff rates for 2012 were JPY40 (excluding tax) per kWh, and power companies are required to purchase power at this rate for 20 years. Prices have since been pushed down, with the rate being JPY36 (excluding tax) per kWh in 2013 to JPY32 (excluding tax) per kWh in 2014. In 2015, the purchase prices are JPY29 (excluding tax) per kWh for contracts between FIT-certified facilities and power utilities struck by June 2015 and JPY27 (excluding tax) per kWh for contracts done in July and later. The figure was JPY24 (excluding tax) during 2016.

The tariff and purchase period set under the FIT schemes are set each year by METI before the start of the financial year. The minister is required to take into account the opinions of a neutral, third-party committee (Feed-in Tariff Calculation Committee), which conducts public deliberations.

Revised FIT Act passed in May 2016

Revisions to the FIT Act were passed by the Diet in May 2016, and the fixed-price purchasing scheme for renewable energy will undergo changes from April 2017. It is Shared Research's understanding that the revisions to take place from April 2017 onward that will have an impact on the company's operations are changes to the methods employed to determine the purchase price of power, and changes to approval procedures for power generation equipment.

Changes to methods employed to determine prices

Prior to the revisions, the purchase price was fixed as of the time the solar power generation facilities were approved, and power would subsequently be purchased at that price for a fixed period, typically between 10 to 20 years.

After the revisions, for industrial power generation with capacity of 10kW or more in generating capacity will have the purchase price revised on an annual basis, and for large-scale solar power generation plants with high capacity, a bidding system will be introduced. This is to create conditions such as purchase volume and price limits on solar power generation, causing solar power generation companies to request a purchase price and bid on power generation output, ultimately allowing for companies with lower prices to win the auction and receive approval for the purchase system.

Changes to approval procedures for power generation equipment

Under the pre-revision FIT, the purchase price for power relied solely on the pricing that was obtained when approval was granted for the equipment. As a result, some mega solar providers received approval in the early years of the program—when the FIT price was JPY40/kWh (excluding tax)—but have yet to actually build any facilities.

After the revision in April 2017, even companies that have received approval will, in principle, lose their approvals if they are unable to enter into connection contracts with power companies (including contracts for payment of construction costs) by March 31, 2017.

Solar power operators to have difficulty in forecasting profitability due to output curtailment

In September 2014, electric power companies suspended approvals of applications for grid connection by operators of (non-residential) solar power facilities. The suspension came as the utilities were concerned over possible disruption to stable supply of electricity as expansion of approved solar power generating facilities may disturb the supply-demand balance at a time when the burden of electricity demand remains light.

As a measure to cope with the situation, where some utilities had suspended acceptance of applications for grid connection by operators of renewable energy facilities, the Agency for Natural Resources and Energy (ANRE) in January 2015 decided to revise part of the Act on Special Measures Concerning Procurement of Electricity from Renewable Energy Sources by Electricity Utilities (the "Renewable Energy Act") and renew the operation system for the FIT scheme under new output control rules.

After the enforcement of revised ministerial ordinances (in January 2015 and later), solar power facilities calling for grid connection are obliged to restrict output when needed and install equipment to curtail output when relevant utilities require to do so.

Shared Research recognizes that the extended coverage of the curtailment of solar power purchases under the revised ordinances make it difficult for operators of solar power plants to forecast volumes, revenues and profitability of electricity to be sold by facilities that newly apply for grid connection.

Historical performance

Q3 FY03/17 results

▷ Sales: JPY2.5bn (-24.0% YoY)

▷ Operating loss: JPY43mn (operating loss of JPY90mn in Q3 FY03/16)

▷ Recurring loss: JPY103mn (recurring loss of JPY138mn in Q3 FY03/16)

▷ Net loss*: JPY88mn (net loss of JPY180mn in Q3 FY03/16)

*Net loss refers to net loss attributable to parent company's shareholders.

All segments posted profits, except for the Geothermal Power Plant business, in which the company is preparing to begin operation.

Electronic and Communication Device

▷ Orders: JPY2.0bn (+32.7% YoY)

▷ Sales: JPY1.5bn (+6.1% YoY)

▷ Operating profit: JPY58mn (operating loss of JPY102mn in Q3 FY03/16)

Mobile telecom providers restrained capital investment on base stations, leading to a drop in demand; the company focused on increasing order flows from the public and government sectors. Sales in the mobile-telecom sector were JPY371mn (+12.2% YoY), while government sector sales were JPY358mn (-25.1% YoY). Other sales (public, disaster prevention, and measuring instruments) were JPY745mn (-28.4% YoY). Profits rose in tandem with an increase in overall sales and improved profit margins. The company made efforts to raise operational efficiency and reduce costs. Sales of the company's own products, which are relatively more profitable, also increased, accounting for 38.0% of the segment's sales (23.4% in Q3 FY03/16). Local procurement ratio at subsidiary Tamagawa Electronics Vietnam Co., Ltd. rose to 80% and contributed to reduction in CoGS.

Major initiatives undertaken in cumulative Q3 FY03/17 were as follows:

- While demand fell in the mobile-telecom sector, improvements made in price competitiveness, thanks to increased local procurement at Tamagawa Electronics Vietnam and lowered CoGS, led to a rise in orders and sales of products related to 4G base stations.
- In the area of 5G mobile telecoms equipment, the company pushed ahead with development work on 5G devices and equipment for field testing with the aim of a full-scale commercial rollout in 2020. The company expects to begin shipping the test equipment around FY03/18, and, toward this end, is in the process of developing equipment to field test the reliability of next-generation mobile telecoms-use semiconductors and sensors for gauging the performance of antennas. The company has completed the development of front-end analog modules to handle millimeter and sub-millimeter waves (a part connected directly below the antenna to transmit signals) and begun to prepare for a product launch in March 2018. The company is also developing multi-wave duplexers capable of handling signals on multiple wavelengths, and next-generation high-efficiency power amplifiers.
- In the government sector, sales declined YoY during the cumulative Q3 period. However, the company said that sales were expected to recover in FY03/18 since demand was on the mend and that it has seen a growing number of inquiries about possible orders related to new projects.
- In the public sector, disaster prevention, and measuring instruments areas, the company won orders for its commercial wireless optical transmission system for use in airports (Narita Airport) and in next-generation weather forecasting equipment. The company also began to approach airports other than Narita Airport to drum up sales.
- The company won an order from Toshiba for a subsystem used in next-generation weather forecasting equipment. The new weather forecasting equipment is being developed under Japan's Strategy Innovation Promotion Program as part of an initiative to promote "Enhancement of Societal Resiliency against Natural Disasters" that would improve forecasting of heavy rains and tornados and thereby help the government better prepare for natural disasters. The project team is now working on

a next-generation weather radar that will allow forecasters to make quick and accurate predictions of meteorological conditions, such as heavy cloudbursts and tornados, and create a system to quickly convey the information to local governments and other interested parties.

- In the area of electric noise resistance testing equipment in the automotive sector, the company developed a new product that converts the signals from the noise resistance test equipment into optical signals that could be sent via fiber-optic cables, thereby enhancing the sensitivity of the test equipment and expanding the range of signals that could be measured. The company supplied a prototype to a major automaker during cumulative Q3 FY03/17. The company also said that it had received inquiries about this product from a certain Tier 1 automaker.
- Testing equipment for power semiconductors saw an expansion in orders as the company targets FY03/17 sales of JPY511mn (2.1x YoY).

Renewable Energy System Sales

- ▷ Orders: JPY983mn (-73.7% YoY)
- ▷ Sales: JPY891mn (-51.1% YoY)
- ▷ Operating profit: JPY34mn (operating loss of JPY28mn in Q3 FY03/16)

Sales in this segment during cumulative Q3 FY03/16 only reflected equipment sales. Meanwhile, in the latest cumulative Q3 period, sales reflected revenues from installation work at three different solar power facilities (with combined power generating capacity of roughly 1.2MW), that included a profitable contract for operation and maintenance, which significantly contributed to earnings. The company also received development contract fees in connection with the development of Misawa plant (power generating capacity of roughly 9.5MW).

Major initiatives undertaken in cumulative Q3 FY03/17 were as follows:

- The company plans to pursue joint projects to secure the financing needed for development of solar power plants with output capacity of at least 10.0MW. As of February 2017, the company was considering a project following the Misawa power plant project (joint development with Etrion Japan), that would allow it to continue earning development contract fees in FY03/18.
- In the area of small-scale wind power facilities, in March 2016 the company erected its own small-scale wind turbine (capacity 19.5kW) on some extra land at its Tateyama solar park. For small-scale wind turbines with power generating capacity of 20kW or less, the feed-in tariff is fixed at JPY55 per kWh during the 20-year purchase period (compared with JPY24 per kWh for solar systems capable of generating 10kW or more). Wind turbines also have an advantage over solar power arrays of being able to generate power more hours every day because, unlike solar panels, they can generate electricity at night. The company, as of February 2017, obtained seven permits to build small-scale wind power facilities.

The Agency of Natural Resources and Energy sent out a cautionary notice in November 2016 about the transition to a new feed-in-tariff system. The notice set the deadline for submitting a notice of minor changes to the Bureau of Economy, Trade and Industry—necessary for acquisition or sale of a power plant by March 2017—at January 20, 2017. This deadline made it difficult for the company to carry out related acquisition and sales activities as originally planned.

As for the solar power plant in Kasumigaura, Ibaraki Prefecture, scheduled for connection in late March 2017, the company had initially planned to sell the plant to an outside customer for a profit through consolidated subsidiary Tamagawa Energy. However, the company later decided to operate the plant within the group instead of selling it for short-term profit, thinking that owning and operating the plant would generate steady cash flow for 20 years and help strengthen the earnings structure and finances of the company for the medium to long term.

Solar Power Plant Operations

- ▷ Sales: JPY173mn (-4.1% YoY)

▷ Operating profit: JPY56mn (-0.7% YoY)

The segment booked electricity sales from mega solar power plants in Shimonoseki, Tateyama, and Sodegaura.

Tamagawa is considering raising output capacity at solar power plants in Shimonoseki, Tateyama, and Sodegaura by building additional power generation facilities. According to the company, in cases where the output capacity of a solar power plant is increased through such additions, a feed-in-tariff rate equivalent to that of the preexisting facilities will also be applied to the added facilities. The company said that it was making steady progress toward the medium-term goal of achieving total capacity of 20.0MW in FY03/20.

Tamagawa Holdings solar power plants

Solar parks	Location	Feed-in-tariff (JPY/kWh)	Output (MW)	Operation start	Sales (JPYmn; Shared Research estimates)
Shimonoseki	Shimonoseki, Yamaguchi	40.0	1.6MW	Q1 FY03/13	77
Tateyama mega solar	Tateyama, Chiba	40.0	1.9MW	Q4 FY03/15	91
Sodegaura mega solar	Sodegaura, Chiba	36.0	1.3MW	Q4 FY03/15	56
Noboribetsu	Noboribetsu, Hokkaido	40.0	2.0MW	Q4 FY03/17	96
Kasumigaura mega solar	Kasumigaura, Ibaraki	36.0	2.4MW	Q4 FY03/17	150
Misawa	Misawa, Aomori	36.0	3.0MW	Q4 FY03/18	130
Goto	Goto, Nagasaki	36.0	5.3MW	Q1 FY03/19	250
Minamishimabara	Minamishimabara, Nagasaki	40.0	1.0MW	Q2 FY03/19	48
Total	-	-	18.6MW	-	802

Source: Shared Research based on company data
Shared Research estimate for sales, based on annual electricity sales of 1,200MWh per 1MW solar power facility.

Geothermal Power Plant Operations

No sales or expenses were booked, as the company prepares to start operations of geothermal power plants.

1H FY03/17 results

▷ Sales: JPY1.8bn (+63.7% YoY)

▷ Operating profit: JPY3mn (operating loss of JPY161mn in 1H FY03/16)

▷ Recurring profit: JPY43mn (recurring loss of JPY190mn in 1H FY03/16)

▷ Net loss*: JPY4mn (net loss of JPY249mn in 1H FY03/16)

*Net loss refers to net loss attributable to parent company shareholders.

Electronic and Communication Device Business

▷ Orders: JPY1.3bn (+34.0% YoY)

▷ Sales: JPY948mn (+0.2% YoY)

▷ Operating profit: JPY6mn (operating loss of JPY90mn in 1H FY03/16)

Amid cutbacks in capital spending on base stations by mobile telecom service providers and falling demand for telecom equipment, the company focused on increasing its order flow from the government and public sector institutions. Overall sales were basically flat versus a year earlier but varied by industry, with mobile telecoms-related sales of JPY202mn (-3.0% YoY), sales to the government of JPY254mn (-16.8% YoY), and other sales (public sector, disaster prevention, measuring instruments) of

JPY491mn (+13.8% YoY). Along with the modest top-line growth, the Electronic and Communication Device segment was also able to move back into the black with the help of operational streamlining and concerted cost-cutting.

Major initiatives undertaken during 1H FY03/17 were as follows:

- Amid waning demand for mobile telecoms-related equipment, the company's subsidiary in Vietnam, Tamagawa Electronics Vietnam Co., Ltd., worked to increase local procurement in an effort to lower production costs and increase cost competitiveness. With the help of improved quality and cost competitiveness, the company is looking to increase product sales in overseas markets in 2H.
- In the area of 5G mobile telecoms equipment, the company pushed ahead with development work on 5G devices and equipment for field testing with the aim of a full-scale commercial rollout in 2020. The company expects to begin shipping the test equipment around FY03/18 and, toward this end, is in the process of developing equipment to field test the reliability of next-generation mobile telecoms-use semiconductors and sensors for gauging the performance of antennas. Devices under development include front-end analog modules to handle millimeter and sub-millimeter waves (a part connected directly below the antenna to transmit signals), multi-wave duplexers capable of handling signals on multiple wavelengths, and next-generation high-efficiency power amplifiers.
- In the government sector, the company says demand is on the mend and that it has seen a growing number of inquiries about possible orders related to new projects since the start of 2H.
- In the public sector, disaster prevention, and measuring instruments areas, the company won orders for its commercial wireless optical transmission system for use in airports and subways. It also reports that orders for its testing equipment for power semiconductors have been growing rapidly and it expects sales in this area to double from last year.
- New products in the public sector, disaster prevention, and measuring instruments areas include a subsystem used in next-generation weather forecasting equipment, for which the company booked an order from Toshiba in November 2016. The new weather forecasting equipment is being developed under Japan's Strategy Innovation Promotion Program as part of an initiative to promote “Enhancement of Societal Resiliency against Natural Disasters” that would improve forecasting of heavy rains and tornados and thereby help the government be better prepared to handle natural disasters. Working together with Osaka University and the Osaka prefectural government, Toshiba began field-testing a system designed to detect signs of pending cloudbursts in July 2016. Having completed the field tests, the project team is now working on developing a next-generation weather radar that will allow weather forecasters to make quick and accurate predictions of meteorological conditions, such as heavy cloudbursts and tornados, and create a system that will quickly convey the information to local governments and other interested parties.

Renewable Energy System Sales Business

- ▷ Orders: JPY778mn (-41.6% YoY)
- ▷ Sales: JPY735mn (27x 1H FY03/16)
- ▷ Operating profit: JPY81mn (operating loss of JPY109mn in 1H FY03/16)

Although major sales projects tend to be concentrated in 2H, focusing on sales promotions led to higher sales and profits. At this time last year the sales total for this segment reflected only sales of equipment. In contrast, the sales in 1H this year also reflect revenues from the installation work done at three different solar power facilities (with combined power generating capacity of roughly 1.2MW). Because the installation work also came with a profitable contract for operation and maintenance, it also made a large addition to earnings. The company reported it also received additional compensation as a contractor for the development work it had done in connection with the Misawa plant (power generating capacity of roughly 9.5MW).

In the area of small-scale wind power equipment, in March 2016 the company erected its own small-scale wind turbine (capacity 19.5kW) on some extra land at its Tateyama solar park. For small-scale wind turbines like this (with power generating capacity of 20kW or less), the feed-in tariff is fixed at JPY55 per kWh versus JPY24 per kWh for solar systems capable of generating 10kW or more. Wind turbines also have an advantage over solar power arrays of being able to generate power more hours every day because, unlike solar panels, they can generate electricity at night.

The company reports that it has fielded a large number of inquiries about its small-scale wind turbines and had filed a total of 46 applications for construction of wind-power generation systems using small-scale turbines as of September 2016, and expects to receive permits for a total of 90 such projects by the end of FY03/17.

Solar Power Plant Business

▷ Sales: JPY131mn (-2.8% YoY)

▷ Operating profit: JPY55mn (+7.4% YoY)

The segment booked electricity sales from mega solar power plants in Shimonoseki, Tateyama, and Sodegaura

Geothermal Power Plant Business

No sales or expenses were booked, as the company prepares to start operations of geothermal power plants.

Other: Misawa power plant (joint venture with Etrion Japan)

To secure the financing needed to develop large-scale solar power plants (capable of generating at least 10.0MW), the company intends to enter into joint ventures. One such joint venture is Etrion Energy 5 LLC, a special-purpose company established jointly by Etrion Japan and Tamagawa Holdings (30%) in June 2015 for the purpose of building and operating a utility-scale solar power plant in Misawa, Aomori Prefecture. The Misawa plant was scheduled to begin operations in February 2017. With total power generating capacity of about 9.5MW (of which Tamagawa will hold the rights to 3.0MW), the Misawa solar power plant is expected to generate about JPY390mn per year in gross revenues. Tamagawa expects the Misawa plant to start contributing to earnings from 2H FY03/17 through equity-method investment income.

The Misawa solar power plant will be built and operated by Etrion Energy 5 LLC, in which Tamagawa Holdings has a 30% stake, Etrion Japan a 60% stake, and Hitachi High-Technologies a 10% stake. However, Hitachi High-Technologies will be the company that actually undertakes the engineering, procurement, and construction for the project. Of the JPY3.4bn in funding needed to complete the project, the equity portion will be funded by Tamagawa Holdings, Etrion Japan, and Hitachi High-Technologies, and the debt portion will be funded by loans from Sumitomo Mitsui Trust Bank.

As a participant of this mega solar power plant joint development project, in addition to revenue from selling power, the company as the project's developer has received compensation for disposal of land ownership rights and the preparation of requisite legal documentation.

By undertaking this project as part of a joint venture rather than alone, Tamagawa is limiting the amount of capital it has to commit as well as diversifying risk and generating incidental income (compensation for its role as the project's developer). The joint venture is also helping Tamagawa improve its capital efficiency. In fact, Shared Research estimates that Tamagawa will also generate a 16.0% internal rate of return (IRR) on the sales from its 3MW of generating capacity, much higher than the IRR of 8.2% the company would earn if it built the solar power plant on its own.

Q1 FY03/17 results

▷ Sales: JPY476mn (-30.2% YoY)

▷ Operating loss: JPY104mn (operating loss of JPY22mn in Q1 FY03/16)

▷ Recurring loss: JPY129mn (recurring loss of JPY32mn in Q1 FY03/16)

▷ Net loss*: JPY90mn (net loss of JPY38mn in Q1 FY03/16)

(*Net loss refers to net loss attributable to parent company shareholders.)

Electronic and Communication Device Business

▷ Orders: JPY481mn (+5.9% YoY)

▷ Sales: JPY402mn (-32.4% YoY)

▷ Operating loss: JPY22mn (operating profit of JPY5mn in Q1 FY03/16)

Mobile telecom providers continued to restrain capital investment on base stations from Q4 of the previous year, leading to a drop in both segment sales and profit.

Renewable Energy System Sales Business

▷ Orders: JPY127mn (-36.9% YoY)

▷ Sales: JPY8mn (-56.4% YoY)

▷ Operating loss: JPY64mn (operating loss of JPY46mn in Q1 FY03/16)

As major sales projects are concentrated in 2H, the segment saw reductions in sales and profit.

Solar Power Plant Business

▷ Sales: JPY67mn (-5.0% YoY)

▷ Operating profit: JPY29mn (-1.9% YoY)

The segment booked electricity sales from mega solar power plants in Shimonoseki, Tateyama, and Sodegaura.

Geothermal Power Plant Business

No sales or expenses were booked, as the company is still preparing to start operations of geothermal power plants.

FY03/16 results

▷ Sales: JPY7.3bn (+42.5% YoY)

▷ Operating profit: JPY280mn (-47.4% YoY)

▷ Recurring profit: JPY211mn (-58.9% YoY)

▷ Net income: JPY165mn (-61.3% YoY)

(*Net income refers to net income attributable to parent company shareholders.)

Electronic and Communication Device Business

▷ Orders: JPY2.2bn (-33.1% YoY)

▷ Sales: JPY2.1bn (-38.1% YoY)

▷ Operating loss: JPY12mn (operating profit of JPY467 in FY03/15)

Mobile telecom providers changed their construction plans for base stations and restrained capital investment, leading to a drop in both segment earnings and profits. In other areas (public sector, disaster prevention, measurement, etc.), orders were acquired in the wireless transport (railway and airports) sector for fiber-optic products for use in airport facilities, and in Tamagawa-manufactured products, orders were favorable for testing equipment for power semiconductors.

A breakdown of sales is as follows:

▷ Mobile telecoms: JPY486mn (-65.4% YoY)

▷ Defense: JPY688mn (-32.9%)

▷ Other (public sector, disaster prevention, measurement, etc.) JPY934mn (-3.6%)

Renewable Energy System Sales Business

- ▷ Orders: JPY4.9bn (+187.9% YoY)
- ▷ Sales: JPY5.0bn (+176.4% YoY)
- ▷ Operating profit: JPY287mn (+155.9% YoY)

The sale of equipment for solar power plants resulted in both sales and profits rising YoY.

Solar Power Plant Business

- ▷ Sales: JPY230mn (+161.8% YoY)
- ▷ Operating profit: JPY57mn (+155.2% YoY)

Mega solar power plants in Shimonoseki, Tateyama, and Sodegaura sold electricity in line with forecasts.

Geothermal Power Plant Business

No sales were recorded, and operating loss was JPY20mn due to various expenses.

FY03/15 results

- ▷ Sales: JPY5.1bn (+22.1% YoY)
- ▷ Operating profit: JPY531mn (+11.3%)
- ▷ Recurring profit: JPY514mn (+7.5%)
- ▷ Net income: JPY427mn (-2.2%)

Electronic and Communication Device Business

- ▷ Orders: JPY3.2bn (-7.8% YoY)
- ▷ Sales: JPY3.4bn (+5.3%)
- ▷ Operating profit: JPY467mn (-2.7%)

Mobile telecom providers increased their investments in wireless facilities at the beginning of 2H. However, they changed construction plans during Q4.

The company sought to win new orders in the area of 3.9-generation mobile facilities, defense facilities, and public wireless facilities. As a new business area, the company began to sell testing equipment for power semiconductors in June 2014. Since Tamagawa has secured orders in the new business, it expects to report sales in FY03/16. The company also installed a new high-definition monitoring system essential for the safe and smooth management of its group solar-power plants. Sales of the company's own products totaled JPY1.4bn (+22.5% YoY), accounting for 40.4% in the segment.

Operating profit declined due to spending on research and development worth JPY239mn (JPY124mn in the previous year).

Segment profit after allocation of corporate costs and others was JPY420mn (-7.3% YoY), surpassing the initial target of JPY370mn. The company attributed the more profit than planned to a rise in sales of its own products, efficient procurement of materials due to the introduction of a core system, and disappearance of the cost to cope with defects.

Solar System Sales Business

- ▷ Orders: JPY1.7bn (+102.8% YoY)
- ▷ Sales: JPY1.8bn (+101.8%)

▷ Operating profit: JPY112mn (+118.6%)

The company streamlined its operations and expanded sales reach to all parts of the country.

The company started sales of solar power plant equipment. By selling 2.3MW equipment, it reported sales of JPY1.1bn.

Solar Power Plant Business

▷ Sales: JPY87mn (+70.7% YoY)

▷ Operating profit: JPY22mn (operating loss of JPY19mn a year earlier)

The Shimonoseki solar park, which operated for nine months in the previous year, was in full-year operation in FY03/15. Plants in Tateyama (1.9MW) and Sodegaura (1.3MW), both in Chiba Prefecture, began operations in February and March, respectively, of 2015.

Geothermal Power Plant Business

This segment was created during FY03/15. The company is preparing to start operations of geothermal power plants during FY03/16. No sales were recorded, and operating loss was zero.

FY03/14 results

Electronic and Communication Device Business

This segment saw mobile telecoms companies increase their capex spending on base stations and public expenditure increase for defense facilities and public wireless facilities. Orders received totaled JPY3.5bn (+7.3% YoY) and sales were JPY3.2bn (+2.5%). Specifically, sales in mobile telecoms were JPY1.4bn (-26.5%) due to a large-scale order that was completed in FY03/13 causing a relative decrease. Sales related to defense systems were JPY905mn (+79.6%).

According to the company, it is becoming increasingly adept at developing products in-house. As a result, sales of internally developed products were JPY1.3bn (+36.6% YoY).

Operating profit for the segment was JPY480mn (+28.1% YoY). In addition to the effects of increased revenue, the sales composition of internally developed products—which have relatively higher margins compared to other products in the segment—went up from 30% in FY03/13 to 35% in FY03/14.

Solar system sales Business

Orders for solar power systems have been increasing since the Act on Special Measures Concerning Procurement of Renewable Electric Energy by Operators of Electric Utilities (FIT Act—for feed-in tariffs) came into effect (August 2011). The company also worked to make its sales operations more efficient. Thus, orders received were JPY845mn (+27.3% YoY), sales were JPY890mn (+83.0%), and operating profit was JPY54mn (-5.5%).

Solar Power Plant Business

Sales of electricity began, following the completion of construction of the solar park in Shimonoseki, Yamaguchi Prefecture. The company booked sales revenue from the project from July 2013. However, other solar power projects required startup investment. In the end, sales were JPY52mn (there were no sales recorded for this segment the previous year), and the company made an operating loss of JPY20mn (against an operating loss of JPY12mn the previous year).

Income statement

Income statement (JPYmn)	FY03/07 Non-cons.	FY03/08 Cons.	FY03/09 Cons.	FY03/10 Cons.	FY03/11 Cons.	FY03/12 Cons.	FY03/13 Cons.	FY03/14 Cons.	FY03/15 Cons.	FY03/16 Cons.
Total sales	**3,114**	**4,012**	**4,299**	**2,803**	**2,640**	**3,106**	**3,672**	**4,171**	**5,095**	**7,260**
YoY	**22.1%**	**28.8%**	7.1%	-34.8%	-5.8%	17.7%	18.2%	13.6%	22.1%	42.5%
CoGS	2622	3274	3,348	2,412	2,314	2,516	2,623	2,973	3,616	5,710
Gross profit	**526**	**738**	**951**	**392**	**326**	**590**	**1,049**	**1,198**	**1,479**	**1,550**
GPM	16.9%	18.4%	22.1%	14.0%	12.3%	19.0%	28.6%	28.7%	29.0%	21.3%
SG&A expenses	457	620	1,020	619	612	619	675	721	947	1,270
SG&A-to-sales ratio	14.7%	15.5%	23.7%	22.1%	23.2%	19.9%	18.4%	17.3%	18.6%	17.5%
Operating profit	**69**	**118**	**-68**	**-227**	**-286**	**-30**	**373**	**477**	**531**	**280**
YoY	271.9%	71.0%	-	-	-	-	-	27.8%	11.3%	-47.4%
OPM	2.2%	2.9%	-1.6%	-8.1%	-10.8%	-1.0%	10.2%	11.4%	10.4%	3.9%
Non-operating income	42	49	45	16	18	14	19	9	8	16
Non-operating expenses	12	58	105	14	16	8	17	8	25	84
Recurring profit	**99**	**109**	**-128**	**-224**	**-284**	**-24**	**375**	**478**	**514**	**211**
YoY	226.7%	9.9%	-	-	-	-	-	27.6%	7.5%	-58.9%
RPM	3.2%	2.7%	-3.0%	-8.0%	-10.8%	-0.8%	10.2%	11.5%	10.1%	2.9%
Extraordinary gains	44	16	52	0	45	-	1	2	5	61
Extraordinary losses	3	492	341	346	109	7	0	0	0	3
Tax charges	2	39	-7	-1	3	6	36	44	92	104
Implied tax rate	2%	-11%	1.6%	0.1%	-0.8%	-20.9%	9.6%	9.1%	17.7%	38.6%
Net income	**138**	**-408**	**-408**	**-570**	**-351**	**-37**	**340**	**436**	**427**	**165**
YoY	-	-	-	-	-	-	-	28.5%	-2.2%	-61.3%
Net margin	4.4%	-10.2%	-9.5%	-20.3%	-13.3%	-1.2%	9.3%	10.5%	8.4%	2.3%

Source: Shared Research based on company data
Note: Figures may differ from company materials due to differences in rounding methods.

Historical forecast accuracy

Initial CE vs. Results (JPYmn)	FY03/07 Non-cons.	FY03/08 Cons.	FY03/09 Cons.	FY03/10 Cons.	FY03/11 Cons.	FY03/12 Cons.	FY03/13 Cons.	FY03/14 Cons.	FY03/15 Cons.	FY03/16 Cons.
Sales (Initial CE)	2,650	3,000	3,870	3,389	3,110	2,980	3,378	4,504	4,534	5,600-7,300
Sales (Results)	3,114	4,012	4,299	2,803	2,640	3,106	3,672	4,171	5,095	7,260
Initial CE vs. Results	**17.5%**	**33.7%**	**11.1%**	**-17.3%**	**-15.1%**	**4.2%**	**8.7%**	**-7.4%**	**12.4%**	**-**
Operating profit (Initial CE)	-	40	129	139	191	22	69	493	506	590-850
Operating profit (Results)	69	118	-68	-227	-286	-30	373	477	531	280
Initial CE vs. Results	**-**	**195.2%**	**-**	**-**	**-**	**-**	**441.1%**	**-3.2%**	**5.0%**	**-**
Recurring profit (Initial CE)	101	52	71	133	179	18	65	488	489	520-790
Recurring profit (Results)	99	109	-128	-224	-284	-24	375	478	514	211
Initial CE vs. Results	**-1.8%**	**109.5%**	**-**	**-**	**-**	**-**	**476.5%**	**-2.0%**	**5.1%**	**-**
Net income (Initial CE)	92	50	63	133	179	13	60	449	450	400-570
Net income (Results)	138	-408	-408	-570	-351	-37	340	436	427	165
Initial CE vs. Results	**50.3%**	**-**	**-**	**-**	**-**	**-**	**466.3%**	**-2.8%**	**-5.1%**	**-**

Source: Shared Research based on company data
Note: Figures may differ from company materials due to differences in rounding methods.

From FY03/09 through FY03/12 the company initially forecast profits every year but delivered a series of losses. However, in the absence of a solid profitability roadmap, results fell short of company forecasts.

Balance sheet

Balance sheet (JPYmn)	FY03/07 Non-cons.	FY03/08 Cons.	FY03/09 Cons.	FY03/10 Cons.	FY03/11 Cons.	FY03/12 Cons.	FY03/13 Cons.	FY03/14 Cons.	FY03/15 Cons.	FY03/16 Cons.
ASSETS										
Cash and equivalents	1,074	706	820	665	493	56	390	1,764	1,524	2,737
Marketable securities		256	-	-	-	-	-	-	-	-
Accounts receivable	1,343	2,046	1,033	915	663	864	1,345	1,112	1,377	985
Inventories	306	580	345	275	328	299	328	347	447	318
Other current assets	192	134	47	63	45	74	52	197	258	181
Total current assets	**2,915**	**3,722**	**2,245**	**1,918**	**1,530**	**1,293**	**2,114**	**3,421**	**3,606**	**4,221**
Buildings	186	174	162	132	94	80	87	114	130	157
Tools, furniture and fixtures	62	458	88	36	5	1	58	87	126	88
Machinery and equipment	3	20	2	1	1	0	22	430	1,458	1,407
Land	198	198	198	126	106	52	52	52	540	652
Construction in progress	-	-	-	-	-	-	346	35	156	159
Accumulated depreciation	973	1,142	1,151	997	959	899	884	908	966	966
Total tangible fixed assets	**453**	**855**	**451**	**295**	**205**	**133**	**564**	**718**	**2,410**	**2,464**
Investment securities	630	90	251	69	23	8	14	19	23	17
Other	156	7	16	20	7	9	13	19	131	152
Total other fixed assets	**786**	**97**	**267**	**89**	**30**	**18**	**27**	**38**	**154**	**169**
Software	17	301	25	25	-	-	1	19	88	77
Other	25	22	22	14	-	-	-	12	106	232
Total intangible assets	**42**	**323**	**47**	**39**	**-**	**-**	**1**	**31**	**194**	**309**
Total fixed assets	**1,281**	**1,275**	**765**	**423**	**235**	**150**	**593**	**788**	**2,759**	**2,942**
Total assets	**4,195**	**4,997**	**3,010**	**2,341**	**1,766**	**1,445**	**2,709**	**4,210**	**6,376**	**7,164**
LIABILITIES										
Accounts payable	145	1,301	511	443	430	364	386	474	620	321
Short-term interest-bearing debt	615	404	507	433	203	30	40	323	300	1,395
Accounts payable	38	253	108	39	31	48	108	86	169	101
Other current liabilities	512	336	99	111	220	156	173	247	392	232
Total current liabilities	**1,310**	**2,293**	**1,226**	**1,026**	**884**	**598**	**708**	**1,130**	**1,481**	**2,049**
Long-term interest-bearing debt	242	441	216	67	-	-	151	294	539	612
Lease obligations	-	-	-	-	-	-	-	-	947	925
Other fixed liabilities	84	208	101	86	83	85	100	148	247	283
Total fixed liabilities	**327**	**649**	**318**	**153**	**83**	**85**	**251**	**442**	**1,733**	**1,820**
Total interest-bearing debt	858	844	724	500	203	30	192	618	839	2,007
Total Liabilities	**1,636**	**2,942**	**1,544**	**1,179**	**967**	**683**	**959**	**1,572**	**3,215**	**3,869**
SHAREHOLDER EQUITY (NET ASSETS)										
Capital stock	1,029	1,029	1,029	1,102	1,102	1,102	1,387	1,625	1,656	1,677
Capital surplus	1,196	1,196	1,024	1,096	1,096	1,096	1,381	1,620	1,077	1,057
Retained Earnings	322	-119	-619	-983	-1,335	-1,372	-991	-555	445	611
Total shareholder equity (net assets)	**4,195**	**2,055**	**1,466**	**1,162**	**799**	**761**	**1,751**	**2,638**	**3,161**	**3,295**
Working capital	1,504	1,325	867	747	562	800	1,287	986	1,204	982
Interest-bearing debt	858	844	724	500	203	30	192	618	839	2,007
Net debt	-216	138	-96	-165	-290	-26	-198	-1,146	-685	-730

Source: Shared Research based on company data
Note: Figures may differ from company materials due to differences in rounding methods.

Assets

During FY03/16, current assets accounted for 58.9% of total assets. The ratio of fixed assets has increased since FY03/13.

Primary factors of current assets were cash and equivalents (64.8% of current assets in FY03/16) and accounts receivable (23.3%). Operating cash flows stemming from improved profitability, stock issuances, and financing activity were factors in cash and equivalents increasing from JPY390mn in FY03/13 to JPY2.7bn in FY03/16.

Tangible fixed assets shrank from JPY451mn in FY03/09 to JPY133mn in FY03/12 owing to a string of impairment losses amid slumping profits. In FY03/13 and onward, tangible fixed assets have been on an uptrend due to construction of solar parks and capex in the Electronic and Communication Device business.

Liabilities

In FY03/16, a majority of liabilities is comprised of accounts payable, interest-bearing liabilities, and lease obligations.

Interest-bearing liabilities shrank from JPY844mn in FY03/08 to JPY30mn in FY03/12. Shared Research estimates that borrowing was difficult due to the profit slump, so Tamagawa repaid short- and long-term borrowings, corporate bond redemptions continued, and there was no debt refinancing. In FY03/13 interest-bearing liabilities increased for the first time in five years and amounted to JPY192mn. In FY03/16 the figure increased to JPY2.0bn.

In FY03/16 net debt (interest-bearing liabilities minus cash and deposits) was positive, amounting to positive JPY730mn.

The company newly reported lease obligations in FY03/15 because it built the solar parks in Tateyama and Sodegaura, both in Chiba Prefecture, on leases.

Net assets

Due to the extended profit slump and net losses, net assets declined from JPY4.2bn in FY03/07 to JPY761mn in FY03/12. Retained earnings were minus JPY1.3bn in FY03/12.

In FY03/13 net income returned to the black, leading to an increase in retained earnings for the first time in five years. Capital and additional paid-in capital increased due to the placement of 2.1mn shares in January 2013 and the issuance of options (potential issuance: 4.8mn additional shares). We note that 1.8m additional shares were issued in FY03/13 on the exercising of options.

From FY03/14 onward, net assets increased by JPY477mn from the exercise of share subscription rights issued in January 2013 and by net income in each year.

Cash flows

Cash flow statement (JPYmn)	FY03/07 Non-cons.	FY03/08 Cons.	FY03/09 Cons.	FY03/10 Cons.	FY03/11 Cons.	FY03/12 Cons.	FY03/13 Cons.	FY03/14 Cons.	FY03/15 Cons.	FY03/16 Cons.
Cash flows from operating activities (1)	-305	-136	259	-1	68	-332	36	764	387	1,614
Cash flows from investing activities (2)	59	-111	-17	12	93	77	-454	-265	-865	-392
Free cash flow (1+2)	-246	-247	242	11	162	-255	-418	499	-478	1,222
Cash flows from financing activities	-43	-121	-194	-82	-299	-168	783	875	238	-2
Depreciation & amortization (A)	48	58	217	76	20	14	22	84	106	187
Capital expenditures (B)	-31	-134	-82	-22	-7	-12	-446	-254	-866	-662
Working capital changes (C)	381	-179	-459	-120	-186	238	488	-301	219	-222
Simple FCF (NI + A + B - C)	-226	-305	186	-397	-152	-272	-572	568	-552	-87

Source: Shared Research based on company data
Note: Figures may differ from company materials due to differences in rounding methods.

Cash flows from operating activities

Cash flows from operating activities hinge on net income, depreciation, goodwill amortization and changes in working capital. The reason that operating cash flow topped net losses plus depreciation and goodwill amortization from FY03/09 through FY03/11 was impairment losses, valuation losses on investment securities and a drop in working capital. In FY03/12 operating cash flow fell despite a narrower net loss due to an increase in accounts receivable. In FY03/13 and later operating cash flow stayed in the black as the company continued to report annual net income.

Cash flows from operating activities were significantly higher than net income during FY03/16 due to equipment sales in the Renewable Energy System Sales business, which caused cash inflows from the increase and decrease in inventories.

Cash flows from investing activities

Through FY03/12 Tamagawa was restrained in its investments with capex below JPY100mn, so cash flows from investing activities were minus JPY17mn in FY03/09 but positive from FY03/10 through FY03/12. Tamagawa's investment cash flow remained in negative territory in FY03/13 and the subsequent years due to capital investments in the Electronic and Communication Device Business and capex in the solar parks.

Cash flows from financing activities

Interest-bearing debt declined from FY03/09 through FY03/12, so cash flows from financing activities remained negative. In January 2013 Tamagawa made a placement of 2.1mn shares and issued options (if exercised would prompt the issuance of 4.8mn additional shares) to fund solar park construction. There were 1.8m shares issued in FY03/13 on the exercising of options. In FY03/13 Tamagawa saw JPY783mn in financing cash flows: JPY554mn from the issuance of shares; JPY47mn from option issuance; JPY170mn from long-term borrowing; and JPY100mn from corporate bond issuance.

During FY03/14, inflows included JPY450mn from the issuance of shares, and inflows from borrowings, leading to JPY875mn in financing cash flows.

In FY03/15, cash flows from financing activities came to JPY238mn, due to JPY58mn in revenue from issuing new shares, JPY26mn in revenue from issuing share purchase warrants, and borrowings.

Other information

History

Founded in 1968, the company was a leader in analog high-frequency wireless technology. By the mid-2000s the business was derailed by Korean competitors. After several missteps and ownership changes Tamagawa found itself with the current leadership in 2012.

J Bridge Corp became a shareholder in 2007. In 2007 J Bridge Corp (now Asia Development Capital Co Ltd; TSE2: 9318) became a shareholder. J Bridge in turn installed an executive from a company in which it held an equity stake (J Capital Management Co Ltd, 14.7% stake) to Tamagawa's board in 2007. The new board member was then made CEO and proceeded to make a number of failed acquisitions, speculative investments and unwise decisions, leading to further deterioration.

Raised capital for biomass energy in 2010. After the J Bridge-appointed CEO stepped down in 2009, the company liquidated some money-losing subsidiaries in a bid to regain profitability. But amid declining sales its core electronics and telecommunications equipment business continued to lose money in FY03/09-FY03/11. In 2010 the company raised JPY144mn in new capital to launch a biomass energy business. It was liquidated in March 2012 after posting operating losses in FY03/11 through Q2 FY03/13.

Masanori Kobayashi joins core business in June 2011. In June 2011, Masanori Kobayashi, a veteran of the company, was appointed a director of Tamagawa Electronics Co Ltd, a subsidiary that is the core business. Kobayashi was subsequently appointed CEO of Tamagawa Electronics in April 2012 and he took charge of rebuilding the electronics and telecommunications equipment business. The reform included exiting unprofitable projects, something Tamagawa was routinely doing while battling overseas rivals. The segment returned to operating profitability in FY03/12.

Focusing on profits. In April 2012, following a request from a major Tamagawa HD shareholder, Toru Masuzawa became executive director of Tamagawa Holdings, and CEO in June 2012. In June 2014, Tamagawa shifted to a joint leadership system of two representative directors to cope with difficult market conditions. In addition to the incumbent Representative Director Toru Masuzawa, the company promoted Masanori Kobayashi to new representative director with the aim to establish a fair and transparent management base by maintaining and improving its compliance system and ensuring strong corporate governance. In the same month, Yasuhiko Noguchi assumed presidency of Tamagawa Solar Systems (currently Tamagawa Energy).

The company's main task is to ensure profitability. The focus is on Tamagawa Energy, headed by Mr. Noguchi, and solar park management where FIT pricing is guaranteed by the government. Another priority is ensuring stable profitability at Tamagawa Electronics under the command of Kobayashi.

News and topics

March 2017

On **March 1, 2017,** the company announced the acquisition of a mega solar power plant in Kasumigaura, Ibaraki Prefecture, and revisions to its full-year FY03/17 earnings forecasts.

Acquisition of mega solar power plant in Kasumigaura, Ibaraki Prefecture

Tamagawa's consolidated subsidiary GP Energy B G.K. passed a resolution on an installment sales agreement with Ricoh Leasing Company, Ltd., for the purchase of a 2.4MW solar power plant in Kasumigaura, Ibaraki Prefecture, scheduled for connection in late March 2017.

The plant is ready to start selling electricity from late March 2017. Originally Tamagawa was considering the plant for resale to an outside customer through consolidated subsidiary Tamagawa Energy, which conducts the Renewable Energy System Sales business, but decided to operate it as its own project.

Overview of mega solar power plant in Kasumigaura, Ibaraki Prefecture

- ▷ Acquisition cost equivalent: JPY1.0bn
- ▷ Total cost paid in installments: JPY1.3bn
- ▷ First installment: Late March 2017 (planned)
- ▷ Capacity: Approx. 2.4MW
- ▷ Feed-in tariff: JPY36/kWh (fixed for 20 years)
- ▷ Generation revenue: Approx. JPY105mn/year (planned)
- ▷ First-year generation volume: Approx. 2,900MWh (planned)
- ▷ Start of the sale of electricity: Late March 2017 (planned)

Revisions to full-year FY03/17 earnings forecasts

Full-year FY03/17 earnings forecasts

- ▷ Sales: JPY4.4bn (previous forecast JPY6.6bn)
- ▷ Operating profit: JPY133mn (JPY354mn)
- ▷ Recurring profit: JPY51mn (JPY260mn)
- ▷ Net income: JPY12mn (JPY192mn)

Reasons for the revisions

There are two reasons for the revisions:

- The power plant GP Energy B will acquire in Kasumigaura, Ibaraki Prefecture, was originally slated for resale by Tamagawa Energy to an outside customer, with the proceeds to be booked as earnings. However, the company decided to operate the plant as its own project instead of selling it for a one-time profit.
- Because of revisions in tax and application systems scheduled to take effect in April 2017, there has been intense competition for plants that can be connected before the end of March 2017. As a result, the amounts spent for acquisition, and received in sales, of plants in the Renewable Energy System Sales business have stayed below original plans. Further, the Agency of Natural Resources and Energy sent out a cautionary notice in November 2016 about the transition to the new system. The notice set the deadline for submitting a notice of minor changes to the Bureau of Economy, Trade and Industry—necessary for acquisition or sale of a power plant by March 2017—at January 20, 2017. This deadline made it difficult to carry out acquisition and sales activities as originally planned.

January 2017

On **January 16, 2017**, the company announced that GP Energy 2 Co., Ltd., a consolidated subsidiary, will acquire a solar power plant through a leasing agreement. The company has been planning to construct the plant in Goto City, Nagasaki Prefecture.

The plant is a large-scale, mega solar power plant with an approximately 5.3MW output, connecting to an extra-high voltage grid, the company's first of its kind. The power plant will be able to sell electricity at a feed-in tariff of JPY36 per kWh (excluding consumption tax) for twenty years, with expected yearly generation revenue (planned) of approximately JPY250mn.

Details of lease

- ▷ Description of lease assets: Solar power generation systems, for a total lease fee of JPY2.9bn
- ▷ Lessor: Ricoh Leasing Company, Ltd.
- ▷ Conclusion of the agreement: January 15, 2017
- ▷ Lease start date: March or April 2018 (planned)

November 2016

On **November 1, 2016**, the company announced that it received an order for a subsystem that will be used in a next generation weather instrument.

The company received an order from Toshiba Corporation for a subsystem that will be used in a next-generation weather instrument. This device is part of the "research and development of technology to predict heavy rains and tornadoes," one item of the national project "Enhancement of Societal Resiliency against Natural Disasters" under the Strategic Innovation Promotion Program (SIP). The results of this project are expected to be used in the 2020 Tokyo Olympics and Paralympics.

Resiliency is used in this case to refer to the ability of a society to recover and withstand natural disasters that result from climate change.

October 2016

On **October 31, 2016**, the company made an announcement regarding the acquisition of fixed assets (mega solar electricity generation facilities) through a lease.

GP Energy 6 Co., Ltd., a subsidiary of Tamagawa Holdings' consolidated subsidiary GP Energy Co., Ltd., has passed a resolution to acquire the mega solar power plant in Noboribetsu city, a facility with an output of approximately 2MW that the company has been planning for construction in Hokkaido's Noboribetsu city. GP Energy 6 intends to acquire the power generation plant by entering into a contract with Ricoh Leasing Company, Ltd., with the lease planned to begin in August 2017.

The mega solar electricity generation facility in Noboribetsu city, Hokkaido occupies a favorable site approximately 72,000sqm in area, and will be able to sell electricity at a fixed feed-in tariff of JPY40 per kWh (excluding consumption tax) for twenty years, with an expected yearly generation revenue (planned) of approximately JPY94mn. Further, twelve units of tracking systems that can be anticipated to improve the efficiency of solar energy power generation are planned for installation within the same site, and are expected to contribute to earnings of the company. KCCS Mobile Engineering Co., Ltd., the company responsible for construction of this power generation facility, is a Kyocera group company that has worked on installation and construction of public and industrial solar power generation system facilities throughout Japan. Shared Research believes that the construction of this facility to proceed in a rapid, reliable manner.

Description of assets to be leased (mega solar power generation facility in Noboribetsu city, Hokkaido)

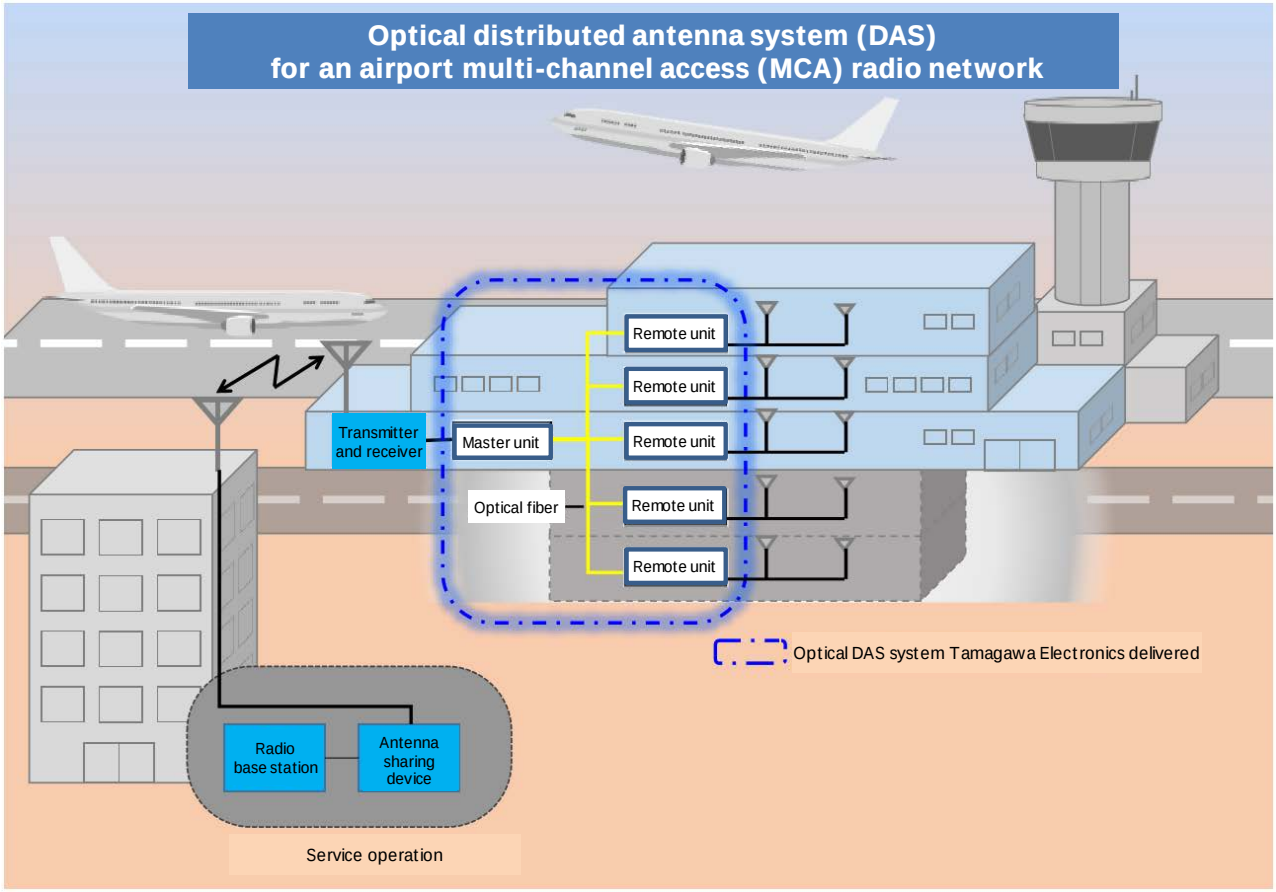
- ▷ Operator: GP Energy 6 Co., Ltd.
- ▷ EPC operator: KCCS Mobile Engineering Co., Ltd.
- ▷ Capacity: Approximately 2MW
- ▷ First year output (planned): About 2,350,000kWh
- ▷ Outline of leased assets and total lease fee: Solar power generation systems for JPY711mn
- ▷ Acquisition cost equivalent: JPY490mn

On **October 6, 2016**, the company announced the operational launch of a system for which the company had earlier won a consignment contract in the public and social infrastructure field.

The company's Tamagawa Electronics Co., Ltd. unit (Tamagawa Electronics), sought to win more contracts in the public and social infrastructure field to expand its business territory. As a result, the company received an order from Nippon Airport Radio Service Co., Ltd. for development and production of an optical distributed antenna system (DAS) for an airport multi-channel access (MCA) radio network. The system has begun operation at Narita International Airport.

Tamagawa Electronics supplied the DAS system, an optical transmission device for dead zones aimed at increasing the number of communications lines and enhancing the overall network functionality. One of the major features of this system is that it can be

expanded with the addition of more units, allowing the user to easily enlarge the wireless communications area. The system can also be used with a surveillance application using the ethernet to monitor various devices in operation.



Source: Shared Research based on company data

September 2016

On **September 12, 2016**, the company announced the status of its mega solar power plant in Noboribetsu, Hokkaido Prefecture.

Status of the mega solar power plant in Noboribetsu

The company already received certification for the land and power sales business at the mega solar power plant in Noboribetsu, Hokkaido Prefecture. It had been applying for development permits and preparing for construction. It received permission from Hokkaido Prefecture to develop forested area necessary to build a large solar power plant.

The price has been approved under METI's feed-in tariff scheme for renewable energy, at JPY40 per kWh (excl. tax; fixed for 20 years).

Overview of the plant

- ▷ Capacity: About 2MW
- ▷ Feed-in tariff (fixed for 20 years): JPY40/kWh (excl. tax)
- ▷ Generating revenue (planned): About JPY94mn/year
- ▷ First-year output: About 2,350,000kWh

June 2016

On **June 29, 2016**, the company announced a new medium-term management plan, covering from FY03/17 to FY03/20.

The new plan calls for FY03/20 sales of JPY10.1bn and operating profit of JPY1.1bn. Detailed targets for each segment are outlined below:

Medium-term management plan: Segment sales and profit targets

Long-term outlook (JPYmn)	FY03/16 Act.	FY03/17 Plan	vs. FY03/16 Changes	FY03/20 Plan	vs. FY03/16 Changes
Sales	7,259	6,633	-8.6%	10,140	39.7%
Electronic and Communication Device	2,091	2,600	24.3%	3,500	67.4%
Renewable Energy System Sales	4,938	3,787	-23.3%	5,100	3.3%
Solar Power Plant	230	246	7.0%	1,190	417.4%
New businesses	-	-	-	350	-
Operating Profit	279	354	26.9%	1,090	290.7%
Electronic and Communication Device	-11	214	-	350	-
Renewable Energy System Sales	286	223	-22.0%	370	29.4%
Solar Power Plant	56	61	8.9%	335	498.2%
New businesses	-	-	-	35	-

Source: Shared Research based on company data
Note: Figures may differ from company documents due to differences in rounding methods.

- Electronic and Communication Device Business: Generate stronger earnings by capturing orders for power amplifiers (used in next generation mobile phones), increasing overseas market share, and M&A targeting related businesses.
- Renewable Energy System Sales Business: Expand sales of small-scale wind power generation equipment, commercialize geothermal power generation, biomass power generation and small-scale wind power generation equipment, and launch initiatives to win orders in the second-hand solar power plant market, expand the sales network, and strengthen its organizational structure by expanding the sales network and hiring more personnel.
- Solar Power Plant and Geothermal Power Plant Businesses: Expand capacity at the company's power stations from the present 5MW to 20MW, generate stronger earnings by acquiring customers for its upcoming geothermal power plant operations and evaluate the possibility of setting up renewable energy plants in the overseas Asian market.
- New businesses: Undertake initiatives related to hydrogen power storage and business investment, and explore ways to realize synergies with existing businesses and to directly/indirectly tap opportunities at related businesses.

On **June 22, 2016**, the company announced that it had obtained an equity interest in Etrion Energy 5 LLC (to become an equity-method affiliate).

As it announced on March 30 and June 11, 2015, Tamagawa was in talks with Etrion Japan KK (Etrion) as to how to proceed on a joint solar power generation venture in Misawa City, Aomori Prefecture. At a board of directors meeting held on June 22, 2016, a resolution was passed on obtaining an equity interest in Etrion Energy 5 LLC (Etrion 5GK). The effective date of the equity purchase is June 22, at a price of JPY300,000, and this will give Tamagawa a 30% stake in Etrion 5GK, making it an equity-method affiliate.

With the equity interest Tamagawa is obtaining from Etrion in Etrion 5GK, the operation will proceed as a joint venture, and construction will begin as early as possible so that the sale of electricity can begin in the near future. According to a term sheet agreed with Etrion, Tamagawa will hold a 30% stake in the special purpose company that will oversee the project, and the equity purchase is based on this agreement.

Tamagawa will also make an additional investment of JPY53mn in Etrion 5GK effective the same date as the aforementioned equity purchase (June 24, 2016). The other investors in the project will make additional investments in proportion to their stakes, so that even after this additional round of investments, the equity interest ratio will remain unchanged. Furthermore, on the same date as the aforementioned equity purchase and in keeping with their respective stakes, the various investors in Etrion 5GK will

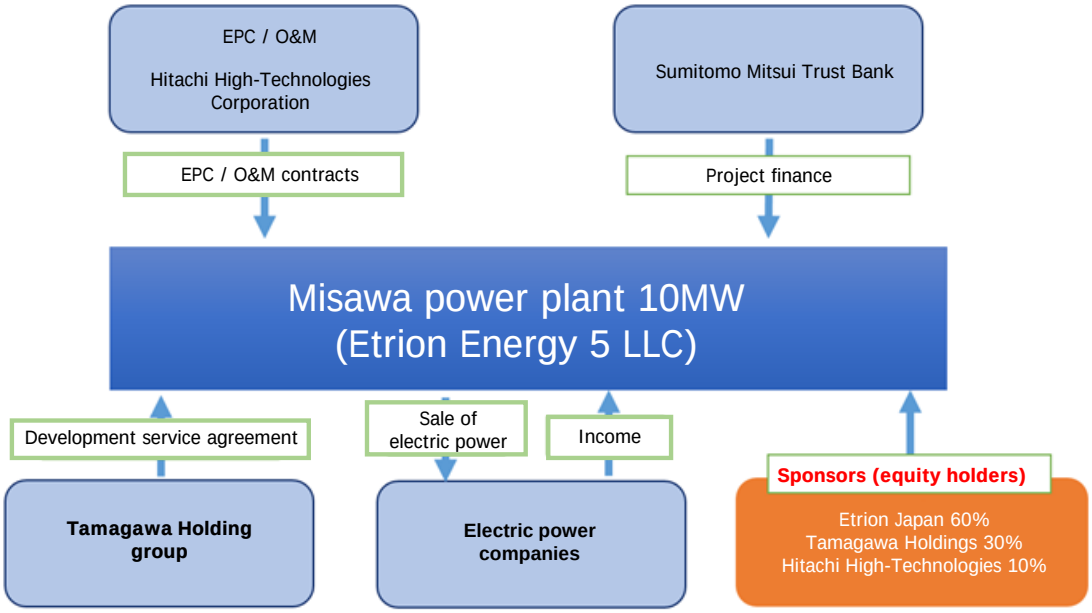
provide subordinated loans in accordance with subordinated loan agreements they have with Etrion 5GK. Tamagawa's planned loan is JPY106mn.

By conducting development operations jointly with a major corporation and a major EPC contractor, Tamagawa believes it can effectively operate this large solar power generation facility. This will also be the first project to receive financing through a project finance scheme with a major financial institution, so this is an important project in terms of the company's business strategy. Once Etrion 5GK receives the initial loan from the financial institution, Tamagawa plans to transfer land for the project to Etrion 5GK at a price of JPY274mn (book value).

Power plant overview

- ▷ Location: Misawa City, Aomori Prefecture
- ▷ Operator: Etrion Energy 5 LLC
- ▷ EPC: Hitachi High-Technologies Corporation
- ▷ Capacity: approximately 9.5MW (total)
- ▷ Feed-in tariff: JPY36/kWh (before tax; fixed for 20 years)
- ▷ First-year output: 10,740,000kWh (estimate)
- ▷ Construction to start: July 2016
- ▷ Commercial operation to start: February 2017

Outline of Etrion Energy 5 LLC



Source: Shared Research based on company data
*EPC refers to businesses comprehensively undertaking construction projects across the fields of engineering, procurement, and construction.
*O&M refers to businesses that undertake operation and maintenance of facilities after construction is complete.

March 2016

On **March 28, 2016**, the company announced successfully completed grid connections for its small-scale wind power generation facility.

As announced on February 1, 2016, the company has decided to begin power sales from small-scale wind power generation equipment. Following the construction of Small-scale Wind Power Generator Facility No. 1 (power output: 19.5kW) on grounds available at its Tateyama mega solar power plant (power output: approx. 2,000kW), connections with Tokyo Electric Power Company's grid were completed and sales of electrical power started on March 25, 2016.

On **March 14, 2016,** the company announced upward revisions to its FY03/16 earnings forecasts.

Revisions to full-year earnings forecast

- ▷ Sales: JPY7.1bn (previous forecast JPY5.4bn)
- ▷ Operating profit: JPY258mn (JPY159mn)
- ▷ Recurring profit: JPY187mn (JPY105mn)
- ▷ Net income: JPY176mn (JPY106mn)

Reasons for the revision

At the Renewable Energy System Sales segment, the company was able to win more new orders for its solar power plant equipment than projected in its previous forecast (December 10, 2015), and based on these favorable sales expects both sales and profits to outstrip the previous forecast.

On **March 1, 2016,** the company announced the development of optical transmission equipment for trains.

Subsidiary Tamagawa Electronics Co. Ltd. (Tamagawa Electronics) has increased efforts to win contracts for telecoms and broadcasting-related public works projects to minimize the impact of restrained capex spending in the mobile-phone infrastructure market. As a result, Tamagawa Electronics has won an order for optical transmission equipment for use in trains, and has decided to start developing these products.

According to the company's press release, one benefit of Tamagawa Electronics' analog optical transmission equipment is the cost effectiveness due to system simplification. They enable wireless signals that are the same as radio waves to be directly converted to optical signals and transmitted. Further, compared to coaxial cables, optical fiber is suitable for transmitting wireless signals over long distances because of its high frequency characteristics, in addition to fewer signal losses.

The company expects the development of these products to boost earnings from FY03/17–FY03/19, and plans to have a separate release regarding the earnings impact of this product when announcing its FY03/17 earnings forecast.

February 2016

On **February 22, 2016,** the company announced the establishment of a new subsidiary.

The company plans to expand its renewable energy business overseas, starting with Vietnam. In order to carry out accurate and precise assessments of the business environment, it has established a subsidiary to increase its understanding of the joint crediting mechanism (JCM) and the local electric power system in Vietnam, as well as to facilitate joint research with educational institutions as it seeks to develop businesses overseas in the future.

Subsidiary details

- ▷ Name: THD Research Institute Co., Ltd.
- ▷ Date of establishment: March 7, 2016 (planned)
- ▷ Capital: JPY1.0mn
- ▷ Owner: Tamagawa Holdings Co., Ltd. (100%)
- ▷ Business: Investigation, promotion of research, and the holding of seminars relating to the company's overseas renewable energy business, starting with Vietnam

On **February 1, 2016**, the company announced new products (small-scale wind power generation equipment) in its Renewable Energy System Sales segment. The new product will be sold by Tamagawa Energy, a subsidiary of the company.

Summary of small-scale wind power generation equipment

Small-scale wind power generation refers to wind power generation equipment producing less than 20kW of electricity, with a purchase period of 20 years. Provided that wind speeds are sufficient, wind power generation can generate electricity during the night, differentiating it from solar power generation. The company thinks that demand for such power generation will increase in the future.

In order to demonstrate the reliability and functionality of this product, the company plans to construct and operate Small-scale Wind Power Generator Facility No. 1 (power output: 19.5kW) on grounds available at its Tateyama plant (power output: approx. 2,000kW). The wind turbines are to be supplied by C&F Green Energy, the manufacturer of models the company plans to sell. The Tateyama plant has already received approval from the Ministry of Economy, Trade and Industry, and approval from Tokyo Electric Power (TSE: 9501) to provide power through its grid. Tamagawa aims to complete construction and began sales of power in March 2016.

Summary of turbine manufacturer

C&F Green Energy—a C&F Group member company based in Ireland—is set to provide wind turbines to Tamagawa. C&F Green Energy began development, production, and installation of small and medium scale wind power generation facilities in 2006. It has installed over 1,000 wind turbines across Europe, including in Ireland, the United Kingdom, Italy, France, and Switzerland. The C&F Group began design, manufacturing, and supply of metal and chrome parts for automotive applications in 1989, and provides its products to companies across the globe.

The current wind turbine units—manufactured by C&F Green Energy—to be provided to Tamagawa have received ClassNK approval from Nippon Kaiji Kyokai, a necessity for facilities to receive approval under the feed-in tariff system.

Sales plans

From an efficiency standpoint, the small-scale wind power generation equipment should ideally be placed in regions where the wind speed is at least 5m/s. In FY03/16, Tamagawa plans to perform final checks on the functionality of wind power generation equipment it owns, prior to beginning sales of the same models in FY03/17. By actively acquiring and developing areas that meet the aforesaid standard, the company aims to sell about 100 units during FY03/17.

January 2016

On **January 25, 2016**, the company announced plans to install a solar power tracking system at its solar park in Sodegaura.

As announced on March 24, 2015, the company launched electricity sales at its solar park in Sodegaura, Chiba (hereafter, Sodegaura solar park) last year. In order to explore new possibilities for its Solar Power Plant Business, it has decided to establish a solar power plant at this park which makes use of an automatic tracking system—the company's first usage of this technology.

About the tracking system

The tracking system the company plans to use is known as a universal-axis solar tracker. It automatically adjusts the solar panel to the optimal angle in relation to the sun's position, allowing it to gather more sunlight than a fixed panel and as such make full use of the available solar energy. This in turn greatly increases its energy output. The company expects that the total amount of energy generated will be 20-30% more than that generated by the fixed solar panels it has been using until now, and anticipates an increase in its power generating efficiency.

About the tracking system's installation

▷ Location: Sodegaura City, Chiba Prefecture

▷ Capacity: Approx. 12kW

▷ Feed-in tariff: JPY32/kWh (excluding tax, fixed for 20 years)

▷ Maker: TopperSun (Taiwan)

On **January 12, 2016,** Tamagawa Holdings Co., Ltd. announced an update on the status of its plans to construct a solar park in Goto City, Nagasaki Prefecture.

As announced on November 18, 2014, the company is planning to construct and operate a solar park in Goto City, Nagasaki Prefecture. Tamagawa has now selected a contractor to carry out the construction work for the solar park.

The solar park plans to utilize a 5.3MW extra high voltage system—the first of its type for Tamagawa. The company has been preparing to start the sale of electricity there as soon as possible.

Nangoku Corporation, which is scheduled to perform construction work for the solar park, is a general trading company based in Kagoshima that operates businesses such as construction materials, machinery and equipment, telecommunications, and energy throughout the Kyushu region and has more than 40 subsidiaries and affiliates. Nangoku plans to build 30 solar energy power plants on its own in Kyushu for a total generating capacity of around 200MW and has constructed more solar power facilities.

About the Goto City solar park

▷ Location: Yoshikugi-cho, Goto City, Nagasaki Prefecture

▷ Operator: GP Energy 2 Co., Ltd. (wholly owned subsidiary)

▷ Area: 10 hectares

▷ Capacity: Approx. 5.3MW

▷ Feed-in tariff: JPY36/kWh (fixed for 20 years)

▷ Generation revenue: JPY250mn/year (tentative)

▷ First-year generation volume: Approx. 6,790,566kWh

▷ Start of the sale of electricity: April 2017 (planned)

On **January 4, 2016,** the company provided an update on the status of its plans to launch a power plant business in Misawa, Aomori Prefecture.

As indicated in its December 26, 2014 announcement, the firm plans to construct and operate solar energy power plant facilities with a total capacity of approximately ten megawatts in Misawa, Aomori Prefecture (hereafter “power plant business”). It is in the process of performing the necessary procedures and hopes to start electricity sales at an early stage. Tohoku Electric Power Co. has now officially approved a request for grid connections to Tamagawa’s power plant facilities (procedure for connecting to a power company’s grid, which is a precondition for selling power).

As the firm indicated on June 11, 2015, it reached a basic agreement with Etrion Japan KK (hereafter “Etrion”) to jointly operate these power plant facilities. The official approval of the grid connection request should encourage quicker and more concrete discussions with Etrion as the company looks to start operations.

Tamagawa Holdings expects this power plant business to begin selling power from FY03/17 and plans to promptly report any concrete developments regarding this joint project with Etrion.

Power plant overview

▷ Location: Misawa, Aomori

- ▷ Operator: GP Energy A, GP Energy B, GP Energy C, GP Energy D (wholly owned units)
- ▷ Premises: Approx. 153,000sqm
- ▷ Capacity: Approx. 10MW
- ▷ Feed-in tariff: JPY36/kWh (before tax; fixed for 20 years)
- ▷ Revenue: JPY390mn a year (estimate)
- ▷ First year output: Approx. 10,852,814kWh (estimate)

December 2015

On December 10, 2015, the company revised its sales and earnings forecast for FY3/16, and also provided an updated status report on its Geothermal Power Plant Business.

Revised FY 3/16 forecast

- ▷ Sales: JPY5.41bn (previously JPY5.6–7.3bn)
- ▷ Operating profit: JPY159mn (previously JPY590–850mn)
- ▷ Recurring profit: JPY105mn (previously JPY520–790mn)
- ▷ Net income: JPY106mn (previously JPY400–570mn)

Reasons for the revision

Moves by telecommunications carriers to restrain abrupt spending on mobile phone infrastructure and a lull (due to seasonality) in work on large government projects hurt sales at the Electronic and Communication Device segment. As this left 1H sales short of the company's initial forecast and put the Electronic and Communication Device segment below its breakeven point, the company revised its full-year earnings forecast.

Tamagawa Holdings had previously given its full-year forecast as a range estimate, owing to its Renewable Energy System Sales segment, where sales and earnings vary depending on changes in the operating environment caused by external factors. As indicated in the Geothermal Power Plant Business status report released the same day, the upper end of the forecast range was based on the assumption that upon the completion of construction of the two geothermal power plants that are currently under construction, the company would sell electrical power from the geothermal power plant and the geothermal power plants themselves, and would also sell the sites previously acquired for two other geothermal power plants where construction has not yet begun. However, the company has sold the two plants that were under construction to a third party, resold the land acquired to build the two other geothermal power plants, and halted the sale of geothermal power plants. In addition to lowering the expected sales amount at the Electronic and Communication Device segment, these moves caused the company to revise down earnings figures at both the upper and lower end of the expected range.

The sharp drop in expected profits relative to the company’s full-year revised sales forecast is due to the fact that the decline in sales was at the high-margin Electronic and Communication Device segment.

Given the current operating environment, company plans for restoring orders and sales at the Electronic and Communication Device segment call for focusing on expanding sales to the defense market and the public sector disaster preparedness-related market, and also on acquiring new customers. These efforts have brought in new large scale orders and improved the segment's order flow but, since most of the deliveries under these orders will not be until April 2016 or later, the contributions to earnings from will not appear until next fiscal year.

Current status of previously planned geothermal power plants

On January 29, 2015, the company announced that it planned to build a total of seven geothermal power plants, and to this end acquired a total of seven separate plots of land. The company moved forward on construction at two of the seven sites but

changed its plan. Under the new plan, the company will sell the two plants currently under construction to a third-party and sell back the sites acquired for the five other geothermal power plants to their original owners.

At the geothermal power plant located in Beppu City, Oita Prefecture, a reexamination of data acquired after work had begun showed that Tamagawa Holdings was unlikely to get the return on the project it originally envisioned. After a series of talks with the outside party that originally proposed the project, Tamagawa Holdings reached an agreement to sell the two power plants currently under construction to a company owned by the party that originally proposed the project at a price that would be greater than the total amount Tamagawa Holdings had invested in the two projects. The transaction and payment under this agreement are be completed by the end of January 2016.

As for the remaining five sites at which construction of geothermal power plants has not yet begun, Tamagawa Holdings chose to exercise its right under the original purchase contract to sell the land back to the original owner at the same price for which it was purchased. Two of the five sites have already been sold back to their original owners and the sales of remaining three sites are expected to be completed by the end of December 2015.

The company had expected to use some of the capital that was raised by a warrant issue for its geothermal power plant operations. However, after only 10 of the warrants issued were exercised, adverse changes in the operating environment and the stock market pushed the company's share price down to a level where it made sense for the company to buy back and cancel all of the remaining 9,990 warrants and finance construction at the first geothermal power plant site with cash on hand.

October 2015

On **October 1, 2015,** the company announced the current status of its Geothermal Power Plant Business (in planning).

As announced on December 26, 2014, the company has been carrying out administrative procedures and construction work for its new Geothermal Power Plant Business in order to initiate electric power sales at an early stage. The company officially received a notice on September 30, 2015 from Kyushu Electric Power Co. regarding the approval and timing for grid connections of Tamagawa's two geothermal power plants.

Overview of the Geothermal Power Generation segment

- Connection date: Around April 2016
- Business: Geothermal power generation is not affected by the weather, seasons, or day/night fluctuations like solar power. As a result, one 125KW geothermal power plant generates electricity roughly equivalent to a 1MW solar power plant. Geothermal power plants can be built on small plots of land, which makes efficient power procurement possible. The feed-in tariff of electricity produced by geothermal power plants is JPY40 per kWh (less than 15,000kW; excluding consumption tax).

Overview of the geothermal power plant

- Location: Beppu, Oita Prefecture
- Output capacity: About 250kW
  (two plants, equivalent to a 2MW solar power plant; a 125kW geothermal plant is equivalent to a 1MW mega solar plant)
- Feed-in tariff: JPY40/kWh (fixed for 15 years)
- Feed-in revenue: About JPY80mn/year (estimate)
- Generating capacity: About 2,200,000kWh/year (estimate)
- Sales start date: Around April 2016

The company projects that this geothermal power plant will begin operations in FY03/17. Although it expects the effect on FY03/16 earnings to be negligible, it will swiftly announce any updates as soon as it is possible to calculate earnings forecasts.

September 2015

On **September 18, 2015,** the company announced the acquisition and cancellation of No. 6 stock warrants (with an option to adjust the exercise price).

At a board of directors meeting on the same day, the company resolved to acquire and cancel all No. 6 stock warrants issued to Macquarie Bank Limited on January 16, 2015.

Details of the acquisition and cancellation of warrants

- ▷ Name: No. 6 stock warrant (with an option to adjust the exercise price)
- ▷ Allottee: Macquarie Bank Limited
- ▷ Number of warrants: 10,000 (1,000 shares per warrant)
- ▷ Allocation date: January 16, 2015
- ▷ Payment amount: JPY1,960 per share
- ▷ Exercise price: JPY218 per warrant
- ▷ Exercise period: January 19, 2015 to January 18, 2017
- ▷ Number outstanding: 9,990 warrants
- ▷ Acquisition and cancellation date: October 16, 2015

Reasons for the acquisition and cancellation of No. 6 stock warrants

The company issued No. 6 stock warrants on January 16, 2015 to the allottee, Macquarie Bank Limited, in order to procure funds for the development of its solar and geothermal power plants. However, Tamagawa Holdings' stock price has remained at a low level following the issuance of the warrants, owing to the company's operating environment and the stock market, and so the company believes the allottee is unlikely to voluntarily exercise the warrants. It is also possible for the company to meet the abovementioned funding needs using cash on hand and indirect financing. Further, the company has determined that it is necessary to alleviate market concerns of possible dilution owing to the continued existence of unexercised warrants that the company believes are unlikely to be exercised.

Tamagawa Holdings believes that the acquisition and cancellation of the warrants will have a negligible impact on its FY03/16 investment plans.

July 2015

On **July 24, 2015,** the company released the update on its geothermal power plant operations.

On December 26, 2014, the company had announced that it was planning to kick off selling electricity of its geothermal power plant in August 2015. However, it now states that this may be pushed back, because of a surge in applications for grid connections to its geothermal power plant in Beppu, Oita Prefecture, where it is driving geothermal business while engaging in grid-connection talks with Kyushu Electric Power Co. This has created a potential need to procure voltage regulators (SVCs, or Static Voltage Controllers) in the grid-connection project with Kyushu Electric to begin selling power.

Tamagawa has already completed the negotiation stage for grid connection with Kyushu Electric and has received confirmation that it can proceed with the connection. Going forward, the company will crystallize timelines for the completion date and the selling start date based on the detailed blueprint for grid connection by Kyushu Electric.

June 2015

On **June 11, 2015**, the company announced the progress of a business alliance with Etrion Japan KK.

The company has concluded a Memorandum of Understanding regarding the business alliance with Etrion Japan, and the two companies have discussed the process for establishing a solar power business in Misawa, Aomori. Both parties have now agreed upon a Term Sheet setting forth the specific process for this business and each company's stake. The company is analyzing the effect of this alliance on earnings for FY03/16 and plans to make an announcement as soon as possible.

Key points

- ▷ The two companies will establish a special-purpose company (SPC) for this joint business.
- ▷ Tamagawa may hold a stake of up to 30% in the SPC.
- ▷ The two companies aim to complete all procedures necessary to begin construction by December 2015.
- ▷ The two companies will jointly decide the method of funding and appoint engineering, procurement, and construction agents.

Overview of the power plant

- ▷ Location: Misawa, Aomori
- ▷ Operator: GP Energy A, GP Energy B, GP Energy C, GP Energy D (wholly owned units)
- ▷ Premises: 153,000sqm
- ▷ Capacity: 10MW
- ▷ Feed-in tariff: JPY36/kWh (before tax; fixed for 20 years)
- ▷ Revenue: JPY390mn a year (estimate)
- ▷ First year output: 10,852,814kWh (estimate)

Other

The company has been subject to harmful internet rumors, and is taking steps to improve its reputation, including filing civil and criminal actions, to bring the perpetrators to account.

Major shareholders

Top Shareholders	Voting interest
Marilyn Tan	10.4%
Pershing Division of Donaldson, Lufkin & Jenrette Sec Corporation (Standing proxy: Citibank Japan Ltd.)	5.8%
Japan Securities Finance Co., Ltd.	5.5%
Hiromasa Shimanuki	4.6%
Toru Masuzawa	3.2%
H.S. Securities Co., Ltd.	2.6%
Sada Kubota	2.2%
Tamagawa HD (Treasury stock)	1.4%
Yuichi Sunaga	1.3%
Rakuten Securities, Inc.	1.3%

Source: Shared Research based on company data
As of end-March 2016

Top management

President & CEO: Toru Masuzawa

Masuzawa joined Wako Securities Co., Ltd. (now Mizuho Securities Co., Ltd.) in April 1985. He gained experience at Commerzbank Southeast Asia from 1994, HSBC Securities from 1998, Barclays Private Bank from 1999, and Time Square Venture from 2004. Later in 2004, he became an executive officer at J Bridge Corp (now Asia Development Capital Co. Ltd) and then president in 2005. In April 2012, he became an executive officer at Tamagawa and, in June 2012, became the company president (current position).

Executive Vice President: Akihiro Ushiroda

Ushiroda joined U-EN Corporation in July 2005 and then KDA Audit Corporation in 2007. He joined Tamagawa in January 2012 as manager of the business administration department, was promoted to director of the corporate planning department and finance and accounting department in 2015, and was then promoted to executive vice president in June 2016 (current position).

Executive Vice President: Masanori Kobayashi

Kobayashi joined Fuji Keiki Co., Ltd. in April 1977, then moved to Tamagawa in December 1981. He became manager of the measuring instruments department in 1999 and was put in charge of director information in 2005. He became an auditor in 2006, an executive officer at Tamagawa Electronics Co., Ltd., in 2011, president of Tamagawa Electronics in 2012 (current position), and executive vice president of Tamagawa Holdings in 2014 (current position).

Company profile

Company	Head office
Tamagawa Holdings Co., Ltd	VORT Hamamatsu-cho I, 1-6-15, Hamamatsu-cho, Minato-ku Tokyo, Japan 105-0013
Phone	**Listed on**
+81-3-6435-6933	JASDAQ
Established	**Exchange listing**
May 7, 1970	August 31, 1999
Website	**Fiscal year-end**
http://www.tmex.co.jp/english/index.html	March
IR Web	
http://www.tmex.co.jp/english/ir-info.html	

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Artspark Holdings Inc.	Heiwa Real Estate Co., Ltd.	SanBio Company Limited
AS ONE CORPORATION	IDOM Inc.	SANIX INCORPORATED
Ateam Inc.	IGNIS LTD.	Sanrio Company, Ltd.
Aucfan Co., Ltd.	IID, Inc.	SATO HOLDINGS CORPORATION
Axell Corporation	Infomart Corporation	SBS Holdings, Inc.
Azbil Corporation	Intelligent Wave, Inc.	Seria Co.,Ltd.
Bell-Park Co., Ltd.	istyle Inc.	SHIP HEALTHCARE HOLDINGS, INC.
Benefit One Inc.	Itochu Enex Co., Ltd.	SMS Co., Ltd.
Canon Marketing Japan Inc.	J Trust Co., Ltd	Snow Peak, Inc.
Carna Biosciences, Inc.	Japan Best Rescue System Co., Ltd.	SOURCENEXT Corporation
Chiyoda Co., Ltd.	JINS Inc.	Star Mica Co., Ltd.
Chugoku Marine Paints, Ltd.	KAMEDA SEIKA CO., LTD.	SymBio Pharmaceuticals Limited
cocokara fine Inc.	Kenedix, Inc.	Takashimaya Company, Limited
COMSYS Holdings Corporation	KFC Holdings Japan, Ltd.	Takihyo Co., Ltd.
CRE, Inc.	LAC Co., Ltd.	TAMAGAWA HOLDINGS CO., LTD.
CREEK & RIVER Co., Ltd.	Lasertec Corporation	TEAR Corporation
Daiseki Co., Ltd.	MATSUI SECURITIES CO., LTD.	3-D Matrix, Ltd.
DIC Corporation	MEDINET Co., Ltd.	TKC Corporation
Digital Arts Inc.	MEGANESUPER CO., LTD.	TOKAI Holdings Corporation
Digital Garage Inc.	Milbon Co., Ltd.	Tri-Stage Inc.
Don Quijote Holdings Co., Ltd.	MIRAIT Holdings Corporation	VISION INC.
Dream Incubator Inc.	MONEY SQUARE HOLDINGS, INC.	VOYAGE GROUP, INC.
EARTH CHEMICAL CO., LTD.	NAGASE & CO., LTD	WirelessGate, Inc.
Elecom Co., Ltd.	NAIGAI TRANS LINE LTD.	YELLOW HAT LTD.
Emergency Assistance Japan Co., Ltd.	NanoCarrier Co., Ltd.	YUMESHIN HOLDINGS CO., LTD.
en-Japan Inc.	Net One Systems Co.,Ltd.	Yushiro Chemical Industry Co., Ltd.
euglena Co., Ltd.	Nichi-Iko Pharmaceutical Co., Ltd.	ZAPPALLAS, INC.
Ferrotec Holdings Corporation	NIPPON PARKING DEVELOPMENT Co., Ltd.	
FIELDS CORPORATION	Nisshinbo Holdings Inc.	

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Contact Details

Shared Research Inc.
3-31-12 Sendagi Bunkyo-ku Tokyo, Japan
http://www.sharedresearch.jp
Phone: +81 (0)3 5834-8787
Email: info@sharedresearch.jp