Japan NEDO Project: Collaborative Development of Dynamic Wireless Power Transfer and Energy Management System

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Park City, UT

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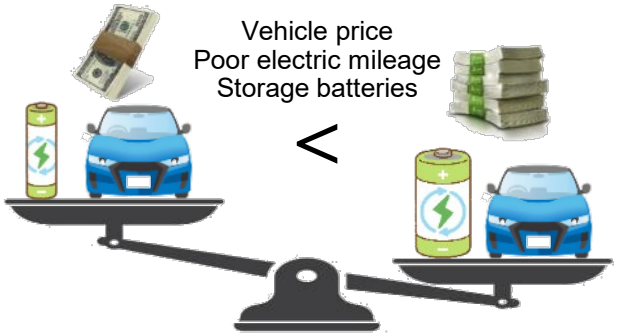
Background and Objectives

Challenges involved in achieving widespread adoption of electric vehicles (EVs)

1.Short cruising range

* This problem could be addressed by increasing the capacities of storage batteries (LIBs), but this could make vehicles more expensive, and the increased weight

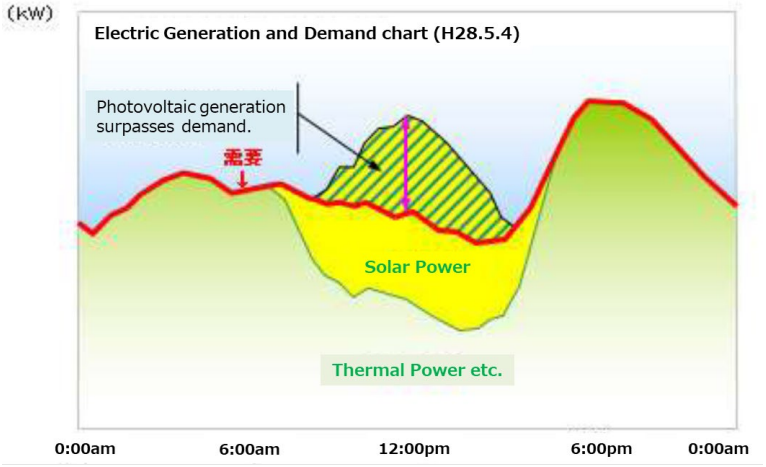


2.Charging is inconvenient

* Charging time takes longer than refueling a gasoline-powered vehicle.
* If the number of electric vehicles increases, we expect there will be traffic jam at public chargers.

3.Effective use of renewable energy

* As solar power generation increases, there are expected to be power surpluses during the daytime, so effective use of renewable energy will be another challenge.



Modified version of figure on the Kyushu Electric Power Company website (https://www.kyuden.co.jp/td_renewable-energy_purchase_control.html)

Advantages of DWPT

* Lower capacity batteries
* Wireless charging (Free drivers from wired charging operation)
* Charging and discharging can be controlled for Evs during the daytime (Effective use of renewable energy and leveling system loads on electricity power)

We have been developing DWPT and EMS through a 5-year NEDO project launched in 2021

(Project Partners) R&D Framework

Technology Development Manager
The Kansai Electric Power Co., Inc.
Masaya Takashima

The Kansai Electric Power Co., Inc.

* Evaluate impact of large-scale deployment of EVs on power supply and demand in urban areas
* Optimize discharging and charging infrastructure design
* Investigate business viability and system preparation

関西電力 power with heart

DAIHEN Corporation

* Ensure system safety
* Dynamic Wireless Power Transfer
* EMS coordination technologies
* DWPT technology infrastructure
* Investigate business viability and system preparation

DAIHEN

Obayashi Corporation

* Road embedding method
* Investigate business viability and system preparation

OBAYASHI

Joint research

Osaka University

* Evaluate impact of large-scale deployment of EVs on power supply and demand
* Optimize discharging and charging infrastructure design

大阪大学 OSAKA UNIVERSITY

Commissioned project

Sumitomo Electric Industries, Ltd.

* Power supply and demand control systems, system coordination technologies for EMS and mobility

SUMITOMO ELECTRIC Connect with Innovation

Joint research

University of Tokyo

* Dynamic Wireless Power Transfer
* DWPT technology infrastructure

東京大学 THE UNIVERSITY OF TOKYO

Joint research

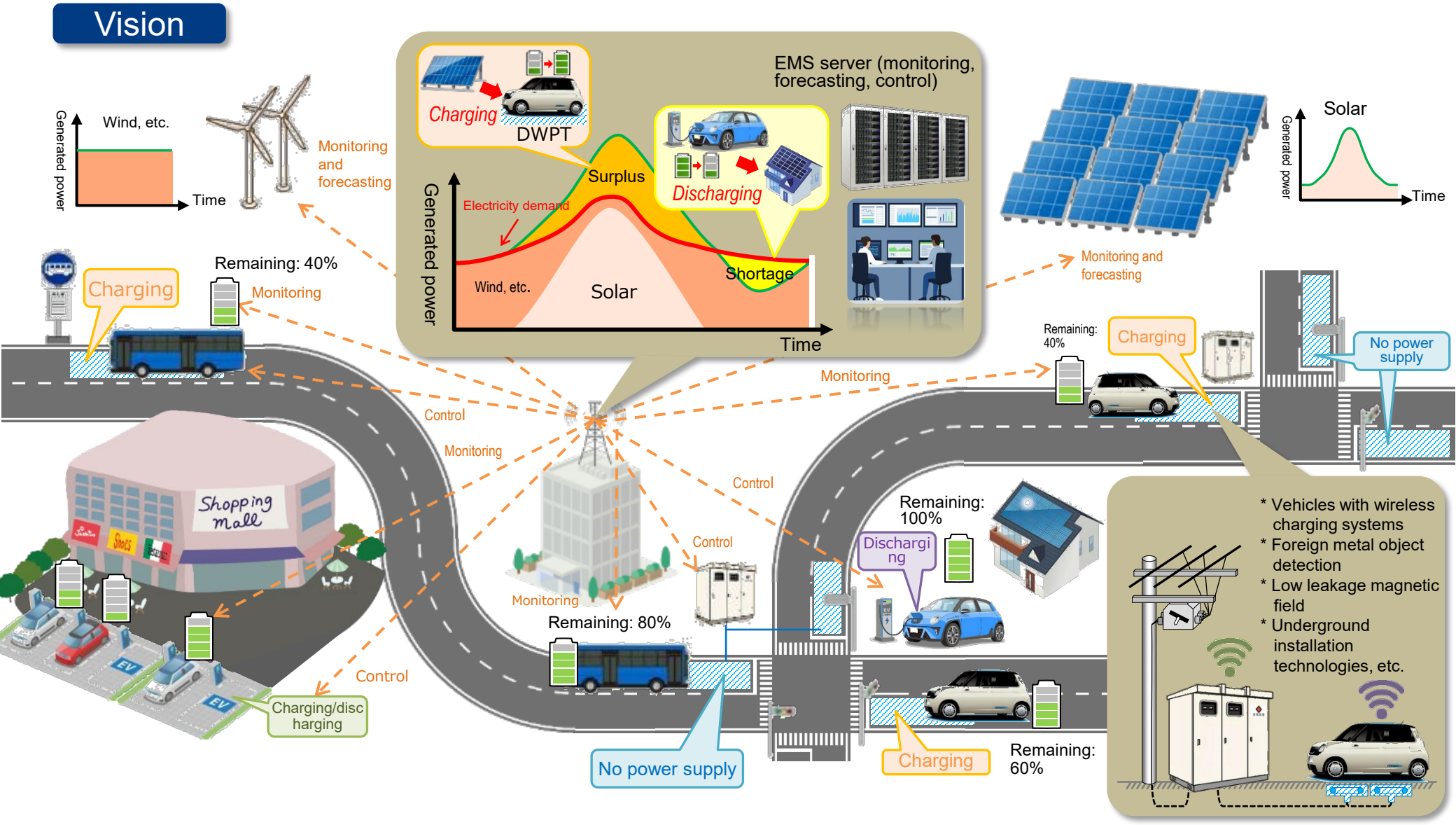
Tokyo University of Science

* DWPT technology infrastructure

東京理科大学 TOKYO UNIVERSITY OF SCIENCE

Overview and Tasks

Vision



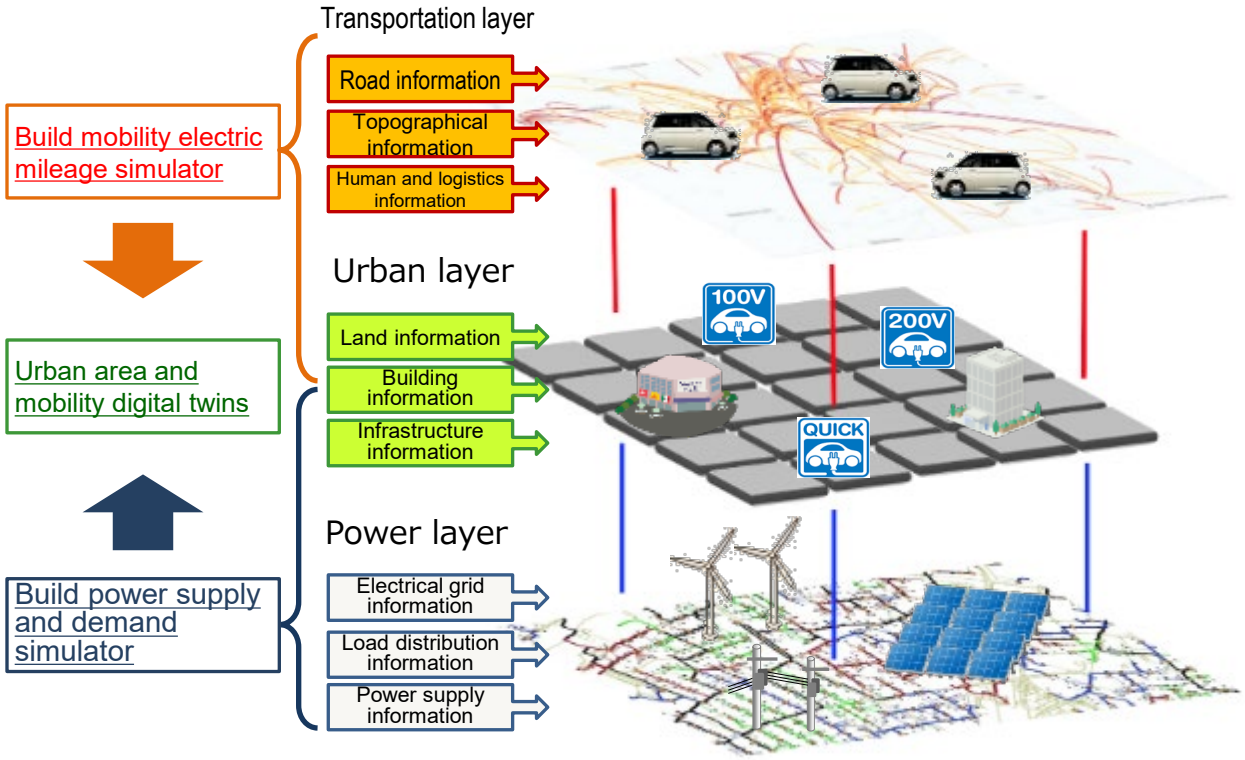
Tasks and Goals of the Project

① The first goal of the project

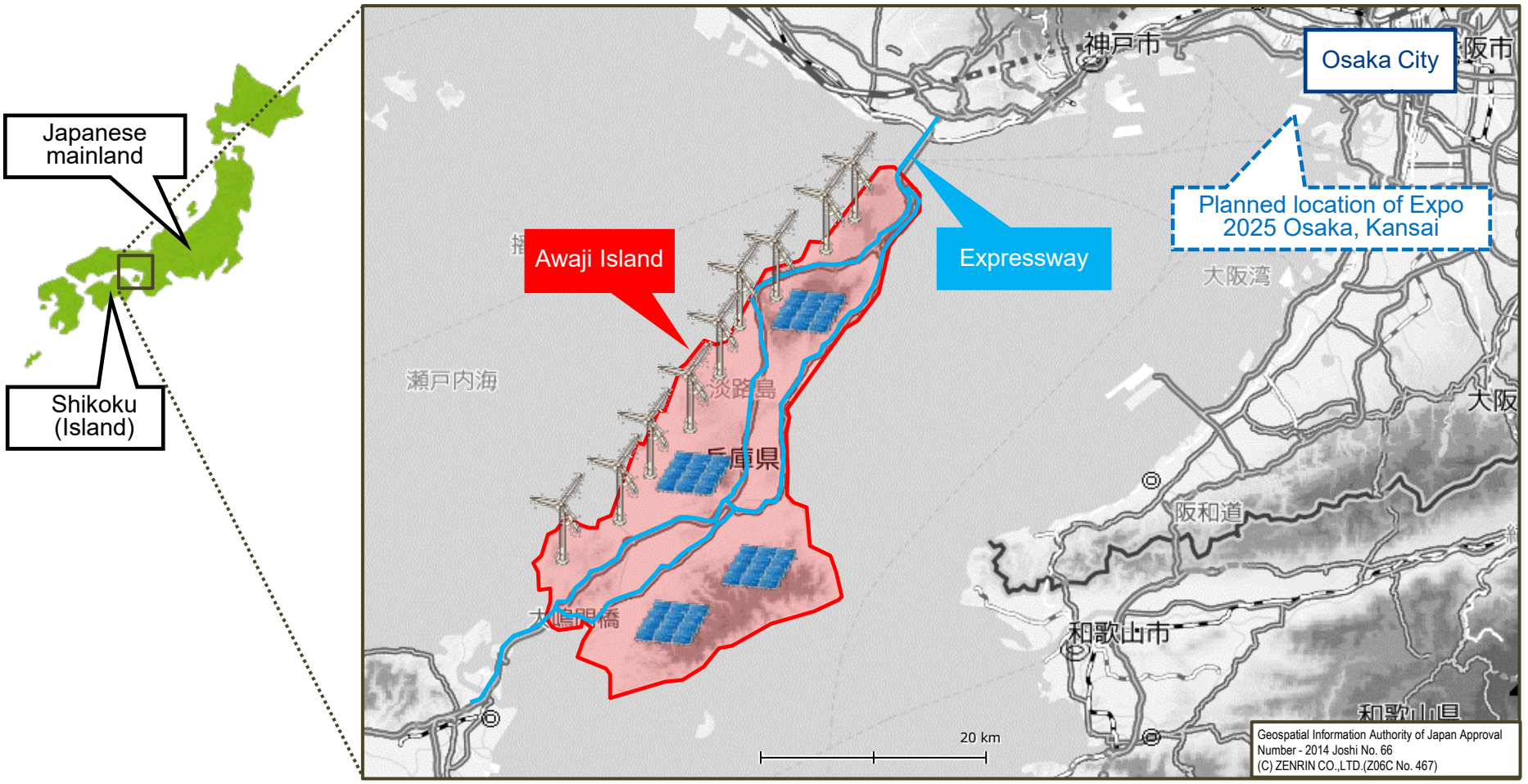
* combine information from 3 different layers of existing area into a single asset, and develop simulation software.
* Use the simulation software to reduce vehicle storage battery, and to examine and evaluate the optimal charger infrastructure plan for the flow of people and logistics.

② The second goal of the project

* Develop EMS that effective use of renewable energy, and a system to link EMS and EVs



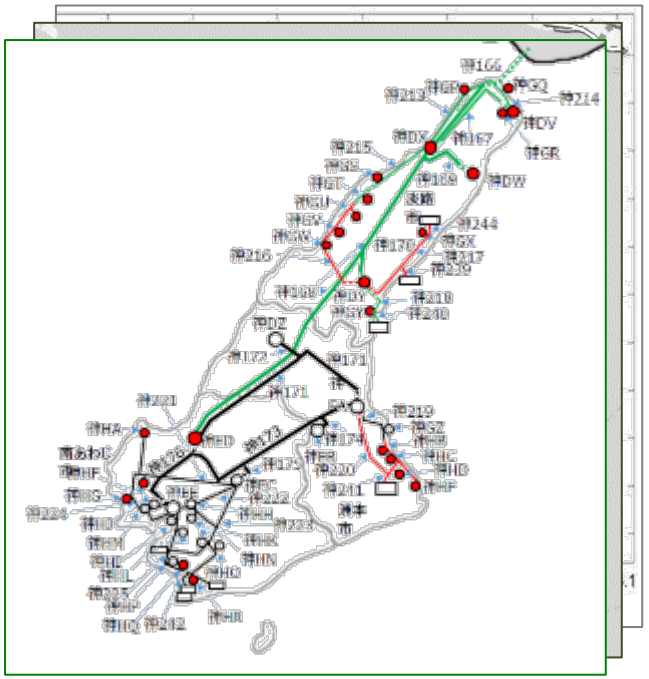
Selection of Actual Region

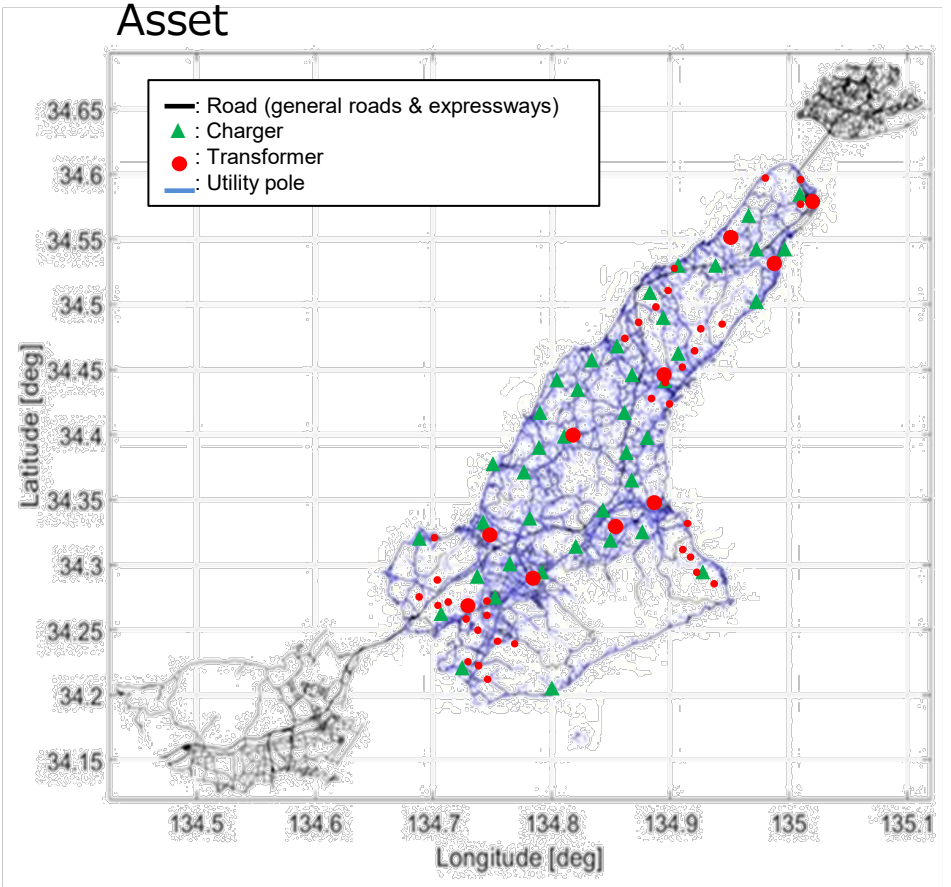


* Awaji Island is located between the Japanese mainland and a large island called Shikoku. They are connected by an expressway, so there is a large flow of vehicles, people, and goods through the region.
* There are many solar power utilizing abundant sunlight and wind power that take advantage of the strong winds of the west coast. During the daytime, renewable energy generation is greater than electricity demand on Awaji Island.

R&D Method (the first goal)

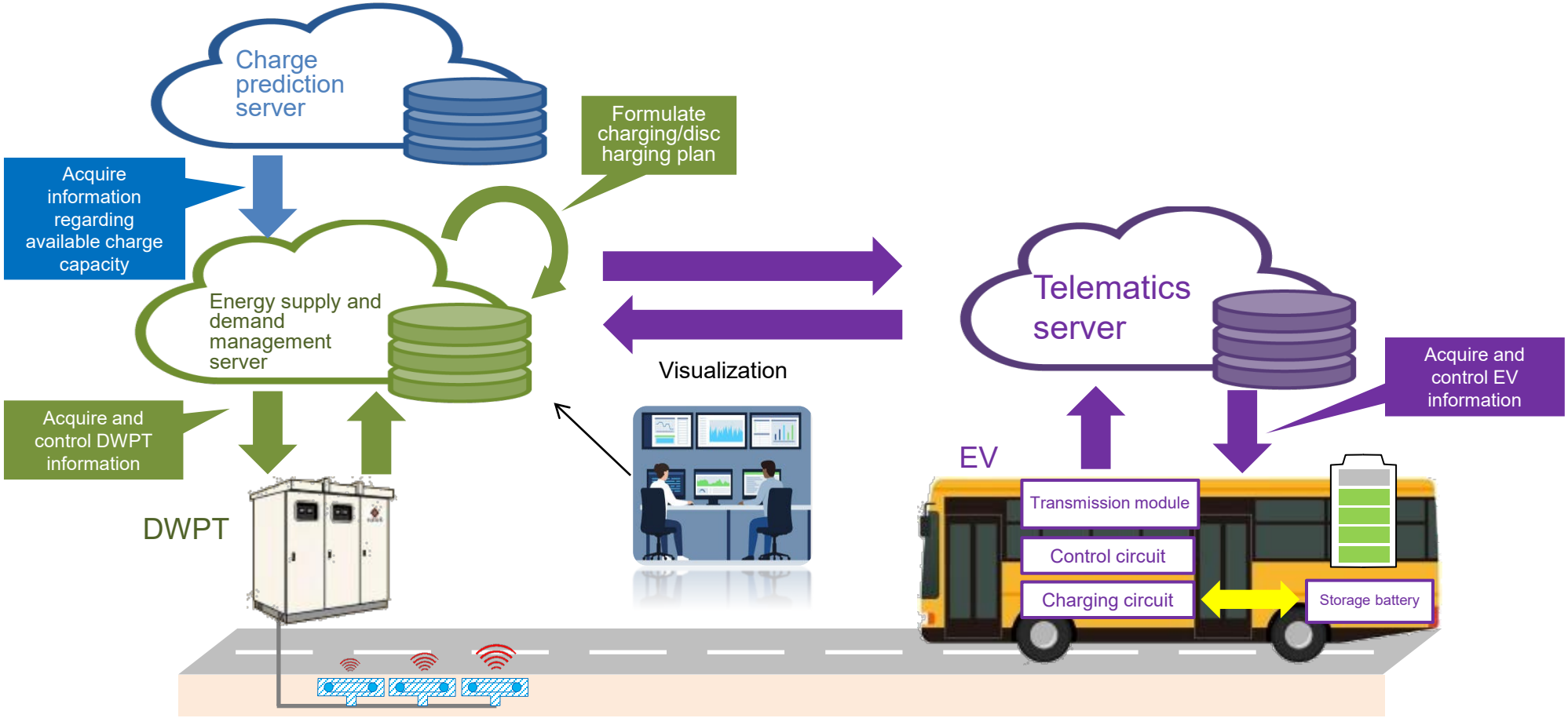
Transportation layer, urban layer, and power layer





* Create an asset from the transportation layer (roads and vehicle movement lines), urban layer (public chargers), and power layer (electrical grid) information of Awaji Island.
* In the future, we plan to expand this asset into virtual simulations in order to design and evaluate optimal charging infrastructure and systems.

R&D Method (the second goal)



* Organize the requirement definitions of the logic to male effective use of renewable energy.
* “Energy supply and demand management server” and “telematics servers” are currently being developed.
* In the future, we plan to test between the servers and actual vehicles.

(Ref.: Expo 2025 Osaka, Kansai demonstration plan)

(Activity outside the scope of this NEDO project)

We plan to demonstrate DWPT and EMS at the Osaka-Kansai Expo in 2025.

Reference: Japan Association for the 2025 World Exposition Basic Plan Ref. 2022-12-15.