NEDO's International Activities
- Examples of Supported Projects -

Renewable Energy/International Activities/Demonstration

International Projects Supported by NEDO

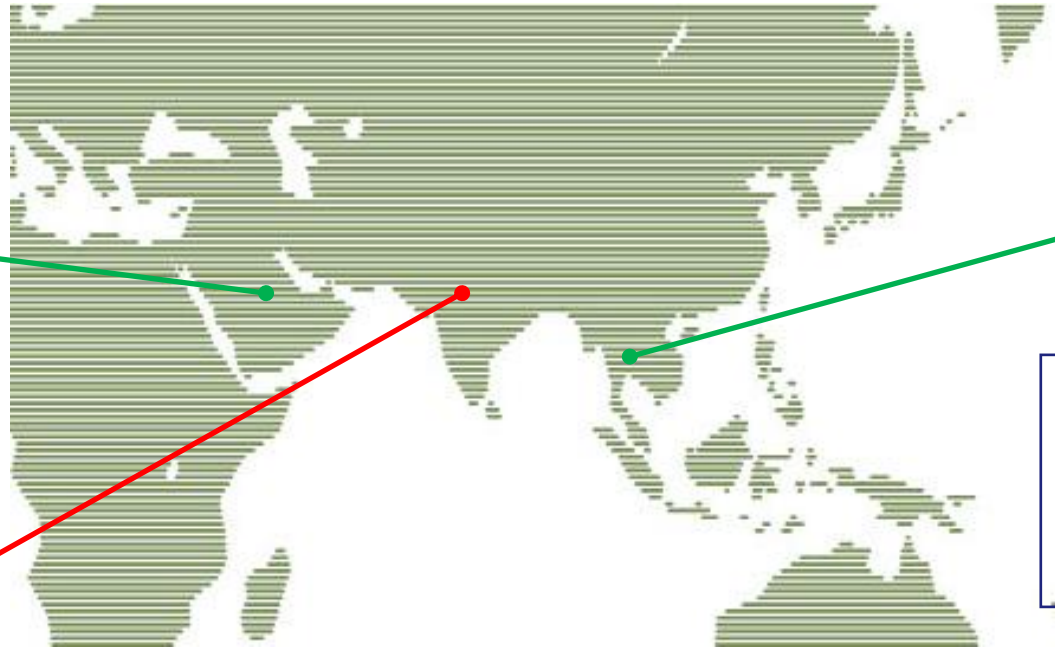
Aiming for global deployment of Japan's advanced technologies, with overseas trials feeding back benefits to Japan.

Saudi Arabia
Energy Management

Wind and solar power with batteries controlled by EMS

India
Micro Substation

Micro substation using PVT in areas without distribution networks



Thailand
Transmission System Optimization

OPENVQ

Optimize voltage and reactive power to reduce transmission loss and lower emissions

- International Demonstration Project on Japan's Technologies for Decarbonization and Energy Transition
- Program to Facilitate Overseas Promotion of Low Carbon Technology Through the Joint Crediting Mechanism (JCM)

NEDO Project International Activities

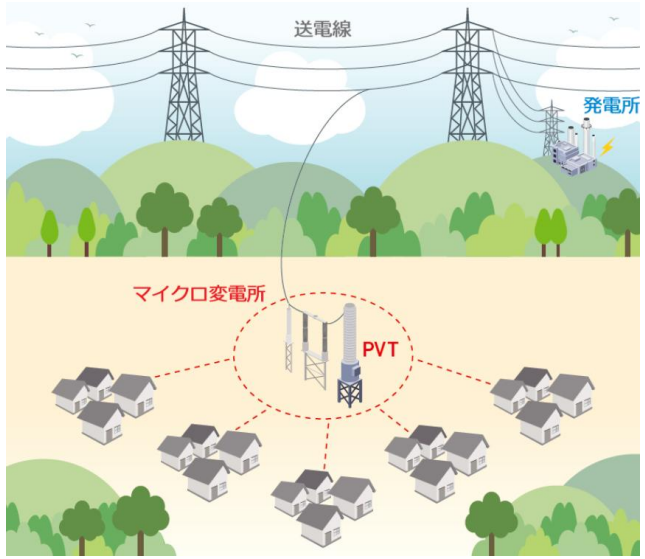
Contact Information
Energy System Unit, Renewable Energy Department
https://www.nedo.go.jp/english/activities/international.html

Project Highlight #1
Demonstration of Micro Substation in India

Micro Substation/PVT/Rural Electrification

Project Overview

A micro substation utilizing a power voltage transformer (PVT) has been installed at a substation on the outskirts of Delhi. It converts power from the extra-high voltage transmission line to a lower voltage, providing stable electricity to the surrounding area.



How a micro substation with a PVT works

PVT (66 kV, 100 kVA)

Challenges and Solutions in India

- Vulnerable rural distribution grids

  India's "24x7 Power for All" policy aims to supply electricity to every region in the country 24 hours a day, 365 days a year. However, north and northeast India have many areas where the power grid is underdeveloped or vulnerable even though transmission lines have been installed.

- Air pollution from diesel generators

  Rural areas employ mini grids powered by diesel generators, but increased fossil fuel consumption leads to air pollution, a major concern for society.

Solution: power supply through a micro substation with PVT

By equipping micro substations with PVTs, stable and affordable electricity is possible even in areas with underdeveloped distribution networks and unelectrified regions. The need to construct large-scale substations is also avoided. Such micro substations are simple and highly reliable, and can supply stable power to 50 to 100 households.

NEDO Project

International Demonstration Project on Japan's Technologies for Decarbonization and Energy Transition, Demonstration Research on Micro Substations to Realize Power Supply With Low Environmental Impact in Areas With Underdeveloped Power Distribution Networks

Contact Information

Energy System Unit, Renewable Energy Department
https://www.nedo.go.jp/english/activities/activities_AT1_00175.html

Project Highlight #1
Demonstration of Micro Substation in India

Micro Substation/PVT/Rural Electrification

Project Features

Micro substations have many advantages over a conventional substation or a power supply system that uses a diesel generator.

Comparison of Power Supply System Characteristics

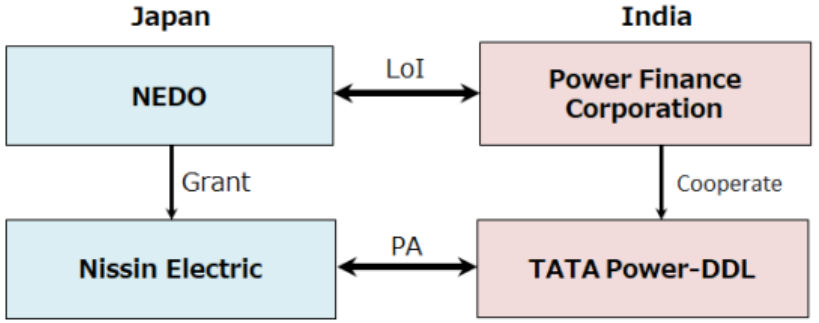
	Micro Substation	Conventional Substation	Diesel Generator
Equipment cost	★★ Mid-range	★ Expensive	★★★ Cheap
Operation cost	★★★ Cheap	★★★ Cheap	★ Expensive
Installation space	★★★ Small	★ Large	★★★ Small
CO_2 emissions	192 ton-CO_2/year	—	569 ton-CO_2/year
Output capacity	★ 100 kVA	★★★ 20 MVA	★ A few hundred kVA

Comparison is based on 100kVA equipment.
Calculated assuming 24/7 power supply for an average load of 50kW over 365 days.

This demonstration project will allow 240V low-voltage power to be obtained directly from a 66 kV extra-high voltage transmission line. Its effectiveness, including compliance with local regulations and power supply quality, will then be analyzed.

Project Structure and Timeline

In January 2024, NEDO signed a letter of intent with Power Finance Corporation Limited, a leading Non-Banking Financial Company under administrative control of India's Ministry of Power. Project implementer Nissin Electric signed a project agreement with TATA Power-DDL, a local distribution company, in August 2024.



2023
2024
2025

- NEDO/PFC sign agreement (LoI)
- Nissin Electric/Tata Power-DDL sign contract (PA) laying out details of design, orders, on-site delivery, on-site foundation work
- Completion of installation and wiring work, initial performance evaluation, start of demonstration operation
- Data collection and analysis, verification of equipment functionality, promotion of use → Demonstration project complete

NEDO Project
International Demonstration Project on Japan's Technologies for Decarbonization and Energy Transition, Demonstration Research on Micro Substations to Realize Power Supply With Low Environmental Impact in Areas With Underdeveloped Power Distribution Networks

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Project Highlight #1
Demonstration of Micro Substation in India

Micro Substation/PVT/Rural Electrification

Progress and Future Outlook

Micro substation with a PVT

Opening ceremony held on June 18, 2025

Construction wrapped up and the operation of a micro substation at the TATA Power-DDL substation site in New Delhi has commenced. A ceremony was held to mark the occasion, attended by stakeholders from Japan and India.

Currently supplying power to the surrounding area

40 households in the vicinity are receiving electricity from the micro substation. Operational data is measured continuously, and power quality is being analyzed and evaluated based on this data.

Encouraging the use of the technology

Nissin Electric plans to expand the use of this technology to other regions in India and other countries facing similar issues.

NEDO Project

International Demonstration Project on Japan's Technologies for Decarbonization and Energy Transition, Demonstration Research on Micro Substations to Realize Power Supply With Low Environmental Impact in Areas With Underdeveloped Power Distribution Networks

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Project Highlight #2
Demonstration Project on Energy Management in Saudi Arabia

Storage Battery/EMS/Effective Utilization of Renewable Energy

Project Overview

This demonstration project aims to develop a hybrid renewable energy power system consisting of photovoltaics, a wind power generator, battery energy storage systems (BESS), and an energy management system (EMS). The project launched in Huraymila in the Riyadh Region of the Kingdom of Saudi Arabia in June 2025.

Demonstration site (image)

Background and Challenges in Saudi Arabia

- Initiatives Toward Renewable Energy

  The national strategy “Saudi Vision 2030” includes key energy-sector targets:
  - 50% renewable energy share
  - 58.7 GW of installed renewable energy capacity (40 GW from photovoltaics, 16 GW from wind power)

  A significant expansion in renewable energy deployment is expected in the coming years.

- Hurdles to Overcome in Saudi Arabia

  1. *Increased renewable energy penetration comes with challenges*

     As large amounts of weather-dependent renewable energy sources are introduced, the grid will face rapid, steep fluctuations in power output, increasing difficulty in maintaining supply–demand balance, and potential surplus renewable energy during low-load periods, all of which lead to reduced energy utilization efficiency.
  2. *Overloading of distribution substations*

     Due to the country's rapid economic growth, electricity demand is rising sharply. Preliminary studies conducted prior to this demonstration revealed that approximately 9% of distribution substations are already experiencing overloading issues.

NEDO Project

Program to Facilitate Overseas Promotion of Low Carbon Technology Through the Joint Crediting Mechanism (JCM), Demonstration Project for Hybrid Renewable Energy Management System Using Storage Batteries at Huraymila, Saudi Arabia

Contact Information

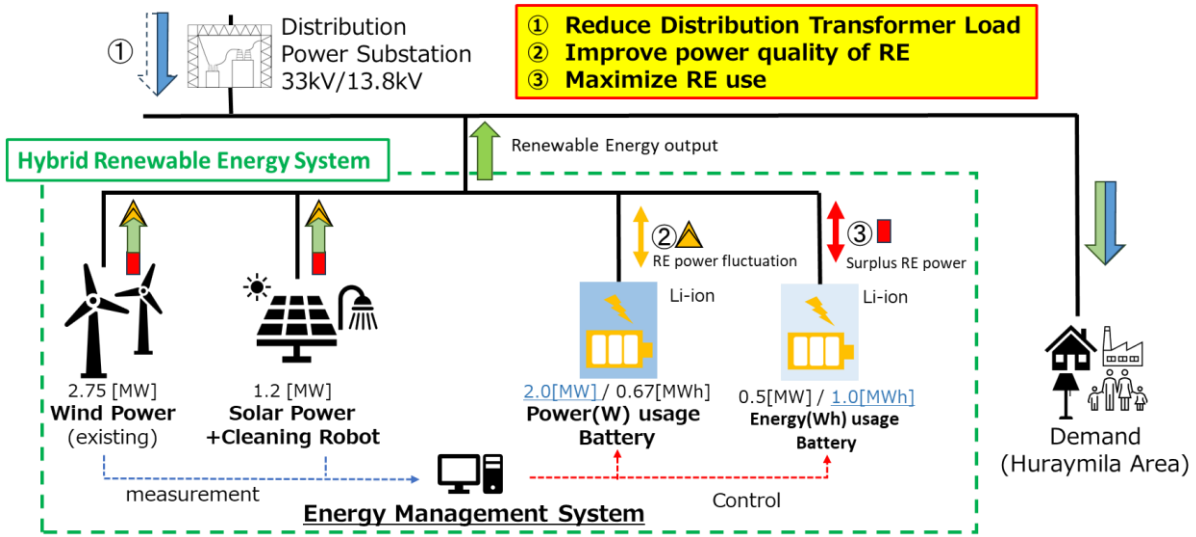
Energy System Unit, Renewable Energy Department
https://www.nedo.go.jp/english/activities/activities_ZZJP_100022.html

Project Highlight #2
Demonstration Project on Energy Management in Saudi Arabia

Storage Battery/EMS/Effective Utilization of Renewable Energy

Project Features

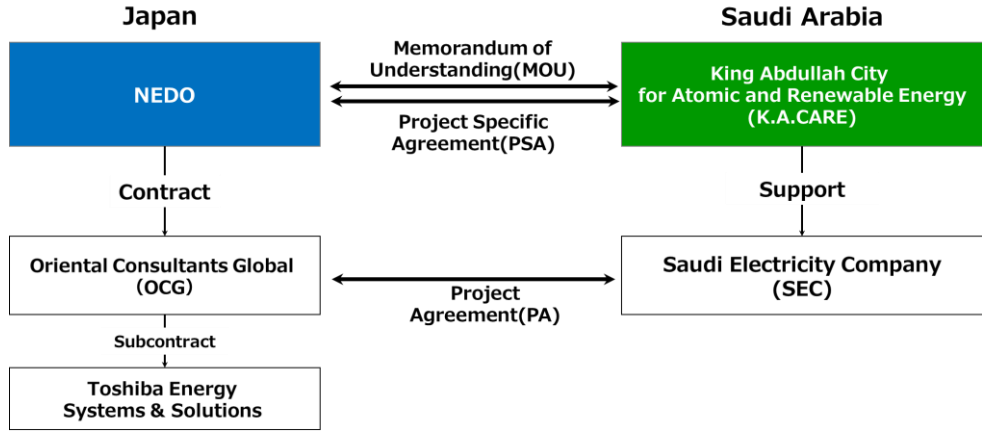
The charging and discharging of two types of battery energy storage systems, one power-oriented and the other energy-oriented, will be controlled through the EMS. This demonstration aims to achieve the objectives listed as 1, 2 and 3 below.



Demonstration items

Project Structure

- A memorandum of understanding (MOU) and a project specific agreement (PSA) were concluded between NEDO and the King Abdullah City for Atomic and Renewable Energy (K.A.CARE, the governmental research institution responsible for renewable and nuclear energy in the Kingdom of Saudi Arabia).
- Oriental Consultants Global Co., Ltd. (OCG) was appointed as the commissioned project operator and a project agreement (PA) was signed between OCG and the Saudi Electricity Company (SEC).



NEDO Project

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Project Highlight #2
Demonstration Project on Energy Management in Saudi Arabia

Storage Battery/EMS/Effective Utilization of Renewable Energy

Timeline of Progress

The official kick-off meeting was held at K.A.CARE's headquarters in Riyadh in November 2025.

The demonstration equipment is under construction and is scheduled to start demonstration operations by the end of fiscal year 2026.

2024	Aug.	Conclusion of MOU (NEDO/K.A.CARE)
2025	Apr.	Conclusion of PA (OCG/SEC)
	Jun.	Conclusion of PSA (NEDO/K.A.CARE)
	Jun.	Launch of demonstration project
	Nov.	Official kick-off meeting
	↓	Engineering, procurement, construction of demonstration equipment
2026	Nov.	Start of demonstration operation
	↓	Demonstration period (1.5 years)
2027		
2028		Evaluation, compiling results, promotion

NEDO Project

Program to Facilitate Overseas Promotion of Low Carbon Technology Through the Joint Crediting Mechanism (JCM), Demonstration Project for Hybrid Renewable Energy Management System Using Storage Batteries at Huraymila, Saudi Arabia

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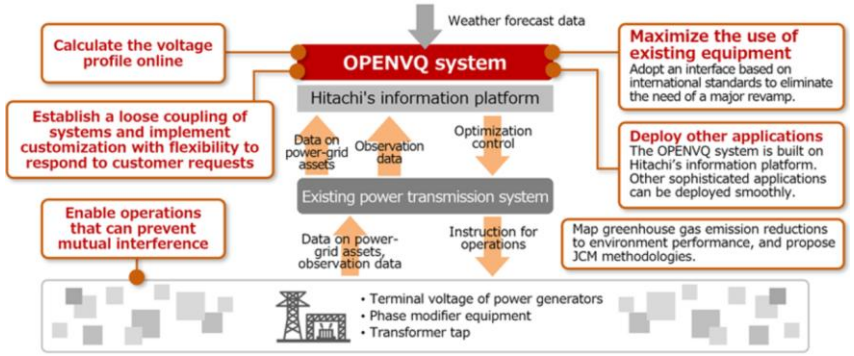
Project Highlight #3
Decarbonizing and Improving the Power Grid in Thailand

OPENVQ/JCM/Advanced Power Grid Systems

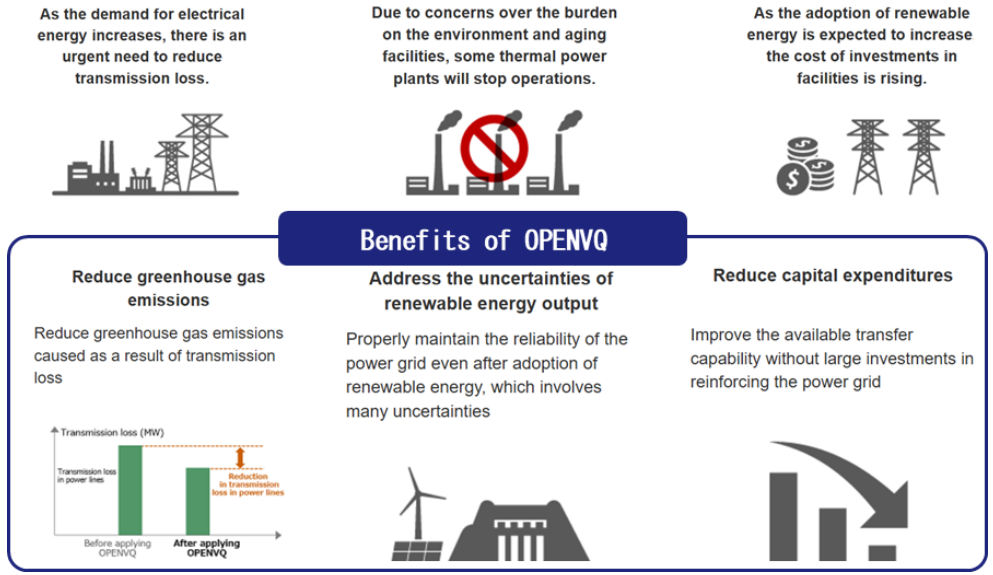
Project Overview

OPENVQ, or Optimized Performance Enabling Network for Volt/var (Q), is a system that combines power grid asset and observation data with data on external information such as weather forecasts and power generation plans. Based on this data, OPENVQ predicts the supply and demand balance and estimates power grid conditions for the immediate future, thereby maximizing the performance of the power grid. Among other benefits, OPENVQ improves efficiency by reducing transmission loss. It can increase the available transfer capability and greenhouse gas emissions that result from transmission loss are reduced.



Challenges in Thailand's Power Grid

In Thailand, electricity demand is growing alongside economic development. However, the lack of a mechanism to optimize transmission system voltage poses a challenge: balancing transmission loss reduction with stable power generation.



NEDO Project

Program to Facilitate Overseas Promotion of Low Carbon Technology Through the Joint Crediting Mechanism (JCM), Demonstration Project on Low-Carbon Operation of a Power Grid Utilizing Online Voltage-var(Q) Optimal Control "OPENVQ" With ICT

Contact Information

Energy System Unit, Renewable Energy Department
https://www.nedo.go.jp/english/activities/activities_ZZJP_100022.html

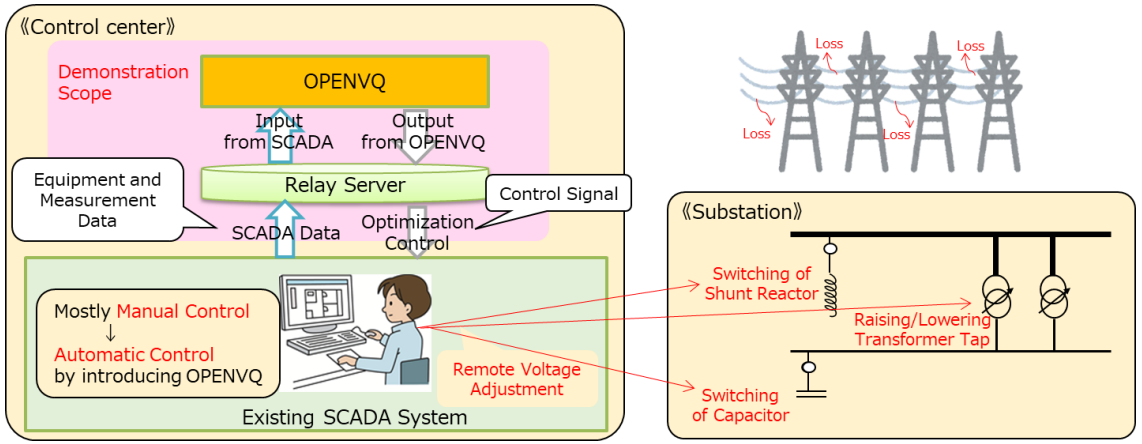
Project Highlight #3
Decarbonizing and Improving the Power Grid in Thailand

OPENVQ/JCM/Advanced Power Grid Systems

Project Features

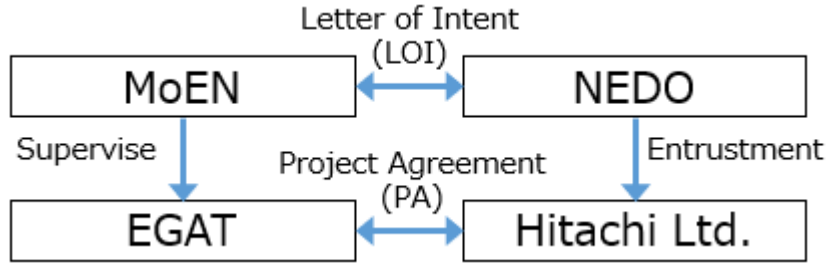
OPENVQ has been introduced into the existing control system* of the Electricity Generation Authority of Thailand (EGAT) to verify its effectiveness in reducing transmission loss and lowering greenhouse gas emissions. As part of the quantification process, methodologies for the Joint Crediting Mechanism (JCM) have been approved, and the credit application procedures are currently underway.

*Supervisory control and data acquisition (SCADA)



Project Structure and Timeline

NEDO and the Ministry of Energy of the Kingdom of Thailand (MoEN) are carrying out this demonstration project with the aim of achieving carbon reduction and enhancements in power system operations. Hitachi and EGAT worked together to install OPENVQ and its demonstration operation commenced in February 2023.



2020
2021
2022
2023
2024
2025

- Relevant parties conclude agreement, demonstration project begins
- Design and equipment installation details confirmed
- OPENVQ system commences operation
- Monitoring of transmission loss reduction, completion of demonstration project
- Transition to quantitative follow-up project
- Monitoring of transmission loss reduction and implementation of JCM procedures

NEDO Project

Program to Facilitate Overseas Promotion of Low Carbon Technology Through the Joint Crediting Mechanism (JCM), Demonstration Project on Low-Carbon Operation of a Power Grid Utilizing Online Voltage-var(Q) Optimal Control "OPENVQ" With ICT

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Project Highlight #3
Decarbonizing and Improving the Power Grid in Thailand

OPENVQ/JCM/Advanced Power Grid Systems

Progress and Future Outlook

All initial targets have been achieved. Monitoring continues during the follow-up quantification project period with the goal of further reducing greenhouse gas emissions.

Item	Goal	Result	Achieved?	Remaining Issues
Reduction in CO_2 emissions	10,000 tons of CO_2 annually[1]	Jan-Mar 2024: target CO_2 emissions reduction achieved [Actual values] Feb-Dec 2023[2]: 4,498 tCO_2 (operating rate:[3] 29.0%) Jan-Mar 2024: 2,640 tCO_2 → Annualized[4] 10,560 tCO_2 (operating rate: 55.3%)	✓	None
Reduction in transmission loss rates	6% reduction compared to pre-introduction	Jan-Mar 2024: target transmission loss reduction rate achieved [Actual values] Feb-Dec 2023: 6.3% Jan-Mar 2024: 7.6%	✓	None

1. The emission factor at the start of the demonstration was 0.5664 tCO2/MWh. It was changed to 0.4401 tCO2/MWh in November 2023. Actual values have been calculated using the revised emission factor.
2. The 2023 JCM credit verification period is from February to December 2023.
3. The effective operating rate is calculated as *(OPENVQ operation time and control output time) / (operating period).*
4. Annualized figures are calculated as *(actual value) * 12 / (number of months operated).* For 2024, actual values are multiplied by *(12/3).*

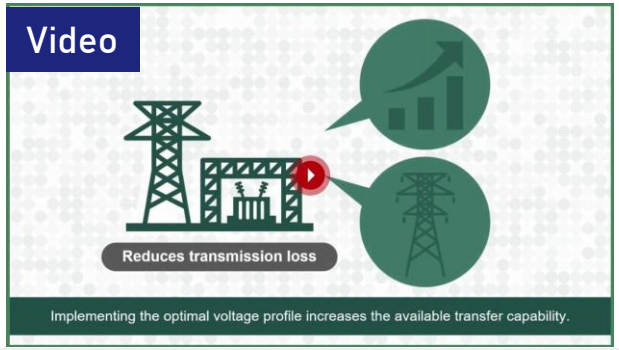
Promoting the use of the technology

- Within Thailand

  By introducing OPENVQ to other areas of EGAT, further transmission loss reductions and lower CO_2 emissions across the entire EGAT system can be expected.

- Other regions

  To contribute towards the realization of an ASEAN Power Grid, promotional activities are underway in ASEAN countries to increase the recognition of OPENVQ as a core technology for achieving successful power grid operations over a wide area.



NEDO Project

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