



DEMAND RESPONSE

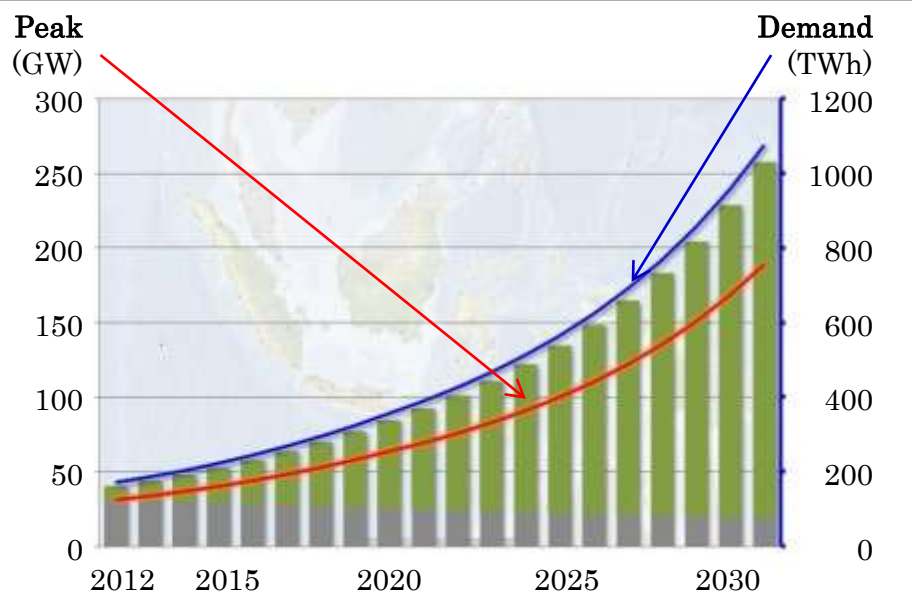
DAIKIN INDUSTRIES.LTD.
PT. DAIKIN AIRCONDITIONING INDONESIA

Background

In ASEAN region,

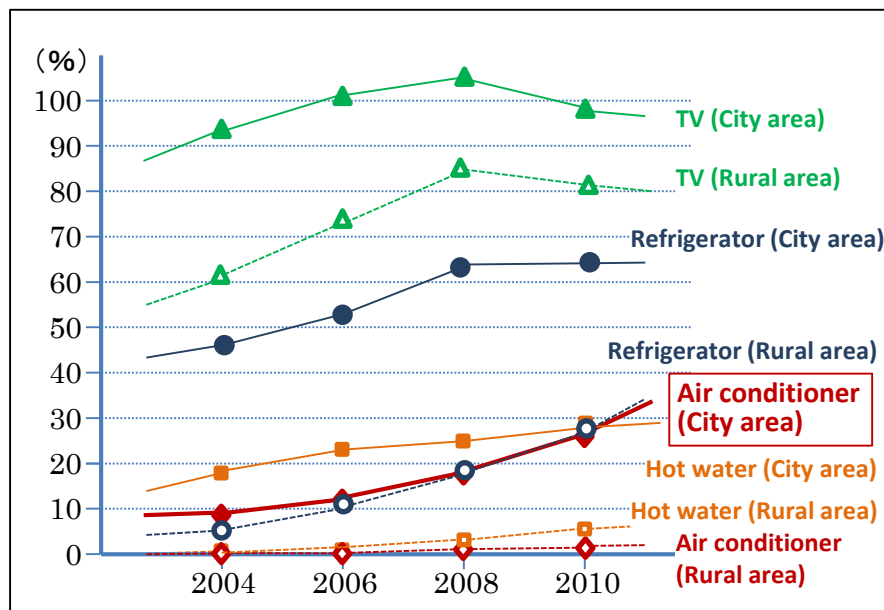
- The electricity demand will increase significantly.
- Air conditioner is rapidly increasing in city area.

e.g. Electricity demand and peak projection of Indonesia



Source: 2013 ESDM

e.g. Penetration of home appliances in Vietnam

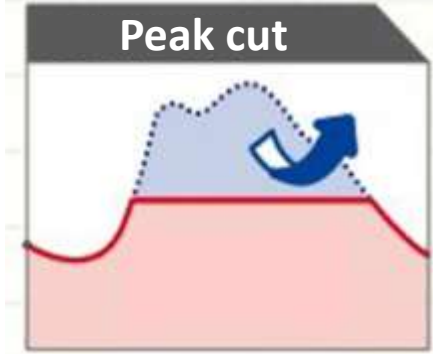
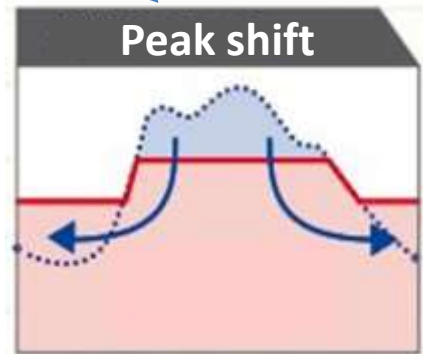
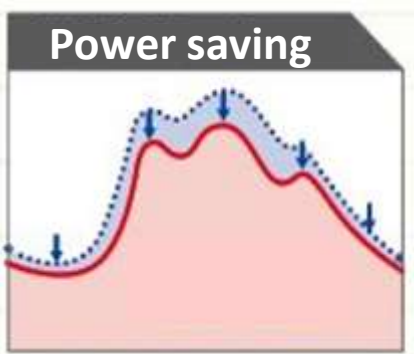
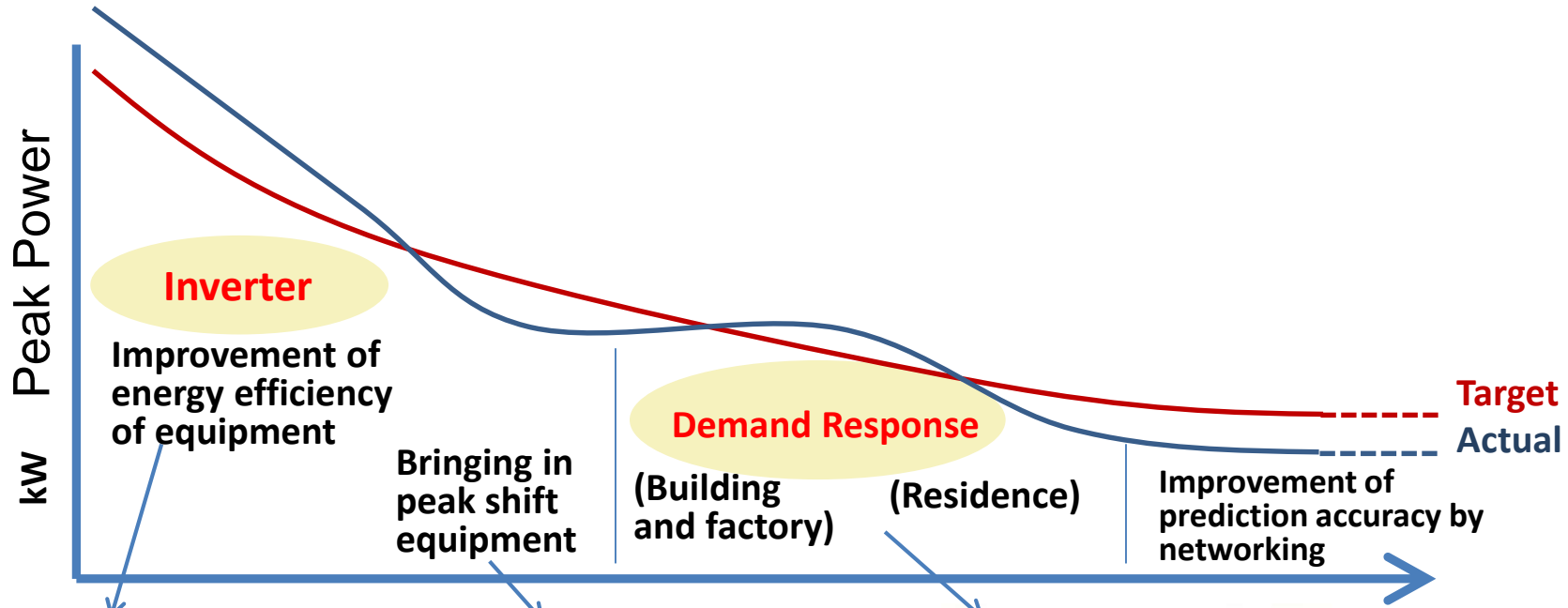


Source: based on Vietnam GSO

➔ In 2015, Thailand and Vietnam electricity company announced to start the demand response trial project.

Progress of suppression of the peak

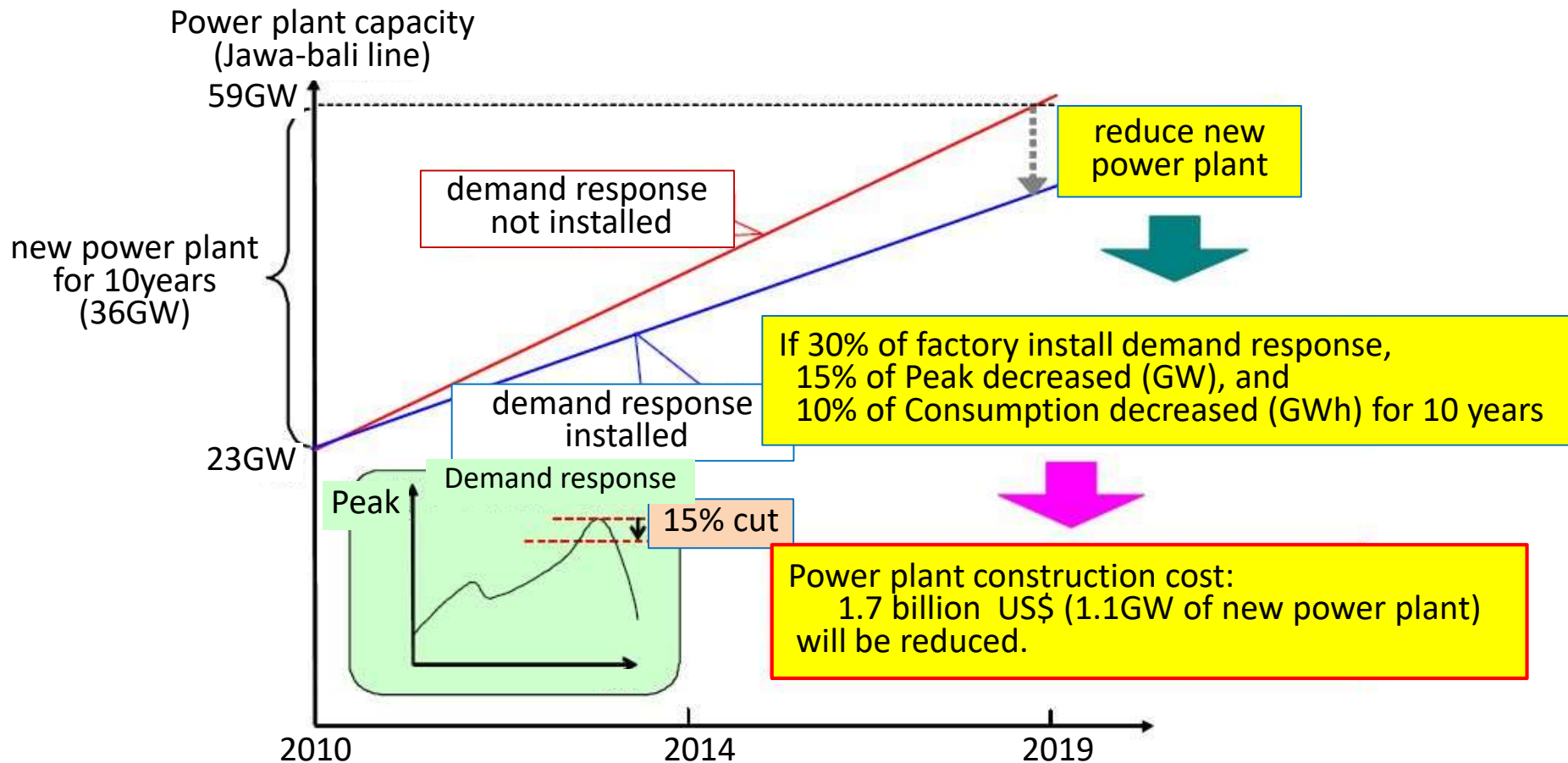
“Equipment side” to “Operation side”



Estimation of Demand Response

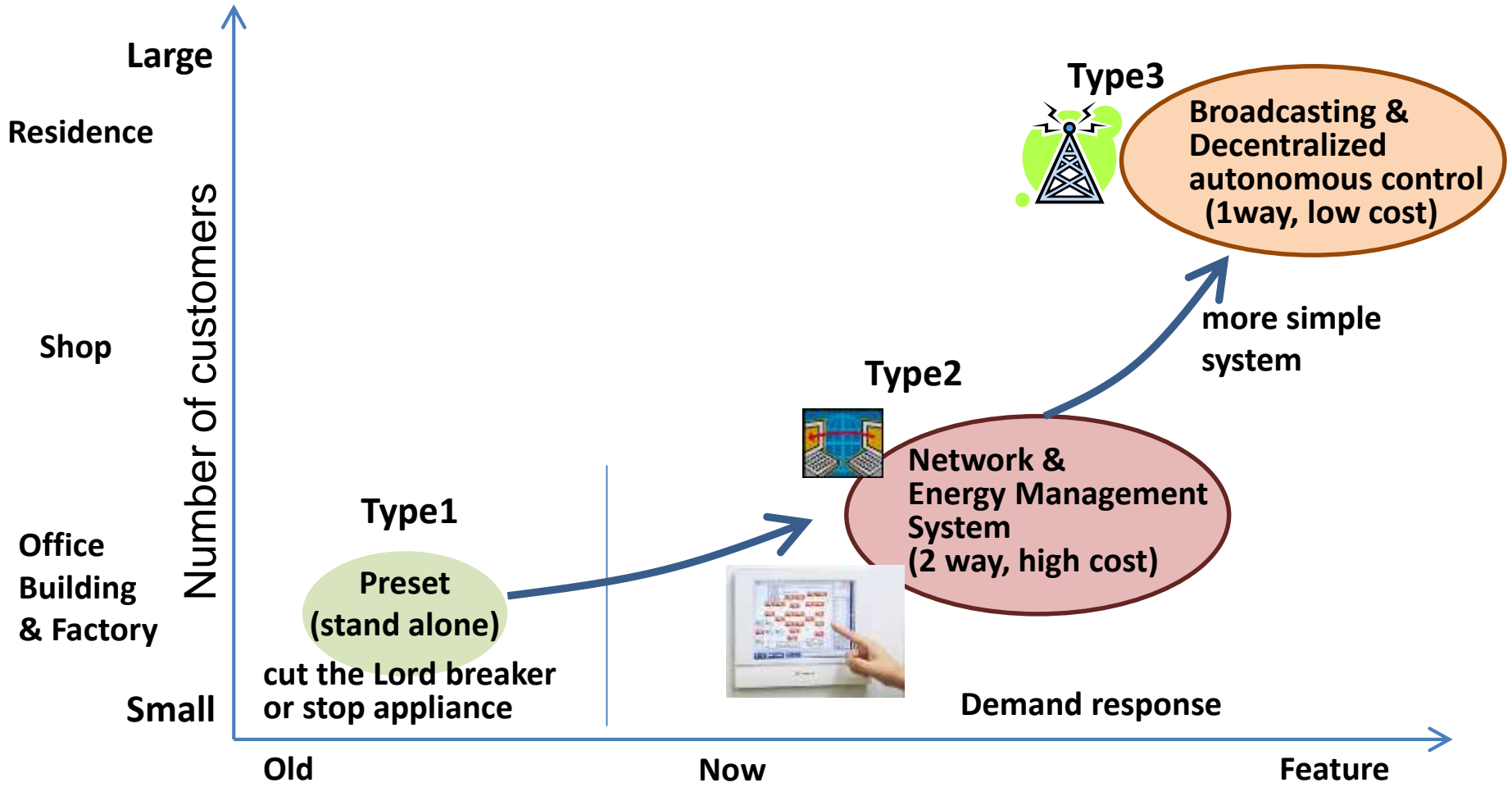
Feasibility study by NEDO in 2010-2011

- NEDO: **N**ew **E**nergy and Industrial Technology **D**evelopment **O**rganization of Japan.
- They considered about 7 Industrial Estates near Jakarta.



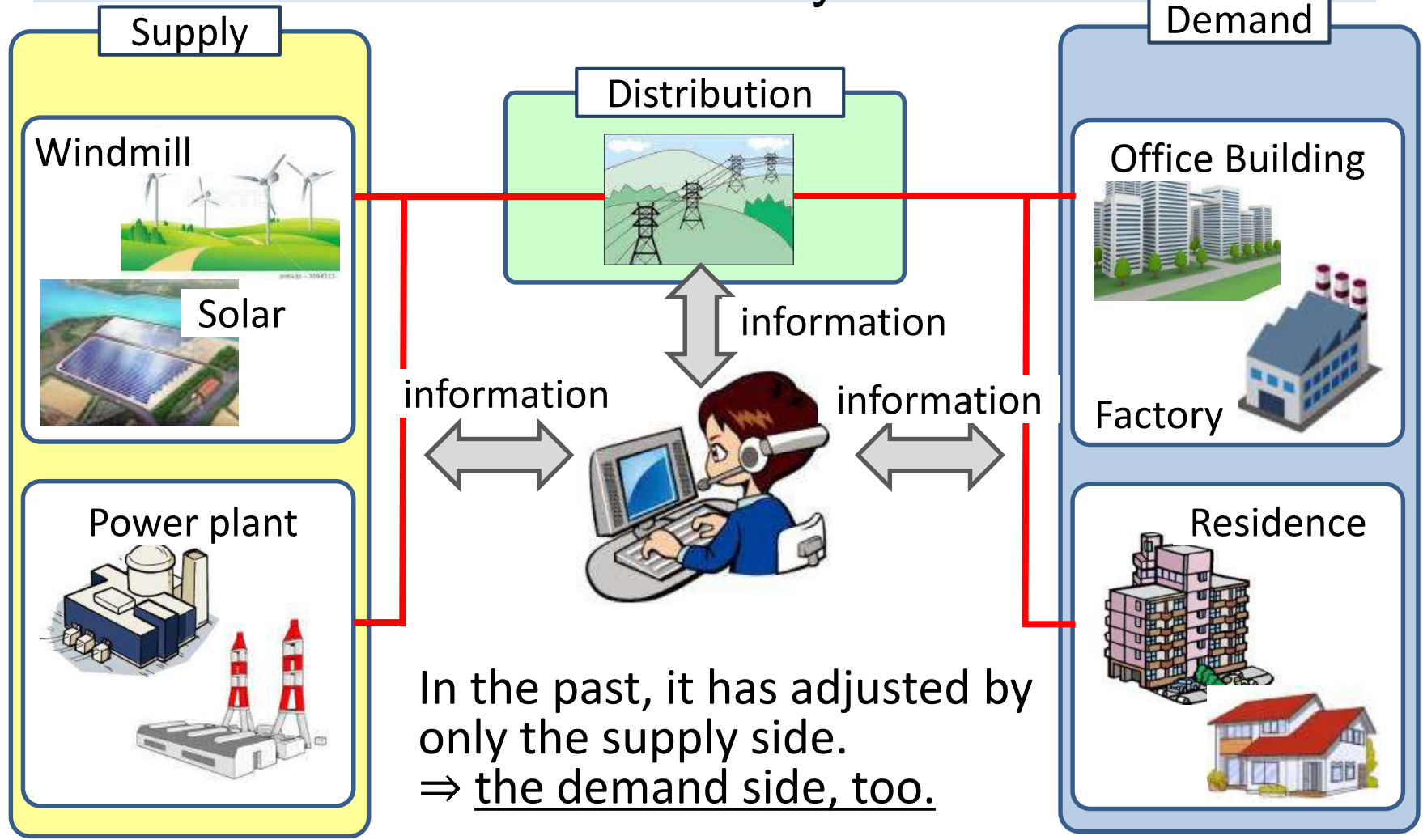
Progress of Demand response

- Considering the efficiency of investment, office buildings are first target. ⇒ **Today's proposal**
- For residence , it needs low cost and simple system.



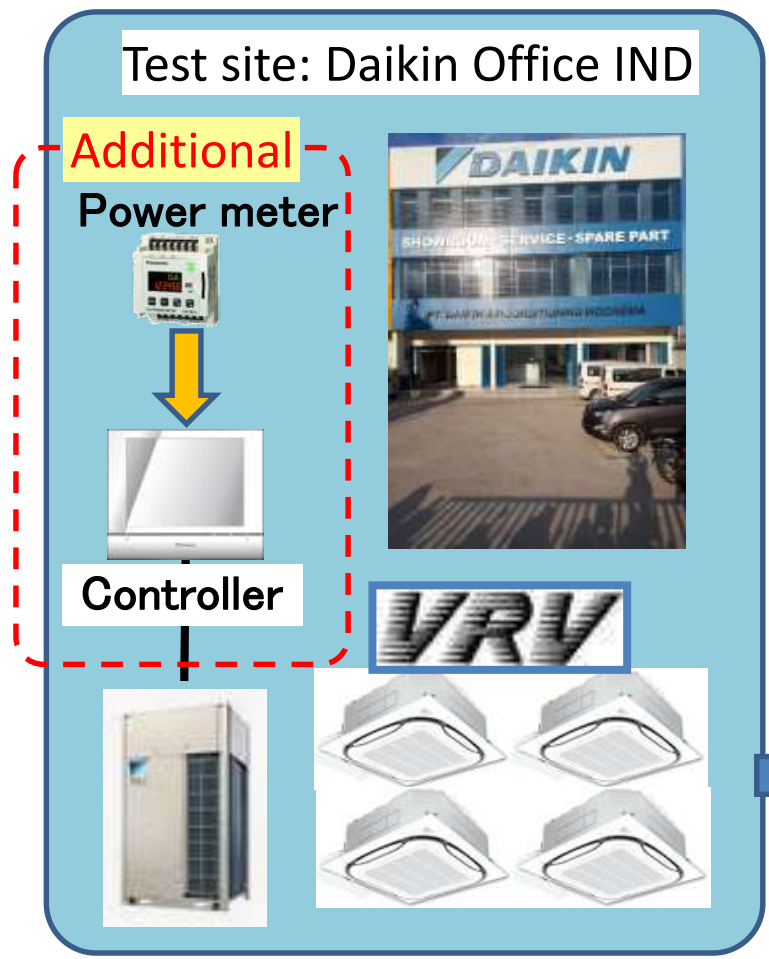
What is Demand Response ?

Balancing the supply and the demand to stable the electricity distribution.

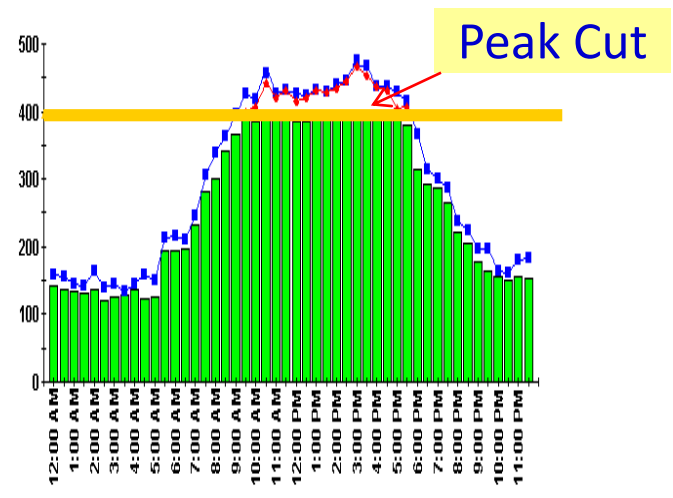


Over view of proposal

Daikin would like to demonstrate the capability of VRV for demand response with high efficiency and comfort.



“Temperature shift”,
“Priority” settings
and “power limiting”



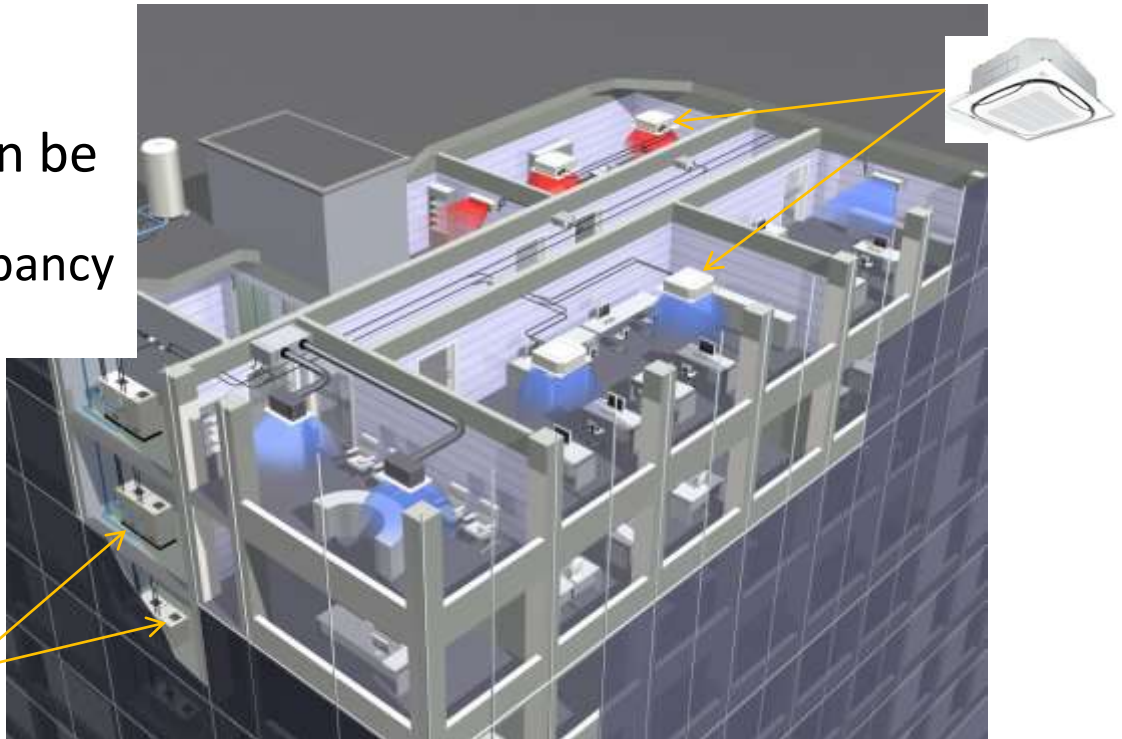
Daikin VRV System

High efficiency Air Conditioning system for office building
by inverter and zoning control.

- VRV (**V**ariable **R**efrigerant **V**olume/**F**low)
= Inverter + Zoning
- Zoning
Unoccupied spaces can be completely shut down
- Ex: Utilization of occupancy sensor through EMS



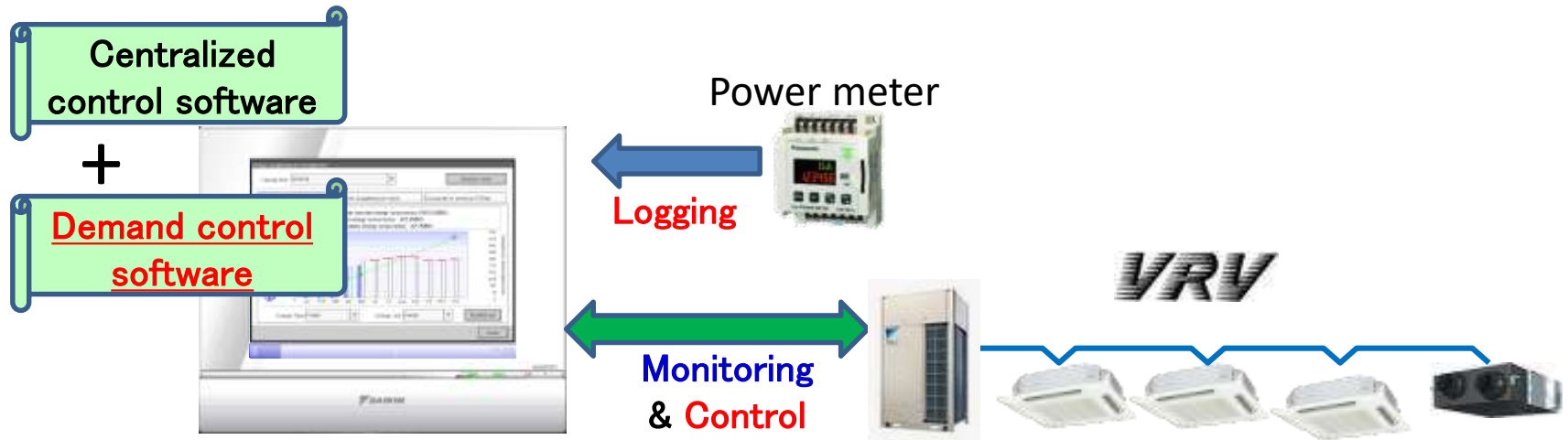
So effective for saving energy!!!



Daikin Demand Response Solution

- Daikin propose VRV demand control for office building.

ITM (intelligent Touch Manager) is centralized controller for VRV system. By Logging of electricity and Monitoring, *ITM* can realize demand control, too.



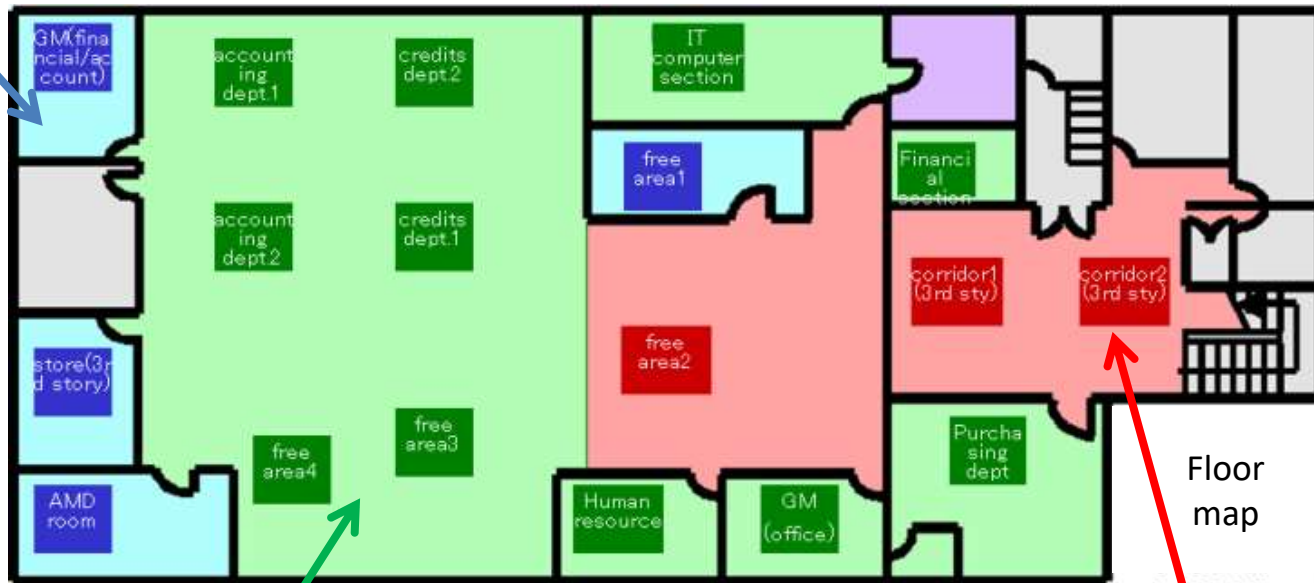
ITM(intelligent Touch Manager)

Feature of VRV Demand Response - 1

Maximum peak cut with setting priority for each rooms.

by Indoor unit

Keep thermal comfort for **“Low Priority”** area.
(e.g. Guest room, VIP Room...)

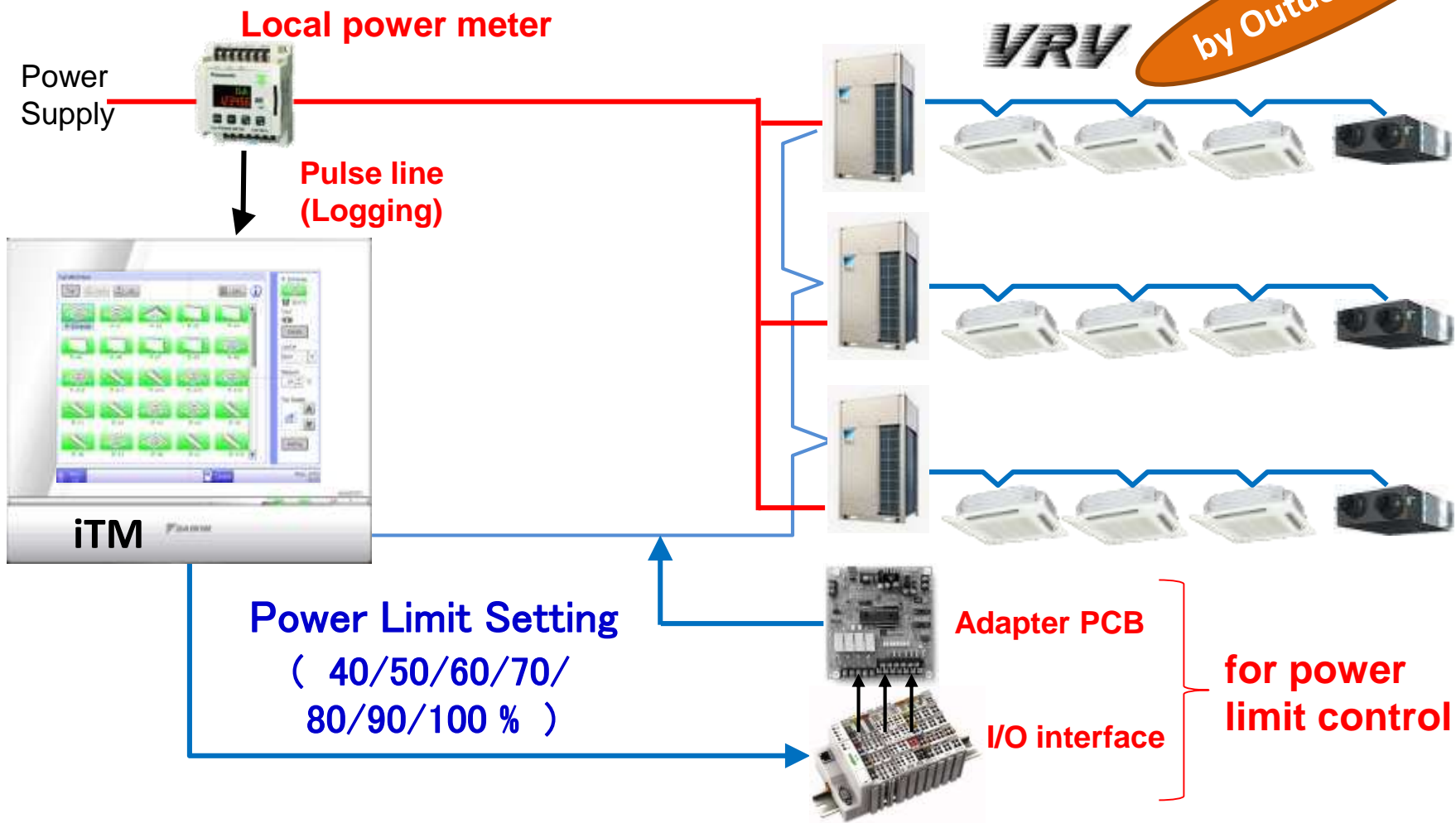


Moderate control for **“Middle”** area.
(e.g. Office area, Manager room...)

Drastic control for **“High Priority”** area.
(e.g. Corridor, Free space...)

Feature of VRV Demand Response - 2

Reliable power reduction by every 10% of power limit control.

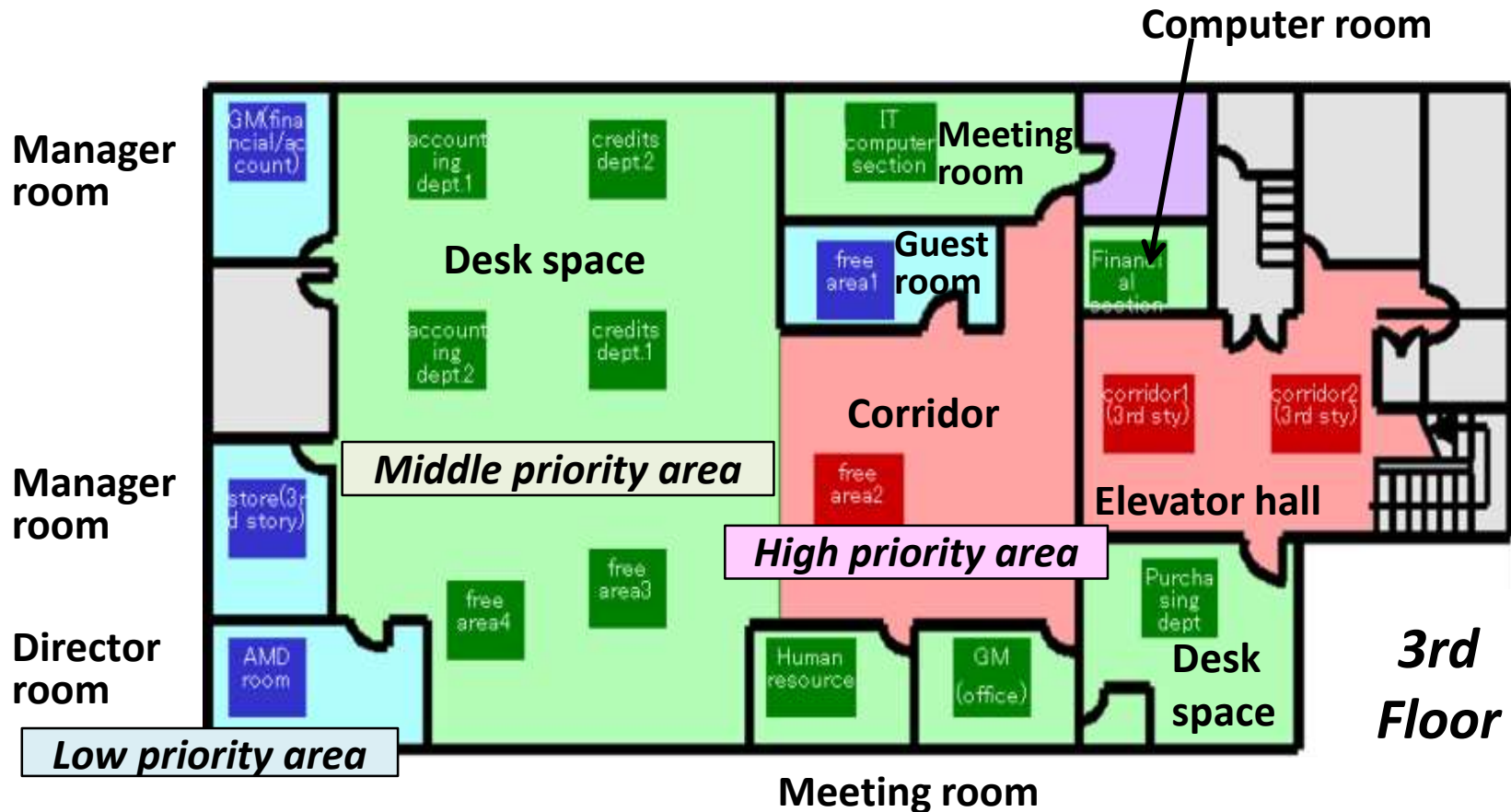


Typical sample of setting

(1) Priority setting for each indoor unit of each floor.

Priority is depend on the purpose of the space.

The ratio of the total area should be High(20%)/Middle(60%)/Low(20%).

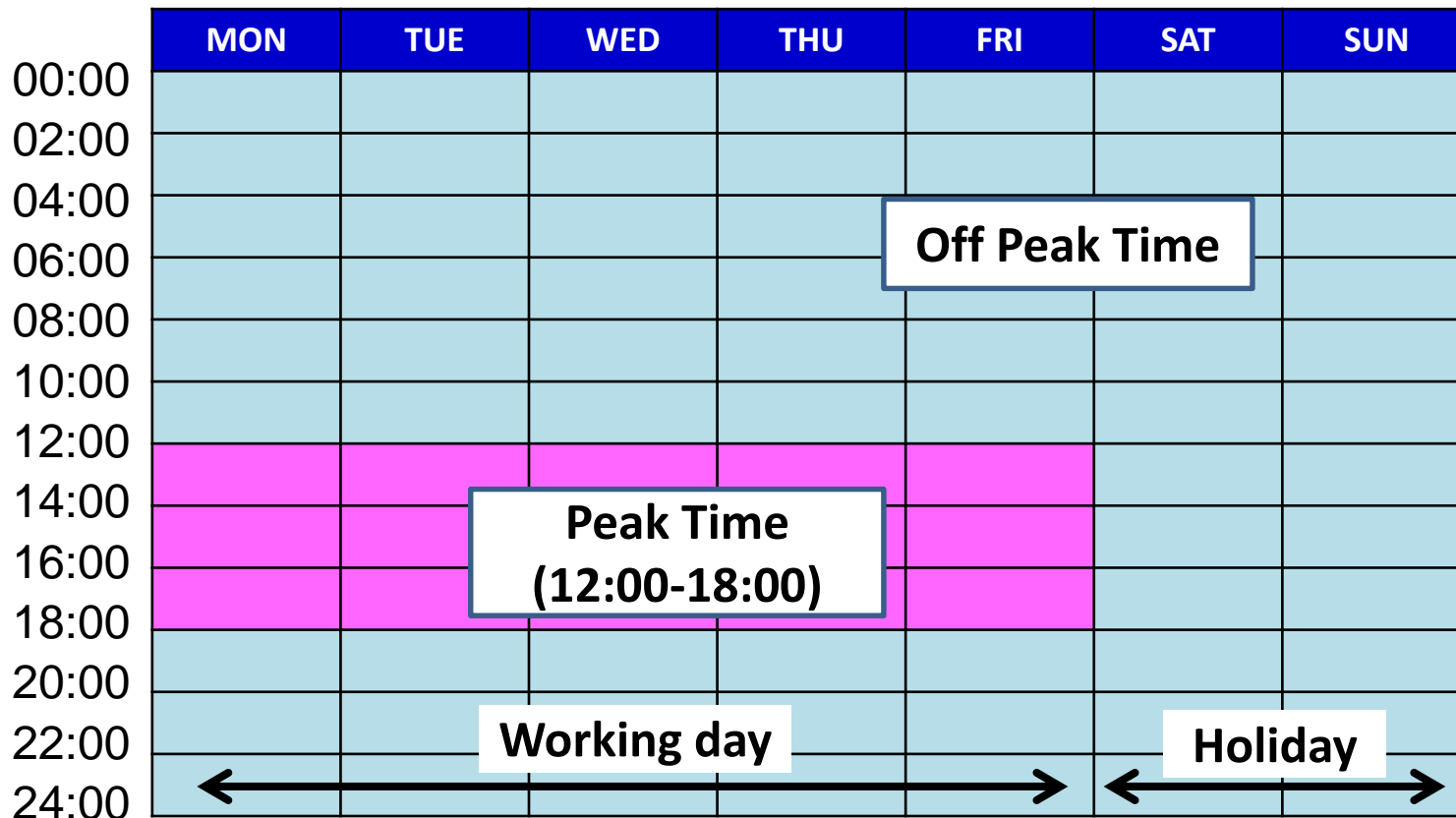


Typical sample of setting

(2) Define the peak time pattern for a week.

This sample is for office.

Air conditioner will power down in the peak time.



Typical sample of setting

(3) Define the air conditioner setting pattern

Air conditioner will be set as following
 Saving pattern for the Peak time, and
 Normal pattern for the Off Peak time.

Unit	item	for Peak time (Saving)	for Off Peak time (Normal)
Indoor unit	setting temperature for Low Priority Area	+1°C (25°C→26°C)	±0°C (25°C)
	setting temperature for Middle Priority Area	+2°C (25°C→27°C)	±0°C (25°C)
	setting temperature for High Priority Area	+3°C (25°C→28°C)	±0°C (25°C)
Outdoor unit	Power Limiting	60%	100%

Typical sample of setting

(4) Register the calendar of the iTM controller.

The pattern for working day and holiday are registered to the calendar function of the iTM controller for automatic control.

The screenshot shows a calendar interface for the year 2015, month 9. The days of the week are listed at the top: Sun, Mon, Tue, Wed, Thu, Fri, Sat. The calendar grid shows dates from 1 to 30. The days are color-coded: pink for working days (12:00-18:00 as peak) and light blue for holidays (no peak time). The working days are 1-5, 7-11, 14-18, and 21-23. The holidays are 6, 12, 13, 19, 20, 24, 25, and 27. Arrows point from the labels to the corresponding days in the calendar.

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

Working day (12:00-18:00 as peak)

Holiday (no peak time)

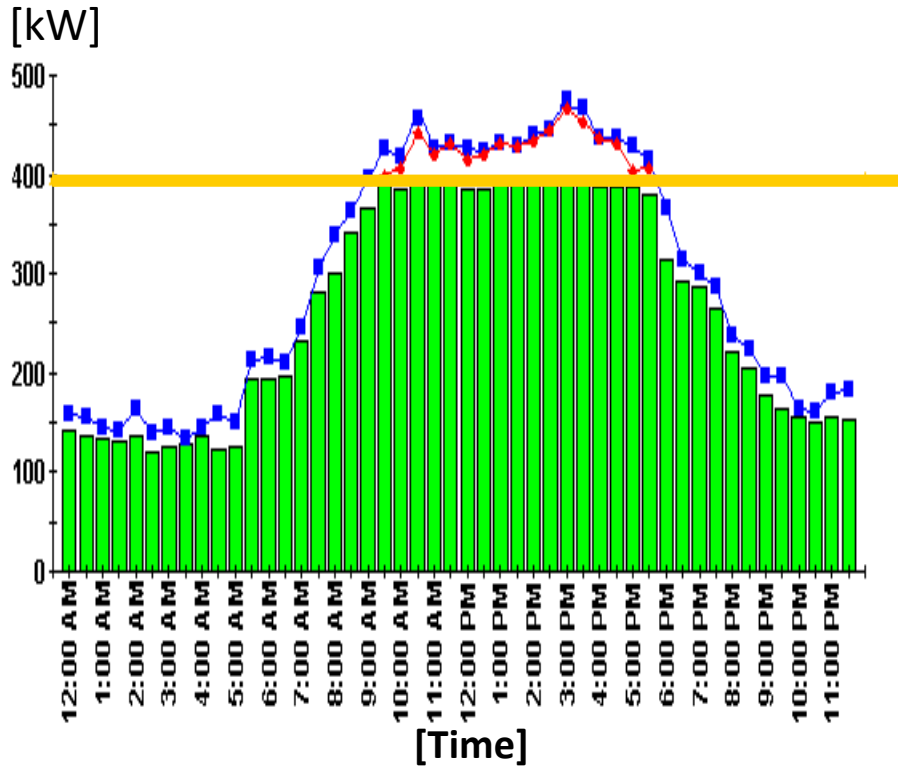


Calendar function of the intelligent Touch Manager

Case Study in Japan

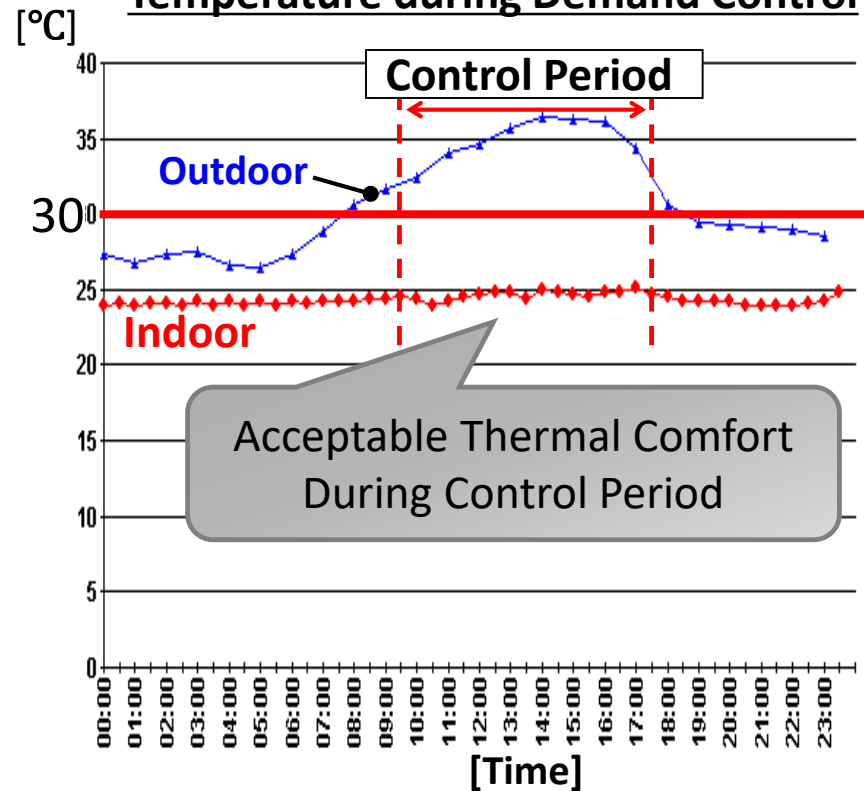
The peak of demand appears at day-time in office.
Indoor temperature was kept within comfortable level.

Power consumption of Office Building



- Power consumption
- Predicted maximum demand power
- Target power
- ◆ Estimated Power without Control (After Control)

Temperature during Demand Control



- Indoor Temperature
- ★ Outdoor Temperature

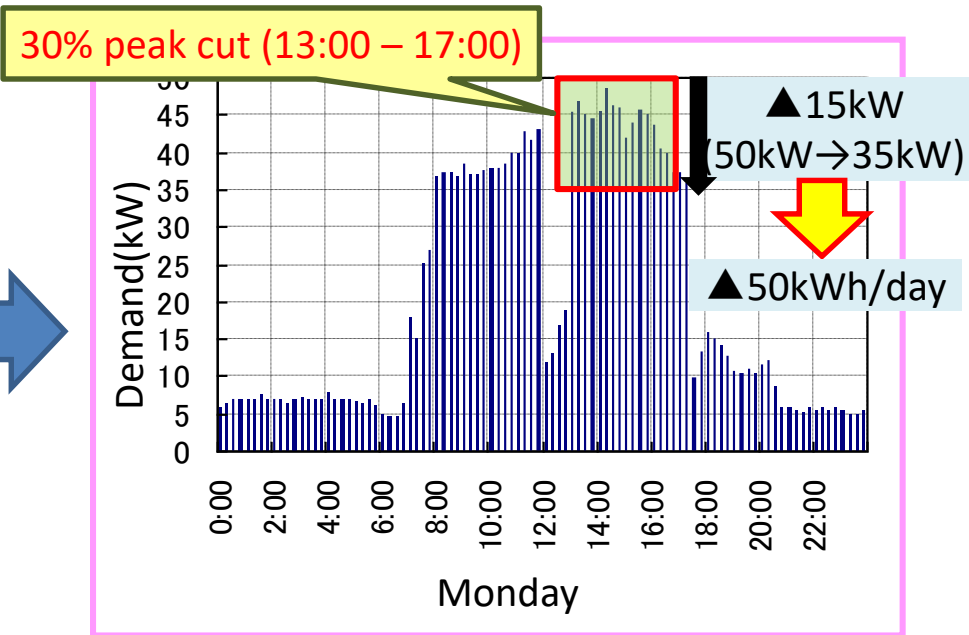
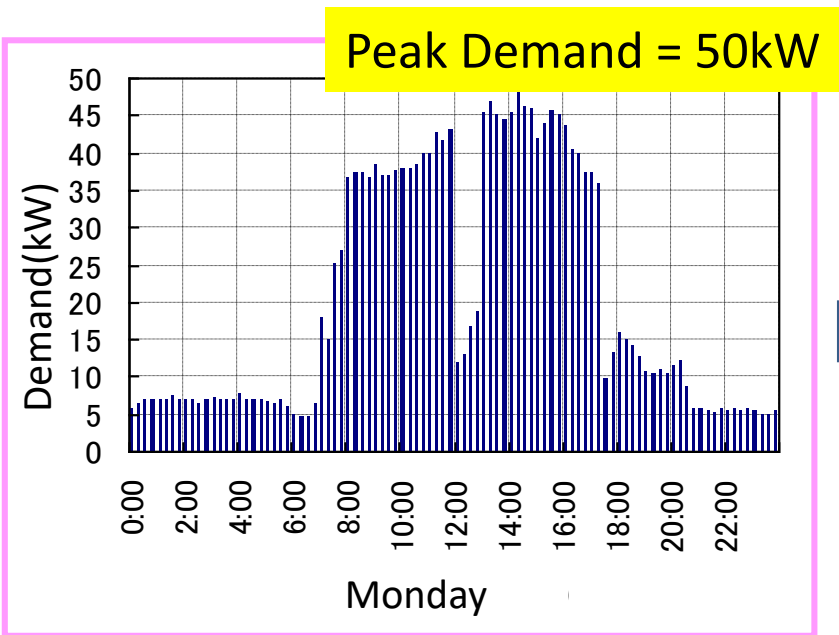
Case Study in Thailand

[Site Information] Siam Daikin Sales, office
 Floor Space: 1-3 Floor, 1,500 m²
 VRV Capacity: 100HP, Peak 51kW

by Indoor unit
 by Outdoor unit



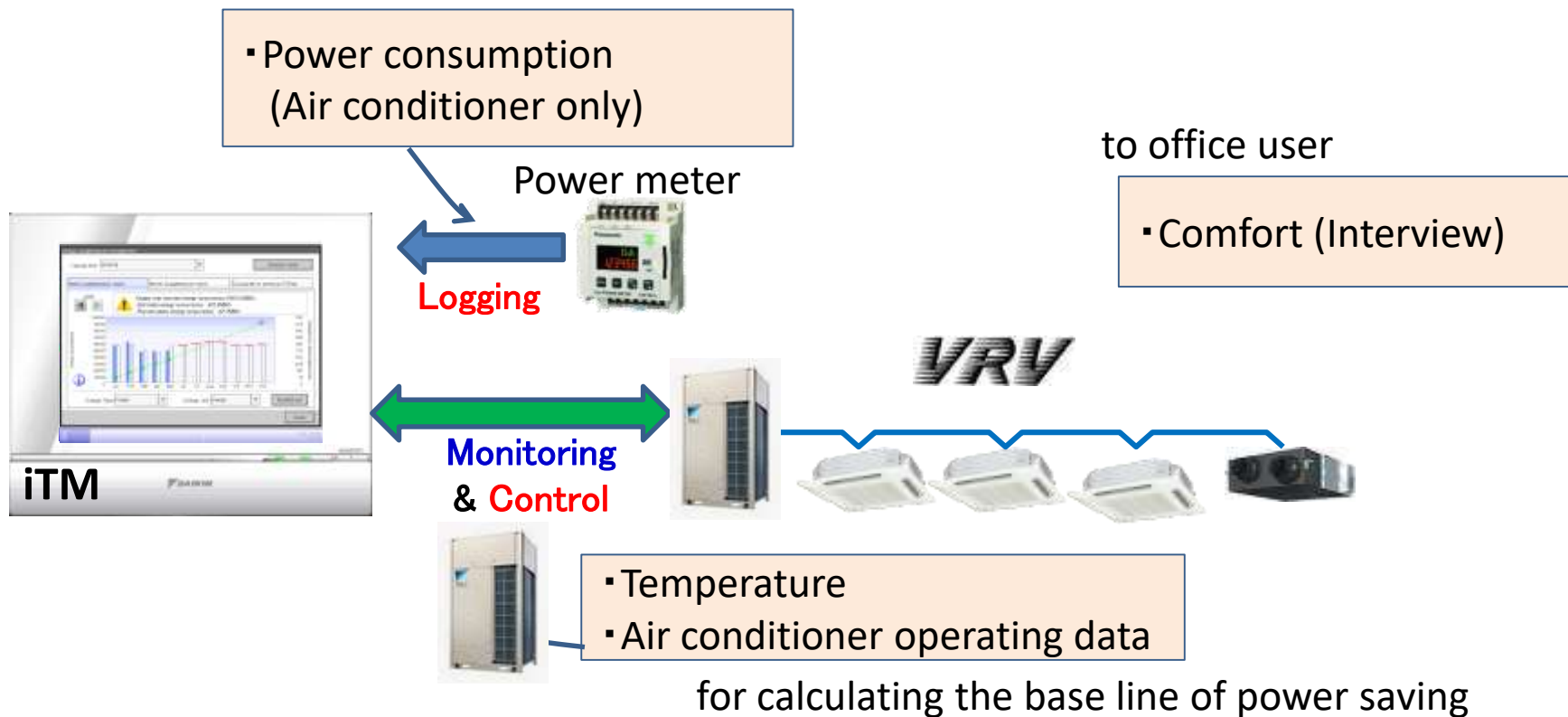
Priority	Examples	Capacity Ratio
Low	Manager room, separated room	16%
Middle	Office area	66%
High	Corridors, stairs...	18%



Collecting data for Trial

Point of view

1. How about actual peak reduction and power saving in Indonesia condition ? (Climate, Building etc.)
2. Is there any compliant from office users with comfort ?

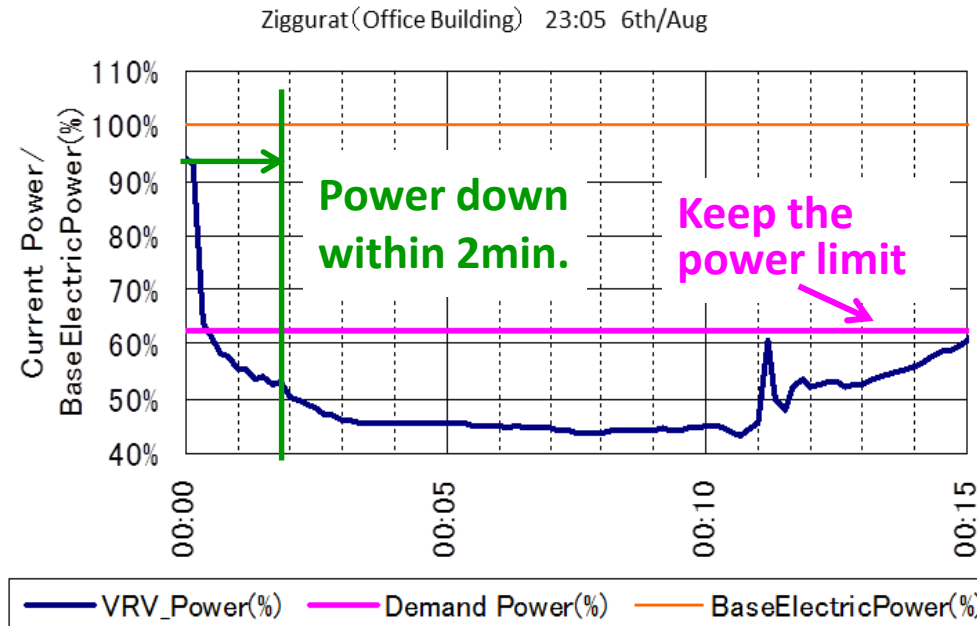


Case study in Europe

VRV can power down within 2 minutes, and reduced 22% of rated power

2012-2014

e.g. VRV demand response trial at commercial building in London



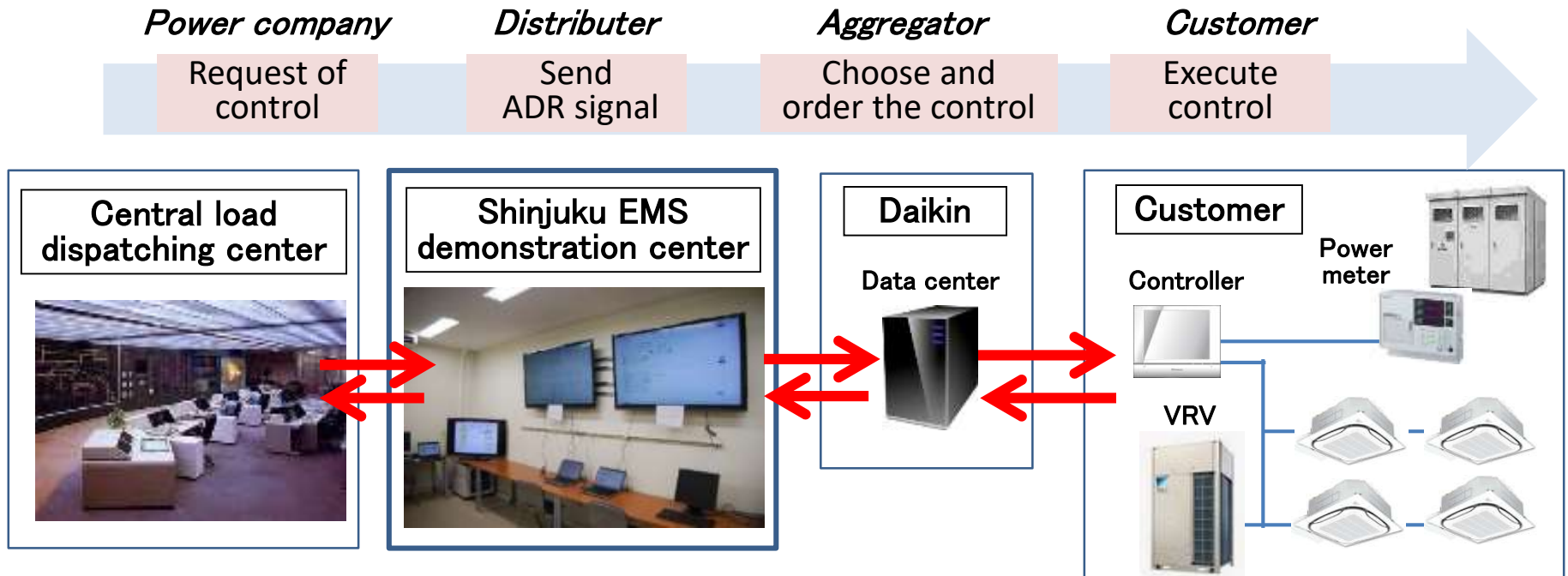
VRV

Reduced 22% of rated power

Case study in Japan

- Daikin participate the Open ADR trial by Japanese government.
- Carry out cooperative operation with aggregator in wide area.

e.g. Participate Japanese Open ADR trial in Waseda university.



Note) Open ADR: International standard protocol for automated demand response

Conclusion

- ① VRV + iTM system can realize the demand control.
 - But need Simple and Small additional engineering.

- ② VRV Demand system realizes reliable peak cut.
 - Advanced inverter control achieves peak cut.
 - Optimal settings realize max reduction and comfort.

- ③ Estimated effect is 30% of peak power of VRV.

Thank you