

## **Demonstration Project of India's First Micro Substation With Power Voltage Transformer (PVT)**

— Establishing technology to achieve stable power supply for areas without a power grid—

Nissin Electric Co., Ltd. will commence a demonstration project to supply power from India's first Micro Substation with Power Voltage Transformer (PVT), as part of the International Demonstration Project on Japan's Energy Efficiency Technologies, publicly solicited by the New Energy and Industrial Technology Development Organization (NEDO).

To start the project, Nissin Electric signed a Project Agreement (PA) on August 21<sup>st</sup>, 2024 with Tata Power Delhi Distribution Limited, a power distribution company in Delhi, and a subsidiary of Tata Power.



Contract Signing Ceremony

### **[ Overview ]**

In India, "24x7 Power for All" has been adopted as the main power-related policy, aiming to supply power to all regions 24 hours a day and 365 days a year. However, in North and Northeast India, there are many areas where transmission lines have been installed but a power grid has not yet been developed or is vulnerable. Mini grids that utilize diesel generators are utilized in such areas, but air pollution caused by fossil fuel consumption has become a social problem.

This demonstration project will make it possible to supply power to the surrounding areas by constructing Micro Substation with PVT—a voltage transformer designed with a large capacity to supply power—so as to obtain low voltage directly from extra high-voltage power transmission lines.

Power that through power transmission lines is usually very high voltage, making it necessary to build large substations to step down the voltage in stages using transformers.

In this connection, a Power voltage transformer (PVT) is used to convert high voltage to low voltage for measurement purposes. For the construction of a large substation, it is necessary to provide a budget and a large installation space required for the installation of large-scale equipment. In addition, multiple conversions will result in more losses. PVT is a device that directly converts extra high voltage to low voltage. Its introduction has been promoted primarily at domestic power plants in line with the spread of renewable energy in recent years. Utilizing the technology that the company has accumulated over many years of working on a wide range of voltage classes of equipment, Nissin Electric has developed new PVT for the demonstration project to suit India's power environment.

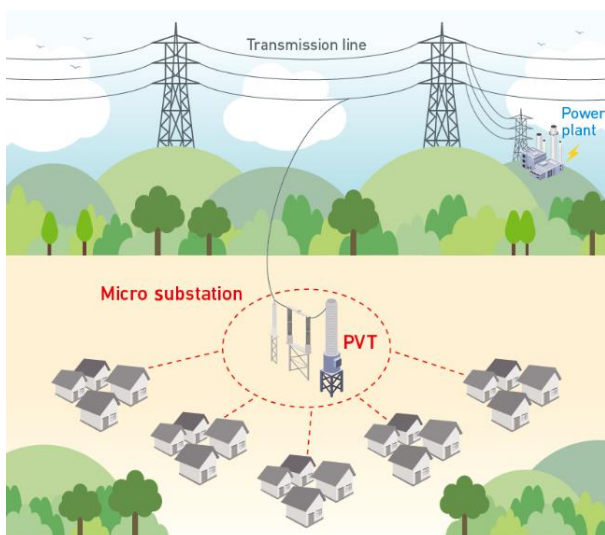
The goal of the project is to supply cost effective & stable power to remote areas across India, where transmission lines are installed but the power grid is not yet fully developed, or non-electrified areas, by installing micro substations, without the need to build large-scale substations, and while being environmentally friendly.

**[ Plan ]**

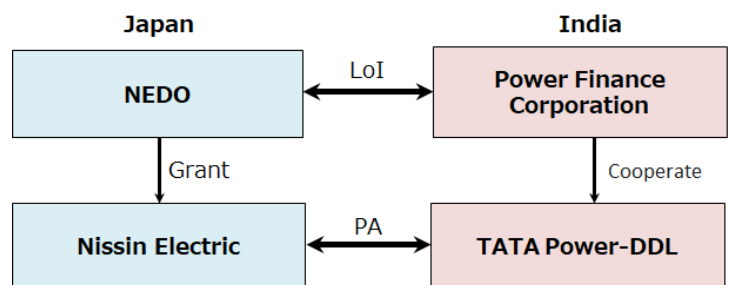
Nissin Electric has been conducting a feasibility study along with Tata Power-DDL on this project since FY2018 and has been working on the project since FY2020 with the support of NEDO. Development of the demonstration PVT is scheduled to be completed in October 2024. The period of this demonstration project is scheduled to run until FY2025. After installing and testing the equipment at a substation on the outskirts of Delhi, the company will start demonstration operations in March 2025 and conduct operating status analysis and evaluation until March 2026. This is the first demonstration project of Micro Substation with PVT in India.

Using acquired data, Nissin Electric, along with Tata Power-DDL will verify environmental compliance, the reliability of power supply, the effectiveness of power quality, and the local load characteristics. In addition, the company will establish a technology to supply stable power to areas where a power grid is not yet developed or non-electrified areas. Also, the company will expand these technologies to other regions in India possibly with Tata Power-DDL and other countries facing similar issues.

Prior to the start of the project, NEDO signed a letter of intent (LoI) with Power Finance Corporation Limited, which is a leading Non-Banking Financial Corporation under administrative control of India’s Ministry of Power, on January 10 of this year regarding a demonstration project to supply power through a micro substation. After a PA is concluded between Nissin Electric and Tata Power-DDL, Nissin Electric will start a project to construct Micro Substation with PVT at a substation operated by Tata Power-DDL on the outskirts of Delhi to directly convert power from extra-high-voltage power transmission lines to low-voltage power and supply it to the surrounding areas.



The image of a micro substation using a power voltage transformer (PVT)



Project organization chart

**[ Details of the demonstration project ]**

In this project, Nissin Electric will apply its transformer technology to micro substations and verify the substations that enable the direct receiving of low-voltage power (240V) from extra high-voltage power transmission lines (66 kV or higher) by using large-capacity PVT for power supply.

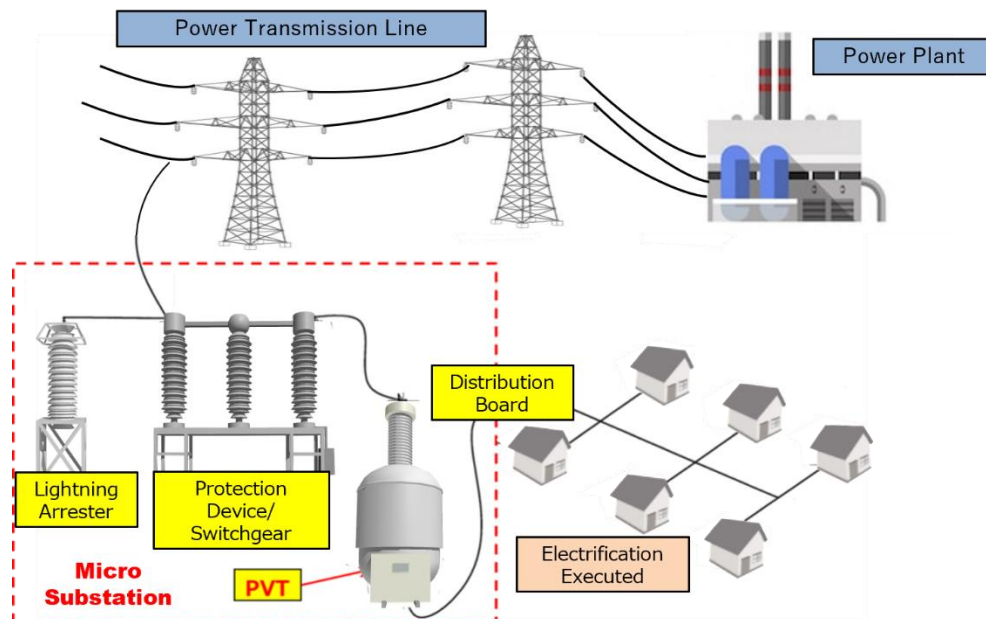


Image of power supply by Micro Substation with PVT

A micro substation consists of protective devices, switchgear, lightning arresters, and distribution board, as well as a PVT. PVT makes it possible to acquire low-voltage power of about 100 kVA (assumed to be able to supply 50 to 100 households per substation) directly from transmission lines without installing a conventional large-scale distribution substation.

In addition, since it can be operated only with stationary devices, it has a simple configuration and high reliability, and has the following advantages over a conventional substation or a power supply system using a diesel generator.

- (1) Low cost of Operation: Since refueling and frequent maintenance of a generator are not required, running costs can be reduced.
- (2) Space saving: It can be installed in a smaller space than conventional substations.
- (3) Low environmental burden: A significant CO<sub>2</sub> reduction (about 45%) can be achieved compared to a diesel generator.

Comparison of systems assuming power supply to small-scale demand in areas without a power grid

	Micro Substation	Conventional substation	Diesel generator
Equipment cost	○Medium	△High	◎Low
Operating cost	◎Low	◎Low	△High
Space	◎Small	△Large	◎Small
Environmental burden	◎Low	◎Low	△High

\* Evaluated by Nissin Electric



Developed demonstration PVT

This is a business activity that contributes to one of the six growth strategies in the Nissin Electric Group Medium-to-Long-Term Business Plan VISION2025, “Increasing environmental awareness in emerging countries.”

The Nissin Electric Group has been stepping up its efforts to promote the SDGs through its business operations. This accomplishment is related to the following goals among the 17 SDGs.

- 7. Affordable and Clean Energy
- 9. Industry, Innovation and Infrastructure

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**[Notes]**

- Growth strategies  
“Environmentally friendly products” “Distributed energy” “Renewable energy” “Adoption of DX” “Increasing environmental awareness in emerging countries” “Expansion of EVs”
- Power Voltage Transformer (PVT)  
A voltage transformer that can supply power by directly converting extra high voltage to low voltage by applying transformer technology used to convert extra high voltage to low voltage for the measurement of high AC voltage.
- Extra high voltage  
A voltage exceeding 7 kV (7,000 V); high voltage refers to 750 V to 7,000 V DC and 600 V to 7,000 V AC, while low voltage refers to 750 V DC or less and 600 V AC or less (as per Japan regulation).
- Micro Substation with PVT  
A substation that directly obtains low-voltage power of about 10 kVA to 100 kVA from extra-high-voltage transmission lines of 66 kV or more by using PVT, which applies voltage measurement transformer technology, with increased capacity for power supply.
- Stationary device  
A general term for power equipment that does not have moving parts, such as voltage and other transformers, switchgear control devices.
- Rural area  
An area away from urban areas.