

Japanese Electrical and Electronics Industries

Long-Term Strategy on Climate Change



1 Social Issues

The UN Sustainable Development Goals advocate 17 goals to address social issues covering the environment, health, poverty and hunger. Among them, environmental issues have an impact on the planet's climate, resources, and ecosystems. Efforts are now underway internationally to address climate change, create circular economies, and prevent marine plastics. These efforts place growing expectations on Japan's electrical and electronics industries (EE industries).

Focus on SDGs and environmental initiatives

- Reduce energy constraints and achieve decarbonization to address climate change
- Ease resource constraints and create a circular economy
- Co-exist with nature and maintain biodiversity enabling the sustainable use of ecosystems

Among these, we recognize that **reduce energy constraints and achieve decarbonization to address climate change** represents the focal point of our initiatives given our involvement with electricity.

2 Characteristics of EE Industries

We engage in a broad range of business activities. In the process, we supply high quality, reliable and functional technologies, goods and services to various sectors in global markets. Furthermore, we contribute to a sustainable society by improving quality of life through the digitalization of the value chain and subsequent innovations powered by advanced IT connecting all industries and customers.

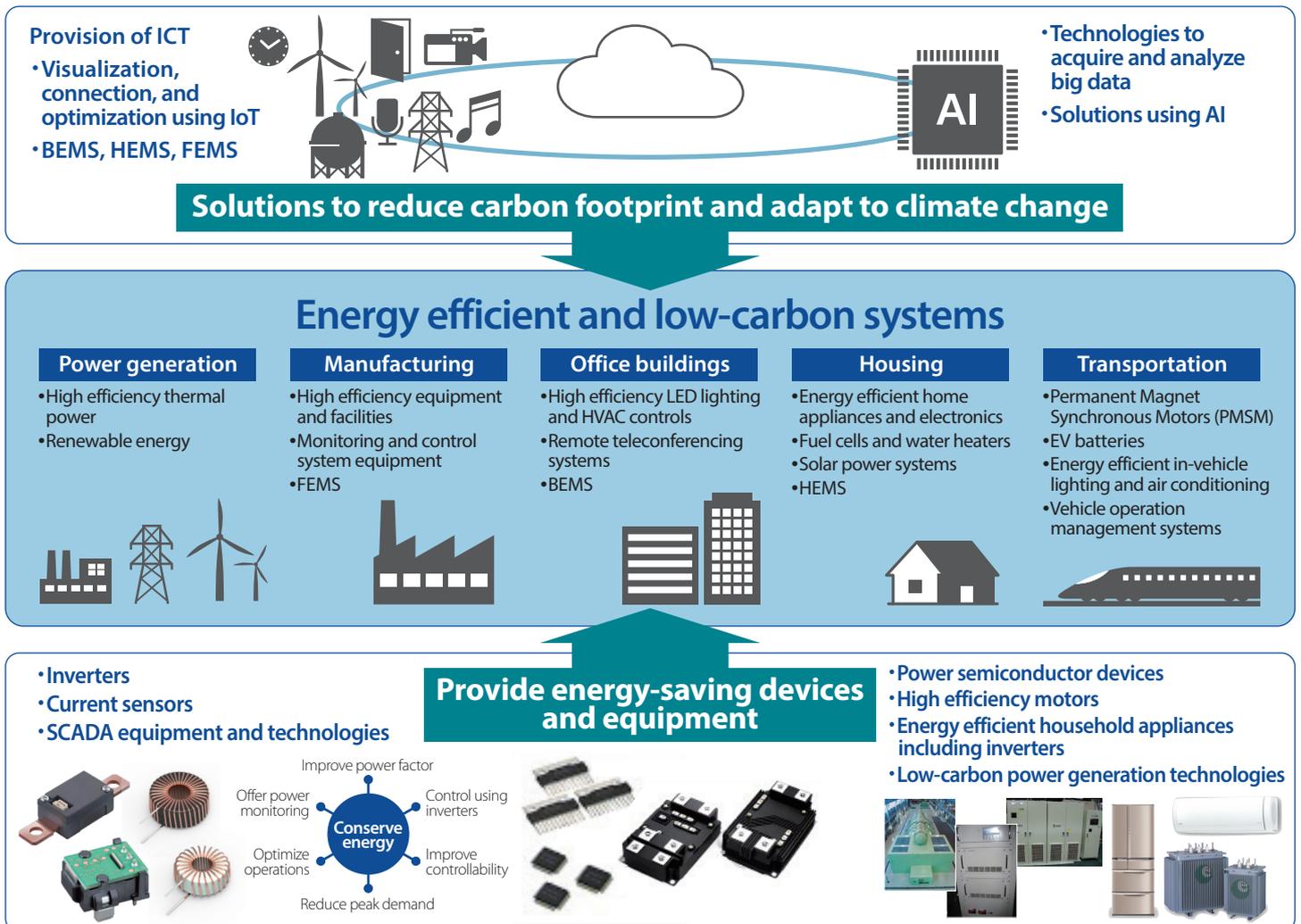


Figure 1: Our current initiatives for an energy efficient and low-carbon society

Business activities and GHG emissions of EE industries

Nearly all GHG emissions across the entire value chain of EE industries are Scope3*. Figure 2 indicates that **the percentage of emissions from the use of goods and services account for an extremely large share.**

The GHG Protocol Corporate Accounting and Reporting Standard defines emissions as Scope 1, Scope 2*, and Scope 3*. The standards define calculation and reporting methods for each of the 15 categories under Scope 3, including Category 1* and Category 11*.

*Scope 1: direct emissions from one's own business sites and plants, etc.

Scope 2: indirect emissions associated with energy consumption including purchased electricity

Scope 3: indirect emissions in the value chain

Category 1: emissions of purchased goods and services

Category 11: emissions from the use of goods and services

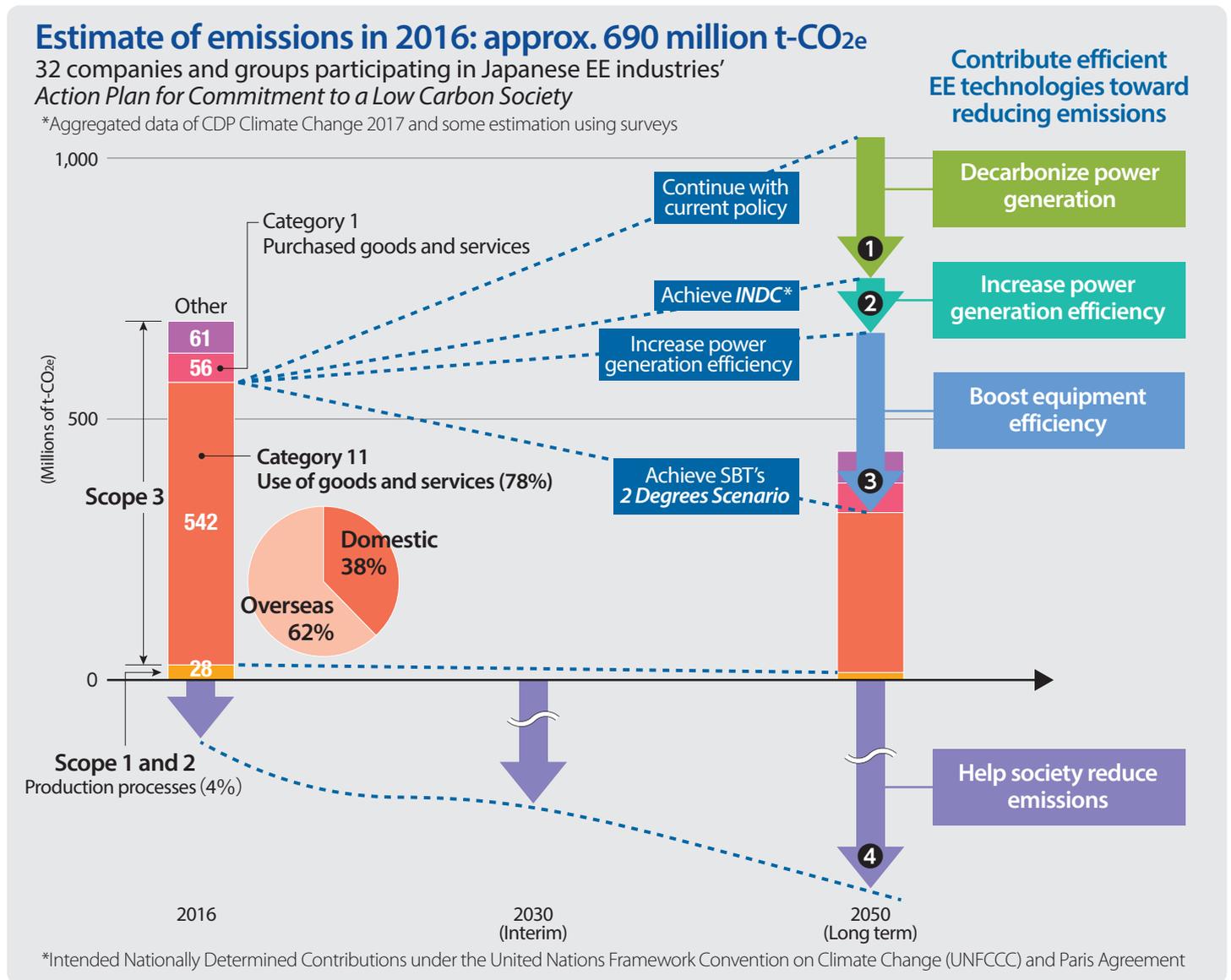


Figure 2: Our GHG emissions in the global value chain: present vs. future

*Emissions in 2050 based on GHG reduction rate of SBT's 2 Degrees Scenario, focused on use of goods and services in scope 3. Emissions from Achieve INDC and Increase power generation efficiency are calculated referencing the IEA's *World Energy Outlook 2017*, *Energy Technology Perspectives 2017*, etc.

Based on this, we should focus on **helping to reduce GHG emissions during the use of goods and services** leveraging our supply-demand-driven technologies. Therefore, the following four areas are critical to our industry.

- ① Achieve decarbonizing the power generation by expanding renewables
- ② Increase efficiency of power generation systems and support the switch to renewables
- ③ Boost efficiency of equipment
- ④ Help reduce GHG emissions from society in general

See the four arrows for reducing emissions in Figure 2 at right

Based on the above, Japan's EE industries have formulated the following **Long-Term Strategy on Climate Change**, centered around the **Basic Policy** and **Vision for the Future**.

3 Our Long-Term Strategy

1. Basic Policy

- Control GHG emissions in our value chain globally. Help to reduce GHG emissions in every sector of society, given the characteristics of our businesses.
- Aimed at a carbon-free value chain, resolve social issues through our businesses, from the three perspectives of *Technology, Co-creation, and Resilience*.

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

2. Vision for the Future

Energy and Power Infrastructure Systems

- 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.

Equipment and Devices

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

Solutions

- 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

4 Sector-Specific Initiatives and Technologies

The following presents mainly ongoing development and reviews required to achieve our *Vision for the Future*.

Energy and Power Infrastructure Systems

Decarbonize power grids and improve system flexibility

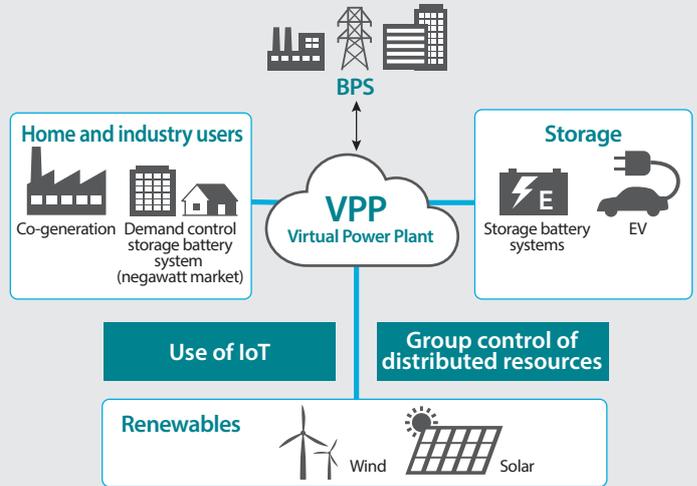
- ▶ Distributed energy resources (DERs) + next-gen storage batteries
- ▶ Smart grids and virtual power plants
- ▶ Superconductivity and HVDC transmission technologies

Carbon sequestration and storage technologies

- ▶ CCUS (CCS, BECCS, etc.)

Carbon-free hydrogen technologies

- ▶ Hydrogen production using electrolysis and pure hydrogen fuel cells



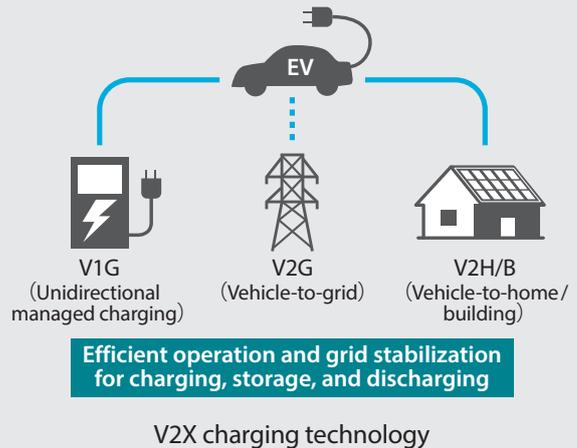
Equipment and Devices

Next-gen communication systems

- ▶ 5G modules and LPWA chips

Next-gen mobility systems

- ▶ Power semiconductors
- ▶ Next-gen charging systems for rapid or wireless charging



Solutions

Mobility revolution

- ▶ Autonomous driving systems
- ▶ Car sharing and on-demand transportation systems

Advanced supply chains

- ▶ Smart factories using visualization and connectivity
- ▶ On-demand manufacturing and logistics systems

Adaptation to climate change

- ▶ Accurate weather observation and flood forecast simulation technologies

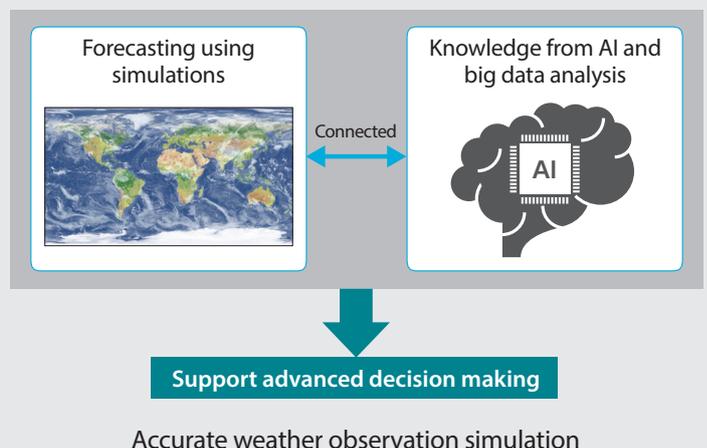


Figure 3 presents the many technologies and initiatives of our industries helping to solve social issues. The four arrows in Figure 4 are the same as those in Figure 2.

Sector	Social issues related to our industries	Technologies to reduce GHG emissions				
		Initiatives	Solutions for adaptation and decarbonization	Efficient technologies, facilities, and equipment	Efficient devices	
Power supply	Decarbonized power generation	➊	Use of IoT, AI, cloud computing, and robotics in society	Smart grids	Renewables, advanced nuclear and carbon-free power generation facilities, power conditioners, CCS, and carbon-free hydrogen	Magnets for wind power, reactors for power conditioners, power semiconductors, and electricity storage batteries
	High efficiency power generation facilities	➋		Advanced EMS for grid power, technology for interconnecting DERs with grids, and VPP	Supercritical thermal power generation facilities, superconductive, and HVDC transmission systems	Large capacitance capacitors, converters, and inverters
Industrial supply chain	Energy efficient heavy electric and industrial equipment	➌		Demand controller and M2M	High efficiency motors and converters, heat pumps, air conditioners, advanced LED lighting, co-generation, fuel cells, and industrial robots	Magnets, coils, inverters, and sensors
	Energy efficient factories			Demand forecasting systems and smart factories (FEMS)		Sensors and communications modules
Consumer	Comfortable and efficient living			Smart homes (HEMS)	Smart home appliances, solar power, and home battery systems	RF-ID, power semiconductors, non-contact power supply units, sensors, communications modules, and camera modules
Business	ZEB office buildings			Smart buildings (BEMS)	Heat pumps, air conditioners, lights, solar power, co-generation, and fuel cells	Sensors and communications modules
	New working styles			➓	Teleworking, remote conferencing systems, paperless offices, and VR meetings	Monitors, microphones, speakers, and communication equipment
Transportation	Low-carbon transportation methods			AVM, automated dispatch, and route instruction systems	EVs, fuel cell vehicles, V2X charging technology	Onboard chargers, converters and inverters, high capacity batteries, power semiconductors, EV motors, sensors, and camera modules
	Optimal control of traffic flow			Smart logistics, on-demand distribution systems, and accurate satellite positioning	Security systems for connected cars	Sensors and communications modules
Others	Comfortable and efficient community development			➔	Accurate weather observation, flood forecast simulation technology, smart city, i-Construction, and IoT implementation in the community	Robots for inspecting advanced infrastructure and disaster relief

- ➊ Decarbonize power generation
- ➋ Increase power generation efficiency
- ➌ Boost equipment efficiency
- ➓ Help society reduce emissions

Figure 3: Technology mapping for reducing GHG emissions

Closing

The Paris Agreement states decarbonization on a worldwide scale requires that the entire world grow and prosper in a sustainable manner, despite the various elements of uncertainty we face today. At present, Japan's EE industries have reviewed their operations, advanced technologies and correlation with GHG emissions to answer the question of how we can contribute as a member of the international community. Furthermore, we maintain connections with various industries and customers, and as such, we compiled this **Long-Term Strategy on Climate Change** as a common direction for reducing GHG emissions through various technologies, products, and services, with an eye toward a carbon-free value chain.

By taking action under our **Basic Policy**, we will work on innovative, advanced energy conservation and carbon-free technology and implementation of advanced information solutions in society, aimed at the realization of our **Vision for the Future**. Looking ahead to the future, we will combine our diverse strengths to play an important role in creating a positive cycle for the environment and economic growth, and implementing social reforms to pivot toward renewables and achieve decarbonization.

Liaison Group of Japanese Electrical and Electronics Industries for Global Warming Prevention
 For further information about our activities, visit the website: ➔ <http://www.denki-denshi.jp/en/>

<p>Japan Electronics and Information Technology Industries Association (JEITA) http://www.jeita.or.jp/english/</p> <p>Japan Business Machine and Information System Industries Association (JBMA) http://www.jbma.or.jp/english/</p> <p>Japan Lighting Manufacturers Association (JLMA) http://www.jlma.or.jp/en/</p> <p>The Japan Electrical Manufacturers' Association (JEMA) http://www.jema-net.or.jp/English/</p>	<p>Communications and Information Network Association of Japan (CIAJ) http://www.ciaj.or.jp/en/</p> <p>Association for Electric Home Appliances (AEHA)</p> <p>The Japan Refrigeration and Air Conditioning Industry Association (JRAIA)</p> <p>Battery Association of Japan (BAJ)</p> <p>Japan Photovoltaic Energy Association (JPEA)</p>
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