


# Hitachi Energy
# MMS User Group Meeting 2026

**October 19-21, 2026**

Santa Clara, California

Public ©Hitachi Energy Ltd 2026. All rights reserved

HITACHI

# MMS Solutions Advancing Japan’s Market and Energy Management Systems

©Hitachi Energy Ltd 2026. All rights reserved

HITACHI

# Background

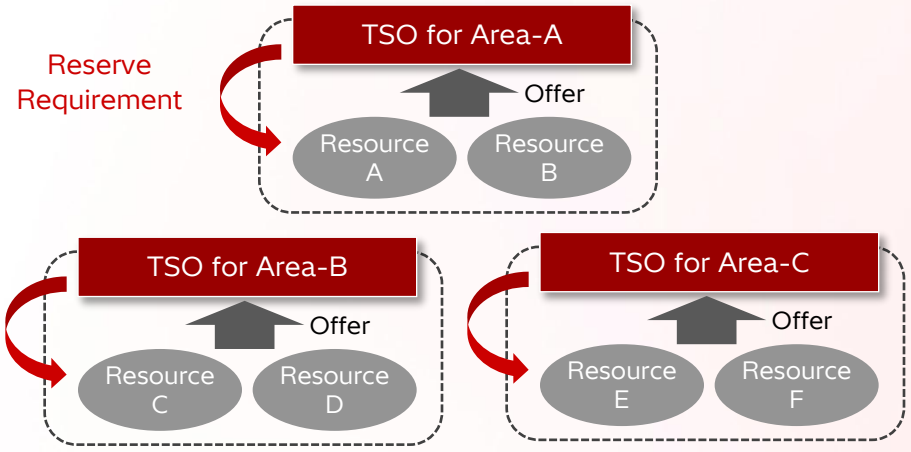
## Reserve procurement before the market introduced

- Before the balancing market was introduced, TSO in each area procured the necessary reserve by public offering within the area, as annual contract.
- The procurement was not optimized in the entire country. TSO could not procure reserve from low-cost resources located out-side the area.

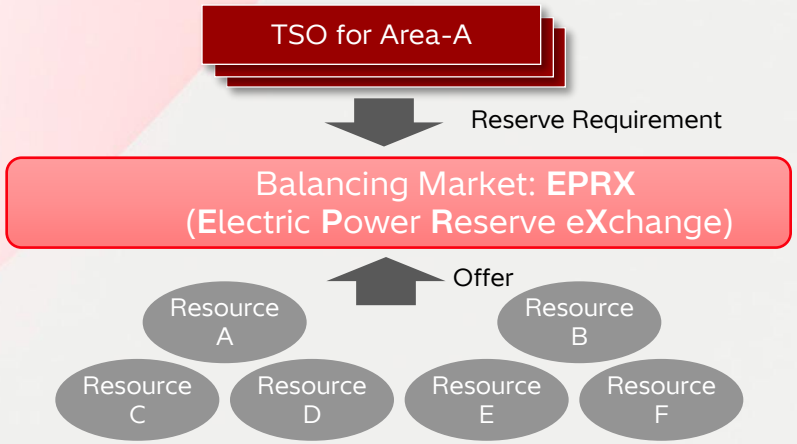
## Introduction of balancing market

- In 2021, Balancing market in Japan went-live to enable nation-wide trading of reserve, as well as to make the procurement process more transparent.
  - TSOs to submit required reserve quantity
  - Power generation companies to offer the available reserve of the owned resources

**Reserve procurement by public offering**
(In-area procurement only)




**Reserve procurement in Market**
(Cross-area procurement)



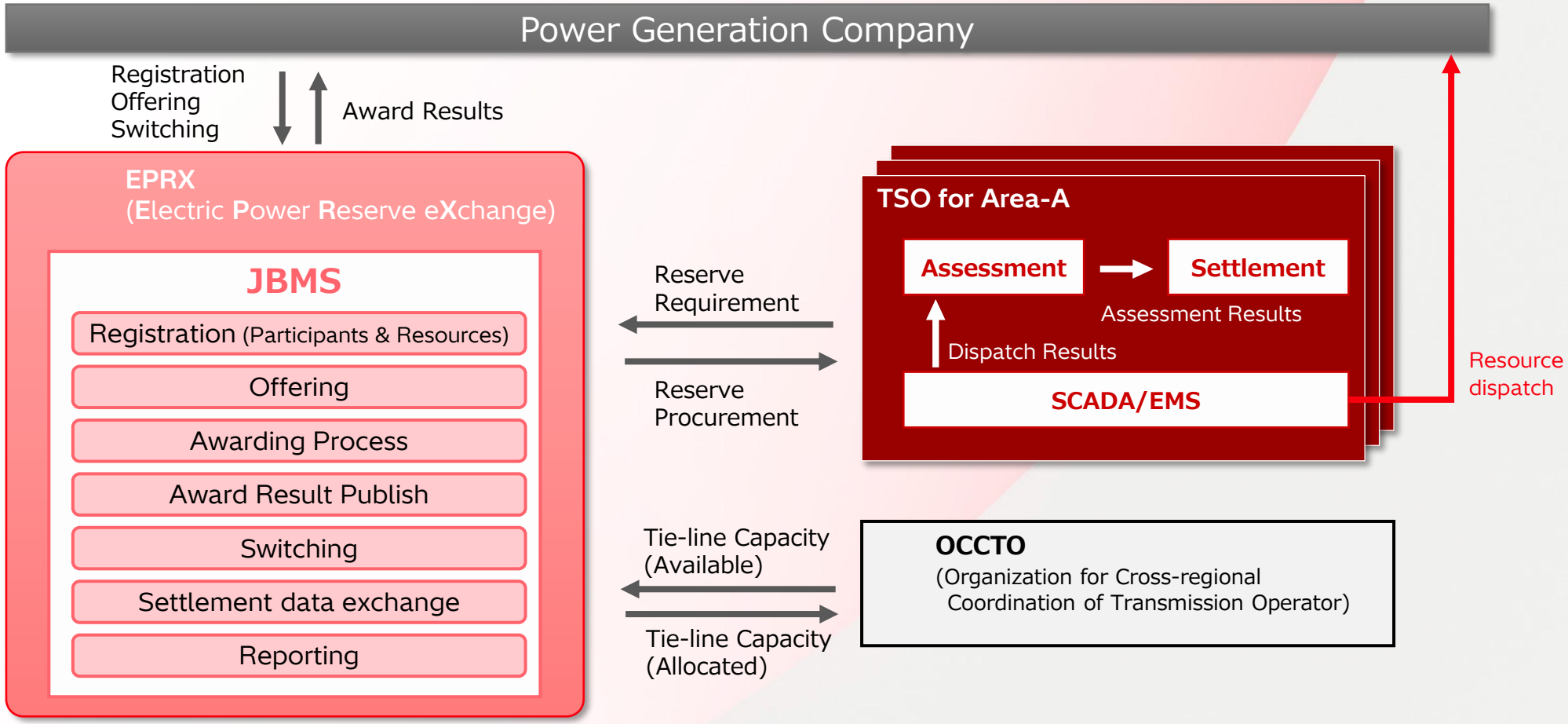

https://www.eprx.or.jp/outline/docs/kaisetsu_ver.2_20260401.pdf



Public ©Hitachi Energy Ltd 2026. All rights reserved

# Solution

– Hitachi Energy has been providing MMS solution as “JBMS” to EPRX, with customization for the regulation in Japan.






Public ©Hitachi Energy Ltd 2026. All rights reserved

HITACHI

# Traded reserve types & Markets

**Traded reserves:**

- 5 types of reserves are traded in EPRX, depending on the requirements for the reserve, such as control method, response time etc.
  - Governor Free : **Primary (PRI)**
  - Load Frequency Control : **Secondary-1 (SEC1)**
  - Economic Dispatch Control : **Secondary-2 (SEC2), Tertiary-1 (TER1), Tertiary-2 (TER2)**

**Markets:**

- **TER2 Market** : Reserves procured for balancing the prediction error of FIT(Feed-in Tariff) renewable energy (solar, wind etc.)
- **PRI~TER1 Market** : Reserve procured for balancing the other prediction error, short-period supply/demand variation, as well as for coping with incident scenario such generator trip.

| | Primary (PRI) | Secondary-1 (SEC1) | Secondary-2 (SEC2) | Tertiary-1 (TER1) | Tertiary-2 (TER2) |
|---|---|---|---|---|---|
| Control Method | Governor Free | Load Frequency Control | Economic Dispatch | Economic Dispatch | Economic Dispatch |
| Response Time | ≤ 10 sec | ≤ 5 min | ≤ 5 mins | ≤ 15 min | ≤ 60 min |
| Dispatch Frequency | N/A | ≤ few ten sec | ≤ few min | ≤ few min | 30 min |
| Minimum Offer | 1 MW | 1 MW | 1 MW | 1 MW | 1 MW |

PRI~TER1 Market

TER2 Market

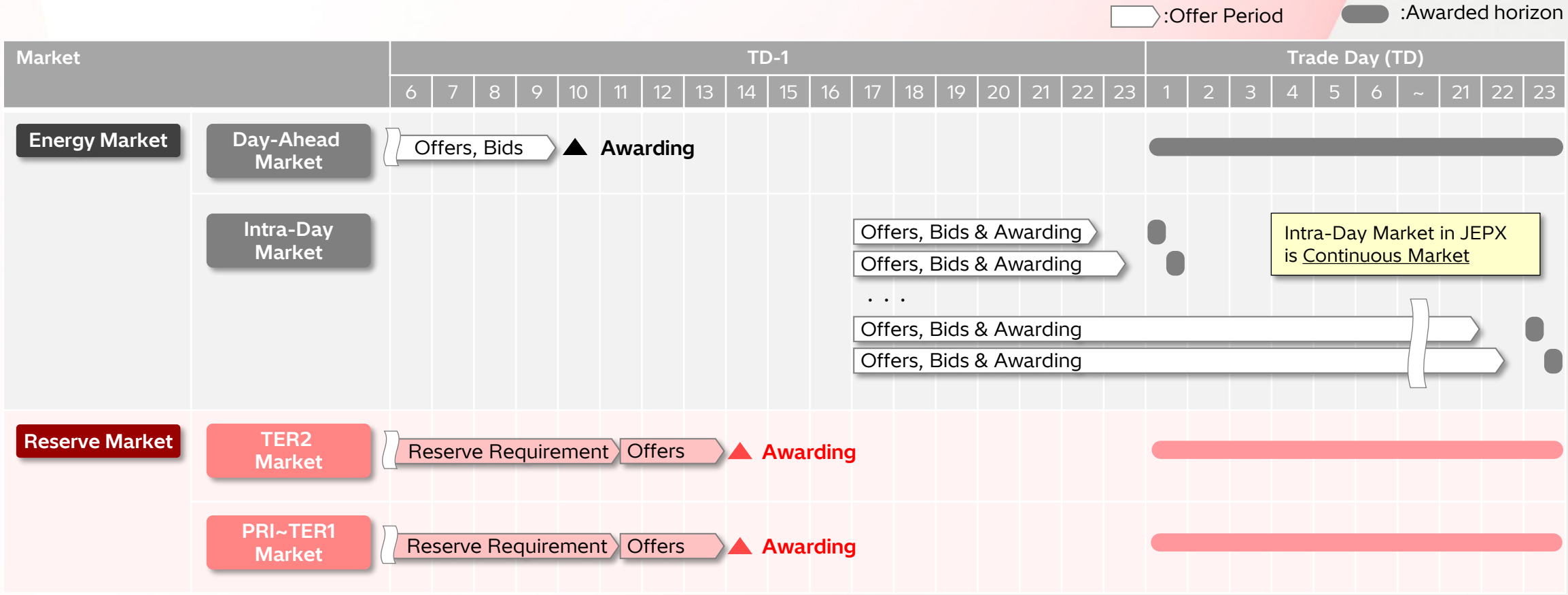
https://www.eprx.or.jp/outline/docs/shouhin_ver.6_20260313.pdf



Public ©Hitachi Energy Ltd 2026. All rights reserved

# Market Timeline

– Both TER2 and PRI~TER1 reserves are **traded Day-Ahead.**




https://www.jepx.jp/electricpower/outline/pdf/Guide_2.00.pdf
https://www.eprx.or.jp/outline/docs/shouhin_ver.6_20260313.pdf

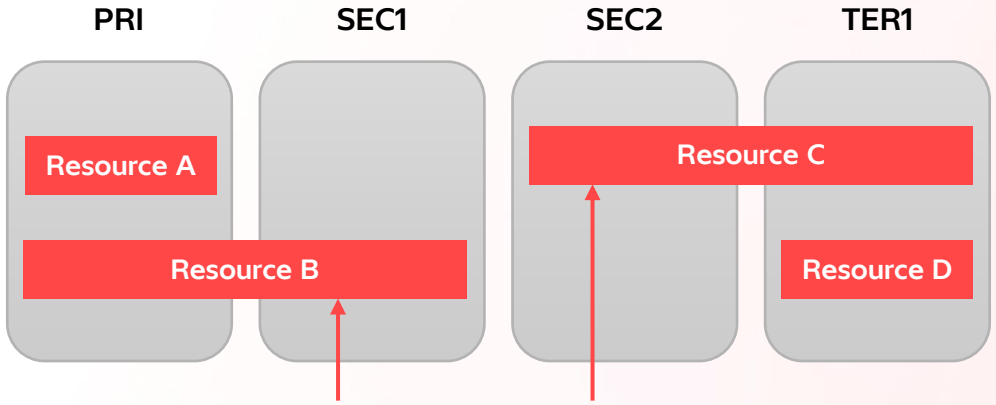

Public ©Hitachi Energy Ltd 2026. All rights reserved

HITACHI

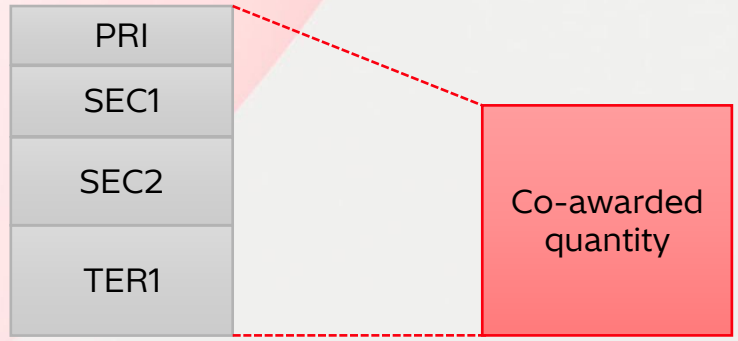
# Co-optimization awarding logic for PRI~ TER1 Market

## Co-optimization for multiple reserve types

- In PRI~TER1 market, four types of reserves are traded by “co-awarding” logic.
- In the operation phases, the procured reserves for different reserve types (PRI, SEC1, SEC2, TER1) are not necessarily used at the same timing.
- “Co-optimization awarding”, developed for JBMS, achieves efficient use of resources and hence reduction of the total procurement quantity and cost, by enabling sharing of resource capacity for multiple reserve types.




Resources that are able to cover the requirements for multiple reserve types.
The capacity are shared by multiple reserves to reduce the entire procurement quantity




Sum of reserve quantity of individual reserve types

Total awarded reserve quantity

https://www.occto.or.jp/assets/iinkai/chouseiryoku/sagyoukai/2020/files/chousei_sagyokai_34_02.pdf



Public ©Hitachi Energy Ltd 2026. All rights reserved

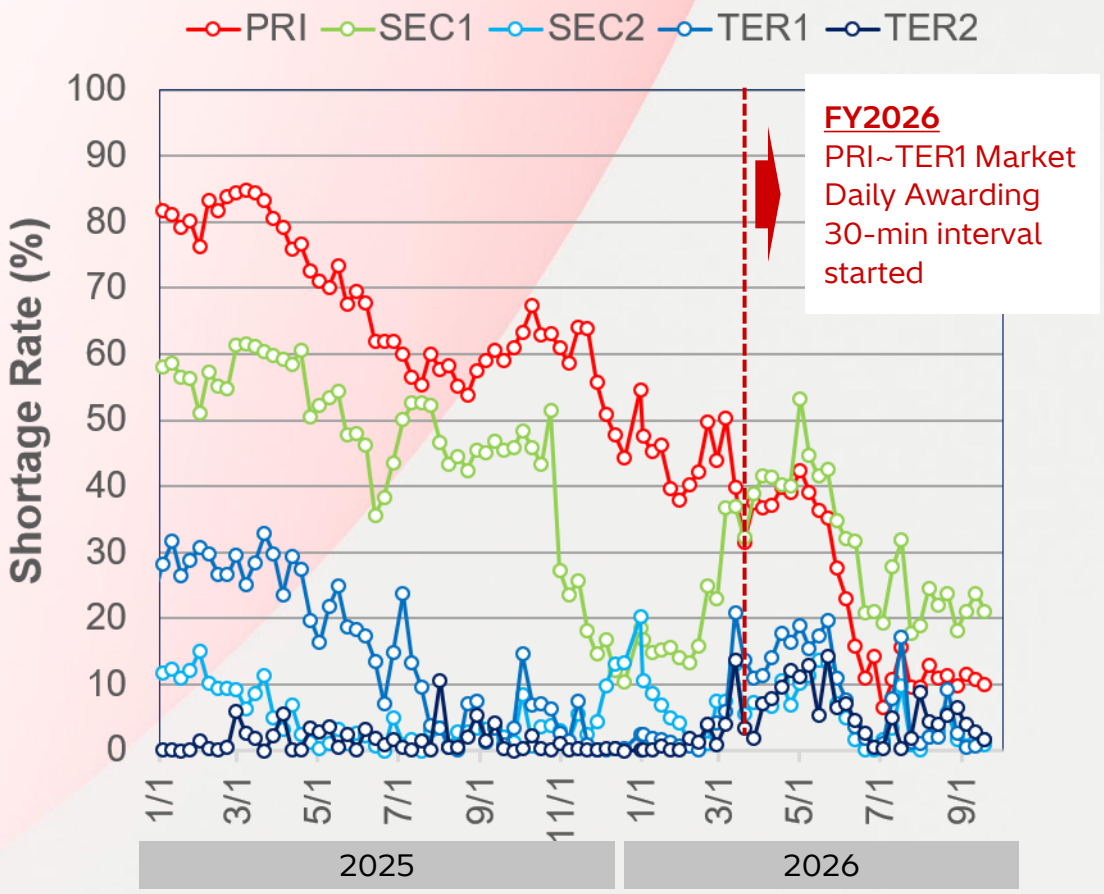
# Latest Market Situation

## Improvement of Procurement Shortage

- Since the trading started, procurement shortages have been observed.
  - TER2 Market started from 2021
  - PRI-TER1 Market started from 2024
- Market design has been updated to enable more flexible offering
  - Week-ahead trading → Day-ahead trading
  - 3-hour interval → 30-min interval
- With the above changes in market trading, together with optimization of the reserve requirements, procurement shortage has been improved.[1)]

1) https://www.occto.or.jp/iinkai/jukyuchousei/63.html

| Market | | FY2021 | FY2024 | FY2025 | FY2026 |
|---|---|---|---|---|---|
| TER2 | Frequency | Daily | | | |
| | Interval | 3-hours | | 30-min | |
| PRI-TER1 | Frequency | - | Weekly | | Daily |
| | Interval | - | 3-hour | | 30-min |




Data source: https://www.eprx.or.jp/information/



Public ©Hitachi Energy Ltd 2026. All rights reserved

HITACHI

# Background

## Objectives to build integrated TSO system (JIEMS)

### Common Platform

- ✓ Unified protocol (IEC61850)
- ✓ Centralized information publication

### Nation-wide Merit Order

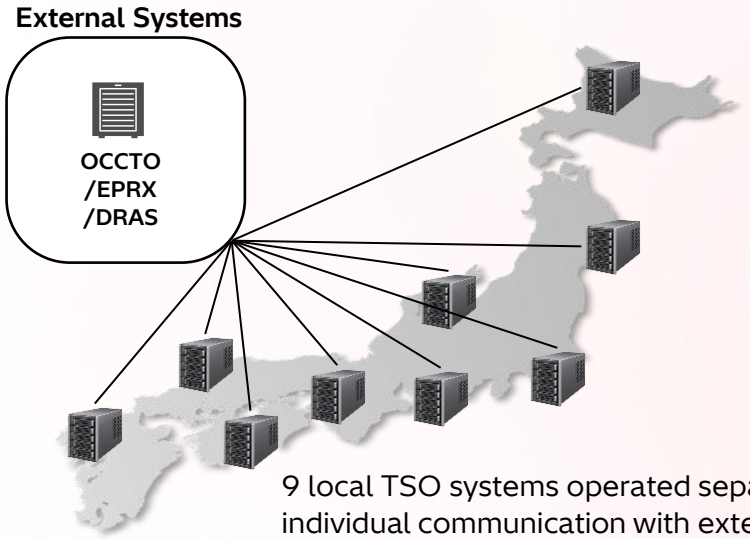
- ✓ Nation-wide optimized economic dispatch and congestion management

### Resilience & Costs Reduction

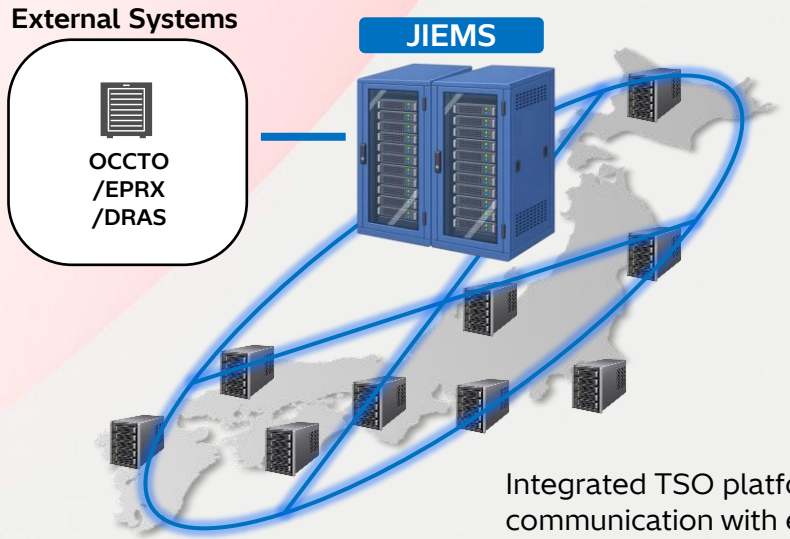
- ✓ Centralized functionality
- ✓ Distributed backup systems for secure resilience

### Future Flexibility

- ✓ Functional upgrades limited to the integrated system.




9 local TSO systems operated separately with individual communication with external systems




Integrated TSO platform with centralized communication with external systems

https://www.occto.or.jp/assets/iinkai/chouseiryoku/jukyuchousei/2022/files/jukyu_shijyo_33_04.pdf

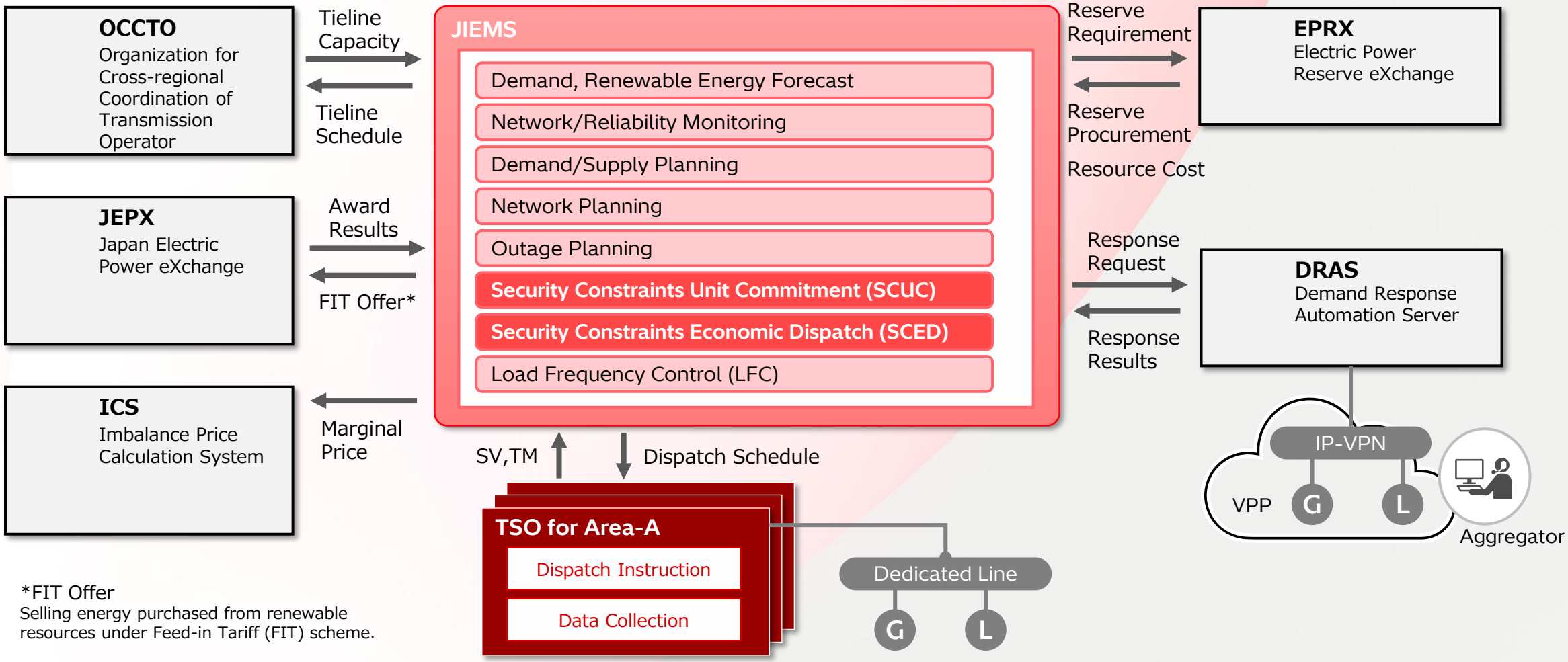


Public ©Hitachi Energy Ltd 2026. All rights reserved

HITACHI

# Solution – Overall System

– Hitachi Energy's MMS solution applied to SCUC/SCED application in JIEMS




*FIT Offer
Selling energy purchased from renewable resources under Feed-in Tariff (FIT) scheme.

https://www.occto.or.jp/assets/iinkai/chouseiryoku/jukyuchousei/2022/files/jukyu_shijyo_33_04.pdf
https://www.meti.go.jp/shingikai/enecho/denryoku_gas/saisei_kano/smart_power_grid_wg/pdf/008_02_00.pdf



Public ©Hitachi Energy Ltd 2026. All rights reserved

HITACHI

# Advanced Engine for Reliability and Operations Scheduling: SCUC/SCED

– SCUC/SCED logics have been designed to consider Japan-unique business requirements and operational rules.

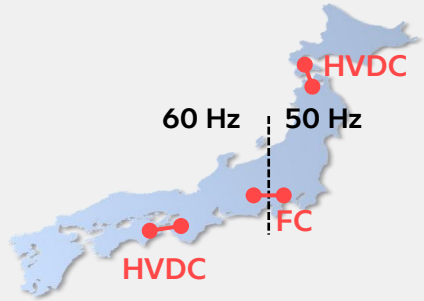
## Generator Group Constraints

Minimum number of online units (MNOU) must be satisfied within a certain group of generators.
Below picture is the case of MNOU = 1 for three generators



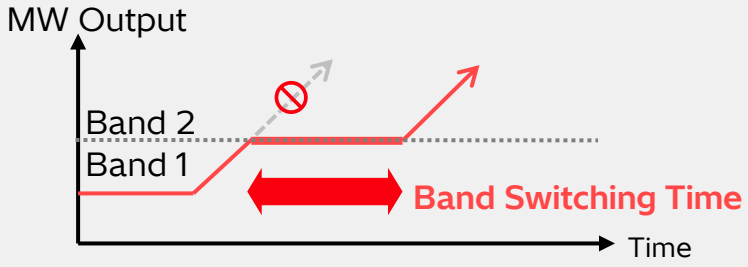

## HVDC/FC Constraints

Power flow in HVDC/FC facilities must satisfy specific operational constraints, such as:
- Flow Ramp rates
- Flow Change Intervals
(etc.)




## Generation Band Switching Constraints

MW output must be kept for the certain time during the band-switching.




## Curtailment Priority Requirements

In situation where generation surplus is forecasted, curtailment instruction must be determined as per **pre-defined priority rule based on resource type, instead of the actual generation costs.**

Instruction Priority

#1 - Thermal Curtailment & Hydro Pumping
#2 - Inter-Area Exchange
#3 - Biomass Curtailment
#4 - Solar / Wind Curtailment
#5 - Baseload Resource Curtailment



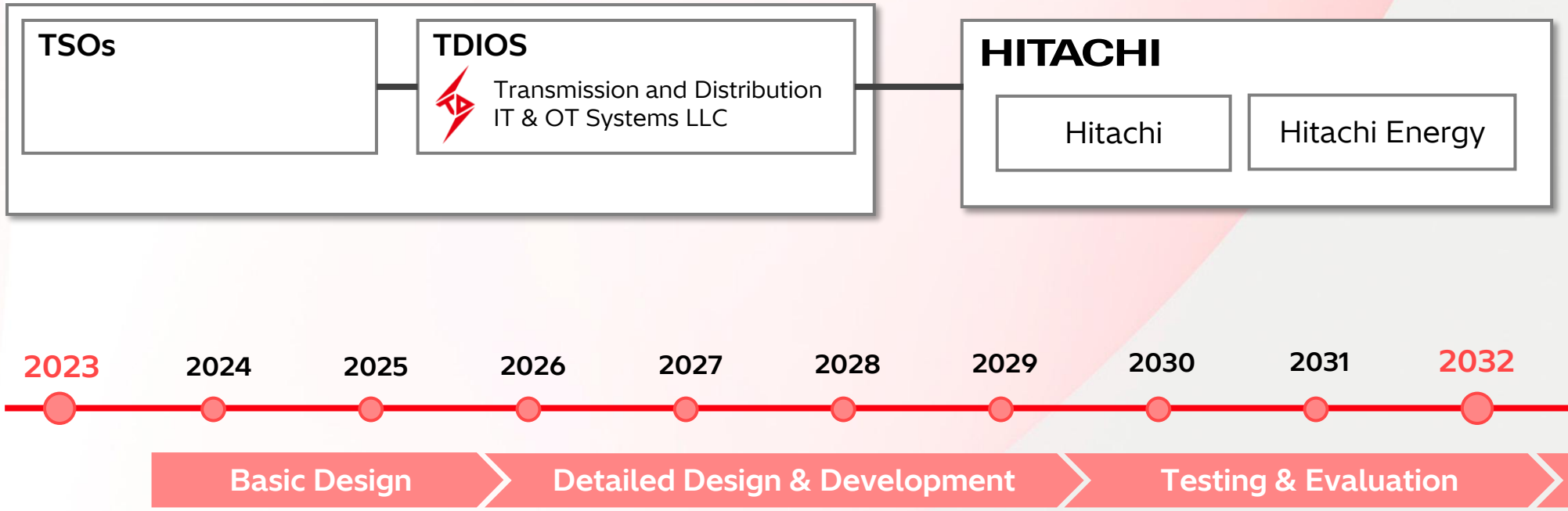
https://www.meti.go.jp/shingikai/enecho/denryoku_gas/saisei_kano/smart_power_grid_wg/pdf/008_02_00.pdf

Public ©Hitachi Energy Ltd 2026. All rights reserved

HITACHI

# System Development Schedule

- Hitachi Group has been selected by TDIOS (Transmission and Distribution IT & OT Systems LLC) to undertake the development of the JIEMS and has been working closely with TDIOS since the project was launched.
- TDIOS was established by Japan's TSOs to develop, maintain, and operate common systems for the transmission and distribution sector in Japan.
- Launched in 2023, the JIEMS project is targeting the start of operations in 2032.




https://souhai-sys.co.jp/information/20231113/index.html

https://www.meti.go.jp/shingikai/enecho/denryoku_gas/saisei_kano/smart_power_grid_wg/pdf/008_02_00.pdf



Public ©Hitachi Energy Ltd 2026. All rights reserved

HITACHI

# Thank you.

©Hitachi Energy Ltd 2026. All rights reserved