KAITEKI Value for Tomorrow

APTSIS 20

Presentation to Investors

February 12, 2020

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Mitsubishi Chemical Holdings Corporation

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List of Abbreviations

MCHC: Mitsubishi Chemical Holdings Corporation
MCC: Mitsubishi Chemical Corporation
MTPC: Mitsubishi Tanabe Pharma Corporation
LSII: Life Science Institute, Inc.
TNSC: Taiyo Nippon Sanso Corporation

Diamond Edge Ventures: Diamond Edge Ventures, Inc.
LSIM: LSI Medience Corporation
MCIS-UK: MC Ionic Solutions UK, Ltd.
MCIS-US: MC Ionic Solutions US, Inc.
MFI: PT. MC PET Film Indonesia
Nippon Gohsei UK: Nippon Gohsei UK Limited
Noltex: Noltex L.L.C.
PTT MCC Biochem: PTT MCC Biochem Co., Ltd.
SAMAC: The Saudi Methacrylates Company
SIC: Science and Innovation Center
UMBM: Changshu UM Battery Materials Co., Ltd.

AddiFab: AddiFab ApS
Audi: Audi AG
CLOMA: Japan Clean Ocean Material Alliance
C-m-p: c-m-p gmbh
C.P.C.: C.P.C. Srl
DIGILENS: DigiLens Inc.
Goldman Sachs Japan: Goldman Sachs Japan Co., Ltd.
IMI: IMI Co., Ltd.
JST: Japan Science and Technology Agency
JXTG Nippon Oil & Energy: JXTG Nippon Oil & Energy Corporation
Lenovo: Lenovo Corporation
Linde: Linde AG
LLP: Limited liability partnership
Mazda: Mazda Motor Corporation
NEDO: New Energy and Industrial Technology Development Organization
PHCHD: PHC Holdings Corporation
Piper Plastics: Piper Plastics, Inc.
Praxair: Praxair, Inc.
SkymatiX: SkymatiX, Inc.
Toyota: Toyota Motor Corporation

3DP: 3D printer
ABS: Acrylonitrile butadiene styrene
ALS: Amyotrophic lateral sclerosis
API: Active pharmaceutical ingredients
ASU: Air separation unit
BCS: Black column spacer
BMA: Methyl methacrylate
CASE: Connected, autonomous, shared, electric
CFRP: Carbon fiber reinforced plastic
CF-SMC: Carbon fiber-sheet molding compound
CVC: Corporate venture capital
DDS: Digital data storage
DX: Digital transformation
EVOH: Ethylene vinyl alcohol copolymer
GaN: Gallium nitride
GHG: Greenhouse gas
HyCO: Hydrogen (H2) and carbon monoxide (CO)
ICT: Information and communication technology
IoT: Internet of Things
ITO: Idium tin oxide
LCA: Life cycle assessment
LIB: Lithium-ion battery
MAA: Methacrylic acid
MI: Material informatics
MR: Medical representative
MLCC: Multi-layered ceramic condenser
MOE: Management of Economy
MOS: Management of Sustainability
MOT: Management of Technology
MT: Metric ton
OLED: Organic light-emitting diode
PBS: Poly butylene succinate
PMMA: Polymethyl methacrylate
PoC: Proof of concept
PP: Polypropylene
SCAAT: Super critical acidic ammonia technology
SGDs: Sustainable Development Goals
SMC: Supply chain management
THVPE: Trihalide vapor phase epitaxy
UHC: Universal health coverage
VLP: Virus-like particle

Today's Agenda

1. Progress with Financial Goals
2. Priority Management Measures
   - 2–1 Focus Market Growth Strategies and Action Plan Progress
   - 2–2 Healthcare Strategies
   - 2–3 Measures for Industrial Materials Domain and Establishment of Industrial Gas Major Position
   - 2–4 Driving Growth through Synergies
   - 2–5 Reinforce Foundations
   - 2–6 Initiatives for Creating New Businesses
3. KAITEKI Management Initiative
4. KAITEKI Vision 30

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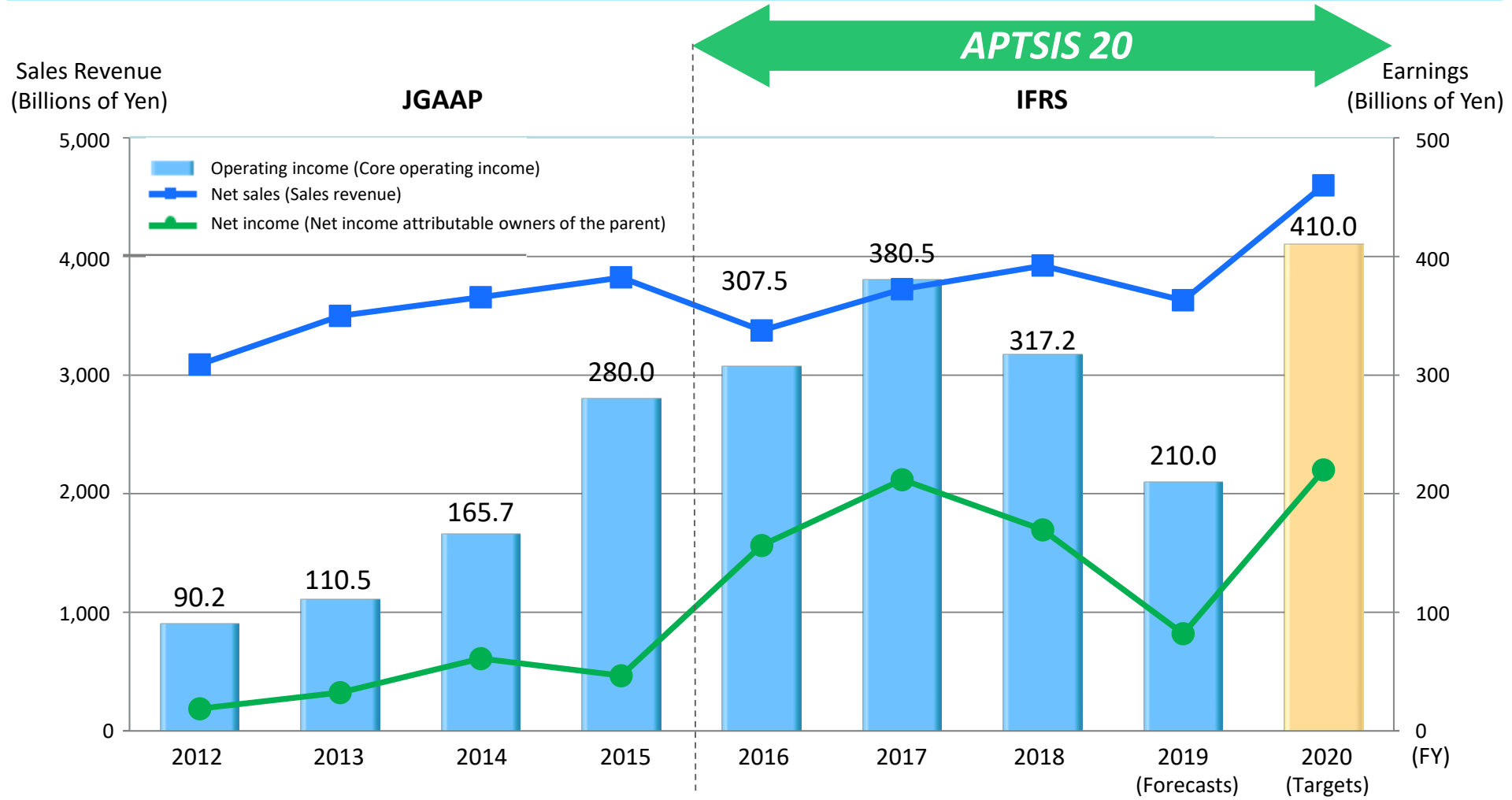
Operating Results

- Earnings deteriorated owing to impact of U.S.-China trade friction and absence of healthcare royalties
- Although maintaining final year target for *APTSIS 20*, hurdles to reaching goals are high



ROE (%)	**2.3**	**3.7**	**6.4**	**4.8**	**15.1**	**17.8**	**12.7**	**6.2**	**13.0**

Financial Indicators

■ With MTPC becoming wholly owned subsidiary, net D/E ratio rose to 1.8

		FY2019 Forecasts	FY2020 Targets
Financial Indicators (MOE)	Core operating income	¥210 billion	¥410 billion
	ROS (Core operating income)	5.8%	9%
	Net income attributable to owners of the parent	¥81 billion	¥220 billion
	ROE	6.2%	13%
	Net D/E ratio	1.8	1.0

Investment Plan Progress

■ Undertook ¥1.0 trillion in investment and loans* by fiscal 2019 for major industrial gas acquisitions and others

*Limited to expenditures categorized as cash flows from investing activities and excluding funding to make MTPC and other subsidiaries wholly owned

Priority Businesses for Investment

Performance Products

- New markets: High-performance films; Information Electronics and display
  - ⇒ Boosted polyester film production capacity in Indonesia
- Food ingredients; Advanced polymers
  - ⇒ Lifted U.S. Soarnol™ production capacity
- New technologies: High-performance engineering plastics; Carbon fiber and composite materials; Performance chemicals

Industrial Materials

- Overseas development: Industrial gases; MMA
- ⇒ Completed acquisitions of Praxair's European business and of Linde's U.S. HyCO business

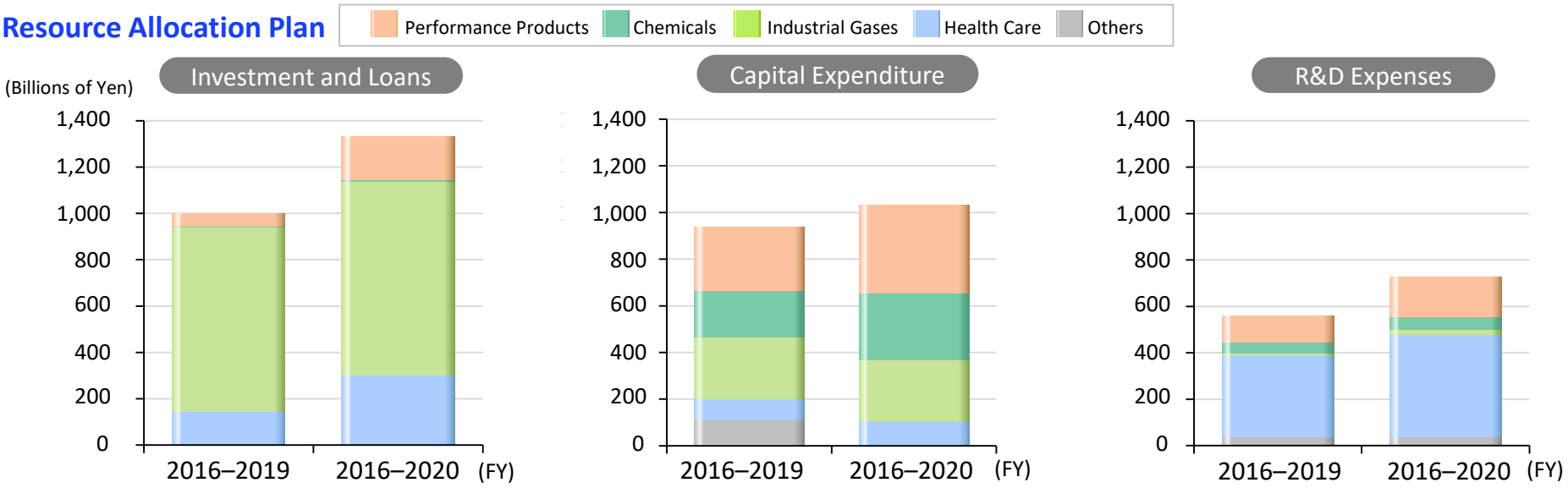
Health Care

- Development in North America: Ethical pharmaceuticals; VLP vaccine
- New markets: Regenerative medicine

Others

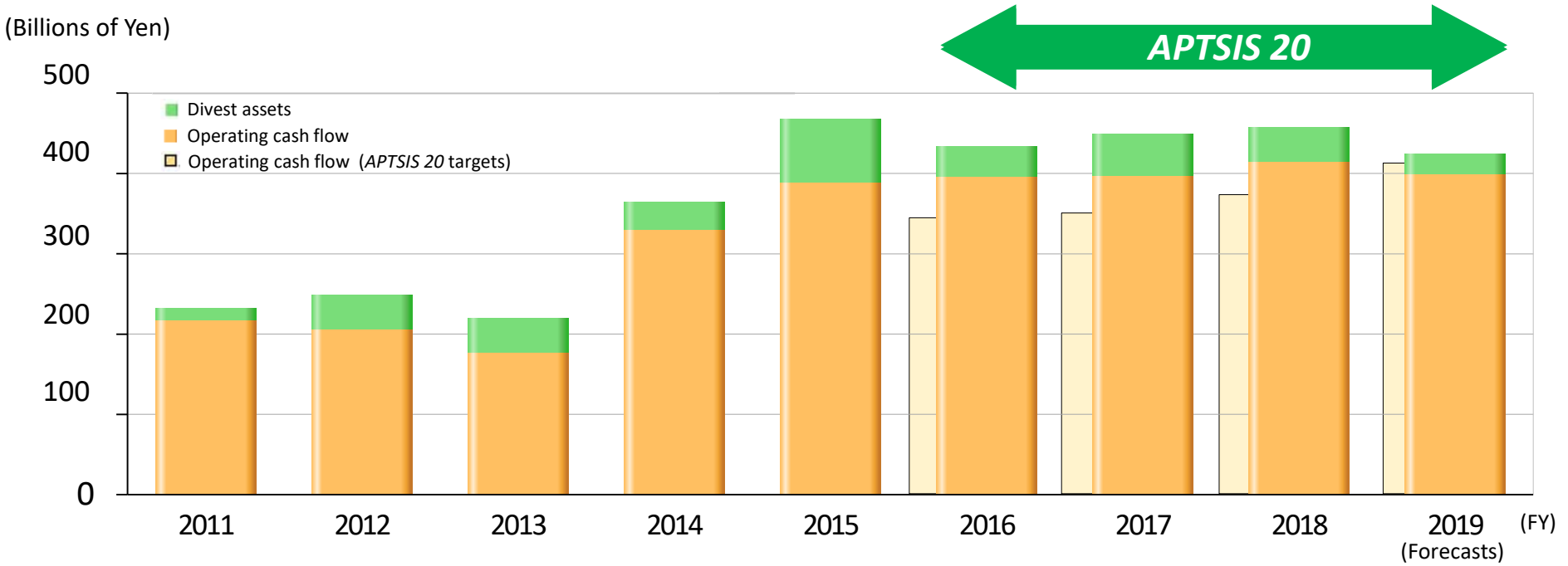
- ⇒ Constructing MCC's SIC research building

Resource Allocation Plan



Increasing Capital Efficiency

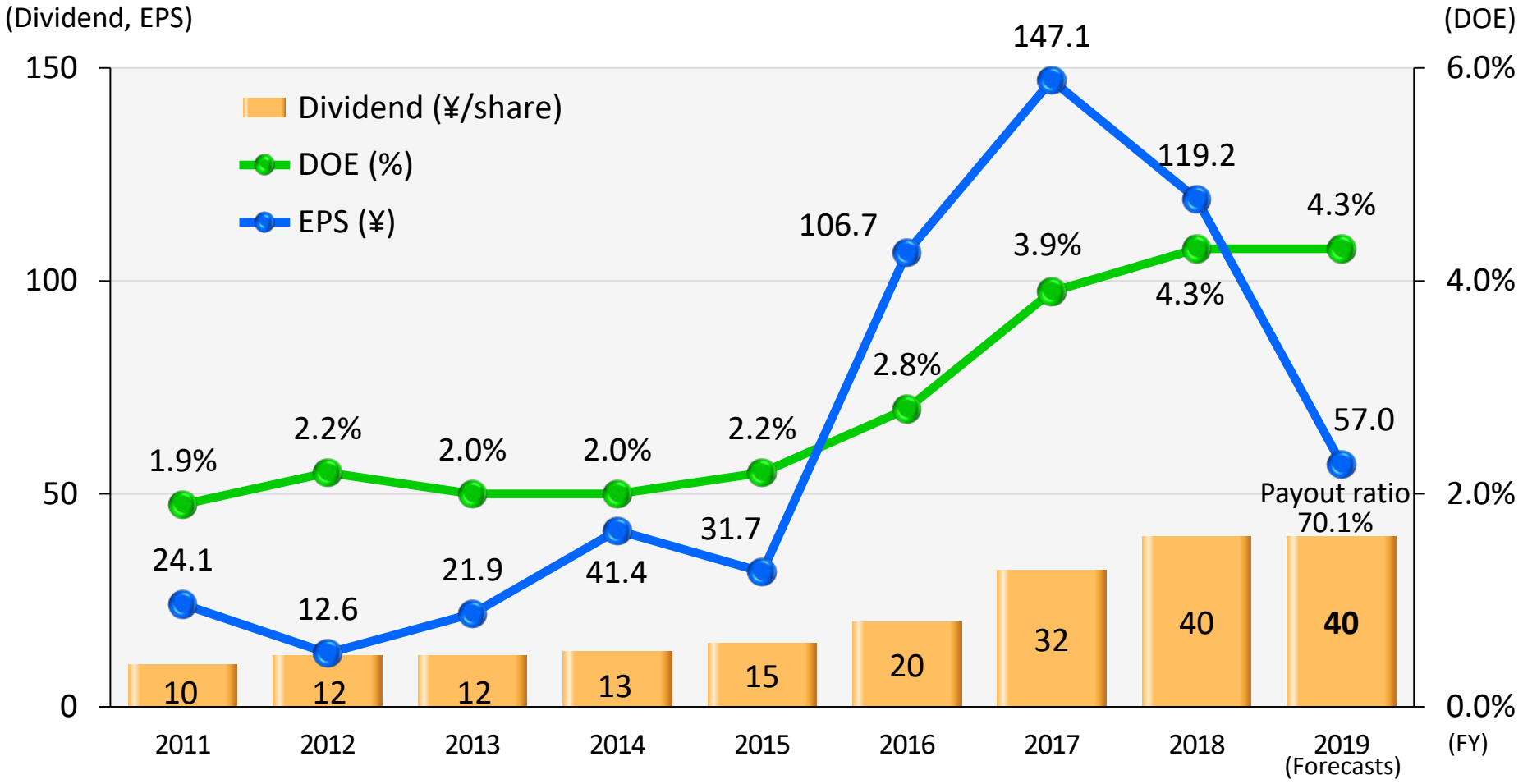
■ Instituted ¥700 billion in financial structure reforms through asset efficiency measures



		APTSIS 20 Targets (FY2016 to 2020)	Forecasts (FY2016 to 2019)	Forecasts (FY2016 to 2020)
Financial Structure Reforms	Lower cross-shareholdings	**100**	**120**	**120**
	Cut working capital	**100**	**80**	**100**
	Reduce cash and deposits	**100**	**300**	**400**
	Divest assets	**—**	**100**	
			60	**60**
Total from capital efficiency and other factors		**300**	**660**	**680**

Shareholder Returns

■ **Dividend policy is to balance growth investments and financial structure improvements and deliver stable dividends (setting a 30% medium-term payout ratio)**



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Priority Management Measures under *APTSIS 20*

Performance Products

Reinforce portfolio management
- Accelerate portfolio reforms
- Deploy focus market growth strategies

Industrial Materials

Reinforce business foundations
- MMA, Industrial gases: Maintain and expand global share
- Petrochemicals: Shift to high-performance materials and optimize productivity

Health Care

Ethical pharmaceuticals:
- Strengthen pipeline
- Expand U.S. businesses

Life science:
- Commercialize regenerative medicine
- Cultivate healthcare and medical ICT businesses

Generate integration benefits and synergies from new MCC

Reinforce global market access and marketing (including by setting up regional headquarters)

Swiftly commercialize next-generation businesses (through R&D, open innovation, and DX)

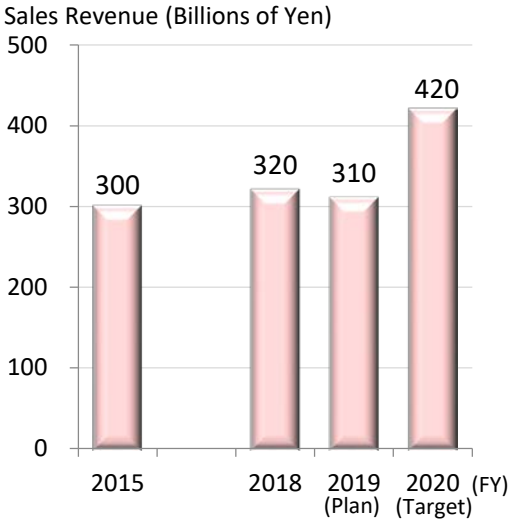
Deepen KAITEKI Management and reform workstyles

Reinforce Foundations

Focus Market Growth Strategies

Automobiles, Aircraft (Mobility)

Items in red are priority measures in fiscal 2019



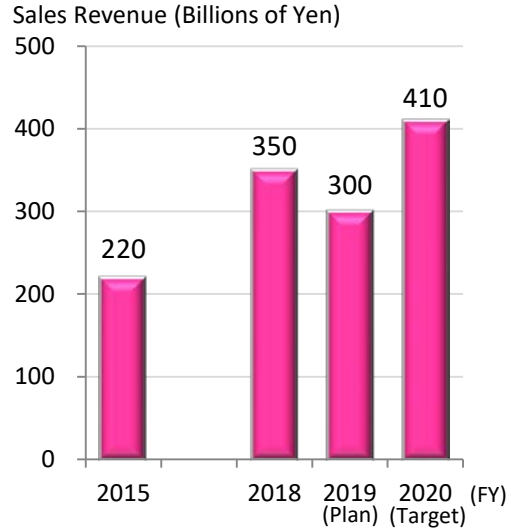
Growth Measures

- Respond to trend toward CASE in the automotive industry, reinforce response to environmental issues
- Reinforce carbon fiber and composite materials business and accelerate overseas expansion
- Accelerate overseas expansion of resin compounds business

Progress

- **Reinforcing overseas network for carbon fiber and composite materials business**
  Invested in C.P.C.; **Constructing a new CF-SMC production facility in Italy; Acquired c-m-p, a German CF prepreg manufacturer**
- Expanding adoption of CF-SMC: Toyota Prius PHV, etc.
- PP: Commenced commercial operation (150,000 MT/Y) at the Goi Plant (January 2020)
- Acquired two plastic compound producers (India and Indonesia)

IT, Electronics, Displays



Growth Measures

- Reinforce display-related products business: LCD, OLED materials
- **Expand semiconductor-related business:**
  Production capacity increase in high-performance and high-quality polyester films for MLCC; Expand precision cleaning agent-related business; Develop thermal management materials

Progress

- Optical films: Constructed a new production line in China and started its operation
- OPL film™: Constructing a new production line at the Kumamoto Plant (Slated to start operation in March 2020)
- Precision cleaning of semiconductor manufacturing equipment: Acquired Cleanpart Group
- **Polyester films: Production capacity increase at MFI**

Mobility

Reinforcing overseas network for carbon fiber and composite materials business

- Aiming to build platforms at C.P.C. in Italy to expand CFRP applications for European luxury vehicles
- Constructing a new CF-SMC production facility located on a site adjoining C.P.C., aiming to establish and strengthen carbon fiber and composite materials supply system
- Establishing a prepreg supply system in Japan, the U.S., and Europe through the acquisition of c-m-p, and accelerating the expansion of composite materials business for automobiles and aircraft secondary structural materials by leveraging high-quality thick prepreg manufactured by c-m-p to press molding by C.P.C.

C.P.C.
World's largest composite material press facility

Roof of the Audi RS 5 Coupe using MCC's CFRP, optional specifications (Photos by Audi)

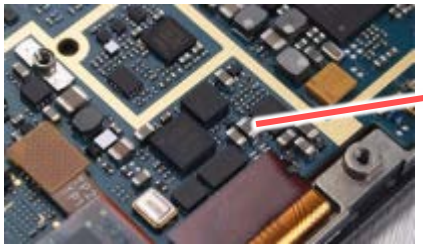
External view of c-m-p

IT, Electronics, Displays

■ **Expand semiconductor-related business:**
Deploying high-quality polyester films for electronic components for communications
Considering the development for in-vehicle applications utilizing durability

- Increase in polyester film production capacity at MFI (25,000 MT/Y)
- Invested approximately US$130 million in building a new production facility (Slated for completion at the end of 2021)
- Planning to produce high-performance and high-quality polyester films for MLCC for which demand is expected to increase

Multi-layered ceramic condenser (MLCC)



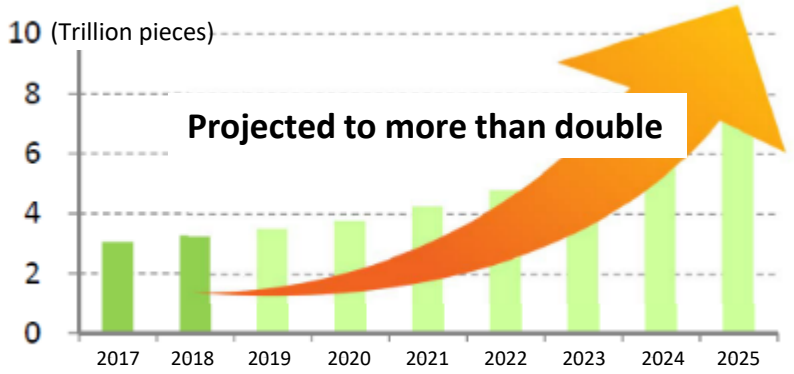
Length and width: 0.2–1.0 mm

An important component when driving an electric circuit of a device

Approximately 700 or more MLCCs are used in one smartphone.

MLCC Demand Forecast

Demand is rising with the advancement of ADS and the spread of IoT.



Polyester films are used as materials in the MLCC manufacturing process.

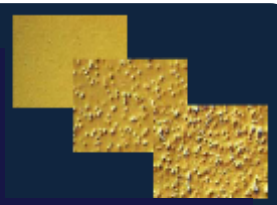
There are requirements for surface functionality of polyester films in order to enhance the capacity and performance of a condenser.

Planeness of surface

Reduction of scratches and foreign substances

Meet such requirements with MCC's manufacturing technology

Surface shape design

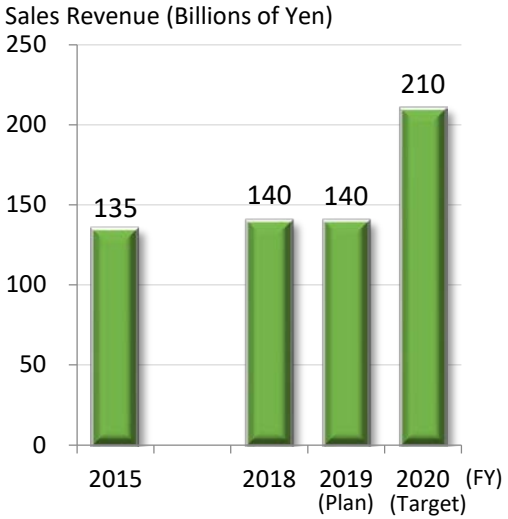


Various surface shapes

Thorough control of scratches and foreign substances

Focus Market Growth Strategies

Environment, Energy



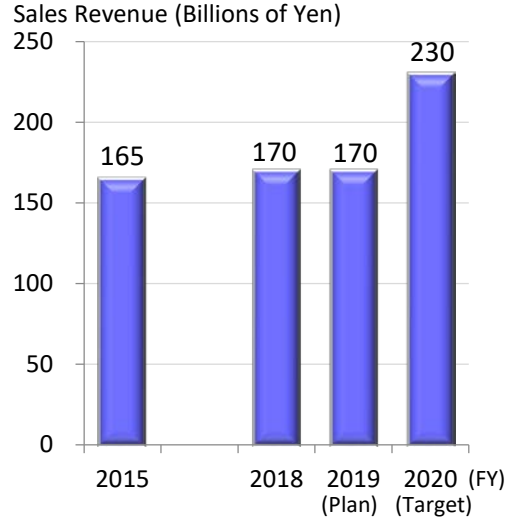
Growth Measures

- Expand sales of LIB materials
- Accelerate development of wastewater treatment business in China and water supply treatment business in Japan
- Develop products that reduce environmental impact

Progress

- **Business expansion and high-performance product development in battery materials (electrolytes and anode materials)**
  Started full-scale sales of wastewater treatment facilities for farming villages and pig farms in China
- **Expanding the business of biodegradable polymers and bio-based polymers**

Packaging, Labels, Films



Growth Measures

- Barrier application: Accelerate overseas expansion of food packaging films, **production capacity increase and sales expansion of new high-barrier performance products**
- High-performance film: Develop new products by combining the Group's technologies

Progress

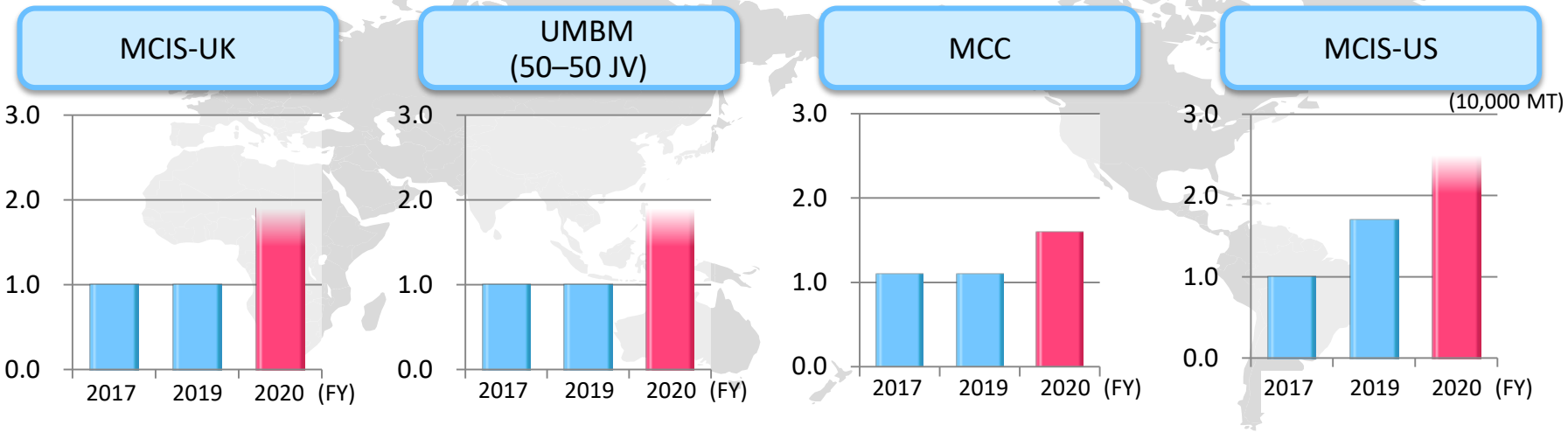
- Started full-scale operation of a new polyester film line in 2018
- Launch of high-barrier performance deep-formed microwavable containers
- Constructing a new DIAMIRON™ production site in Thailand (Slated to start operation in 2020)
- **Increasing the production capacity for Soarnol™**

Environment, Energy (1)

■ **Business expansion and high-performance product development in battery materials:**
Electrolytes: Production capacity increase in response to market expansion
Anode materials: Developed a new manufacturing process contributing to improvement of battery performance

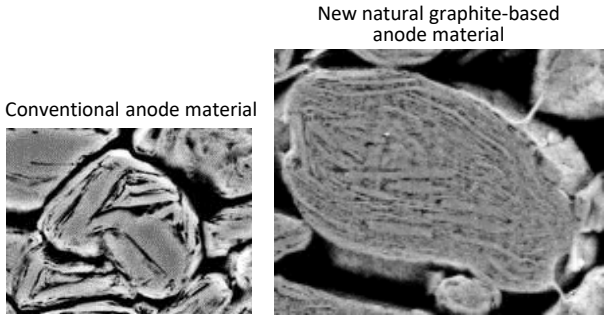
Electrolytes

- Production capacity increase: U.S.: +7,000 MT (2019); Japan: +5,000 MT (Slated to start operation in 2020)
- Considering continuous capacity increase to meet demand for in-vehicle batteries



Anode Materials

- Developed the world's first manufacturing process to control expansion, a problem in natural graphite-based anode materials
- Introducing a new anode material using the process that contributes to longer battery life and improves fast charging performance



Images taken by electron microscope

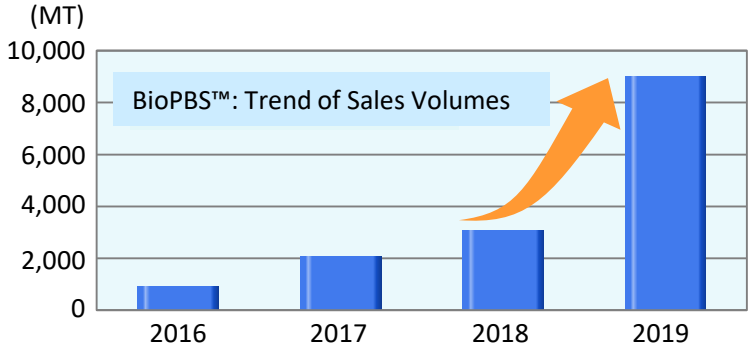
Environment, Energy (2)

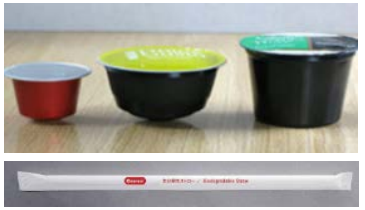
■ Expanding the business of biodegradable polymers and bio-based polymers

Accelerating application development for biodegradable polymer, BioPBS™

- Expanding demand driven by the microplastics problem tripled the sales volume compared to 2018, attracting many users through paper cups, straws, cutlery, etc.
- A paper cup coated with BioPBS™ received an innovative cup liners award in the NextGen Cup Challenge sponsored by the NextGen Consortium, founded by Starbucks and McDonald's in the U.S.
- Accelerating application development: Shopping bags and others

BioPBS™ is a bio-based and biodegradable polymer developed and patented by MCC and manufactured by PTT MCC Biochem in Thailand





Left: Paper cups awarded in the NextGen Cup Challenge
Center: Coffee capsules and straws adopted at Washington Hotel and Keikyu Group facilities
Right: Shopping bags adopted at Commes des Garcons stores

Expanding bio-based polymer, DURABIO™

- Increased the production capacity of isosorbide-based DURABIO™ from 5,000 to 8,000 MT/Y
- In addition to automotive applications, adopted DURABIO™ for Lenovo smartphone housing; aiming to expand the business

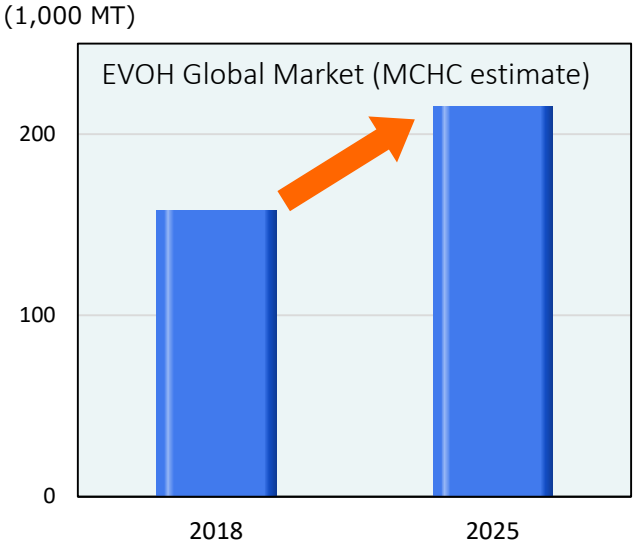
Left: DURABIO™ is adopted for Mazda CX 5
Right: DURABIO™ is adopted for the housing (3D-shape rear panel) of Lenovo smartphones

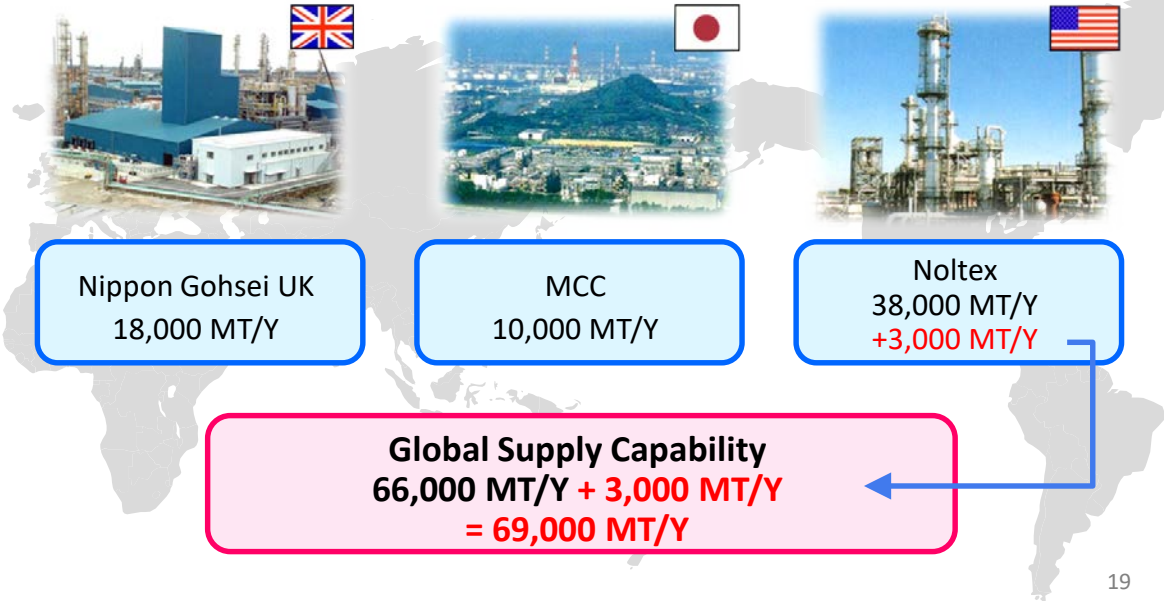
Packaging, Labels, Films

■ **Production capacity increase and sales expansion of new high-barrier performance products: Expanding global production and sales systems responding to the growing demand for food packaging materials**

Expansion of Soarnol™ business

- MCC decided to increase the annual production capacity of EVOH (ranked 2nd in estimated world market share with the brand name Soarnol™) of consolidated subsidiary Noltex to expand the global supply capability including Japan, the U.S., and Europe to 69,000 MT/Y, while considering further expansion.
- Accelerating application development of food packaging materials by leveraging high gas barrier properties





Nippon Gohsei UK
18,000 MT/Y

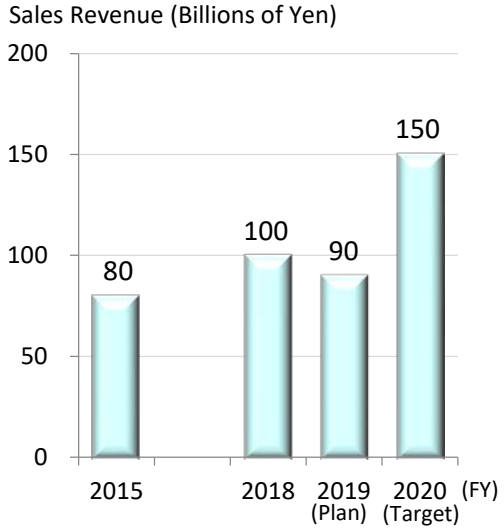
MCC
10,000 MT/Y

Noltex
38,000 MT/Y
+3,000 MT/Y

Global Supply Capability
66,000 MT/Y + 3,000 MT/Y
= 69,000 MT/Y

Focus Market Growth Strategies

Medical, Food, Bio Products



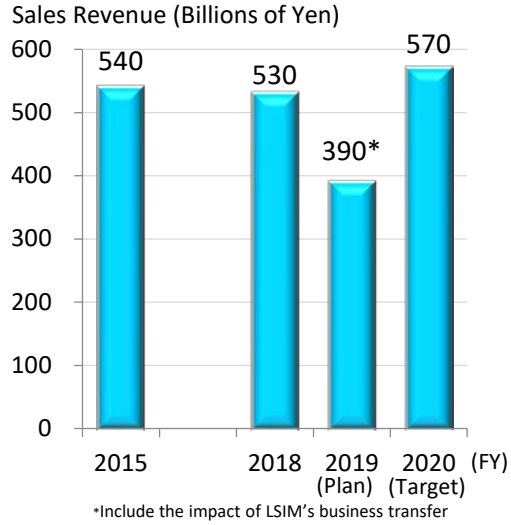
Growth Measures

- Expand the implant materials business
- Expand the nutrition-related business
- Expand the medical gases business

Progress

- Acquired a U.S. high-performance engineering plastic company, Piper Plastics
- Food emulsifier: Expanding sales mainly in China and other ASEAN countries
- Respiratory-related business including home healthcare services: Acquired IMI
- **Supplying oxygen gas for aquaculture**

Healthcare



*Include the impact of LSIM's business transfer

Growth Measures

- Reinforce pipelines for ethical pharmaceuticals
- Develop the business in the U.S.
- Commercialize VLP vaccine
- Commercialize regenerative medicine

Progress

- **Making MTPC a wholly owned subsidiary through TOB**
- **Started phase 3 clinical trials of Radicava™ oral suspension and ND0612 in the U.S.**
- **Acquired PoC for erythropoietic protoporphyria treatment in the U.S.**
- **Started clinical trials on spinal cord injury using Muse cells**
- **Obtained a license to manufacture regenerative medicine products**
- Completed strategic alliance with PHCHD

Medical, Food, Bio Products

■ Supplying oxygen gas for aquaculture

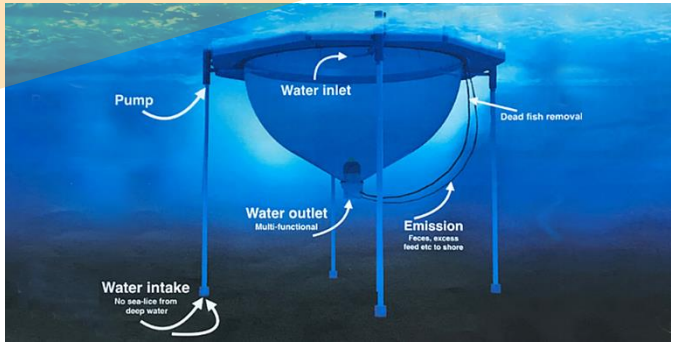
Responding to rising demand for aquacultured fish

Against the background of rising global demand for aquacultured fish due to increased health awareness in the developed countries and population growth in the emerging countries, established a new oxygen gas production base for marine aquaculture

Business area in Norway

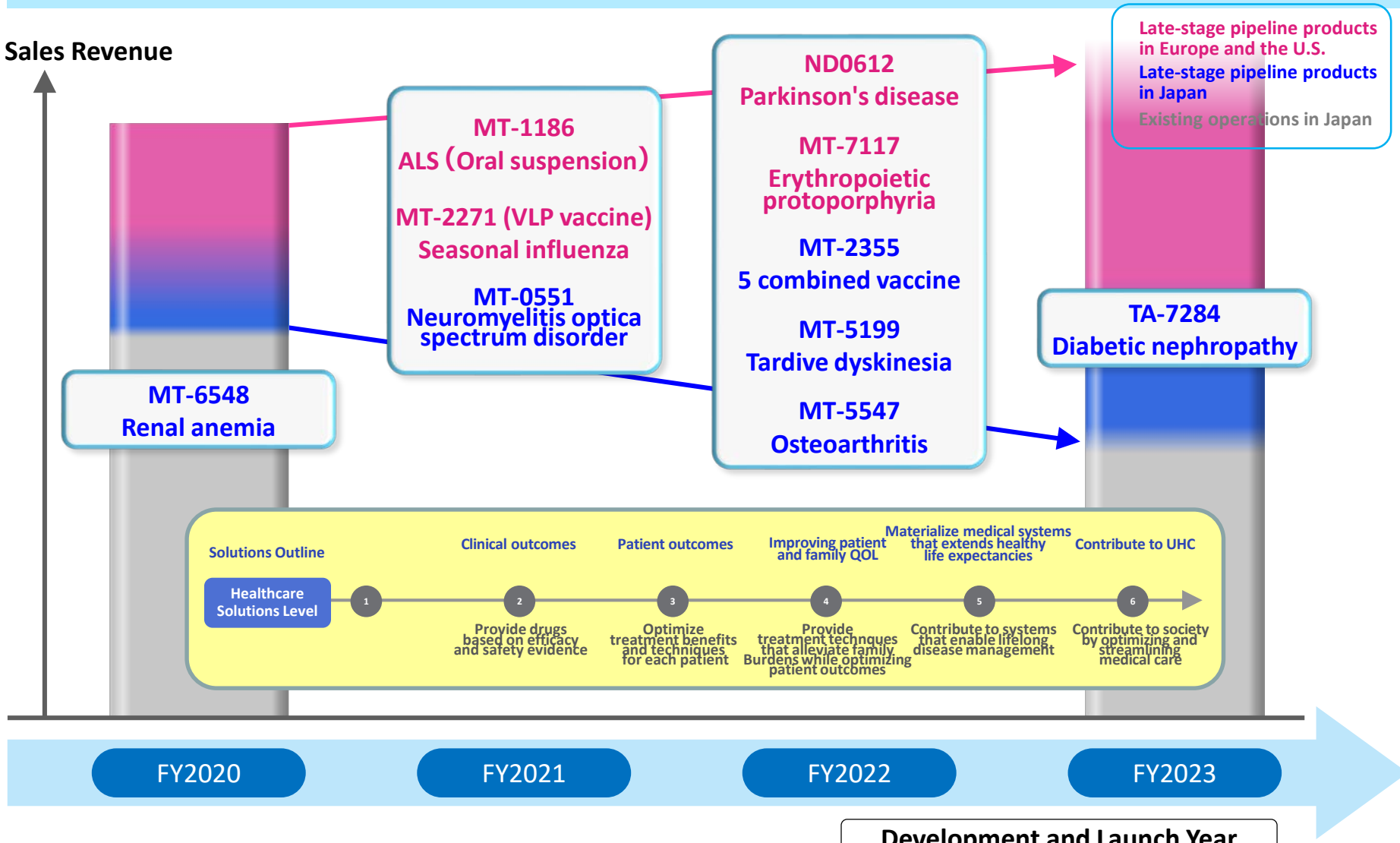
Supplying the aquaculture industry in Norway

Closed aquaculture facilities



Making MTPC a Wholly Owned Subsidiary

- Optimize pipeline value by making MTPC a wholly owned subsidiary
- Swiftly boost revenue to more than ¥500 billion



Generating Group Synergies

- Creating solutions to help solve social issues through agile and flexible use of technologies and human resources in the biotechnology, chemistry, and digital fields among Group companies
- Established the Synergy Creation Committee to start examination in each growth business field aiming to generate synergies

Themes	MCHC	MCC	MTPC	LSII	TNSC
Regenerative medicine, Precision medicine		Muse cell business promotion Cell culture materials, gene therapy, nucleic acid medicines, and cold chains			
Pharmaceuticals + Medical materials		Materials development, 3DP processing technologies, artificial joints, dental materials, functional substitutes, DDSs			
Pharmaceutical formulation materials/API			Business efficiency and clarification		
Medical gases			^{17}O, etc.		^{17}O, etc.
Microbiomes	Lactic acid bacteria, enteric-coated capsules, etc.				
Integrated DX/healthcare platform	✓	✓	✓	✓	✓
Corporate cooperation	✓	✓	✓		
CVC	✓		✓		

Regenerative Medicine Progress: Muse Cells

- Started clinical trials with the Muse cell-based product in patients with spinal cord injuries, in addition to acute myocardial infarction, cerebral infarction, and epidermolysis bullosa
- Planning to apply for marketing approval in fiscal 2020 and to obtain approval in fiscal 2021
- Obtained a license to manufacture regenerative medicine products (July 2019)
- Establish a marketing system and cold chain following cell production using proprietary technologies

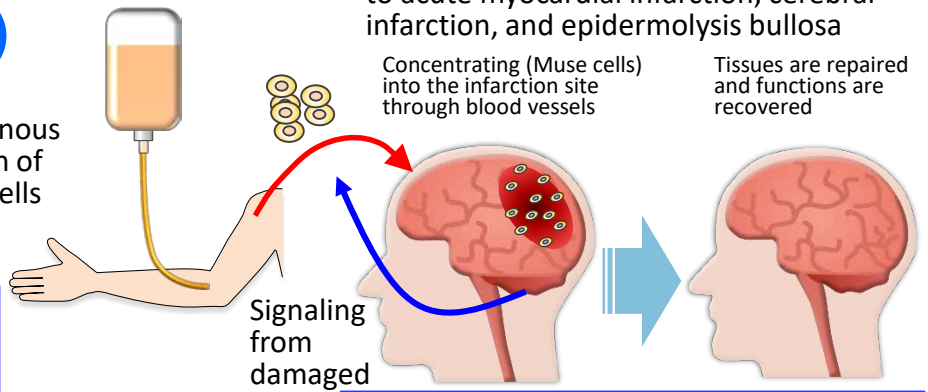
2017 2018 2019 2020 2021 2025

Clinical trials → Application → Approval → **Launch**

Aiming to obtain approval as quickly as possible through development of applications for spinal cord injury in addition to acute myocardial infarction, cerebral infarction, and epidermolysis bullosa

Tonomachi CPC
(in the Life Innovation Center)

Characteristics of Muse cells



Proprietary technologies

- Cell culture technique
- Cryopreservation technology

Migration ability and spontaneous differentiation ability

Muse cells, discovered by the team led by Prof. Mari Dezawa of Tohoku University in 2010, are pluripotent stem cells that exist in the human body.

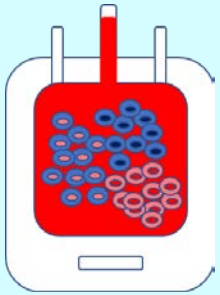
Muse Cell Business Promotion

■ **Promoting commercialization and generate synergies through collaboration among MCHC operating companies**

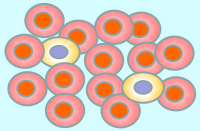
LSII

MCC
- Cell scaffolding materials and other culture peripheral materials
- Development of mass culture equipment

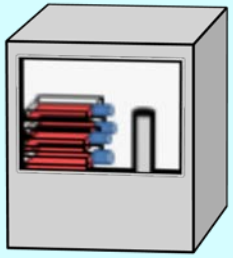
TNSC
- Establishing a cold chain

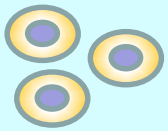


Cell source



Mesenchymal stem cells

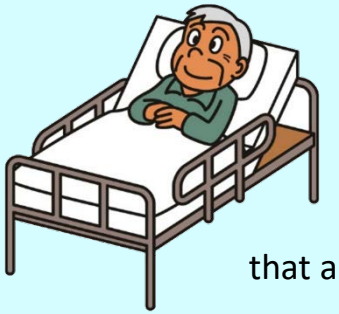




Concentration of Muse cells

Cell preparation (Cryopreservation)

MTPC
- Utilization of human resources and know-how in the development, manufacture, and sales of pharmaceuticals



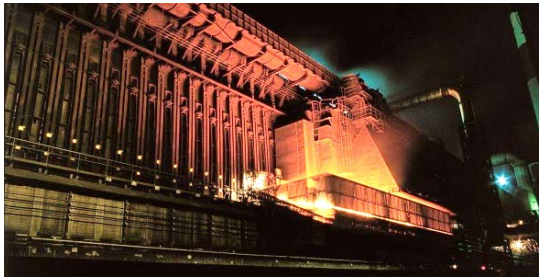
Apply to those above diseases that are difficult to treat with conventional methods

Muse cells, discovered by the team led by Prof. Mari Dezawa of Tohoku University in 2010, are pluripotent stem cells that exist in the human body

Measures for the Industrial Materials Domain

Fundamental Industrial Materials

Measures	■ Expand presence in the market ■ Strengthen profitability of overseas business ■ Materialize a highly productive corporate structure
Progress	**Chemicals** ■ Started full-scale plant operations at SAMAC ■ Increased production capacity in MAA and BMA ■ Continuing review of MMA project in the U.S. ■ Promoting DX in MMA supply chain management ■ Reinforcing coke furnace to maintain conditions ■ Unified ethylene production facilities in Mizushima ■ Continuing utility alliances at the petrochemical complex ■ Strengthening the competitiveness of polyolefins ■ **Expanding petroleum refining/petrochemical synergy: Establishment of LLP with JXTG Nippon Oil & Energy** **Industrial Gases** ■ **Completed business acquisitions of Praxair and Linde** ■ **New global management system** ■ Expanded gas production facilities for electronic materials in East Asia ■ Construction of ASUs in the U.S. (completed) and Asia (under construction)



Fundamental Industrial Materials

■ Establishment of LLP with JXTG Nippon Oil & Energy

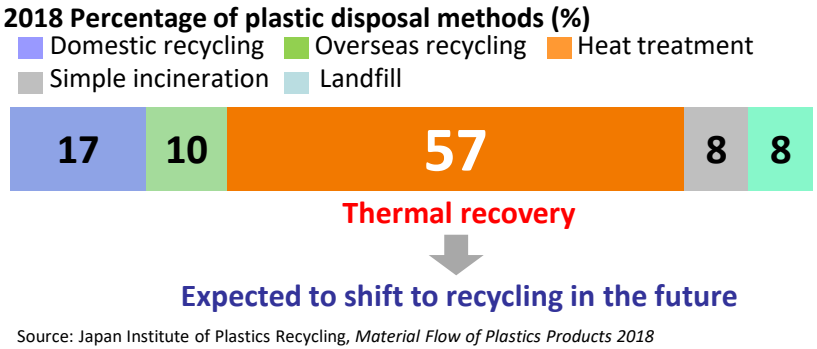
Considering measures to strengthen the coalition between petroleum refining and petrochemicals, including introduction of chemical recycling technology

- Considering improvement of the efficiency of the raw materials and manufacturing processes, utilization of gasoline base materials, and production optimization of petrochemicals

- Further considering commercialization of chemical recycling reusing waste plastics as raw materials for petroleum refining and petrochemicals

Importance of chemical recycling

2018 Percentage of plastic disposal methods (%)



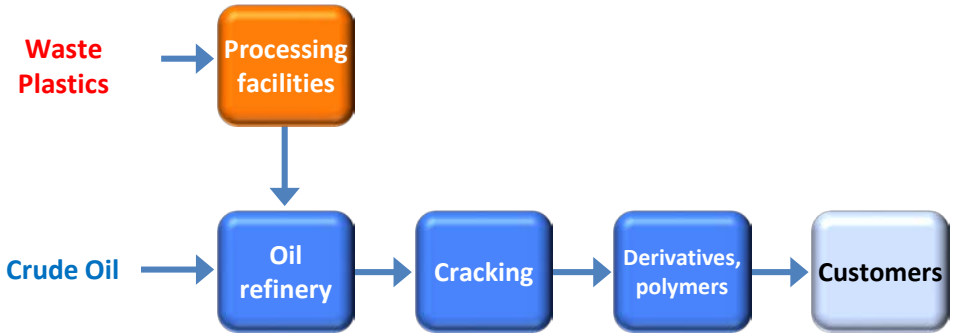
Source: Japan Institute of Plastics Recycling, *Material Flow of Plastics Products 2018*

Strengthening coalition between petroleum refining and petrochemicals

Problems and response examples of general coalition between petroleum refining and petrochemicals

Items	Major examples of response
Diversification of raw materials	• Inexpensive crude oil processing • Turn ethane and LPG into raw materials for ethylene decomposition furnaces
Improvement of heavy oil cracking capacity	• Increase the capacity of heavy oil cracking facilities
Petroleum products ⇔ Petrochemical products	• Fuel oil ⇔ Flexible production of petrochemical base products (olefins, aromas) and coordination and integrated operation of petroleum refining and production of petrochemicals
High-value-added fractions	• Effective use of unused fractions and shift to high-value-added materials

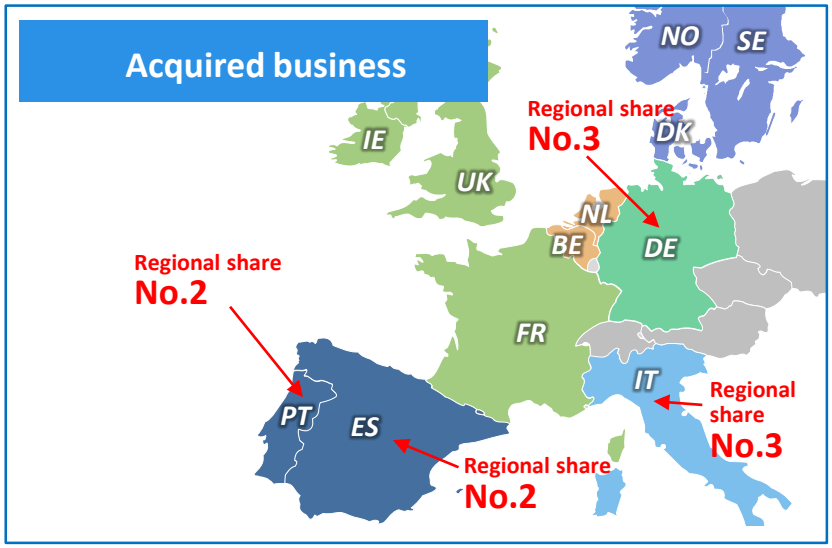
Image of chemical recycling



Establishment of the Industrial Gas Major Position (1)

- Completed business acquisitions of Praxair and Linde
- Capturing long-term management vision of the industrial gases, "¥1 trillion in sales revenue" within range

Acquisition of Praxair's European business



Acquired business

- **Acquisition value: €4,934 million (Approx. ¥635.8 billion*)**

*€1=¥128.86 (As of December 3, 2018)

- Major assets:

ASUs	Cylinder filling plants	Liquide CO_2 plants	Dry ice plants
27	35	12	19

- **Net sales: ¥168.0 billion***
- **Core operating income: ¥25.5 billion***

*€1=¥120 (Assumed rate for fiscal 2019)

Acquisition of Linde's HyCO business and related assets in the U.S.

Acquired assets

- HyCO SMR plants (5 locations), pipelines, remote supervision systems, supply contracts, operating technologies, human resources of HyCO businesses that Linde is developing in the U.S.
- **Acquisition value: US$416 million (Approx. ¥46.1 billion)**

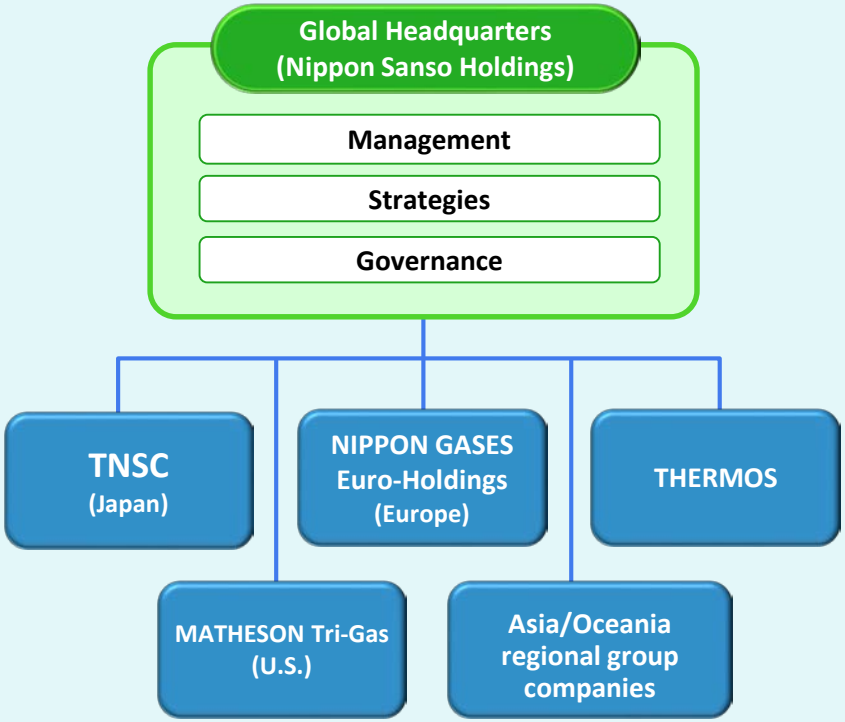
*US$1=¥110.59 (As of February 28, 2019)

Establishment of the Industrial Gas Major Position (2)

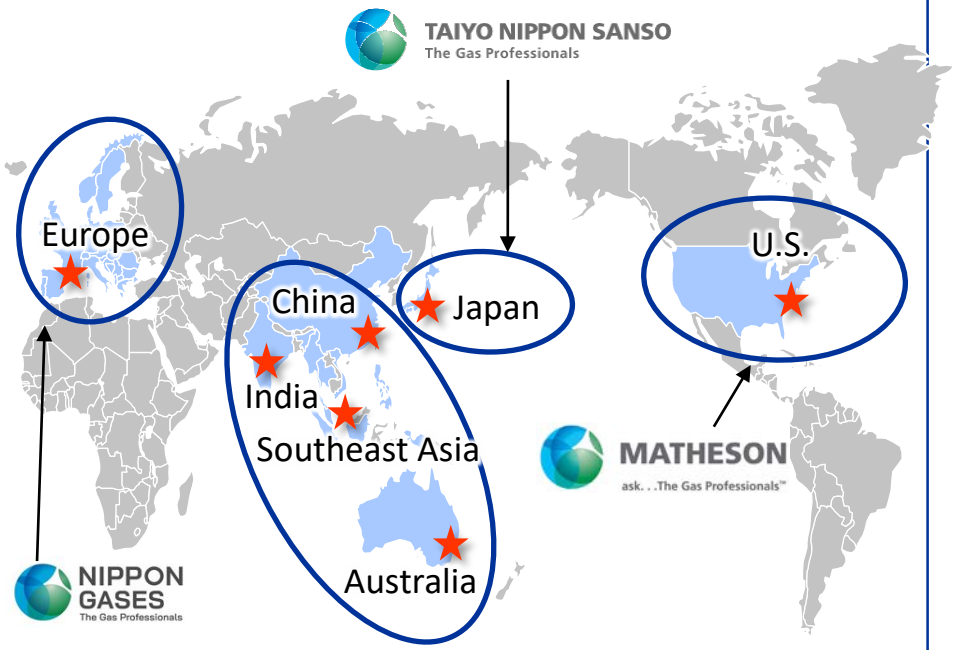
- Establishing post-acquisition global quadrupole operations (Japan, the U.S., Europe, and Asia/Oceania)
- Sharing best practices in each region to accelerate Group comprehensive strengths and synergies
- Building a global governance system

Shift to New Global Management System

New Global Management System (Effective October 2020)



Global Business Bases



Driving Growth through Synergies

- **Boosted earnings by ¥20 billion by fiscal 2019 from growth through collaboration efforts**
- **Seeking to further enhance earnings by steadily deploying focus market growth strategies**

Driving Growth through Synergies **¥35 billion** **Fiscal 2016 – 2019: ¥20 billion (Performance Products: ¥10 billion; Industrial Materials: ¥10 billion)**

Automobiles, Aircraft (Mobility)

- Respond to trend toward CASE in the automotive industry, reinforce response to environmental issues
- Reinforce overseas network for carbon fiber and composite materials business
- Accelerate overseas expansion of resin compounds business

Environment, Energy

- Expand sales of LIB materials
- Accelerate development of wastewater treatment business in China and water supply treatment business in Japan
- Develop products that reduce environmental impact

IT, Electronics, Displays

- Reinforce display-related products business
- Expand semiconductor-related business

Packaging, Labels, Films

- Accelerate overseas expansion of food packaging films,
- production capacity increase and sales expansion of new high-barrier performance products
- Develop new products by combining the Group's technologies

Medical, Food, Bio Products

- Expand the implant materials business
- Expand the nutrition-related business
- Expand the medical gases business

Fundamental Industrial Materials

- Expand presence in the market
- Strengthen profitability of overseas business
- Materialize a highly productive corporate structure

Rationalization, Including from Integrating Three Chemical Companies

- Reached target of ¥15 billion from operational efficiency by fiscal 2019, including from integrating three chemical companies
- Looking to rationalize further, including through reorganizations, from making MTPC a wholly owned subsidiary

Rationalization, including from integrating three chemical companies

¥15 billion Fiscal 2017 – 2019: ¥19 billion

Integrating subsidiaries and affiliates

- Reduce number of Group subsidiaries and affiliates by 25% from current level of 760
- **Eliminate 164 subsidiaries and affiliates (86% of final target) by end of fiscal 2019**

Productivity improvements and workstyle reforms

- Help improve productivity by deploying global communication tools
- Boost productivity by reducing working hours
- **Implement safety measures**
- **Bolster R&D (Constructing MCC's SIC research building)**
- Introduce global enterprise system (SAP)
- **Boost productivity through digital transformation efforts**

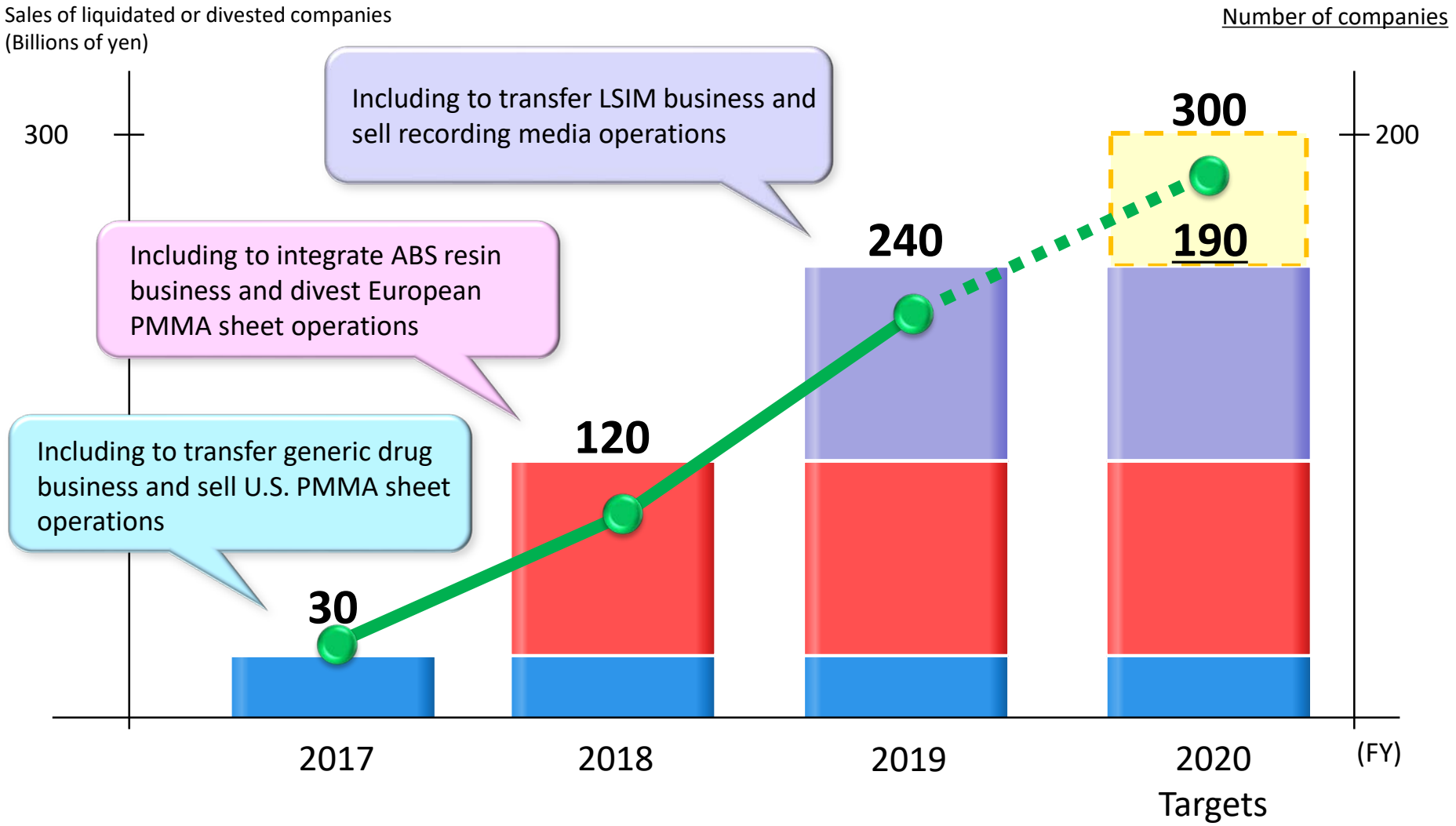
Rationalize by making MTPC wholly owned subsidiary

Challenges

- Including integrate corporate functions, and **reorganize research**

Progress with Business Structural Reforms

- **Liquidated and divested businesses generating ¥240 billion in sales from fiscal 2017**
- **Eliminate 164 subsidiaries and affiliates by end of fiscal 2019**



Promote Safety Measures

■ **Reinforce business foundations by ensuring thoroughly safe and stable production operations**

Reduce mentally and physically stressful work

- Planning and implementing measures to reduce mentally and physically stressful work with the aim of “creating a human-friendly workplace environment” from the front-line job site point of view
  - Reduction targets: 257 tasks based on risk/work strength evaluation and operators’ opinions

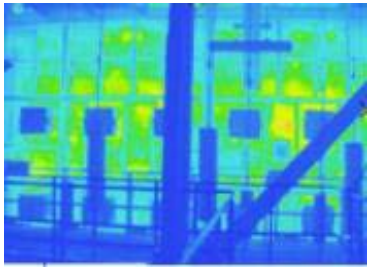
    ⇒ To be reduced in 7 years by fiscal 2025
    (Assumed investment of ¥40 billion)
  - Planning to reduce 136 tasks for fiscal 2019
    (Investment of ¥5 billion)

Example: Reduction of workload using a power suit (under verification)

Develop plant maintenance technology

- Joint development of plant facility management methods with SkymatiX utilizing drone image-processing technology

Drone



Thermal image

Pursue progress under White Logistics Movement

- Improve supply chain safety, stability, and security by collaborating with logistics firms to ensure sustainable logistics environment through the White Logistics Movement

Global Market Access

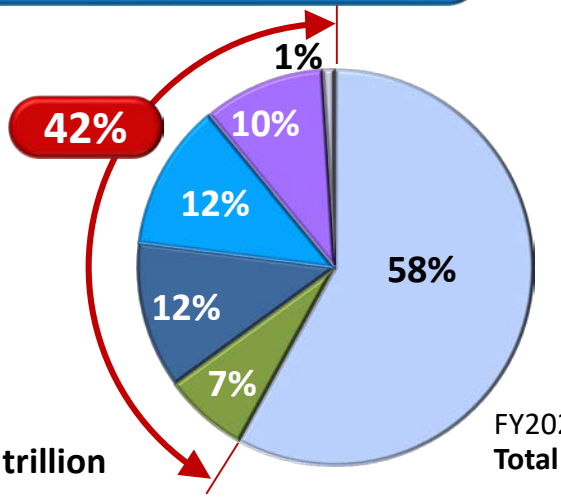
- **Achieved an overseas sales ratio of 42% in fiscal 2018, compared to a 50% target (estimated at 45% in fiscal 2019)**
- **Fostering recognition of "One MCC" initiatives**

One-stop-solution supply system

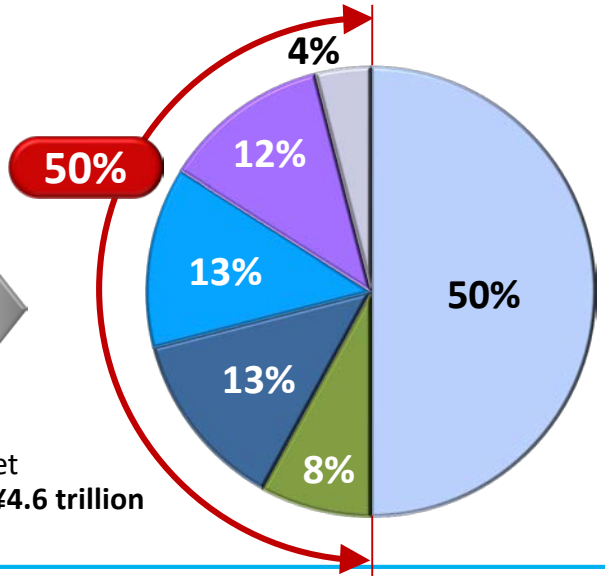
- Accelerate high-performance and high-value-added product development through modularization and systemization, and cost reduction efforts by package sales of products
- Publicized "One MCC" initiatives through exhibitions, etc., in the European market, where various automotive materials are being developed

MCC's exhibition booth at K2019 in Dusseldorf

Composition of Sales Revenue



FY2018
Total Sales: ¥3.9 trillion



FY2020 Target
Total Sales: ¥4.6 trillion

DX Initiatives

- **Deploy Groupwide activities under autonomous and sustainable DX promotion system**
- **Push ahead digital projects to cultivate on-site usage**
- **Fostering human resources and enhancing Groupwide infrastructure and techniques**

DX portfolio \ Value chain	R&D	Manufacturing	Purchasing, Logistics	Sales, Service
Operational Excellence	• Stabilize plant operations • Mathematical Optimization Center of Excellence (including in terms of wide-area energy cooperation and production, sales, and inventory optimization) • Productivity improvement by image analysis • Harness and disseminate knowledge from patents and diaries			
New Business Models			• Drive business operation and SMC advances • Business model reform that helps optimize customer operations	
New Digital Paradigms	• Apply MI at sites and develop new techniques • Use quantum computing experimentally • Participate in government architecture assessments			
Common Foundation	• Create digital maturity index and step up Groupwide activities • Establish and deploy system to develop digital human resources • Collaborate with startup companies in such areas as text mining and drones • Collaborate with academia, such as through joint research division with the Institute of Statistical Mathematics			

Implementation stage examples

1. Health Care
Digital marketing to improve MR productivity

2. Industrial Materials: Petrochemicals
Use mathematical optimization models to optimize wide area energy cooperation planning

3. Industrial Materials: MMA
Optimize timely supply chain according to demand and raw material trends

4. Industrial Materials: Industrial Gases
Reduce power consumption by analyzing operational data at production sites

5. Performance Products: New Energy
Use MI to design electrolytes

6. Develop digital human resources
- Collaborate with Shiga University to cultivate medical data scientists
- Establish digital university

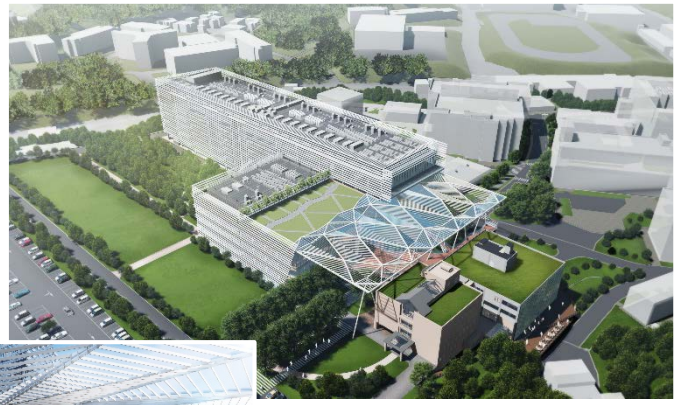
Initiatives for Creating New Businesses (1)

- **Constructing SIC research building in response to digitalization and open innovation**
- **Strengthening functions through reorganization of ethical pharmaceutical R&D bases**

Constructing SIC research building (MCC)

- Constructing SIC research building in Yokohama to strengthen R&D and promoting open innovation both internally and externally
- Introducing state-of-the-art digital infrastructure to enable the use of big data and AI
- Introducing facilities, such as collaboration areas and web conferencing systems that can be connected to internal and external partners in real/virtual ways, and improving the office environment

Artist rendering of the finished SIC research building



Artist rendering of interior of the finished SIC research building

Strengthening R&D functions by base reorganization (MTPC)

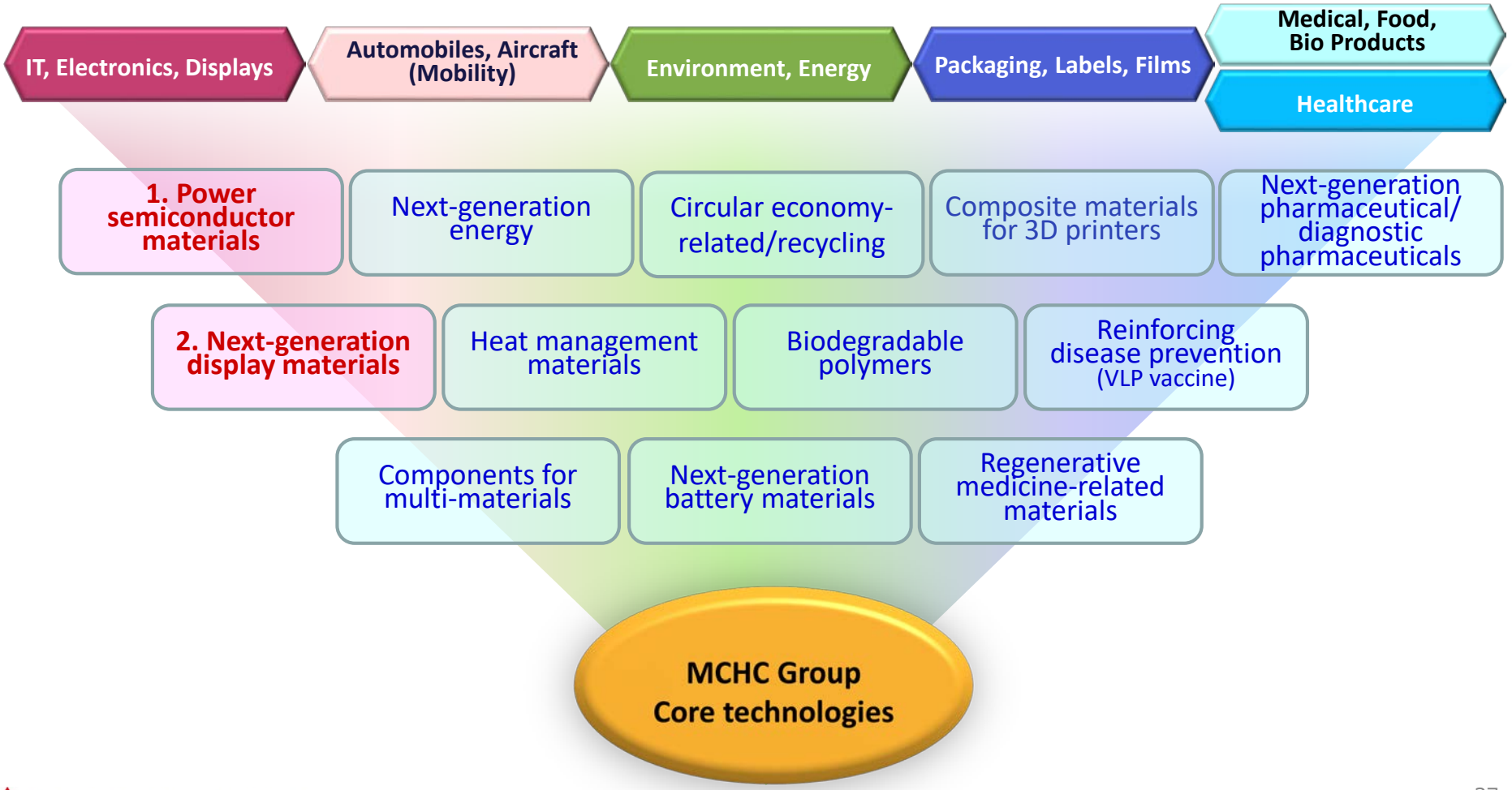
- Reorganizing the Toda Office and the Yokohama Office into the Shonan Office and the Yokohama Office, expanding opportunities for open innovation
- Transferring the Kashima Office's CMC research function to the Onoda Office

Artist rendering of the Shonan Office in the Shonan Health Innovation Park

Artist rendering of the finished research building at the Onoda Office

Initiatives for Creating New Businesses (2)

- **Accelerate commercialization in line with changes in the focus markets**
  1. 5G, 6G compatible: Power semiconductor materials
  2. Higher performance displays: Next-generation display materials
  3. Harness CVC to create new businesses



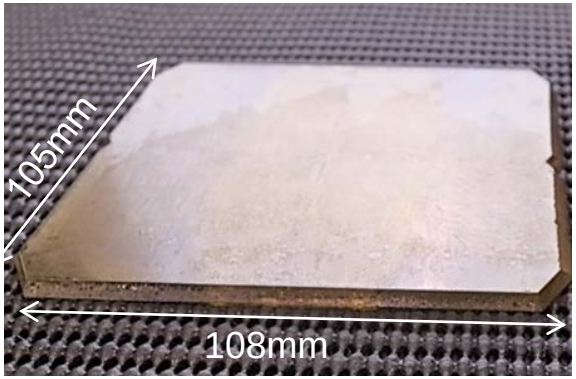
1. Power Semiconductor Materials

■ **Development of GaN substrates for power electronics**
Development of high-quality 4-inch single crystals and substrates by the liquid phase growth method
Completion of crystal growth equipment to realize high-speed and continuous growth (THVPE method)

Development of 4-inch single crystals and substrates

- Successful production of 4-inch, ultra-low-defect-density (power semiconductor compatible) GaN single crystals by proprietary liquid phase growth method (SCAAT™)
- Accelerating development with the aim of establishing substrate technology

This result is based on the NEDO subsidy program.



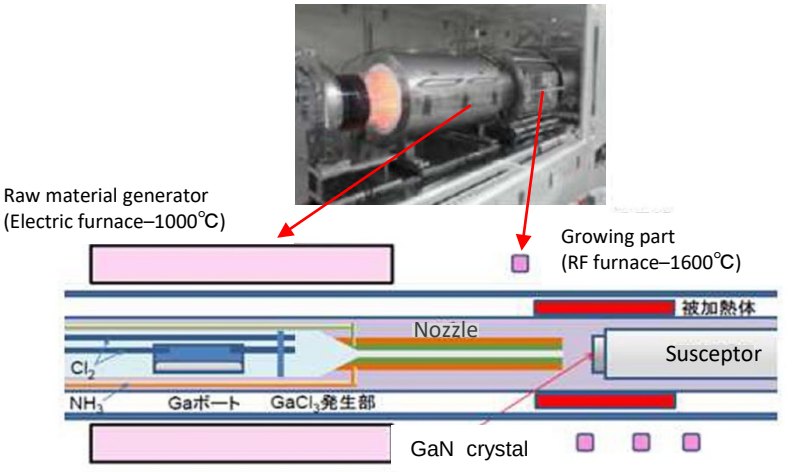
4-inch GaN single crystal

Completion of THVPE crystal-growing equipment

- Crystal growth at a higher temperature than in the HVPE method was completed with vapor phase growth equipment capable of achieving a low-defect-density (1/5 of conventional density), a high growth rate (3 times higher than conventional rate), and continuous growth.

This result is based on the JST's subsidy program.
(Joint research with Tokyo University of Agriculture and Technology)

Accelerating product development by utilizing the features of each substrate growth method to realize ultra-low-defect GaN substrates



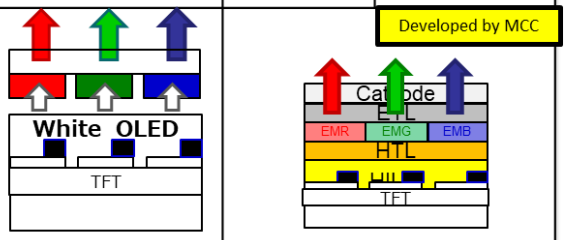
Appearance and cross-sectional structure of crystal growth furnace

2. Next-Generation Display Materials

■ **Developed key materials (low molecular weight coating material, banking material) for coating-type OLED**

Achieve lower costs and higher definition (4K/8K)
Low molecular weight coating material

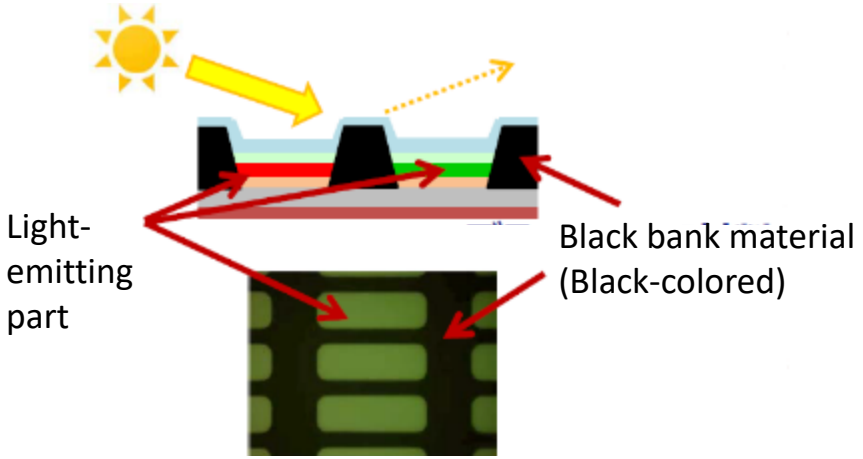
- RGB color coating method using inkjet which has benefits in terms of manufacturing cost and energy consumption (efficiency)
- Favorable for 4K/8K panels with less risk of color mixing

	Vapor-deposition-type OLED (White) + color filters	Coating-type OLED	
		High molecule type	Low molecule type
Structure	 Developed by MCC		
Manufacturing cost	× (Vapor-deposition)	○ (Coating)	
Energy consumption (efficiency)	×	○ (RGB spontaneous light emission)	
Driving life	○	○	
In-plane uniformity	○	○	
High resolution	○	△	○

Improve color sharpness (light and dark contrast)
Black bank material

- It is possible to express “jet black” by suppressing the reflection of external light, using black-colored bank material.
- LCD technology (BCS) applied
- Started sample work for panel giants

Cross-sectional schematic diagram of organic EL pixel



Magnified picture of exterior appearance of organic EL model elements
*Looking from the light emitting side of vapor-deposition type light-emitting layer/bank material/ITO film/glass substrate

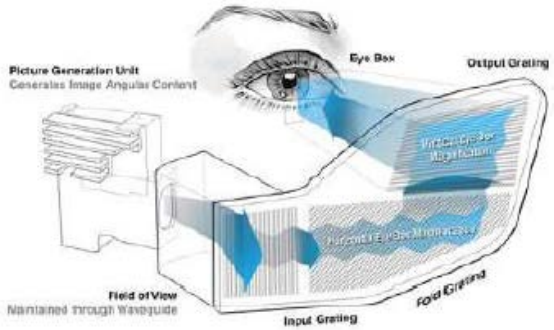
Harness CVC to Create New Businesses

■ Globally access advanced technologies and new business models to generate advanced business opportunities beyond existing frameworks

Diamond Edge Ventures Investments (As of February 12, 2020)

DIGILENS

Development of innovative light guide panel system to reduce the weight and to improve performance of AR/VR devices



Invested in October 2018

Started collaborating with MCC to enhance lightness and safety through resin substrates

AddiFab

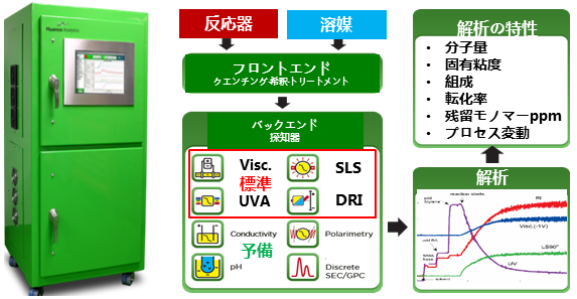
Speedy 3D printing of high-performance injection molds for complex shapes that were previously impossible to attain

Invested in June 2019

Jointly developing materials and collaborating to help customers accelerate product development

Fluence Analytics

Polymer production monitoring system that accelerates industrial IoT



Invested in May 2019

Started trials with MCC to deliver high-performance resin production

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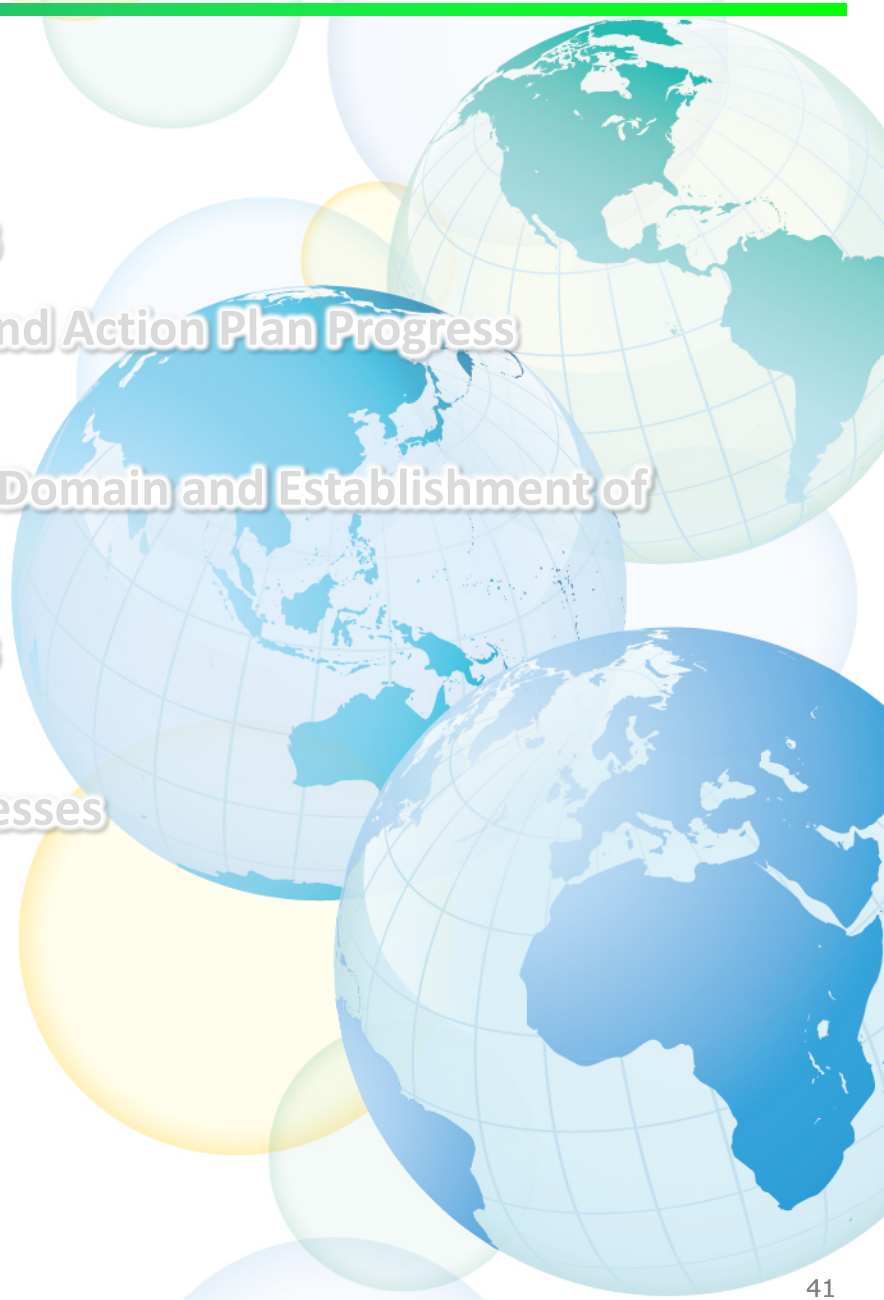
1. Progress with Financial Goals
2. Priority Management Measures
   - 2–1 Focus Market Growth Strategies and Action Plan Progress
   - 2–2 Healthcare Strategies
   - 2–3 Measures for Industrial Materials Domain and Establishment of Industrial Gas Major Position
   - 2–4 Driving Growth through Synergies
   - 2–5 Reinforce Foundations
   - 2–6 Initiatives for Creating New Businesses
3. **KAITEKI Management Initiative**
4. KAITEKI Vision 30

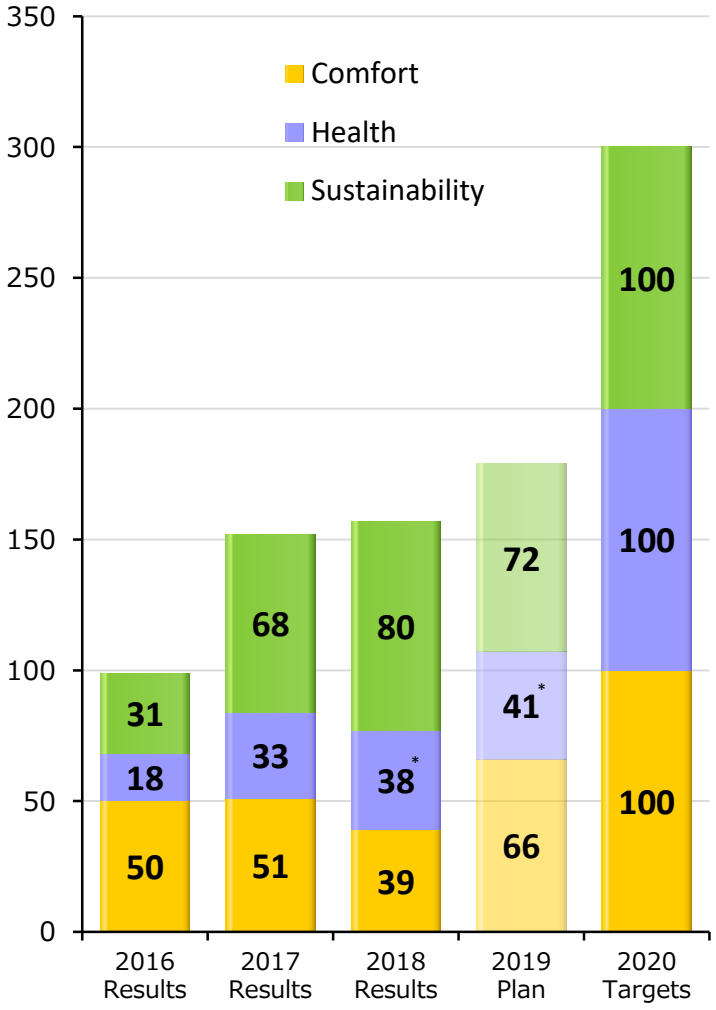


Progress with MOS Activities

■ **Enhance sustainability by employing MOS activities to internally monitor corporate activities**

MOS Activities	FY2018 Results	Self-Assessment	FY2020 Targets
Reduce burden on the atmosphere	**488 LIME/¥100 million**	☆☆☆	548.7 LIME/¥100 million
Provide products and services that contribute to reducing GHG emissions	**7.5 million t-CO_{2e} reduction**	☆☆	1.5 million t-CO_{2e}
Promote use of renewable energy	**55.6 MW**	☆☆☆	50 MW
Provide vaccines	**7.8 points achieved**	☆☆	14 points
Provide products and services that contribute to a comfortable society and better lifestyles	**8.8% increase**	☆	40%
Prevent accidents and injuries: Reduce lost time rates	**17.0% decrease**	-	50%

MOS Indices



*Include the impact of LSIM's business transfer

Participation in Initiatives

■ Endeavor to improve sustainability by participating in initiatives and joint research

Pursue Initiatives to develop new techniques to calculate corporate value

The first Japanese member of the Value Balancing Alliance (VBA)

Deploying life cycle assessments and developing techniques to measure the social impacts of companies

Comments from Mr. Daigo Shimizu, General Manager, Equity Sales Group, Business Development Department, Securities Division, at Goldman Sachs Japan

- People forget that non-financial information will eventually become financial information
- This VBA initiative should prove very valuable in filling the time gap

* LCA: Life Cycle Assessment

Joint research to materialize KAITEKI

Launching the Global KAITEKI Center

- Joint research with Arizona State University to materialize a sustainable society
  (Research themes: Visualization and quantification of social values in future businesses, Introduction of CE concept and roadmap to chemical industry, Food loss reduction, Urban heat management and material development)
- Serving as a hub from which to disseminate KAITEKI to the world

The vision of The Global KAITEKI Center is to become a premier research center for the advancement of KAITEKI, i.e. the advancement of *Sustainable Well-Being of People, Society, and our Planet Earth.*

Initiatives to lower environmental impacts

AEPW — ALLIANCE TO END PLASTIC WASTE

JaIME — Japan Initiative for Marine Environment

CLOMA — CLOMA

Circular Economy 100 — ELLEN MACARTHUR FOUNDATION THE CIRCULAR ECONOMY 100

Carbon Recycling Fund Institute — 一般社団法人 カーボンリサイクルファンド

Maintaining and Enhancing Corporate ESG Assessment

- Monitoring progress with KAITEKI Management through corporate ESG assessments
- Selected for the Dow Jones Sustainability World Index for three consecutive years

Dow Jones Sustainability Indices

MEMBER OF
Dow Jones Sustainability Indices
In collaboration with SAM a RobecoSAM brand

FTSE4Good Index

FTSE4Good

CDP

CDP

- Climate Change — Score: A-
- Water — Score: B

RobecoSAM Sustainability Award Bronze Class

SAM Sustainability Award Bronze Class 2020

Nikkei Smart Work Management Survey

NIKKEI Smart Work ★★★★★ 2020 Best 23

Nikkei SDGs Management Survey

★4.5

FTSE Blossom Japan Index

FTSE Blossom Japan
GPIF

S&P/JPX Carbon Efficient Index

S&P/JPX カーボン エフィシェント 指数
GPIF

MSCI Japan ESG Select Leaders Index*

MSCI 2019 Constituent MSCI ジャパンESG セレクト・リーダーズ指数
GPIF

MSCI Japan Empowering Women Index*

MSCI 2019 Constituent MSCI日本株 女性活躍指数 (WIN)
GPIF

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   - 2–6 Initiatives for Creating New Businesses
3. KAITEKI Management Initiative
4. **KAITEKI Vision 30**

Overview

■ Clarifying MCHC Group vision for 2030, as backbone of next medium-term management plan

Environmental and Social Issues

- Faster climate change
- Water stress and pollution
- Plastics in the ocean
- Rising populations and aging societies
- Globalization and widening disparities
- Increasing protectionism (Populism and trade wars)
- Expanding regional economic zones
- Increased medical expenses

KAITEKI Vision 30

< Innovation & Solutions >

The Earth

Addressing climate change and improving resource and energy efficiency
- ▶ Reduce greenhouse gases
  - Manage carbon through LCAs
  - Establish CO_2 usage and other technologies

Society

Foster a circular economy
Help materialize healthy and vibrant societies
Resolve social issues by transforming business models and the utilization of digital technologies

People

Enhance work satisfaction and improve creativity and productivity
- ▶ Personnel system that encompasses diversity, expertise, and mobility
- ▶ Organization that accelerates growth by addressing global needs

Social Vision

- A recycling-oriented society
- Sustainable well-being

Corporate Approach

- Identify new social issues and provide ongoing solutions

Backcasting

Prospective solutions

Reflect in next medium-term management plan

Reduce threats to MCHC Group's sustainable growth

2018 2025 2030 2050

Regulatory Trends

- Paris Agreement: Zero GHG emissions early in second half of this century
- Countries strengthening automotive fuel efficiency regulations
- Europe's 2030 circular economy target: Recycle75% of packaging waste
- G7's 2018 announcement of Ocean Plastics Charter
- More carbon taxes
- Strengthening soft laws relating to human rights, etc.

Dramatic Changes

Globalization
Irreversible trends

Digitization
Transcending of time, borders, and languages
Converging real and virtual worlds

Socialization
Diversification and networking
Constant connections

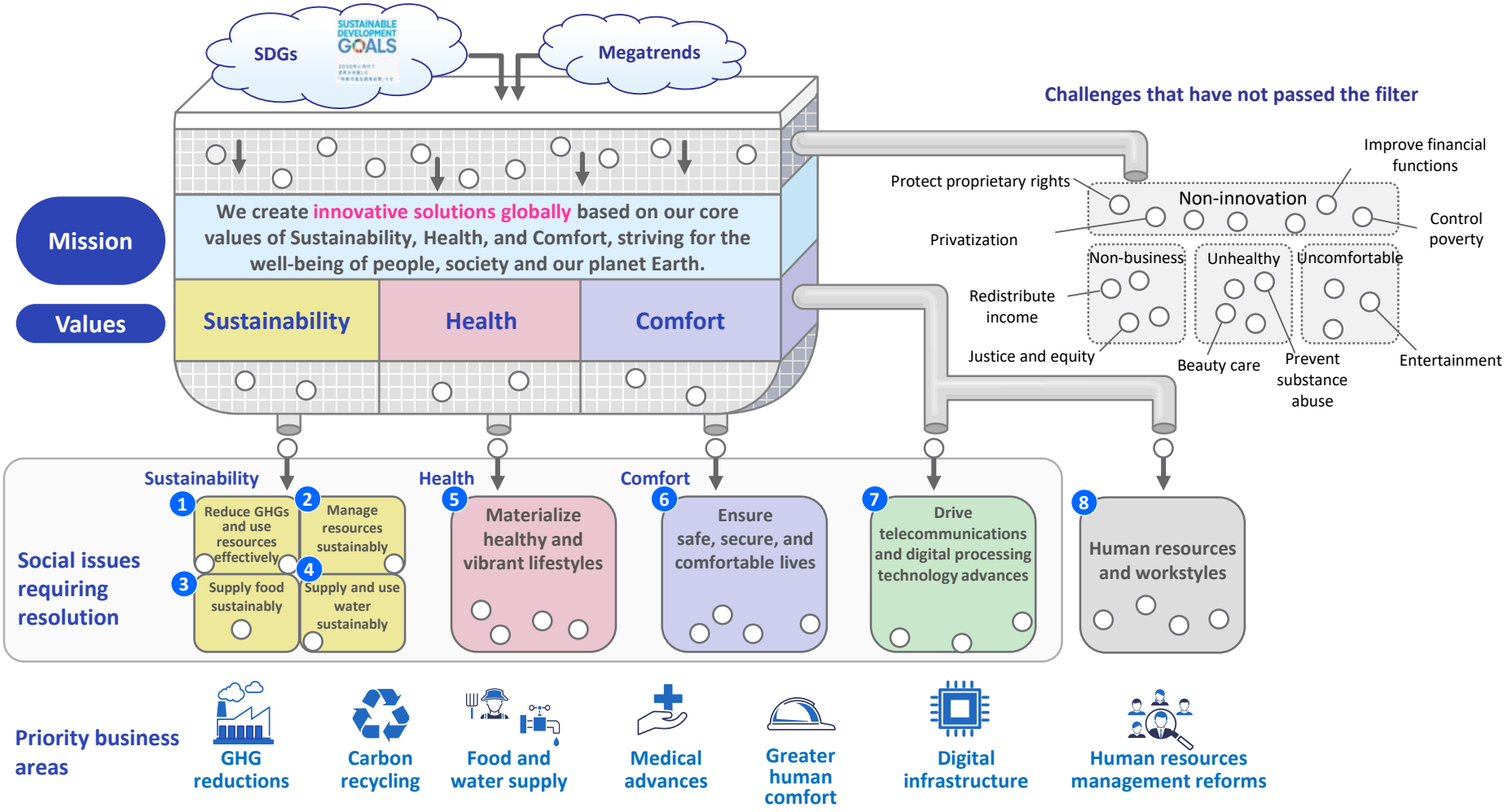
Society in 2050 ➡ One that Has Resolved its Issues

Social Vision	Sustainable carbon	• **GHG neutral** by managing carbon globally
	Resource recycling-centric	• **Optimal resource-recycling society** that deviates from an intention to expand entropy • Valuing usage over ownership
	Freedom from food and water insecurity	• Establish **food and water systems** that sustainably overcome population and economic growth and climate change
	Healthy and vibrant lifestyles	• **Significantly extend healthy life expectancies** – Offer preventive medicine based on individual health data – Optimize individualized medicine through new modalities and digital technologies
	Sustainable cities	• **Establish smart and sustainable urban systems** through telecommunications, digital processing technologies, distributed energy generation systems, and nuclear fusion and other new technologies
	Diversity	• **Workstyles that integrate diverse abilities, skills, and ideas to create new value** • Leverage digital technology to materialize time- and place-independent workstyles • Empower **people to keep acquiring skills** in response to technological innovations
Data and digital technology infrastructure		• Evolve technologies (**apply quantum computing**) needed to acquire, process, and output enormous amounts of data • Human and AI coexistence
Develop biotechnology based on information science		• **Develop genome editing technology and harness non-depleted resources**

Social Issues that MCHC Group Should Help Resolve

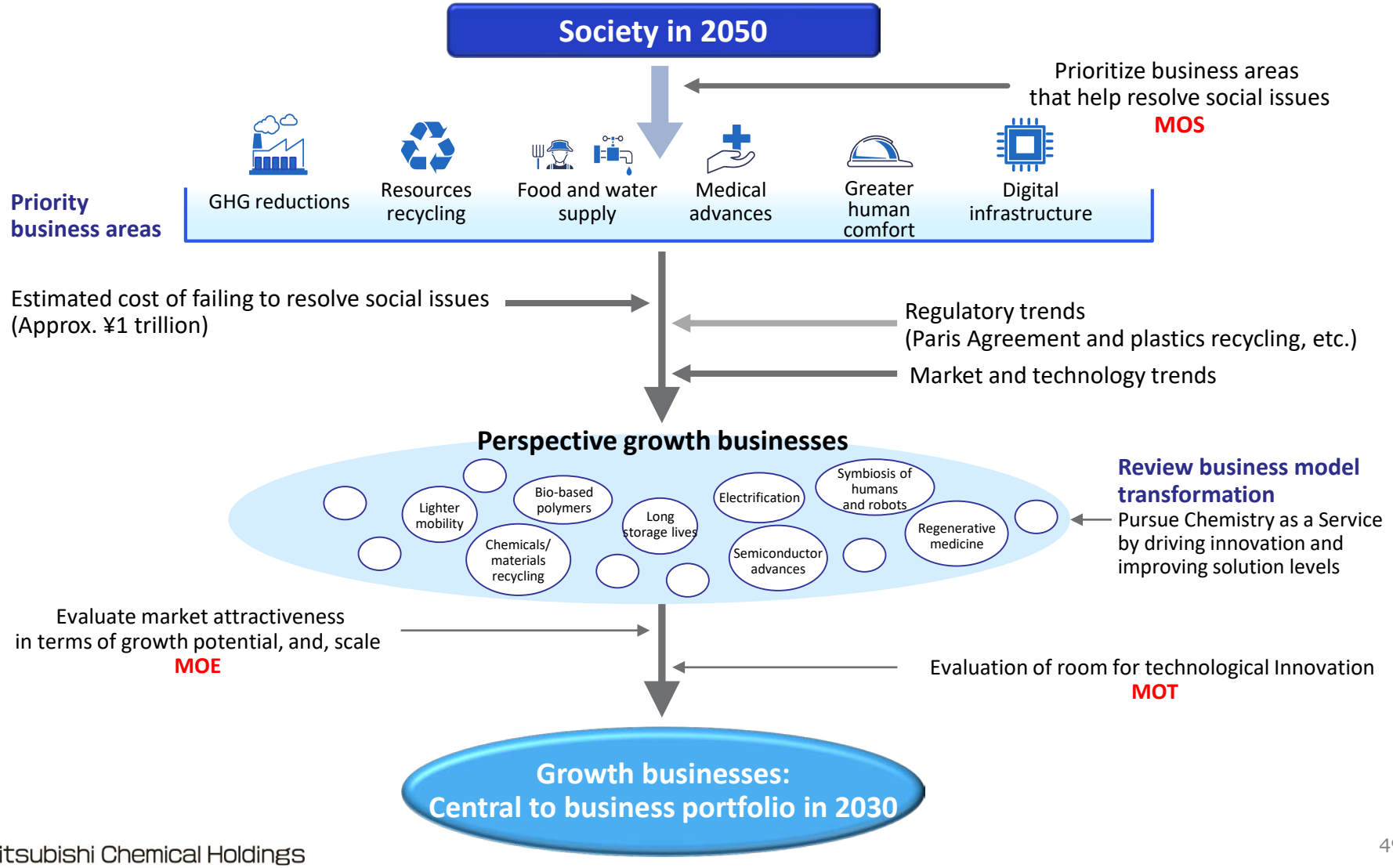
■ **Identify social issues and business areas in which MCHC Group should contribute to resolutions by reviewing SGDs and megatrends in light of its mission and values**

Identifying Social Issues Requiring Resolution



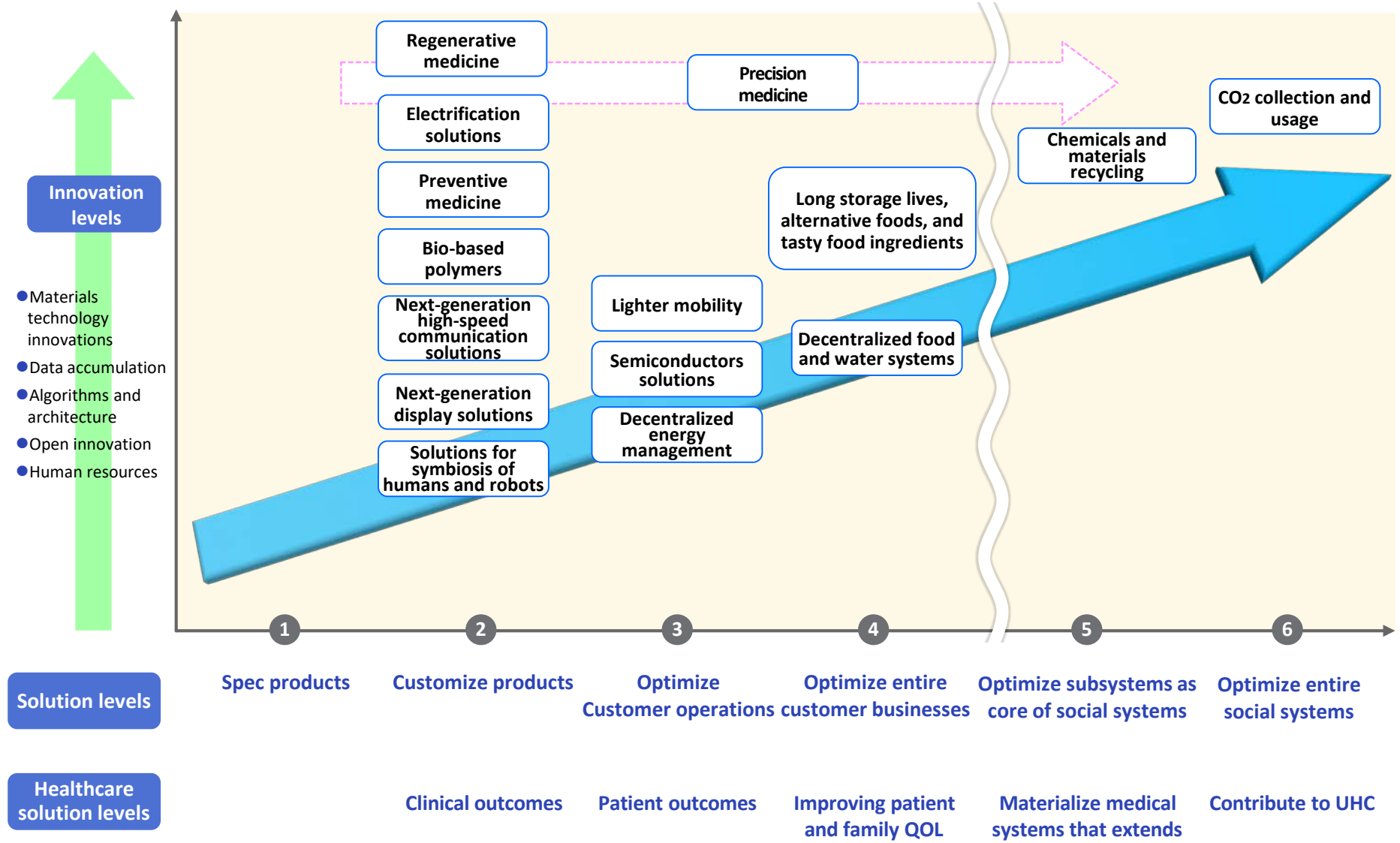
Identifying Growth Businesses

- Identify growth businesses (solutions) in light of pressing social issues
- Selection perspectives: Trends in risks, regulations, markets, and technologies, business model transformation, market attractiveness, and room for innovation



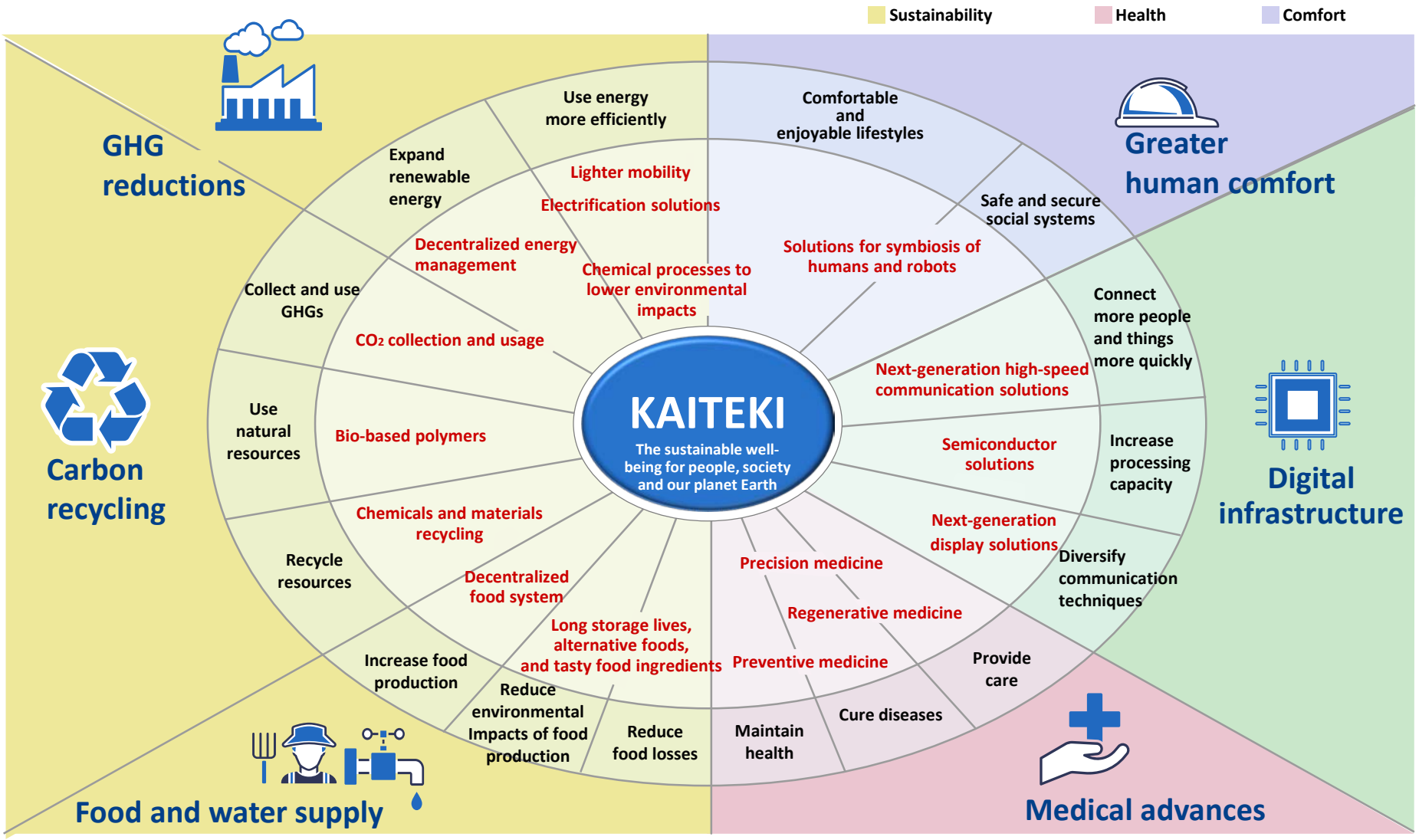
Business Model Transformation

■ Pursuing Chemistry as a Service by driving innovation and improving solution levels



Business Portfolio for 2030

■ Growth businesses contributing to resolve social issues



Social issues requiring resolution and priority business areas

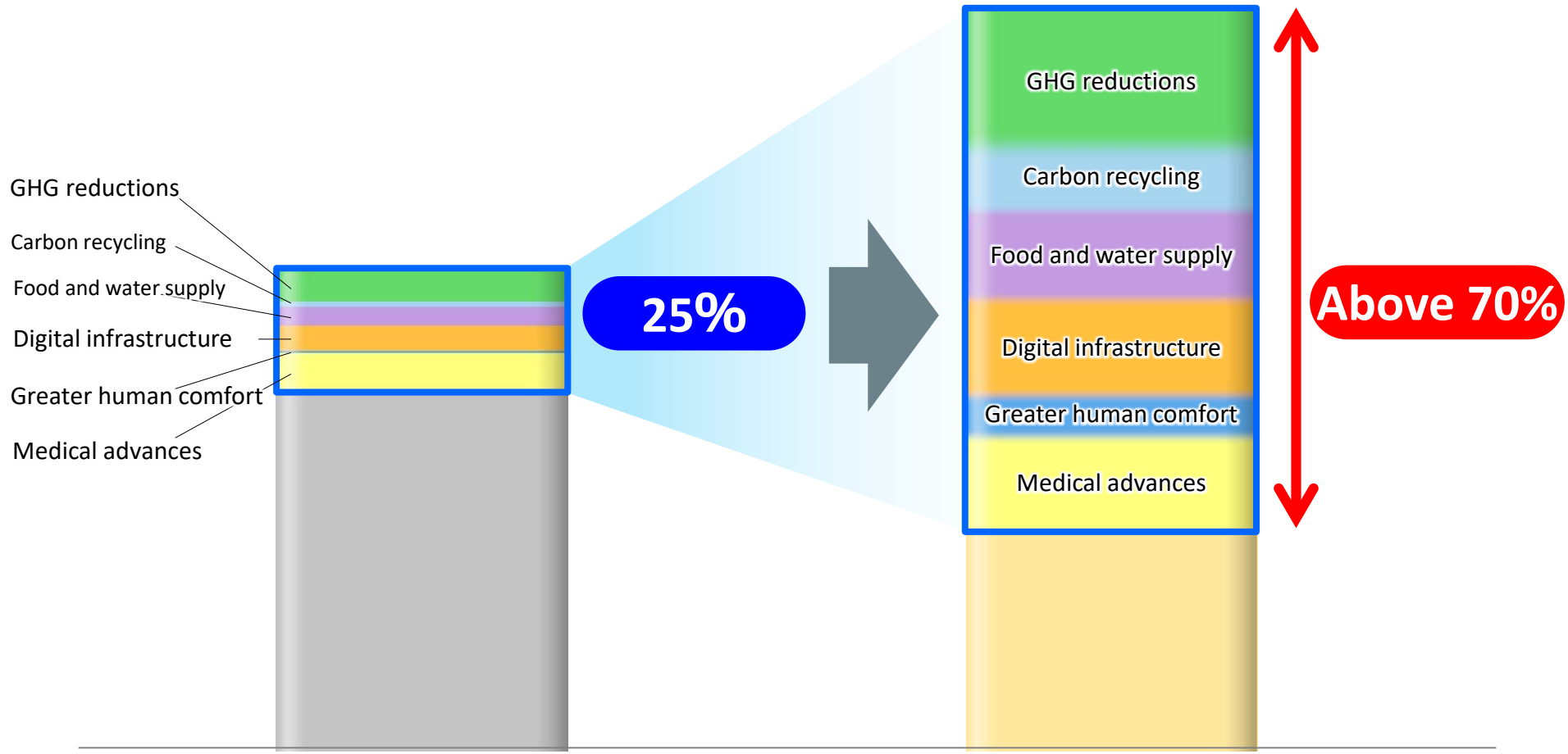
Innovation and solutions

Business Portfolio Transformation

■ Transform business portfolio based on selected growth businesses

2018 Sales Revenue ¥3.9 trillion

2030 Sales Revenue (Target) ¥6 trillion



Sustainability Management Measures

■ Help improve environmental and social sustainability through progress in five key areas

1 Evolve LCA tools

- Leverage LCAs in carbon management

2 Reduce environmental impact

- Cut GHG emissions through value chains
- Use CO_2
- Use less water
- Reduce waste

3 Create a circular economy

Cultivate business that accelerate shift to circular economy

- Chemicals recycling
- Materials recycling
- Bio-based polymers
- Biodegradable polymers

4 Feasibility studies of KAITEKI factories

Integrate ecosystems (KAITEKI factories) with local communities, centered on smart factories

5 Build foundations for supporting sustainability initiatives

- Manage using LCA tools

■GHG emissions: Lower domestic emissions 26% from fiscal 2013 level by fiscal 2030
Pursue reductions overseas in line with national and regional target levels

■Build foundations for zero environmental impact by 2050

Human Resources System Reforms and Global Management

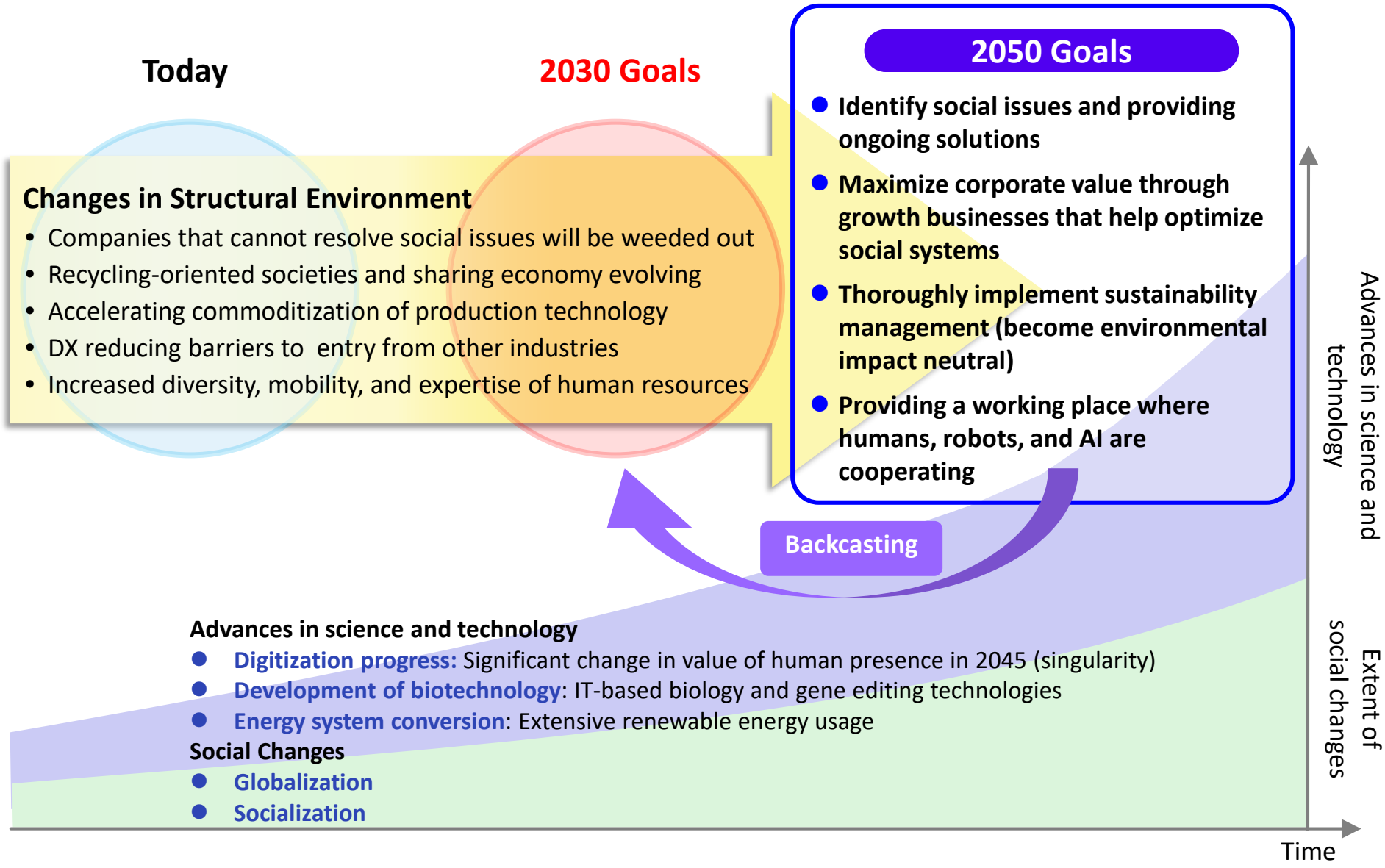
- **Diversity, mobility, and expertise are central to reforms**
- **KAITEKI Values connects talent and the Group**

	Globalization	Digitization	Socialization
Global trends	● Capital, people, and information move across national and regional borders	● Digital technology is irreversibly changing society, industrial structures, workstyles, and values	● Everyone connecting and communicating online beyond geographical limitations
Personnel situations (work environment and workstyles)	**Diversity** ● Working together regardless of age, gender, race, area of residence, experience, workstyles, values, or disabilities	**Mobility** ● Diversifying values and workstyles improving in-house and external human resources mobility	**Expertise** ● Greater social complexity demanding more expertise
Perspectives in reform human resources systems	**Respect for individuals** ● **Providing workplaces that empower self-actualization**	**Flexibility** ● **Human resources systems that embrace diversity, mobility, and expertise**	**Market value/ performance** ● **Compensation and treatment based on employee market values and performances**

Globalizing Management

- Shift away from Japanese style management
- Establish global governance system
- Develop management system that embraces different cultures and societies

Changes in Structural Environment and 2050 Goals



2030 Goals

Become a solutions provider
that leads social issue resolutions for a sustainable future

- **Accelerate growth and enhance corporate value by making resolving social issues a business opportunity**
- **Establish innovative R&D structure and keep supply solutions to social issues**
- **Build infrastructure to ensure environmental impact neutrality by reinforcing sustainability management**
- **Create flexible human resources system that embraces the diversity, expertise, and mobility of its people**
- **Maintain dynamic digital natives who are sufficiently skilled to accelerate growth**
- **Intensify global management structure to meet regional needs and accelerate growth**