Long-Term Strategy on Climate Change

[Updated in November 2022]

Liaison Group of Japanese Electrical and Electronics Industries for Global Warming Prevention

1 Challenge of Carbon Neutrality

As a response to climate change, the movement toward carbon neutrality is accelerating in countries around the world under international frameworks such as the Paris Agreement. In Japan, the government has declared that it aims to achieve carbon neutrality by 2050 as well. As an ambitious goal consistent with carbon neutrality by 2050, the government has announced the aim to reduce its greenhouse gas (GHG) emissions by 46% in FY2030 from its FY2013 levels, and will continue to take on the challenge of achieving the 50% target.

Keidanren has also changed the name of its voluntary industrial reduction activities to the Keidanren Carbon Neutrality Action Plan in order to promote public-private cooperation to achieve the government's ambitious targets. These government goals and Keidanren's action plan focus on contributing to the reduction of GHG emissions in Japan, and are centered on reducing emissions in domestic business activities. In response to this, electrical and electronics industries have also formulated the following Phase II targets for domestic business sites under the Carbon Neutrality Action Plan.

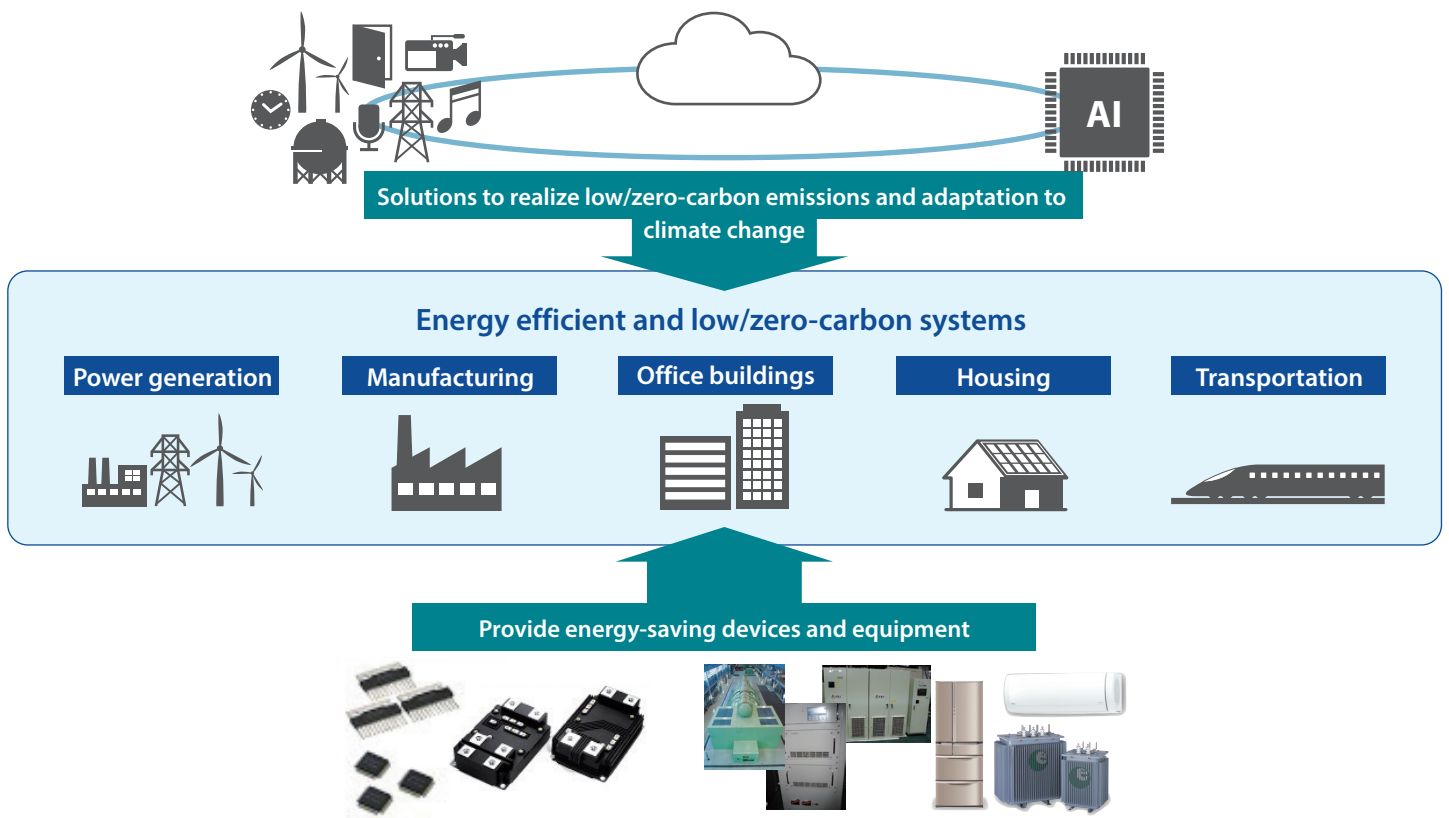## Japanese Electrical and Electronics Industries "Carbon Neutrality Action Plan," Phase II

Production processes at domestic business sites (Scope 1 and 2) [FY2030 target]

● **Energy conservation and energy efficiency improvement (commitment): Improve energy intensity by an average of 1% per year (9.56% improvement compared to FY2020)**
● **Energy-derived CO_2 emissions reduction (challenge): 46% reduction compared to FY2013**

To achieve the targets, continue with steady energy-saving and efficiency measures and promote the voluntary use of renewable energy

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In addition, the movement to promote the decarbonization of the entire value chains related to corporate activities is expanding on a global scale. Since the electrical and electronics (EE) industries provide products and services in all fields—from industry, business, households, and transportation to energy conversion (power generation) both in Japan and overseas—we have established the following basic policy for the entire global value chain in which we are involved.

Our current initiatives for an energy efficient and low/zero-carbon society

Solutions to realize low/zero-carbon emissions and adaptation to climate change

Energy efficient and low/zero-carbon systems

| Power generation | Manufacturing | Office buildings | Housing | Transportation |

Provide energy-saving devices and equipment

2 Basic Policy

This Long-term Strategy is formulated as a "Vision for the Future" and "activities to be tackled (challenged)" in the EE industries, and as a "guidepost" for companies in the industries in their planning of long-term goals.

> We aim to achieve carbon neutrality in terms of GHG emissions in the entire value chain of the EE industries by 2050 on a global scale. Specifically, we will implement the following initiatives:
>
> **(1) Reduce emissions of Scope 1+2* to the maximum extent possible by saving energy and using renewable energy**
> **(2) For Scope 3*, strive to reduce emissions as much as possible through co-creation with stakeholders in the value chain and technological development/innovation**
> **(3) Use various methods, including carbon removal, to offset residual emissions**
> **(4) In addition to the above, we will contribute significantly to the decarbonization of all sectors of society**
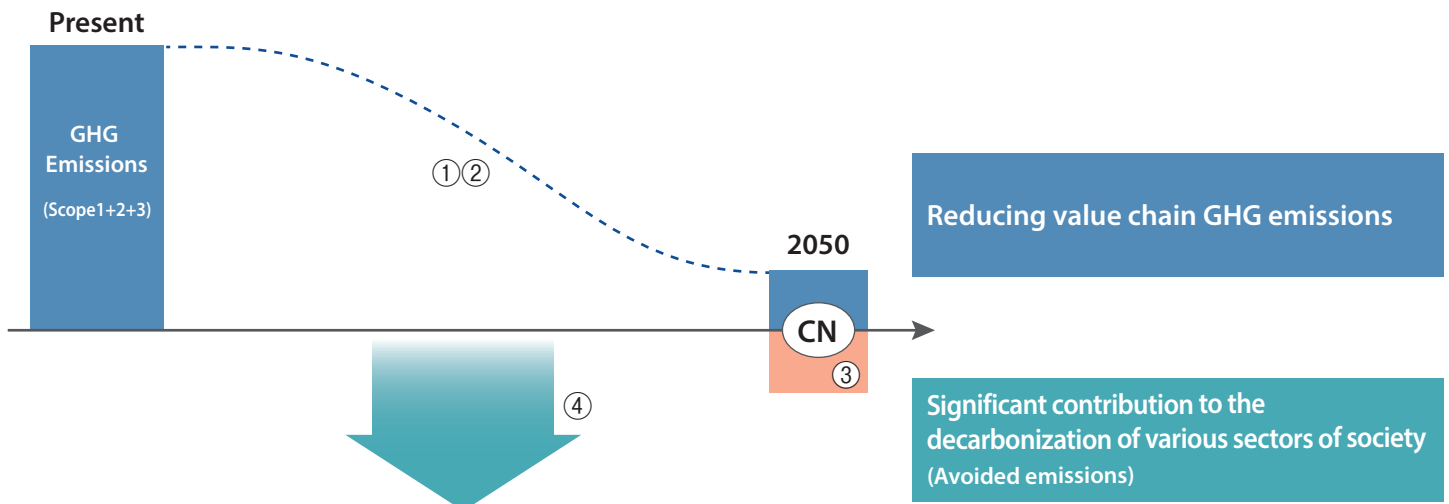
* Scope 1: Direct GHG emissions occur from sources that are owned or controlled by the company, for example, emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc.; emissions from chemical production in owned or controlled process equipment.

Scope 2: Scope 2 accounts for GHG emissions from the generation of purchased electricity, steam, or heating/cooling (referred to here collectively as "electricity") consumed by the company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organizational boundary of the company. Scope 2 emissions physically occur at the facility where electricity is generated.

Scope 3: Scope 3 is an optional reporting category that allows for the treatment of all other indirect emissions. Scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company. Some examples of Scope 3 activities are extraction and production of purchased materials; transportation of purchased fuels; and use of sold products and services.

Category 1: purchased goods and services; Category 11: use of sold products, etc.

Source: The Greenhouse Gas Protocol (A Corporate Accounting and Reporting Standard)

Present

GHG Emissions (Scope1+2+3)

①②

2050

CN

③

④

Reducing value chain GHG emissions

Significant contribution to the decarbonization of various sectors of society (Avoided emissions)

3 Characteristics of the EE Industries and the Path to the Vision for the Future

Looking at GHGs across the industries' value chain, Scope 3 accounts for most of the emissions with the proportion of emissions from the use of products and services being particularly large. For this reason, as part of our efforts we will focus on reducing GHG emissions from the use of products and services, in addition to lowering carbon emissions from production processes that fall under Scope 1 and 2. Furthermore, we will expand our value chain and make significant contributions to reducing GHG emissions in each sector of society.

Specifically, we will focus on the following initiatives:

- As purchased electricity (Scope 2) accounts for more than 80% of the total emissions of Scope 1 and 2 combined, we will make great efforts to reduce power consumption (energy conservation) and then expand the voluntary use of renewable energy through in-house power generation, the use of PPAs, and the purchase of certificates. In addition, we will strive to convert energy used in processes requiring heat from non-electricity energy to electricity as much as possible.
- For Category 11 of Scope 3 (use of sold products and services), we will continue to work for thorough energy efficiency, create products and services that lead to energy conservation, and promote their use by customers.
- For Category 1 of Scope 3 (upstream of the product and service supply chain), we will promote low/zero-carbon initiatives in cooperation with the supply chain and work on collaborative measures, such as the development and use of low-emission parts and materials.
- For the emissions remaining in 2050, we will strive to remove an equivalent amount of CO_2 through forest absorption, various technologies for CO_2 collection, storage, and removal, and the use of credit schemes.
- We will promote the development of innovative technologies and the creation of innovative ideas, provide the market with a variety of environmentally conscious products (components), services and solutions that contribute to the mitigation of GHG emissions and climate change adaptation. In this way, we will make a significant contribution to achieving low/zero-carbon society in each sector of society (avoided emissions).

Business activities and global GHG emissions (CO_2e) of the EE industries

Estimated emissions in 2020: Approx. 1.16 billion t-CO_2e

Major companies and groups participating in the EE industries' Carbon Neutrality Action Plan [40 groups and companies]
(Aggregated based on public data for CDP Climate Change 2021 Scope 1, 2 and 3.)

Note: In addition to APS, which sets the temperature rise to 2.1°C in 2100, the IEA also published SDS and NZE scenarios that are expected to significantly reduce CO_2 emissions by 2050 by backcasting from less than 2°C and 1.5°C, respectively.
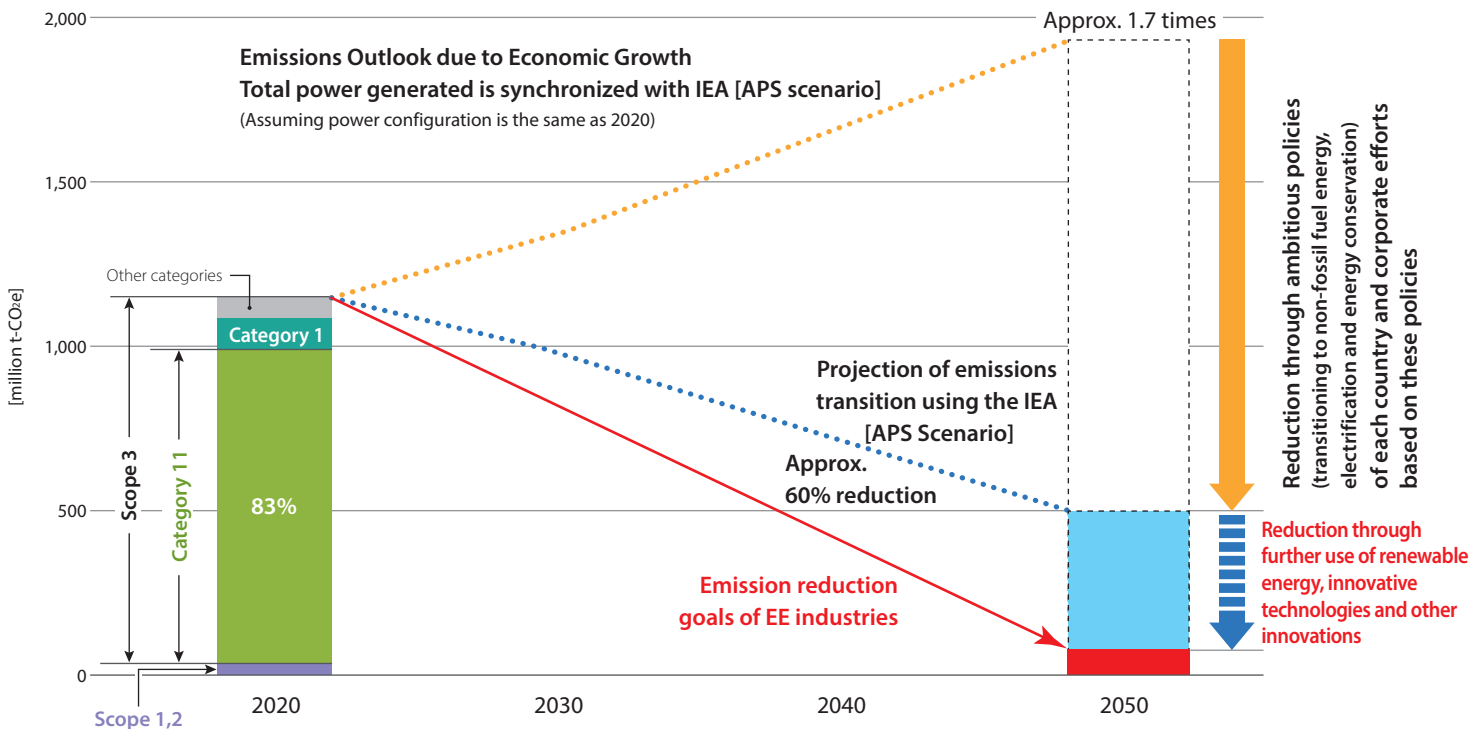
IEA APS (IEA's Announced Pledges Scenario): Reflects ambitious targets declared by like-minded countries (2.1°C temperature rise in 2100)
Source: International Energy Agency (IEA): World Energy Outlook 2021 (WEO 2021)

To work further towards carbon neutrality, in addition to the above-mentioned emission reductions, we will offset residual emissions and make a significant contribution to reduce emissions in each sector of society (avoided emissions) while transitioning.

4 Sector-Specific Initiatives and Technologies

The following presents ongoing development and reviews in the fields of energy and power infrastructure systems, equipment and devices, and solutions to achieve our Vision for the Future.

Energy and Power Infrastructure Systems

Vision for the Future
- Decarbonize power generation while securing S+3E* and improving resilience
- Enable advanced and stable operation, and the mass introduction of renewable energy using next-gen storage cell technologies

*A basic concept in Japan's energy policy is achieving energy security and economic efficiency with safety a top priority, while also making maximum efforts toward environment suitability.

Technologies
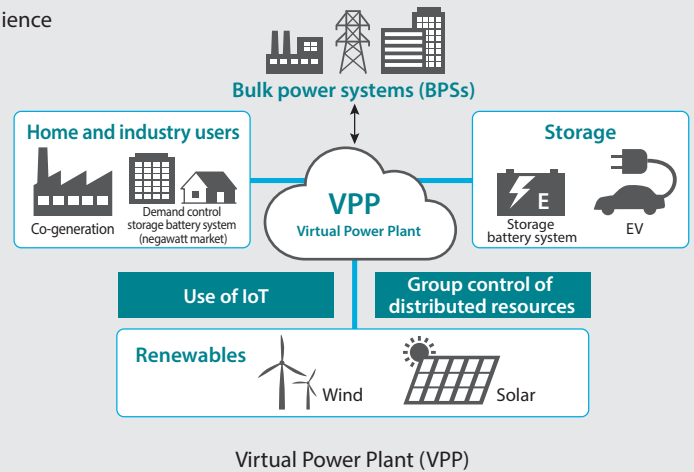
Decarbonize power grids and improve system flexibility
- ▶ Technologies for renewable-energy power generation (solar, wind, geothermal, small and medium-sized hydropower, etc.)
- ▶ Distributed energy resources (DERs) + next-gen storage batteries
- ▶ Smart grids and virtual power plants (VPP)
- ▶ Superconductivity and HVDC transmission technologies

Carbon sequestration and storage technologies
- ▶ CCUS (CCS, BECCS, etc.)

Carbon-free hydrogen technologies
- ▶ Hydrogen production using electrolysis and pure hydrogen fuel cell generators

Bulk power systems (BPSs)

Home and industry users — Co-generation / Demand control storage battery system (negawatt market)

VPP Virtual Power Plant

Storage — Storage battery system / EV

Use of IoT

Group control of distributed resources

Renewables — Wind / Solar

Virtual Power Plant (VPP)

Equipment and Devices

Vision for the Future
- Achieve ultimate energy conservation of the entire systems
- Source electricity from renewables wherever possible and promote higher efficiency manufacturing processes

Technologies

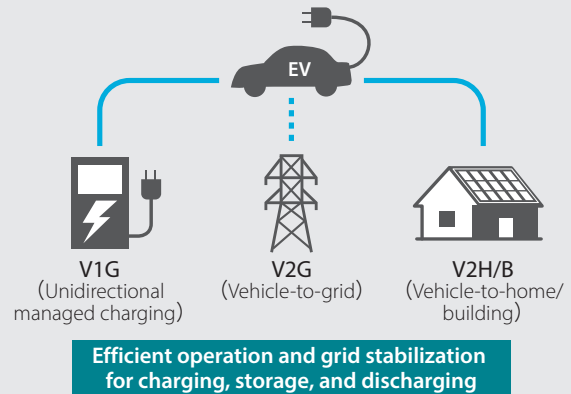Next-gen communication systems and related technologies
- ▶ 5G/Beyond 5G, M2M modules, LPWA chips, etc.

Sensing/monitoring traceability
- ▶ Sensors and image processing systems

Next-gen mobility systems
- ▶ Power semiconductors
- ▶ Next-gen charging systems
  (Quick charging, xEV wireless feeding systems and modules)

EV

V1G (Unidirectional managed charging)

V2G (Vehicle-to-grid)

V2H/B (Vehicle-to-home/ building)

Efficient operation and grid stabilization for charging, storage, and discharging

V2X charging technology

Solutions

Vision for the Future
- Roll out solutions for reducing GHG emissions in society fully utilizing technology such as IoT, AI, and cloud computing
- Dramatically improve adaptability to climate-related disasters

Technologies

IoT/AI and digital twin
- ▶ AR/VR,CAE simulation
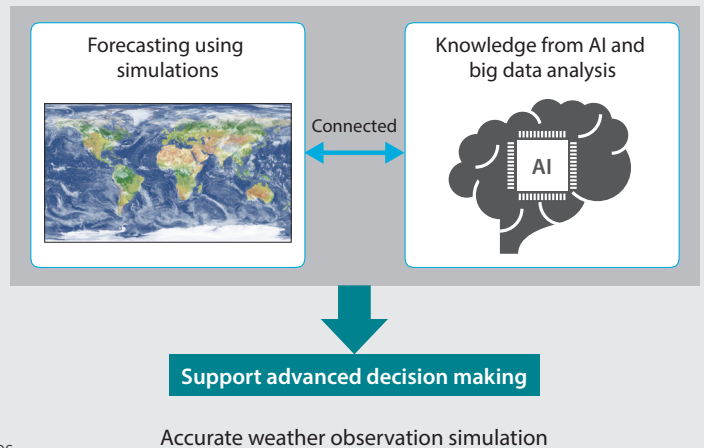
Mobility revolution
- ▶ Autonomous driving systems
- ▶ Car sharing, on-demand transportation systems

Advanced supply chains using DX
- ▶ Smart factories using visualization and connectivity
- ▶ On-demand manufacturing and logistics systems

Adaptation to climate change
- ▶ Accurate weather observation and flood forecast simulation technologies

Forecasting using simulations — Connected — Knowledge from AI and big data analysis (AI)

Support advanced decision making

Accurate weather observation simulation

The following presents the many technologies and initiatives of our industries helping to solve social issues.

Technologies that contribute to GHG emissions control and reduction

Sector in society	Social issues related to the EE industries	Technologies to reduce GHG emissions			
		IoT/AI solutions		Efficient technologies, facilities, and equipment	Supporting devices
		Cross-sectoral technologies	Sector- and area-specific		
Green power supply — Energy conversion	Decarbonized power generation	IoT/AI; digital twin (AR/VR, CAE simulation); 5G/Beyond-5G network systems / Distribution/wide-area connection; remote control	Smart grids; advanced EMS for grid power; technology for interconnecting DERs with grids; VPP	Renewables; distributed zero-emissions power generation facilities; nuclear/hydrogen power generation; use of carbon-free hydrogen; pure hydrogen fuel cell generators	Magnets for wind power; reactors for power conditioners; power semiconductors; electricity storage batteries; large capacitance capacitors (converters/inverters); MV/LVDC
	High efficiency power generation facilities (decarbonization of thermal power facilities, etc.)			(Hydrogen-ammonia co-firing) Supercritical thermal power generation facilities + CCS/CCUS	
	Enhancement and stabilization of power transmission and distribution systems			Superconductive and HVDC transmission technologies	
Sophisticating power demand — Industry (supply chains)	Energy efficient heavy electrical and industrial equipment	Automatic/optimal control and authentication, sensing/monitoring	Demand controller; M2M	High efficiency motors, converters, heat pumps, etc.; Solid State Luminaires (SSL); pure hydrogen fuel cell generators; stationary storage batteries; industrial robots; high-efficiency cooling (liquid immersion server, water-cooled 5G); innovative optical and wireless network (IOWN); DC conversion	Power semiconductors; inverters; sensors; communication/camera modules; RF-ID; non-contact power supply units
	Product automation; high efficiency and optimization of manufacturing		FEMS (energy demand forecasting system)		
Consumer	Comfortable and efficient living		HEMS	Smart home appliances; SSL lighting (Connected Smart Lighting [CSL]); home storage battery systems	
Businesses	ZEB office buildings		BEMS; service solutions (VR/teleworking systems, Standard Operating Procedures (SOP)/ Master Production Schedule (MPS))	Perovskite solar cells; high efficiency heat pumps/air conditioning; SSL lighting (CSL); pure hydrogen fuel cell generators; communication/office equipment for next-gen network	
	New work styles				
Transportation/ logistics (mobility)	Decarbonization of transportation methods		Smart mobility (Automatic Vehicle Monitoring System (AVM) /automatic dispatch/route instruction systems)	EVs; fuel cell vehicles (batteries); V2X; logistics efficiency (eco-driving support)	Power semiconductors; onboard chargers; converters/inverters; high-capacity batteries/next-gen storage batteries; advanced EV motors; sensors; communication/camera modules
	Optimal control of traffic flow		Smart logistics; on-demand distribution systems; accurate satellite positioning systems	Security systems for connected cars	
	Sustainable society and community development [resilience and adaptation]		Accurate weather observation; flood forecast simulation technologies; smart city; i-Construction (IoT implementation in the community)	Robots for infrastructure inspection and disaster relief; UPS/emergency power generators	Large capacity batteries; advanced storage batteries; sensors; communications/camera modules

5 Closing

In order to realize the global carbon neutrality goals of the international community, the electrical and electronics industries, which are involved in producing and using electricity and have connections with various businesses and customers, will promote the following initiatives with the aim of greening the value chain.

● From the three perspectives of Technology, Co-creation, and Resilience, we will solve social issues related to climate change and energy constraints through the diverse business fields of member companies.

Technology
● Develop and provide efficient technologies for reducing GHG emissions throughout the lifecycle of goods and services
● Help reduce GHG emissions of each sector using various technologies developed by EE industries
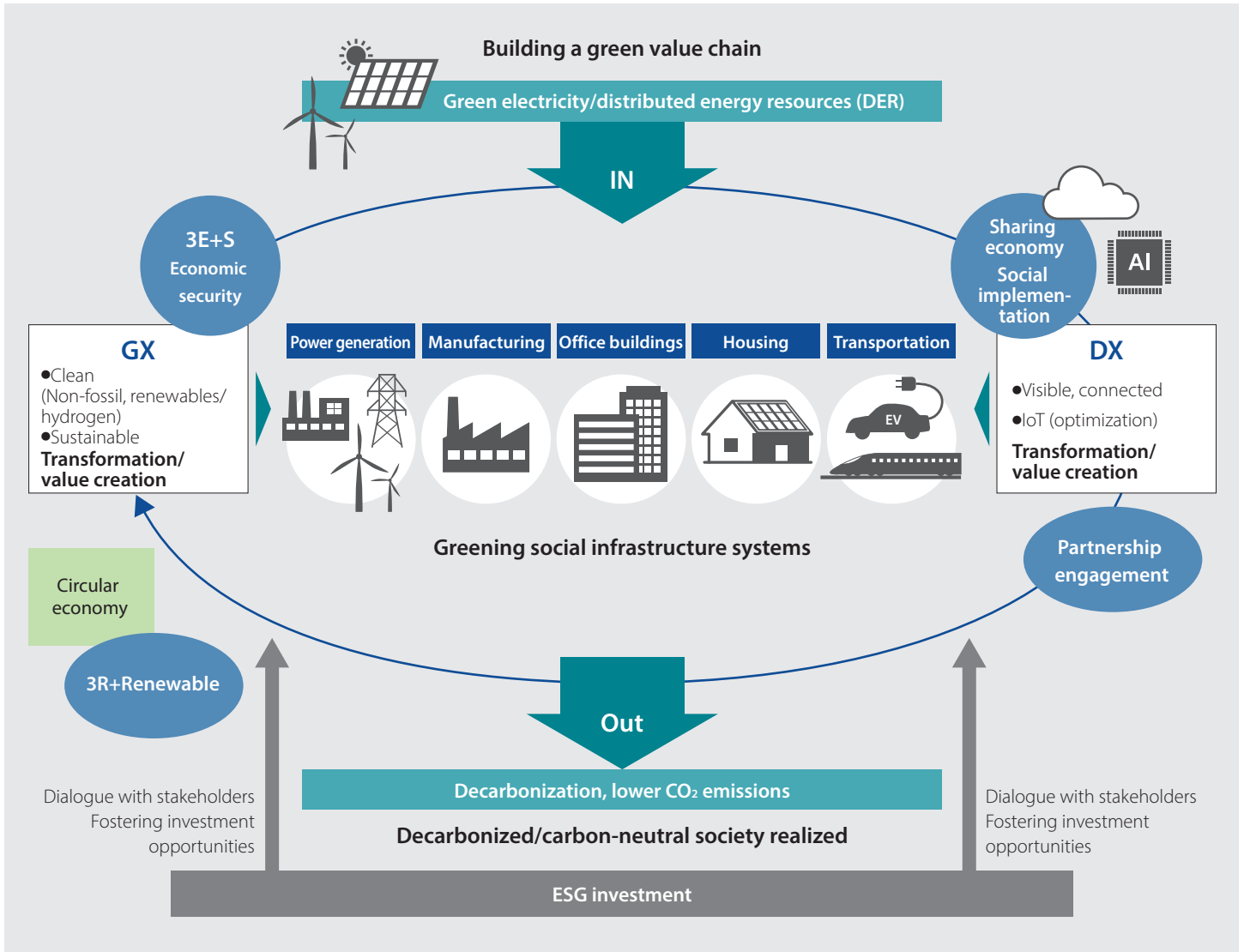
Co-creation
● Establish comfortable, high efficiency next-gen mobility systems with the auto, public transit, and logistics industries
● Integrate distributed energy resources and BPS with power producers and users

Resilience
● Build resilient and economical social infrastructure systems for transportation, communications, and power globally
● Contribute to the international community's adaptation by providing weather forecasting systems for disaster risk reduction

- In response to the policy expectations regarding the supply and demand of green electricity, we will collaborate and cooperate with the government and the electric power industry, and undertake early development of innovative technologies. In this way, we will provide solutions, using digital transformation (DX) to redesign the optimization of "connections" between people and goods and the innovation of "sustainability."
- Through dialogue with investment institutions and other stakeholders, we will respond to their trust and collaborate and cooperate to accelerate sustainable businesses and expand investment in the development of products and solutions.

Innovation for the realization of a sustainable society and green value chain (GX/DX)

Building a green value chain

Green electricity/distributed energy resources (DER)

IN

3E+S Economic security

Sharing economy Social implementation

AI

GX
- Clean (Non-fossil, renewables/hydrogen)
- Sustainable

Transformation/value creation

Power generation	Manufacturing	Office buildings	Housing	Transportation

EV

Greening social infrastructure systems

DX
- Visible, connected
- IoT (optimization)

Transformation/value creation

Circular economy

3R+Renewable

Partnership engagement

Out

Dialogue with stakeholders Fostering investment opportunities

Decarbonization, lower CO_2 emissions

Decarbonized/carbon-neutral society realized

Dialogue with stakeholders Fostering investment opportunities

ESG investment

Furthermore, as we face issues in addition to climate change, such as new infectious diseases and resource constraints, the businesses and technologies of EE industries will contribute to transition to a "circular economy" society through co-creation with each business partner. At the same time, we will strive to build a robust and sustainable supply chain and achieve both environmental and economic growth.

In addition to addressing environmental issues, we will also promote initiatives to achieve the 17 goals of the United Nations Sustainable Development Goals (SDGs) to solve various social issues.

Liaison Group of Japanese Electrical and Electronics Industries for Global Warming Prevention

**The Liaison Group of Japanese Electrical and Electronics Industries for Global Warming Prevention
is supporting industry-wide initiatives to prevent global warming,
including the formulation of the Carbon Neutrality Action Plan.**

**Detailed activities are available on our websites.
https://www.denki-denshi.jp/**

Japan Electrical Manufacturers' Association
https://www.jema-net.or.jp/English/

**Association for
Electric Home Appliances**

**Japan Electronics and
Information Technology Industries Association**
https://www.jeita.or.jp/english/

**Japan Photovoltaic Energy
Association**

**Communications and
Information Network Association of Japan**
https://www.ciaj.or.jp/en/

Battery Association of Japan

**Japan Business Machine and
Information System Industries Association**
https://www.jbmia.or.jp/english/index.php

**Japan Refrigeration and
Air Conditioning Industry Association**

Japan Lighting Manufacturers Association
https://www.jlma.or.jp/en/index.html