

**APCBC** presentation in ICEBO  
(*Asia Pacific Conference on Building Commissioning*)  
Sept. 2014, Beijing, China

**14th SHASEJ** Special award 'DECADE AWARD'  
(*Society of Heating, Air-Conditioning and Sanitary Engineers of Japan*)

## **Continuous Commissioning Performance of Panasonic Tokyo-Shiodome Building**

**Presented by Jeffrey Zhang (Nikken Sekkei)**

**Planning/Operating  
Design/Verification  
HVAC Construction/Verification  
Automation Construction/Verification  
Maintenance/Management**

**Panasonic Echo Solutions  
Nikken Sekkei  
Takasago Industry  
Panasonic ES Engineering  
Panasonic ES Facility  
Management**

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# INTRODUCTION

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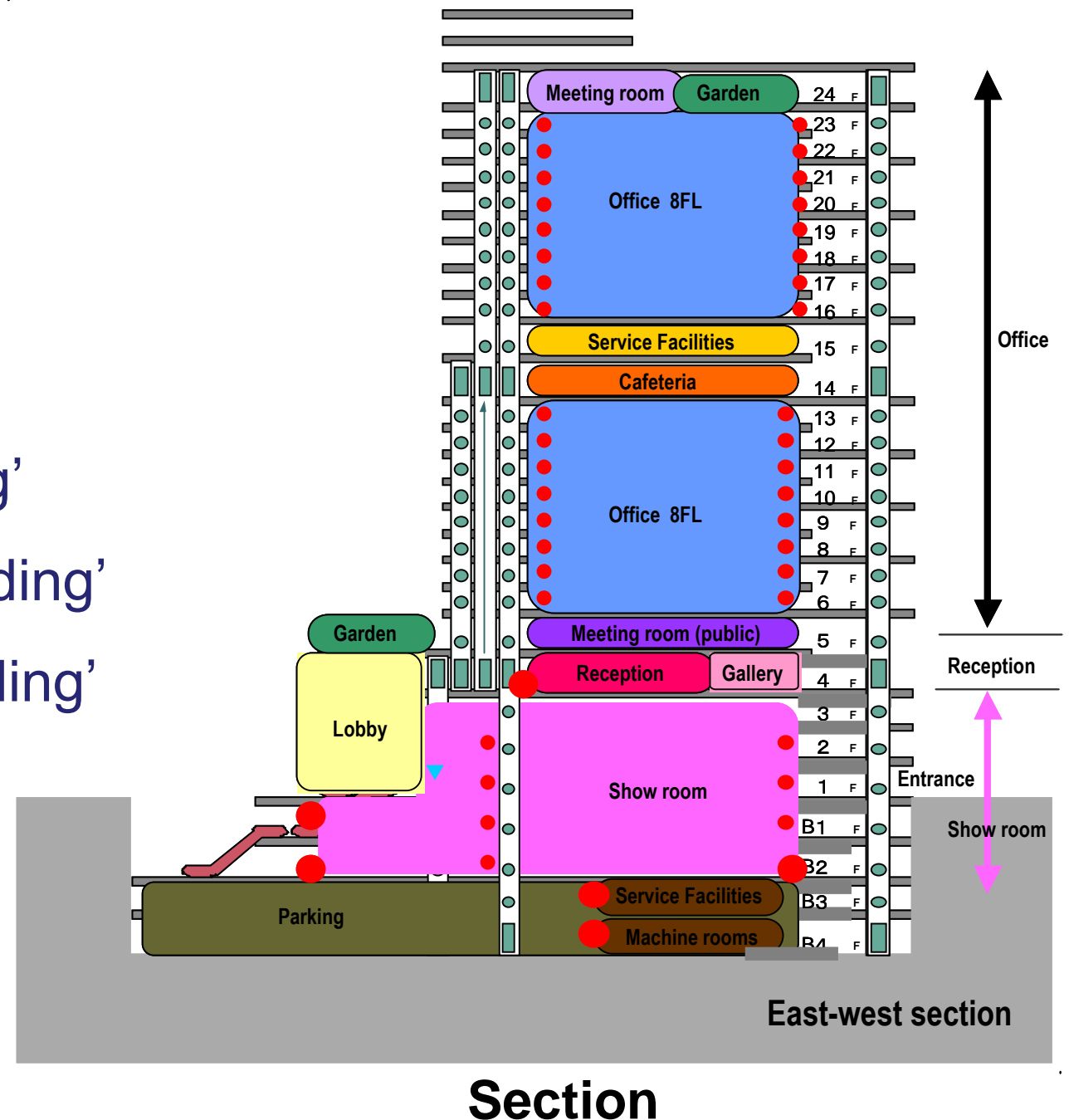
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## ● Corporation Headquarter

- Completed at Jan 31<sup>st</sup> 2003
- Underground 4F, Up-ground 24F
- Total area 47,275sqm

## ● Concept

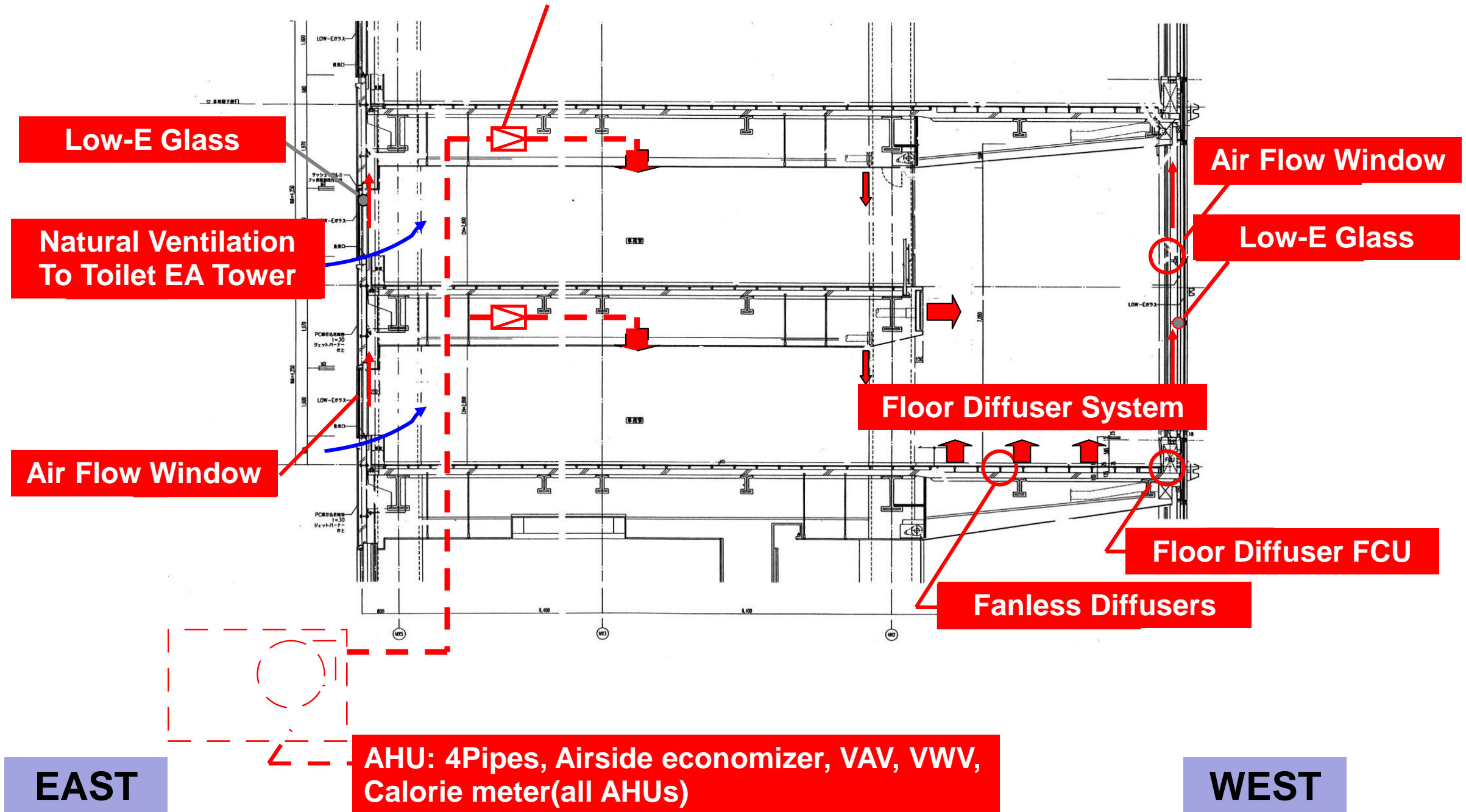
- 'Show room for the whole building'
- 'Lighting fixture for the whole building'
- 'Energy saving for the whole building'



# Advanced HVAC System



## VAV System





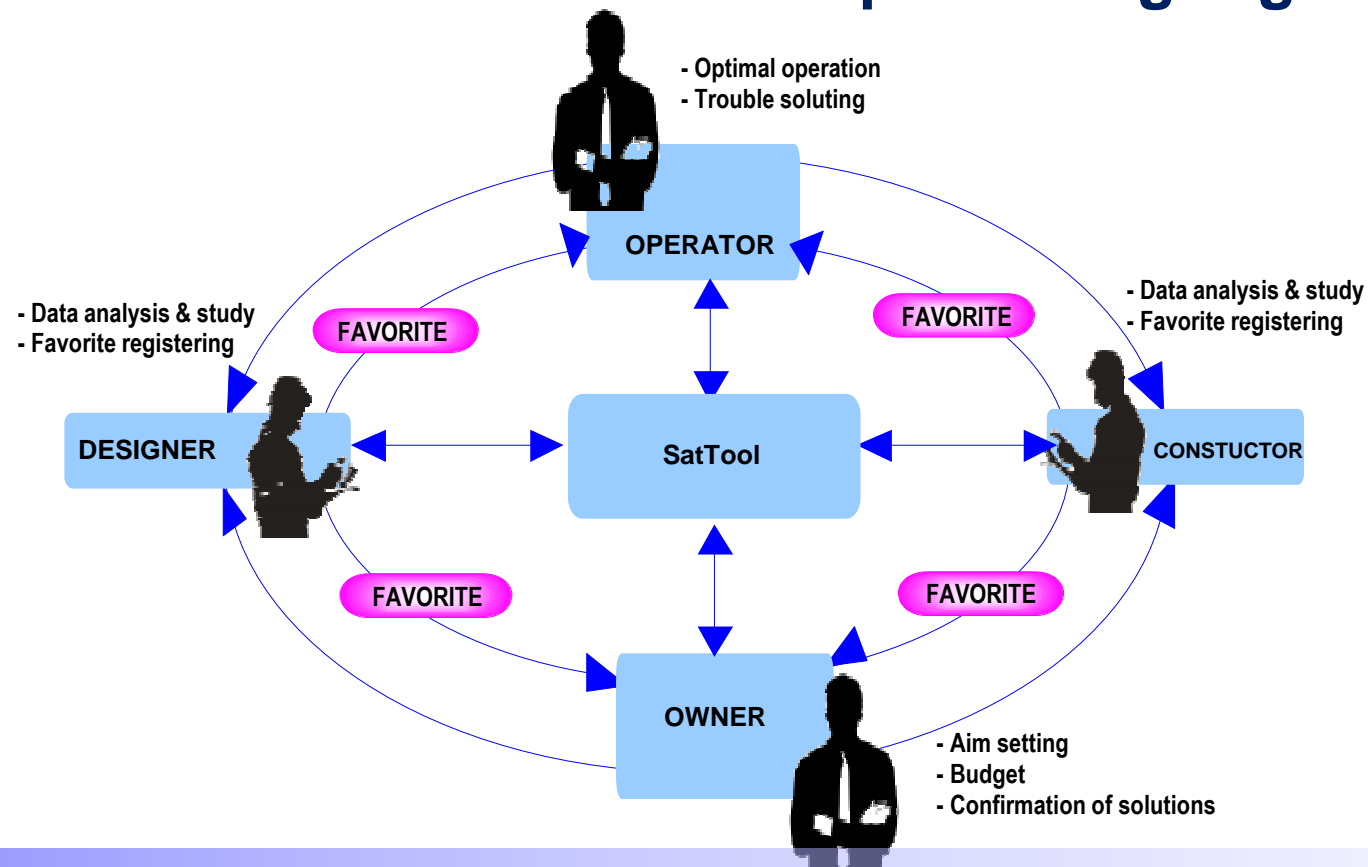
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# FOOTPRINT IN THE PAST DECADE

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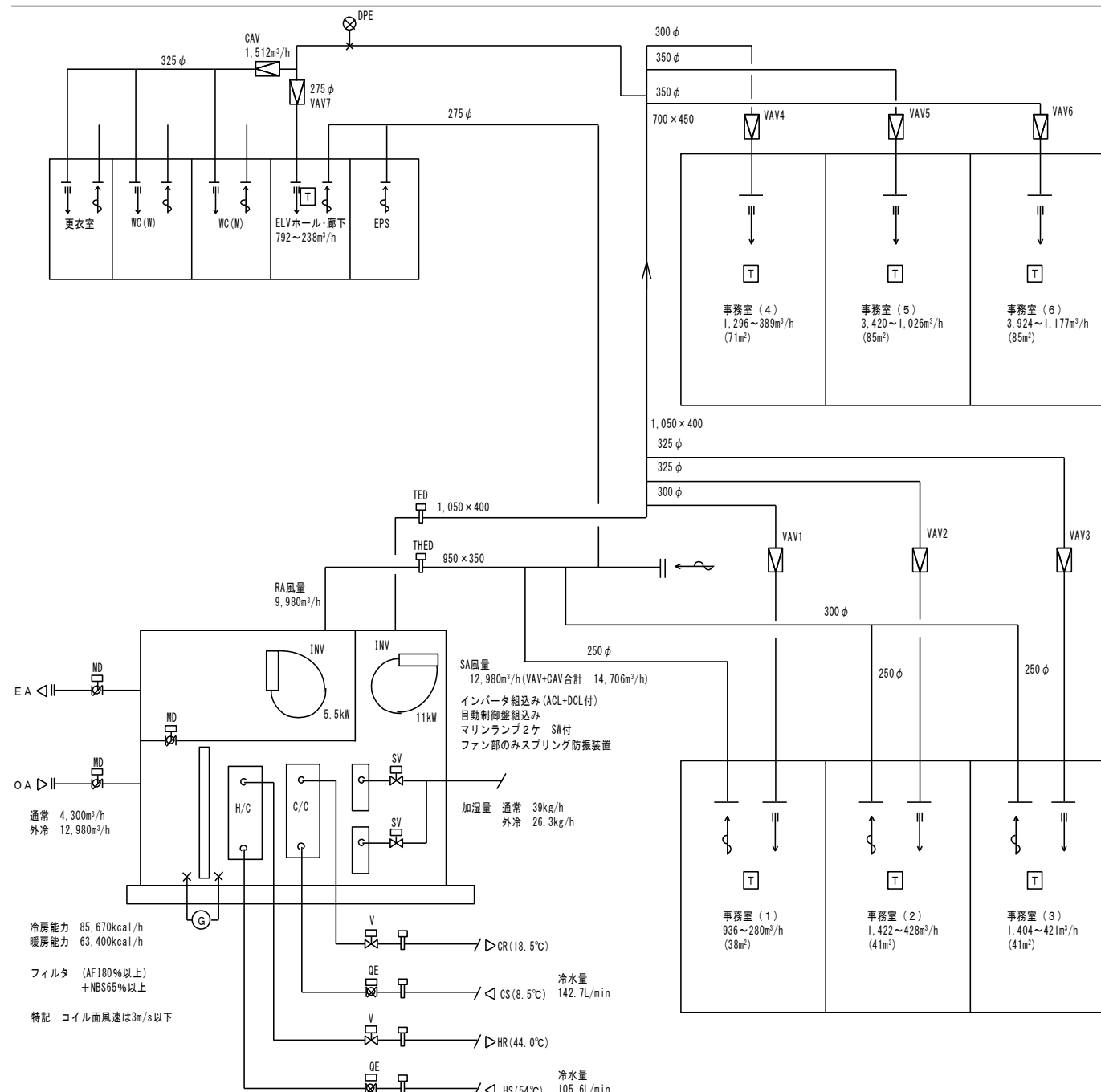
## Infrastructure construction for energy saving after construction

- **HARDWARE: Construction of 'visible' system**
  - Measuring point: 15,000 points
  - Detailed power measurement
  - Calorie meter for all AHUs
  - Data collecting & Analyzing software: SatTool
- **SOFTWARE: Construction of promoting organization**



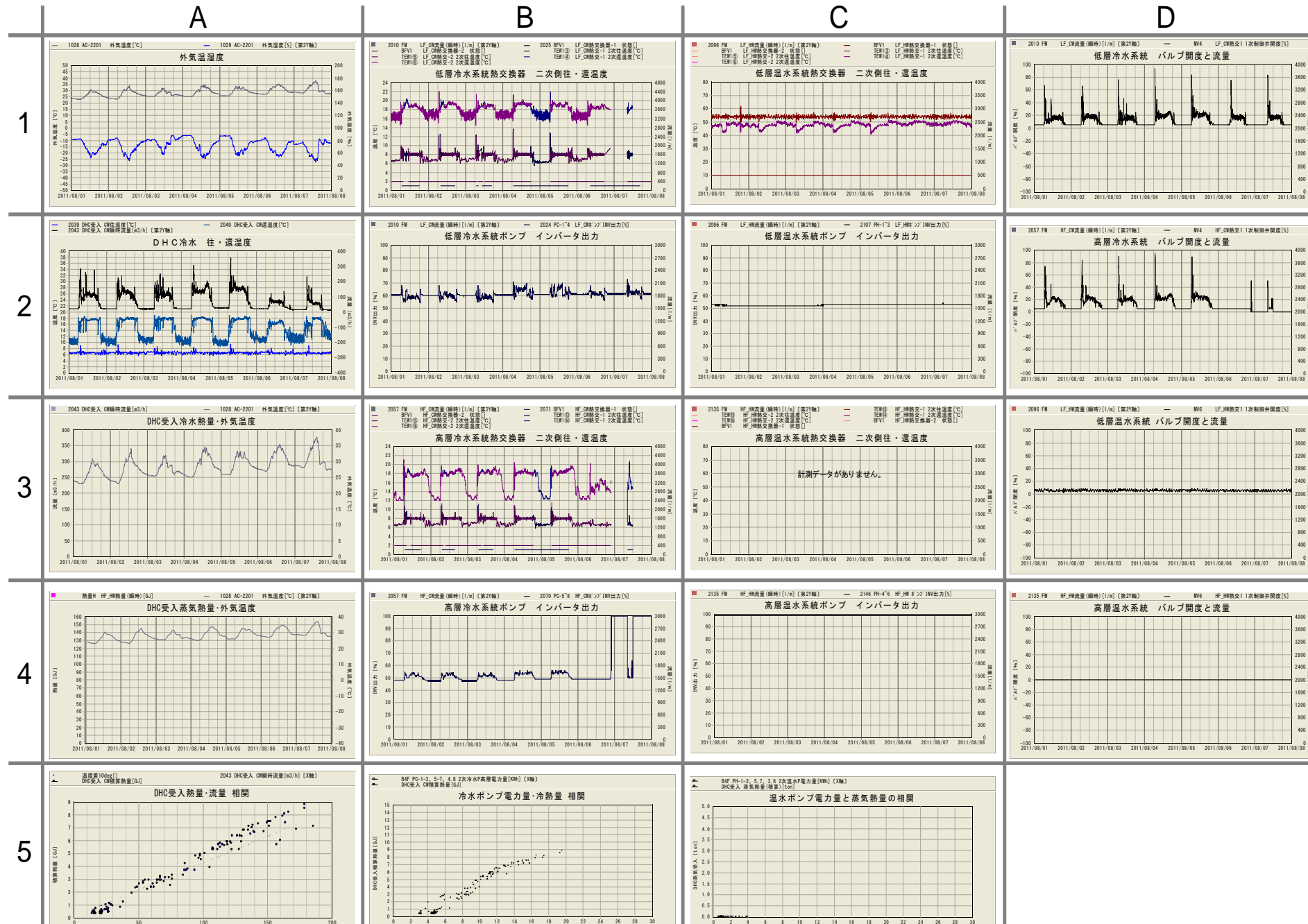
# System diagram

- One diagram including all equipment, setting points, etc





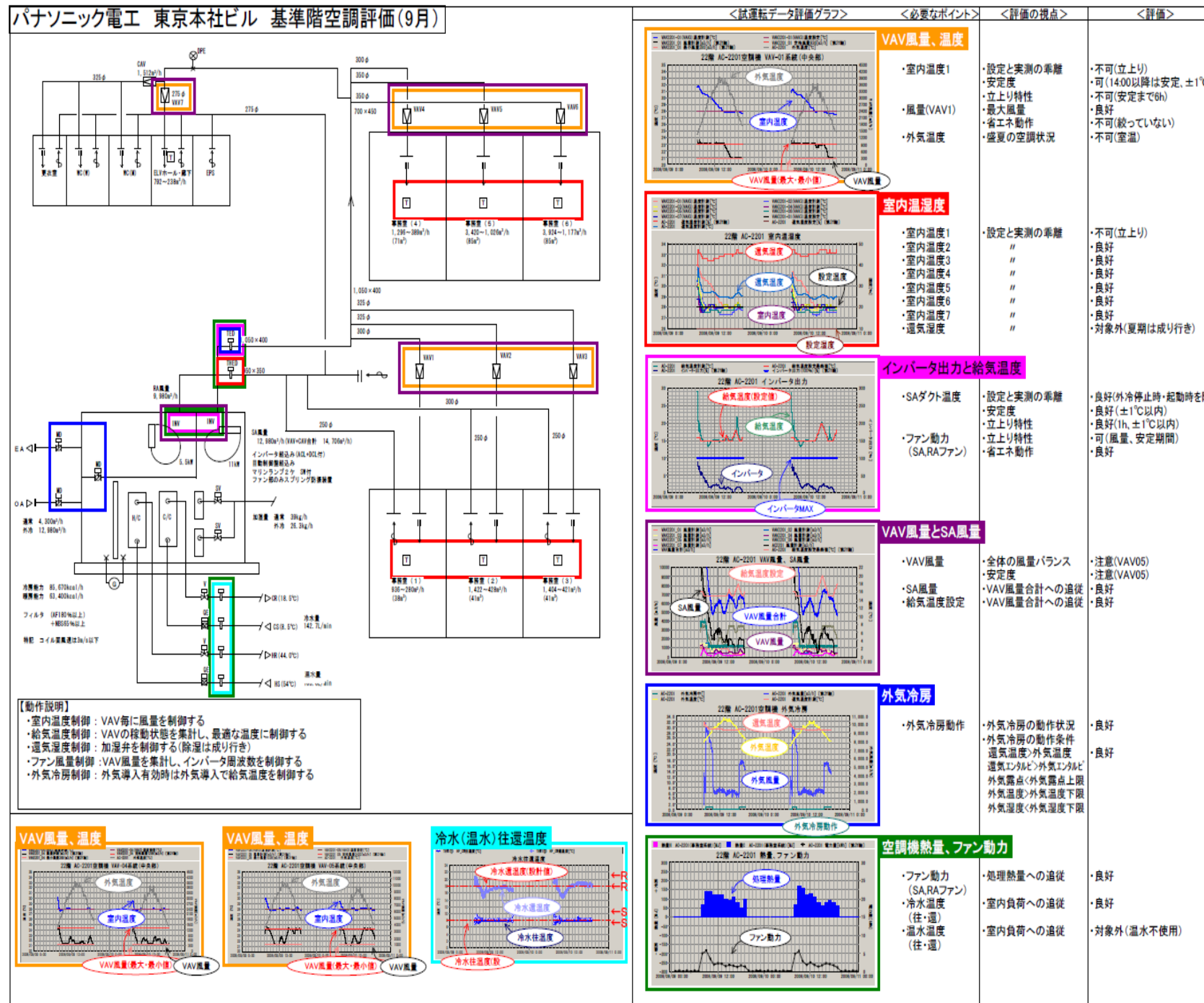
## ● Daily & weekly report graphs including outdoor air condition, chilled water temperature and other operating data.





# Collection of operating methods

## ● Operation description and evaluation standards for optimal operation



## Early Performance Verification

- **Performance verification for automation**
  - **Airflow window**
    - VAV, VWV
    - Air side economizer
    - Day lighting intake
    - Lighting control by human sensor
- **Verification of annual energy consumption**



**Additional temporary measurement for confirmation**



## Tuning 1: Stabilization period

- **4 Viewpoints**

- 1. Basic on design purpose**
- 2. Improving sensors and automation**
- 3. Adjustment into more rationalized operation**
- 4. Advanced tuning for equipment**



**Energy saving special committee (organized once per month)**

# Main Tuning Items

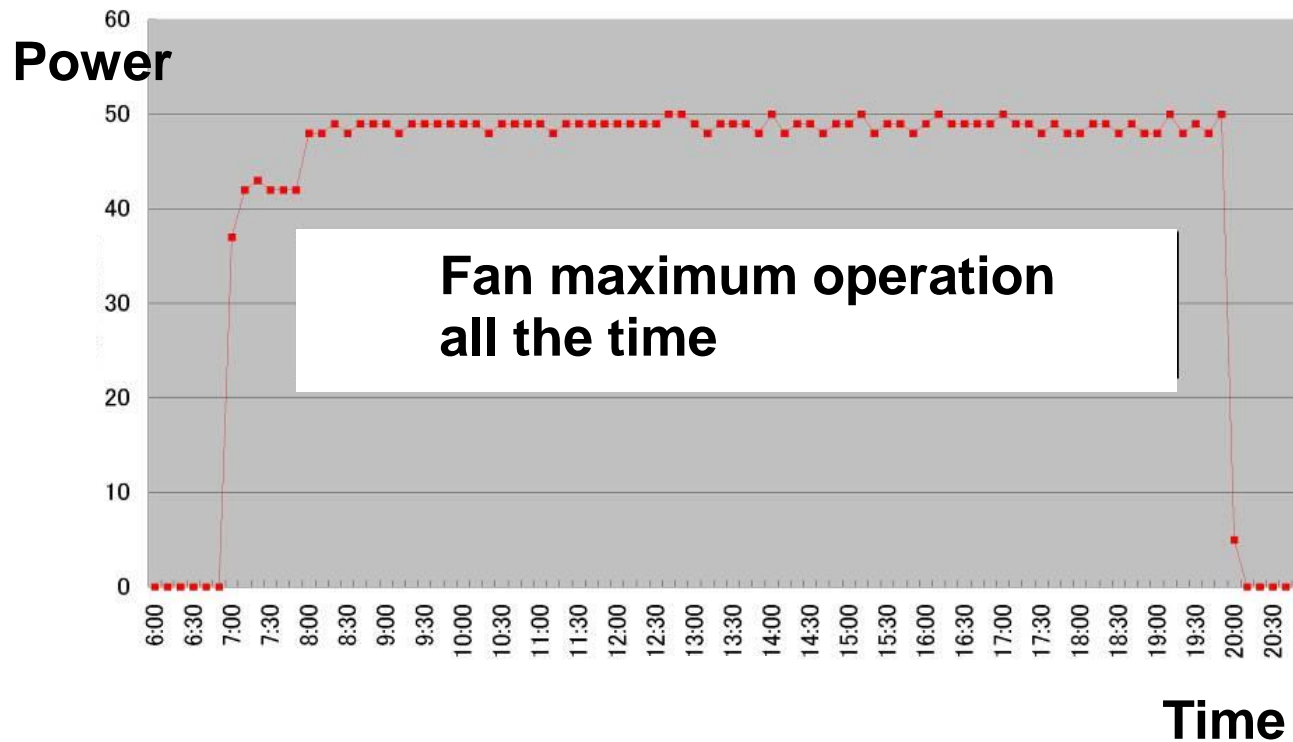
## Detailed items of different categories and sub categories

- Load reduction
  - Temperature
    - ✓ Setting point for canteen temperature **(3)**
  - Outdoor air amount
  - Mixing loss
- Machine operation efficiency
  - Automation
    - ✓ Position of sensor for heat exchanger control **(2)**
    - ✓ Parameter of several AHUs **(4)**
- Reduction of delivering power
  - Pumps
  - Fans
- Operational optimization
  - Operation management
  - Maintenance
  - Ventilation equipment
    - ✓ Air flow control of Outdoor AHU of kitchen **(1)**
  - Architectural

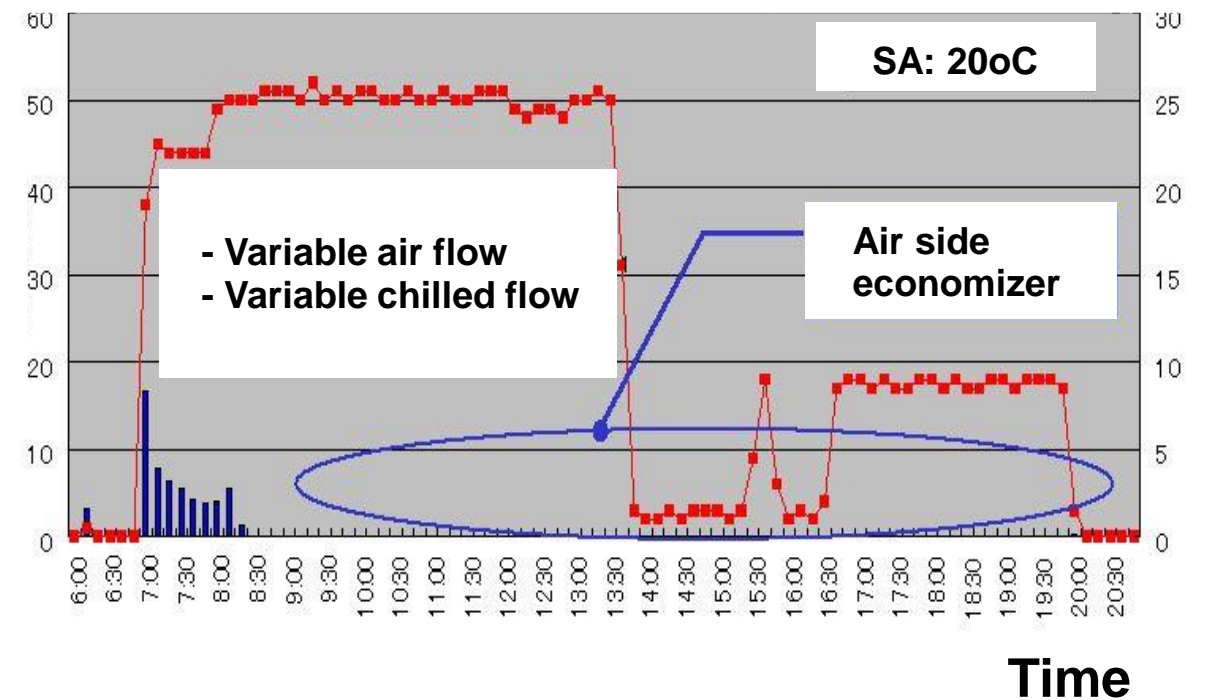
# Air Flow Control of OAHU of Kitchen

- **Viewpoint 1. Basic on design purpose**

**BEFORE**



**AFTER**



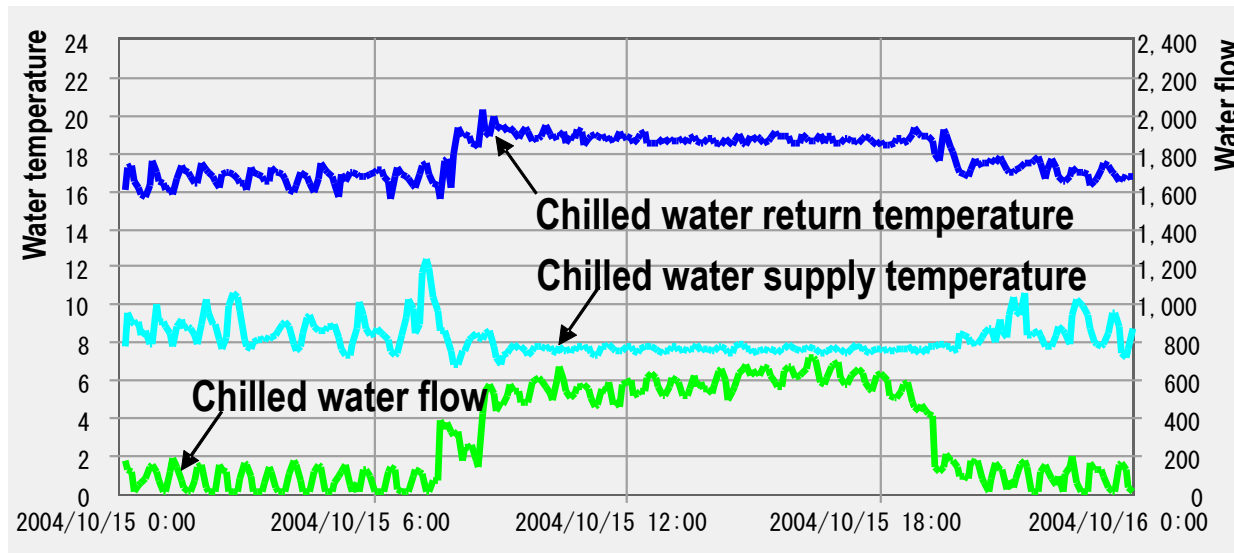
- **By improving operating method according to design purpose, air flow is controlled variably and air side economizer is applied at proper season. As a result, power consumption and processing load is reduced significantly.**



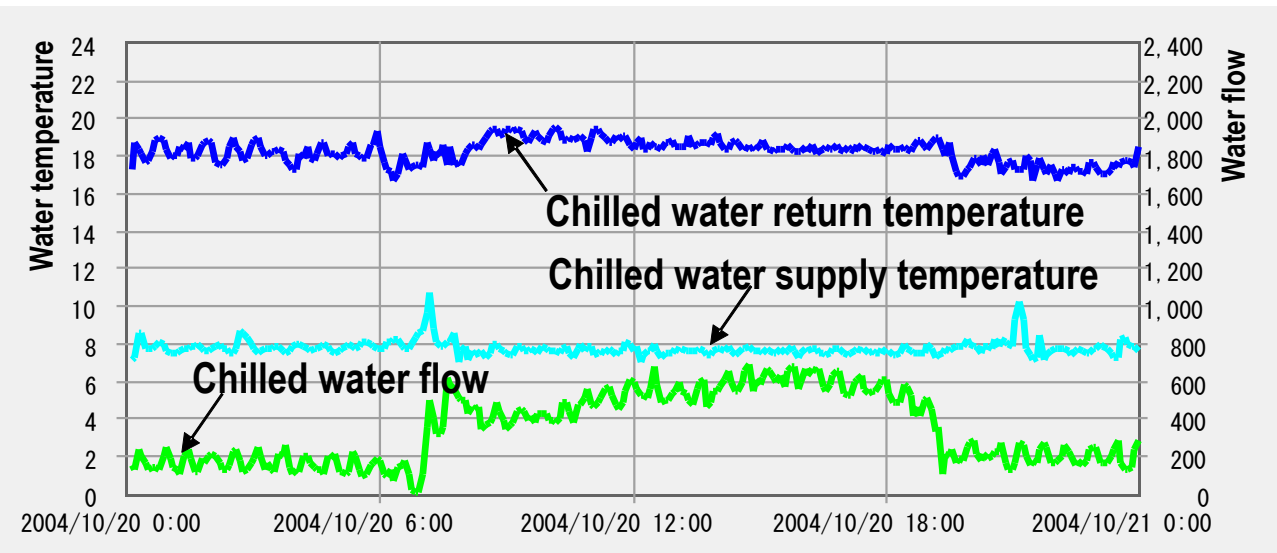
# Position of Sensor for Heat Exchanger Control

- **Viewpoint 2. Improving sensors and automation**

**BEFORE**



**AFTER**



- **Chilled water supply temperature appeared unstably during night time of low load. After adjustment of the position of sensor for heat exchanger control, water flow become stable throughout the whole day.**

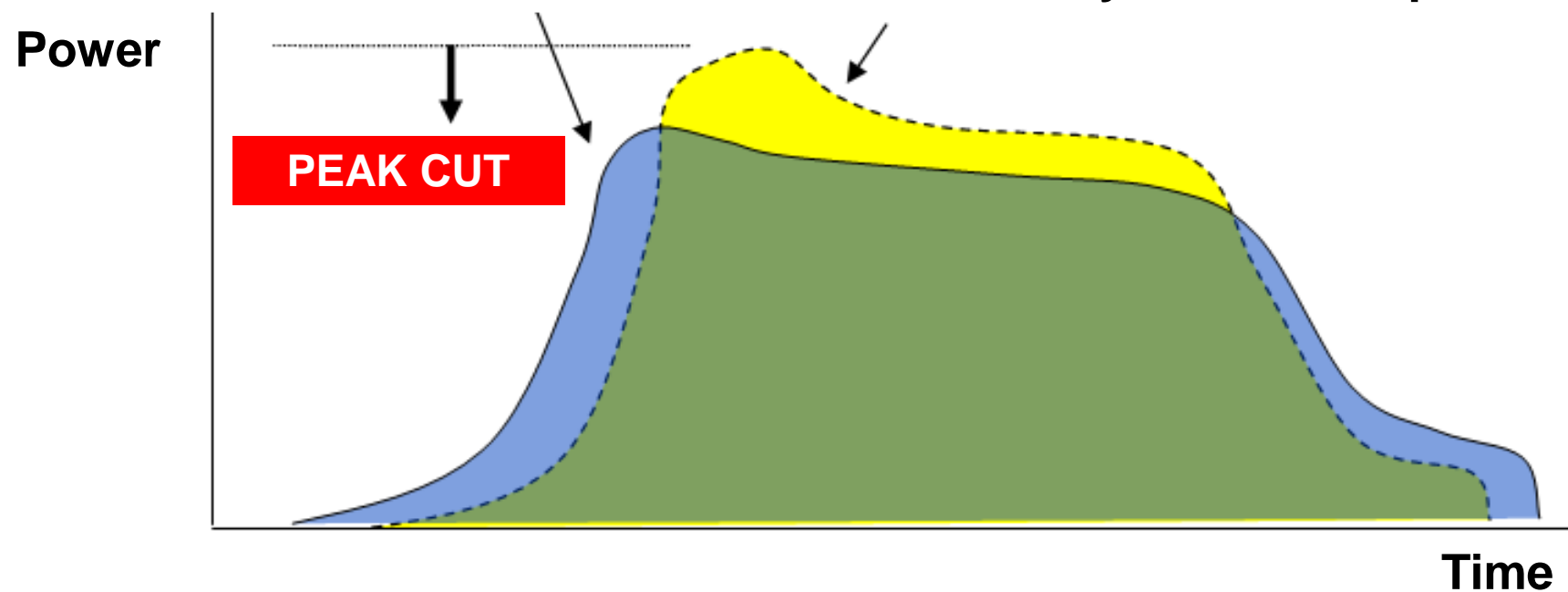


## Tuning 2: Challenging energy saving 50%

- Aggressive introducing new energy saving technology and materials by Panasonic group
- ZEB promotion of Japan: 50% energy cut for exist
- Electricity peak cut under power company's request

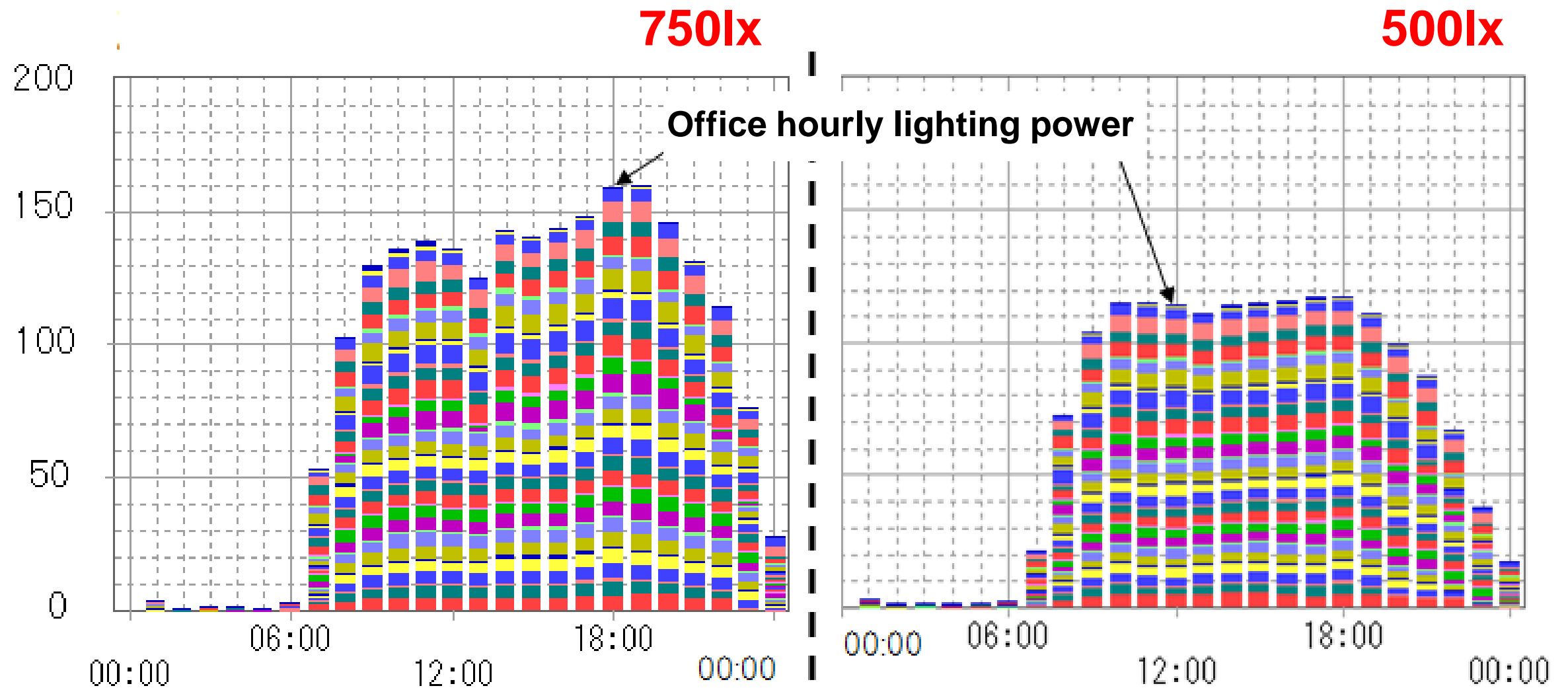
Adjusted daily AC consumption curve

Usual daily AC consumption curve



# Lighting for Peak Cut

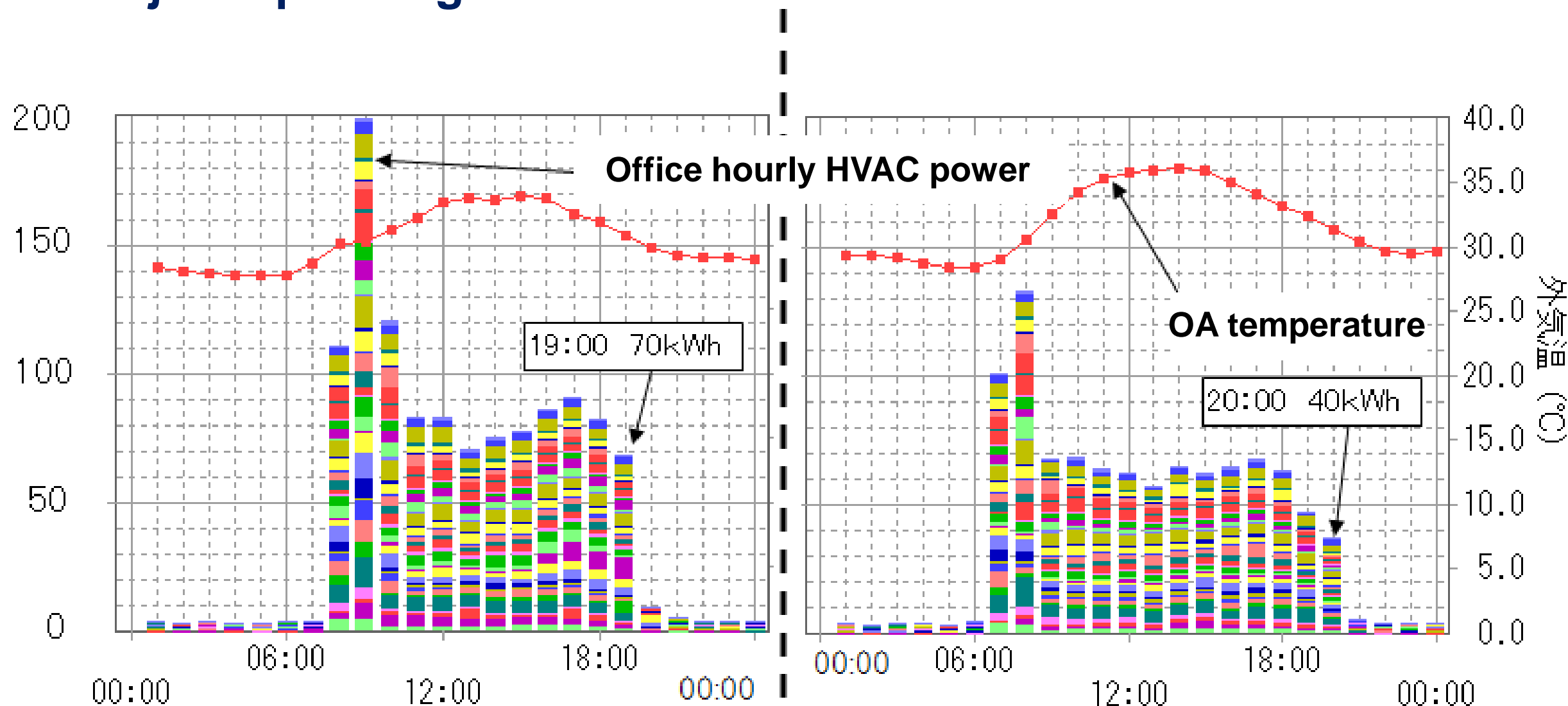
- Reduce setting illumination intensity



- Achieve maximum 48kwh/hour, 540kwh/day power reduction

# AC Operation for Peak Cut

- Adjust operating time



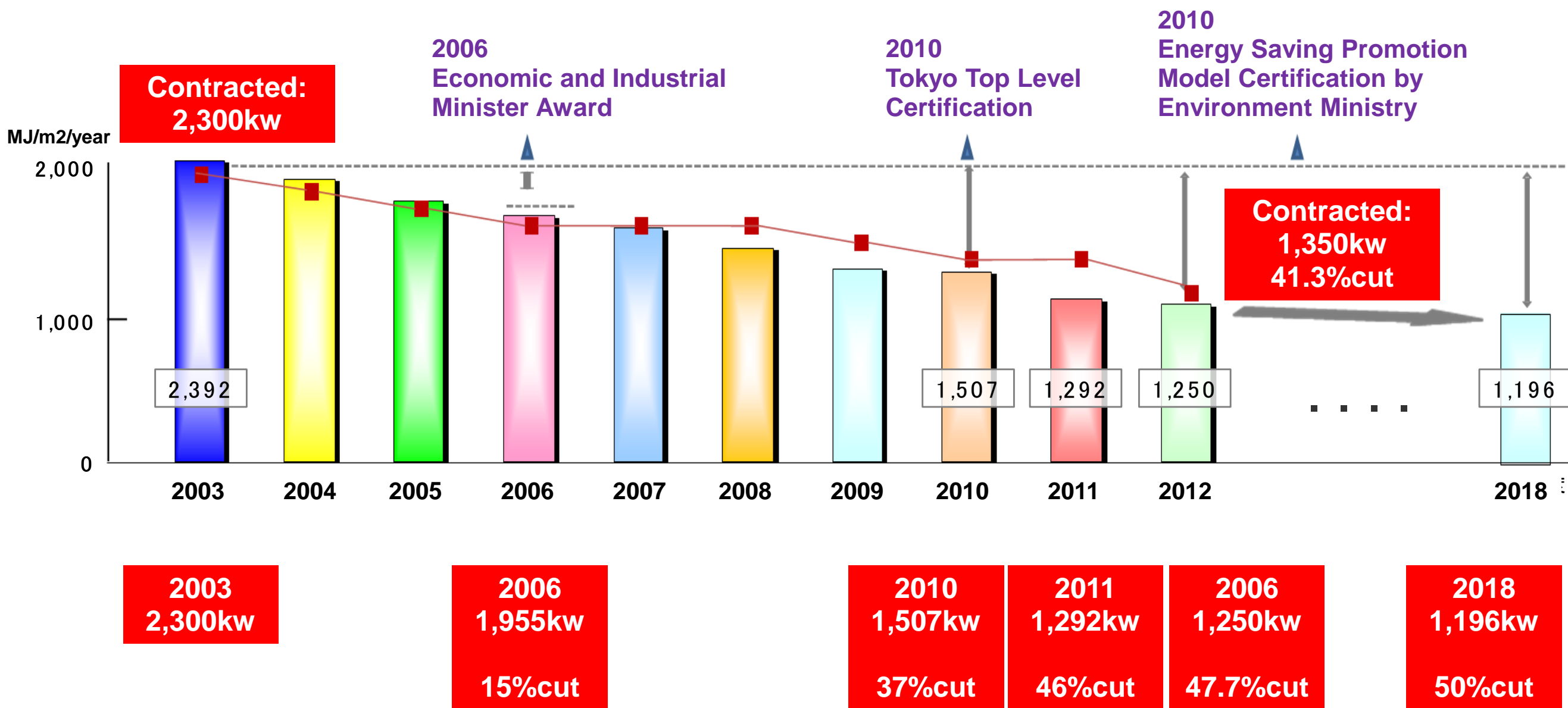
- Pre-operate HVAC 1 hour early

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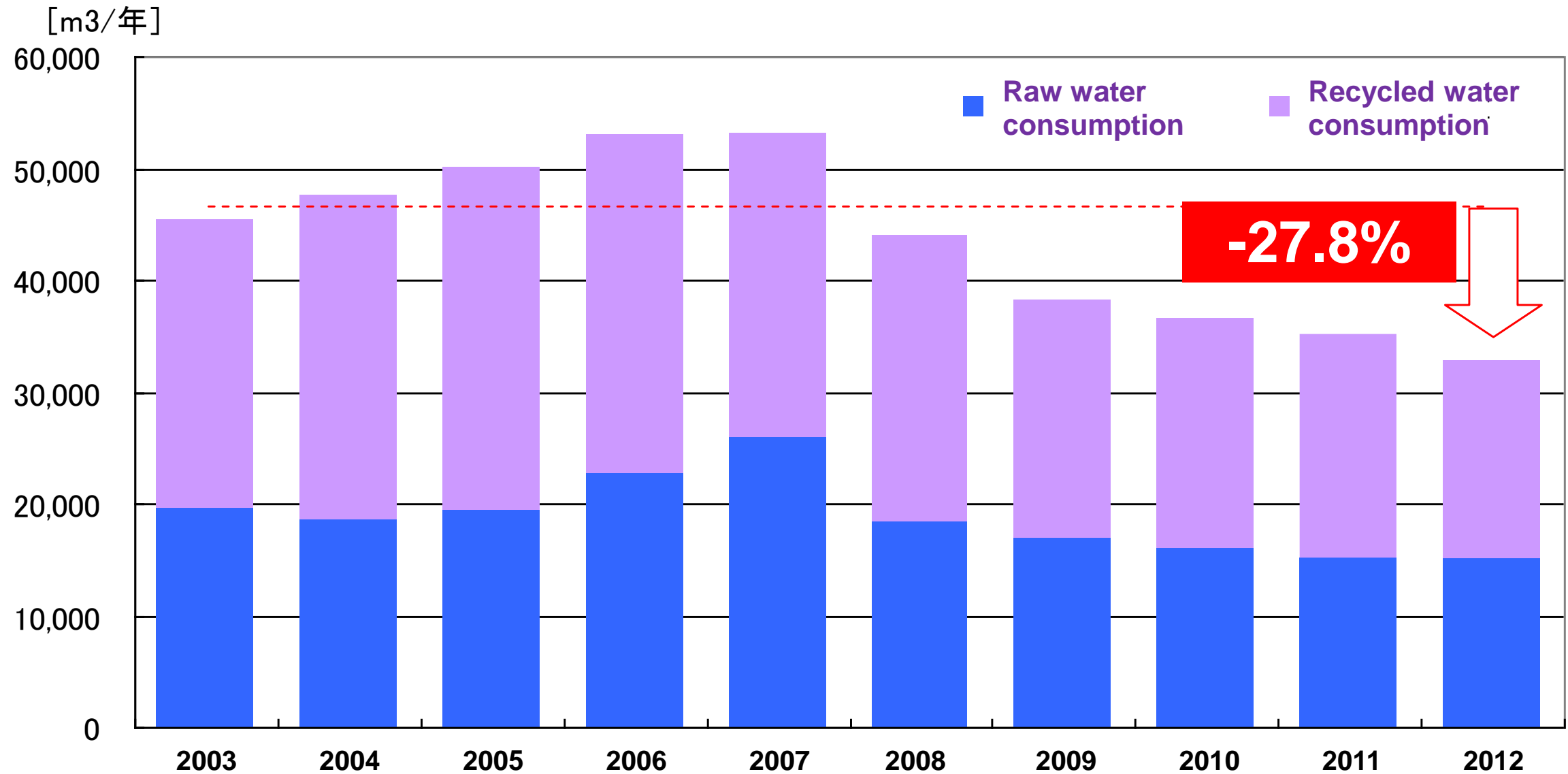
# RESULTS

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# Annual Primary Energy Reduction

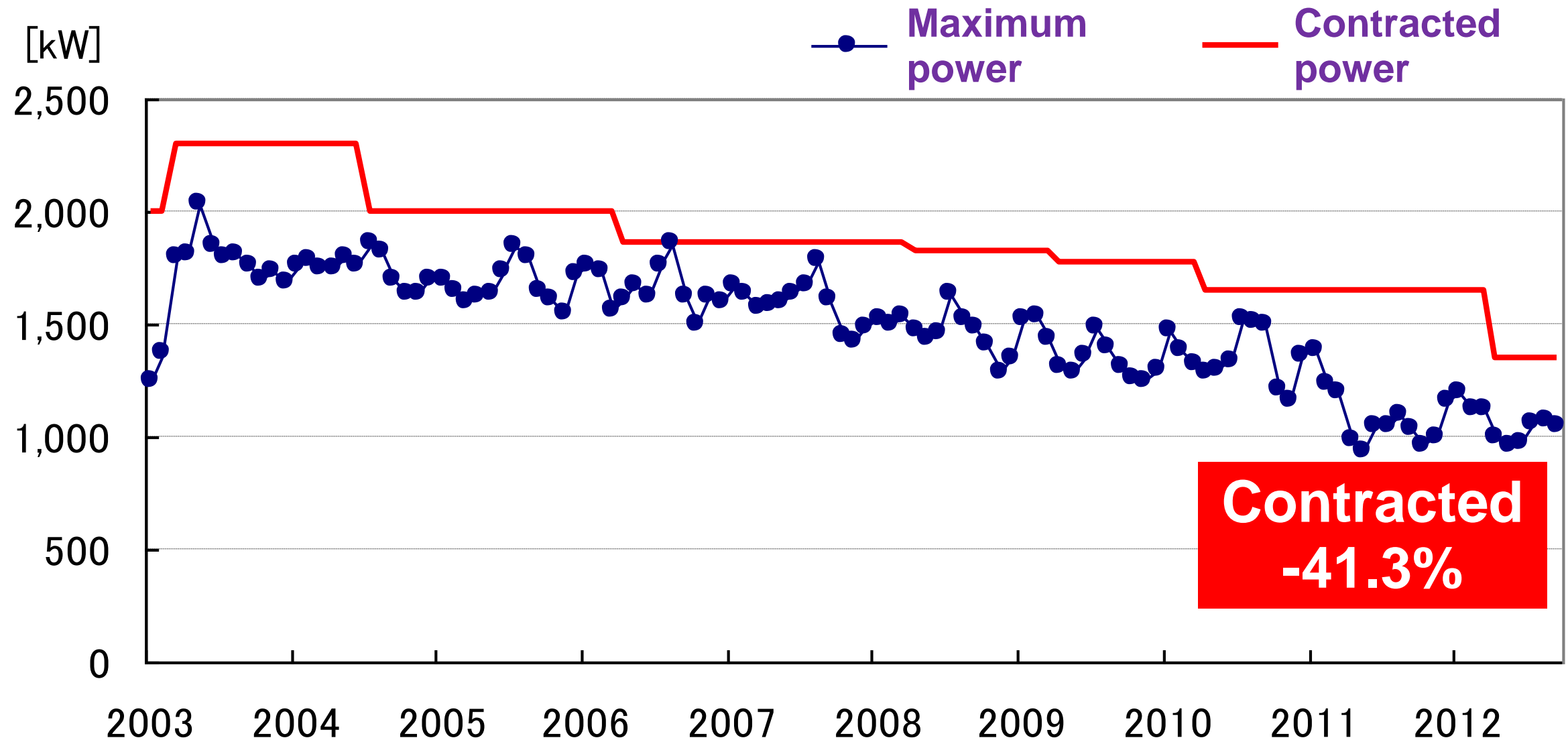


# Water Consumption: 45,000 -> 32,000m<sup>3</sup>/year

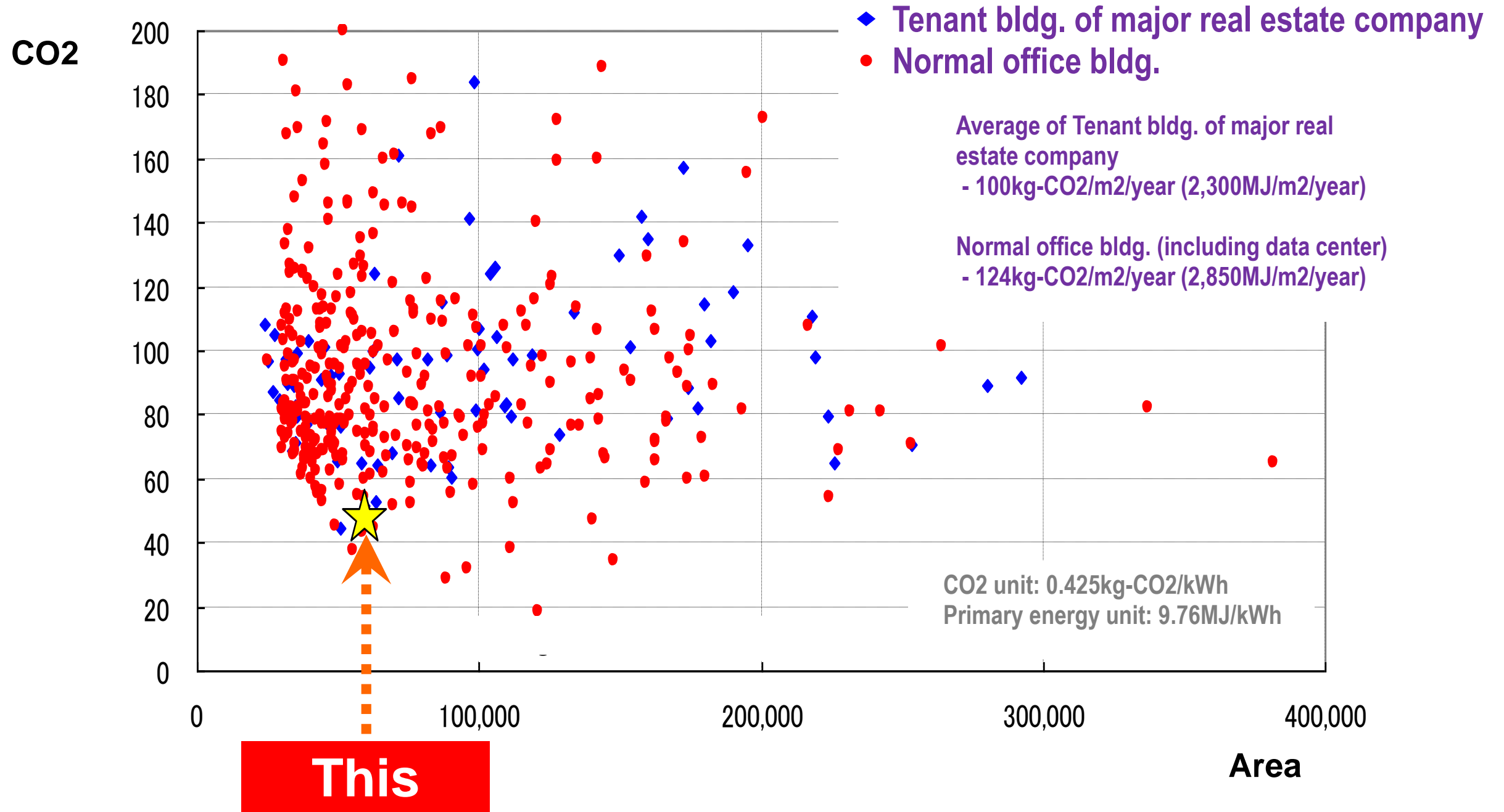




# Peak Power: 28.4W/m<sup>2</sup>



# CO2 Emission: 54.9kg-CO2/m2/year



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# THANK YOU !

**Jeffrey Zhang, Nikken Sekkei**