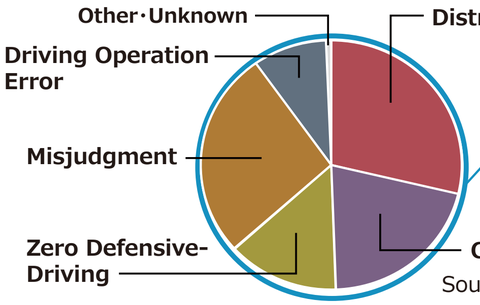
Honda SENSING Elite

Desire for Safety

Honda customers are led by “curiosity”, and drivers continue to make new discoveries from various destinations to find much joy and happiness in life. We want to deliver the “fun” in the freedom of mobility to all. That’s why Honda deeply cares about safe mobility that protects lives, and we continue to strive in creating a safer society.

Highway Accidents Caused By Human Factors



We understand most real-world traffic accidents are caused by human errors. We feel the driver assistance technology is vital to significantly reducing human errors.

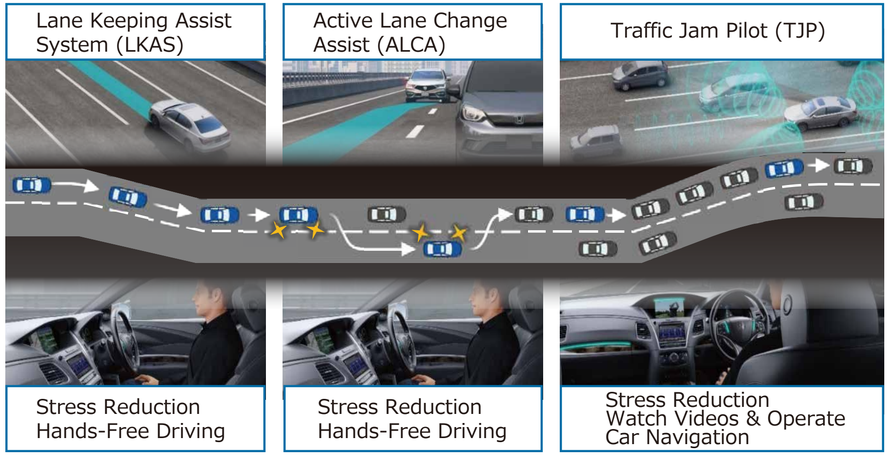
Source: Institute for Traffic Accident Research and Data Analysis (ITARDA)

The advanced driving assistance technology with great potential in eliminating human errors is essential.

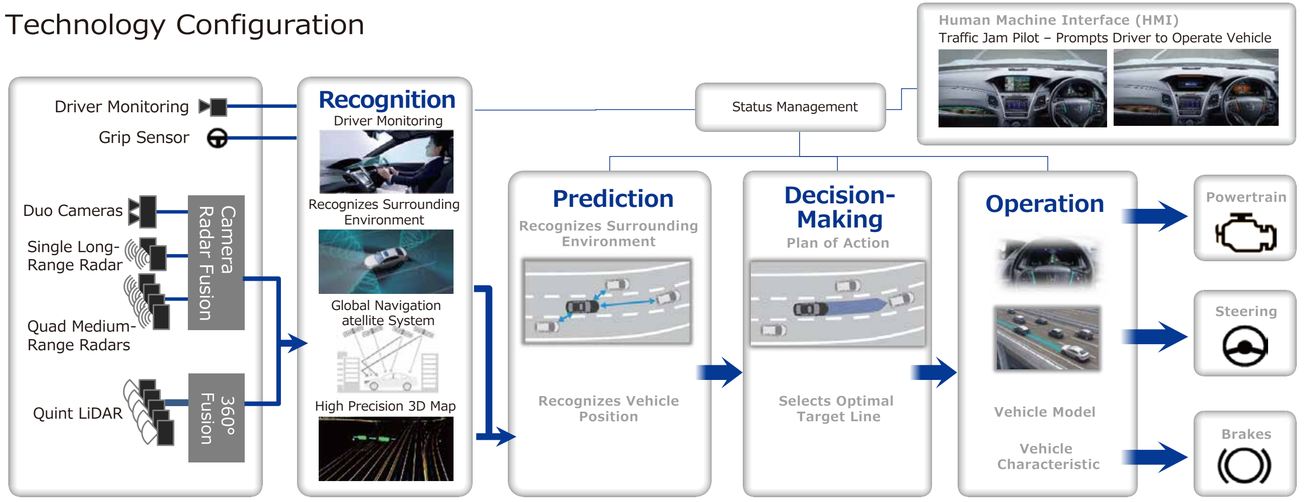
(E.g.) Driver Monitoring Camera

Next Stage in Advanced Safety Technology and Our Aim to Eliminate Human Errors

Driving Situations



Technology Configuration



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Importance of Safety and Reliability

Examined presumable cases from early stages of development and ran multiple simulations. In order to reduce unforeseen cases too numerous to list, a 1.3 million kilometer demonstration experiment was conducted. Based on the collected data, an additional 10 million patterns of simulation were conducted. The verification activity will continue until the system is confirmed to be safe.

System Architecture and Concept

Avoid Unsafe Events → **Eliminate risks and identify system design imperfections which become factors for unsafe events** → **Demonstration Experiment** → **Confirm Safety of Operation** → **Implementation of Traffic Jam Pilot (TJP)**

Detect Unforeseen Factors → **Eliminate Detected Factor**

Demonstration Experiment

Actual images of driving environments from the 1.3 million kilometer demonstration experiment

Overhead Crossings

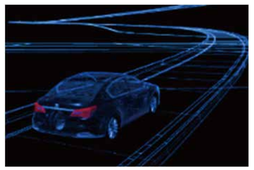
Highway Lanes

Tunnels

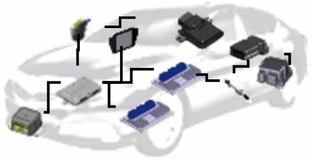
Traffic Jams

Confirmation of Safe Operation

10 million patterns of simulation using an advanced computer system



Model in the Loop Simulation (MIL)



Hardware in the Loop Simulation (HIL)

Driving Simulator

Safety Measures Before Driver Takes Over

HMI

The Human Machine Interface (HMI) Simulator accurately informs the driver of operation status and driving conditions.
The system prompts the driver to take over operation of vehicle with specific actions when necessary.

Further efforts to achieve a zero accident society

Our knowledge and expertise gained through the research and development of Level 3 autonomous driving technology will be utilized to further enhance the level of ADAS (Advanced Driving Assistance System) intelligence, and similarly aim to improve the accident coverage ratio. The all new ADAS which evolved into an omnidirectional advanced driver-assistance will be adopted into four-wheeled vehicle models in developed countries by 2030.

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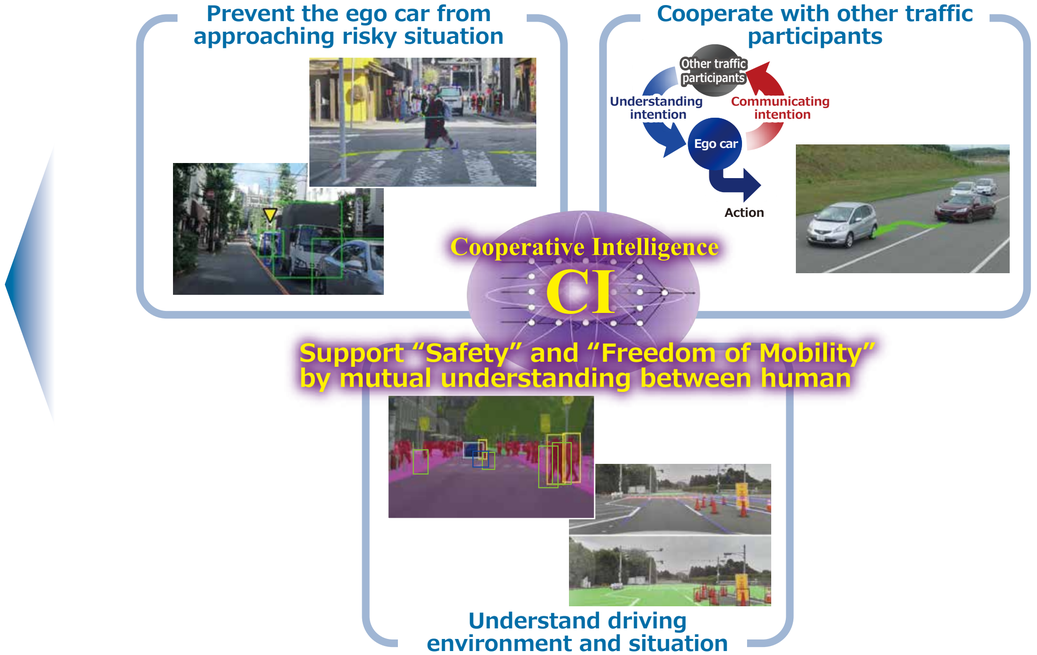
Automated Driving via Anticipation, Prediction and Cooperative Driving by AI

Desire for Safety



Vehicle Demonstration

Taking Safe Actions by Predicting Risks

Crossing through Intersection While Understanding Traffic participants' Intentions and Traffic Rules

Turning Right Safely at Blind T-intersection

Taking Cooperative Action While Ensuring Safety

Lane-changing through Cooperative Action in Traffic Jam

Turning Right at Congested T-Intersection while Avoiding Collisions

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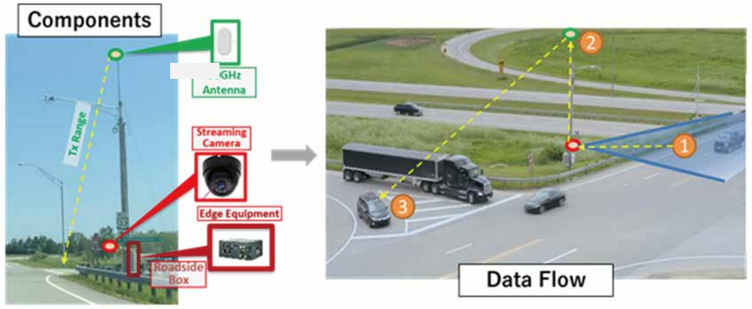
SAFE SWARM

mmWaveSystem　Demonstration experiment of safety technology between infrastructure on the road and vehicles using mmWave technology

- Introducing the efforts of three parties in constructing an intersection system using mmWave this time
- HRI develops mainly in-vehicle integration

•Intersection use case

Location: US OH, US-33 off ramp intersection



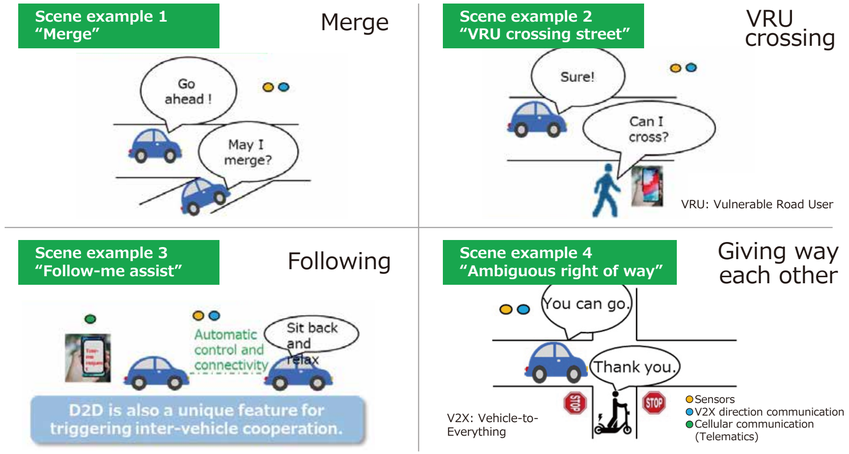
- 1．mmWave Antenna / 2．Streaming Camera / 3．Edge Equipment
- These 1.) and 2.) equipment above installed on US-33
- 3.) above installed on the vehicle

Driver-to-Driver　Research on contributions to safety through communication between drivers

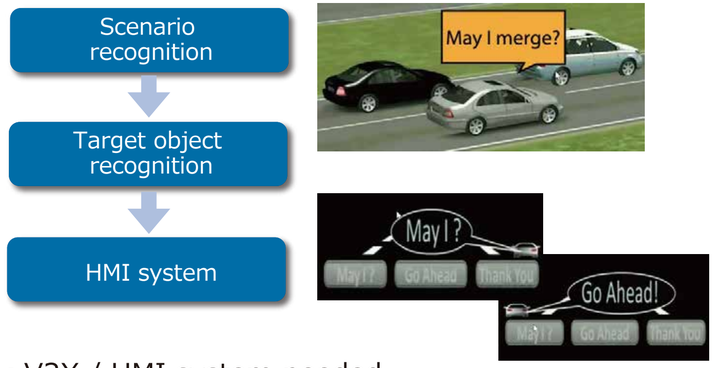
Needs effective intention-sharing

- Effectively convey your intentions to others and reduce driver frustration
- Providing compassionate services that reduce anxiety and strengthen empathy

•Use case scenarios　When(In what type of scene)D2D Is needed?



•How it works



- V2X / HMI system needed
  Scene and target recognition needed
- Firstly, Communicate each other, then behave

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SAFE SWARM

5G System Demonstration experiment of safety technology between vehicles or between vehicles and pedestrians via infrastructure using 5G

•Efforts for safety and relief utilizing communication technology

- Share speed and location information using Safe Swam technology using V2X
- Considering how to utilize new communication technology to reduce collisions and fatal accidents

•Use case scenarios

Invisible Pedestrian

Invisible / inaudible emergency vehicle

invisible ignoring signals Vehicles

•How it works

- 5G ULTRA WIDEBAND
- MOBLIE EDGE COMPUTING
- V2X SOFTWARE PLATFORM

- 5G ULTRA WIDEBAND
- Camera on the pole

•Future plan

- V2X and 5G network availability extension
- Contribute to a safer society by seamlessly communicating with self-driving cars

HONDA

L3Pilot Driving Automation

L3Pilot Driving Automation

1,000 drivers
100 cars
10 European countries
Piloting Automated Driving on European Roads

Project details

Duration: 50 months,
September 2017 - October 2021

Budget: €68 million
Coordinator: Aria Etemad,
Volkswagen Group Innovation

Funding and support:
Co-funded by the European Union under the Horizon 2020 research and innovation program under grant agreement No 723051 with €36 million.
Supported by the European Council for Automotive R&D (EUCAR).

Honda is member of a Pan-European Level 3 AD Pilot (Pilot Operation Test) Project, funded by the European Commission under Horizon 2020, to test automated driving on public roads. Due to the higher dynamic requirements and the differences in European countries, challenging situations can be identified and used as a basis for natural driving behavior of AD vehicles in real traffic.

Consortium

VOLKSWAGEN · Audi · BMW GROUP · STELLANTIS · Mercedes-Benz · Ford · HONDA
Jaguar Land Rover · Opalrund · STELLANTIS · Renault Group · TOYOTA · Volvo · APTIV · FEV · veoneer
bast · RDW · FIA · Allianz · Swiss Re · Deutsches Zentrum für Luft- und Raumfahrt · ika RWTH AACHEN UNIVERSITY · VTT · CHALMERS · SNF
UNIVERSITY OF LEEDS · wivw · UNIVERSITÀ DEGLI STUDI DI GENOVA · TNO innovation for life · WMG · ASAM · eject

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723051.

eucar
Supported by the European Council for Automotive R&D

Working groups and Honda's contribution

Code of Practice
Partners will define a set of rules for system engineering and safety validation for automated driving functions

Methodology
A multidisciplinary evaluation methodology developed by the project will facilitate reliable testing results for piloting automated driving

Fleet — Honda participation
100 passenger cars from different European automotive manufacturers will be equipped and prepared for testing.

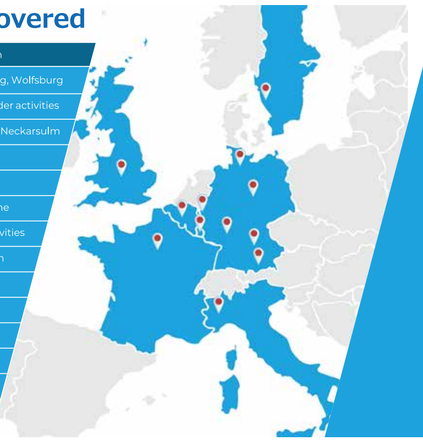
Data — Honda participation
A set of tools will enable logging. management and analysis of the various data acquired during testing.

Piloting — Honda participation
The tests across 10 European countries will be coordinated and harmonized. Showcases will present the functionalities to various audiences.

Evaluation
The evaluation will draw conclusions on technical aspects, user acceptance, driving and travel behavior, and impact On traffic and society.

European Countries to be covered

Partner	Country	Region
Volkswagen	DE	Hamburg, Wolfsburg
Aptiv	DE,LU,FR	cross-border activities
AUDI	DE	Ingolstadt, Neckarsulm
BMW	DE	Munich
CRF	IT	Turin
FEV	DE	Aachen, Cologne
Ford	DE,BE,UK	cross-border activities
Honda	DE	Frankfurt am Main
ika	DE	Aachen
JLR	UK	Coventry
STLA	FR,DE	cross-border activities
Renault	FR	Paris and other regions
Toyota	BE	Brussels
Volvo Cars	SE	Gothenburg



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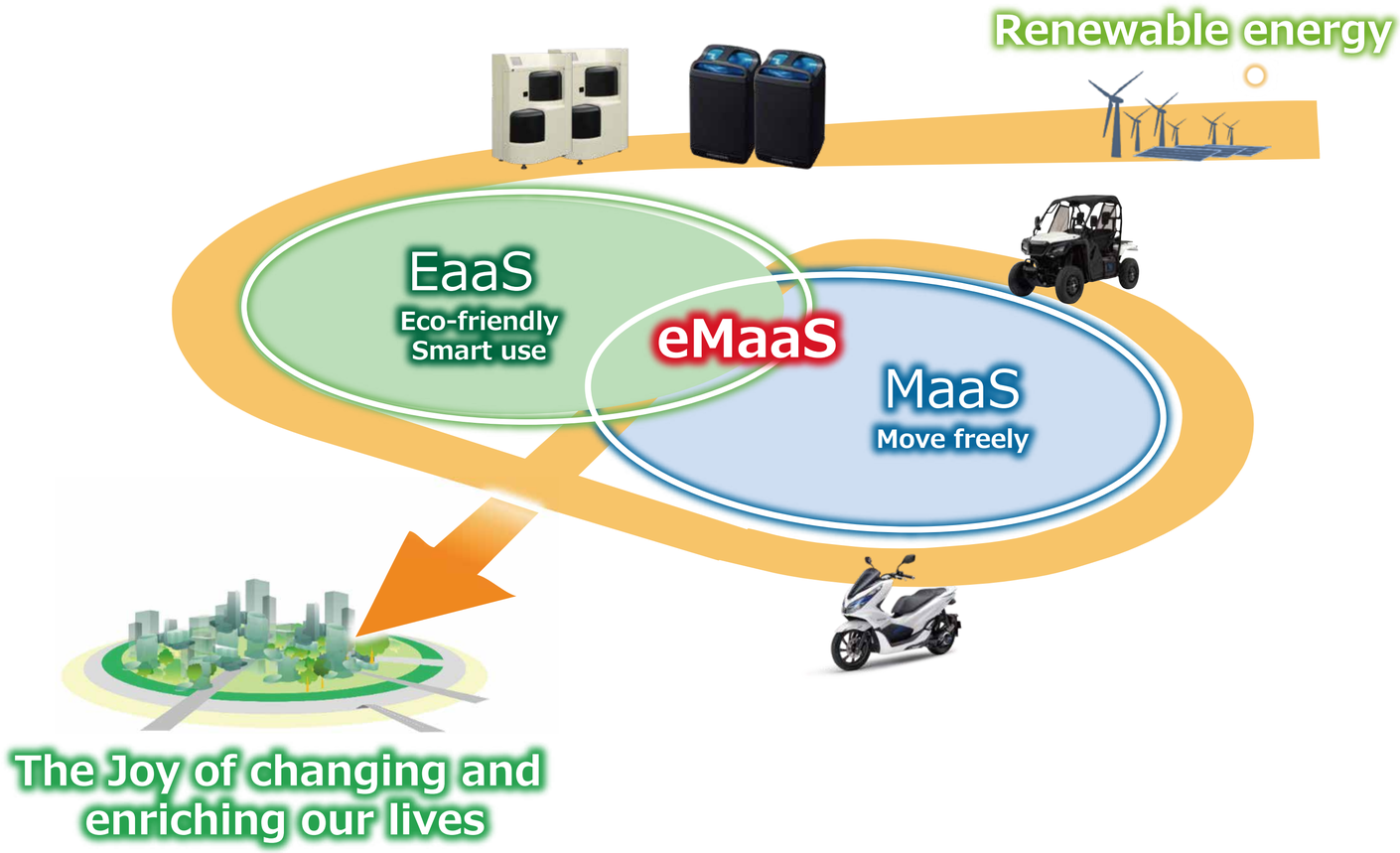
Honda Mobile Power Pack

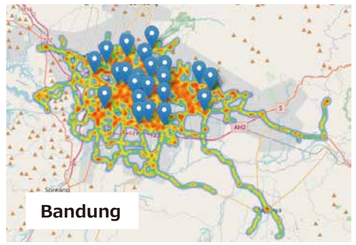
Demonstration Program

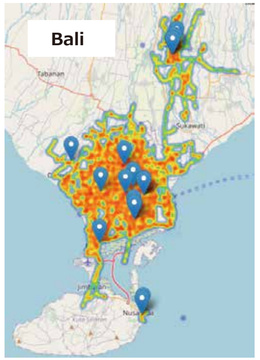
To create a prosperous lifestyle and a sustainable society,
Honda proves the business concept of battery sharing as a social eco-system.

Honda e:TECHNOLOGY

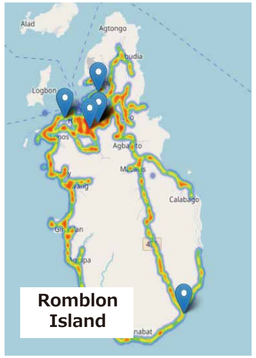


INDONESIA





PHILIPPINES



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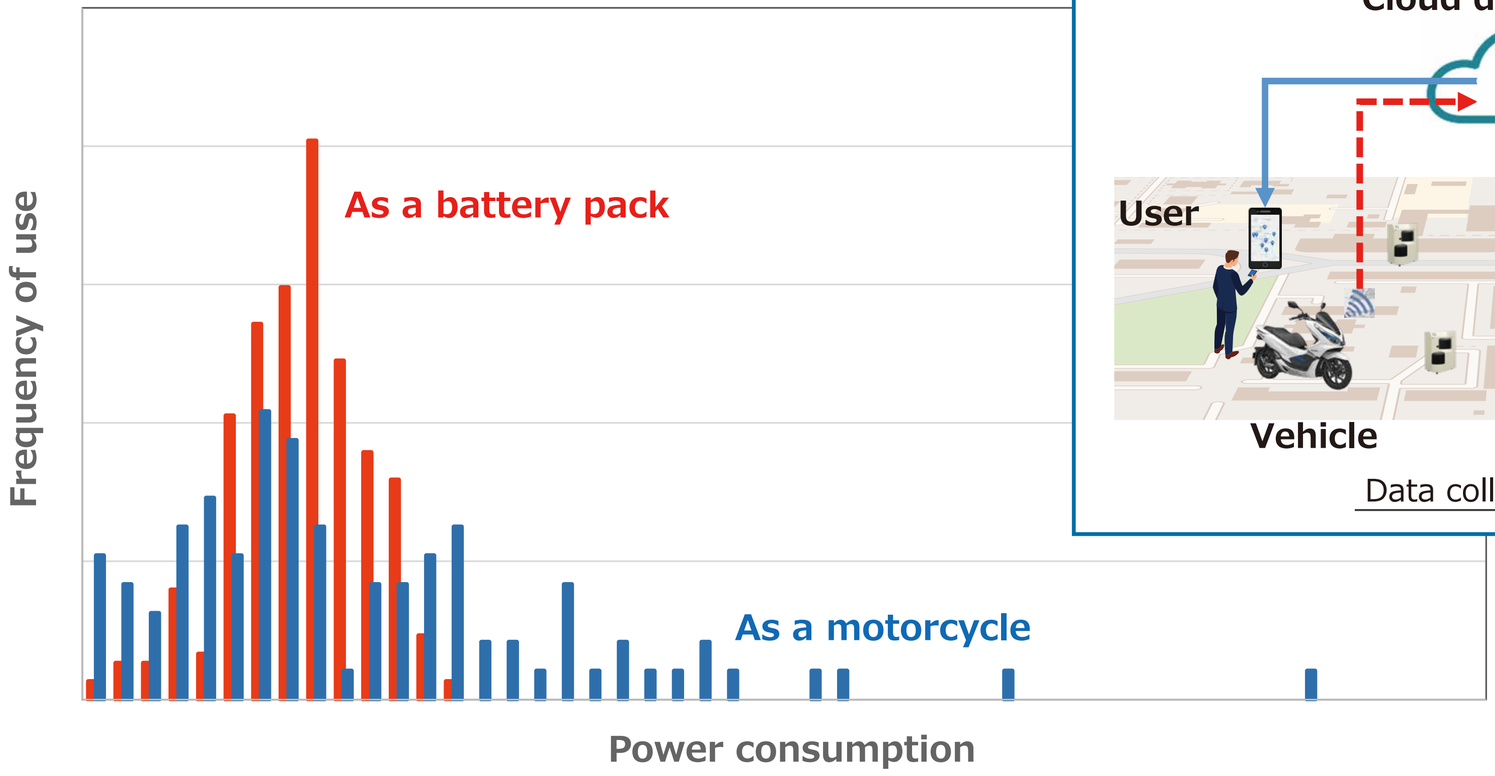
Honda Mobile Power Pack

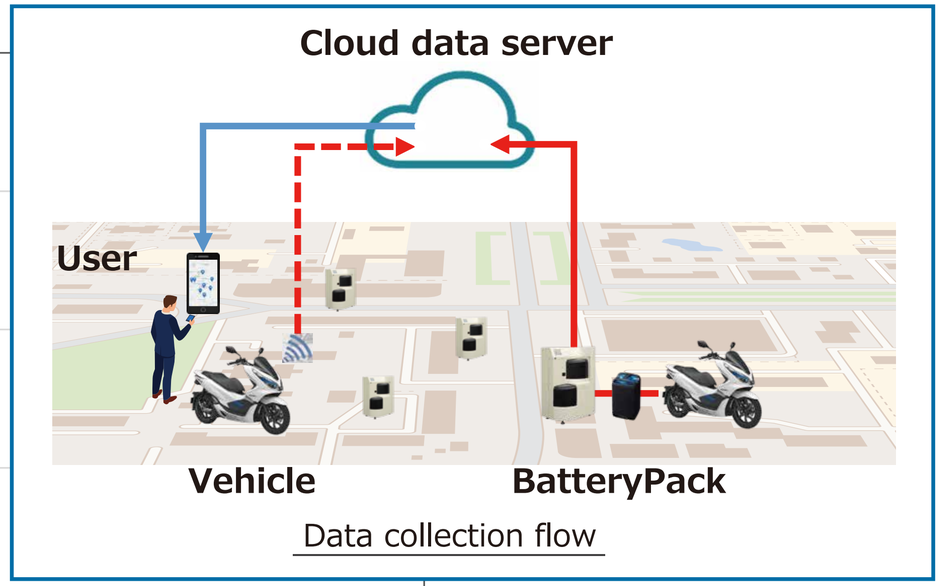
Data analysis

By sharing battery packs, the power consumption as a battery pack is leveled. As a result, it is possible to suppress variations in its deterioration and stabilize quality in the market.

Honda e:TECHNOLOGY



Monthly power consumption distribution in Romblon Island



Data collection flow

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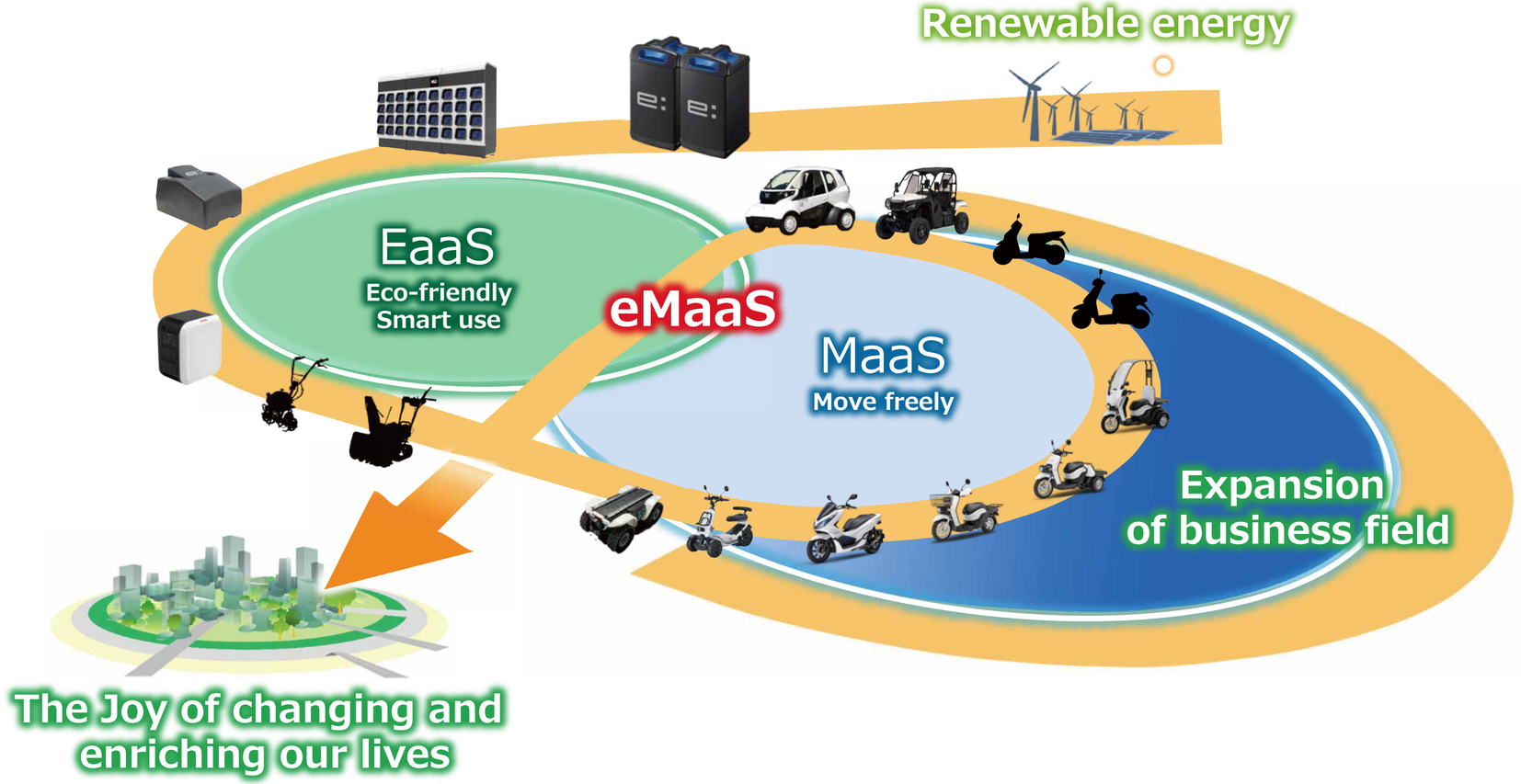
Honda Mobile Power Pack

Business Vision

We make society cleaner and more efficient through electrification by increasing applicable applications in collaboration with partners in various business fields.

Honda e:TECHNOLOGY



Excavation

Transport
Robot

Construction
Machinery

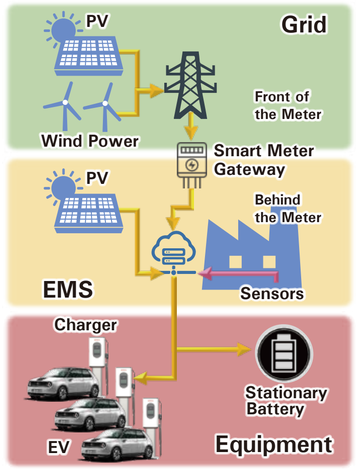
Energy
Cooperation

Honda R&D Europe Energy Management Initiative

Purpose

Develop energy services that make effective use of renewable energies, save energy, reduce energy costs and CO_2 emissions in Europe, which is the world leader in this field.

Concept



R&D Facility and Equipment

Renewable Energy

PV self consumption/ CO_2 Reduction

Grid Stabilization

Peak shaving/ V2G operation

Energy management/ Resource Aggregation

Stabilization /
Energy flow Optimization

・Aggregation system
・EMS

Measurement & Prediction

Big data processing/ analysis/
demand- supply prediction

・Smart meter
・AI / Non-linear analysis
・Deep learning for prediction

Charging Infrastructure

Optimal operation of
e-mobility

・Bi-directional charger
・Fast charger

Power Manager

Energy Storage

Energy storage/
Peak shaving

・2nd life
stationary Battery

※ black:Technology blue:Facility

Demonstrations

PV self consumption Project V1H

Energy management with EVs in customer houses equipped with PVs

Monitor household power consumption and optimize EV charging for maximal use of PV power.

Charging Manager Project V2B

Energy management for Honda R & D Europe facilities and EV commuter vehicles

EV charging optimization by monitoring and predicting of power consumption and PV generation.

V2G service Project V2G

Realization of V2G services using EVs

Research and demo about technologies required on the EV and charger in order to realize V2G services using EVs.

Contribute to carbon neutrality by developing not only electric vehicles
but also energy management services to make effective use of renewable energy sources.

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Honda Electric Road System

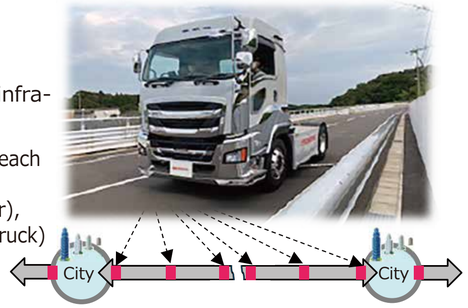
Our Goal

Develop a new technology in traveling and moving (using energy charge and supply technology while driving) with integration of automobiles and road infrastructure, and create a path toward a new mobile society and global environment protection.

Zero Emission While Driving and Infinite EV Cruising Range

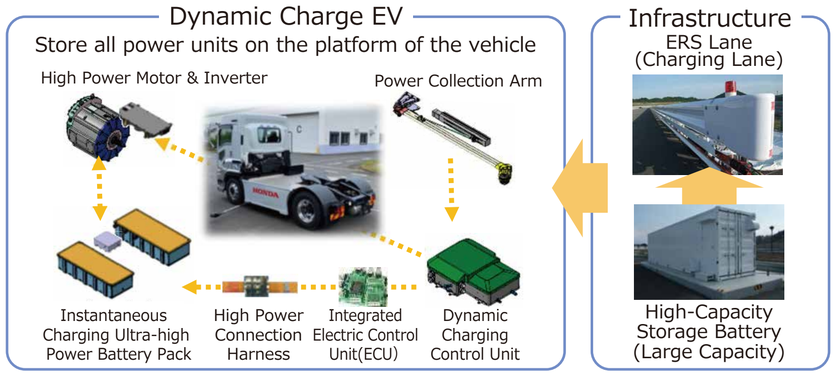
Infinite EV cruising range by intermittently charging while driving

- Applicable on Passenger Car and Heavy-duty truck (sharing the same infra-structure).
- Charging distance of each 50km section: 2.7Km(Passenger Car), 15 km (Heavy-duty truck)



Electric Road System :ERS (Dynamic Charging System)

Total System Development (Develop both vehicles and infrastructure)

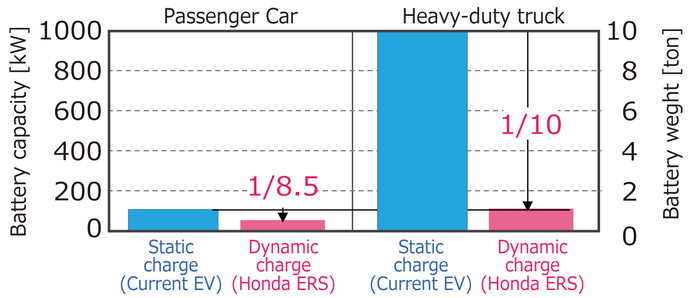


Heavy-duty truck Specifications

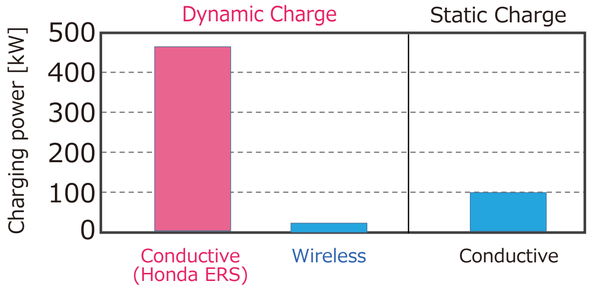
Total vehicle weight		45.29t
Max. load weight		38.04t
Tractor weight		7.25t
Max. Speed (Legal Speed)		80 km/h (Speed Limiter)
Cruising Range		Infinite (km)
Motor	Max. Power	350 kW(476 PS)
	Max. Torque	3,500 N･m
Battery	Battery Capacity	100 kWh(50kWh×2)
	Max. Power Output	DC750 V、600 A
Dynamic Charge	Charging Power	450 kW (DC750 V,600A)
	Vehicle Speed	7(Creep speed)～80 km/h
	Vehicle to Road Distance	0.1 ～1.5 m
	Charging distance (80 km/h while driving)	Charges 15 km (in 50 km section)

Reduction of on-board batteries (One Tenth the Amount)

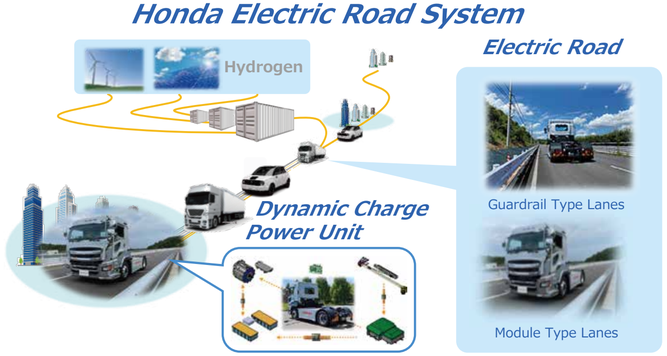
- Battery capacity, Cost, Waste amount : One tenth of Current EV
- Electrification of Heavy-duty truck realizable with same battery capacity as current Passenger EV



Ultra Fast Charging (450 kW)



Expand the Travel Range by Electrification



Leading the mobility evolution by accelerating the logistics of electrification, and developing the world's first, by standard charging system while driving

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