HITACHI
Inspire the Next

R&D strategy for global growth of social innovation business

14th April 2011

Shigeru Azuhata,
Senior Vice President and Executive Officer,
General Manager, Research & Development Group,
Hitachi, Ltd.

HITACHI
Inspire the Next

Contents

1. R&D strategy for new growth
2. Enhancing global R&D
3. Reorganization of domestic R&D
4. Summary

HITACHI
Inspire the Next

Contents

1-1. Management strategy [2012 Mid-term Mgmt. Plan]

HITACHI
Inspire the Next

"Growth driven by Social Innovation business" & "Solid financial base"

Social innovation business is made up of
"Fusion of societal infrastructure & IT" and "Materials & Key devices"

1. Leverage Hitachi's strengths to promote a global growth strategy

- Strengthen locally led project control centers; Develop detailed strategies for each region

2. Focus business resources on Social Innovation business*

- Invest 1 trillion JPY in FY2010 - FY12 period; Spend 600 billion JPY on R&D

3. Stable profit center by strengthening the management platform

- Rigorously cut cost, improve non-operating revenue, etc.; Become a global CSR leader

*Target as of 31st May 2010

HITACHI
Inspire the Next

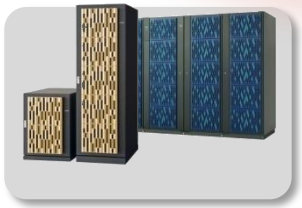
Social Innovation Business

Industrial, transportation and urban development systems

- Eco-friendly city (Water treatment)
- Construction machinery
- Elevators and escalators
- Green mobility
- Healthcare

Information and Telecommunication systems

- Cloud
- Consulting
- Data centers
- Storage



Power systems

- Energy (Thermal, nuclear, renewable)
- Smart grids

+

Materials and key devices

1-3. Group R&D strategy [Prioritizing investment]

HITACHI
Inspire the Next

Concentrate investment on the Social Innovation Business

Global | Fusion | Environment

Strategic allocation of R&D investment

- Appropriate 50% of 1.2T JPY corporate total

➔ FY 2010-2012 Total 600B JPY*

■ Major research examples: Set-up R&D structure according to region

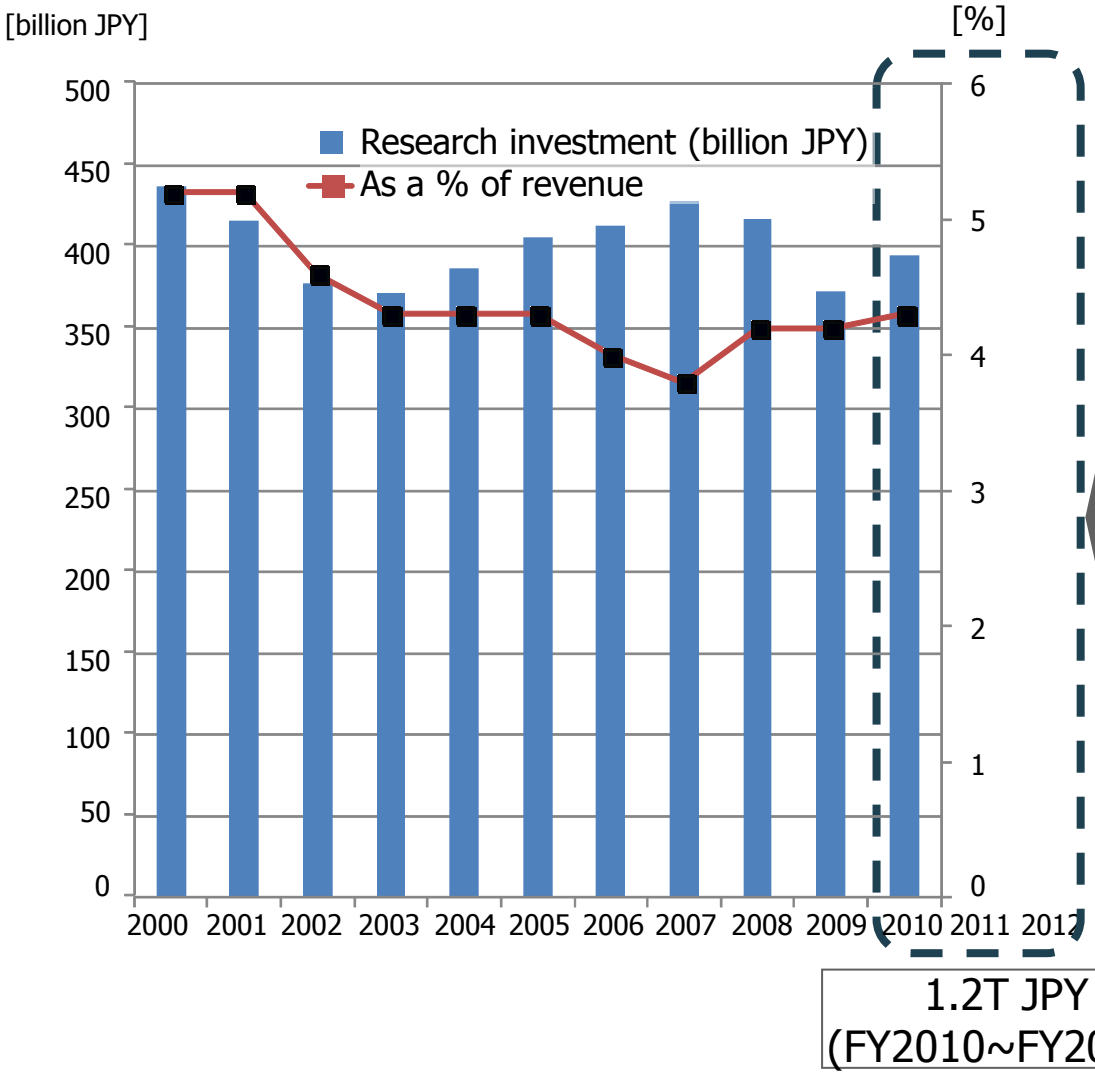
Global	Region specific designed social innovation business	USA: Storage systems China: Smart grid
Fusion	Information platform for societal infrastructure	Large capacity / Real-time / High reliability / Knowledge-based
Environment	New electronics research	New power devices/inverters Li-ion batteries
Basic & Platform	Efficient design using analysis technology	Enhance supercomputing & analysis technology ➡ dramatic reduction in design time

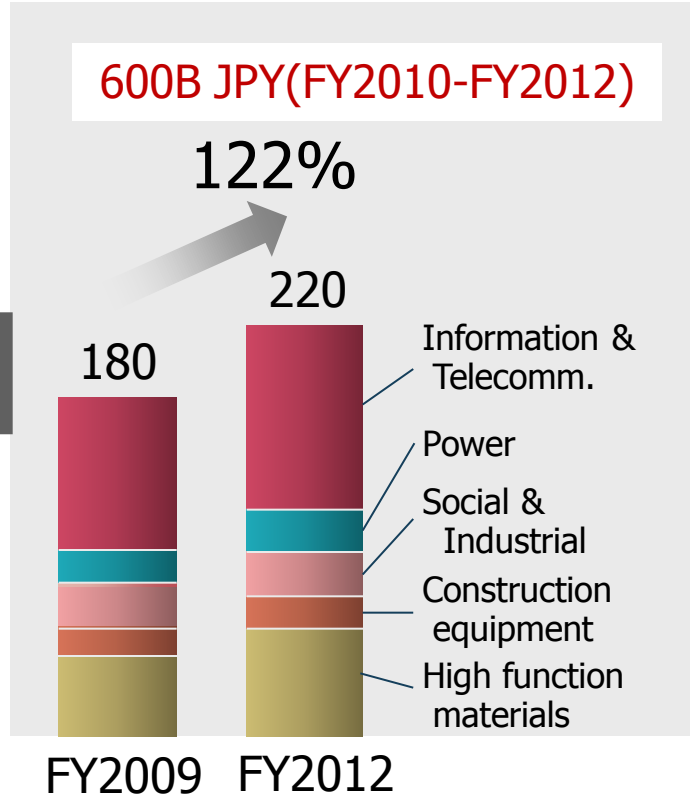
*Target as of 31st May 2010

1.4 Group R&D strategy [Focusing investment]

HITACHI
Inspire the Next

FY2012 R&D investment in social innovation business: 122% of FY2009*





*Target as of 31st May 2010

1-5. Corporate R&D strategy [Alignment with mngt.]

HITACHI
Inspire the Next

New R&D structure to facilitate global growth in social innovation business

Basic strategy:
Reinforce domestic laboratories & expand locally led overseas research

Overseas research centers

- Reinforce locally-led global research

→ Double overseas research personnel

Domestic R&D organization

- Build-up the fundamental research organization to provide strong foundations for Hitachi one hundred years from now
- Consolidate and re-organize research into [Social infrastructure][IT・*Monozukuri*] to strengthen *Honebuto* and Fusion research

→ Reorganize the 6 corporate labs & 2 division labs into 3 corporate laboratories

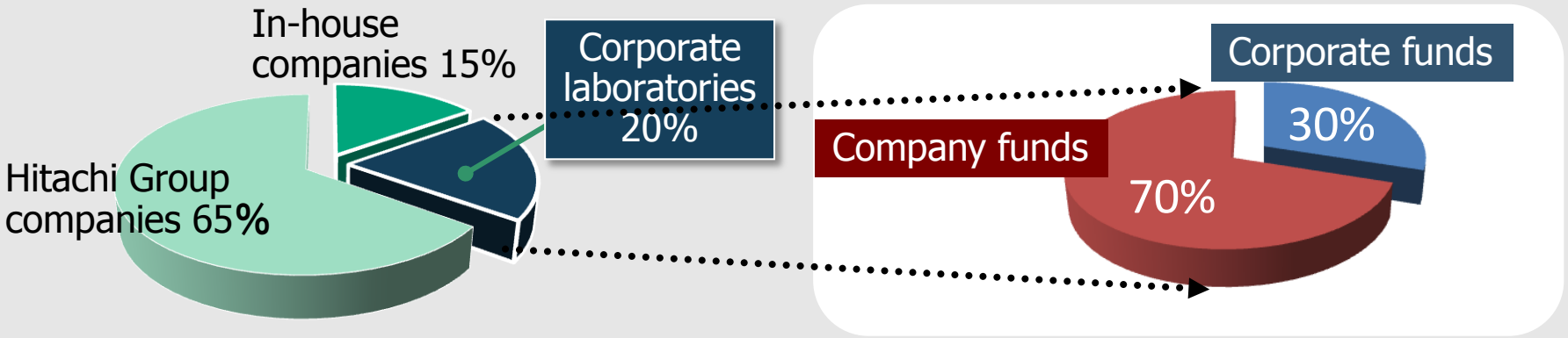
→ Establish a new "Technology Strategy Office"

1-6. Corporate R&D strategy [Focusing investment]

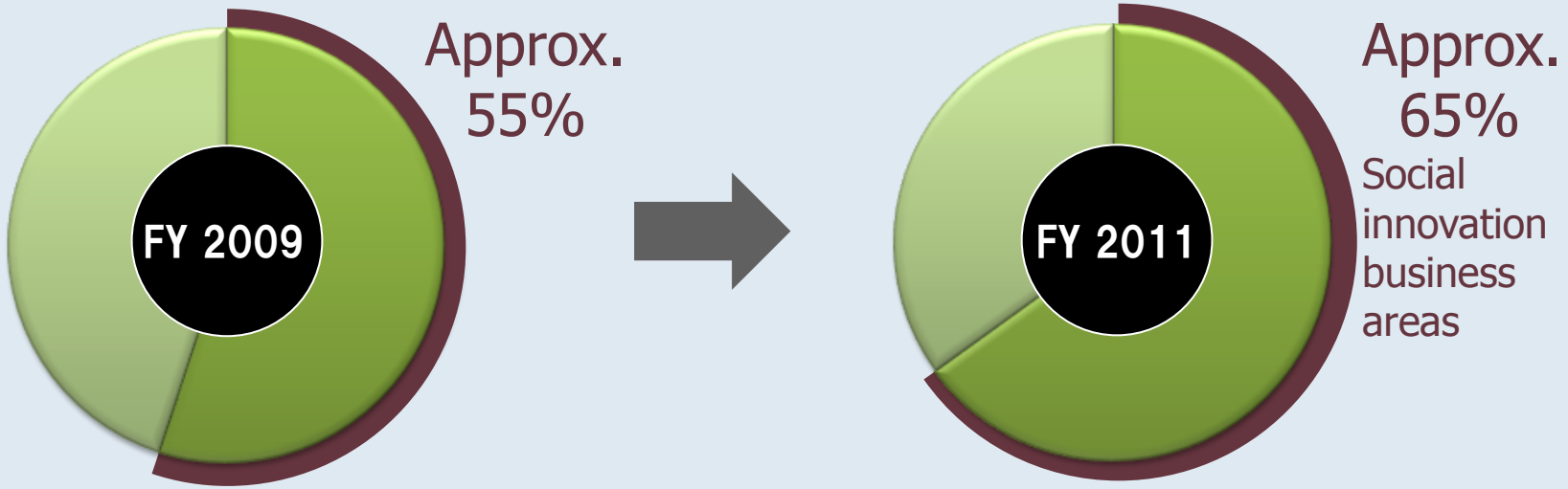
HITACHI
Inspire the Next

Focusing on corporate research funds to social innovation business

Breakdown of Hitachi Group R&D investment



65% of corporate funding to be focused on social innovation business areas



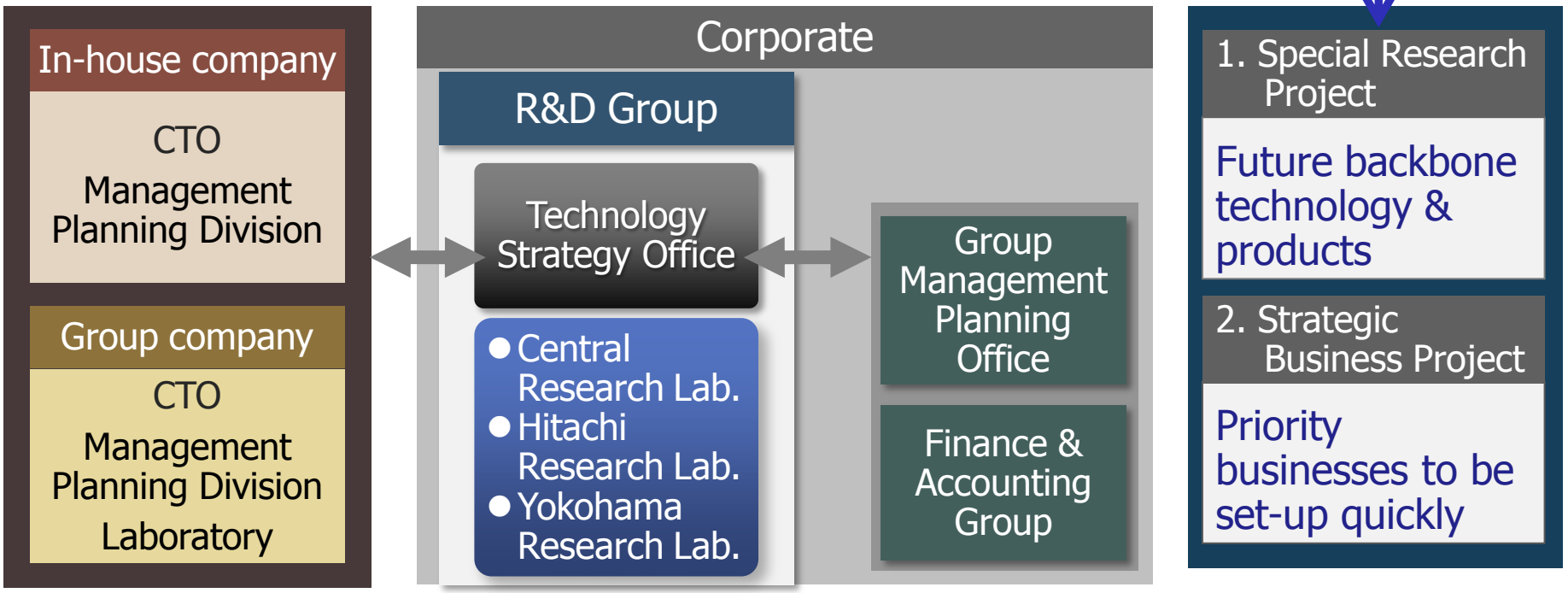
1-7. Corporate R&D strategy [Establish a control tower]

HITACHI
Inspire the Next

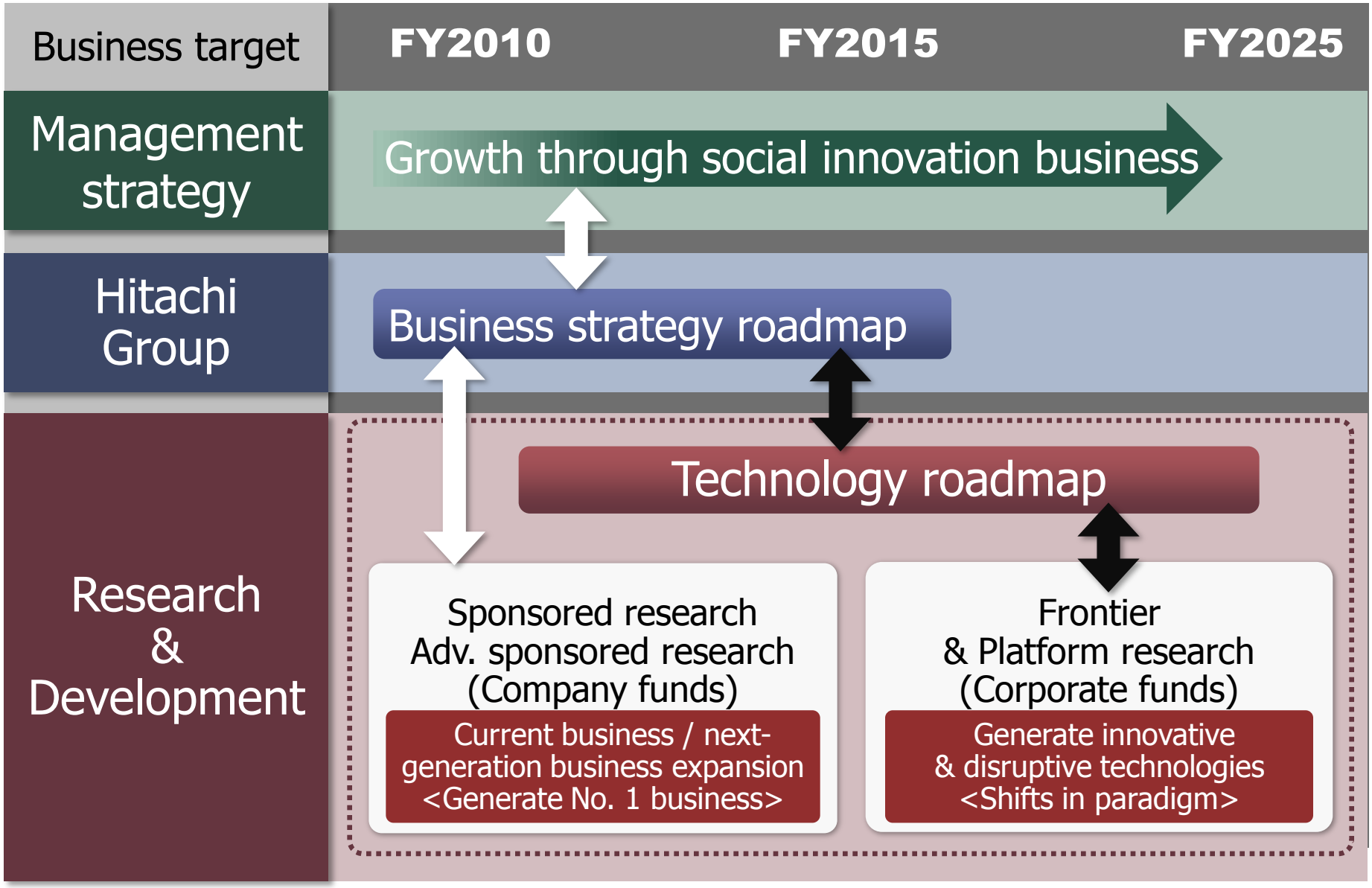
Technology Strategy Office
To lead strategic allocation in social innovation business

Plan technology strategies to achieve Hitachi Gr. management strategies

- Propose Technology Roadmap for the Hitachi Group
- Propose trans-Group strategic projects



1-8. Corporate R&D strategy [Schemes]



HITACHI
Inspire the Next

Contents

2-1. Global growth strategy [2012 Mid-term mngt. plan]

HITACHI
Inspire the Next

Promote and expand global localization

Strengthen project control centers via local leadership

- Rigorously develop a more market-centric approach through local company leaders
- Grasp local values, standards and risks under local leadership

Accelerate deployment of fine-tailored strategies for each region

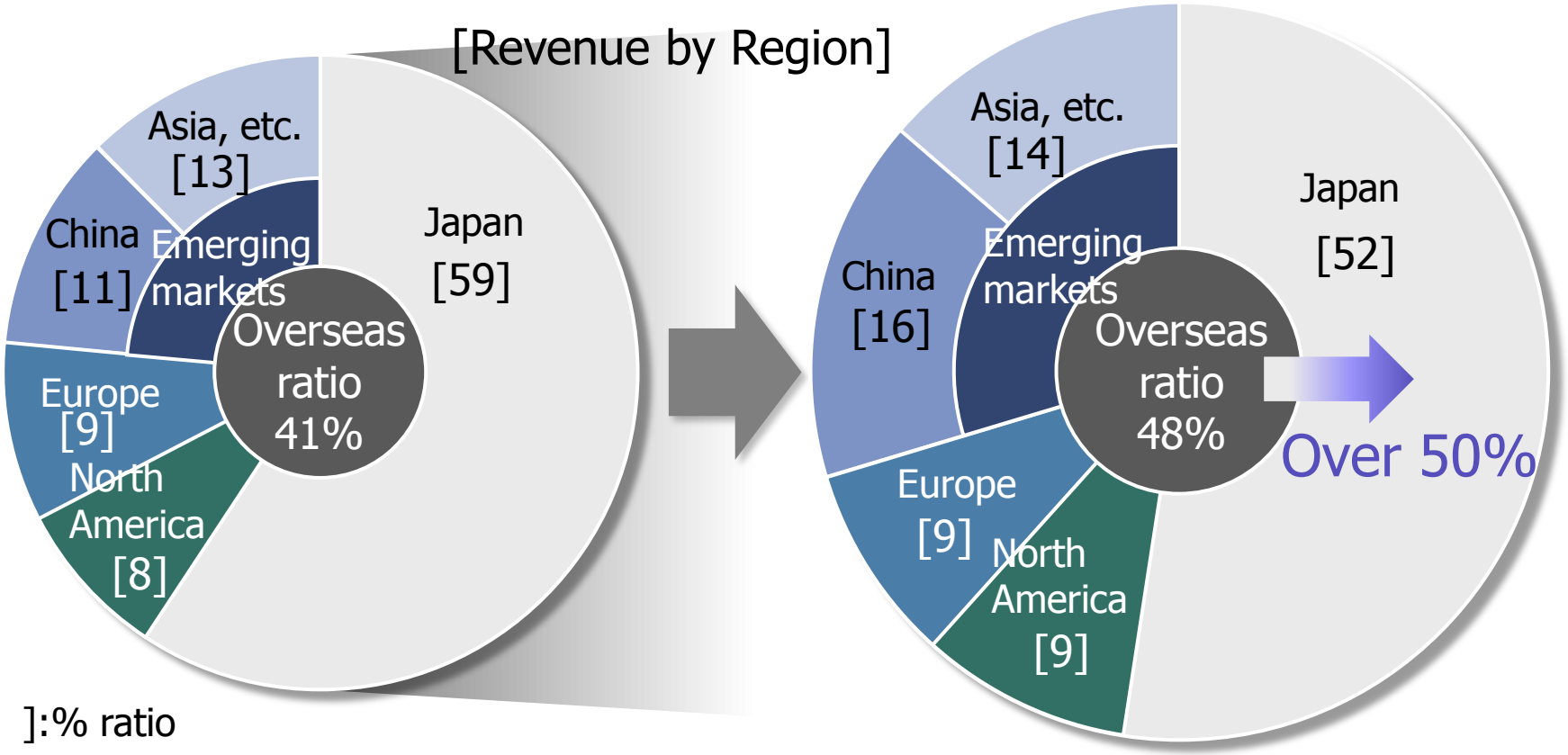
Firmly maintain Japan as the base for business

Emerging markets	Tap into the robust demand for social infrastructure; cooperate with partners
Industrialized nations	Make environmental and integrated technology proposals to address the demand in upgrading social infrastructure
Japan	Develop environmental and integrated services leveraging a strong business base

2-2. Global growth strategy [Overseas revenue]

HITACHI
Inspire the Next

Aim for an overseas revenue ratio more than 50% in FY2012*



[ ]:% ratio

FY 2009

FY 2012

*Target as of 31st May 2010

2-3. Reinforce overseas research centers

HITACHI
Inspire the Next

Strategy: Promote locally-led global research at the 4 worldwide research centers

[Initiative 1]: Increase overseas personnel …
FY2012: approx. 300 (2x)
[Initiative 2]: Foster global R&D human resources …
FY2012: 90%+ local staff, 30%+ doctorate holders
[Initiative 3] Focus on local social innovation business themes

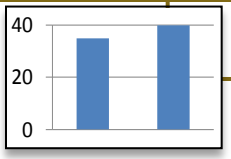
China	● Participate in national social innovation business programs ● R&D base for local Hitachi Group companies
Europe	● Promote open innovation in cutting-edge physics ● Accelerate developments in social innovation business such as Rail & Power systems
USA	● Reinforce next-generation storage systems R&D ● Development of environment-conscious vehicular technologies
Asia	● 2011 establishment of R&D base in India ● Alliance with research organizations in India

2-4. Global research centers & staff increase

HITACHI
Inspire the Next

Europe (Hitachi Europe Ltd.)

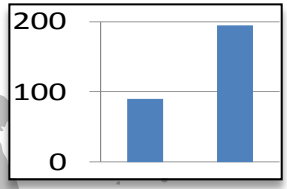
- Adv. physics
- Power systems
- Rail system
- Design



Cambridge
Munich
Sophia Antipolis

China (Hitachi China R&D Corporation)

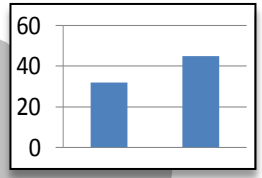
- Social infrastructure systems
- Next-generation networks
- Medical & Imaging systems
- Offshore development
- Design



USA (Hitachi America, Ltd.)

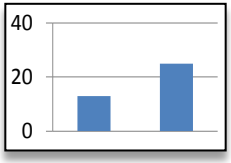
- Storage systems
- Automotive equipment
- Wireless communication systems
- Design

Detroit



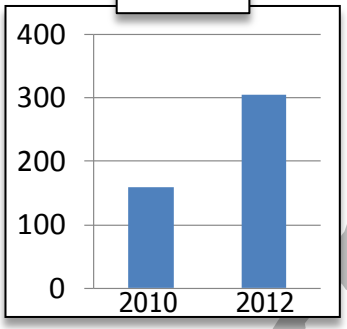
Asia (Hitachi Asia Ltd.)

- Software
- Storage mechanics
- Network storage
- Water treatment



Bangalore

(Empl.) **Total**

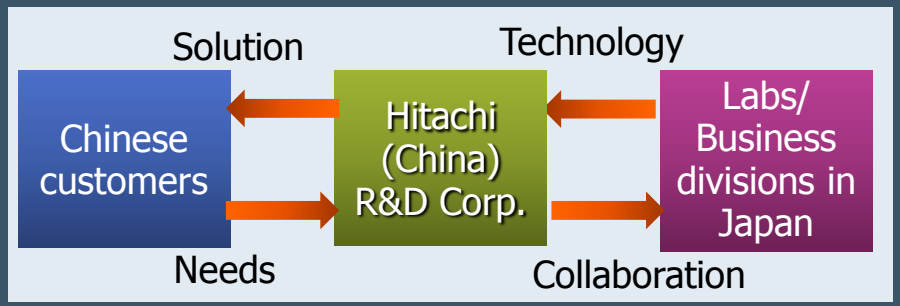


2-5. Global research strategy [China]

Participation in national social innovation projects

■ Established Social Infrastructure System Laboratory (Oct. 2010)

- R&D tailored for China

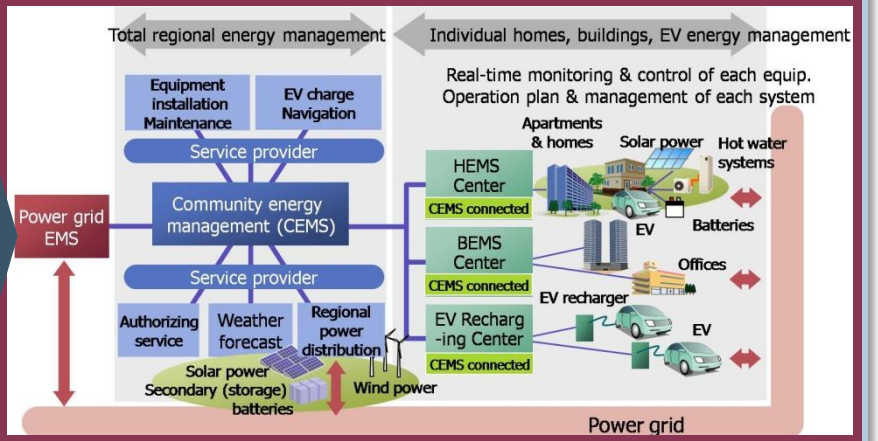


■ Collaboration with leading universities

Tsinghua - Hitachi Ubiquitous IT Joint Laboratory (Established 2001)

Tsinghua-Hitachi Comprehensive collaboration agreement (Ratified 2010)

■ Contribute to China's Eco-city projects <Tienjin, Guangzhou, Dalian>



HEMS: Home Energy Management
BEMS: Building Energy Management System
CEMS: Community Energy Management System
EV: Electric Vehicle

■ Development of the Chinese version of the Smart grid simulator (2012)

2-6. Global research strategy [Europe]

Global
Fusion
Environment

HITACHI
Inspire the Next

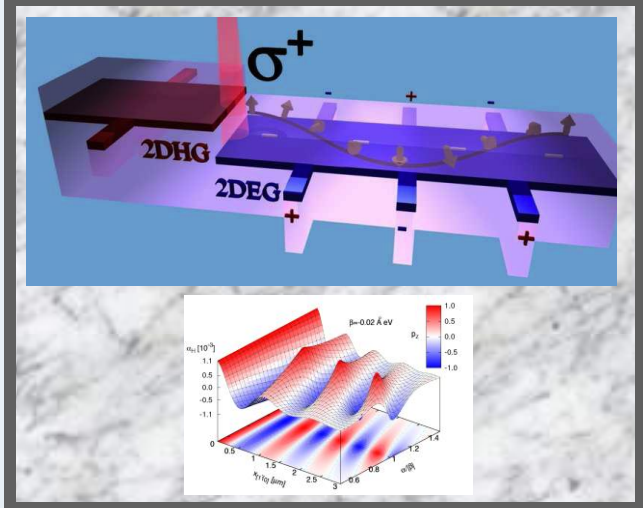
Accelerate business in social infrastructure such as rail & power systems

- Thermal power business: CCS*1, A-USC*2 with local universities
- Provide complete rail solution from manufacturing to maintenance

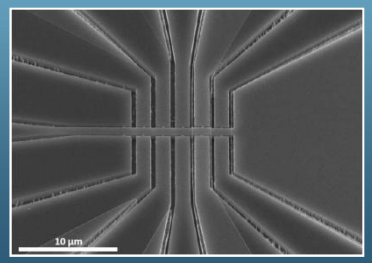
Promote open innovation in frontier physics

Cutting-edge fundamental physics creating a paradigm shift in industry (Hitachi Cambridge Lab.)

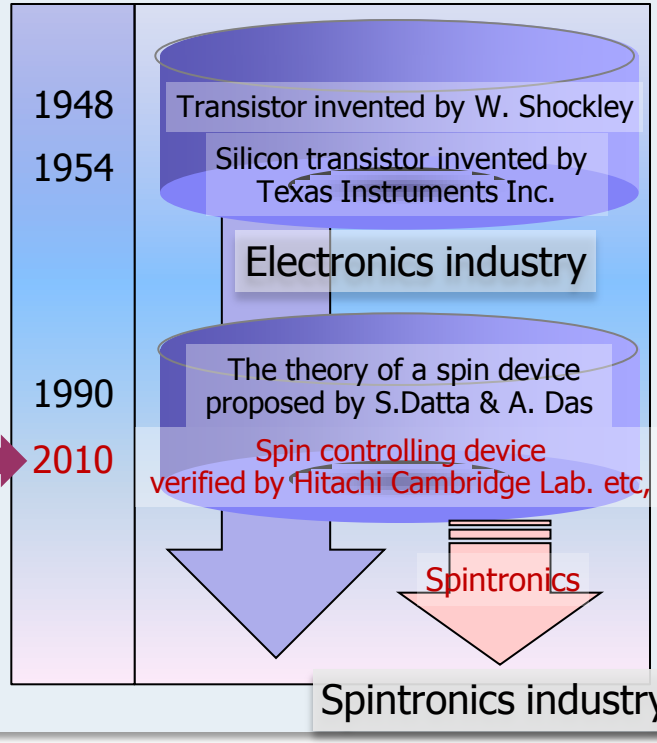
First successful control of pure spin current



Opening the way to achieving information processing requiring almost no power



Science (December 2010)



*1 CCS: Carbon Dioxide Capture and Storage; *2 A-USC: Advanced Ultra Super Critical

2-7. Global research strategy [U.S.A.]

Contribute to US business

- Reinforce R&D for next-generation storage systems
- Development of eco-friendly vehicle-related technology

Storage business: Develop cutting-edge virtualization technology through contact with customers in advanced market

Global business structure

New technology proposal
Virtualization concepts planning

Expand global market
Customer acquisition Service

Customer needs

Hitachi America, Ltd. SAN Solutions Lab. (USA)

Hitachi Data Systems Corp. (USA)

Technical info.

Product Customer information

Yokohama Research Lab. (Japan)

Disk Array Systems Division Software Division (Japan)

Plan spec

Develop No. 1 technology

Product devt. Determine spec.

Core technology

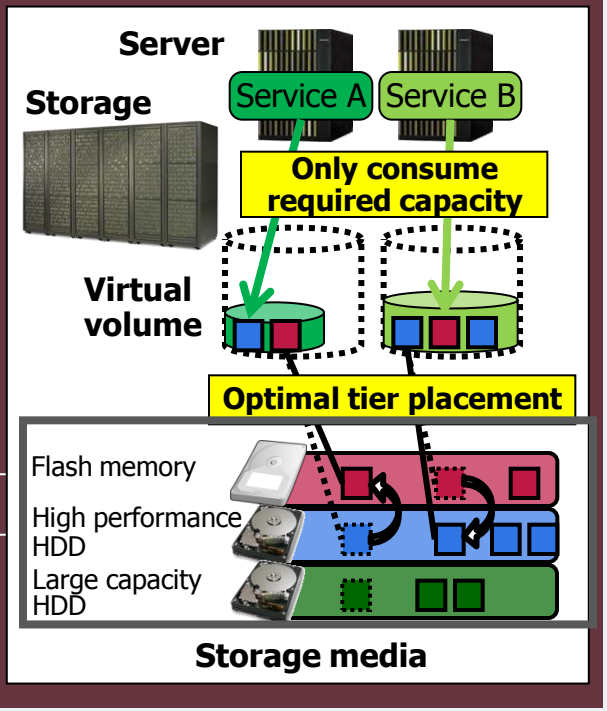
Storage device virtualization (Sept. '04)

Storage capacity virtualization (May '07)

Storage tier virtualization (Sept. '10)

Hitachi Virtual Storage Platform

Approx. 30% reduction in storage media cost



2-8. Global research strategy [Asia]

Global
Fusion
Environment

HITACHI
Inspire the Next

Open a R&D center in India in 2011

Promote market-in style technology development for the Indian market

■ Mission:
Open-up the way for IT business in India

■ Themes being undertaken:

① IT hardware & middleware for the Indian market

② Storage applications for compilation and use of large data volumes

③ Mathematical algorithms, knowledge processing and research on tool sets

Research center
@ Bangalore, India

Collaboration with universities in India

Development of advanced technology in collaboration with universities

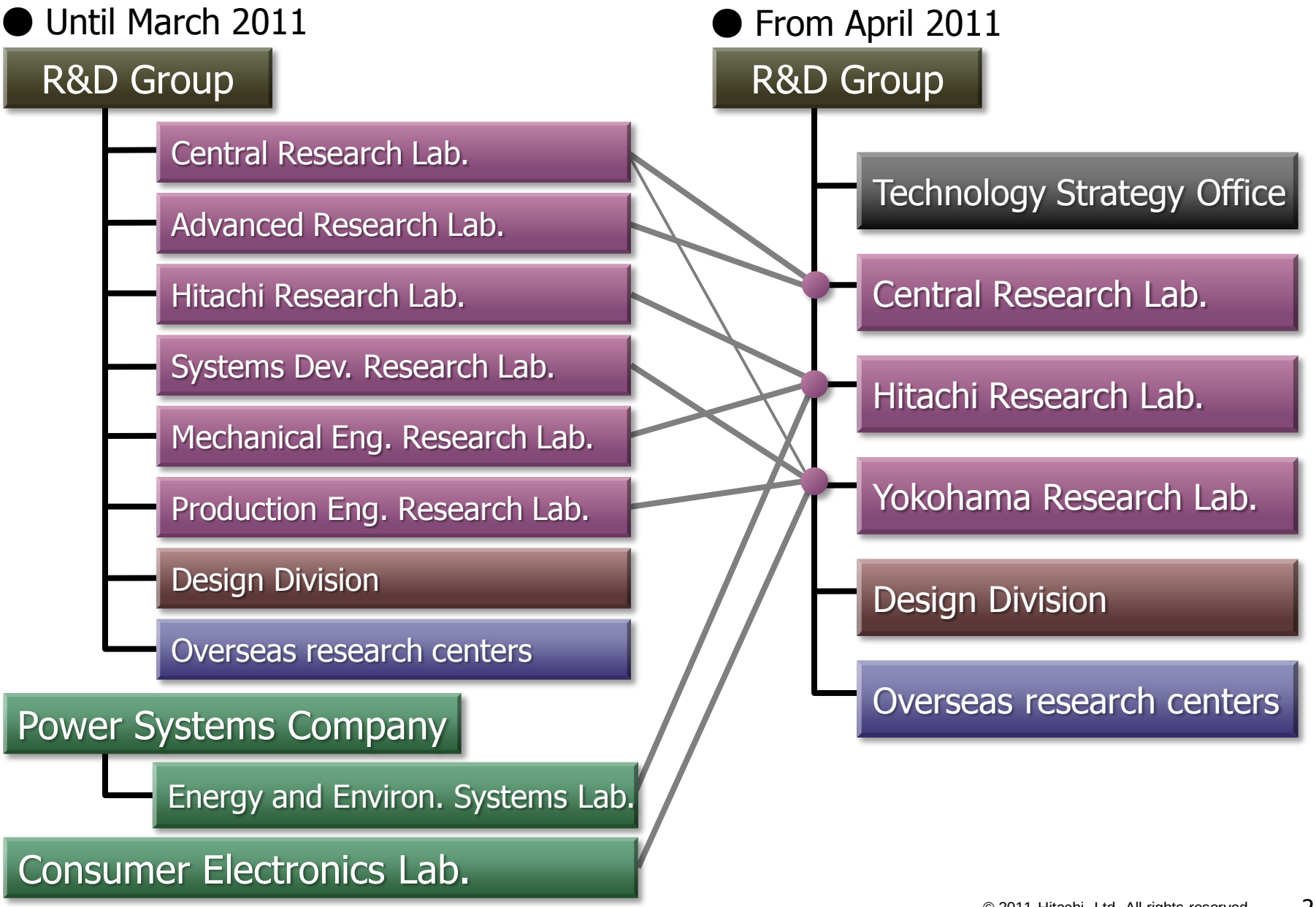
[Large volume information processing]
International Inst. of Information Technology
[Knowledge processing]
Indian Institute of Science
[Social infrastructure]
Indian Institute of Technology

HITACHI
Inspire the Next

Contents

3-1. New R&D organization

HITACHI
Inspire the Next



3-2. Aim of the new laboratories

HITACHI
Inspire the Next

Speed-up decision making & facilitate synergy

Central Research Laboratory	Promote fundamental to applied seamless R&D
Hitachi Research Laboratory	Enhance synergy through integration of social innovation
Yokohama Research Laboratory	Higher efficiency through convergence of IT research & Fusion of *Monozukuri*

3-3. Central Research Laboratory

HITACHI
Inspire the Next

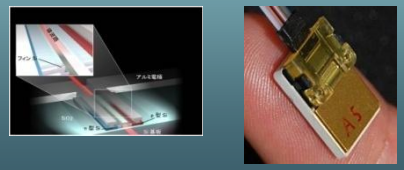
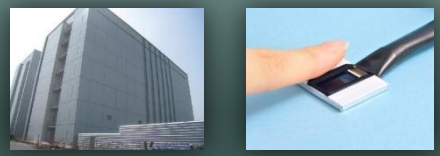
Promote fundamental to applied seamless R&D

Towards a world industry-leading CoE • Personnel: approx. 900

Mission

- Technology development contributing to the expansion of the social innovation business area
- Pioneering R&D of new areas based on future social needs

Applied

New power devices Green IT devices	Healthcare Fusion of diagnostics & therapy	Green IT systems Intelligent & Quantum info. processing
		

Seamless

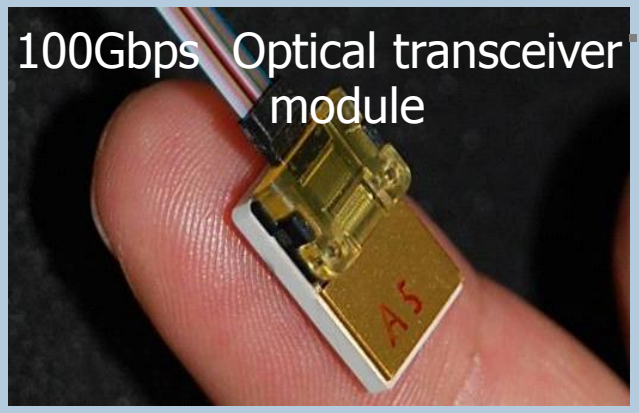
Basic

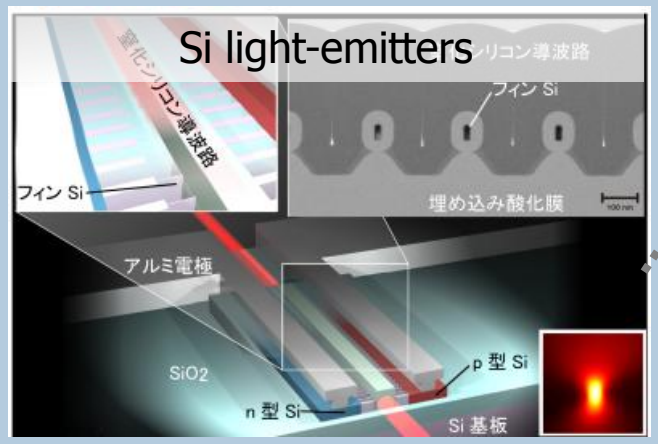
Nano science	Life Sciences	Computer Science

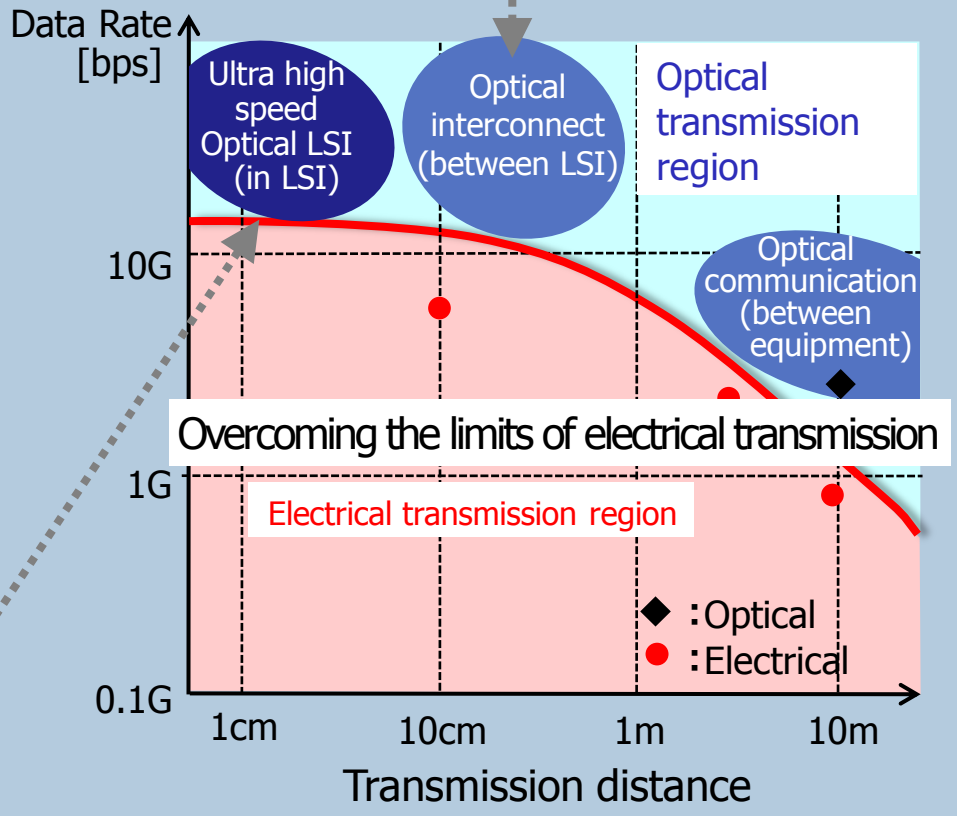
*CoE: Center of Excellence

Overcome the limits in communication equip. using innovative optical technology

Innovative optical transmission devices & modules*







*A part of this research was conducted as part of a project supported by NEDO.
A part of this research was supported by the Funding Program for World-leading Innovative R&D on Science and Technology administered by the Japan Society for the Promotion of Science.

3-5. Fusion of diagnostics & treatment

Fusion

HITACHI
Inspire the Next

Supporting the precise diagnosis of tumors and appropriate therapy systems

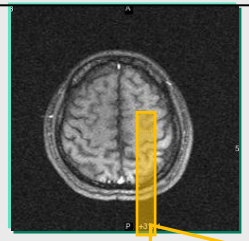
Diagnosis
Imaging, In vitro

Treatment
Radiation, Ultrasound

Open MRI

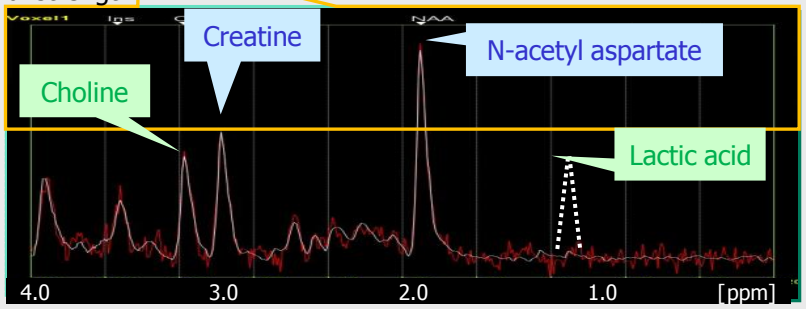
Metabolite analysis for tumor diagnosis using world's highest vertical magnetic field

Translational view of human head



Hitachi Medical Corporation

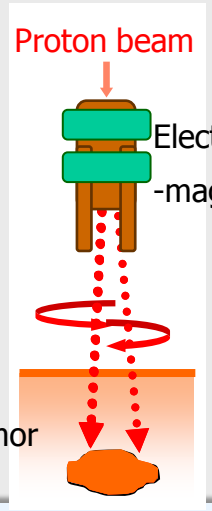
Signal strength



Metabolite spectrum
(Blue decreases with tumors, Green increases with tumors)

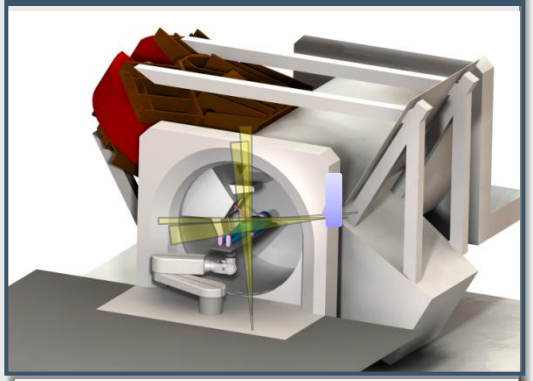
Proton beam cancer therapy

Spot scanning irradiation



Installed in the M. D. Anderson Cancer Center
(1st supply in a general hospital)

Moving tumor tracking



Combined with "Real-time moving tumor tracking" technology developed by Hokkaido University, and refined.

(Joint development with Prof. Shirato of Hokkaido Univ. under the FIRST program)

3-6. Green IT systems

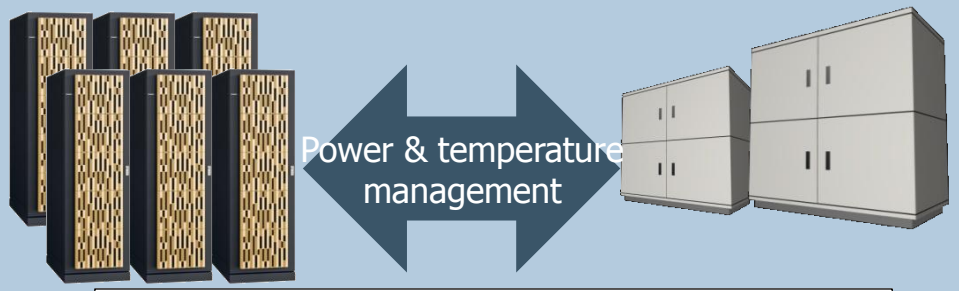
Environment conscious data centers drastically reducing power consumption

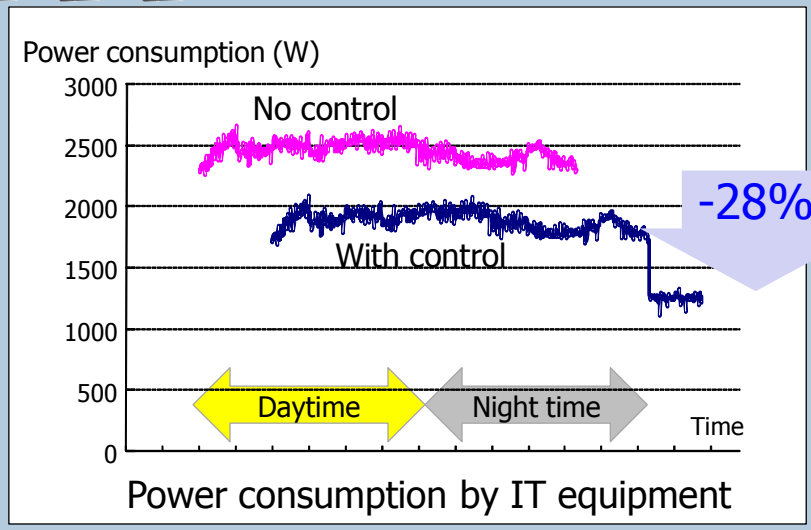
Technology for collaborative control of IT and facilities

■ "No. 3 Yokohama Center"
(Opened 21st July 2009)
Eco-friendly technology employed

Optimal IT load control

Optimal air-conditioner control





3-7. Hitachi Research Laboratory

HITACHI
Inspire the Next

Enhance synergy through integration of social innovation

Towards a globally top-class research center for social infrastructure

- Personnel: approx. 1,200

Mission

R&D to support social innovation business such as Social & Life infrastructures and underlying materials & key devices

3-8. Clean energy

Power generation technology for a prosperous and clean future

Gas turbines

<80MW-class (H-80)>
Largest capacity 2-shaft gas turbine*1

Thermal efficiency 38%*2

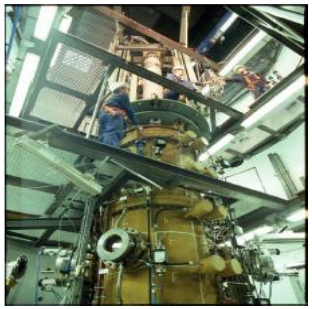
<Adv. humid air turbine>
3MW-class power generation systems

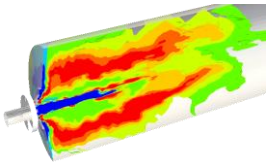
3MW-class pilot plant

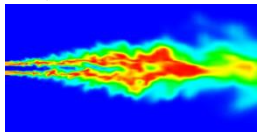
*1: Comparison of heavy duty types according to Hitachi survey as at 22nd Feb 2010
*2: Based on lower heating value

Coal-fired thermal power

<CO_2 capture>
Oxyfuel combustion*3 burner stability tests







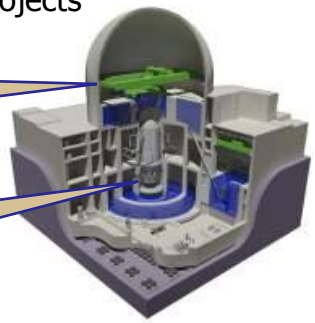
*3: Raising CO_2 concentration using pure oxygen instead of air for combustion making it easier to capture

Nuclear power generation

Pursuing next-generation nuclear reactor development under national projects

Best combination of active and passive safety systems

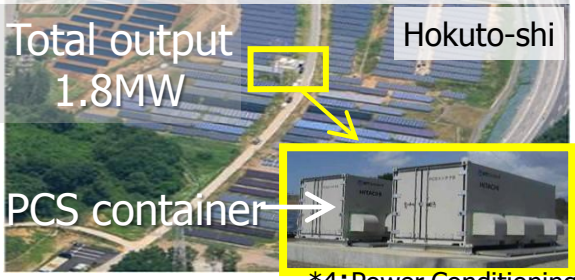
High performance reactor core



Solar power generation

Development of PCS*4 with grid stability function

NEDO Mega solar verification research

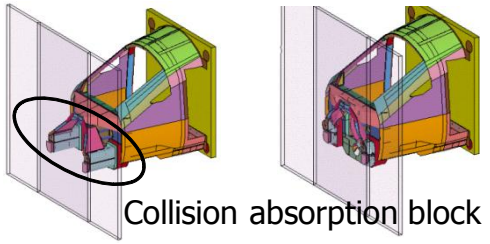


*4: Power Conditioning System

3-9. Green mobility

Expanding global rail business by combining total *MONOZUKURI* power

Analysis-led design



Collision absorption block

Supercomputer simulation

MONOZUKURI technology

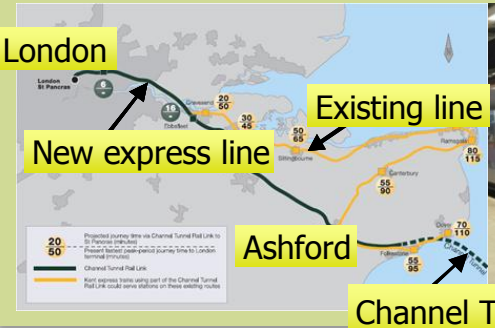
Friction Stir Welding (FSW)

Inverters & Batteries

Li-ion battery system

Rail maintenance

UK high speed express rail cars (Class 395)



Commenced operation December 2009

UK IEP (Intercity Express Programme)

Officially resume the negotiation of IEP (March 2011)

Image of rail car

3-10. Materials research

Environment

HITACHI
Inspire the Next

Lead business in high function materials through advanced materials research

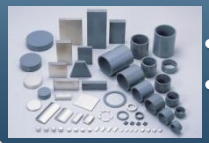
Rare earth metal free magnets

Cables with RF-ID

Rare earth metal free motors

Metals

<Environmental>
<Low power consuming>
materials



- Rare earth magnets
- Amorphous

Cables

<Power><Rail>
<Communication> materials

- Radiation-resistant cables for nuclear plants

Key devices

<Low power consuming>
equipment & devices

- Inverters
- High efficiency motors
- Power devices

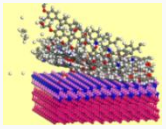
Batteries

<Eco-conscious vehicles>
<Rail>
key components

- Standard Li-ion batteries social & industrial applications

Materials Research

High thermal conductivity resin sheet



Material simulation

Insulating resin material for industrial equip.

Single crystal metal alloy rotar vane

High thermal conductive resin

Chemicals

<Environmental><Energy>
materials

- High thermal conductivity material
- Battery anode material

Low cost high capacity industrial Li-ion batteries

Rare-metal alternative lead-free glass

3-11. Simulation technology

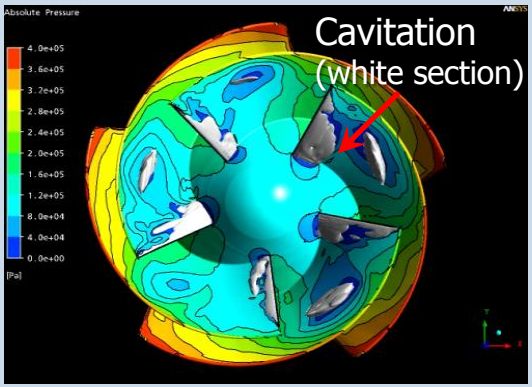
Fusion
Environment

HITACHI
Inspire the Next

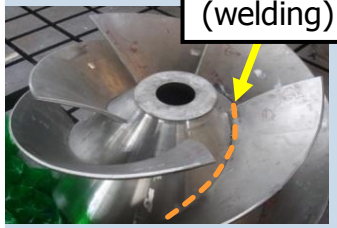
Raise product competitiveness by low costs, less design time & high performance

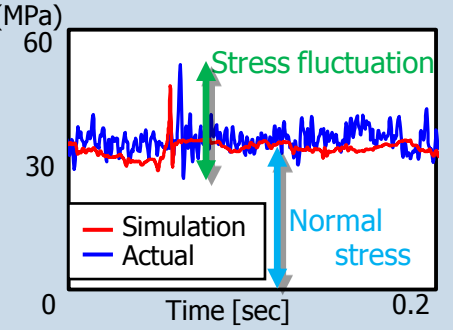
FY2011: Enhance supercomputers ⇒ enable prototype-less, entire system simulation

Large industrial pumps



Pressure distribution on pump impeller

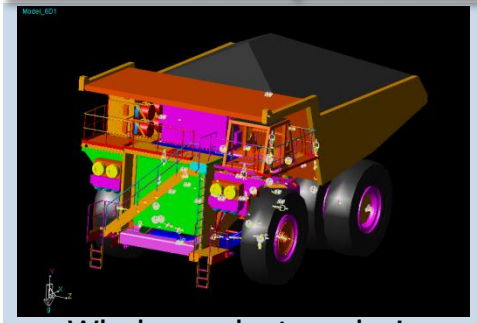




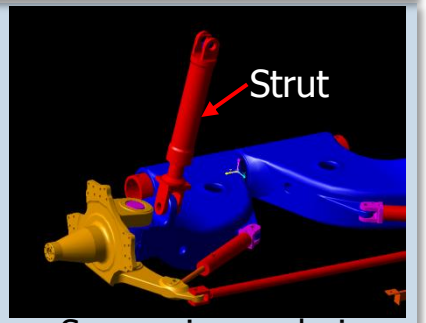
Stress on blade joint

Prediction of hydrodynamic force based on fluid analysis → reliability assured all steel welded pump

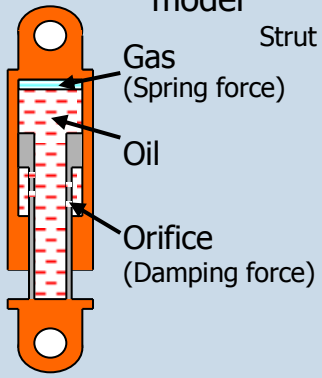
Dump trucks for mines



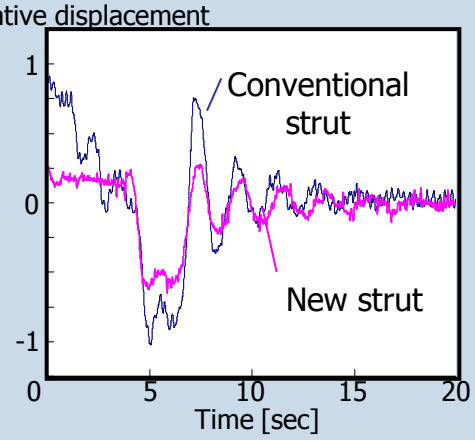
Whole product analysis model



Suspension analysis model



Strut internal structure



Highly accurate prediction of vehicle behavior under various conditions → Reducing carriage vibration by 50%, improving stability

3-12. Reducing environmental load

Environment

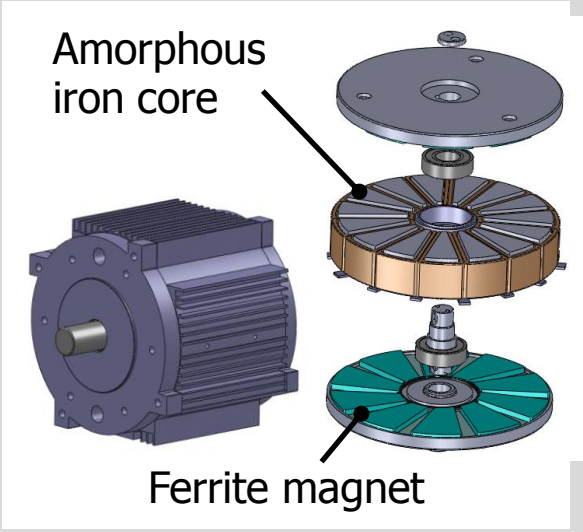
HITACHI
Inspire the Next

Promoting alternatives to rare metals through cutting-edge device, production technology and materials research

Rare earth metal-less motor

- Low-loss amorphous iron core + Ferrite magnet

  High-efficiency rare metal-less motor (3.7 kW)



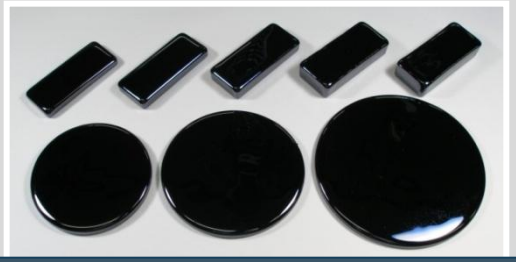
Recycling rare earth metal

- Dry-type low-environmental load recycling method
- Reclamation of rare earth metals (Neodymium (Nd), Dysprosium (Dy))

Purity ≥95%

Rare metal-alternative glass

- Eco-compliant low-melting point lead-free vanadium system glass (alternative for conventional bismuth)
- Sealed at 350~400°C



Vanadium: Plenty of deposit, Distribute number of producing countries

Main element	Reserve	Main producers
Vanadium	38M tons	South Africa, China, Russia
Bismuth	680k tons	China

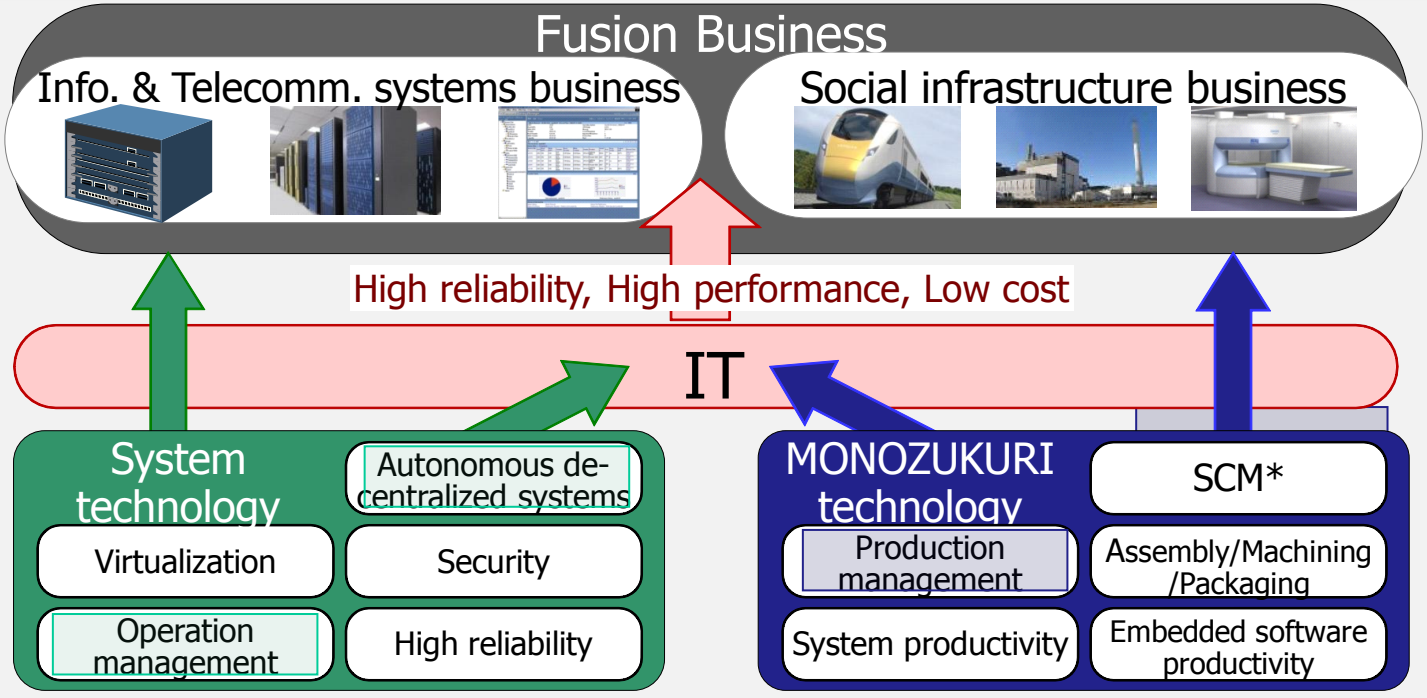
3-13. Yokohama Research Laboratory

HITACHI
Inspire the Next

Higher efficiency in IT research & fusion of *Monozukuri* through convergence

Towards a world-leading IT research center • Personnel: approx. 1,100

Mission System technology supporting IT & Infrastructure Fusion business and IT platform based *Monozukuri* technology



*SCM: Supply Chain Management

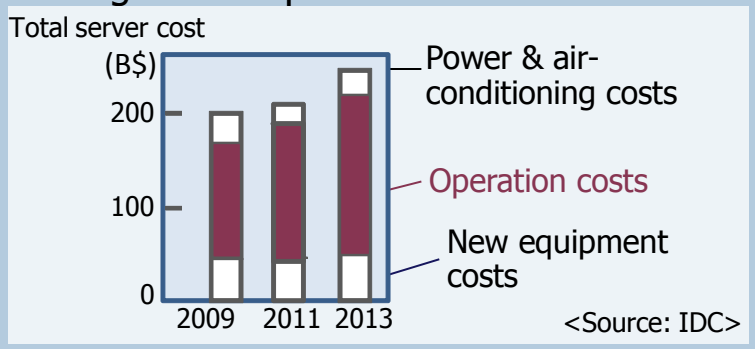
3-14. Data center operation management systems

HITACHI
Inspire the Next

Reducing data center operation costs by automatic IT resource allocation technology

Cloud-type data centers

[Background]
Increasing server operation costs

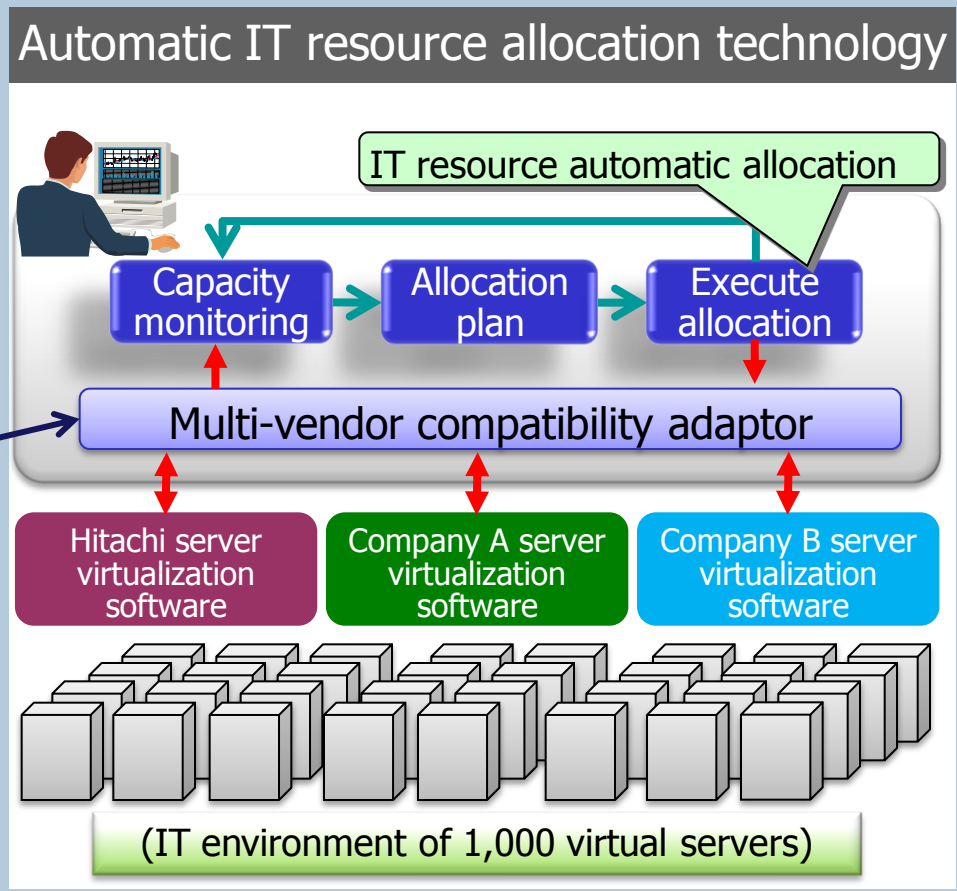


[Technology developed]

① Multi-vendor compatibility adaptor enabling administrators to operate different types of server virtualization software in unified way.
② IT resource automatic allocation technology

[Benefit]

No need to separately administer individual virtualization software
➔ reduce data center operation costs



3-15. Autonomous decentralized systems

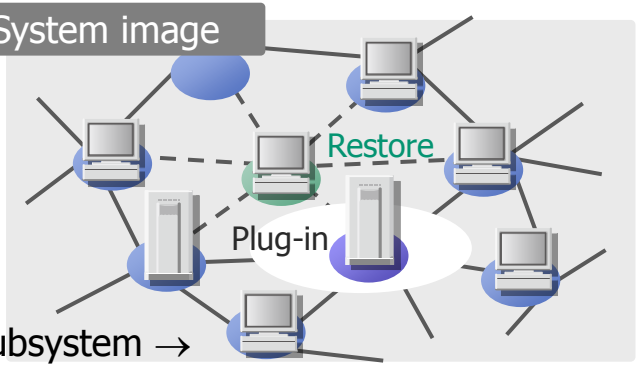
Smart grid application of autonomous decentralized systems technology from rail systems

Automated metering wireless network

Autonomous architecture

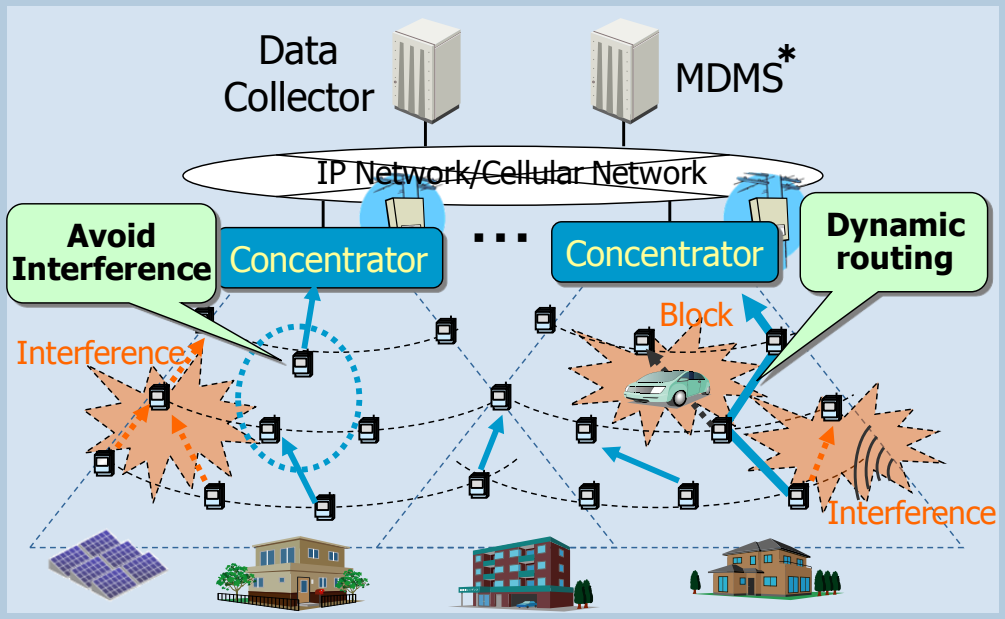
- Each subsystem can function autonomously
- Failure of an individual subsystem does not affect the entire system

System image



Experience accumulated with rail operation systems
(Transport management system applied to rail systems)

Highly reliable automatic reading & collection of groups of several thousands of meters every 30 minutes



*MDMS: Metering Data Management Systems

3-16. Low cost production technology

Wide application of cutting-edge production technology using IT for cost competitiveness

Production management

Production fluctuation simulation technology based on statistical analysis models

<Time between instructions:
reduced from 2hrs ⇒ 1 min>

③ Production fluctuation simulation

Production model

② Statistical analysis

Large-scale high-speed processing

④ Send-out optimal conditions by minutes

① Collect production results

Production line

Improve line operation efficiency

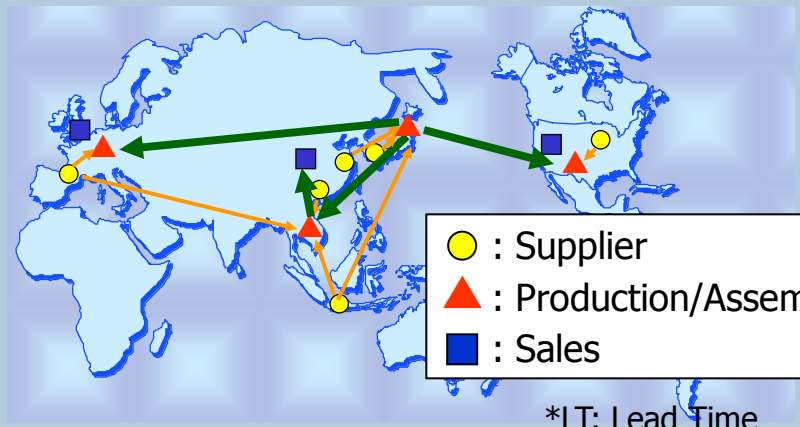
Construction equipment

Facility pipes

Global SCM

Multi-site multi-indices (cost, delivery date, supply LT*, etc.) production logistics model

<Recalculation time for change in plan:
reduced from several hours ⇒ few seconds>



*LT: Lead Time

Reduce number of days for inventory turnover

Disk array system

HITACHI
Inspire the Next

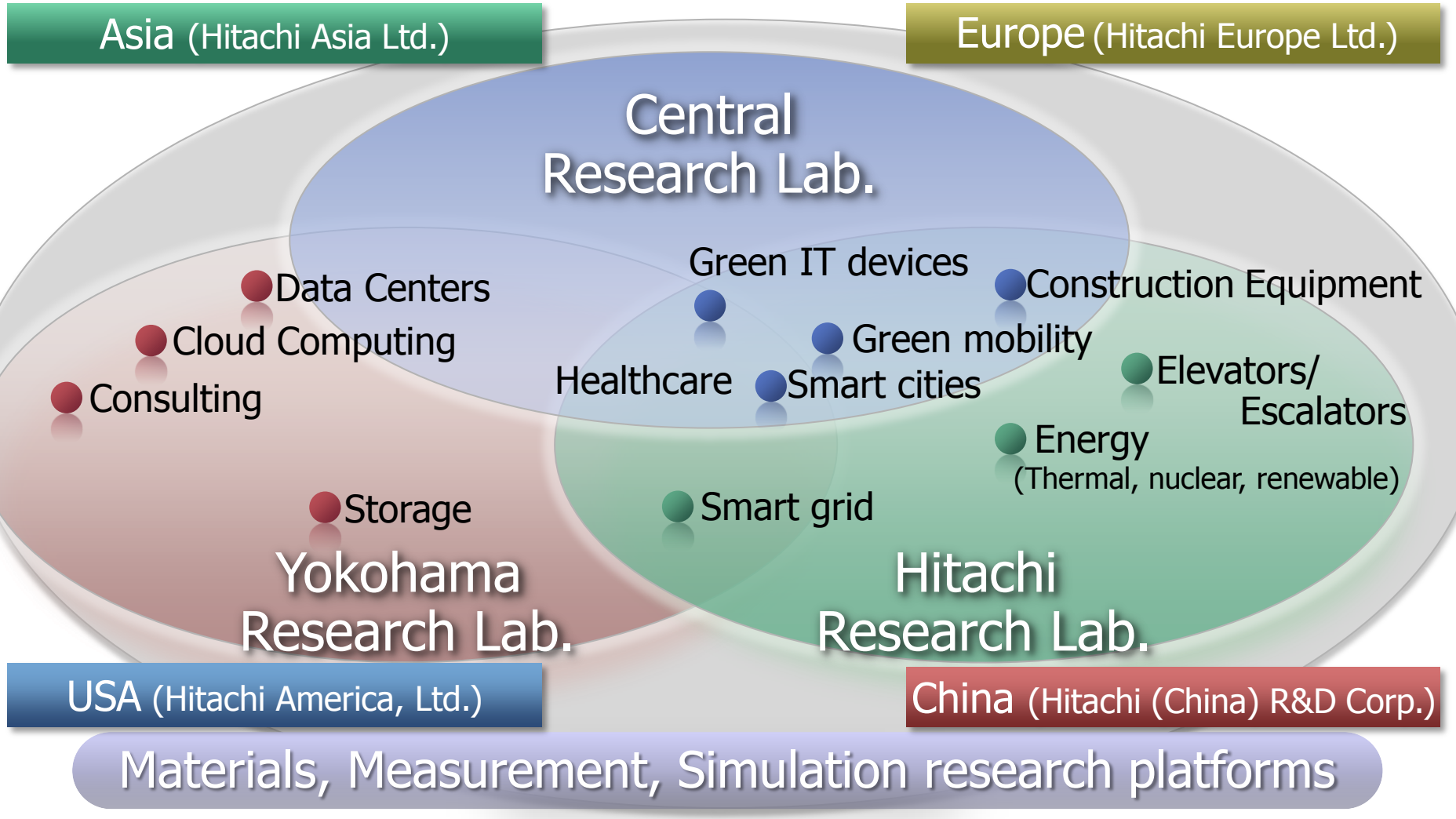
Contents

1. R&D strategy for new growth
2. Enhancing global R&D
3. Reorganization of domestic R&D
4. Summary

4. Summary

HITACHI
Inspire the Next

A new R&D structure for global growth in social innovation business




HITACHI
Inspire the Next