



University of Tokyo, Toyota and TRENDE to Launch Testing of Next-Generation Electricity System

23 May 2019

The University of Tokyo, Toyota Motor Corporation and TRENDE Inc are to conduct joint testing of a next-generation electricity system (P2P – peer-to-peer – electricity transactions) that enables homes, businesses and electrified vehicles connected to the power grid to trade electricity using blockchain¹. The test programme will begin on 17 June at Toyota's Higashifuji Technical Center and the surrounding area in Japan.

As distributed power supplies such as solar panels, secondary batteries and electrified vehicles become more widespread, Japan's electricity supply has entered a transitional phase, shifting from a traditional, large-scale, consolidated system to a distributed system in which individuals and businesses own their own power supply. The objective of the new test is to verify the economic advantage of having "prosumers" – electricity consumers who are also energy producers using self-owned generating equipment, and who trade electricity with consumers via an exchange market, at prices that reflect supply and demand conditions. It will also assess the feasibility of a two-way, self-autonomous electricity supply system that allows direct trading with other prosumers.

Specific steps will include setting up an electricity exchange that can be accessed by households and businesses participating in the test, and the installation of an AI-powered electricity management system – an electricity trading agent – that enables direct trading with other prosumers. The agent places orders to buy and sell electricity according to power consumption and forecasts of the electricity that will be generated by households' and businesses' solar panels. Transactions between individuals take place using a defined algorithm that matches buy and sell orders collected in the exchange from each household and business.

This the world's first test² of electricity trading between individuals that incorporates plug-in hybrid vehicles (PHEVs) as a distributed power supply, in addition to solar panels and secondary batteries. The test aims to verify the economic advantage of having electricity consumers and prosumers trade electricity through market transactions. It will also simulate electricity consignment fees based on distance³, and verify an algorithm for predicting the electricity demand of electrified vehicles, which have varying consumption levels depending on their cruising range.

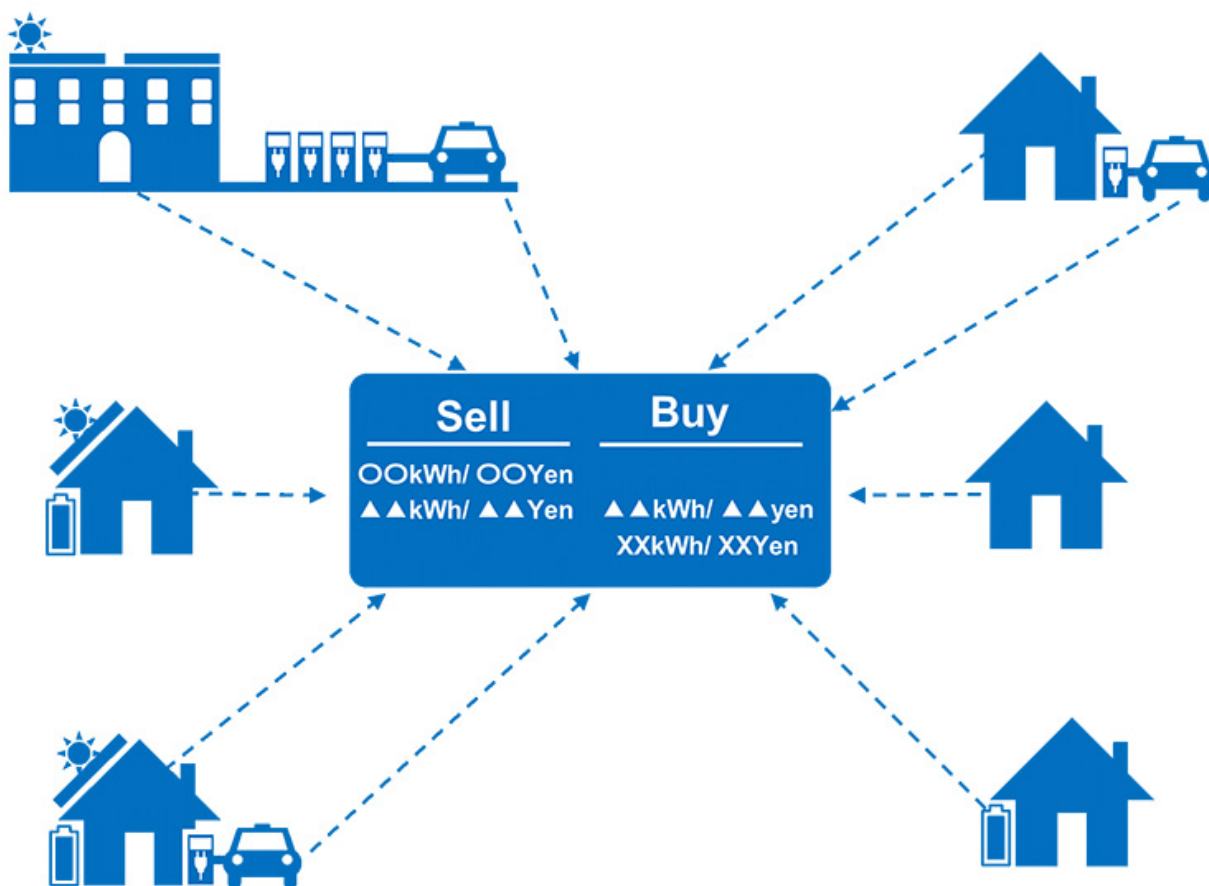
Test overview

Purpose of test	Minimise electricity bills through P2P electricity transactions and verify feasibility as an electricity supply system.
Test duration	17 June 2019 to May 2020 (tentative date).
Test location	Toyota's Higashifuji Technical Centre and the surrounding area.
Test participants	General households: electricity consumers (both people who do and don't own PHEVs); prosumers including owners of any combination of solar panels with secondary batteries and/or PHEVs. Business locations: featuring solar panels and PHEV charging points.
Electricity pricing	Pricing will vary according to supply and demand volume.
Role of each party in the test	The University of Tokyo: establish an electricity exchange and start an electricity trading agent for business use. Toyota: start an electricity agent for business use. TRENDE: start an electricity agent for household use.

Concept diagrams

1. Bidding information from each household, business and PHEV is consolidated at the electricity exchange.

-----> Bidding information

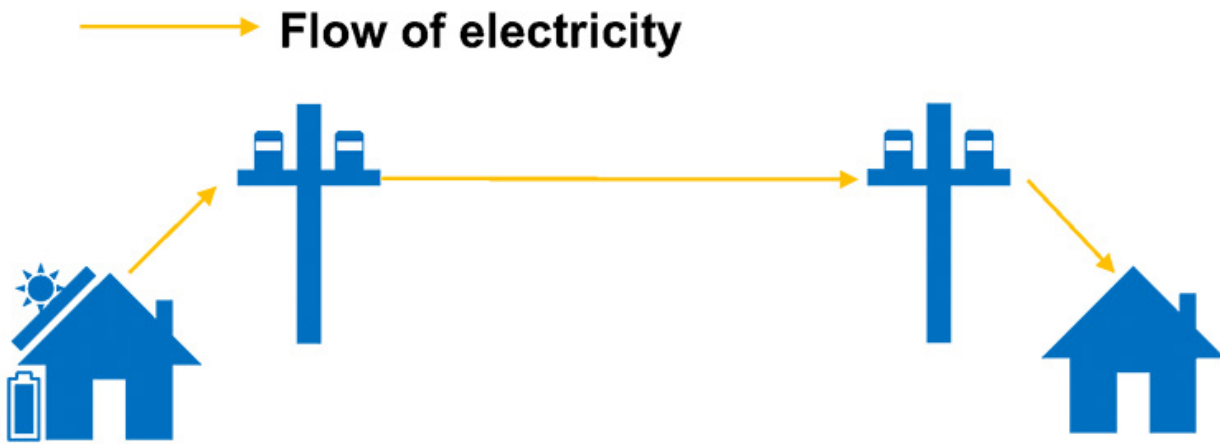


1. The electricity exchange completes transactions by matching buy and sell conditions.

-----> **Bidding information**
 Completed transaction



1. The traded electricity is delivered over the power distribution and transmission grid, according to the completed transaction.



¹ Blockchain, also known as distributed ledger technology, is used to build inexpensive databases in which all network participants share the ledger information, in order to make it resistant to unauthorised modification.

² As of 23 May 2019. Research conducted by TRENDE.

³ This is a scheme for varying electricity consignment fees, based on the length of electricity transmission and distribution distance.

ENDS