

## Creating shareholder value consistent with Sustainable Development Goals, in high-growing communication and energy infrastructure fields, by deploying technology and financial prowess

This report analyzes corporate value based on the perspective of GCC Management™ which emphasizes three elements: **G**rowth (sales growth), **C**onnection (of all stakeholders, leading to improved profitability of capital), and **C**onfidence (enhanced trust and lowered business risks).

### specializing in electronic and communication devices and renewable energy

Tamagawa Holdings Co., Ltd. (referred to here as the Tamagawa HD Group, including consolidated subsidiaries, or simply Tamagawa) originated as Tamagawa Electronics, established in 1968 to develop, manufacture, and sell high-frequency devices, which are key components for communication and broadcasting equipment. After becoming an over-the-counter company registered in the Japan Securities Dealers Association (present JASDAQ Market) in 1999, Tamagawa was forced to report a loss by intense price competition and other influences, became a holding company in 2007, and restructured business under a management mainly of former investment bankers. In fiscal 2009 (ended March 2010), Tamagawa diversified into renewable energy. In the electronic and communication device business In addition to the high-frequency devices, Tamagawa became competitive in technologies to provide public infrastructure systems that combined analog, high-frequency technologies with digital, software technologies. In its renewable energy business Tamagawa uses its financing capability in developing solar, wind, and other power generation projects.

### Some businesses have 10-20 times growth potential for five years ahead

Tamagawa's recovery and strategy were successful; it posted record-high operating profit of ¥805 million, up 426% y-o-y, on a 64.9% growth in sales to ¥6,332 million, in fiscal 2019. Its forecasts for fiscal 2020 are also robust. Sales are expected to increase by 9.5% y-o-y and operating profit by 5.5%, despite anticipating some COVID-19 impact. Medium-term key factors include 1) wind power generation business in Hokkaido, where 4-times growth is expected in 2017-2027; 2) benefit from the projected 17-times global growth in 5G-related investment in 2019-2025; and 3) over 20 times growth in investment in hydropower generation in Indonesia in 2020-2025, according to the METI's survey. Other highlights include initiatives in advanced technologies, such as joint development projects with Tohoku University for optimizing equipment control/monitoring system for surplus energy and small atomic clocks.

### 2-3 times upside potential in shareholder value from the GCC management™ perspective

On August 28, the Tamagawa HD Group announced a third-party allocation of shares with expected funding of about ¥2.5 billion at maximum. J-Phoenix Research (JPR) expects that the funding will accelerate Tamagawa's investment in high-growth areas. Based on this assumption, JPR used the excess profit method in estimating Tamagawa's long-term shareholder value, which turned out to be ¥16.9 billion in a conservative scenario, ¥33.6 billion when incorporating highly-feasible potential growth, and ¥43.6 billion if advanced technologies are commercialized. Theoretically, this means 2-3 times upside potential in market cap, relative to its current level, in a 2-3 year investment period.

1. Use of the three elements is a concept of the GCC Management™, a pending trademark registered by J-Phoenix Research in Japan. It is a framework to visualize a value-creating by categorizing drivers of corporate value into three elements of Growth/Connection/Confidence, or GCC, finding how they associate with satisfying needs and demand of all stakeholders, and analyzing the process of creating sustainable value.

Performance	Sales	Y-o-Y	Operating profit	Y-o-Y	経常利益	Y-o-Y	Net profit	Y-o-Y	EPS	Diluted EPS	Stock price (yen)	
	Million yen	%	Million yen	%	Million yen	%	Million yen	%	Million yen	Yen	High	Low
FY2018	3,255	-26.7%	53	-72.0%	-63	Into red	-147	Into red	-34.9	-	1,310	1,150
FY2019	3,842	18.0%	153	188.7%	-79	-20.3%	129	Into black	29.6	29.4	1,050	430
FY2020	6,333	64.8%	805	426.1%	672	Into black	439	241.8%	96.4	84.1	3,960	734
FY2021 (forecast)	6,937	9.5%	850	5.6%	750	11.6%	499	13.6%	109.5	-	-	-
1Q of FY2020	715	-4.8%	-63	250.0%	-117	46.3%	-115	49.5%	-26.1	-	2,035	734
1Q of FY2021	1,165	63.0%	62	Into black	59	-150.4%	60	Into black	11.6	11.2	2,766	1,825

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## Basic report

Written and Edited by  
J-Phoenix Research Inc.

### Corporate Profile

Headquarters	Minato-ku, Tokyo
President & CEO	Toru Masuzawa
Established	Nov. 1968
Capital	1,961 million yen
Listed	July, 1999
URL	www.tmex.co.jp
Industry	Electric equipment

### Key Indicators (as of August 31, 2020)

Stock price	2,128
Highest in 52 weeks	3,960
Lowest in 52 weeks	1,311
Outstanding Shares	5,471,100 stocks
Trading Units	100 stocks
Market Capitalization	11,642 million yen
Prospective Dividend	5.00
Established Profit Base EPS	92.24 yen
Estimated PER	23.07 times
Actual BPS (March 2019)	823.03 yen
Actual PBR	2.59 times

## 1. Corporate summary

### Corporate summary and history

#### Corporate summary

Corporate name	TAMAGAWA HOLDINGS CO., LTD.
Established	November 1968
Representative	Toru Masuzawa
Location	VORT Hamamatsu-cho 1, 2F 1-6-15, Hamamatsu-cho, Minato-ku, Tokyo, Japan
Capital	¥1,961.82 million (as of March 31, 2020)
Employees	240 (Consolidated; as of March 31, 2020)
Fiscal year end	March 31
Business activities	Electronic and communication devices; renewable energy
Listing	JASDAQ (Standard) [Securities code: 6838]

Source: Prepared by JPR based on disclosed information

#### History

Year	Month	Event
1968	Nov.	Established Tamagawa Electronics Co., Ltd. in Ota-ku, Tokyo; began development, manufacturing, and sale of high-frequency circuit elements
1999	Aug.	Became an over-the-counter company registered in the Japan Securities Dealers Association (present JASDAQ Market)
2007	Oct.	Conducted a company split, renamed to Tamagawa Holdings Co., Ltd., and made Tamagawa Electronics Co., Ltd. its subsidiary
2009	Nov.	Established an environment-related business planning office, to prepare for entry into the renewable energy business
2010	Oct.	Established a solar energy business planning office
2012	Sep.	Established GP Energy Co., Ltd. as a subsidiary specialized in a solar power plant operating business
2013	Feb.	Established Tamagawa Solar Systems as a sales subsidiary of solar power generation system
	June	Registered with the Financial Services Agency as a qualified institutional investor; began electricity sales at a mega solar power plant in Shimonoseki, Yamaguchi Pref.
2014	Dec.	Entered the geothermal power generation business
		Renamed the Solar Energy Business to the Renewable Energy Business
2015	March	Began electricity sales at a mega solar power plant in Sodegaura, Chiba Pref.; announced memorandum of understanding regarding business alliance with Etrion Japan
	April	Subsidiary Tamagawa Electronics established Tamagawa Electronics Vietnam Co., Ltd.
	May	Renamed Tamagawa Solar Systems to Tamagawa Energy
2016	Jan.	Established a hydropower business planning office Installed solar power tracking systems at a mega solar power plant in Sodegaura, Chiba Pref.
	March	Began electricity sales at small wind power plant in Tateyama, Chiba Pref.
	June	Acquired a 30% equity stake in Etrion Energy 5 LLC and made it an equity-method affiliate
	Oct.	Began operation of an optical distributed antenna system (DAS) for an airport multi-channel access (MCA) radio network at Narita International Airport
	Nov.	Received an order for the subsystem for next-generation weather forecasting equipment from Toshiba Corporation
2017	Apr.	Began electricity sales at a solar power plant in Kasumigaura, Ibaraki Pref.
	Sep.	Began electricity sales at a solar power plant in Misawa, Aomori Pref., upon completion of construction
2018	Feb.	Acquired small-scale wind power sale interest in 50 projects in Tohoku and Hokkaido
	March	Began electricity sales at a solar sharing power plant in Shimada, Shizuoka Pref.
		Began electricity sales at a mega solar power plant in Goto, Nagasaki Pref.
	Apr.	Began electricity sales at a small wind power plant in Ooma, Shimokita-gun, Aomori Pref.
	Oct.	Established THEG PTE. LTD. in Singapore
Nov.	Began electricity sales at mega solar power plant in Noboribetsu, Hokkaido	
2019	March	Subsidiary Tamagawa Electronics opened an office in Ho Chi Minh City
		Sold a mega solar power plant in Sodegaura, Chiba Pref.
	July	Began development and verification test of Green Energy Surplus Power Managing & Coordinated Operation System GEMCOS
	Sep.	Sold a mega solar power plant in Shimonoseki, Yamaguchi Pref.
	Nov.	Adopted as a joint operator of the small hydropower generation business in Indonesia for the "Facility Assistant Business among the Joint Crediting Mechanism Funding Support Business"
Dec.	Sold all of its equity holding of Etrion Energy 5 G.K.	
2020	March	Subsidiary Tamagawa Electronics successfully made a general public bid for "Manufacturing of lower-power high-frequency circuit and beam monitor circuit system for next-generation synchrotron radiation facilities" of the National Institutes for Quantum and Radiological Science and Technology. Sold a mega solar power plant in Tateyama, Chiba Pref.; expanded a mega solar power plant in Goto, Nagasaki Pref.

Source: Prepared by JPR based on disclosed information

## Business composition

The Tamagawa HD Group has three business segments: 1) Electronic and Communication Devices; 2) Renewable Energy System Sales; and 3) Renewable Energy Power Plants. Segments 2) and 3) are aggregated as a renewable energy business for explanation purposes.

### Electronic and Communication Device Business

Tamagawa makes use of its key technologies in high-frequency wireless, optical transmission, and digital signal processing for provision of devices for mobile infrastructure, terrestrial digital broadcasting, satellite earth stations, disaster prevention, measurement, public transportation, and the public-sector.

### Renewable Energy Business

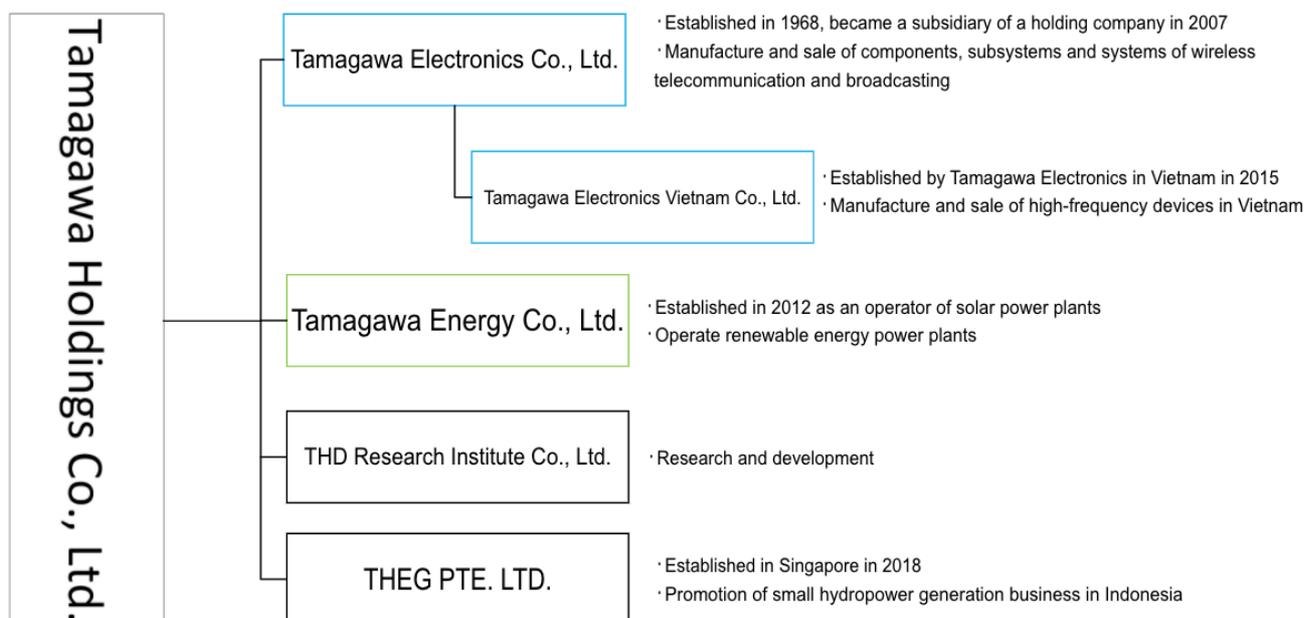
Tamagawa is engaged in the business of selling renewable energy system (one-stop solution offering, from system adoption to management) and the renewable energy power station business (power plant development, and operation of the Group's own power plants).

### Business segments and fiscal 2019 sales

Business segment	Sales (Sales ratio)	Segment profit	Business activities
Electronic and Communication Devices	¥3,417million (54.0%)	¥348 million	Development, manufacturing and sale of high-frequency devices of wireless and communication equipment and public infrastructure systems with strength in high-frequency wireless technology. Engaged in system integration by combining optical transmission, digital signal processing in addition to high-frequency technology. A wide range of adoption from communication infrastructure to terrestrial digital broadcasting, satellite earth stations, disaster prevention, measurement, traffic systems, etc.
Renewable Energy System Sales	¥823 million (13.0%)	▲¥27 million	Planning, installment, inspection, operation, and maintenance of renewable energy systems for companies and general consumers
Renewable Energy Power Plants	¥2,091 million (33.0%)	¥698 million	Development of solar, wind power and other renewable energy power plants by the Tamagawa HD Group and sale of generated power to electric power companies. Daily power generation volume: approximately 50,000kWh (2020/4/30)

Source: Prepared by JPR based on the Company's Financial Summary, Integrated Report for the 60<sup>th</sup> Term Integrated Report, corporate website, etc.

### Group structure



Source: Prepared by JPR based on disclosed information

## Corporate mission and policy

Corporate philosophy is to work on the three “Re”

**First “Re”:**  
Corporate “Re”generation, making the Electronic and Communication Device Business highly profitable

**Second “Re”:**  
Increasing use of “Re”newable energy

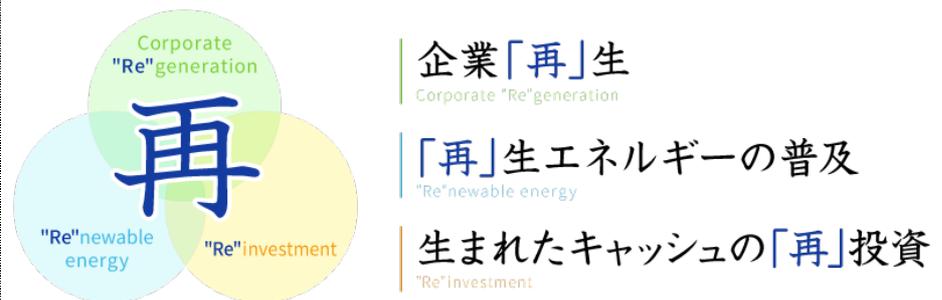
**Third “Re”:**  
“Re”investment of cash

## Work on three “Re” and support abundant lives of people

### Experts in raising shareholder value joined Tamagawa

Since 2007 when the Tamagawa HD Group was established, Tamagawa has hired financial, accounting, and real estate experts in corporate regeneration and creation of shareholder value, and has adopted as a corporate mission to work on three “Re” by using expertise of those professionals.

### Conceptual differentiation of the Tamagawa HD Group



Source: The Tamagawa HD Group’s website

### First “Re” → Corporate “Re”generation

The first mission is corporate regeneration. The Electronic and Communication Device Business, once a chronic loss-maker, broke away from the price-competitive component business, raised its own capability to combine analog technologies with digital ones and hardware with software and construct systems, added more value to its products and services, focused on less-competitive niche areas, and regenerated itself.

### Second “Re” → Use of “Re”newable energy

The second mission is to contribute to increased reliance on renewable energy. Fund-raising capability for use of land sites, and for capital spending, is one key for the renewable energy business. Tamagawa therefore expanded business by strengthening its human resources by hiring professionals in real estate, finance, and accounting.

### Third “Re” → “Re”investment of cash

The third mission is to reinvest cash raised from realization of the first and second mission, and thereby contribute to abundant living of people.

## Contributing to an improved future

Tamagawa’s corporate strategy is, through these three “Re”, to effectively use limited resources, combine diverse technologies to enrich people’s daily lives, and invest in sustainable business with high profitability and ROE with the ultimate aim at enhancing the basis for improving abundance in the daily lives of people, and the well-being of the planet.

**Capability and provision of value**

**Three types of capability to enhance corporate value**

**Capability to realize corporate mission and policy**

**Three types of capability that enables flexible business portfolio conversion**

The Tamagawa HD Group is continuing its business portfolio conversion, starting from regenerating its original business in electronics and communication devices. Entry into the renewable energy business is another conversion. In this new business, Tamagawa has shifted from solar power generation to wind power generation, and has also ventured into an overseas investment project in Indonesia. Moreover, Tamagawa invests in technologies for achieving long-term growth, such as joint development with Tohoku University for optimizing equipment control and monitoring systems for surplus energy and small atomic clocks. Tamagawa's future corporate value depends on whether these business investments will be successful, but aside from this the company is expected to raise its value thanks to its following three types of capability.

**(1) Capability to read future social needs**

Capability to identify a suitable direction for business portfolio conversion, with the aim of optimizing corporate value

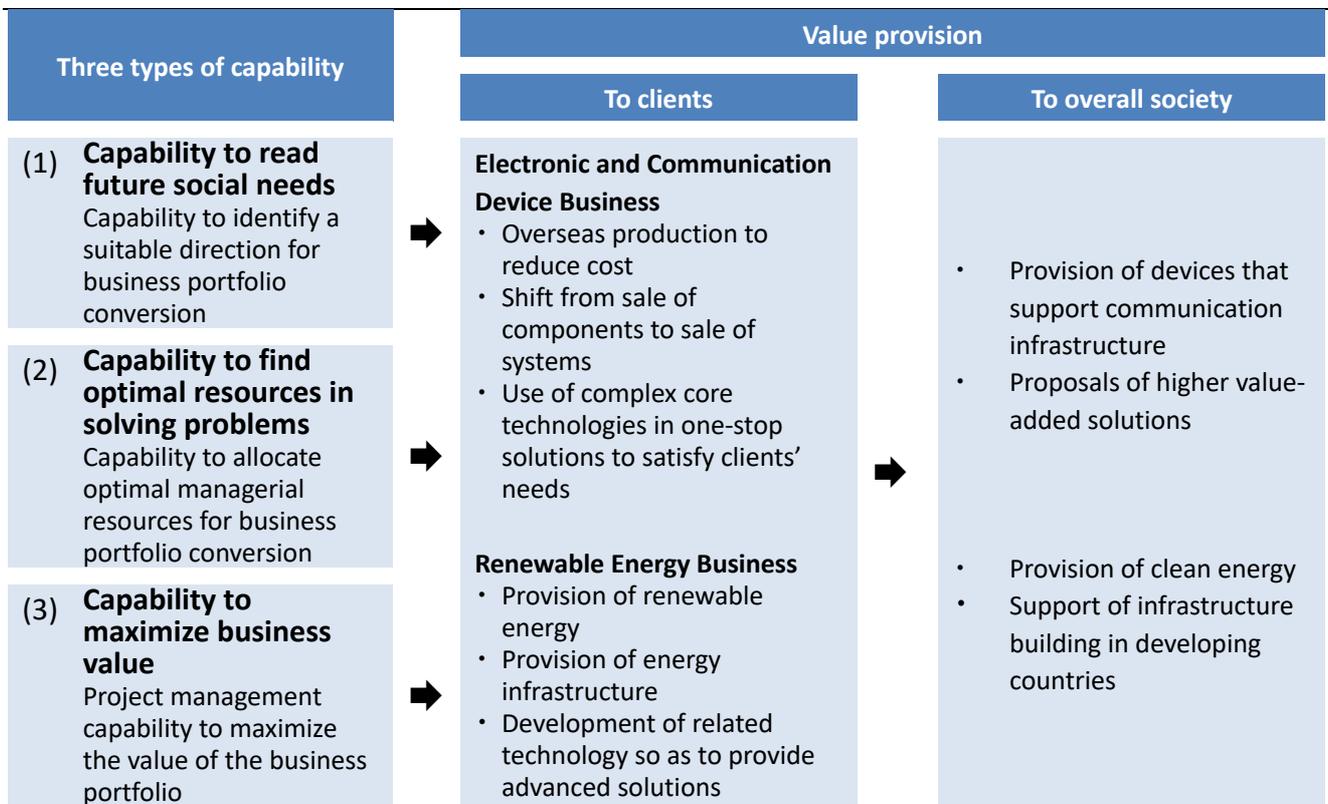
**(2) Capability to find optimal resources in solving problems**

Capability to allocate optimal managerial resources for business portfolio conversion

**(3) Capability to maximize business value**

Project management capability to maximize the value of the business portfolio  
 Tamagawa strives to provide solutions in communication infrastructure and energy infrastructure by adhering to the above concepts.

**Three types of capability and value provision**



Source: Prepared by JPR based on the interviews

## SDGs

### A company with a diversified approach in achieving SDGs

#### Contributing to achievement of SDGs

The Tamagawa HD Group's corporate mission and policy are in accord with Sustainable Development Goals (SDGs) for 2016 to 2030, as adopted by all United Nations member states in 2015. Among the SDGs, Tamagawa is contributing particularly to achievement of the following four.

#### Four SDGs that the Tamagawa HD Group keeps foremost

Renewable Energy Business		Electronic and Communication Device Business	
	Contributing to ensuring access to cheap, reliable, sustainable, modern energy for all people		The Electronic and Communication Device Business to contribute to realizing inclusive, safe, resilient, sustainable cities and human habitation
	Contributing to CO2 emission reduction and climate control measures by proactively conducting renewable energy business, such as solar or wind power generation, in lieu of using carbon energy (coal, oil, natural gas, etc.)		Contributing to development of high-quality, reliable, sustainable, and resilient infrastructure, including regional or transborder infrastructure, so as to support economic development and human welfare, with a focus on cheap, fair access for all people

Source: Prepared by JPR based on the Company's website, etc.

## ESG

### A company with a diversified approach in achieving SDGs in the environmental business and engaged in establishment of communication infrastructure

The Tamagawa HD Group is working at the following initiatives from a viewpoint of Environment, Social, and Governance (ESG).

#### The Tamagawa HD Group's ESG initiatives

 <b>Environment</b> 環境	<ul style="list-style-type: none"> <li>Expansion and promotion of Renewable Energy Business</li> <li>Obtaining ISO14001<sup>1</sup> certification</li> </ul>
 <b>ocial</b> 社会	<ul style="list-style-type: none"> <li>CSR initiatives<sup>2</sup></li> <li>Obtaining quality standard ISO9001<sup>3</sup> certification</li> <li>Establishment of an organization that empowers all employees</li> <li>Promotion of diversity<sup>4</sup></li> </ul>
 <b>overnance</b> 企業統治	<ul style="list-style-type: none"> <li>Timely appropriate disclosure; proactive PR disclosure</li> <li>Corporate compliance</li> <li>Enhanced corporate governance system</li> </ul>

1: ISO14001 is an international standard concerning environmental management.

2: CSR stands for Corporate Social Responsibility, a management style that is considerate of many stakeholders in a community.

3: ISO9001 requires an organization to establish quality management systems and prepares and maintains documentation.

4: Diversity in corporate management is to accept diversity in gender, race, age, personality, academic background, values, etc. and to use diverse human resources for productivity enhancement.

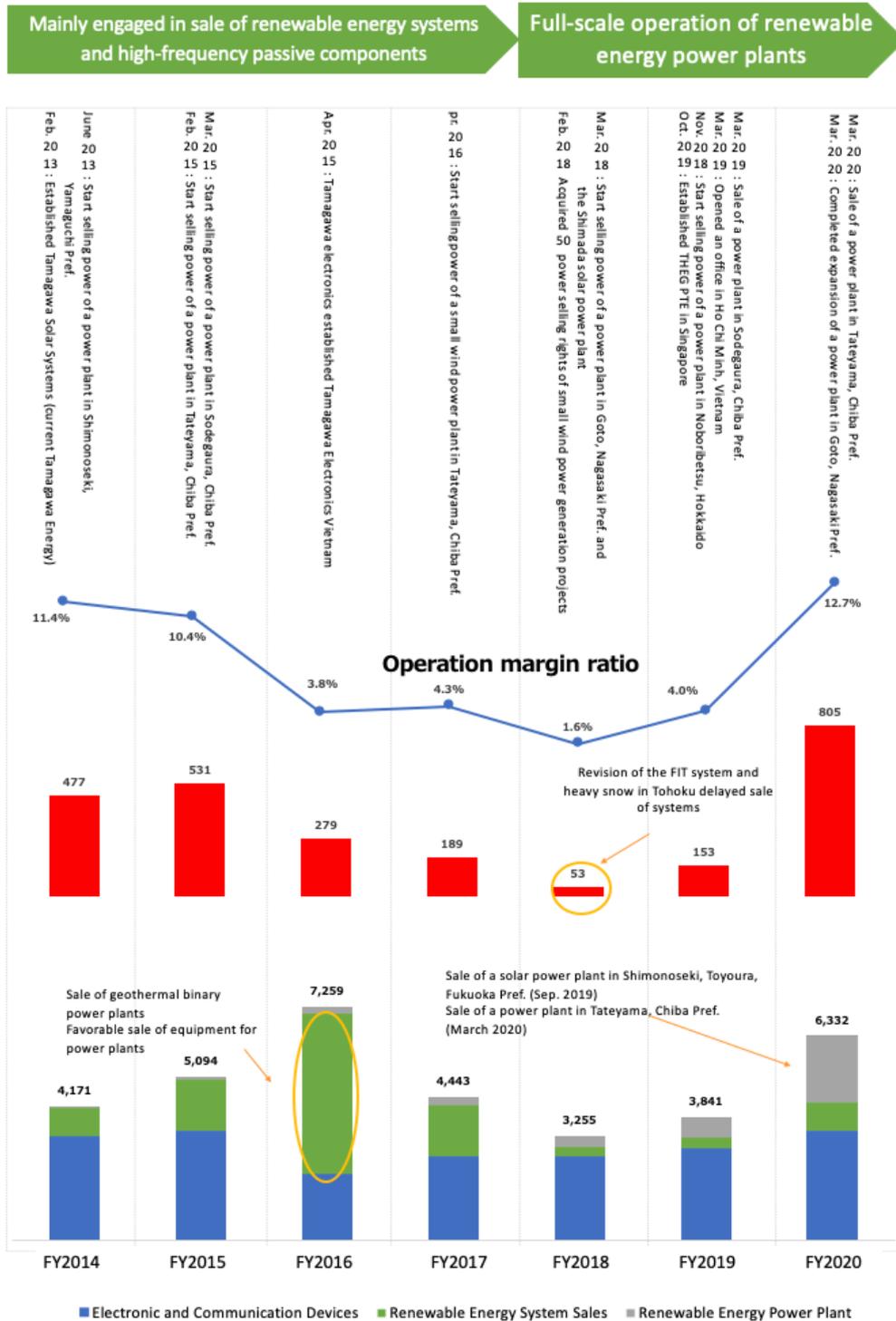
Source: Prepared by JPR based on the Company's website, etc.

## Long-term performance

### Achieve record-high profit in fiscal 2019

The Tamagawa HD Group achieved record-high operating profit in fiscal 2019 (ended March 2020), with a notable contribution by the three “Re” initiatives, and operating margin was 12.7%.

#### Long-term operating performance



Source: Prepared by JPR based on disclosed information

# 1. Business development up to now and outlook

## Business development up to now

### Electronic and Communication Device Business

#### Huge growth potential in the 5G era

The Electronic and Communication Device Business, that Tamagawa has been engaged in since the beginning, has strength in providing solutions centered around high-frequency circuit devices that support wireless transmission. High-frequency solutions are indispensable for capital investment related to 5G, which is projected to increase by 17 times<sup>1</sup> from 2019 to 2025. In the future, application is expected to expand for millimeter and submillimeter waves and opticals, which transmit more data than what they replace, and for various electric and energy systems that use high-frequency technology. Ultimately Tamagawa plans to contribute to so-called Smart City<sup>2</sup> and Smart Grid infrastructure.

1. Source: Infinium Global Research. 5G Infrastructure Market: Global Industry Analysis, Trends, Market Size, and Forecasts up to 2025

2. Smart City is an eco-friendly urban area that uses IT for efficient use of energy and resources. It aims to create a pleasant, safe, sustainable society for environmentally-conscious people.

### Wireless information communication systems, future technological outlook, and Tamagawa's strategy

#### Enhance data transmission capacity — key points in the 5G era

Key points of information transmission capacity	Details
High-speed, high-capacity communication	<ul style="list-style-type: none"> <li>Use millimeter wavelength to ensure a broad frequency band</li> <li>Use modulation technology to increase data transmission volume.</li> </ul>
Long-distance communication and optical transmission technology	<ul style="list-style-type: none"> <li>Use optical technology in long-distance communication</li> <li>Low-loss, low-noise information transformation by use of RoF technology that corresponds to Sub 6 and millimeter bands</li> <li>Use in blind zones or for indoor information communication</li> </ul>
Multi-band support; sharing of frequency waves	<ul style="list-style-type: none"> <li>Multi-band by adding new bands to existing bands</li> <li>Multi-wave duplexer to support multi-band</li> <li>Branch synthesizer to expand frequency waves</li> </ul>

#### Telecommunication technologies that improve information transmission

Technology	Detail
Modulation and demodulation	Development of modulators and demodulators by use of digital signal processing
High integration	Development of highly integrated small high-frequency modules via multi-layers
SDR	Wireless software that supports wide frequency bands
Optical transmission	E/O and O/E converters for optical modulation technology
Frequency conversion	Development of U/C and D/C with IF frequency bands that support millimeter waves
Mounting technology	Wire bonding mounting to improve mounting technology that supports millimeter wave components

#### Types and applications of radio wave: Expanding role of high-frequency waves in the 5G era

Wavelength frequency	← Less linear Smaller transmission of data volume → More linear Greater transmission of data volume									
	Super long, Very long, Long	Medium	Short	Very short	Ultra-short	Micro	Millimeter	Submillimeter	Optic <sup>2</sup>	
Name of wavelength	Super long, Very long, Long	Medium	Short	Very short	Ultra-short	Micro	Millimeter	Submillimeter	Optic <sup>2</sup>	
Application	Vessel/aircraft beacons Standard wave	AM broadcasting	Ocean vessel comm. Shortwave broadcasting Aviation comm. Amateur radio comm.	FM broadcasting Public, defense comm. Aviation comm.	Mobile phone Terrestrial digital TV broadcasting	5G mobile phone Satellite comm. ETC Wireless LAN	5G mobile phone Radio astronomy Satellite comm. Convenience radio Radars	Fixed wireless comm. Radio astronomy Non-destructive medical test image for diagnosis	Infrared comm. Optical wireless LAN Outer space Optical comm.	

#### The Tamagawa HD Group's high-frequency wave domains

Source: Prepared by JPR based on materials of Fujitsu Laboratories Ltd. and the "Principal Uses and Characteristics of Radio Wave" on the website of the Ministry of Internal Affairs and Communications

1. The Radio Law stipulates that any person who wishes to install telegraphy, telephony or other telecommunications facilities which apply a radio frequency current of 10kHz or above to the wired system, or those using a radio frequency current of 10kHz or above such as industrial heating equipment, medical equipment and others, shall obtain individual permission as a rule. Therefore, a radio frequency current of 10kHz or above is called "high-frequency" in this report.

<https://www.tele.soumu.go.jp/e/sys/others/highfre/>

2. Includes infrared rays and visible rays.

### Five strategies that enhanced competitiveness

- (1) Development of system devices
- (2) Enhanced R&D
- (3) Focus on niche areas
- (4) Selective acceptance of orders; immediate delivery system
- (5) Globalization

### Loss making in the 2000s

In the 2000s, Tamagawa had Japan's top share in high-frequency devices for mobile communication bases, which represented 70-80% of the segment sales. However, due to 1) Korean makers' entry and intensified price war, 2) decline in sales in an in-between period of investment cycles, and 3) acceptance of low-profit orders, the segment made loss for five out of ten years during the period of FY3/2001 to FY3/2011.

### Strategy to move out of loss made Tamagawa more competitive

The Tamagawa HD Group enhanced the five strategies to end loss-making.

Strategy	Detail	
	Targeted direction	Targeted direction
① Development of system devices	From simple devices and components to system equipment and system development	Aimed to be in the top league in high-frequency solutions by combining analog with digital and software with hardware. Enhanced analog technologies, digital technologies for developing systems and equipment, hiring of human resources for both areas. Also promoted strengthening comprehensive capacity in hardware and software.
② Enhanced R&D	Enhance relationship with major communication companies, manufacturers, and university research institutes, and foresee potential growth areas for R&D	Engineers, hired for systemization, worked closely with major makers and research institutes for creating prototypes flexibly at reasonable development cost. Collaboration was enhanced and Tamagawa's R&D capability was boosted.
③ Focus on niche areas	Break away from excess dependence on mobile communication, which has volatile capital expenditure cycles, and focus on difficult niche areas (defense, traffic, vehicle installation, broadcasting, space, satellite, and medical).	Provided total solutions by collaborating with engineers, hired for systemization. By becoming one of the industry's top provider of high-frequency solutions, thoroughly responded to clients' niche needs, obtained their trust, and established a solid relationship with them.
④ Selective acceptance of orders; immediate delivery system	Be selective in order acceptance by considering profitability. Establish an immediate delivery system through close relation with clients, information gathering, demand forecasting, and inventory stocking.	Established a system to manage order acceptance by considering profitability. Established an immediate delivery system as targeted.
⑤ Globalization	Established a manufacturing base in Vietnam in 2015, so as to globally provide competitive, Japan-quality products.	Raised the quality of device manufacturing at a manufacturing base in Vietnam to the level in Japan.

Source: Prepared by JPR based on the interviews, etc.

### Strategy results and outlook: 1) development of system devices and 2) enhanced R&D

#### Development of high-value-added products

Entry of overseas makers has intensified price competition of the component

Testing to ensure reliability and functionality of power semiconductors



Enhanced hiring of mid-career engineers who are strong in software and digital

Phased increase in value added from components to modules, then to systems

Expanding from high-frequency technologies to optical transmission and signal processing technologies

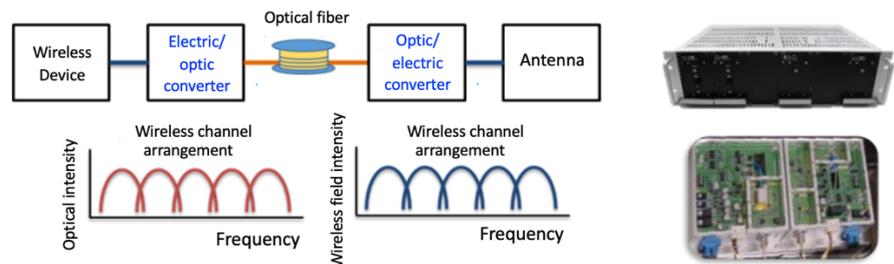
Proactive pursuit of future growth areas

Strong relationship with major telecommunication companies, manufacturers, university research institutions

market, which focuses more on costs. Tamagawa therefore shifted from components to functional modules of multiple components and further to systems so as to add higher value. Tamagawa further enhanced analog technologies – an area of strength since foundation – and hired experienced engineers in systems. At the same time, Tamagawa aggressively enhanced digital technologies in order to establish core technologies, such as for control and signal processing needed in system devices and system development, and hired personnel. A key point in the enhanced comprehensive strength in hardware and software was to make use of its strength in analog high-frequency technologies to expand to optical transmission, signal processing and software as core competence.

With regard to optical transmission technology, that converts wireless signals to optical signals and transmit them via an optical fiber network, Tamagawa developed optical transmission equipment used for railway wireless systems and optical transmission systems against a problem of blind areas of electric waves and for expansion of communication areas. Representative examples of their adoption include commercial wireless systems installed at subways and airports, and in the public sector for radars used in weather forecasting of torrential rain and tornadoes. In addition to analog high-frequency and optical transmission, Tamagawa responded to digitalization requirements and further developed solutions in signal processing and software. This has led to its internal development of burn-in equipment for testing to ensure reliability and functionality of semiconductors, and to capturing of the growing demand for power semiconductors.

**Optical transmission system**



Source: The Tamagawa HD Group's Financial Result Briefing for fiscal 2016

**Successfully received a major project**

The Tamagawa HD Group has also proactively strengthened initiatives in potential growth areas. By leveraging its strong technological capability, Tamagawa established a strong relationship with major telecommunication companies, manufacturers, and university research institutes, and enhanced its system for developing future growth areas.

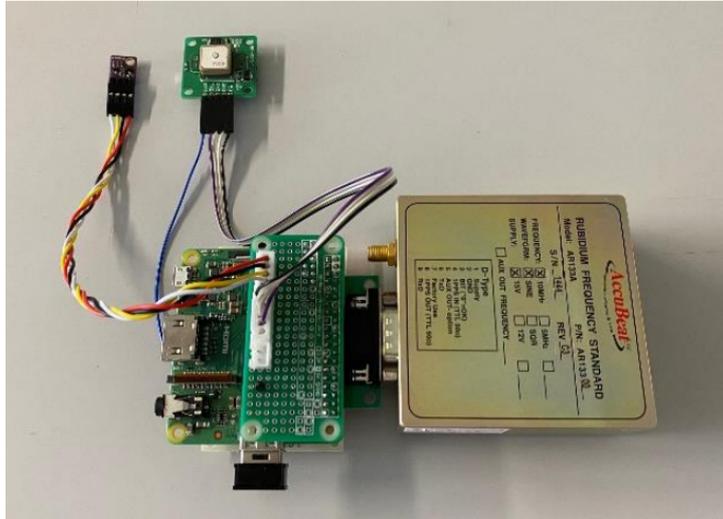
One good example manifesting Tamagawa's successful addition of more value via its strategies for systemization and R&D is that it has received an order to manufacture a low-power high-frequency circuit and beam monitor circuit system for next-generation synchrotron radiation facilities, which was announced on March 12, 2020. Reasons for successful bid include Tamagawa's enhanced hiring of engineers who are strong in software so as to promote systemization. Even with the progress in digitalization, analog transfer continues to be needed at the end of signal processing. As a result, analog technologies, where Tamagawa has accumulated strength since foundation, have received renewed attention and reevaluation. Tamagawa has been successfully hiring engineers with technical skills in broad areas as some engineers find Tamagawa as an attractive workplace that allows analog technologies to be incorporated in software. Hiring of capable engineers contributed to Tamagawa's strong business results and a virtuous cycle has thus been established.

**Working on development of an atomic clock, a key device in realizing Smart City**

### Kick-off of research on small atomic clocks and their applications

On July 6, 2020, the Tamagawa HD Group disclosed that it started joint research on small atomic clocks which are expected to be mounted on mobile terminals, and an application using an atomic clock with Professor Takahito Ono of Tohoku University. As the first step, a prototype of IoT (Internet of Things) system using an atomic clock was developed.

#### ■ Prototype of IoT (Internet of Things) system using an atomic clock



Source: The Tamagawa HD Group's press release of July 6, 2020

**Accuracy of a small atomic clock is a key for more optimal energy allocation and more accurate information analysis**

An atomic clock is a clock based on the frequency of electromagnetic waves absorbed or radiated by an atom (also including neutral and ionic). It was invented in the United States<sup>1</sup> in 1949. A small atomic clock is as approximately 100,000 to 1,000,000 times as accurate as the widely used crystal oscillator and has been expected to be used mounted on artificial satellites for time synchronization of information communication networks as the standard signal source in the space where GNSS (Global Navigation Satellite System) transmissions cannot function. Recently, reduction in energy consumption and downsizing have increased in importance and in this connection atomic clocks are anticipated to be mounted in clocks, base stations, and mobile terminals used in the next-generation mobile communication system because of their highly accurate time synchronization function. Higher accuracy and quality of a small atomic clock embedded in a high-frequency solution system enables higher precision in synchronization of the function timing of different devices, and hence more optimal energy allocation and more accurate information analysis. Reduction of energy consumption, high reliability, and high precision can mean adoption of small atomic clocks for general use, such as by being embedded in smartphones and other devices, and can become indispensable in realizing a better Smart City<sup>2</sup>.

1. Source: Wikipedia

2. Smart City is an eco-friendly urban area that uses IT for efficient use of energy and resources. It aims to create a pleasant, safe, sustainable society for environmentally-conscious people.

**Business expansion from Sub 6 to millimeter waves**

### Development outlook of millimeter products for potential use in 5G

In March 2000, NTT Docomo, KDDI, and other companies launched commercial services of 5G (Fifth-Generation Mobile Communications System) in Japan. Initially, a frequency band of 450MHz to 6GHz (so-called "Sub 6" or "low-band") was used

The industry's top-level experience in high-frequency solutions that combine analog & digital technologies, and software & hardware

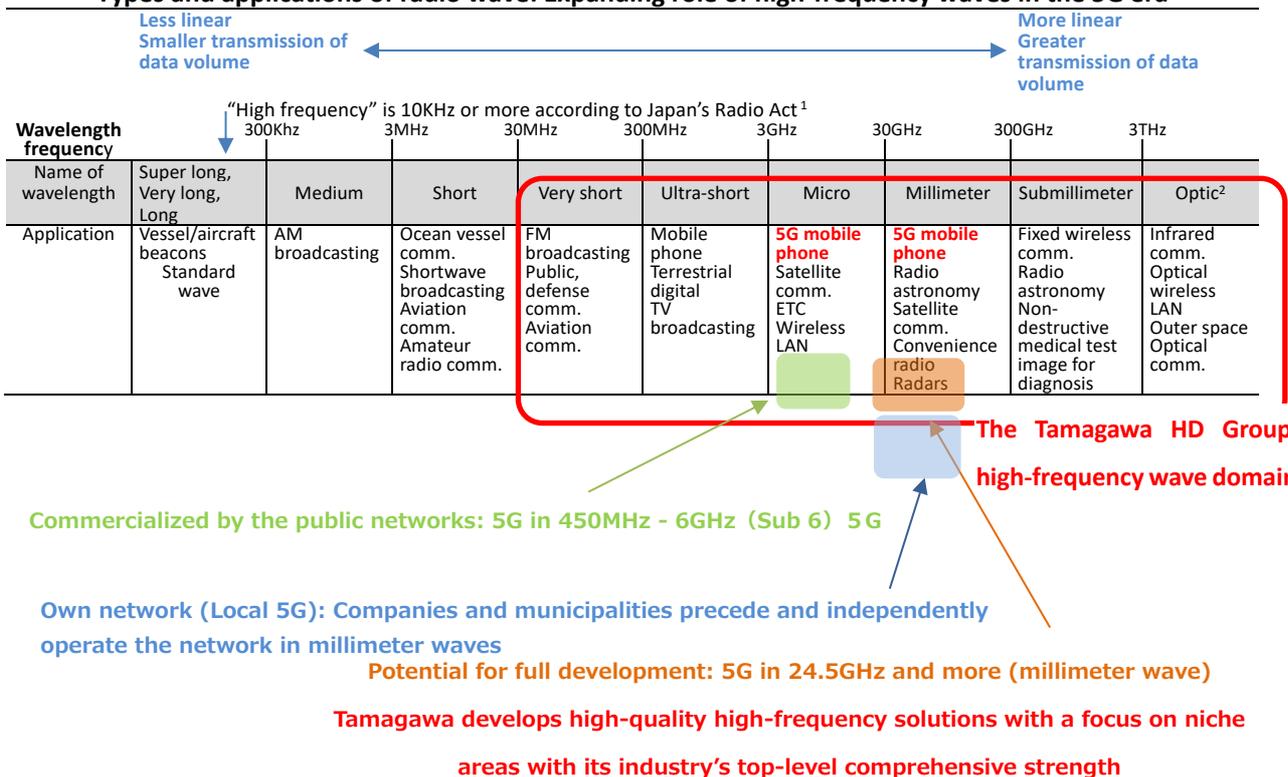
Anticipating a dramatic growth in the 5G field

and it was planned that next a high-volume high-frequency band of 24.5GHz or over and millimeter waves will be used. Millimeter and other high-frequency waves have not yet fully been used for commercial applications, due to feasible applications being limited, but increase in commercial applications is expected to substantially expand its market. In addition to the public network service, Tamagawa plans to commercialize its own 5G (local) service and offer a wide range of practical applications that span from Sub 6 to millimeter waves.

Tamagawa's strong technology in the high-frequency band can be applied in the area of millimeter waves. Thanks to its efforts for 1) systemization and 2) enhancement of R&D, Tamagawa, despite being a small-scale operator, has the industry's top-level experienced engineers in high-frequency solutions that combine analog & digital technologies, and software & hardware. The company also has high-spec cleanrooms and testing equipment that are indispensable in development of advanced high-frequency solutions. Being positioned close to major companies, Tamagawa intends to use these management resources, leverage its credibility and achievement in the high-frequency area, and explore the market. As this area has a different sales channel, a challenge for Tamagawa is to build an aggressive sales and marketing strategy, especially with a focus in a niche area where it would not have to compete with major makers (described later).

**Commercial use of millimeter waves and Tamagawa's growth strategy**

**Types and applications of radio wave: Expanding role of high-frequency waves in the 5G era**



Source: Prepared by JPR based on materials of Fujitsu Laboratories Ltd. and the "Principal Uses and Characteristics of Radio Wave" on the website of the Ministry of Internal Affairs and Communications

Nabiq provides advanced outsourced services in the wireless broadband environment

Capital and business alliances to enable earlier realization of real 5G by use of millimeter waves

**Capital and business alliance with Nabiq**

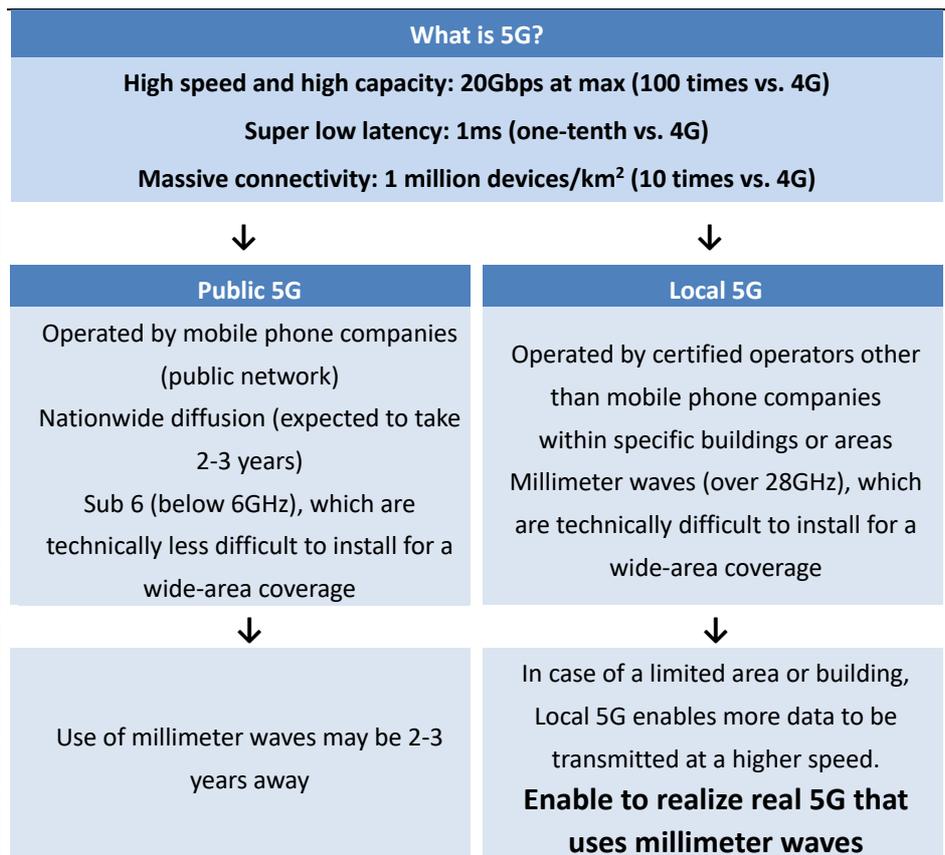
**Nabiq + Tamagawa = Realization of real 5G**

On August 26, 2020, the Tamagawa HD Group’s Board of Directors made a resolution to enter into a capital and business alliance with Nabiq Inc. (headquartered in Chiyoda-ku, Tokyo; Tomonari Takatsu as representative). Nabiq is a consolidated subsidiary of JTOWER Inc. (headquartered in Minato-ku, Tokyo; Atsushi Tanaka as representative), which is listed in the TSE Mothers Market.

Nabiq provides advanced outsourced services in the wireless broadband environment and is engaged in constructing the access environment in which the Wi-Fi application technologies are combined with the existing fixed broadband lines. Sale of Local 5G-related services, that target hospitals, hotels, and other places, in cooperation with Tamagawa, is expected to generate synergies and contribute to expansion of their operating base and business. Moreover, JTOWER, the largest shareholder of Nabiq, has provided services to large facilities in its domestic IBS\* business and has 5G and other diverse related services in its business portfolio with its main focus on infrastructure sharing solutions that unite indoor facilities of mobile phones. A wide range of synergies, therefore, can be expected in terms of business development capacity.

\* JTOWER’s In-Building Solution (IBS) business is to install its own-developed equipment to be shared by mobile carrier operators, each of which, up to now, invested on its own for building indoor mobile infrastructure.

**Features of Public 5G and Local 5G: Early realization of real 5G with Local 5G**



Source: Prepared by JPR from various materials

As described above, there are two usages of 5G: Public 5G to be developed by mobile phone operators; and Local 5G to be developed by other certified operators. Due to short wave-lengths, signals of which cannot smoothly travel through buildings and other objects, the 5G network requires installment of many base

**Longer-term expectation for early realization of real 5G by use of small atomic clocks in the era of edge computing and AI/IoT**

stations. Thus, it is expected to take 2-3 years for Public 5G to be built. In contrast, Local 5G, which is installed in a limited area or within a building, is relatively easily constructed. Millimeter waves enables more data transmission at higher speed, and the millimeter-wave network can be customized, leading to early realization of real 5G.

**Nabiq + Tamagawa + small atomic clocks**

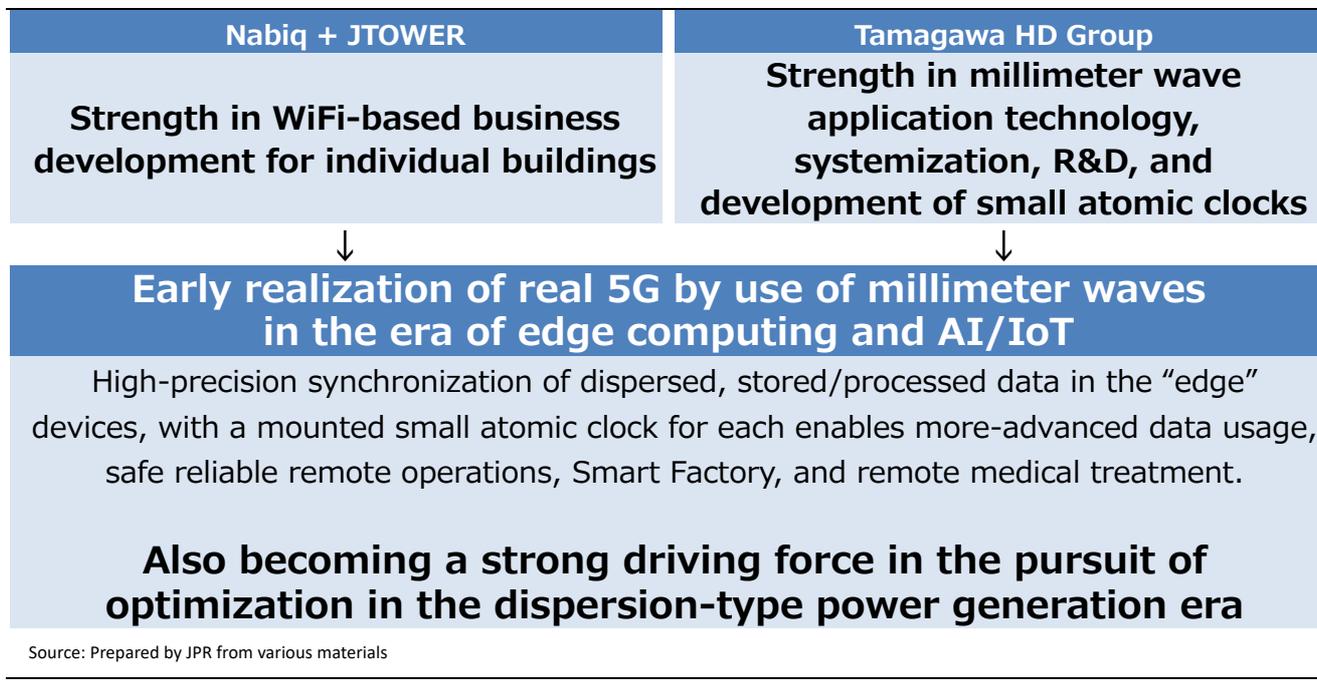
**= Early realization of real 5G in the era of edge computing and AI/IoT**

Real 5G enables to transmit high-resolution images in low latency. This is to be used for the automated driving system, which requires accurate information on position or image, Smart Factories that need advanced automatic control, and advanced remote medical treatment (remote surgical procedures) among other usages.

Edge computing, that enables data processing and storing tasks run by devices, is important for development of advanced IoT. In edge computing, each IoT device at the edge of the network must capture accurate time of each data and one of keys is to develop a small atomic clock, which is to be mounted in a device of the size of a smartphone. Tamagawa’s aforementioned development project of small atomic clocks is noteworthy from this reason as well.

Combination of the Wi-Fi-based business development capability of Nabiq and JTOWER with Tamagawa HD Group’s technological capability in circuit installment, applications, systemization, and R&D technology is an extremely noteworthy step forward in the pursuit of real 5G in the era of edge computing and AI/IoT. Further, edge computing is expected to be critically important in key technology of dispersion-type power generation, another business area of Tamagawa (more details in the Renewable Energy Business section). The strengths of Nabiq, JTOWER, and Tamagawa will be a strong driving force in the pursuit of efficiency in dispersion-type power generation.

**Significance of the capital and business alliance in early realization of real 5G in the era of edge computing and AI/IoT**



Selection and concentration for the pursuit of profit

Prior arrangement and bulk orders led to cost reduction and establishment of an immediate delivery system

More stable business portfolio

Tamagawa's subsidiary in Vietnam



### Strategy results and outlook: 3) focus on niche markets and 4) selective acceptance of orders and immediate delivery

In the highly price competitive mobile area, in addition to a selective, targeted strategy to highly-profitable orders, Tamagawa shifted focus on acquiring high-volume orders in the defense, transportation, broadcasting, and satellite fields and orders for a large system. Tamagawa also focused on collecting demand information ahead of orders and made prior arrangement to place a bulk order for components. This resulted in substantial cost reduction while an immediate delivery system was established in product supply.

These efforts have resulted in achieving high profit margin of around 10% in recent years. Sales destinations have become better balanced with one third each for the mobile communication, governments, and public-related sectors, with reduced dependency on the mobile communication field.

#### Electronic and Communication Device Business: Segment sales and profit, and sales ratio to mobile communication and to others

million yen	2014/03	2015/03	2016/03	2017/3	2018/3	2019/3	2020/3
Sales	3,230	3,406	2,091	2,605	2,627	2,854	3,417
Segment profit	480	467	-12	246	225	222	348
(%)	14.9%	13.7%	-0.6%	9.4%	8.6%	7.8%	10.2%

million yen	2015/03		2016/03		2017/3		2018/3		2019/3	
Electronic and Communication Device	1,404	41%	486	23%	549	21%	630	24%	831	29%
governments, public-related, others	1,995	59%	1,622	77%	2,056	79%	1,996	76%	2,023	71%
Total	3,400	100%	2,108	100%	2,605	100%	2,626	100%	2,854	100%

Source: Prepared by JPR based on disclosed materials

### Strategy results and outlook: 5) globalization

Tamagawa's base in Vietnam focuses on cost control and preparation for overseas expansion

In order to enhance unrivaled price competitiveness particularly in the price-competitive mobile field and expand overseas for a broader market coverage, Tamagawa established a subsidiary in Vietnam in April 2015. At present, almost all high-frequency components used especially in Japan's telecommunication infrastructure are manufactured in Vietnam, while high-function products and multi-system products for the government and public-related sectors, is done in Japan. Both in Japan and Vietnam, Tamagawa has outsourced production processes from circuit mounting to testing, so as to reduce costs and secure resources, and has realized aggressive capital investment and expansion in production capacity. Continued quality guidance from Japan has improved products made in Vietnam to the equivalent quality level to those made in Japan. The Vietnamese subsidiary now plans to promote marketing and sales of their products to overseas telecommunication manufacturers.

#### Establishment of a subsidiary in Vietnam



Source: The Company's Presentation Materials on fiscal 2016

Aiming to be a global top niche company in high-frequency solutions

Use of diverse high-frequency devices in development of advanced solutions

### Providing a wide range of solutions

As a result of the above measures, Tamagawa provides diverse high-grade, high-value-added, high-frequency components and a wide range of high-frequency solutions that support wireless communication infrastructure. It also develops systems that combine signal processing, software, high-frequency technologies, and optical transmission technologies with system devices which embed the high-frequency components. This has enabled Tamagawa to supply products in the niche, difficult areas.

### Tamagawa's broad-based high-frequency solution business

#### The Tamagawa HD Group's diverse high-frequency devices



Use of the above devices in developing system equipment and systems, and supply of comprehensive analog and digital, software and hardware solutions in signal processing, software, high-frequency radio, and optical transmission



#### Focus on niches, difficult areas, and customized solutions

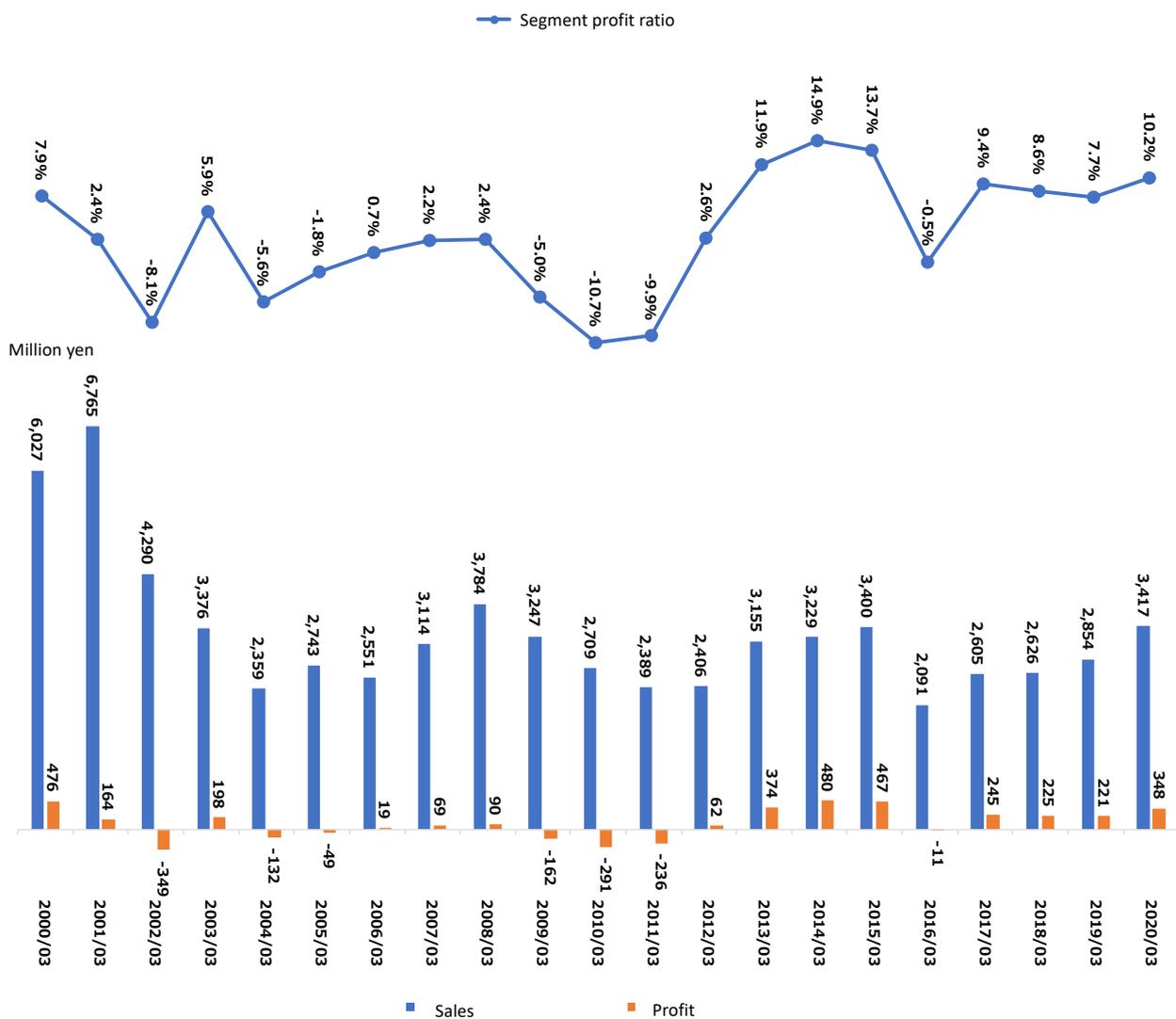


Source: Prepared by JPR based on Tamagawa Electronics' website

### Long-term operating performance

The Electronic and Communication Device Business' long-term results in sales, operating profit, and operating margin are shown below. The figures up to fiscal 2006 are for the overall company as it was only engaged in the Electronic and Communication Device Business. Operating performance has been stable since fiscal 2012, with the exception of fiscal 2015 when the overall capital spending for the domestic mobile infrastructure temporarily dropped.

#### Electronic and Communication Device Business: Sales, operating profit, and margin



Source: Prepared by JPR based on the Company's Financial Summary, etc.

## Renewable Energy Business

Diverse initiatives as a company with a diversified approach to renewable energy

The Tamagawa HD Group became interested in the potential of renewable energy business as a new pillar in 2009 and since then has been engaged in diverse renewable energy related businesses.

### Renewable Energy Business: Power resource development done and managerial technology

Biomass	Solar	Geothermal	Wind power	Hydropower	Renewable energy; efficient use of surplus power
<ul style="list-style-type: none"> <li>● Import raw materials for biomass energy from Southeast Asia</li> <li>● Joint installation of a biomass boiler</li> <li>● Transfer of biomass fuel technology</li> <li>● CO<sub>2</sub> emission credit acquisition</li> </ul> 	<ul style="list-style-type: none"> <li>● Start of solar energy business</li> <li>● Exclusive distributorship with an overseas panel maker</li> <li>● Sale of solar power gen. systems. Identification of optimal systems for diverse sites</li> <li>● Operation and control</li> <li>● Power gen. business of owned facilities</li> <li>● Use of solar sharing and farmland in solar power gen.</li> </ul> 	<ul style="list-style-type: none"> <li>● Geothermal power gen. business</li> </ul> 	<ul style="list-style-type: none"> <li>● Sale of small wind power gen. equipment</li> <li>● Small power gen. business</li> <li>● Study on large power gen. business</li> <li>● Under consideration: onshore wind power plant</li> </ul> 	<ul style="list-style-type: none"> <li>● Investment in small wind power gen. in Indonesia</li> </ul> 	<ul style="list-style-type: none"> <li>● Developed GEMCOS, a system to store and effectively use surplus power</li> </ul>

Source: Prepared by JPR based on the Company's Financial Summary, etc.

Tamagawa has also made use of its financing know-how in building a mechanism to pursue economies of scale and high internal rate of return (IRR). Major initiatives are listed below. One feature of Tamagawa is maximum use of diverse initiatives in the pursuit of high IRR.

### Financial prowess that maximizes diverse investment effects

Initiative	Details
<b>Project finance</b>	<ul style="list-style-type: none"> <li>• Maximize an investment amount by use of low-interest-rate borrowing, leveraging the future cash inflow</li> <li>• Cooperation by deep-pocketed global investors</li> <li>• Seek to raise efficiency in use of capital and to realize larger-scale investments in order to achieve higher IRR</li> </ul>
<b>Collaboration scheme as a qualified institutional investor</b>	<ul style="list-style-type: none"> <li>• As a qualified institutional investor, Tamagawa forms and manages joint power plants with companies and financial institutions, and uses securitization in so doing.</li> <li>• Seek to diversify business risks, expand scale, and raise efficiency in use of capital to realize higher IRR</li> </ul>
<b>Joint operation with companies which own real estate</b>	<ul style="list-style-type: none"> <li>• Joint business with companies who want to effectively use real estate holdings</li> <li>• Seek to diversify business risks, expand scale, and raise efficiency in use of capital to realize higher IRR</li> </ul>
<b>Use of the Joint Crediting Mechanism (JCM)</b>	<ul style="list-style-type: none"> <li>• The Joint Crediting Mechanism (JCM) is a system to cooperate with developing countries for reducing greenhouse gas emissions, in which the result of reduction is shared by both partner countries and Japan.</li> <li>• Use of the JCM enables use of Japan's financing, credit, and technological capability for global activities in CO<sub>2</sub> emission reduction. It also promotes globalization of the renewable energy business. The high spread between Japan's low interest rates and emerging countries' higher yield is beneficial in pursuit of high IRR.</li> </ul>

Source: Prepared by JPR based on the Company's Financial Summary, etc.

**[Power resource development and managerial technology prowess]  
X [Financial prowess to maximize investment effect]  
= A company with a diversified approach to renewable energy**

Tamagawa's broad experience and achievement in power resource development and managerial technology prowess, as well as financial prowess for soliciting investment will be a source of great strength for global expansion of the renewable energy market. Such strength of Tamagawa has been fostered by having professional staff in investment banking, accounting, real estate, etc. Tamagawa intends to form an optimal team of professionals in each region, while use of renewable energy is growing.

Becoming a company with a diversified approach to renewable energy

### Strengths of Tamagawa's Renewable Energy Business

Professionals in investment banking, accounting, real estate, etc.



Develop high-potential business based on technology in power source development and management

Use smart finance to maximize investment effects of technologies in power source development and management



Creation of optimal renewable energy businesses by diverse combination of technologies and finances  
**Becoming a company with a diversified approach to renewable energy**

Source: Prepared by JPR based on the Company's Financial Summary, etc.

### Solar power generation business, a driver of the Renewable Energy Business

The solar power generation business was a driver for significant profit growth in fiscal 2019. At present, the secondary market that trades solar power plants is booming and Tamagawa, partly due to its high credibility as a listed company, has successfully sold some plants at favorable pricing, including two in Shimonoseki and Tateyama in fiscal 2019.

#### Solar power plants that Tamagawa owns at present

Power plant name	Generation amount	Yen/kWh	Start date of selling power
Solar sharing plants, Shimada, Shizuoka	406Kw	36	3/20/2018
Solar power plants, Goto, Nagasaki	5.3Mw	36	3/30/2018
Solar power plants, Noboribetsu, Hokkaido	2.0Mw	40	11/2/2018

Source: Prepared by JPR based on disclosed materials

Small wind power generation business will be the next driver

Hokkaido Electric Power is expected to quadruple purchase of wind power from 2017 to 2027

Efficient use of surplus power is of key importance for a dispersed power generation

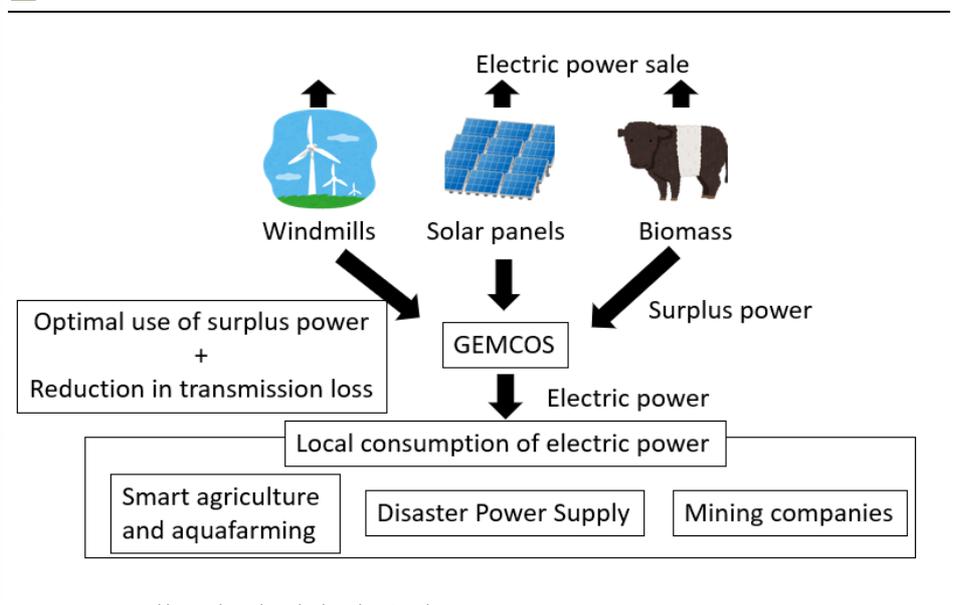
**Small wind power generation business with its high FIT of ¥55**

While limited in terms of locations in Japan, compared to other renewable energy sources, small wind power plants have high feed-in tariffs (FIT scheme of the government’s renewable energy promotion measures) of ¥55/kwh. Tamagawa acquired power sales rights for 50 small wind power plants by the end of fiscal 2018. It selected favorable projects that are located at the coast of Hokkaido, benefit from stable westerlies, have access to a distribution network and relatively cheap land prices. On March 11, 2019, Tamagawa also began small wind power generation business under an SPC scheme with AURA-Green Energy Co., Ltd., which is widely engaged in development of renewable energy in Tohoku and Hokkaido. AURA has approximately 500 power sales rights (fixed purchase price of ¥55/kwh) and land use rights. Their five power plants are currently in operation. Tamagawa plans to deepen its alliance with AURA and construct power stations based on judgement using criteria including IRR comparison, etc. As an aside, Hokkaido Electric Power is said to quadruple its purchase of wind power from 2017 to 2027 (Nikkei Shimbun, March 7, 2017). This suggests a CAGR of 15%.

**GEMCOS promotes local generation and local consumption of power by effective use of surplus power**

Use of surplus power is a challenge for renewable energy, which is usually generated in small-scale plants in dispersed locations. With an objective of establishing a business that uses surplus power, Tamagawa started a joint research project with Tohoku University in February 2019 and developed GEMCOS, a system to store and effectively use surplus power, jointly with AURA and System-I Inc. in July 2019. System-I is a company engaged in design and manufacturing of electric control equipment.

**How GEMCOS is used (schematic)**



Source: Prepared by JPR based on disclosed materials

### Playing an important role in the electric power infrastructure of developing countries

GEMCOS has two key points. The first point is use of surplus power. As an example, the peak of electric power demand is during the night for homes and during the day for offices. Such different demand peaks are preferably leveled as surplus power is to be converted to heat and disposed unless users have a power storage equipment. However, such equipment is expensive. Moreover, if surplus power is to be used at a remote location, long-distance transmission loss must be expected. The second point for GEMCOS is a how to estimate power demand and distribute power. GEMCOS' current assumption is that power is used in a relatively small area under the concept of local generation and local consumption, which enables efficient, flexible use of renewable energy. This system can be used not only for use of surplus power but also for disaster power supply, and in emerging countries where the electric power infrastructure has been underdeveloped, as GEMCOS does not require any large-scale facility.

### Relationship of trust with local people is a key for development of an offshore power plant

#### Large wind power generation project, with potential in offshore wind power generation

Tamagawa is constructing a large wind power plant (1.984MW) in Nemuro, Hokkaido, jointly with AURA. A wind condition study has been smoothly implemented since April 2020 and an IRR of 25.5% is estimated for this project. Given limited onshore site availability, however, an offshore wind power plant is under consideration. In that case, as a potential location may affect local fisheries, patient negotiation with fisheries officials must be held. GEMCOS may bring about a breakthrough as the company may become able to offer stable use of surplus power for fishery and agriculture use, contribute to the community, and build a good local connection with communities.

### Tamagawa's executives (ex-investment bankers) use their network of personal contacts in building the electric power infrastructure in Indonesia

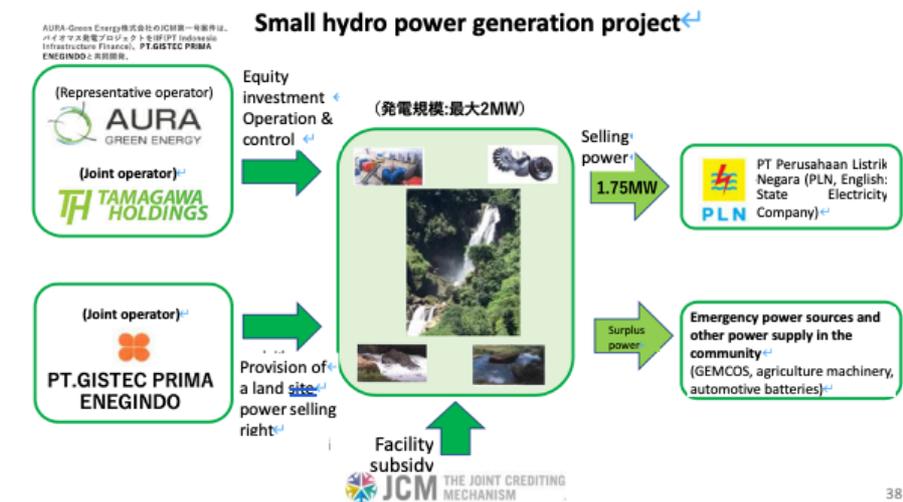
#### Indonesian hydropower generation project as a stepping stone for overseas expansion

The Tamagawa HD Group's 1.75MW small hydropower generation project for the Wae Lega River in Flores Island, in Nusa Tenggara Timur, Indonesia was approved for coverage by the Joint Crediting Mechanism (JCM) Funding Support Business of the Ministry of the Environment. It is Tamagawa's first overseas project. After installation, power will be sold to the Indonesian national electricity company. Partly due to the Japanese government's subsidy, Tamagawa estimates IRR at 25%, similar to that of a large wind power generation project. This project, in a location far away from urban areas, is difficult to undertake even by a major trading company and patient local efforts are required. Tamagawa's executives have insights regarding Southeast Asia and have built a network of personal contacts in Indonesia, when Tamagawa entered into a biomass power generation business and purchased palm shells from Indonesia. The new project is also a joint undertaking with AURA, a frontrunner among Japanese peers, whose biomass power generation projects were also adopted for the JCM Funding Support Business. According to the METI's study<sup>1</sup>, hydropower generation volume in Indonesia is projected to increase by 23.7 times from 154MW in 2020 to 3,675MW by 2025. If Tamagawa captures a decent share of such a rapid-growing market opportunities, dramatic growth can be anticipated.

### Contributing with Japanese technology and financial capacity

1. Fiscal 2017 JCM Infrastructure Development Research Project; METI, March 2018

JCM's project for greenhouse gas emission reduction



Source: Prepared by JPR based on Tamagawa HD Group's fiscal 2019, Second Quarter financial presentation material

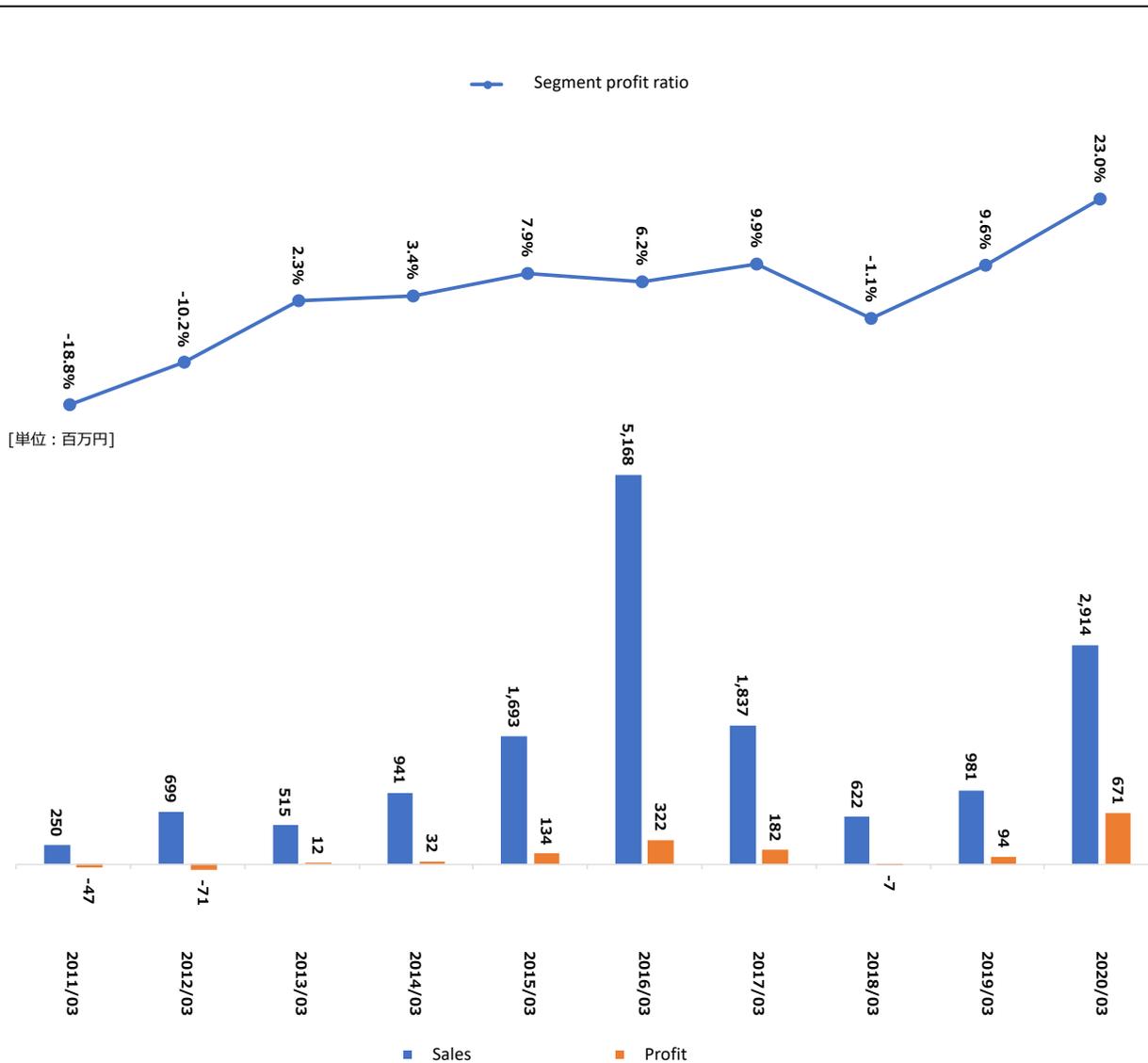
Reference: Japan's promotion of public-private environmental infrastructure investment in developing countries

When Prime Minister Abe gave a speech at the COP 21 (21st Session of the Conference of the Parties to the United Nations (UN) Framework Convention on Climate Change) Summit Meeting, he said that Japan will provide ¥1.3 trillion of public and private climate finance to developing countries which suffer from environmental changes. The Ministry of the Environment also projected in its Overseas Development Strategy (Environment) over ¥23 trillion investment opportunities for energy saving and renewable energy fields in developing countries, and encouraged use of Japan's technology to lead global decarbonization. In competing with Western and Chinese companies that seek to compete through price competitiveness and business formation capability in energy saving and renewable energy businesses, the Ministry argues that it is important to build a strong public-private partnership system and is committed to promoting overseas development of infrastructure where Japan has a comparative advantage by utilizing the JCM. For the Tamagawa HD Group, overseas expansion, in particular to developing countries with high growth potential, is expected to be beneficial. The government's environmental strategy, which emphasizes public-private partnership, provides a strong boost.

### Long-term operating performance

The Renewable Energy Business' long-term results in sales, operating profit, and operating margin are shown below. The business achieved a record-high operating profit of ¥671 million in fiscal 2019. The graph shows how Tamagawa's broad-based initiatives have steadily succeeded.

#### Renewable Energy Business: Sales, operating profit, and margin



Source: Prepared by JPR based on the Company's Financial Summary, etc.

## Results in fiscal 2019 and outlook for fiscal 2020

Sales, up 64.9% y-o-y

Operating profit, up 426%

Combined effects of past efforts brought about a successful outcome

Orders received, up 35.6% y-o-y

### Operating results in fiscal 2019

#### Achieved significant growth in sales and profit

In fiscal 2019 ended March 2020, the Tamagawa HD Group increased sales by 64.9% y-o-y to ¥6,332 million and operating profit by 426% to a record-high of ¥805 million. The Electronic and Communication Device Business increased sales by 19.7% and operating profit by 57.5%, while the Renewable Energy Business increased sales by 197% and operating profit by whopping 613%.

#### Fiscal 2019 operating results

[Million yen]				
	FY3/2019	FY3/2020	Increase	Y-O-Y
Sales	3,841	6,332	2,491	64.9%
Gross margin	1,238	1,982	744	60.1%
Operating profit	153	805	652	426.1%
Net profit	128	439	311	243.0%
Operating margin	4.0%	12.7%		
Net margin	3.3%	6.9%		
Sales: Electronic and Communication Device	2854	3417	563	19.7%
Sales: Renewable Energy	981	2914	1933	197.0%
Operating profit: Electronic and Communication Device	221	348	127	57.5%
Operating profit: Renewable Energy	94	671	577	613.8%
Operating margin: Electronic and Communication Device	7.7%	10.2%		
Operating margin: Renewable Energy	9.6%	23.0%		

#### Electronic and Communication Device Business

Sales growth was attributable to order receipts in the mobile communication infrastructure field, for the semiconductor reliability evaluation equipment in the measurement field, and repeat order receipts from governments. Profitability improved as production for some projects was brought forward for leveling of production, and resulted in actual sales as planned. Orders received grew by 35.6% y-o-y to ¥4,334 million, which suggests sales growth potential for fiscal 2020 and after.

#### Sales and segment profit by client industry

Million yen	FY3/2019	% of total sales	FY3/2020	% of total sales	Y-O-Y	Increase
Sales	2,854		3,417		+19.7%	+563
Governments	909	31.8%	699	20.5%	-23.1%	-210
Public projects	646	22.6%	1,020	29.9%	+57.7%	+373
Mobile communication infrastructure	829	29.0%	1,045	30.6%	+26.2%	+217
Other (FA and measurement-related)	469	16.4%	652	19.1%	+38.9%	+183
Segment profit	221		348		+57.5%	+127

Source: Prepared by JPR based on the Company's Presentation Materials

Other measures taken in fiscal 2019 are summarized in the next table. It shows that the five strategies of systemization, enhanced R&D, focus on niche areas, selective acceptance of orders and immediate delivery system, and globalization had further progressed in the year.

## Measures taken in fiscal 2019

	Measures	Progress in 1Q-2Q	Progress in 3Q-4Q
Mobile communication infrastructure	<p><u>5G low-band development</u> Proactive sales and marketing activities to promote registered/certified products to major and local installation companies</p> <p><u>Overseas sales channel development</u> Promote quality competitiveness of products made in the Vietnam plant and receive orders</p>	<p>1) Completed registered/certified registration of 5G low-band products by each telecom. Operator and some high-frequency components were accepted. Working on registration and PR of macro cell components prior to service start in April 2020.</p> <p>2) Some inquiries for large orders from North America and ASEAN</p>	<p>1) Shipment of 5G low-band products for small cells began in 3Q. Completed registration macro cell components by 4Q-end with expected shipment in Oct. 2021.</p> <p>2) North American major telecom operators are in evaluation of filter samples. Expected shipment in or after 3Q.</p>
Governments and public infrastructure	<p><u>Secured orders for replacement demand for public infrastructure</u> Propose millimeter modules for large projects to acquire orders</p> <p><u>Acquisition of large-project orders</u> Make a proposal at low bid price to large facility project inquiries from national research institutes.</p>	<p>1) Received large orders for business-use wireless systems for trains and governments. Shipment began in fiscal 2020.</p> <p>2) Received some orders related to next-generation communication standards from national research institutes and the private sector, and other orders from governments.</p>	<p>1) Bidding for new large projects for governments. Other pending inquiries include weather radar, drone monitoring, and portable restraint devices.</p> <p>2) Received an order for "Manufacturing of lower-power high-frequency circuit and beam monitor circuit system for next-generation synchrotron radiation facilities" from the National Institutes for Quantum and Radiological Science and Technology in March 2020.</p>
Other (FA and measurement-related)	<p><u>Sales expansion of Radio-over-Fiber (ROF) for car electronics (electromagnetic compatibility (EMC) testing</u> Emphasize the need and advantage of the product at conferences and aim at the product being adopted by all R&amp;D divisions of domestic major automakers and electronic component makers.</p> <p><u>Acquire an order for the semiconductor reliability evaluation equipment</u> Promote technical advantage and prompt response for maintenance and win an order, beating competitors.</p>	<p>1) Presented the product at the Comité international spécial des perturbations radioélectriques (CISPR) and received expressions of interest from automakers and heavy machinery makers. Demo devices are leased out.</p> <p>2) Received repeat orders for the product. Current shipment will continue up to the 1Q of fiscal 2020.</p>	<p>1) Due to the deteriorated market environment, demand has been stagnant.</p> <p>2) Received an additional order for the product. Shipment will continue to the 3Q of fiscal 2020.</p>

Source: Prepared by JPR based on the Company's Presentation Materials

### Renewable Energy Business

Development and sale of solar or small wind power plants have gone well and the solar power plants in operation are steadily selling power. The solar power plant in Kojindake, Goto, Nagasaki Prefecture completed a 500kW extension construction and started selling power generated by this increment at the fixed purchase price of ¥36/kwh. The entire power generation scale expanded to 5,847kW. The solar power plant in Shimonoseki Toyouracho, Yamaguchi Prefecture was sold in September 2019 and the one in Tateyama, Chiba Prefecture were sold on March 25, 2020, in order to raise cash for the next business development. These had contributed to growth of 197% y-o-y in sales and 613% in operating profit.

## Outlook for fiscal 2020

Steady growth in sales and profit are projected by Tamagawa, despite some impact from the spread of coronavirus

Tamagawa is forecasting steady y-o-y growth of 9.5% in sales and 5.5% in operating profit.

### Forecasts for fiscal 2020

million yen	FY03/2019	Composition ratio	FY03/2020 forecast	Composition ratio	Y-o-Y	Increase /decrease
Sales	6,332	100%	6,937	100%	9.5%	605
Profit	805	12.7%	850	12.2%	5.5%	45
Ordinary profit	672	10.6%	713	10.2%	6.0%	41
Net profit belonging to parent company	439	6.9%	499	7.1%	13.6%	60

Source: Prepared by JPR based on the Company's Presentation Materials

### Electronic and Communication Device Business

In fiscal 2020 ending March 2021, Tamagawa is focusing on product development related to full-fledge 5G investment, which will replace 4GLTE in the mobile infrastructure area, and proactive PR activities for business expansion. Tamagawa also aims at enhancing its existing business by putting efforts in receiving orders for reliability evaluation and testing equipment in the measurement field, where demand continued to be robust since the previous year, in addition to commercial-use wireless devices and monitoring systems for the public and government sectors. Moreover, it will develop products for the millimeter waveband where demand is expected to increase and explore new demand for expansion of business fields.

### Renewable Energy Business

Tamagawa is considering development and sales of renewable energy power generation systems other than solar power generation systems. They include small or large wind power generation projects, and small hydropower power generation projects. Through industry-academia projects with Tohoku University, Tamagawa is expected to establish a corporate organization that responds to Japan's social innovation, such as next-generation social concepts, and do business accordingly.

Measures to take in fiscal 2020 by both businesses are summarized below.

**Electronic and Communication Device Business: Major measures in fiscal 2020**

Market and area	Measures to be taken by Tamagawa
Mobile telecom infrastructure	<p><u>Sales expansion of 5G products</u> Carry out PR activities for sales expansion of already-certified and registered products to installation companies, emphasizing price competitiveness of the subsidiary in Vietnam.</p> <p><u>Development of overseas sales channels</u> Emphasize the advantages of the quality control system of the subsidiary in Vietnam, which will fully function starting in the 1Q with the objective of acquiring orders from overseas large-account customers (appeal based on S-rank quality)</p>
Government and public-sector infrastructure	<p><u>Securing of orders for government/public-sector large projects</u> Offer timely, one-stop, solution-type proposals for new large projects</p> <p><u>Publicity targeting research institutes</u> Stress the previous year's achievement in orders received for large projects when contacting other research institutes as a means of acquiring orders</p>
Other (related to measurement and EMC)	<p><u>Acquisition of orders for a new device application of semiconductor reliability evaluation equipment</u> Seek to acquire orders for new projects for 5G devices</p> <p><u>Acquisition of orders for other large projects</u> Make proposals for new large projects for drone monitoring and portable restraint devices, based on the technological advantages.</p>

Source: Prepared by JPR based on the Company's Presentation Materials

**Renewable Energy Business: Major measures in and after fiscal 2020**

● Solar power plant	➡ 3 projects (9 Mw)
● Wind power plant	➡ Projection (10 Mw)
● Small	➡ 5 + 45 projects (900 Kw) + SPC 150 projects (3 Mw)
● Large	➡ 1 project (2 Mw) Start selling power in 2022
● Offshore	→ To be developed
● Hydro power plant	➡ JCM (Indonesia) 1 project (1.7 Mw) Start selling power sale in 2022
● Biomass	
● Surplus power	Use of GEMCOS → Fishery, agriculture, small hydro power, commercial-use, mass production

Source: Prepared by JPR based on the Company's Presentation Materials

## 1Q fiscal 2020 operating results

The Electronic and  
Communication Device  
Business turned profitable  
on a 97.5% sales gain

Renewable Energy Business  
recorded a decline in sales  
and profit, due to the sale of  
two mega solar power  
stations in fiscal 2019

### 1Q fiscal 2020 operating results

In the first quarter of fiscal 2020 (April to June 2020) the Tamagawa HD Group increased consolidated sales by 63% y-o-y and generated an operating profit (compared to the operating loss in the 1Q of the previous year.) The Electronic and Communication Device Business increased sales by 97.5% and has turned into an operating profit position since fiscal 2019. Favorable results were driven by sales efforts mainly in the 5G-related market and the public sector, marketing focus on new markets and client development, and the resultant orders received in the new areas.

The Renewable Energy Business tends to be affected by purchase and sale of power stations. In the 1Q, sales and operating profit decreased by 5.5% and 86.7% y-o-y respectively. The power stations in operation did well in selling power but the sale of two mega solar power stations in fiscal 2019 resulted to a decline in sales and profit.

### 1Q fiscal 2020 operating results

		2020.03				2021.03
		1Q 2019.06	2Q 2019.09	3Q 2019.12	4Q 2020.03	1Q 2020.06
Consolidated	Sales	715	1,754	1,164	2,699	1,165
	Gross profit	244	697	339	700	325
	Selling, general and administrative expenses	307	303	279	286	263
	Operation profit	-63	394	60	414	62
	Ordinary profit	-117	361	34	394	59
	Profit before tax	-117	361	48	259	59
	Net income	-115	242	88	223	60
Electronic and Communication Device Business	Sales	476	931	1,034	976	940
	Segment profit	-40	124	137	127	124
Renewable Energy Business	Sales	236	818	137	1,723	223
	Segment profit	30	306	-14	349	4
Consolidated	Sales	-4.8%	93.9%	42.0%	97.6%	63.0%
	Gross profit	1.9%	126.6%	32.3%	61.4%	33.1%
	administrative expenses	19.2%	10.9%	8.5%	-3.2%	-14.3%
	Operation profit	-	1058.8%	Into black	200.0%	Into black
	Ordinary profit	-	Into black	Into black	497.0%	Into black
	Profit before tax	-	Into black	-41.5%	59.9%	Into black
	Net income	-	Into black	55.7%	34.1%	Into black
Electronic and Communication Device Business	Sales	4.2%	61.1%	63.3%	-17.7%	97.5%
	Segment profit	-	2380.0%	174.0%	-37.1%	Into black
Renewable Energy Business	Sales	-18.9%	151.7%	-26.7%	868.0%	-5.5%
	Segment profit	-50.8%	319.2%	-	Into black	-86.7%

Source: Prepared by JPR based on interviews

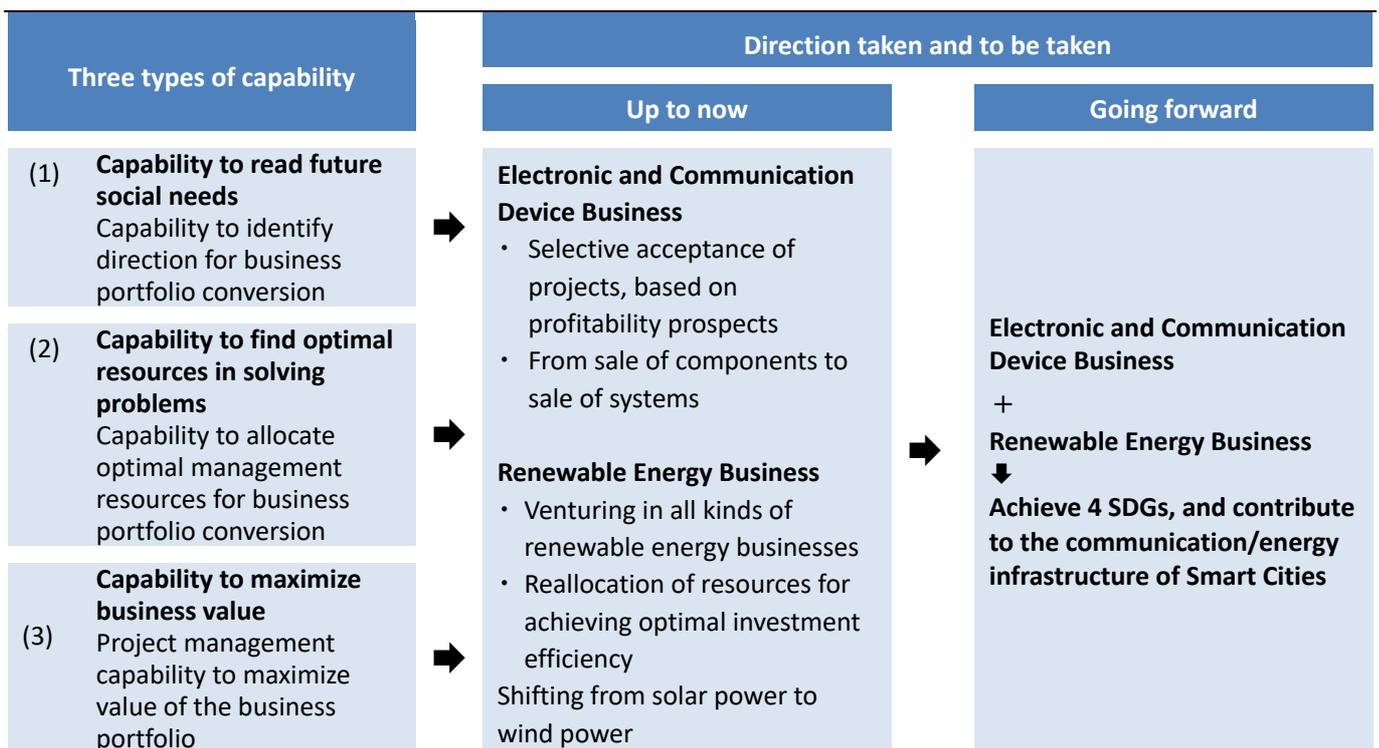
## Going forward

### Contributing to Smart City communication/energy infrastructure

As explained in the “up to now” section (page 8), the Electronic and Communication Device Business was regenerated and then focused on cost reduction and adding higher value, which resulted in maintaining a 10% operating margin, sales expansion, and more stability of business. The Electronic and Communication Device Business shifted to selective acceptance of projects, based on profitability prospects, and from sale of components to sale of systems, while the Renewable Energy Business took up a challenge on all types of renewable energy business, reallocated business resources for optimal investment efficiency, and dynamically shifted a business portfolio from solar power generation to wind power generation.

Going forward, Tamagawa will accelerate investment from funding based on these achievement and experiences, focus on achieving the four SDGs (page 6), and contribute to betterment of the communication/energy infrastructure. This is expected to lead to higher growth and more profit for the company. In fact, achievement of the SDGS will contribute to the formation of Smart Cities. This is summarized in the next figure. Tamagawa is expected to broadly contribute to the formation of Smart Cities in four ways: 1) by establishing optimal renewable energy supply; 2) by analyzing data; 3) by helping to optimally allocate surplus power; and 4) by synchronizing the accurate timing of different devices.

#### Three types of capability and their direction to be enhanced



Source: Prepared by JPR based on the interviews

## Significance of equity financing

Announced equity financing of about ¥2.5 billion

Investment in potentially high-profit projects may quite possibly create ¥7.1 billion in shareholder value, equal to 3 times the financing amount

### Accelerating infrastructure spending into the global market

On August 28, 2020, the Tamagawa HD Group disclosed equity financing for approximately ¥2.5 billion by use of issuance of stock acquisition rights. This will have a dilutive effect of 23% relative to the number of outstanding shares as of the end of the 1Q of fiscal 2020. On August 31, the next trading day, Tamagawa's stock price, however, declined merely by 2.7% from the closing price on 28<sup>th</sup>.

The new acquisition rights will be entirely allocated to Ms. Marilyn Hweetieng Tang, the current largest shareholder of Tamagawa with an approximately 17% stake. The existing shareholder's intention of taking the rights seems to suggest her expectation for Tamagawa's upside potential in value resulting from the financing. The exercise price of the new acquisition rights is set to be 90% of the closing price of Tamagawa on the last trading day prior to the effective date of exercising the rights, which is the standard condition. Use of the funds is summarized below. If the financing goes as planned, Tamagawa's investment in high-growth areas (aforementioned in details in this report) is expected to accelerate.

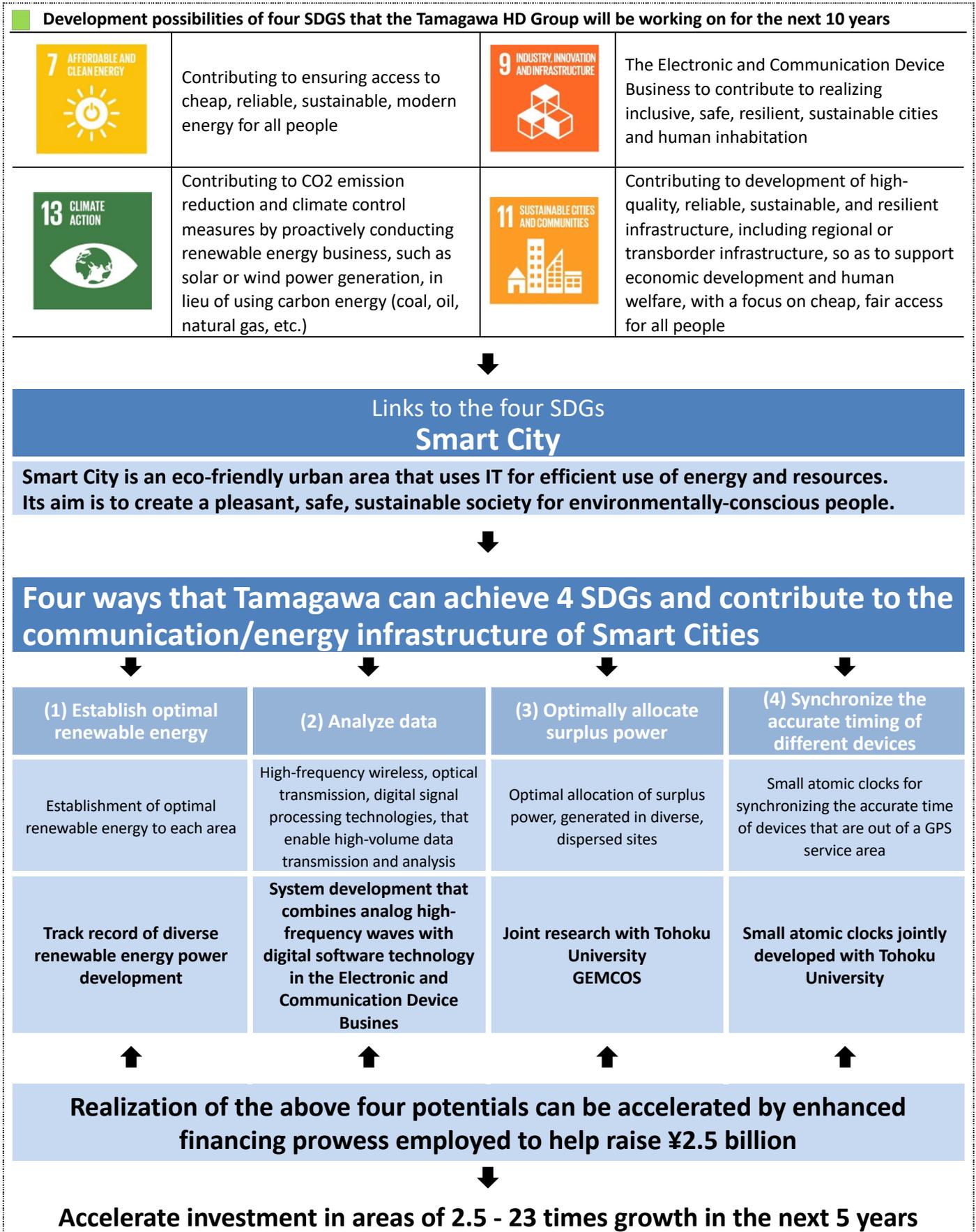
Assuming after-tax IRR of 20% and shareholders' equity cost of 7%, the financing is estimated to generate about ¥7.1 billion in shareholder value, or equivalent to three times the financing amount. Considering what have been discussed so far in this report, this value creation should be quite possible in JPR's view.

#### Use of the fund from the equity finance

Major use of funds	Details
<b>Renewable energy development in Japan and abroad</b>	Investment in projects related to renewable energy development (solar, wind, hydro, and biomass power generation, etc.) in Japan and abroad
<b>M&amp;A-related investments</b>	Investment mainly in IT companies in Japan and abroad, and industry-academia joint development projects; acquisition of overseas companies for overseas business expansion, etc.
<b>R&amp;D investment in 5G and other telecom technologies</b>	Joint R&D projects and capital/business alliances with companies with advanced 5G-related technology, with the aim of early R&D in the related mobile communication technologies

Source: Prepared by JPR based on the interviews

The Tamagawa HD Group's business development and structure of value creation, which is to be accelerated by the equity financing, are summarized in the following table.



Source: Prepared by JPR based on the interviews

### Related areas with high growth potential

Segment		Details	Period and CAGR
Electronic and Communication Device Business	5G capital spending	Global 5G-related capex estimate: \$3.6 bln in 2020 to \$41.8 bln in 2026 (Source: <a href="https://edge-of-cloud.blogspot.com/2017/06/5g-and-lte-infrastructure-spending.html">https://edge-of-cloud.blogspot.com/2017/06/5g-and-lte-infrastructure-spending.html</a> )	2020 - 2026 <b>50.5% (11.6 times)</b>
		Global 5G-related capex estimate: CAGR of 64.1% in 2017 - 2025 (Source: Infinium Global Research)	2017 - 2025 <b>64.1% (17.4 times)</b>
	Small atomic clocks	The world's market for small atomic clocks: \$9.402 mln in 2017 to \$23.402 mln in 2025 (Source: QY Research "Global Miniature Atomic Clock Market Insights, Forecast to 2025")	2017 - 2025 <b>12.1% (2.5 times)</b>
Renewable Energy Business	Wind power generation	Hokkaido Electric Power's purchase of wind power: to quadruple from 2017 to 2027 (Source: Nikkei Shimbun, March 7, 2017)	2017 - 2027 <b>15.8% (4 times)</b>
	Hydropower generation in Indonesia	Hydropower generation volume in Indonesia: 154MW in 2020 to 3,657MW in 2025 (Source: METI; FY 2017 Study of infrastructure development project to obtain joint credit, etc. [Study of international contribution quantification and JCM feasibility])	2020 - 2025 <b>88.4% (23.7 times)</b>

Source: Prepared by JPR based on the Company's Financial Summary, etc.

This report has so far explained the Tamagawa HD Group's regeneration of the Electronic and Communication Device Business and investment development of the Renewable Energy Business. By raising ¥2.5 billion as disclosed on August 28, 2020, Tamagawa will accelerate investment, with a ballpark IRR target at 15%, into areas where Tamagawa's technology insights accumulated in the Electronic and Communication Device Business, exploiting its capability and using its management's financial strength.

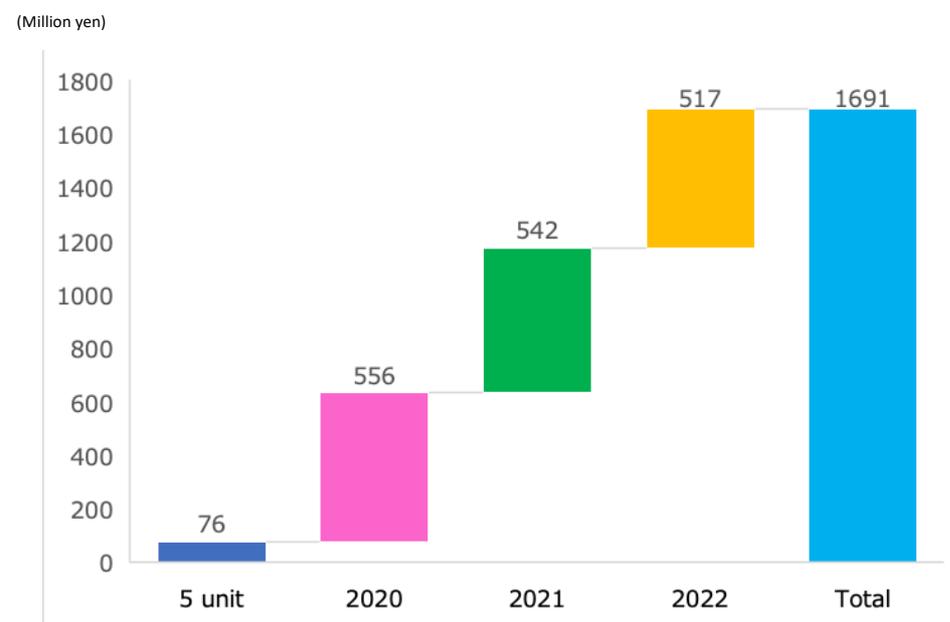
### GEMCOS is utilized to accelerate overseas investment, starting in Indonesia

The GEMCOS system is to be adopted for small hydropower generation in Indonesia. Indonesia consists of numerous islands, which makes it hard to establish a large electric power infrastructure, including a power grid. Therefore, GEMCOS, which enables establishment of an optimal local power network, can be very effective. Based on interviews at Tamagawa, a high IRR of about 20% can be expected and Tamagawa is likely to henceforth accelerate renewable energy-related overseas infrastructure investment.

### Small wind power projects in favorable locations in Hokkaido

Tamagawa currently has five small wind power generators in operation. Tamagawa holds power sales rights for 50 places and has 150 joint projects with AURA. These 200 projects in total are projected to be operating by fiscal 2022. They are located in Hokkaido where stable wind is available as a power resource. Turbine operation requires little maintenance, which will be outsourced to local companies without any problem in normal circumstances. Based on such an assumption, an IRR of 17% is estimated, including maintenance cost and insurance, in addition to facilities cost. The present value of cash inflow estimated from the small wind power generation business is ¥1.69 billion, indicating a rapid growth of about 22 times of the current cash inflow in the accumulated cash inflow over the next three years (see a chart below).

#### ■ Present value of cash inflows of the next three years (50+150 wind power generators)



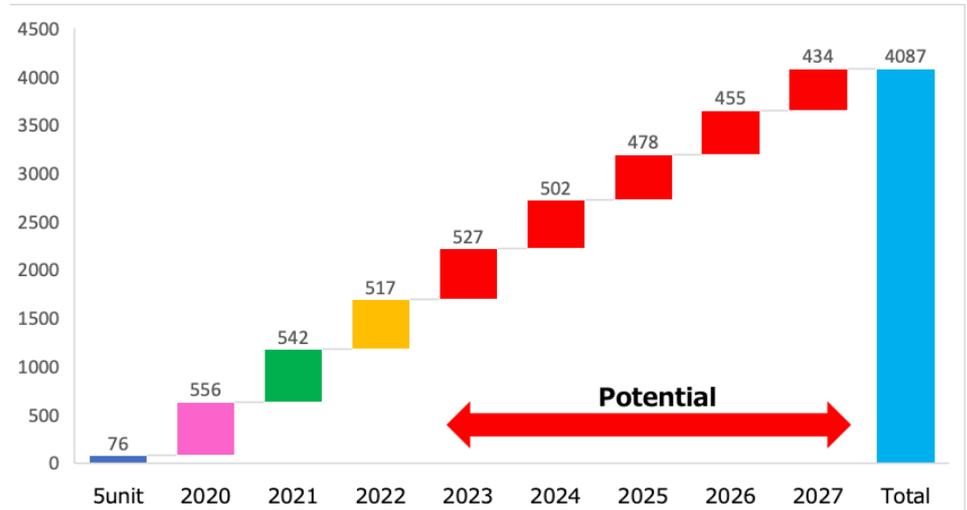
Source: Prepared by JPR based on disclosed materials and interviews to the Tamagawa HD Group

Further, Tamagawa can potentially develop additional 300 wind power generators. If these 300 generators are developed over 5 years starting from 2023, assuming an IRR of 17%, additional cash inflow can be ¥2.39 billion. The total amount, which includes the almost-certain cash inflow of the next three years, is estimated to be ¥4.08 billion. This is 53.7 times the current cash inflow and 2.4 times of the cash inflow over the next three years. Small wind power generation is clearly a key for

Tamagawa's expansion in the Renewable Energy Business.

■ Present value of cash inflows, including potential projects

(Million yen)



Source: Prepared by JPR based on disclosed information and the interviews to the Tamagawa HD Group

## 2. GCC Management™ analysis of Tamagawa's business strategy

### Structure of Tamagawa's value creation, using GCC Management™

Tamagawa's value creation strategy is summarized below from the three perspectives.

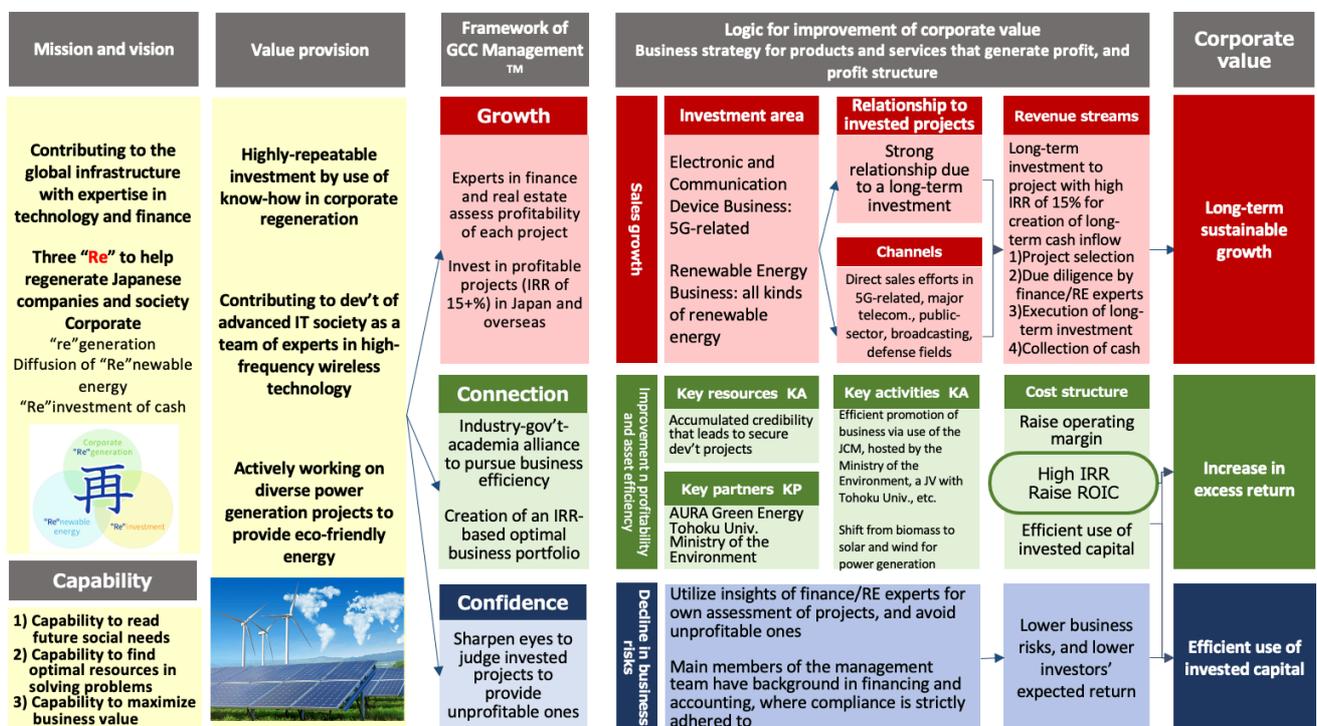
**Growth:** The Electronic and Communication Device Business will grow in the 5G field with focus on niche areas, while the Renewable Energy Business will make investment in areas where high IRR and high growth can be expected. Combining these two, Tamagawa seeks to contribute to the communication/energy infrastructure of Smart Cities and to achieve high growth.

**Connection:** In the Electronic and Communication Device Business, Tamagawa cooperated with universities and major manufacturers, aggressively hired engineers, established the industry's top-level technology in analog/digital, software/hardware high-frequency wave and optical devices, and developed higher added-value products. In the Renewable Energy Business, Tamagawa will seek to achieve high IRR and high return on invested capital (ROIC) by establishing long-term relationships of trust and working with universities.

**Confidence:** Tamagawa's main members of the management team have backgrounds in financing and accounting, where compliance is a strict requirement. They use their expertise in finance and real estate management, avoid potentially unprofitable projects based on their own assessment, and lower business risks and protect investors' expected return.

The following figure describes the structure in detail.

Structure of Tamagawa's value creation, using GCC Management™



Source: JPR

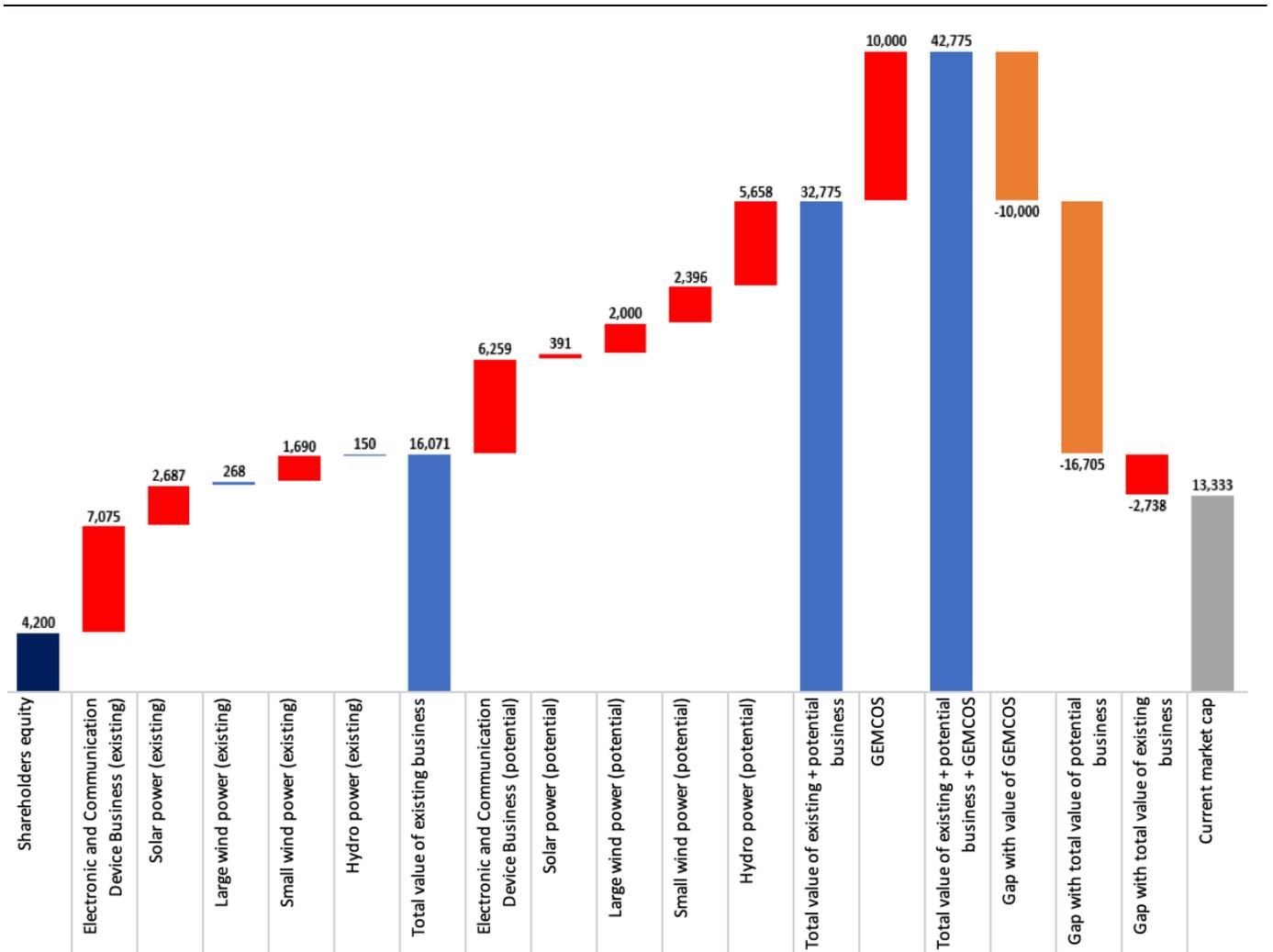
### 3. Shareholder value estimates

#### Estimates using the excess return method

#### Shareholder value estimates by use of the excess return method<sup>1</sup>

The Tamagawa HD Group's long-term shareholder value is estimated by use of the excess return method, in light of the context so far described. The value is estimated to be ¥16.9 billion in a conservative scenario, ¥33.6 billion when incorporated very feasible potential development, and ¥43.6 billion if a business is created from leading-edge technologies. This means theoretical upside potential of 2-3 times to the current market cap during an investment period of 2-3 years. Assumptions in detail are stated on the next page.

#### Structure of shareholder value by use of the excess return method and value gap analysis



Source: Prepared by JPR based on interviews to the Tamagawa HD Group

### Basis for estimating the structure of shareholder value by use of the excess return method

Structure of shareholder value		¥ mln	Basis for estimation
Shareholders' equity		6,900	Sum of the shareholders' equity as of the end of the 1Q fiscal 2020 and the amount of equity finance
Existing business	Electronic and Communication Device Business (existing)	7,075	Assuming CAGR of 20% in sales; operating margin to improve to about 10% by fiscal 2029; IRR to sales to decline from current 70% to about 60% by fiscal 2029; WACC of 7%
	Solar power (existing)	858	Estimated IRR of 12-16% and WACC of 7% based on the remaining FIT period for the three power stations. Assuming zero shareholder value after the end of FIT
	Large wind power (existing)	268	Assuming IRR of 25% for large ones and 17% for small ones for the projected installation of power stations, at WACC of 5%
	Small wind power (existing)	1,690	
	Hydro power (existing)	150	Assuming financing in Japan and IRR of 17% for the project in Indonesia at WACC of 5%
	Total value of existing business	16,942	
Potential business	Electronic and Communication Device Business (potential)	6,259	Upside if CAGR of sales increases to 30%
	Solar power (potential)	391	Estimates from assumed IRR and WACC for power stations scheduled to be constructed
	Large wind power (potential)	2,000	Adding value from the potentially installed stations in Hokkaido, based on interviews at Tamagawa
	Small wind power (potential)	2,396	
	Hydro power (potential)	5,658	Estimates from growth potential of the hydro power generation market in Indonesia
Total value of existing + potential business	33,647		
Max. upside	GEMCOS	10,000	Assuming a certain ratio of future power generated from dispersed power generation to be recognized as sales
	Total value of existing + potential business + GEMCOS	43,647	
Gap analysis	Gap with value of GEMCOS	-10,000	
	Gap with total value of potential business	-16,705	
	Gap with total value of existing business	-2,799	
Current market cap + Amount of equity finance		14,143	

Source: Prepared by JPR based on interviews

Reference material

## What is an analytical framework of the GCC management™?

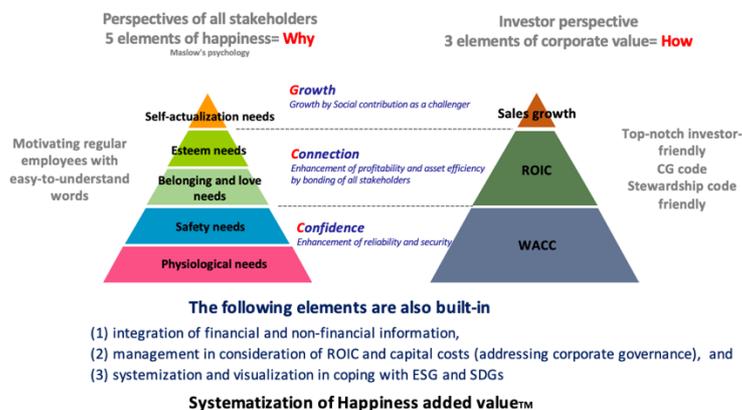
### Integrating financial and non-financial information that capture the hearts and minds of all stakeholders

The GCC management® is an analytical framework developed by J-Phoenix Research in order to evaluate sustainability of shareholder value by integrating non-financial information and financial information with a focus on the happiness of all stakeholders. Happiness of investors is measured by a framework of three elements of corporate value, while happiness of employees is measured by the five-tier model of human needs, created by Abraham Maslow, a prominent American psychologist. People can feel happy when their five needs are satisfied. For example, a company with a built-in framework to raise happiness of employees should be determined as more sustainable than a company with the same shareholder value but without this framework.

The concepts that associate the five levels of needs with the three factors of corporate value are Growth (in sales), Connection (of people and businesses, leading to improve Return on Invested Capital), and Confidence. JPR has defined “Excess return generated from a strategy that incorporates the enhancement of happiness of all employees under the GCC concept” as Happiness Value Added®.

The enhancement of happiness is “why such a company exists,” the raison d’être of a company, while the viewpoint of corporate value is “how the enhancement of happiness is associated with its value.” Use of this framework makes it easy to explain the concept of creating corporate value to its employees. Moreover, this facilitates disclosure of non-financial information, which is required for complying with the Stewardship Code. It also facilitates (1) integration of financial and non-financial information, (2) management in consideration of ROIC and capital costs (addressing corporate governance), and (3) systemization and visualization in coping with ESG and SDGs.

### GCC management™



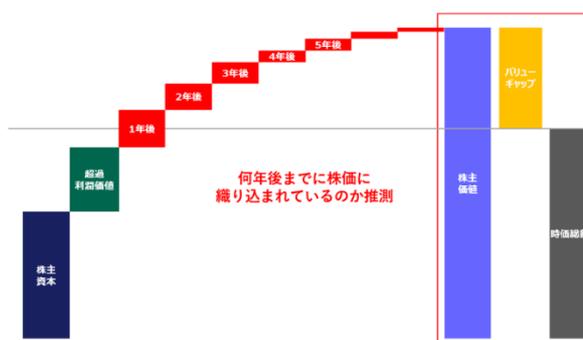
Source: JPR

## Corporate value estimate by use of ROIC and excess return

### Excess return analysis framework

Excess profit or economic value added is widely used worldwide as an indicator to estimate corporate value, evidenced by being adopted by Kao Corporation, a Grand Prix winner of the Tokyo Stock Exchange Fifth Corporate Value Improvement Award (FY2016). In the calculation of excess return, corporate value can be broken down to four elements: invested capital, excess return value, growth value, and non-business assets. This facilitates better understanding of a structure to create corporate value. A company might be overvalued when its market cap is higher than its theoretical corporate value, and undervalued when the market cap is lower. Contribution of each year's corporate value can be visualized in the following figure, in which shareholders' equity is simply represented as a sum of invested capital and non-business asset, subtracting interest-bearing debts. The figure below allows us to estimate how many years of growth might be incorporated in the stock price.

#### Breakdown of corporate value using excess return



Source: JPR

Estimated excess return is profit that exceeds investors' return expectations against invested capital. Its present value is "excess return value" while a potentially growing portion of excess return is "growth value." Moreover, assets which are not used in business are added as non-business asset value in estimating a theoretical corporate value. Theoretically, the estimated corporate value using excess return should be the same as the value estimated by using the discount cash flow (DCF) model. This report calculates excess return by using the following figures in the simplified way.

- Excess return = NOPAT – Invested capital X WACC
- Net Operating Profit After Tax (NOPAT) = Operating profit X (1- Effective tax rate)
- Invested capital = Total assets – Non-business assets – Current liabilities excluding Interest bearing debt
- Non-business assets = Cash and deposits that exceed 10% of sales + Short-term investment securities + Investment securities + Deferred gains or losses on hedges + Land revaluation difference + Foreign currency translation adjustments
- Weighted average cost of capital (WACC) = After-tax interest rate of interest-bearing debt X (D/(E+D)) + Cost of shareholders' equity X (E/D+E)
- Cost of shareholders' equity = 0.5% + 5% X β
- β = Slope of a linear regression line of five-year daily returns of TOPIX and the stock price of the target company
- E = Market cap at the time of calculation
- D = Short-term interest-bearing debt + Long-term liabilities + Minority interests in the latest financial statements at the time of calculation

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