DENSO
Crafting the Core

“Green” Strategy

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DENSO supports the Sustainable Development Goals (SDGs).

Past Efforts to Achieve a Sustainable Region/Society

2000 2015 2017 2020

Company Eco Vision2005 2015 Eco Vision 2025

Policy

Reborn21

Electric propulsion system for urban air mobility

Mobility CO_2 Neutral

Mass production

In-vehicle

Advanced development

New mobility

Energy management system

MG technology

Double-sided cooling inverter

SiC inverter

Next-generation battery ECU

Next-generation MG

In-wheel motor

Steady efforts to promote electrification

Electrification

ICE/Thermal (Chemical reaction)

Common rail system

Catalyst technology

Gasoline direct-injection lean-burn

FC equipment

Sensor

SiC boost converter

Energy CO_2 Neutral

Advanced development

Microalgae biofuel

SOFC

CO_2 circulation concept

CO_2 circulation demonstration

Artificial photosynthesis

Development Integration of environmental technologies

Demonstration plant

Non-automotive

Wireless Power Transfer (Toyota City's feasibility study)

Dynamic Wireless Power Transfer

DENSO has promoted efforts to reduce CO_2 emissions throughout its business operations around the world.

Global Developments Related to Carbon Neutrality

- **Invest €1 trillion in Green Deal (10 years)**
  Tens of billions of euros to be invested by respective countries
- Introduce a carbon border tax
- Expand renewable energy, reduce costs, and terminate coal-fired thermal power generation (U.K., France, Netherlands, etc.: by 2030)
- Introduce CP*1 and improve and promote EU-ETS*2
- Capture CO_2 on a large scale and demonstrate usage

*1 Carbon Price
*2 EU-Emission Trade System

- Many Chinese renewable energy companies ranked among the top 10 in the world (Nine photovoltaic power companies and four wind power companies are Chinese.)
- **Strengthen the EV industry**
- Increase nuclear power generation five- or six-fold

- Carbon neutrality by 2050 declared by President Biden
- **Invest $2 trillion in clean energy (four years)**
- Capture CO_2 on a large scale and demonstrate usage

  Example: Capture CO_2 in the atmosphere and turn it into liquid fuel

- Carbon neutrality by 2050 declared by Prime Minister Suga
- **Invest two trillion yen in the Green Innovation Fund**
- **Reduce CO_2 by 46% by 2030**
- Cost of renewable energy: high, supply amount: small

The global community has been shifting focus from "low" carbon ➡ "zero" carbon.
DENSO will promote technology innovation and solve social issues through its business.

Carbon Neutral Society Envisioned by DENSO and Three Important Fields

■Life cycle of vehicles

③Energy use

Renewable energy

Energy conversion

Electricity

Hydrogen

Fuel Gas

CO_2

CO_2 capture

Green Energy・Recycle Material

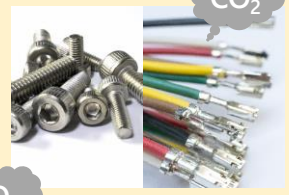
CO_2・Waste

①Manufacturing

②Mobility products

Carbon cycle

Material



Parts

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Produce cars

Use cars

Waste

Achieve carbon neutrality by taking full advantage of renewable energy and capturing and using CO_2

1

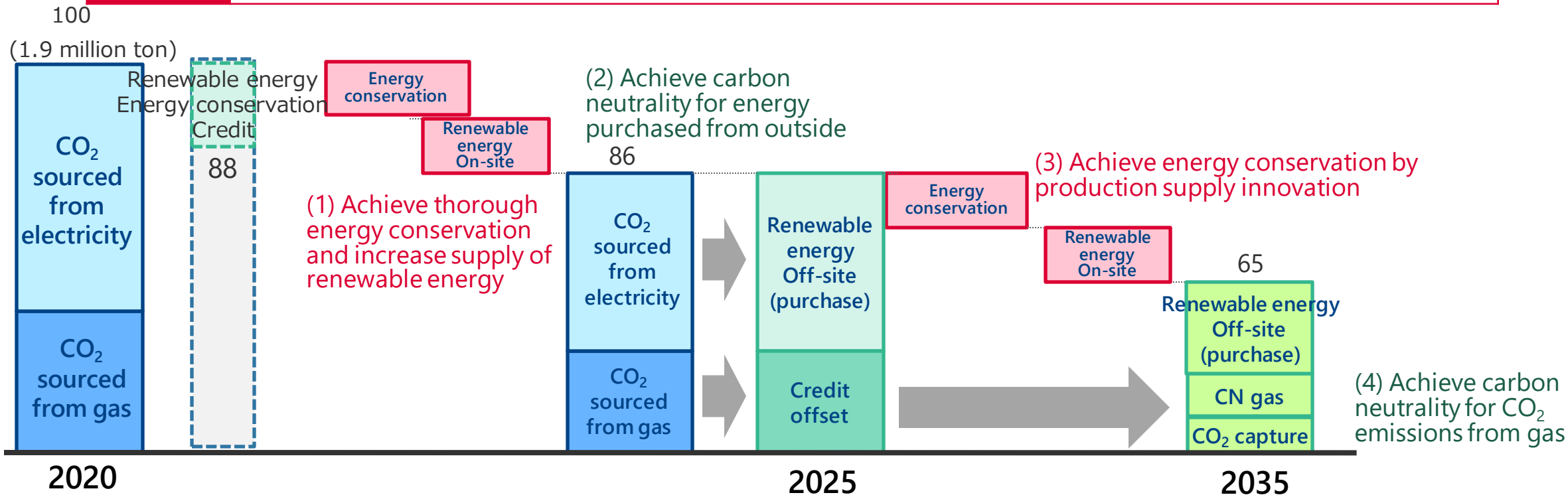
Manufacturing

Efforts to achieve zero CO_2 emissions from factories

Basic Strategy for Carbon Neutrality in Manufacturing: “Change Energy and Manufacturing’

Goal

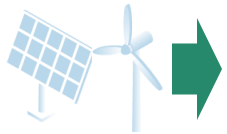
2025: Achieve carbon neutrality for electricity (use credits for gas)
2035: Achieve full carbon neutrality for manufacturing



- Thoroughly accomplish energy conservation at factories to eliminate waste
- Secure renewable energy (including credits) and achieve carbon neutrality of energy purchased from outside
- Promote factory reorganization/innovation and promote carbon neutrality of gas

Carbon-Neutral Factory Initiative

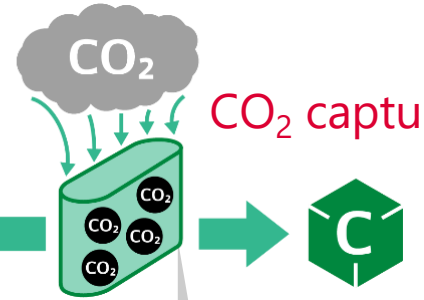
Renewable energy



Electricity

Hydrogen

Fuel Gas



CO_2 capture

Green Energy・Recycle Material

CO_2・Waste

(1) Develop energy-saving techniques/low-C materials

- Thermal binding → Molecular binding
- Die casting → Bio resins

Factory

Continue and strengthen energy conservation activities

(2) Develop super-eco-friendly equipment

- Modularize Heating, processing/assembly
- Production control platform

(3) Achieve zero production loss/waste

- Fully utilize F-IoT

Deployment and support for achieving carbon neutrality of the entire supply chain

Become factories that carbon neutral manufacturing by continuous energy conservation and developing technologies

2

Mobility products

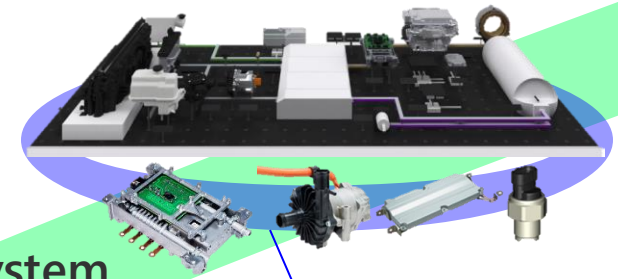
Development of diverse technologies for EVs, HVs, FCVs, and e-VTOL

Basic Strategy for Mobility Products

Achieve energy management from vehicles to infrastructure and contribute to carbon neutrality by offering powertrain and thermal systems

e-VTOL Electric propulsion system

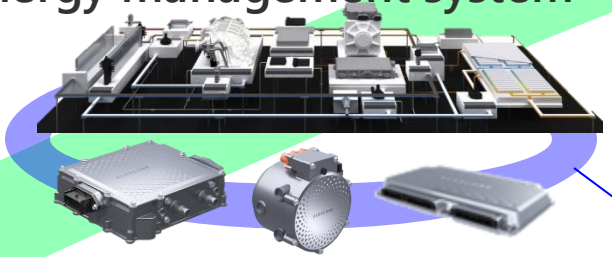
FCEV energy management system



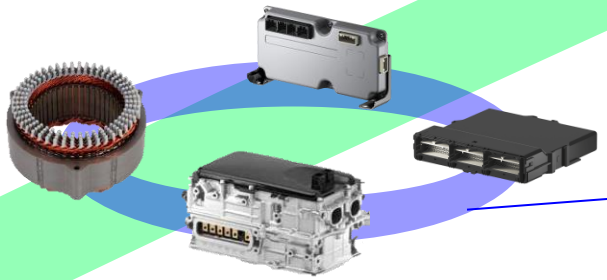
Expanded freedom of movement

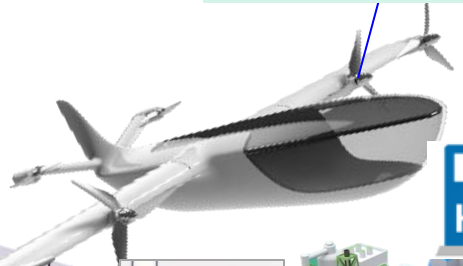
Increased flexibility of energy (including e-Fuel and hydrogen burning)

BEV energy management system

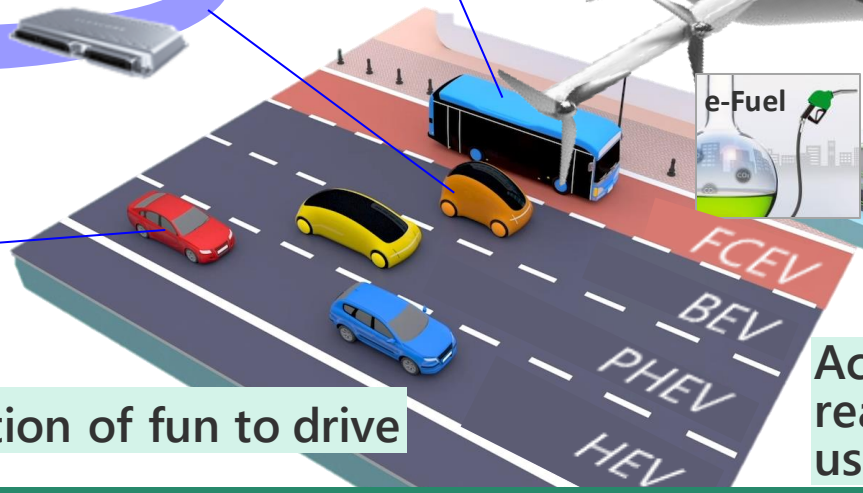


HV energy management system





Source: TOYOTA MOTOR CORPORATION



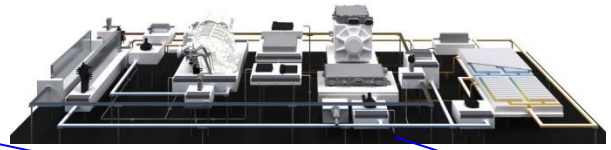
Evolution of fun to drive

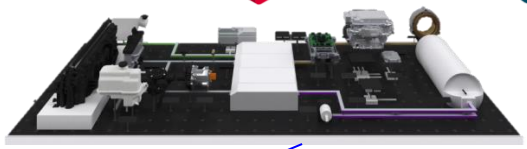
Achievement of reasonable mobility by using renewable energy

Develop diverse technologies in anticipation of future needs, including HEVs, BEVs, FCEVs, and e-VTOL aircraft (air mobility)

Electric Vehicle System Strategy

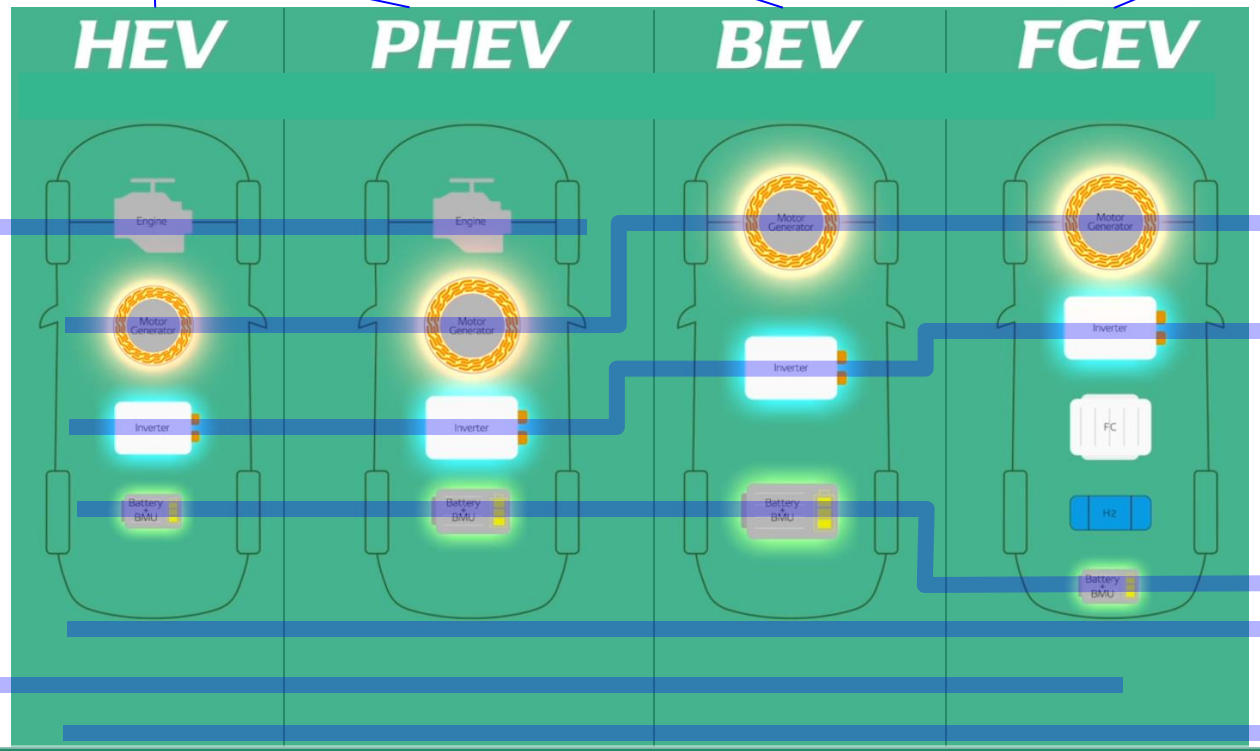
Energy management system





Offer a lineup of systems and products based on the Core & Customization Strategy

High-efficiency engine management system (including e-Fuel and hydrogen burning)



MG

ELEXCORE
DENSO Electrification Product Brand

Inverter

Battery ECU

Electric powertrain integration ECU

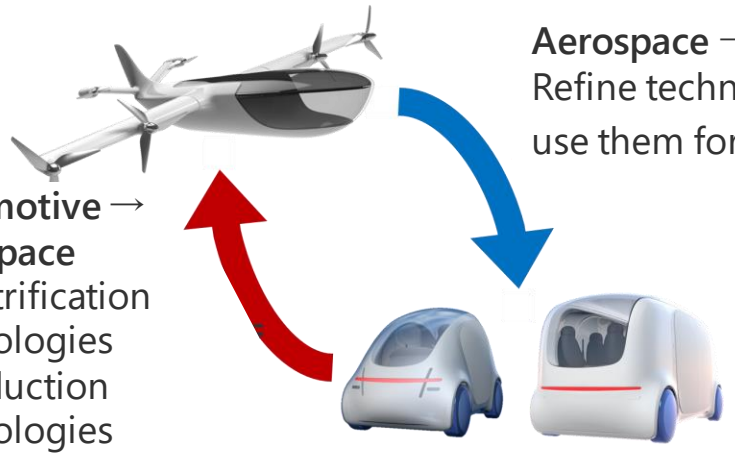
Air-conditioning & cooling system

Connected system

Offer a lineup of systems and products that cover a wide output range from small mobility vehicles to large trucks.
The sales target for 2025 is 1 trillion yen.

Strategy for e-VTOL (air mobility)

■ Objective of entering the air mobility market



Aerospace → Automotive
Refine technologies and use them for automobiles

Automotive → Aerospace
- Electrification technologies
- Production technologies

Develop air mobility technologies in anticipation of future needs
→ Use such technologies for automobiles

■ Business fields

MaaS
Operation management, systems, sharing, security, safety

Safety & cockpit
Automated driving, sensors, communication

Electrification
Motors, inverters, batteries, charging

Thermal
Air conditioning, heat pumps, heat exchangers, etc.

Deployment in all fields

■ Efforts toward commercialization

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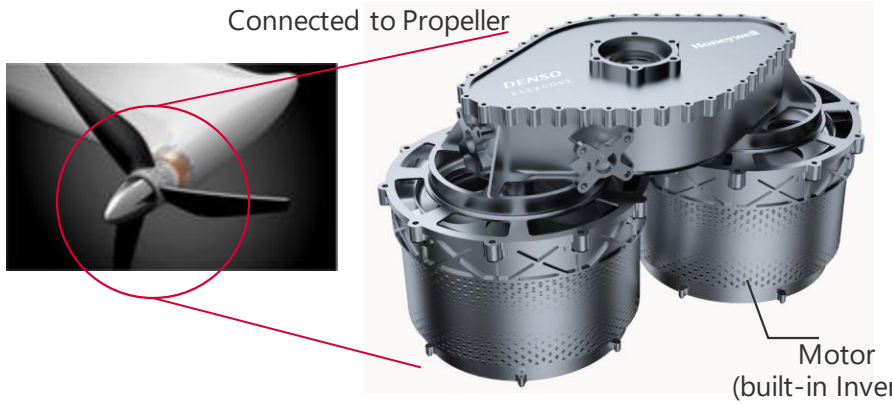
Honeywell THE POWER OF CONNECTED

Lightweight and high-quality products
- **Production capacity (Home)**

Systems, certification, sales channels (Away)



Development of electric propulsion system

Establish alliances

Aim to achieve flight test in 2022

Contribute to the environment through the air mobility revolution and create a new main business

3

Energy use

Development of technologies to capture and reuse CO_2

Technology Development toward an Energy Cycle Society

③Energy use

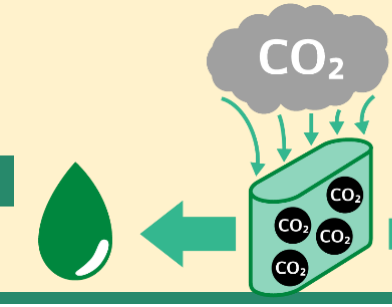
Renewable energy

Energy conversion

Electricity

Hydrogen

Fuel Gas



Capture CO_2

C

Re-resourcing

Clean Energy・Recycle

CO_2・Waste

①Manufacturing

Carbon cycle

Material

Parts

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② Mobility products

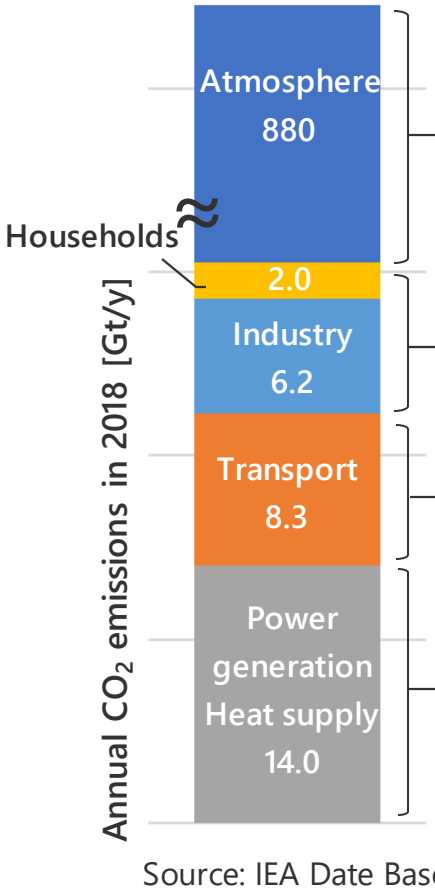
Produce cars

Use cars

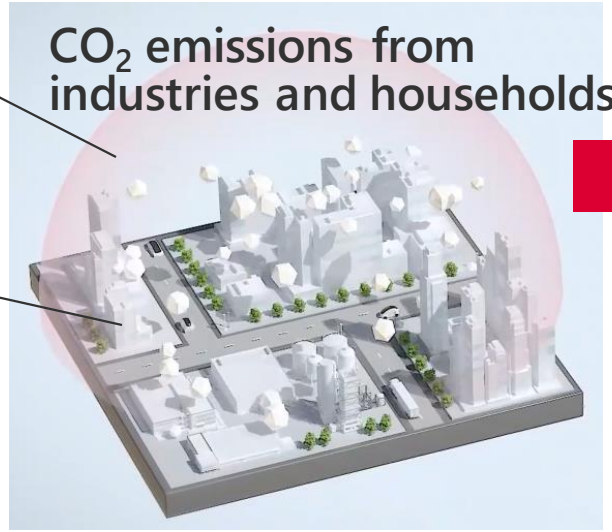
Waste

Develop key technologies toward an energy cycle society

Efforts to "Store" CO_2



Source: IEA Date Base



Contribute through mobility products activity

heavy industries and steel manufacturers

Goal

Artificial photosynthesis

Renewable Energy (e-Fuel)

Factory CO_2 circulation

HEV fuel

Capture CO_2 wherever necessary
→ Use it as a renewable energy and material

Create a convenient, clean and comfortable society and lifestyles

DENSO's Goal

"Green" Aim to achieve carbon neutrality (zero CO_2 emissions) by 2035

	Goal	DENSO's activities Value proposition	Current attainment level	Target
(1) Manufacturing	Achieve zero CO_2 emissions from factories	• Conserve energy through production innovation and use renewable energy • Introduce green energy	Reduce CO_2 emissions 1.9 million ton from factories by 40% (from 2012 level)	**Achieve zero CO_2 emissions from factories** 2025: by using certificate and credits 2035: without using credits
(2) Mobility products (electrification)	Contribute to electrification of vehicles and minimize CO_2 emissions	• Contribute to the electrification field by offering systems/products (cover all fields: HEVs, BEVs, FCEVs, and e-VTOL)	550 billion yen in revenue	**1 trillion yen in revenue (2025)**
(3) Energy use	Contribute to carbon neutrality of the entire society by capturing and reusing CO_2	• CO_2 capture (use CO_2 as a renewable energy and material) Photosynthesis, CO_2 cycle at factories	Start demonstration at the Anjo Plant	**Social demonstration (2025)** **Commercialization (2030)** **300 billion yen(2035)**

DENSO's sustainability management: Solve social issues through business
Business "Spread products and systems" × Solve social issues (environment) "Carbon neutral"

Create a convenient and carbon-neutral society by using DENSO's technologies

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