DSM and Energy Services in Japan

JAPAN FACILITY SOLUTIONS, Inc.

URL: http://www.j-facility.com

Outline of This Presentation

1. Corporate Profile of JFS
2. DSM Triangle for electrification & CO2 reduction
3. DSM Technologies for utilizing tariff system
4. Project Examples adopting DSM technologies
5. Growth of Japanese energy service market & JFS

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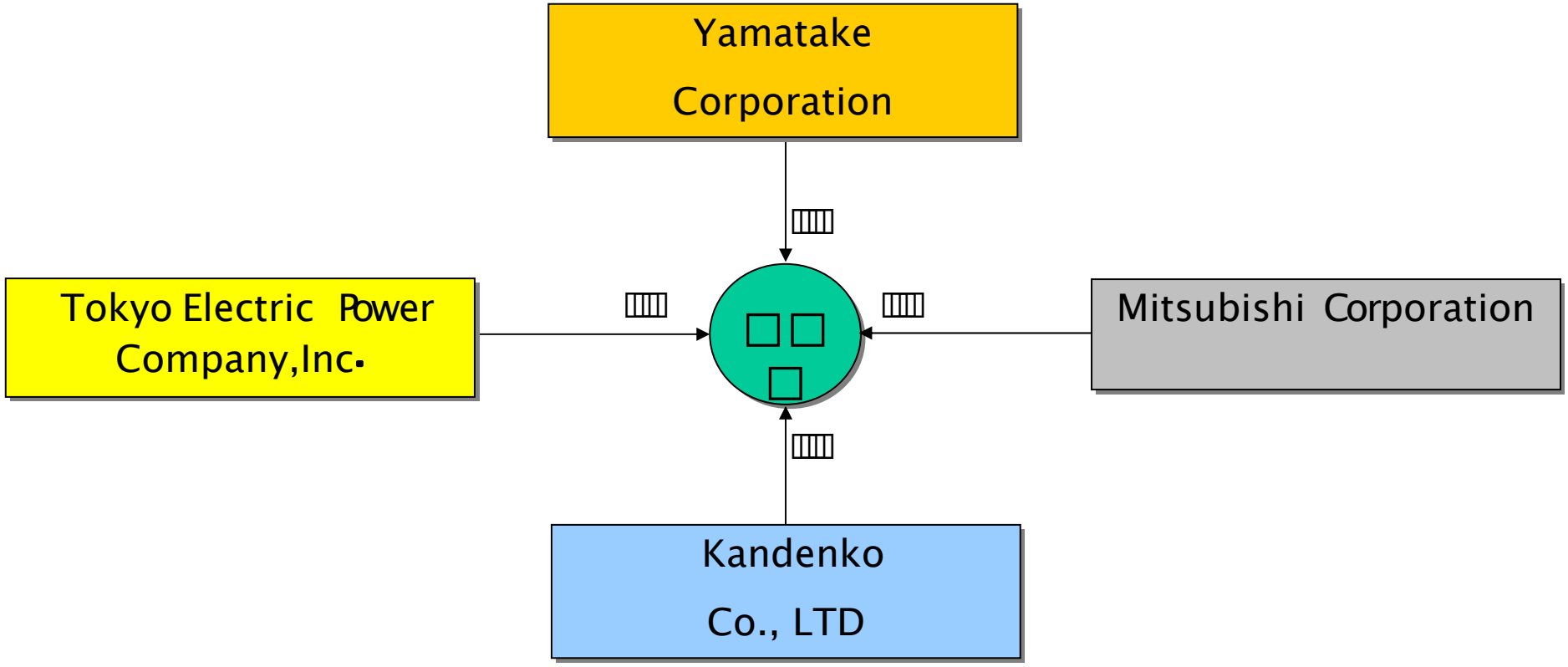
Corporate Profile

Date established : 14 December 2000
Capital fund : 490 million yen (3.3 million euro)
Employees : 45 persons



The Background of JFS Establishment

- Global Warming Issue
- Deregulation in Electricity Market
  - Mar. 2003 / Over 2,000kW (26% of market)
  - Apr. 2004 / Over 500kW (41% of market)
  - Apr. 2005 / Over 50kW (63% of market)

- Non-utilities
  - Joined energy market as PPSs
- Utilities (including TEPCO)
  - Reduced profit and sales
  - Established new energy business such as ESCOs

Business Line up of JFS

- ESCO service /56 projects
- Energy Audit /over 200 projects
  - government office buildings including METI, MoE
- Energy efficiency renovation /27 projects
  - application for governmental subsidy
  - renovation for energy cost saving
- Energy Supply Center Project /1 project

The Characteristics of JFS's ESCO Services

- Focused on buildings (offices, hospitals, hotels, commercial buildings), utilizing efficient electrical system such as turbo chillers

  cf. ESCO with co-generation system by gas companies
- Mainly "Shared savings type" service
- Competitive financing and procurement capabilities
- Energy and cost saving based on the experiences in electricity supply business

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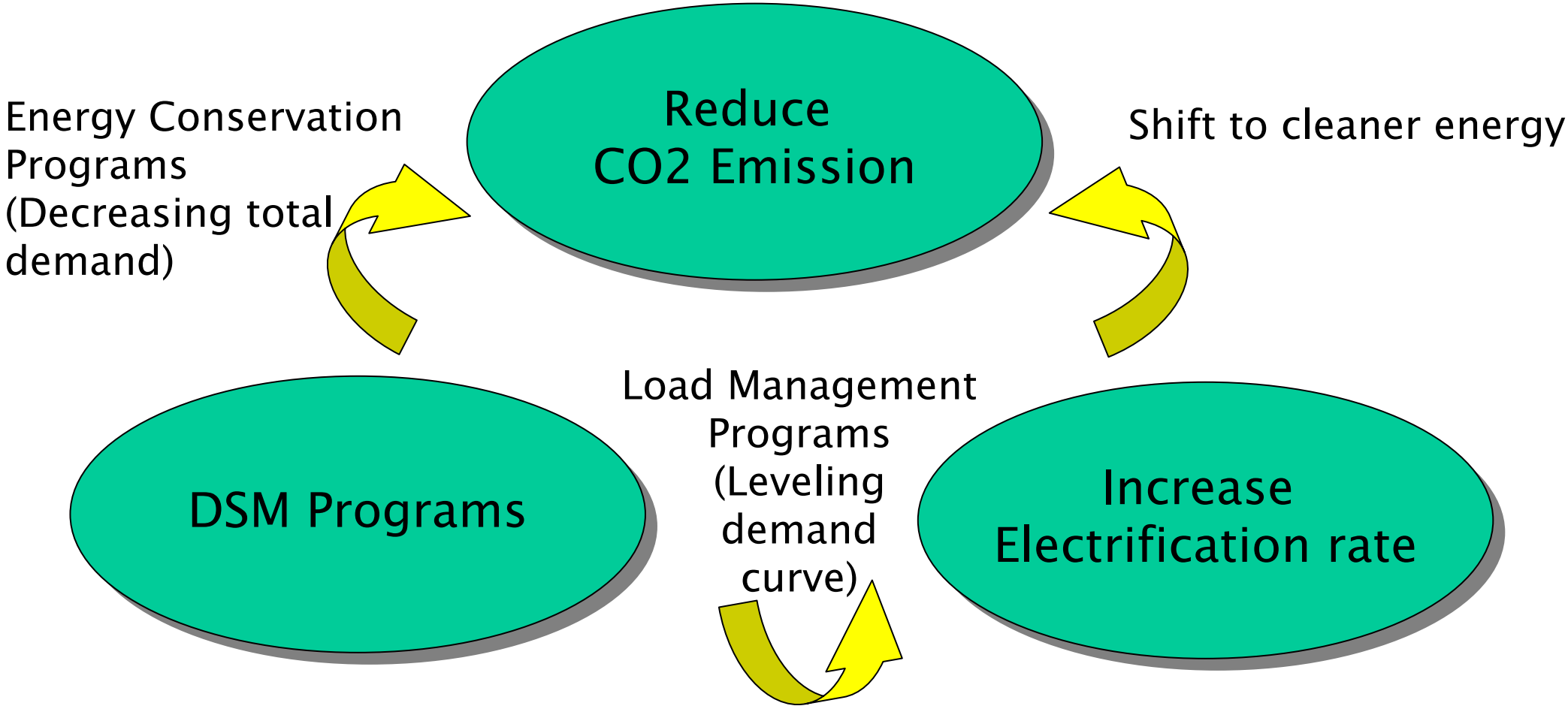
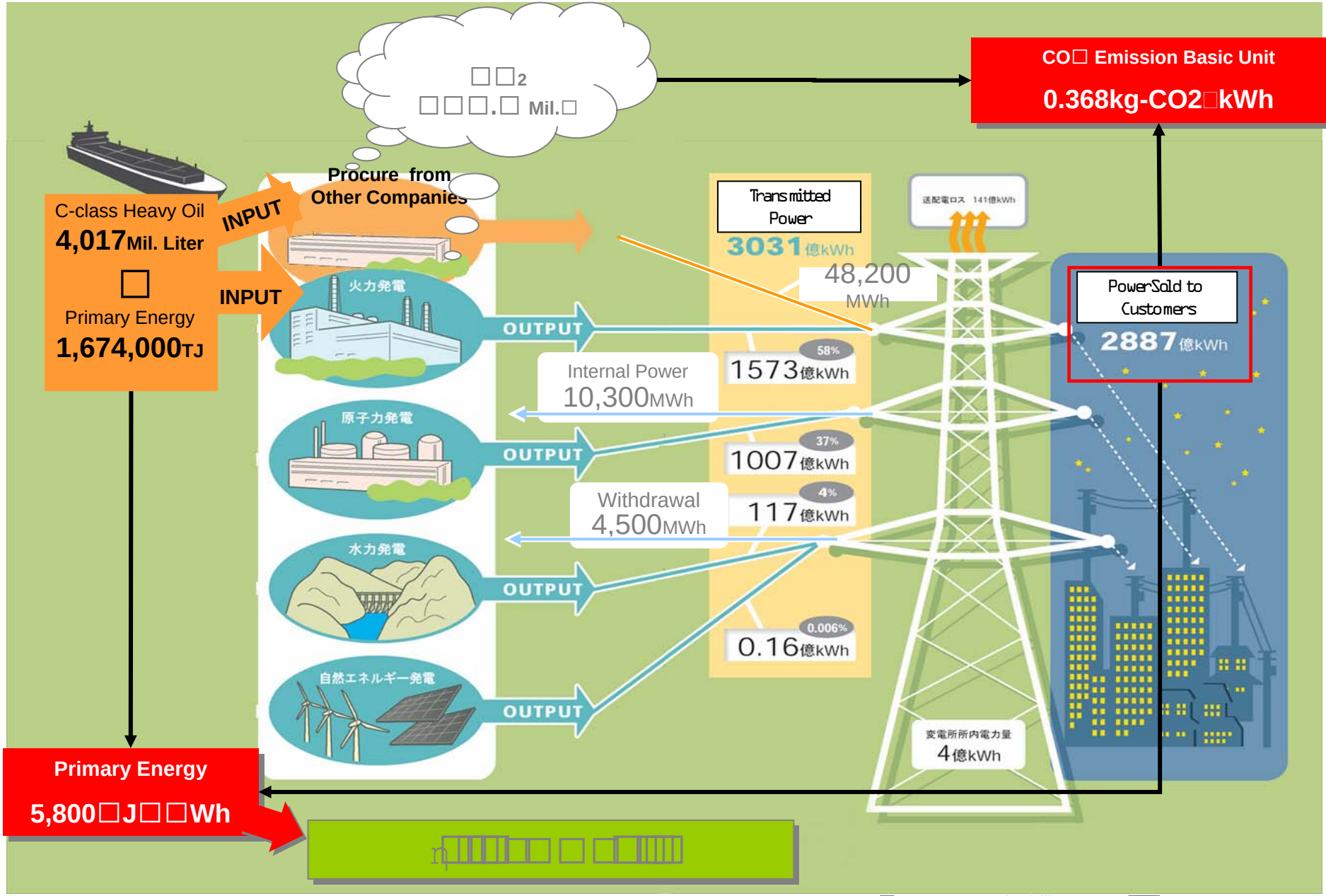
What is □□□ □□□□□□□□?

It is the system that accelerates
electrification & CO2 reduction at the same time…



Why Electrification Leads to CO2 Reduction…



Source□TEPCO Sustainability Report□□□

Energy Conservation Programs

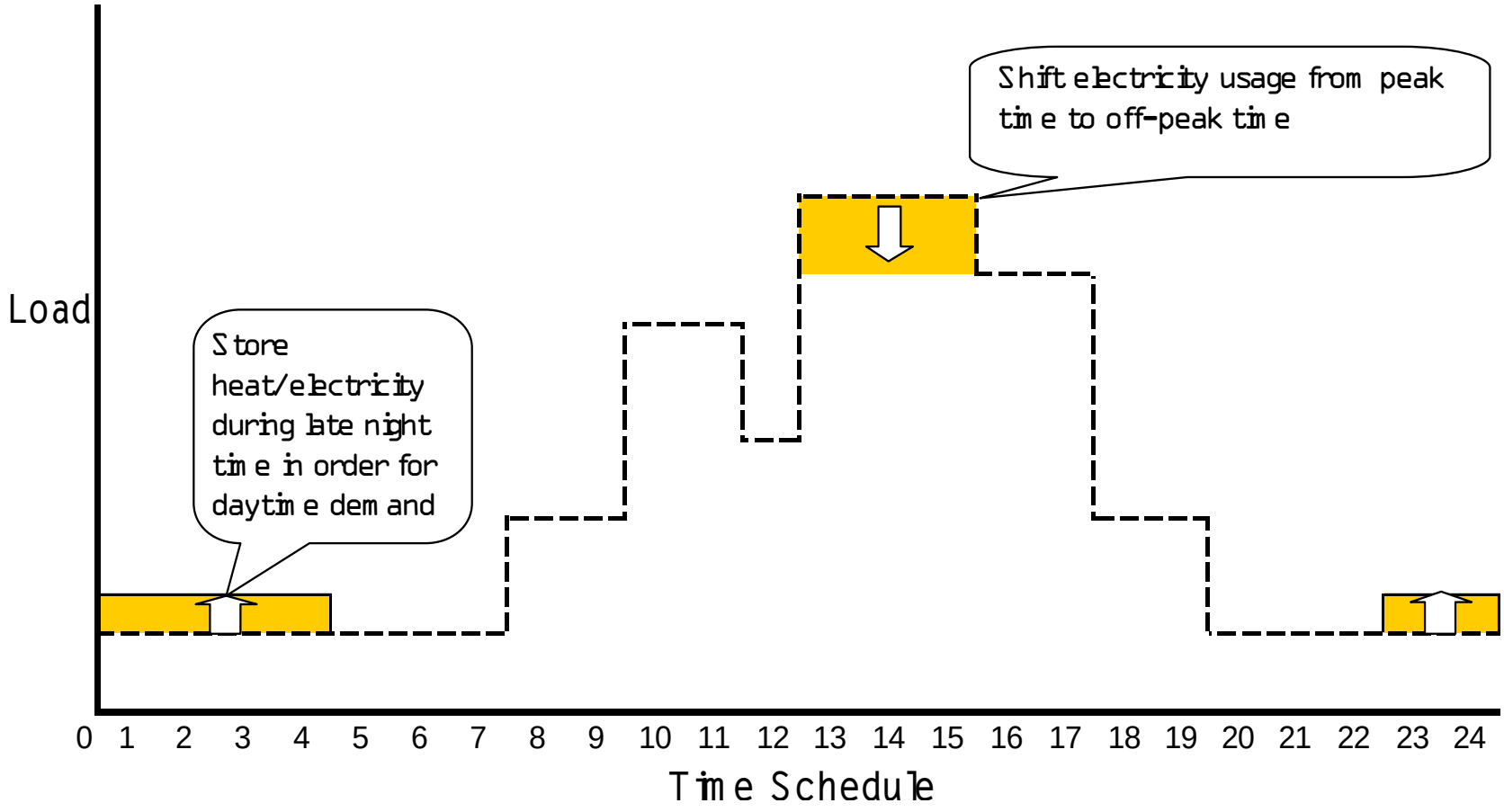
- **Energy Audit**
  - Useful for researching potential energy conservation projects

- **Subsidy for Energy Conservation Projects**
  - Currently 8 major subsidy programs in Japan, totaling 26.7 billion yen of grants annually
  - Stimulates introduction of energy conservation projects
  - ESCOs in Japan utilize such subsidy programs in order to offer more competitive energy services

Load Management Programs

- **Tariff System for DSM Promotion (example□ by TEPCO)**
  - Heat Storage Adjustment Contract
    - Electricity load-shift of daytime demand to late night time, utilizing "heat storage tanks" and " heat pumps" for heat demand
    - Tariff discount for shifted electricity, typically 80%-off compared with day-time rate
  - Peak-Shifting Contract
    - Electricity load-shift of pre-contracted summer-time peak demand to off-peak time, by shifting mainly air-conditioning load
    - Tariff discount for shifted electricity, typically 800-900 yen/kWh/Hour

Peak Shift Scheme by Tariff System



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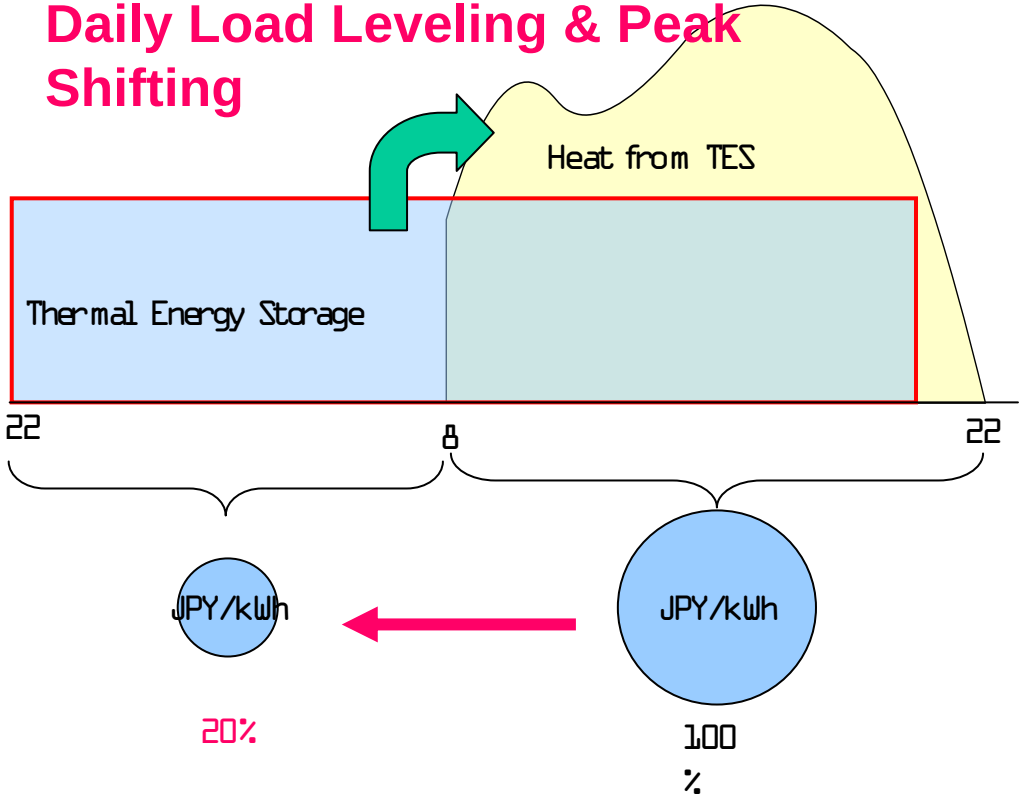
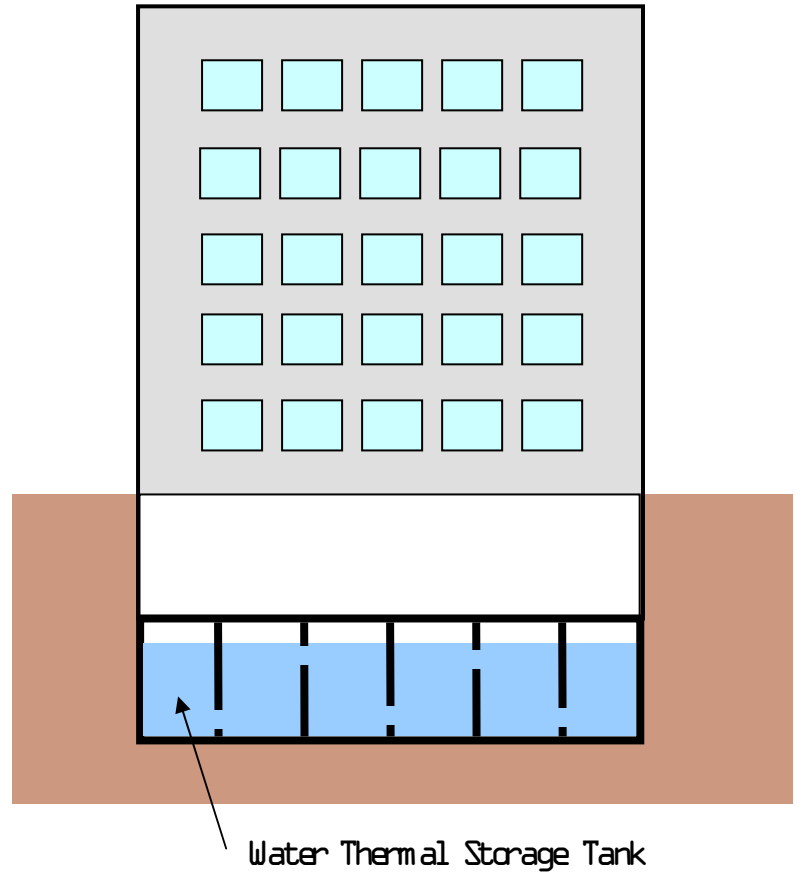
Three Major Technologies…

- Ice/Water thermal storage system
- Highly Efficient Turbo Chillers
- Natrium Sulfur (NAS) Batteries

Thermal Storage System in Japan

Daily Load Leveling & Peak Shifting

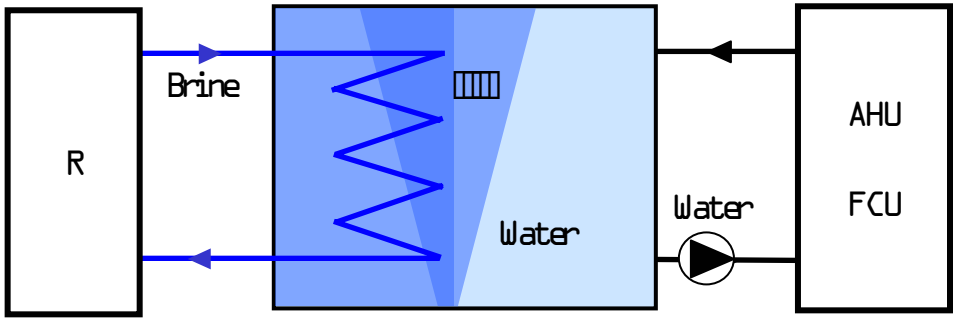




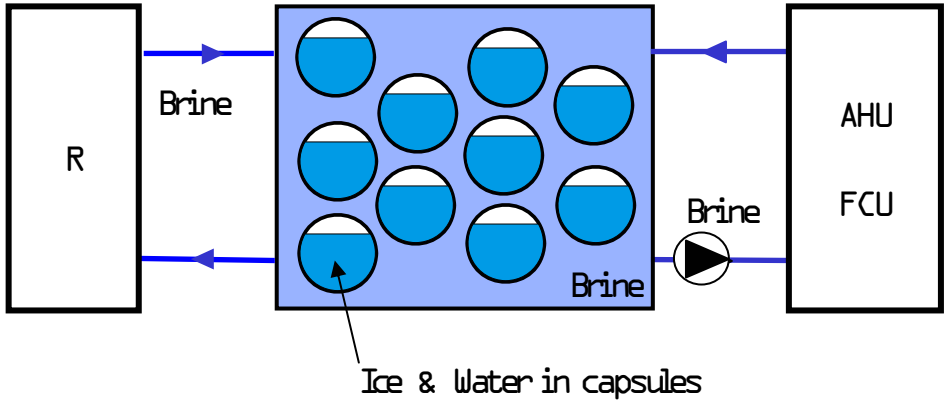
Chilled Water: 14□ → 6□

Hot Water : 35□ → 43□

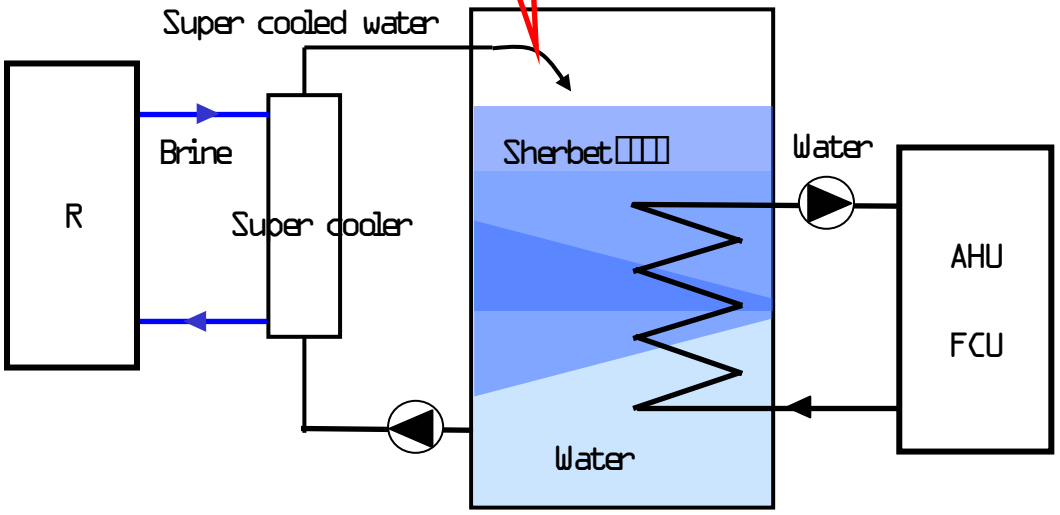
Ice Storage System



Ice on Coil Type



Capsule Type



Super Cooled Water Type

Japanese Highly Efficient Turbo Chillers

■ Turbo chillers' technological advance

(MHI's inverter machine 'NART-I' as an example)

- COP has improved dramatically to as high as 17.8 max (the world highest) (Fig. 1)
- Significant increase in performance under partial loads (Fig. 2)
- Power savings: 40% reduction compared with compatible standard machines
- Could be effective instruments for ESCO & other retrofit schemes (JFS has introduced similar AARTs for Tokyu department store's ESCO project)

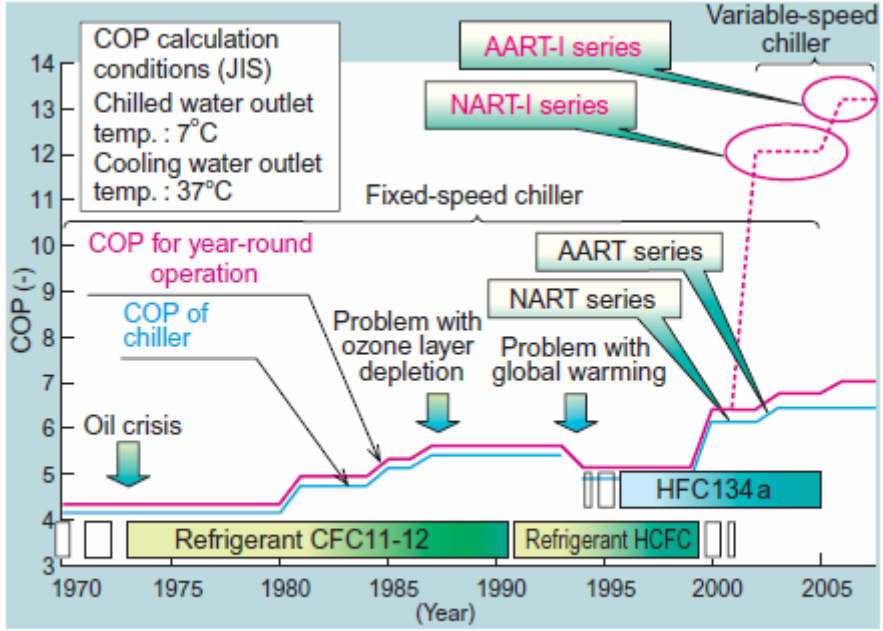


Fig. 1 Trends in turbo chiller performance and refrigerant

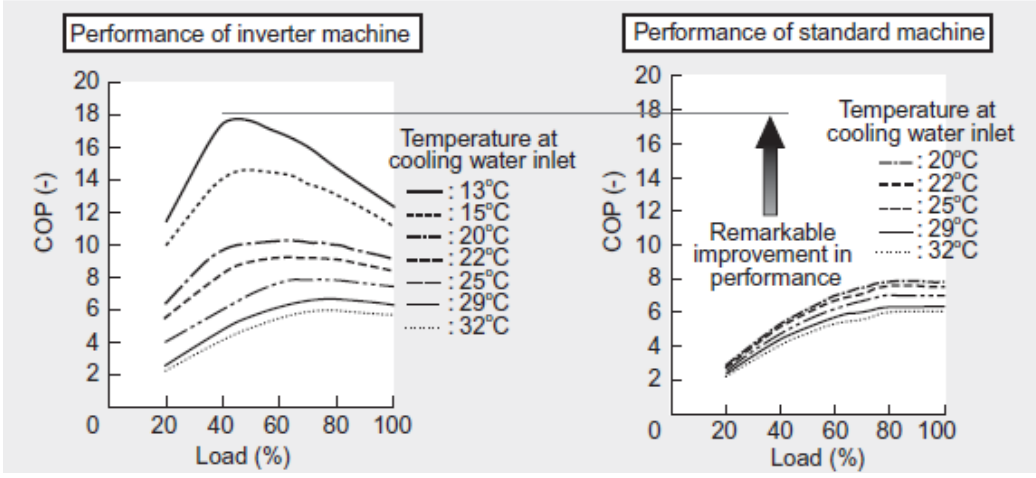
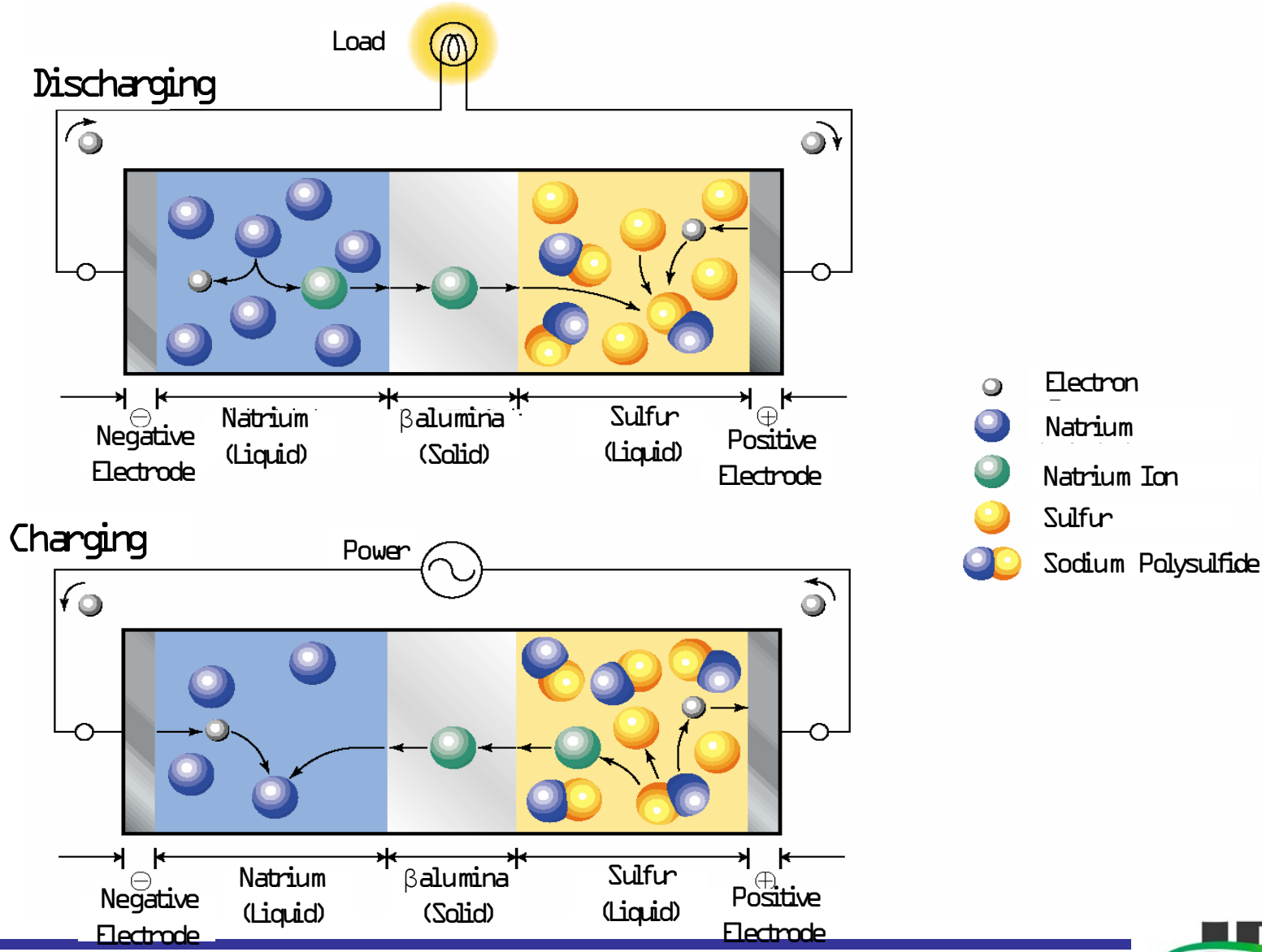


Fig. 2
Performance comparison of inverter machine and standard machine

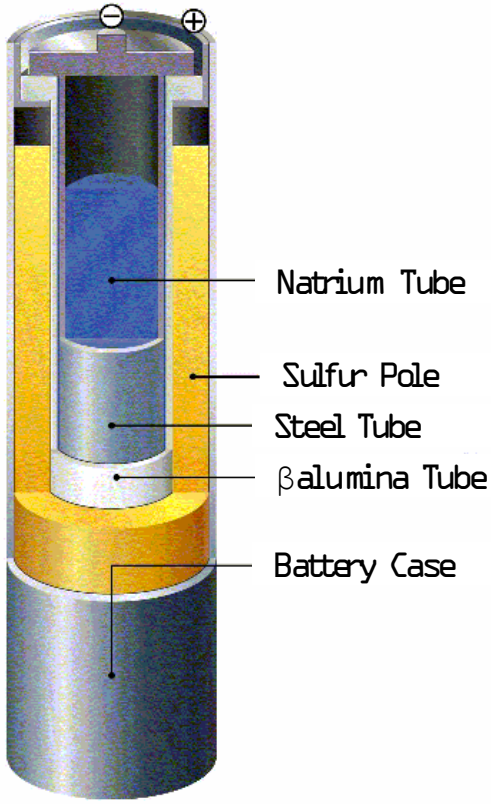
Natrium Sulfur (NAS) Batteries

Operation Mechanism of NAS Batteries

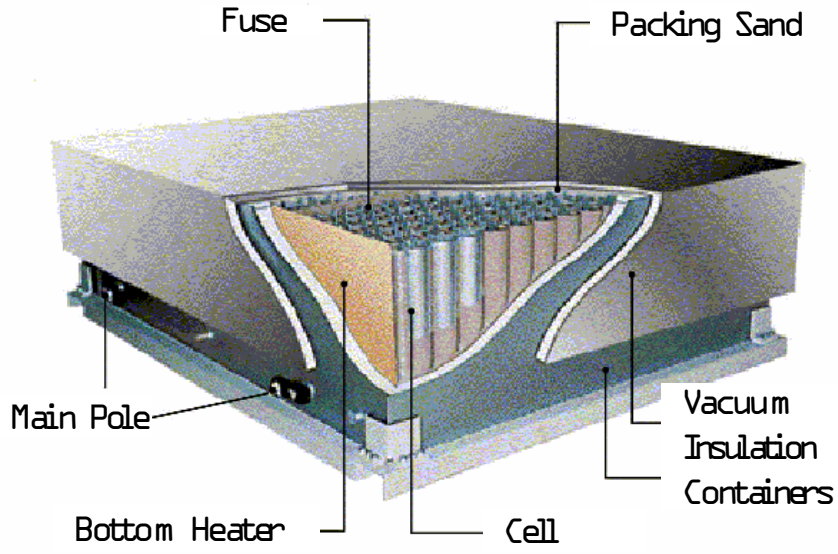


Natrium Sulfur (NAS) Batteries

Structure / specifications of an NAS battery



Cell



Module

Cell Battery	
Voltage	2V
Capacity	1,220Wh
Size	D: 91mm LG: 520mm
Efficiency	Over 89%
Energy Density	359Wh/Liter
Weight	5.5kg

50kW Module Battery	
Output	52.1kW
Voltage	116V
Current	363A
Capacity	375kWh
Size	Width: 2.17m Depth: 1.69m Height: 0.64m
Energy Density	160kWh/m^3
Number of cells	320 cells
Weight	3.5□

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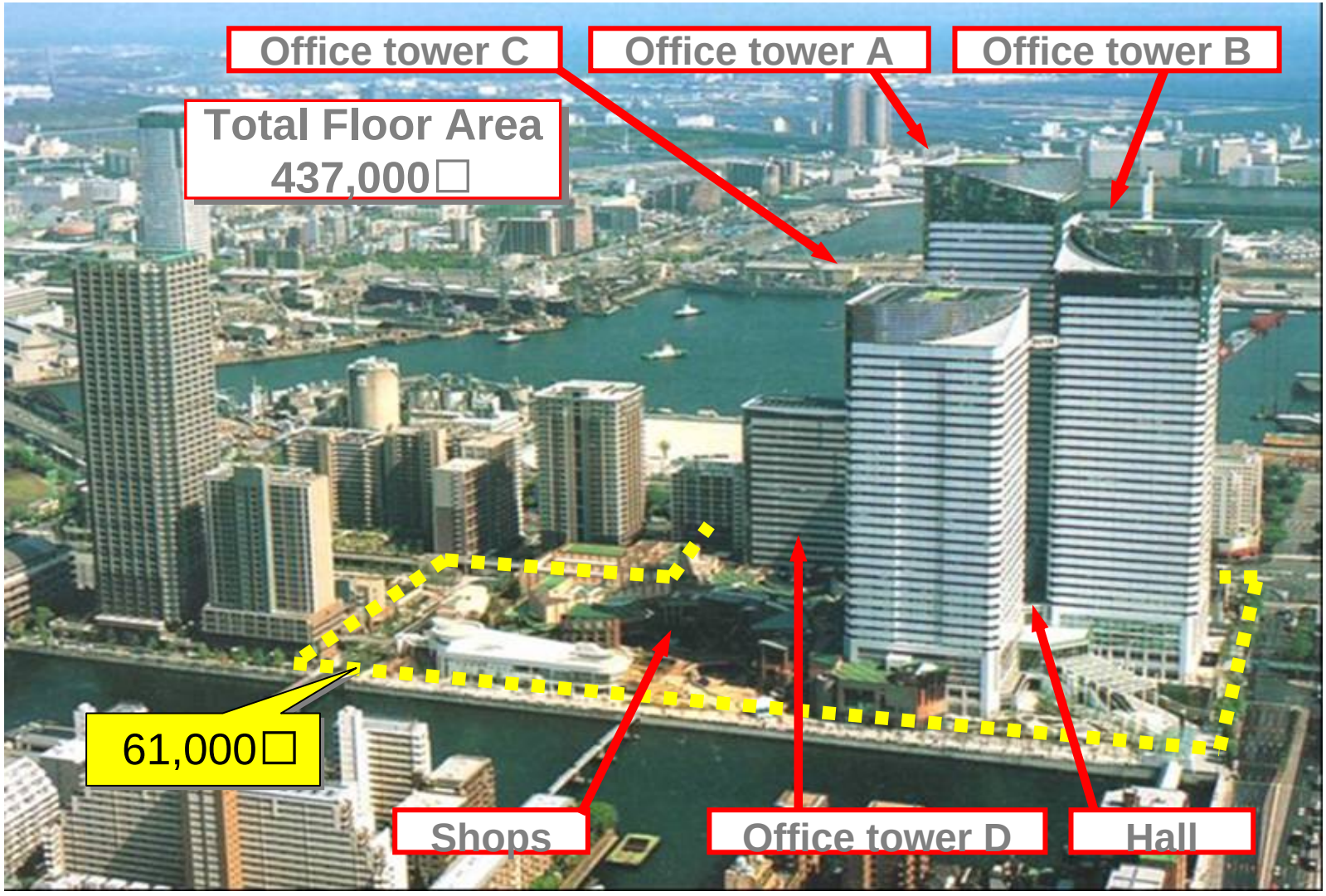
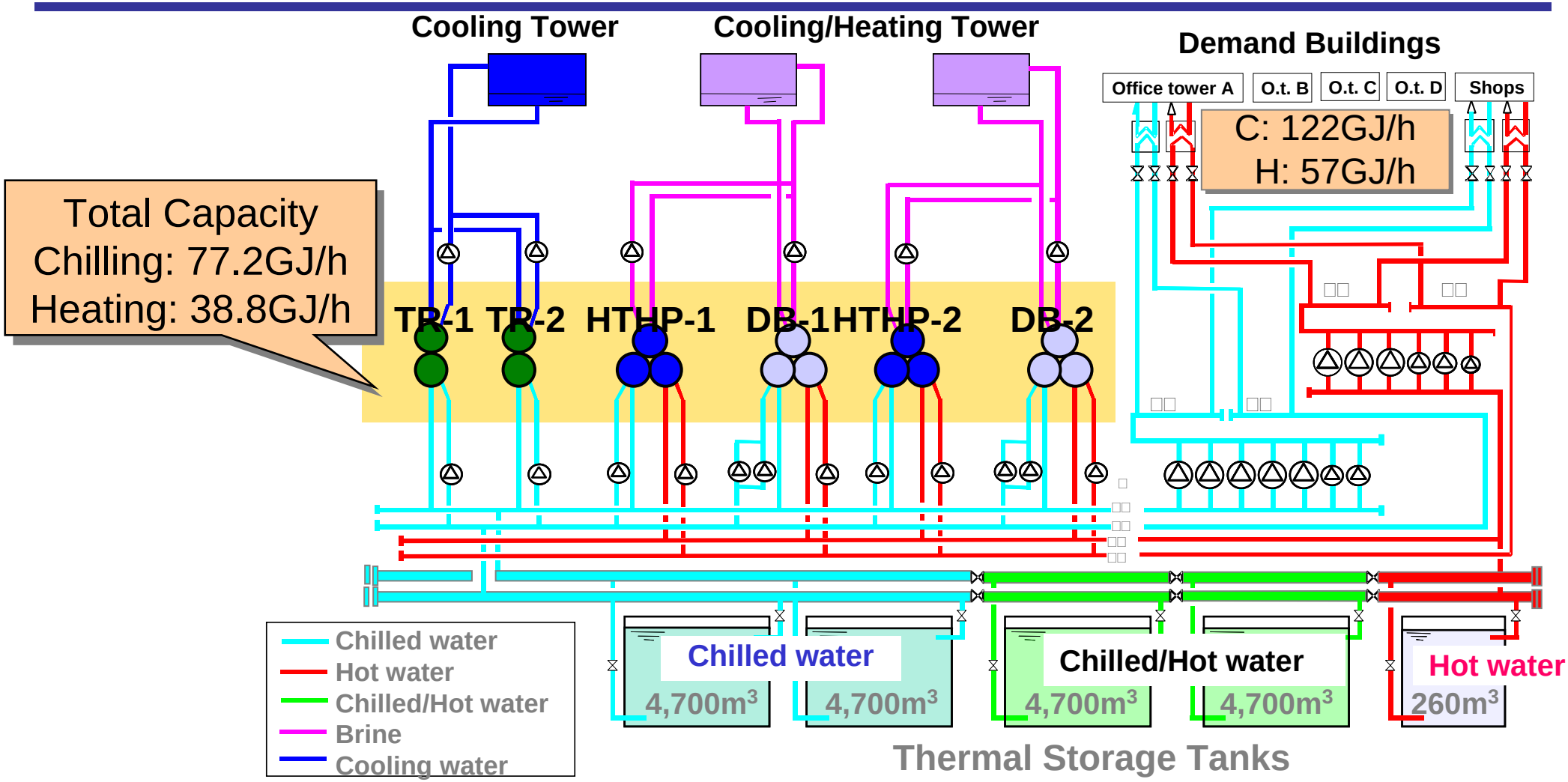
Project 1: DHC Plant in Harumi-Island



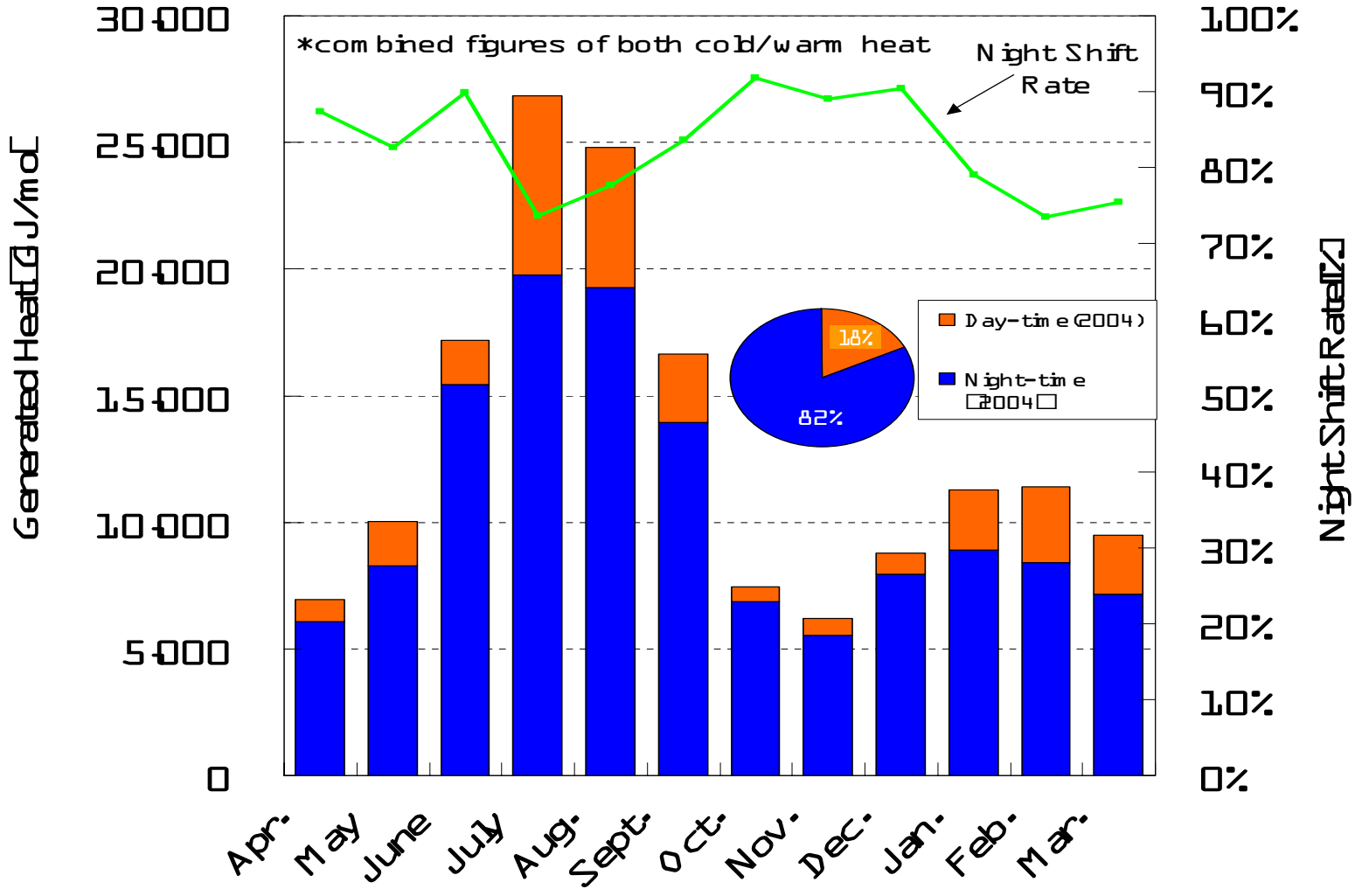
The Harumi-Island Triton Square is a large-scale redevelopment area.
Super high-rise offices, shops, and DHC plant were constructed.
The scheme started in 1984, which completed in April 2001.

Heat Source System of the DHC



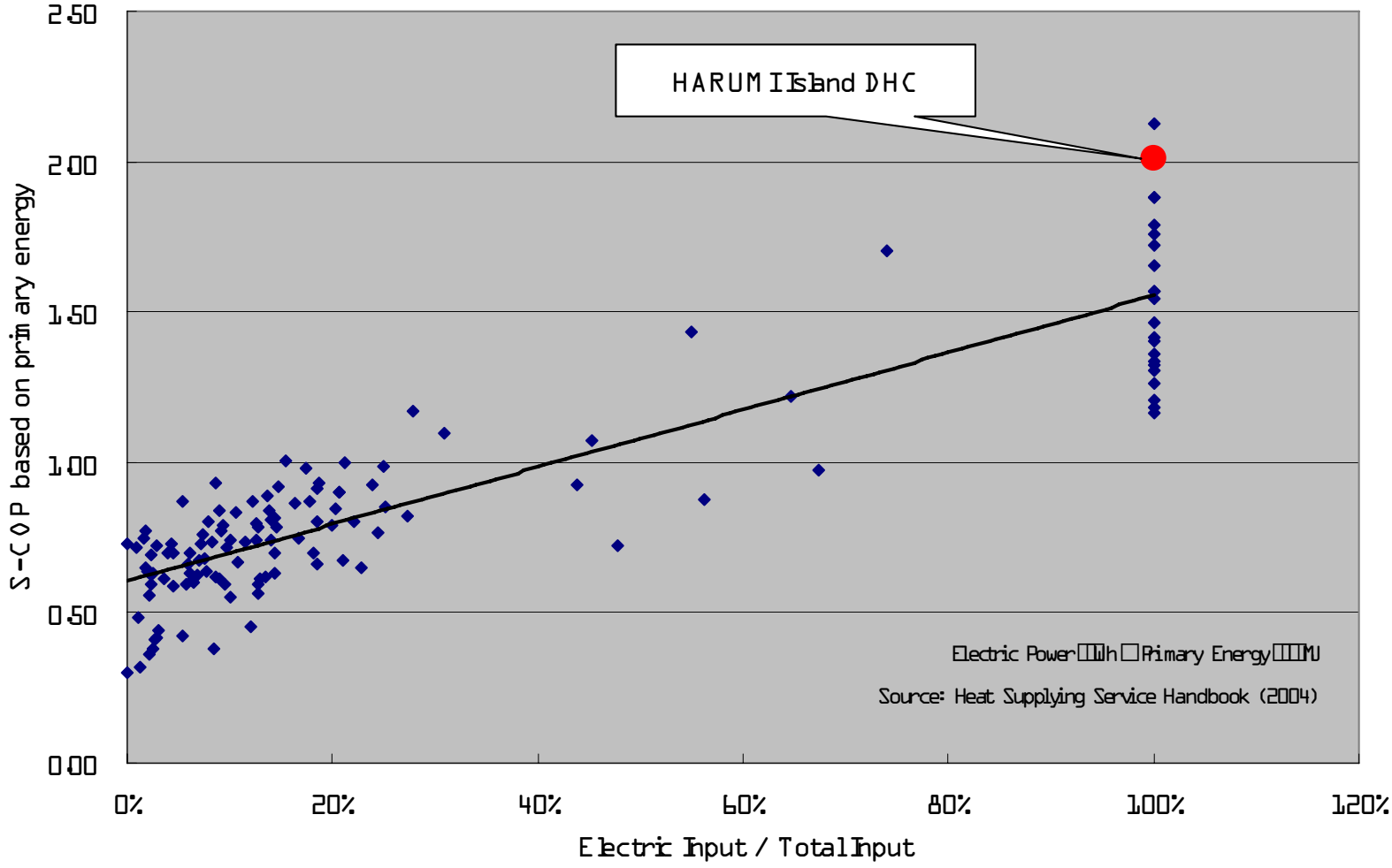
The heat-source machines consist of 2 turbo chillers (TR), 2 heating-tower turbo heat pumps (HTHP), and 2 double-bundle turbo heat-recovery heat pumps (DB).
The thermal storage consists of 5 tanks; 2 for chilled water, 1 for hot water, and 2 for chilled & hot water.

Monthly production of heat classified by day & night



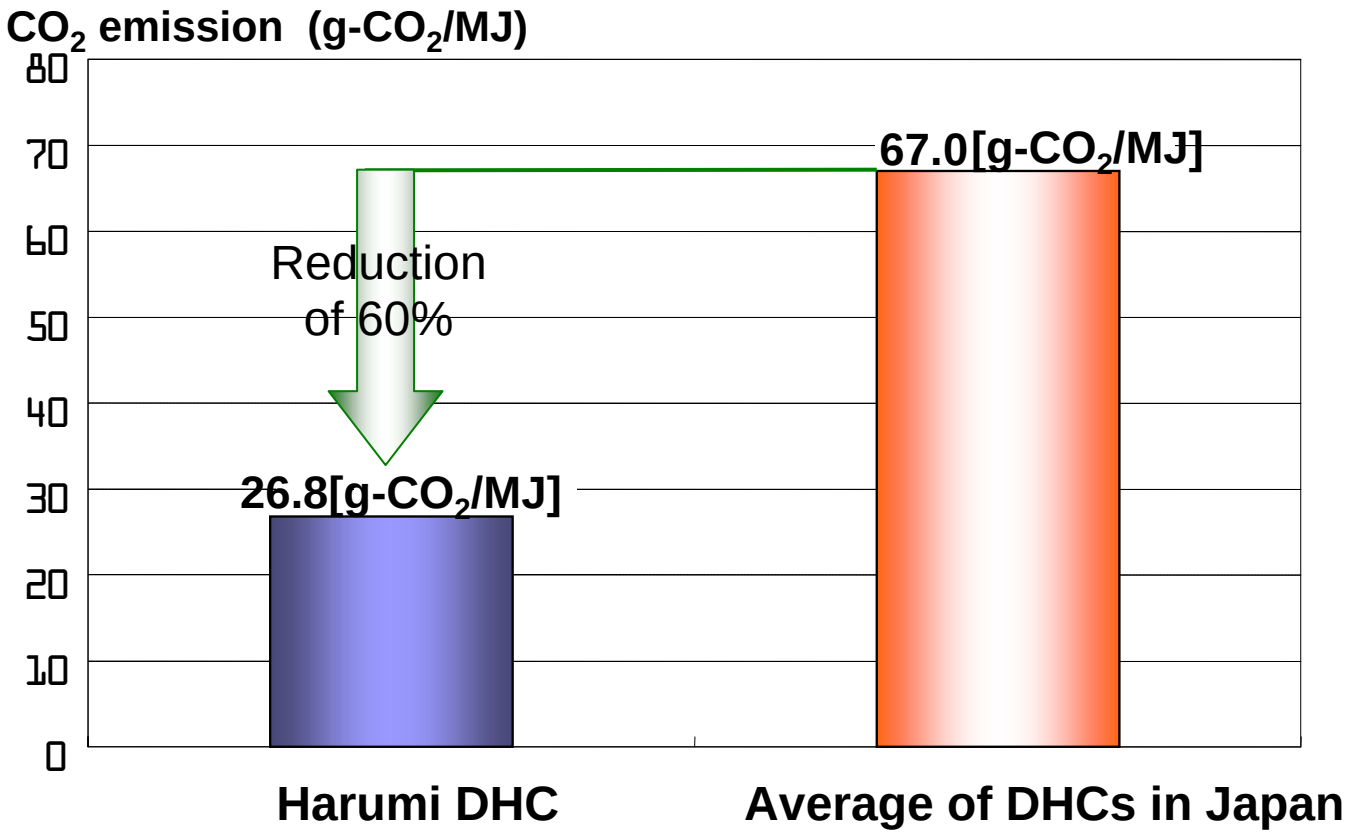
The night-shift-rate of heat production declined in summer and winter, but achieved a high night-shift-rate of 76% throughout the year.

Primary energy based COP of the Japanese DHCs in 2004



The primary energy based COP of the Harumi-Island DHC was 2.01 in 2004, one of the largest values in Japanese DHC systems.

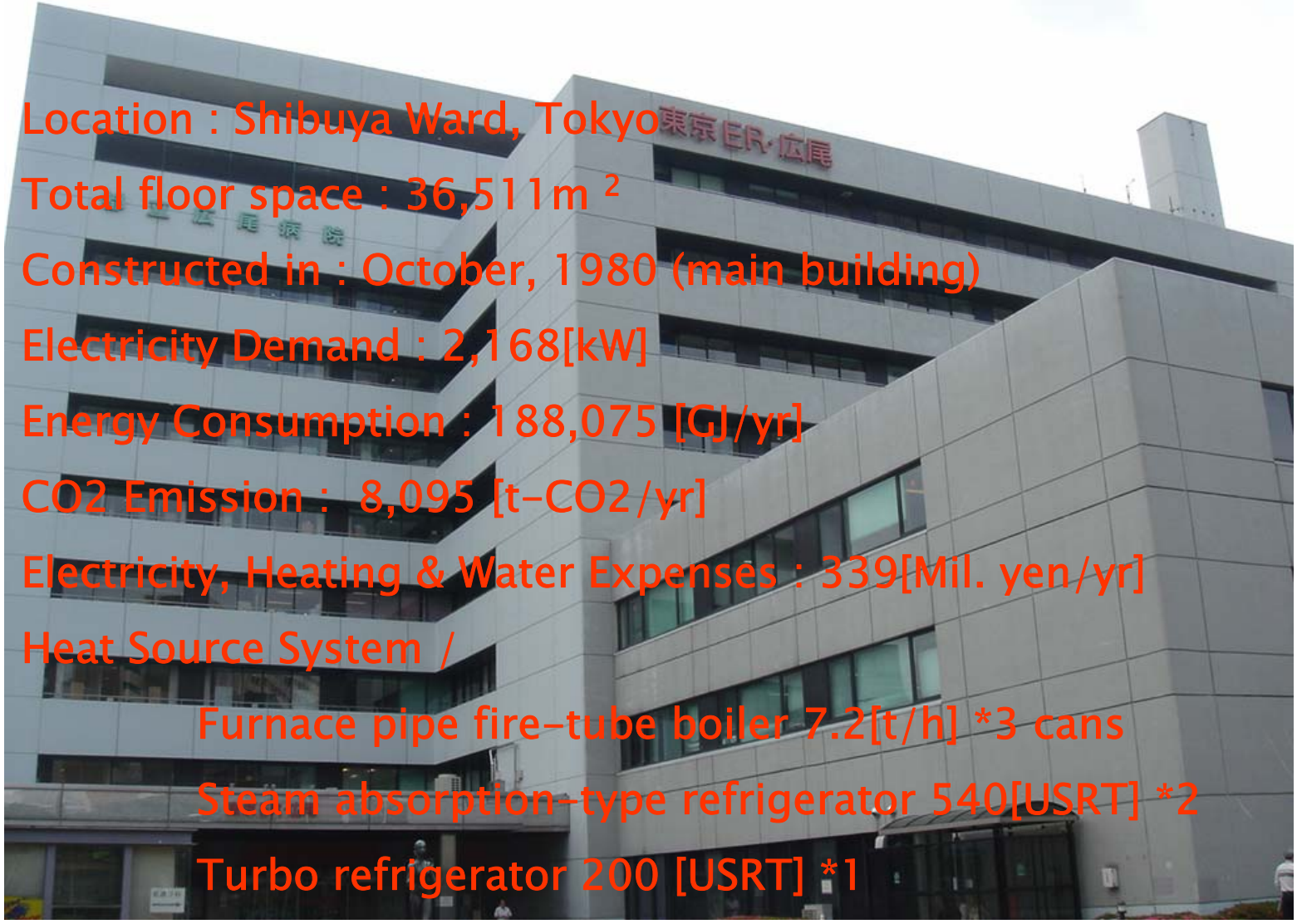
Comparison of the CO Emission with Other DHCs



CO_2 emission divided by the heat production at the Harumi-Island DHC in 2004 was 26.8g-CO_2/MJ, about 60% less than averaged value (67.0g-CO_2/MJ) of all the DHCs in Japan.

Project 2 (ESCO): Outline of Client

Tokyo Metropolitan Hiroo General Hospital



Location : Shibuya Ward, Tokyo

Total floor space : 36,511m ^{2}

Constructed in : October, 1980 (main building)

Electricity Demand : 2,168[kW]

Energy Consumption : 188,075 [GJ/yr]

CO2 Emission : 8,095 [t-CO2/yr]

Electricity, Heating & Water Expenses : 339[Mil. yen/yr]

Heat Source System /

Furnace pipe fire-tube boiler 7.2[t/h] *3 cans

Steam absorption-type refrigerator 540[USRT] *2

Turbo refrigerator 200 [USRT] *1

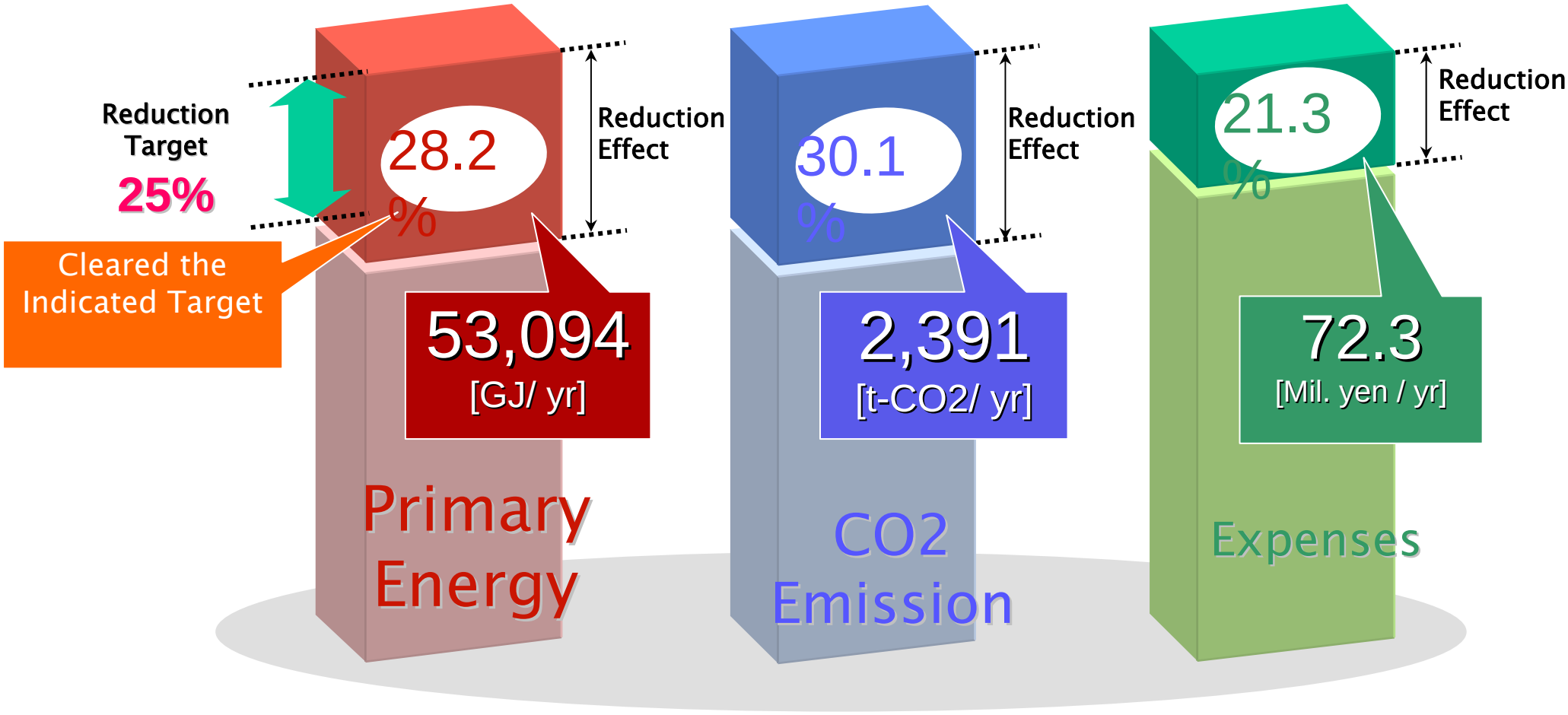
Applying various energy-saving techniques to every stage of HVAC

Reduce Air-conditioning Load Itself	1) Reduce the volume of outdoor air intake according with indoor CO2 density 2) Optimize cool and re-heat process in double coil AHUs by allowing small temperature and humidity fluctuation	5.9%
Produce Heat Efficiently	3) Renew refrigerators/ boilers for higher efficiency (Heat source renewal) 4) Produce chilled water only with cooling tower operation under low out-air temperature (Free Cooling)	12.6%
Transport Heat Efficiently	5) VWV control 6) VAV control	8.0%
Others	7) Intermittence drive of AHUs and ventilation fans	1.7%

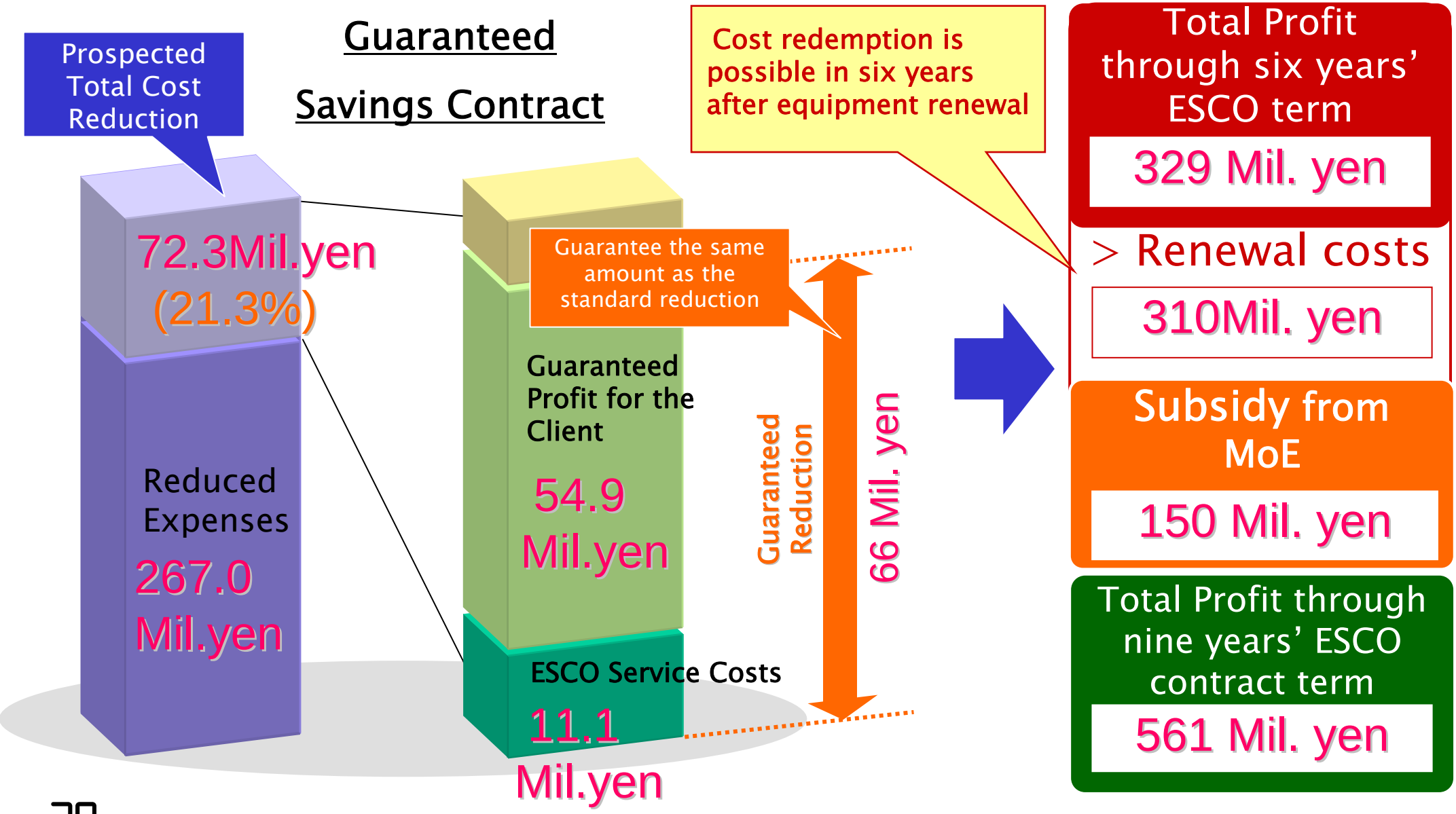
Energy Saving Rate 28.2%

Large Energy-Saving & Environmental Improvement

A big energy-saving effect is to be achieved!



Maximization of the Client's Profit

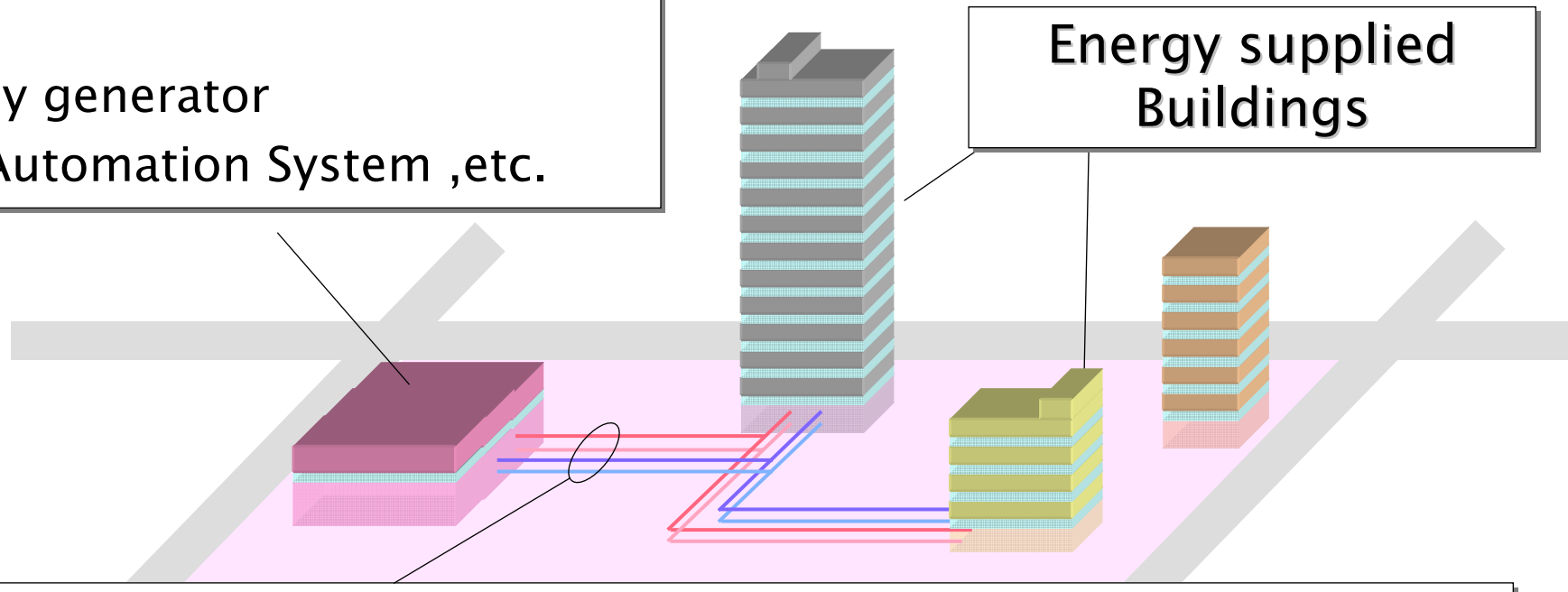


Project 3: Energy Supply Center Business

Energy Center

- Natrium-Sulfur battery
- Centrifugal refrigerate refrigerator
- Thermal storage tank
- Boiler
- Emergency generator
- Building Automation System ,etc.

Project size : \ 4,000 million
(26.7 million euro)

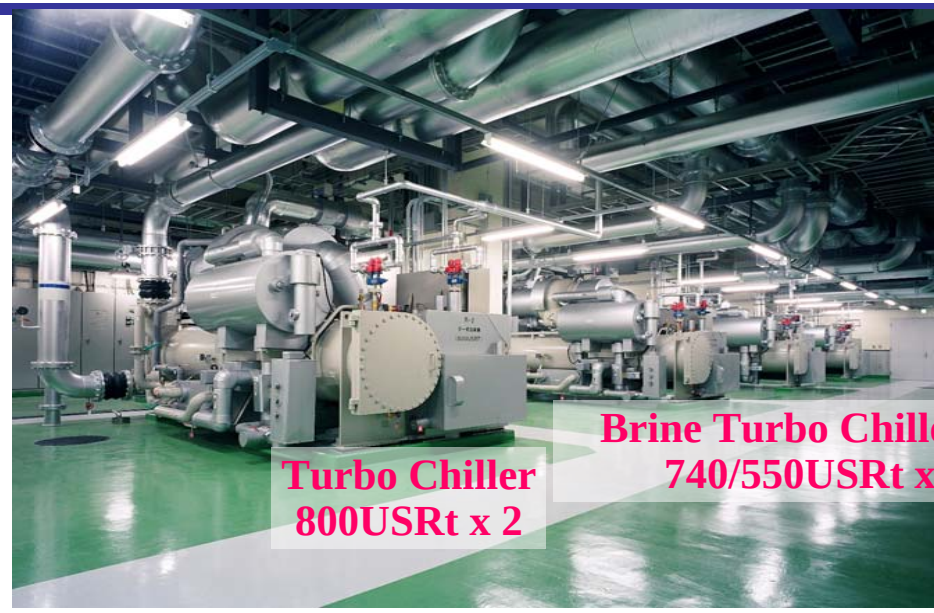


Supplied energy including electricity, cold/hot water, and steam through the trench

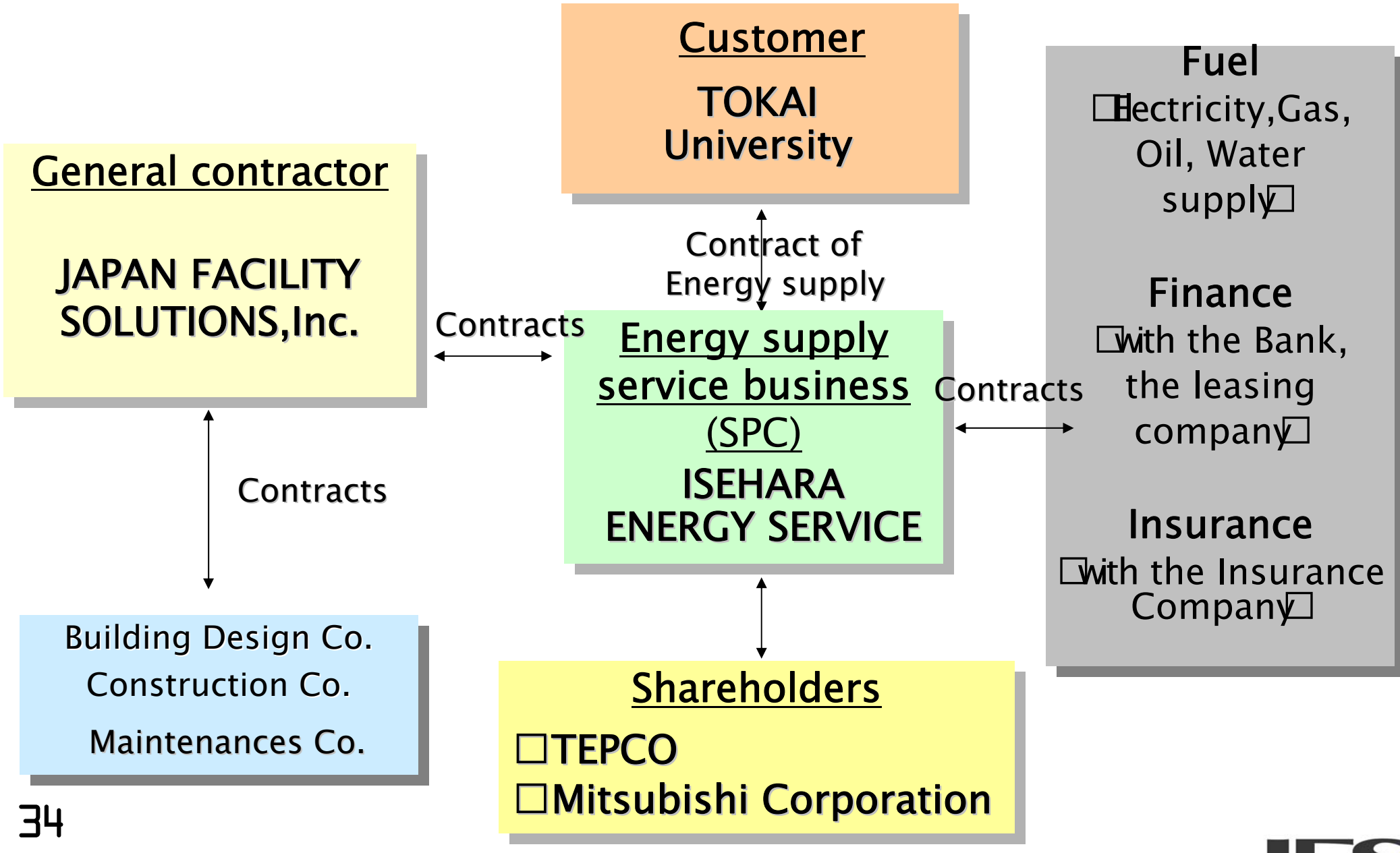
ISEHARA campus of Tokai Univ.

The Overview of Isehara Campus

Installed Facilities for Isehara Campus



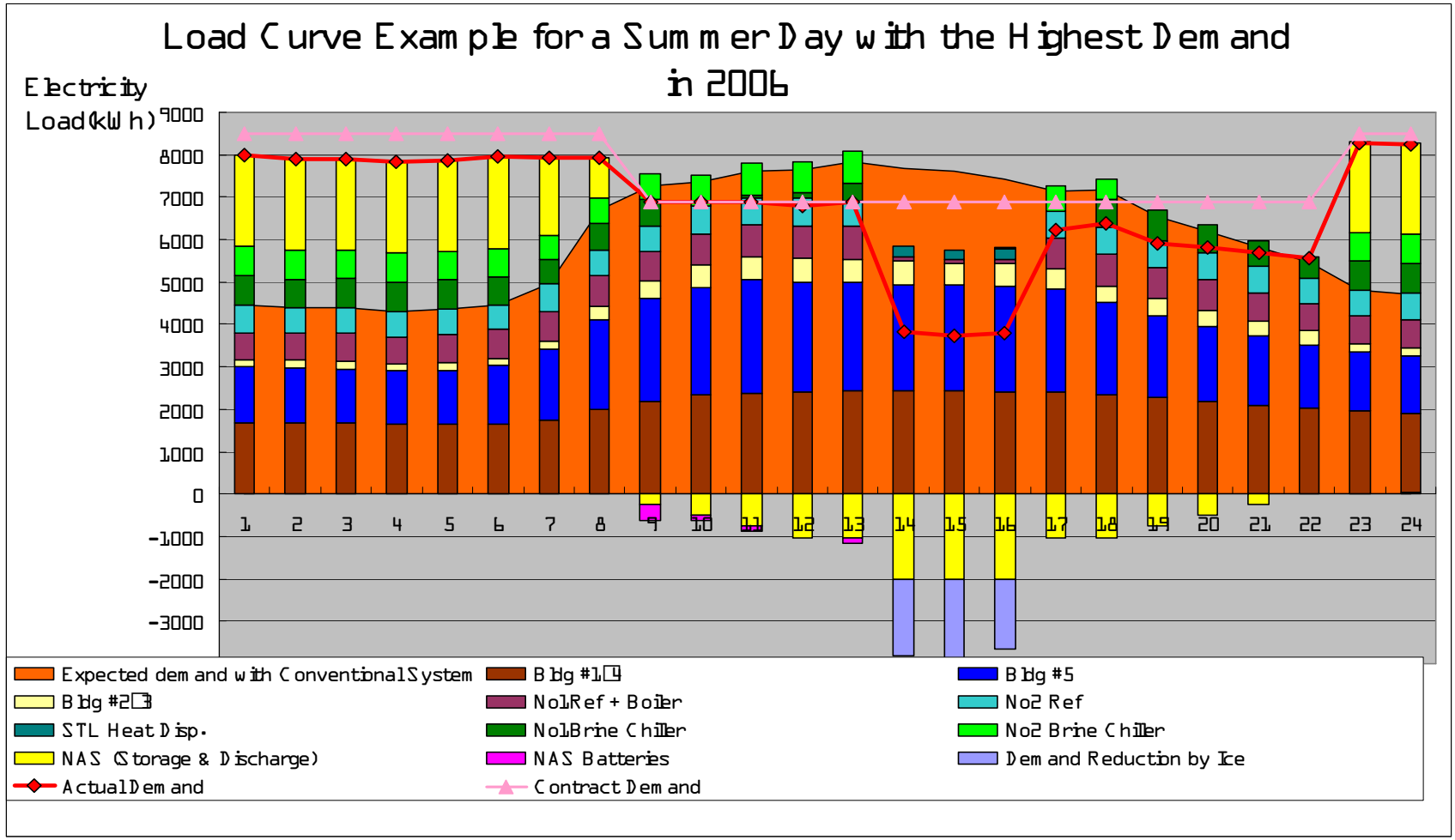
Business Scheme



Remarkable DSM Effect

Introduction of NAS Batteries and Ice Thermal Storage has enabled:

- ✓Reduction of contract demand by 1,000kW
- ✓Reduction of actual demand by 3,000kW for 3 hours during peak time



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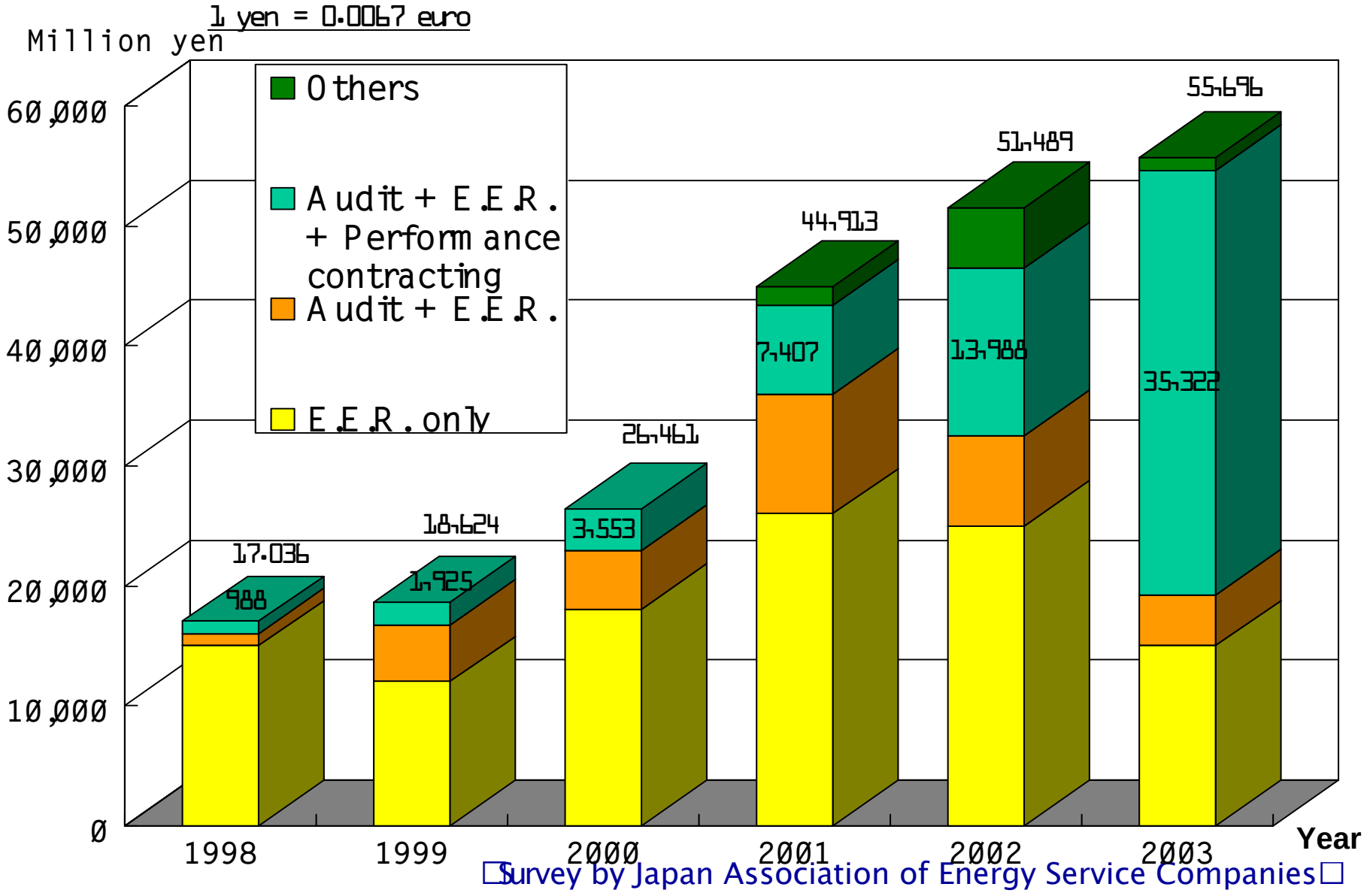
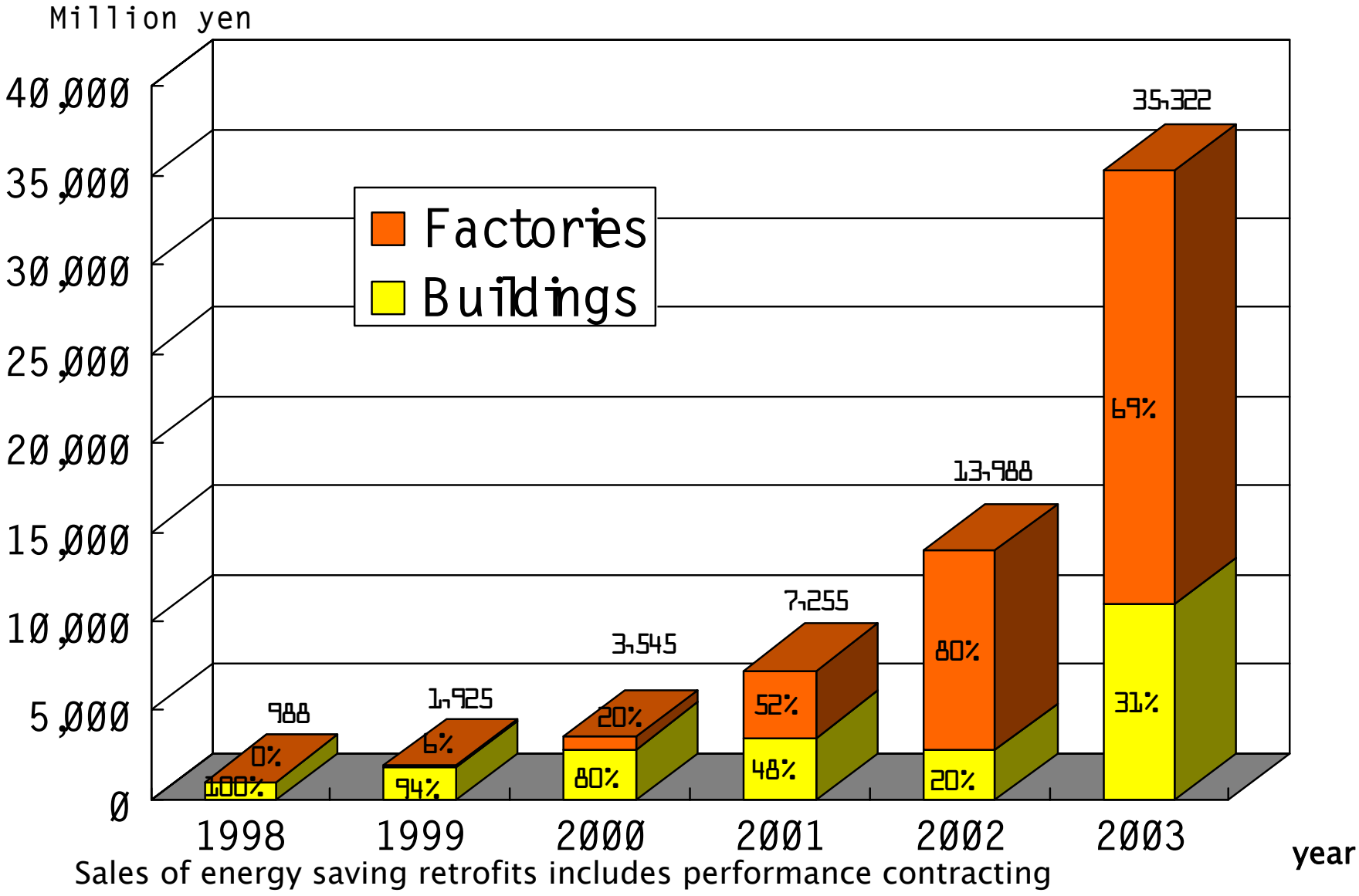
Energy efficiency retrofit market growth in Japan



□Survey by Japan Association of Energy Service Companies□

* E.E.R.: Energy efficiency retrofit

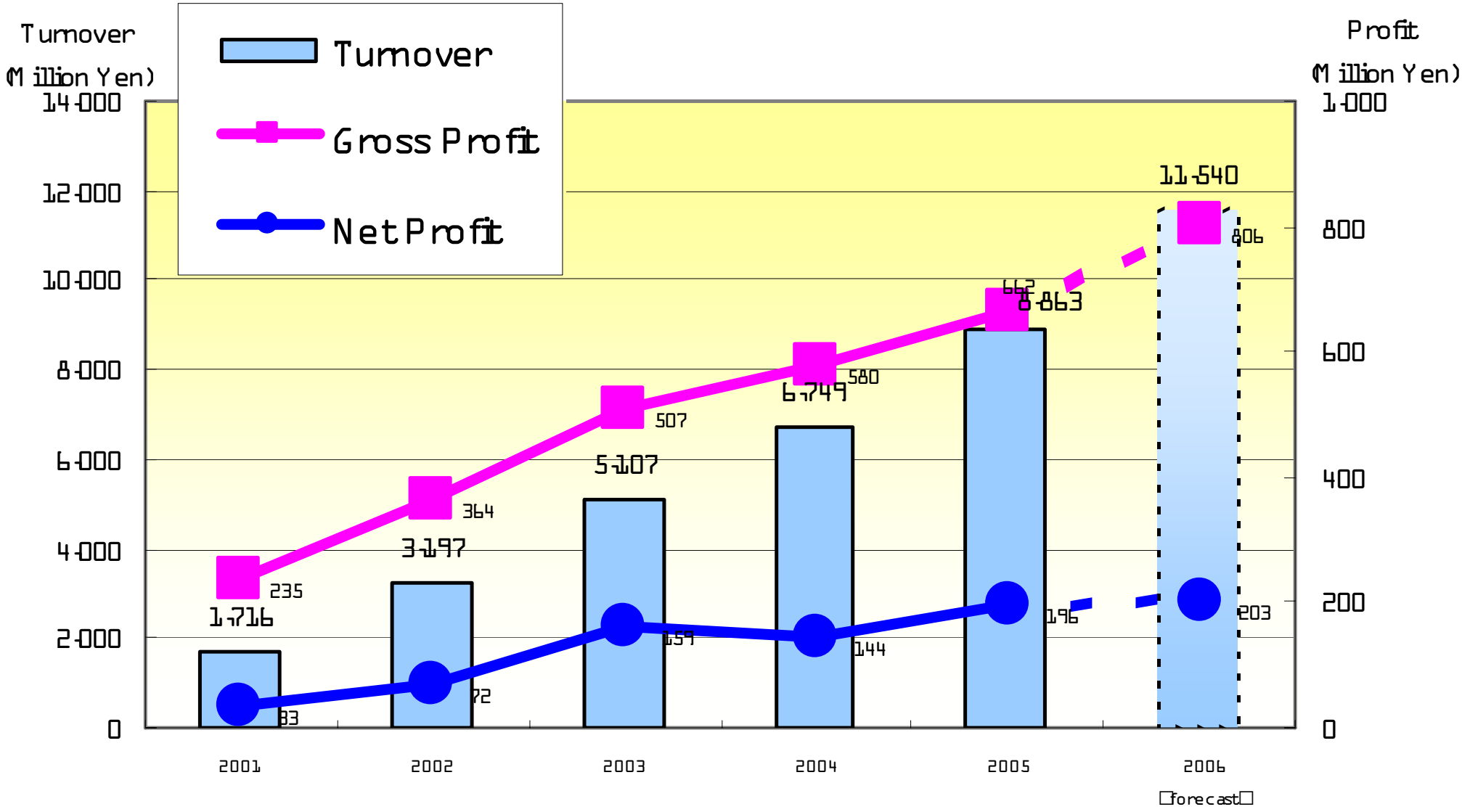
Emerging ESCO contract growth in Japan



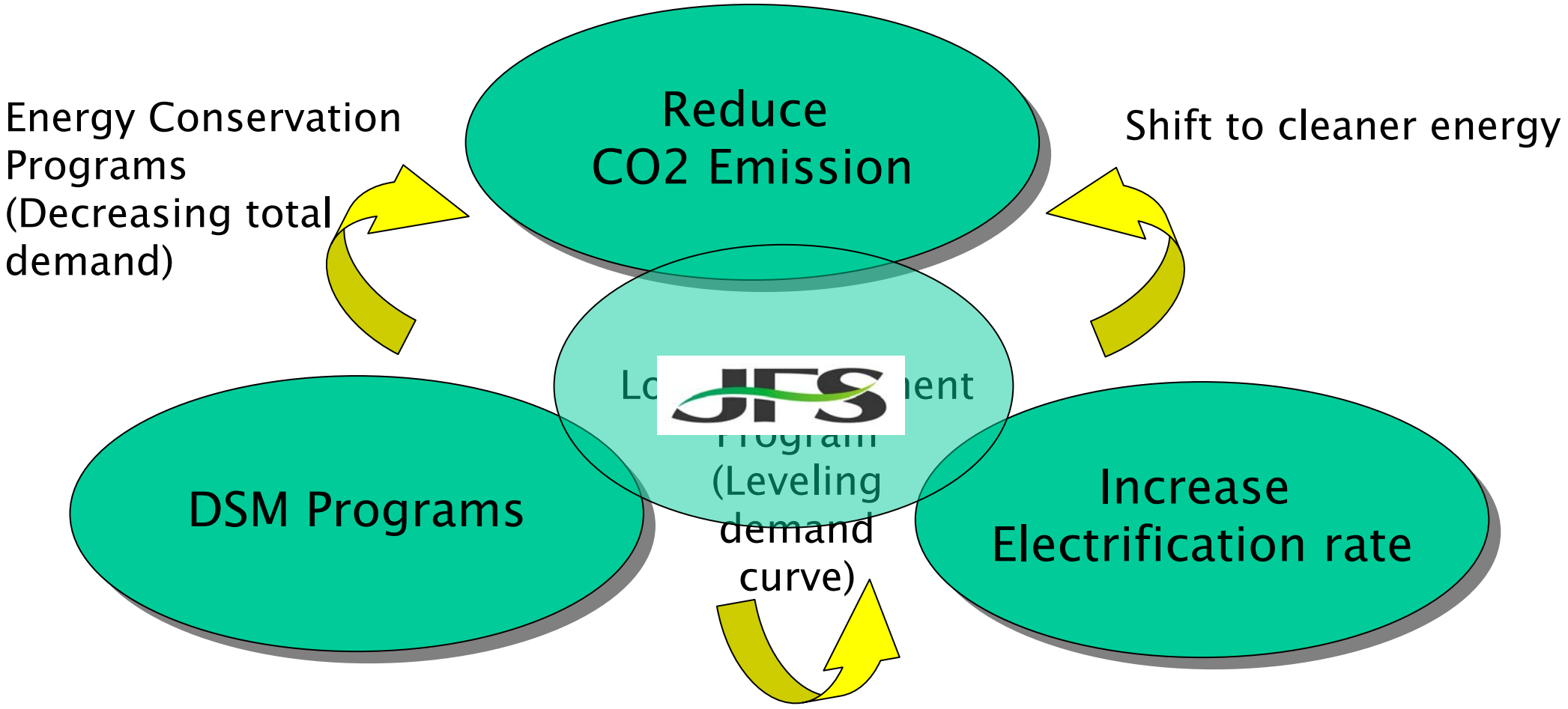
Sales of energy saving retrofits includes performance contracting

□Survey by Japan Association of Energy Service Companies□

Progress of JFS's Turnover and Profit



JFS will continue to work on accelerating DSM Triangle!



Thank you for attention.