

# DENSO

## Sustainability Bonds Report

### (USD-denominated Straight Bonds Due 2026)

June 2023  
DENSO CORPORATION

DENSO is contributing to SDGs  
through its corporate activities



# 1. DENSO Group Long-term Policy 2030

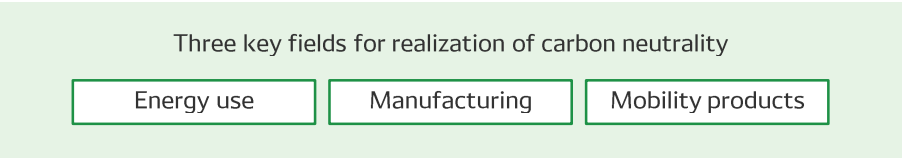
As pressing social issues emerge, such as global warming, aging societies and an increase in traffic accidents, DENSO has formulated the DENSO Group Long-term Policy 2030 and has been promoting activities to contribute to ensuring a society filled with smiling faces through the provision of new value inspired by the Company's initiatives, in addition to maximizing the values of "Green" and "Peace of Mind." DENSO will realize the Long-term Policy 2030 to respond to significant changes in the industrial structure and the business environment, with a view to further enhancing its corporate value.



## Environmental Initiatives

### Aiming to Achieve Carbon Neutrality by 2035

In pursuit of a sustainable society, DENSO has been promoting "environmental management" to reduce environmental impacts and create economic value through environmental protection activities. By further promoting the environmental initiatives DENSO has been engaged in so far, DENSO aims to realize carbon neutrality in our business activities by 2035.



### Initiatives in Energy use

#### DENSO and DENSO Fukushima Launch a Demonstration Project to Realize Carbon-neutral Plant Using Hydrogen

~ Aiming to build a model of local production for local consumption of hydrogen in Fukushima Prefecture ~

DENSO and DENSO Fukushima Corporation started a demonstration project at DENSO Fukushima in March 2023 to produce and use green hydrogen at its plant in collaboration with Toyota Motor Corporation as part of the initiative to realize carbon-neutral manufacturing. Through the demonstration project, the two companies aim to build a model of local production for local consumption of hydrogen and realize carbon-neutral plant.

DENSO and DENSO Fukushima will spread the use of hydrogen from Fukushima, aiming to achieve carbon neutrality at the plant and, as a model plant for carbon neutrality in the DENSO Group, accelerate the realization of carbon neutrality in the production activities of the entire DENSO Group and contribute to carbon neutral manufacturing and a carbon neutral society.



PEM electrolyzer system demonstration facility at DENSO Fukushima

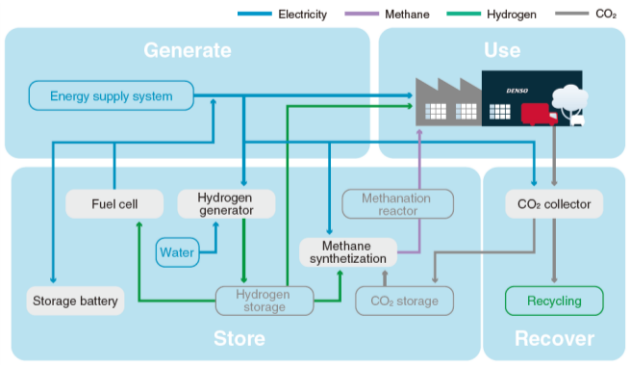
## Initiatives in Monozukuri

DENSO intends to introduce the energy circulation system (case 1), factory-IoT (case 2), digitization (case 3) and energy-saving technologies to 130 plants worldwide with the aim of making all DENSO's plants carbon neutral.

Case  
1

### Energy Circulation System

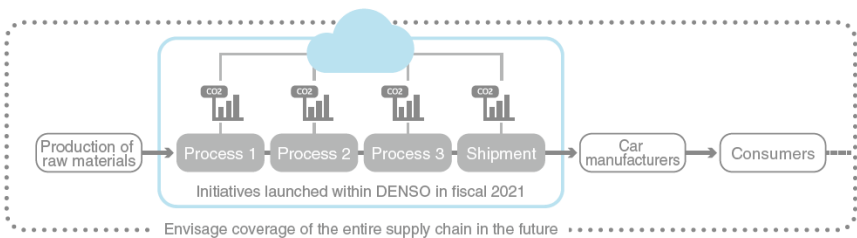
In order to achieve carbon neutrality in Monozukuri using renewable electricity, DENSO needs technology to “store” renewable electricity, which fluctuates depending on the weather and time of day, in the form of electricity, hydrogen, and fuel. DENSO also needs technology to “recover” CO<sub>2</sub>, which is inevitably generated in the manufacturing process, as resources and energy that can be recycled and reused.



Case  
2

### Visualizing and Reducing CO<sub>2</sub> Emissions through Factory-IoT

Through “visualization” of CO<sub>2</sub> emissions, which involves measuring energy consumption in each manufacturing process, converting it using a unit equivalent to CO<sub>2</sub> emissions, and clarifying CO<sub>2</sub> emissions of each facility and process alongside production information, it will be possible to analyze the impact of equipment stoppages and quality losses on CO<sub>2</sub> emissions. Continuing to implement this cycle of analysis and improvement will enable DENSO to boost utilization rates and minimize energy loss.



Case  
3

### Widespread Digitization of Factories

DENSO is promoting digitization of factories in a bid to save energy by reducing paper consumption, processes, travel time, and fuel. Factory digitization will contribute to the enhancement of operational efficiency and accuracy, as well as workstyle reforms.



## Peace of Mind Initiatives

### Aiming to Become a Leading Company that Provides “Peace of Mind” to Society

DENSO aims to provide peace of mind to society through its business activities. By contributing to the resolution of social issues, such as traffic accidents, air pollution, infectious diseases, natural disasters, and aging populations, DENSO will promote initiatives to become a leading company that provides peace of mind to society.

Three pillars of DENSO’s contributions to “peace of mind”

Zero traffic  
fatalities

Comfortable  
space

Support for  
workers

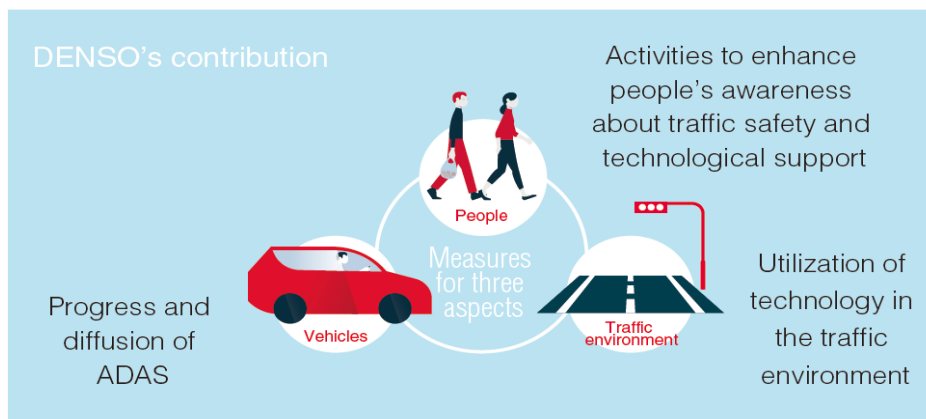
### Initiatives to Eliminate Traffic Fatalities

In order to eliminate traffic fatalities, in addition to DENSO’s own initiatives, it is important to collaborate with all parties concerned, namely relevant government organizations, vehicle manufacturers and industries, so that measures are implemented for three aspects: people, vehicles, and the traffic environment. DENSO will contribute to initiatives to realize a society of zero traffic fatalities through technology.

#### DENSO’s Goals for Technological Progress and Diffusion







- Enhance advanced driver assistance systems (ADAS) to prevent/reduce all types of traffic accidents
- Develop technology to avert hazards through AI-based HMI\* that predicts the risk of traffic accidents and prompts the driver to take appropriate action
- Expand and popularize the lineup of attractively priced ADAS products and retrofit products

\*HMI: Human Machine Interface



## 2. Framework

DENSO has issued Sustainability Bonds to contribute to a sustainable society by providing new value in the fields of “Green” and “Peace of Mind” under the DENSO Group Long-term Policy 2030. DENSO will accelerate initiatives under the Long-term Policy by using net proceeds of Sustainability Bonds for projects with a positive environmental impact and social benefits. The details of DENSO’s Green Social and Sustainability Bond Framework are as below.

	Electrification	“Monozukuri” (Manufacturing)	Advanced Safety and Automated Driving
	Eligible Green Project = “Green”		Eligible Social Project = “Peace of Mind”
Objectives of the project, target and benefit	Electrification of mobility products that contribute to minimizing environmental impact of mobility by electrification of vehicles <ul style="list-style-type: none"> <li>• Achieve sales of one trillion yen in electrification by 2025</li> </ul>	Carbon Neutrality in Manufacturing <ul style="list-style-type: none"> <li>• Achieve carbon neutrality for electricity (use credits for gas) by 2025</li> <li>• Achieve full carbon neutrality for manufacturing by 2035</li> </ul>	Pursue the goal to create a safe mobility society without traffic accident <ul style="list-style-type: none"> <li>• All around in-vehicle sensors, strengthening map functions and V2X (vehicle technology to communicate with infrastructure or between vehicles) and DSM (Driver Status Monitor)</li> <li>• Achieve ADAS Sales 500 billion yen by 2025</li> </ul>
Use of proceeds	Finance, in whole or in part, new or existing electrification businesses, research and development and capital expenditure <ul style="list-style-type: none"> <li>• Research and Development: Technology development that contributes to improving performance such as energy efficiency and electric mileage of vehicle with Inverters, Motor Generators, Battery ECUs, etc., which are essential for driving system of electric vehicles</li> <li>• Capital expenditure: CAPEX to expand the production of the core products described above</li> </ul>	Finance, in whole or in part, new projects in “Monozukuri (Manufacturing)” <ul style="list-style-type: none"> <li>• Introduction of renewable energy such as solar power generation facilities</li> <li>• Expenditures related to the purchase of renewable energy power etc.(including expenditures of the purchase of renewable energy through PPA / Renewable Energy Certificate)</li> </ul>	Finance, in whole or in part, new or existing Advanced Safety and Automated Driving business <ul style="list-style-type: none"> <li>• Scope of Business: Electronic systems, services, and platforms relating to mobility, including but not limited to millimeter wave radar, image sensors, driver status monitors, airbag systems, and other areas</li> <li>• Research and Development: Technologies to improve the performance of millimeter wave radar and image sensors, both of which are the core products of Advanced Safety and Automated Driving</li> <li>• Capital expenditure: CAPEX to expand the production of the core products described above</li> </ul>
Promoted Sustainable Development Goals (SDGs)	<div>       </div>		

### 3. Allocation Report

DENSO has committed to disclosing Allocation Reports on an annual basis until the net proceeds of any Green, Social, and Sustainability Bond issuances are fully allocated to projects meeting relevant eligibility criteria.

Allocation of net proceeds, and projects to which the net proceeds have been allocated, as of March 31 2023 are as below.

	Electrification	"Monozukuri (Manufacturing)"	Advanced Safety and Automated Driving
	Eligible Green Project		Eligible Social Project
Issued amount	500 million dollars		
Allocation			
Allocated amount	<b>241</b> million dollars September 2021 ~ March 2022 74 April 2022 ~ March 2023 167	<b>34</b> million dollars September 2021 ~ March 2022 3 April 2022 ~ March 2023 31	<b>225</b> million dollars September 2021 ~ March 2022 173 April 2022 ~ March 2023 52
Allocated percentage	55%		45%
Unallocated amount	0 million dollars		
Case studies of eligible projects to which proceeds have been allocated	<ul style="list-style-type: none"> <li>Technology development that contributes to improving energy efficiency and electric mileage of battery electric vehicles (BEVs), fuel cell electric vehicles (FCEVs) and air mobility (e-VTOL), such as specially designed inverters, motor generators, battery ECUs, and thermal management systems</li> <li>CAPEX to expand the production of the core products described above</li> </ul>	<ul style="list-style-type: none"> <li>Purchase of renewable energy</li> <li>Expenditures related to the installation of photovoltaic equipment (e.g. in Asia) for the realization of carbon-neutral factories</li> </ul>	<ul style="list-style-type: none"> <li>Technology development to improve the performance of millimeter wave radars and image sensors (such as increasing detection range, widening field of view, etc.), both of which are core products of Advanced Safety and Automated Driving</li> <li>CAPEX to expand the production of the core products described above</li> </ul>

- The proceeds were allocated for research and development and capital expenditures commenced after the issuance of the bonds.
- DENSO has expanded the geographic scope of eligible projects. While the framework stated that the project location was Japan, DENSO has allocated the proceeds to the eligible projects in other regions (mainly in North America, Europe, China and Asia/Oceania) as well as in Japan, in light of the development of the projects.

## 4. Impact Report

DENSO has committed to disclosing the following performance indicators related to eligible projects until the applicable Sustainability Bonds are redeemed, subject to data availability and confidentiality.

The below information is output/impact indicators as at March 31, 2023.

<b>Electrification</b>	Eligible Green Project	Percentage of sales increase from the year before the issuance of the bonds (from FY2020) <b>+460.7%</b>
Objective and benefits	Contribute to the electrification sector by offering systems/products	Percentage of sales increase in FY2022 <b>+114.3%</b>
<b>Monozukuri</b>	Eligible Green Project	Reduction in CO2 emissions from the issuance of the bonds (from the second half of FY2021) <b>236,247 t-CO<sub>2</sub></b>
Objective and benefits	Reduction of CO2 emissions by introducing renewable energy and green energy	Reduction in CO2 emissions in FY2022 <b>219,329 t-CO<sub>2</sub></b>

### Initiatives for the Expansion of Electrification Businesses

#### **DENSO Develops Its First Inverter Using SiC Power Semiconductors ~ Highly efficient Silicon carbide chips significantly reduce power loss in electric vehicles ~**

DENSO has developed its first-ever inverter with silicon carbide (SiC) semiconductors. This inverter, which is incorporated in the eAxe, an electric driving module developed by BluE Nexus Corporation, is used in the new Lexus RZ, the automaker's first dedicated battery electric vehicle (BEV) model released in March 2023.



Inverter

SiC power semiconductors consist of silicon and carbon that significantly reduce power loss compared to silicon (Si) power semiconductors. A cruising test conducted under specific conditions by BEV using SiC semiconductor inverters demonstrated inverters with SiC power semiconductor reduce power loss less than half of ones with Si semiconductor. As a result, the energy efficiency of BEVs is improved and cruising range is extended.

DENSO will contribute to the realization of a carbon-neutral society through development aimed at more efficient energy management for vehicles.

LINK: [DENSO Develops Its First Inverter Using SiC Power Semiconductors](#)

## Advanced Safety and Automated Driving Eligible Social Project

Objective and benefits Realize Safe Mobility Society without Accidents

- Develop products to cover all types of accidents
- Expand sales of core products and variation of retrofit products

Percentage of sales increase from the year before the issuance of the bonds (from FY2020)

**+23.1%**

Percentage of sales increase in FY2022

**+13.5%**

### Status of Implementation of Safety Features Necessary for Advanced Safety and Automated Driving

Safety Technology System	Targeted Safety Feature	Types of Accidents	Achieved as of Sep 2021	Achieved as of Mar 2023
Autonomous emergency braking	Car-to-car	Rear-end collision	●	●
		Reversing	●	●
		Intersection (left turn across path/opposite direction, straight crossing path)		●
		Head-on collision		●
		Lane change (blind spot assistance)	●	●
	Car-to-pedestrian	Rear-end collision/crossing	●	●
		Intersection (crossing after turning)		●
		Reversing		●
	Car-to-bicycle	Rear-end collision/crossing	●	●
		Intersection (crossing after turning)		●
		Reversing		
	Car-to-motorcycle	Rear-end collision		●
		Reversing		
		Intersection (left turn across path/opposite direction, straight crossing path)		●
		Head-on collision		●
		Lane change (blind spot assistance)	●	●
Clash avoidance (low speed)	Vehicle/obstacles, etc.	Pedal error	●	●
Driver assistance/ automated driving (highway)	Vehicle/lane		●	●
	Road curvature			●
Driver assistance/ automated driving (general road)	Vehicle/lane/ pedestrian			●
	Virtual lane guidance (map utilization)			
	Traffic signal			●
	Road sign (speed limit, etc.)		●	●
Parking assist system	Parking assist		●	●
Driver monitoring	Face direction/drowsiness		●	●

This chart on safety features pertain to automobiles; DENSO is contributing to equipping vehicles with these safety features.

## Initiatives Toward a Society with Zero Traffic Fatalities

### DENSO Expands Vision Sensor Detection Angle

~ Widened view helps better detect bicyclists and pedestrians entering roads suddenly from the side ~

DENSO announced it has expanded the detection angle of its vision sensor, increasing the sensor's ability to recognize pedestrians and bicycles around a vehicle to improve road safety. The vision sensor is used on some grades of the SUBARU Legacy Outback, announced in April 2022, for the North American market, and the all-new SUBARU Crosstrek, unveiled in September 2022, for Japanese market.

Drivers are likely to overlook small children and fast bicycles entering the road suddenly from the side, and even if they notice them, struggle to react in time and accidents may occur. Recognizing the importance of the issue, the new car assessment program in Europe (Euro-NCAP) has made it necessary for new vehicles to be able to detect pedestrians and bicyclists from the side of roadways.

DENSO decided to tackle this issue and succeeded in expanding the detection angle of its vision sensor to 128°. This has made it possible to detect bicycles crossing the road when driving at low speed and meets the assessment conditions stipulated by Euro-NCAP. Thus, the sensor will help to prevent accidents at intersections and other areas where vehicles, motorcycles, bicyclists and pedestrians come and go at various speeds.

LINK: [DENSO Expands Vision Sensor Detection Angle](#)



Vision sensor