

## Japan: Pal Town Josai-no-Mori

### BIODATA

<b>PV community name:</b>	Pal Town Josai-no-Mori
<b>Kind of urban area:</b>	Residential – urban
<b>Main building type in community:</b>	Houses - single houses
<b>New/Retrofit/Added:</b>	New district/community – building integration
<b>Type of project:</b>	Demonstration project
<b>Start of operation:</b>	Year 2004(completed in 2006)
<b>City, state, etc.:</b>	Ota, Gunma
<b>Country:</b>	Japan
<b>Latitude:</b>	N36 18' 32"
<b>Longitude:</b>	E139 20' 6"

### PV SYSTEM CHATACTERISTICS

<b>Total PV power:</b>	2 160 kW
<b>Number of houses/buildings:</b>	553 houses
<b>PV power per unit:</b>	2,6 – 5,0 kW/house (averaged power: 3,85 kW/house)
<b>Energy yield per year:</b>	PV Output is controlled by energy management system under R&D planning.
<b>Main PV system type:</b>	Grid-connected - demand side
<b>Main PV application type:</b>	Inclined roof – mounted & Flat roof – mounted
<b>Main PV module type:</b>	Framed regular module
<b>Main PV cell type:</b>	Crystalline silicon
<b>PV module manufacturer/brand:</b>	SANYO Electric Co., Ltd., Kyocera corporation, Sharp corporation, Mitsubishi Electric corporation & Matsushita Ecology Systems Co., Ltd.
<b>Inverter manufacturer/brand:</b>	SANYO Electric Co., Ltd., Kyocera corporation, Sharp corporation, Mitsubishi Electric corporation, Mitsubishi Heavy Industries, Ltd., Matsushita Ecology Systems Co., Ltd.(trial product)
<b>Investment for PV systems:</b>	-

### OWNERSHIP

<b>Building owner:</b>	Inhabitant
<b>PV owner:</b>	NEDO
<b>PV energy user:</b>	Inhabitant



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## PV COMMUNITY DESCRIPTION

### PV Community Brief

A large number of PV systems have been installed on the roofs of houses in the new "Pal Town Josai-no-Mori" residential complex in Ota City, Gunma Prefecture, as a demonstrative research project commissioned by NEDO, and all PV systems have been connected to the power grid as a cluster.

This demonstrative research aims to evaluate performances and capabilities of the PV systems, examine their negative influence on distribution lines, and develop the technology to resolve potential issues. The number of PV systems to be installed in this project eventually reached to 553 houses and total capacity is 2 310kW, one of the world's largest residential clustered PV systems connected to a single distribution line. The project is being implemented with the cooperation of Tokyo Electric Power Co., Ltd. in addition to the R&D consortium organized by project companies, etc. (see below; "Community information")

### Grid issue

In order to promote the introduction of PV systems smoothly and in a reasonable manner, this project aims to develop the generalized technology, which will prevent the suppression of clustered PV system's output caused by the excess voltage on the distribution system, and to demonstrate their effectiveness using actual installed clustered PV systems.

Along with these aims, following technologies are demonstrated from viewpoints of grid issues.

#### <Output suppression avoidance system>

Generated output power will be used for house load in residential PV systems and surplus power will be supplied to the power grid. The voltage in the distribution line rises with increasing surplus output power and the voltage sometimes exceeds the operational range. PV systems have a built-in function to reduce its output when the voltage reaches the upper limit of the operational range to prevent over voltage. However, this phenomenon may occur frequently in clustered PV systems and the suppression of the output may lower the system efficiency significantly. To solve this problem, this project is tasked to develop an "output suppression avoidance system" which uses a battery as energy storage. Surplus power, which may be suppressed in conventional systems, will be stored in the battery. This output suppression avoidance system will allow PV systems to generate their maximum output power even when they are clustered.

#### <Centralized control system>

A centralized control system that will collectively control PV systems based on data such as the amount of power generated by the PV systems, the amount of battery charge/discharge, and the amount of power consumed, will be developed. It is expected that such centralized control will improve the overall efficiency of the area where PV systems are clustered and enhance the performance significantly. Furthermore obtained data will also be utilized for diagnosing battery life and facilitate early detection of system malfunction.

#### <New type islanding protection system>

The residential PV system features a built-in function for detecting islanding. The function is designed to prevent the occurrence of accidents resulting in injuries or death as well as equipment malfunctions by instantaneously halting PV system power generation during blackout. However, the use of a conventional islanding protection system in clustered PV systems may result in failure of islanding detection or unnecessary cut off. To avoid the failure of islanding protection in clustered PV systems, a new type islanding protection system will be developed. The new type islanding protection system will be able to shut off rapidly and securely in the event of distribution system power failure, and during normal operation, will ensure they remain free of malfunctions.

### Urban planning and architectural issues

To implement a demonstrative research project on clustered PV systems, NEDO held a competition of project proposals. Ota city submitted their proposals and it was adopted. Although Ota city had had their original plan of developing residential community without installing PV systems, they changed the plan for applying the competition and this PV community was realized.

### Economic / financial issues

A net-metering scheme was applied so that surplus PV is traded between the inhabitant and the utility company, at the same price of the residential electric tariff. A cost of PV systems is paid by NEDO, and the PV systems are owned by NEDO during the demonstration period.

### Other remarks

Reversed power flow from battery system is prohibited.

## COMMUNITY INFORMATION

**Project leader company:** Kandenko Co., Ltd. & NEDO

**Other project company:** Meidensha Corporation, Electric Power Engineering Systems Co., Ltd., Shin-Kobe Electric Machinery Co., Ltd., Matsushita Ecology Systems Co., Ltd., OMRON Corporation, Tokyo University of Agriculture and Technology, Nihon University & Ota City Office

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