

# F-Gas Free Ultra Eco-Ice System with CO2 Refrigerator

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YAMATO Co. Ltd.

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# YAMATO Co. Ltd.

- ① Established in 1945
- ② Capital is 5 billion yen
- ③ Main business:
  - Design and installation for air-conditioning and refrigeration facilities
  - Development and operation of thermal storage system





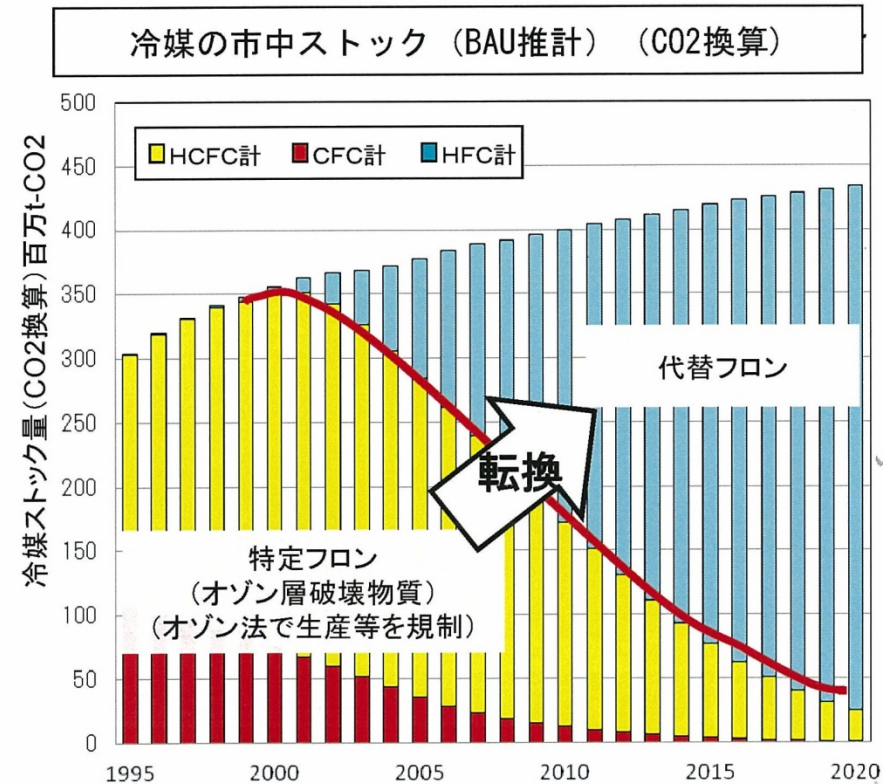
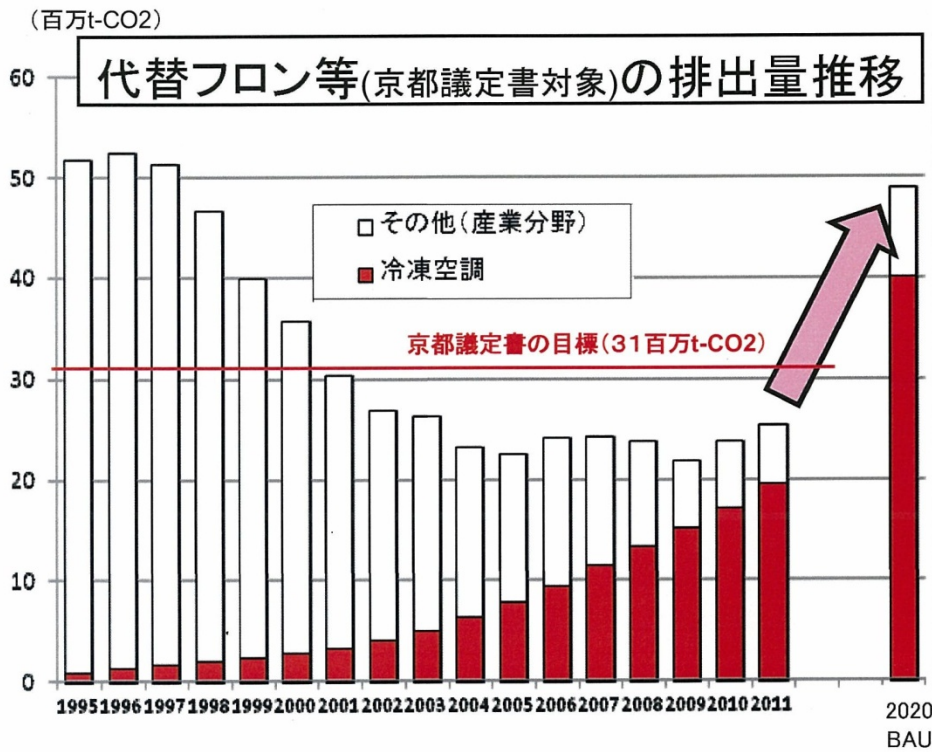
# Problem for most existing SM refrigeration facilities in Japan

- Large Amount of HCFC Systems in Japan
  - :Over 50% existing facilities apply HCFC refrigerant
- The HCFC production will be phase out in 2020 based on Montreal Protocol
- HCFC is exchanged to HFC rapidly

# Rapid increase the emission of HFC: global warming gases

The emission of Fluorocarbons had been decreased significantly focus on the industrial area and it's growing over the Kyoto Protocol Target. However, it will be increased rapidly focus on the refrigeration and air-conditioning area in the future; it will be over twice in the decade.

2011年の排出量は、基準年(1995年)比、産業分野で▲89%、冷凍空調機器では24倍増。

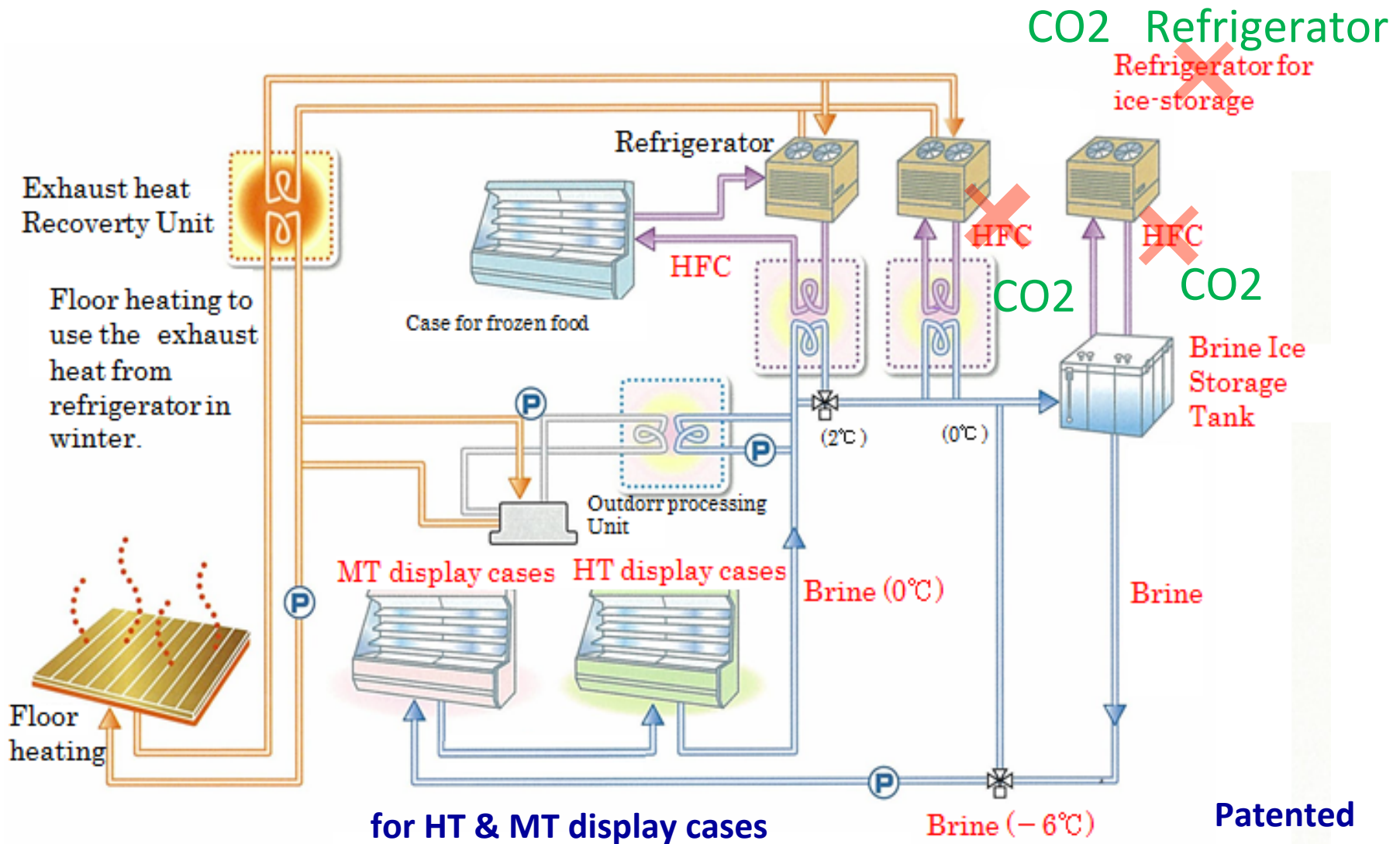


(BAU: Business As Usual ※フロン分野の排出推計においては、現状の対策を継続した場合の推計を示す。)

出典: 実績は政府発表値。2020年予測は、冷凍空調機器出荷台数(日本冷凍空調工業会)、使用時漏えい係数、廃棄係数、回収実績等から経済産業省試算。

# Proposed by YAMATO -1

## F-Gas Free Ultra Eco-Ice System



# Proposed by YAMATO—2

## Procedure of Brine Systemization

- **Remodeling a Part of Existing DX HCFC Display Cases**  
: Remodeling a part of HCFC DX coil for brine use.
  
- ❖ The examination proof of Brine Systematized Display Cases refrigeration of existing F-Gas display cases by Ultra Eco-Ice System with CO2 refrigeration is brought with **support from METI**.

# Brine Systematized Display Case



Existing Display Case



Brine Systemized Display Case



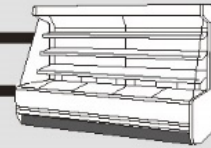
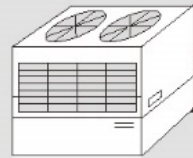
# Refrigerate Situation of F-Gas Free :Brine Systematized Display Cases

Present situation

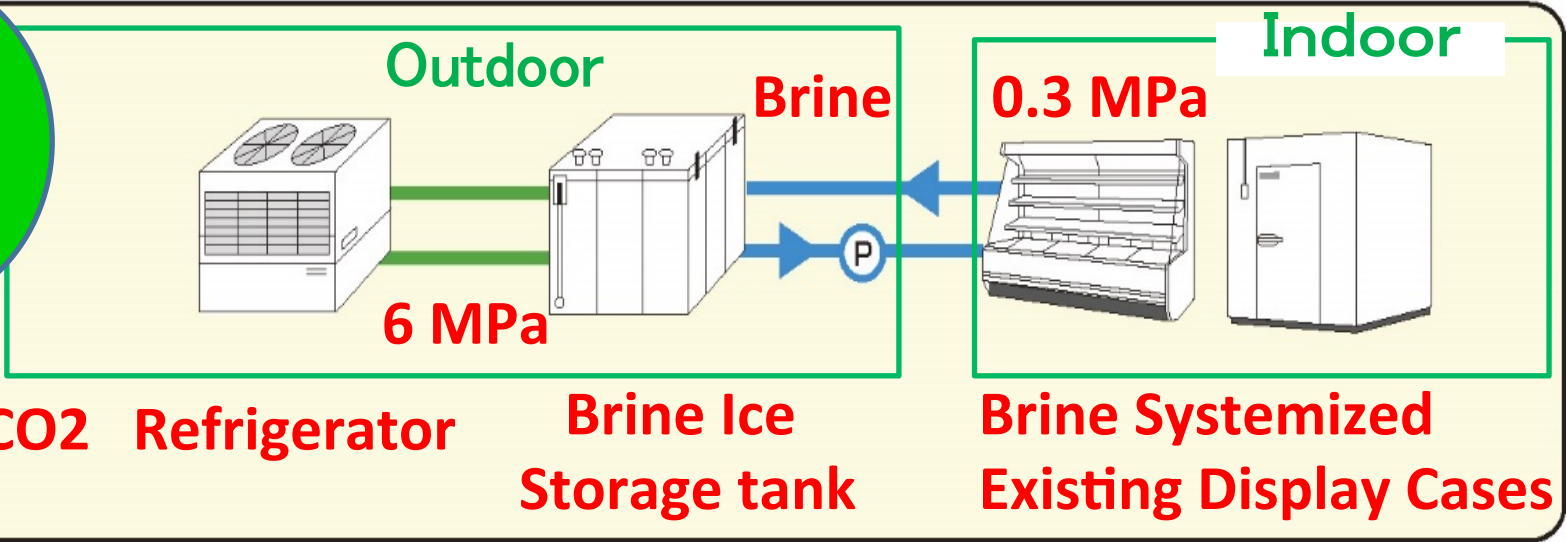


R-22 → R-404A

Dx Display Cases



F-gas free



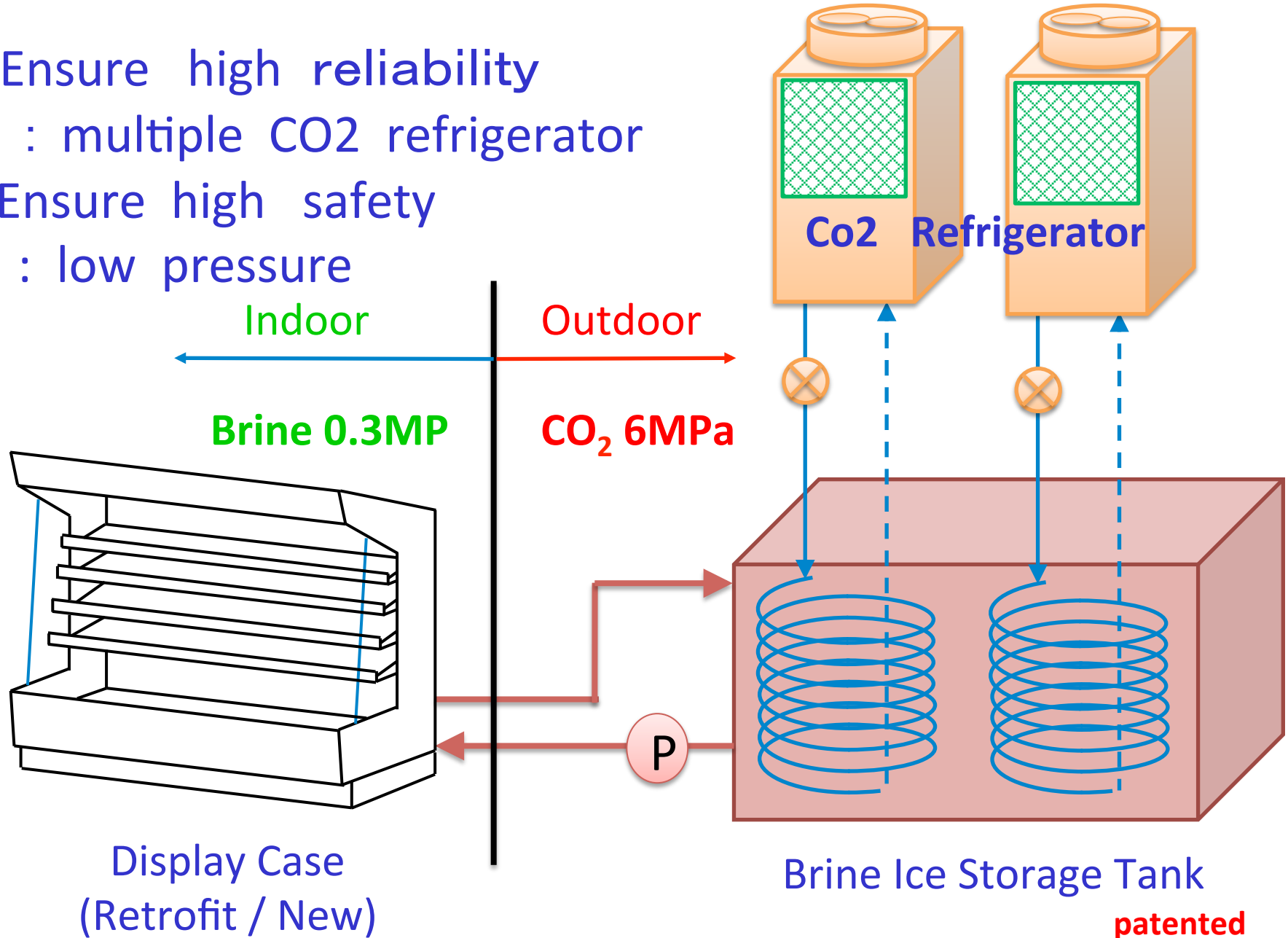
CO2 Refrigerator

Brine Ice Storage tank

Brine Systemized Existing Display Cases

# Refrigerate Situation of F-Gas Free UEI

- Ensure high reliability
  - : multiple CO<sub>2</sub> refrigerator
- Ensure high safety
  - : low pressure

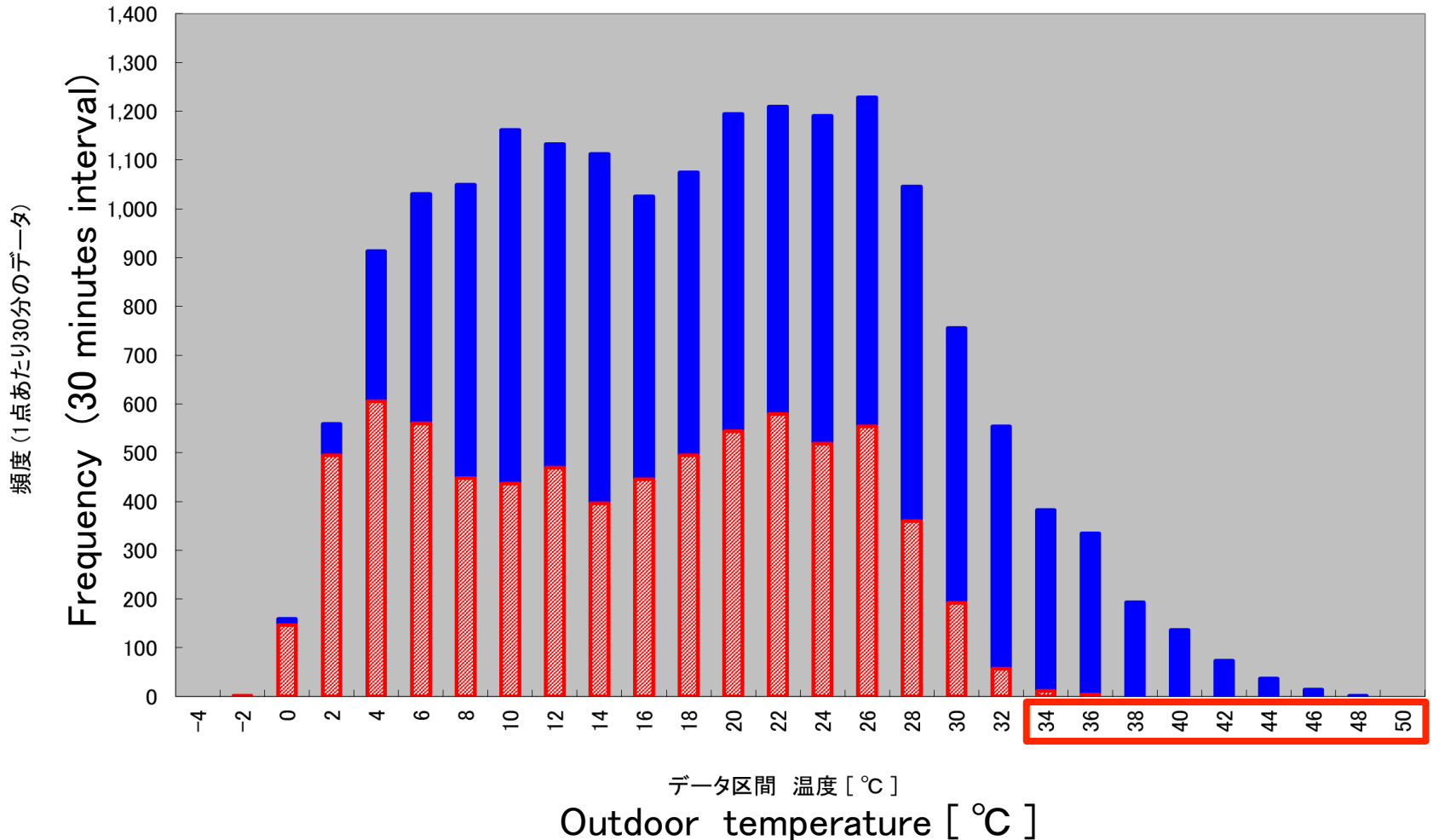


# Energy consumption in night time lower than day time for same cooling load

外気温度発生頻度 [30分間隔の計測]

外気温度データ計測

The generation frequency of outdoor temp. [30 minutes interval]

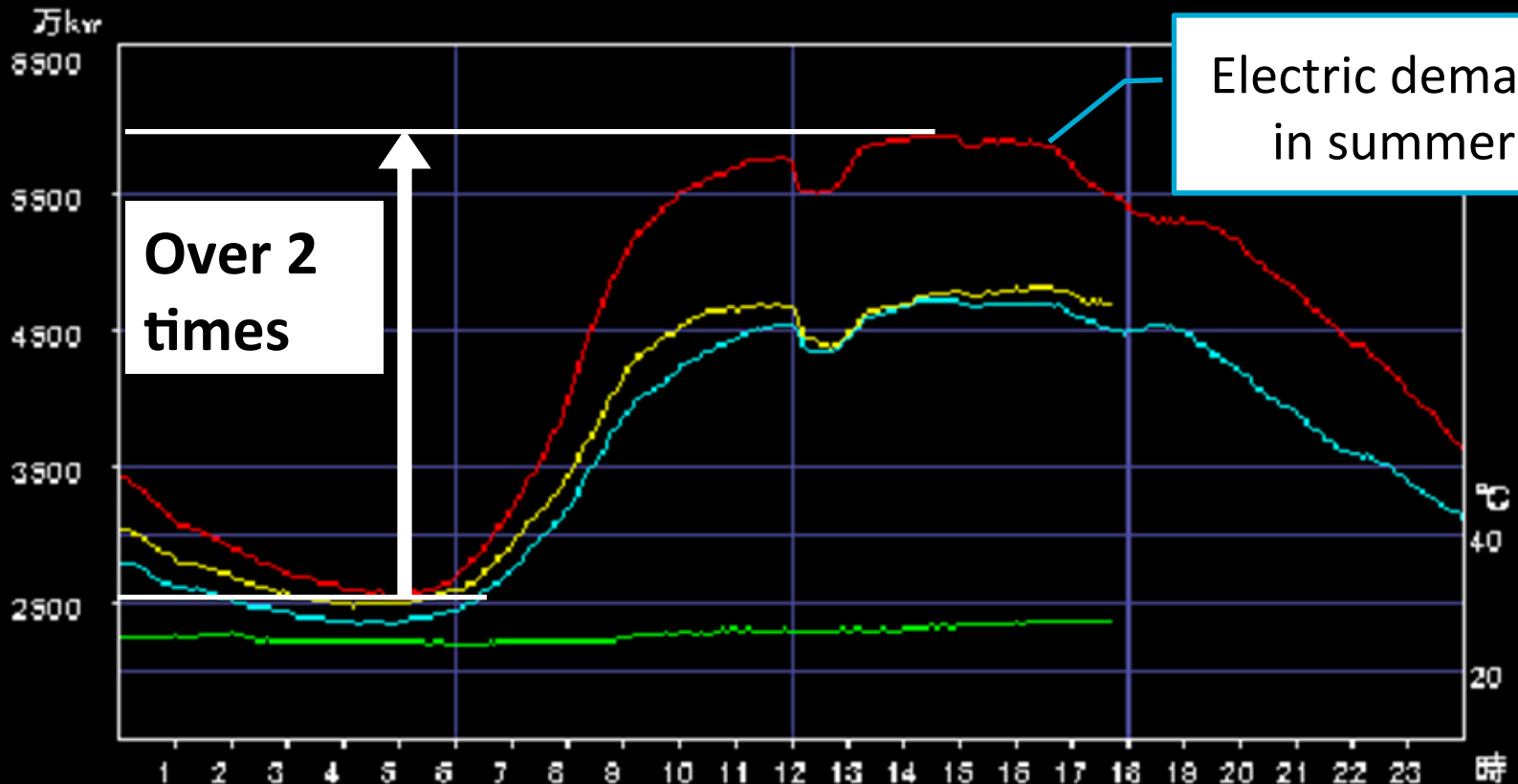


# Electric demand curve

## 需要曲線

本日現在 = 4710.0 2000/ 9/ 7 17:35  
気温 = 27.3

過去最大 = 5940.0 1995/ 7/18  
指定日 = 4733.1 2000/ 9/ 5



Over 2 times

Electric demand in summer

# Brine Ice in Thermal Storage Tank

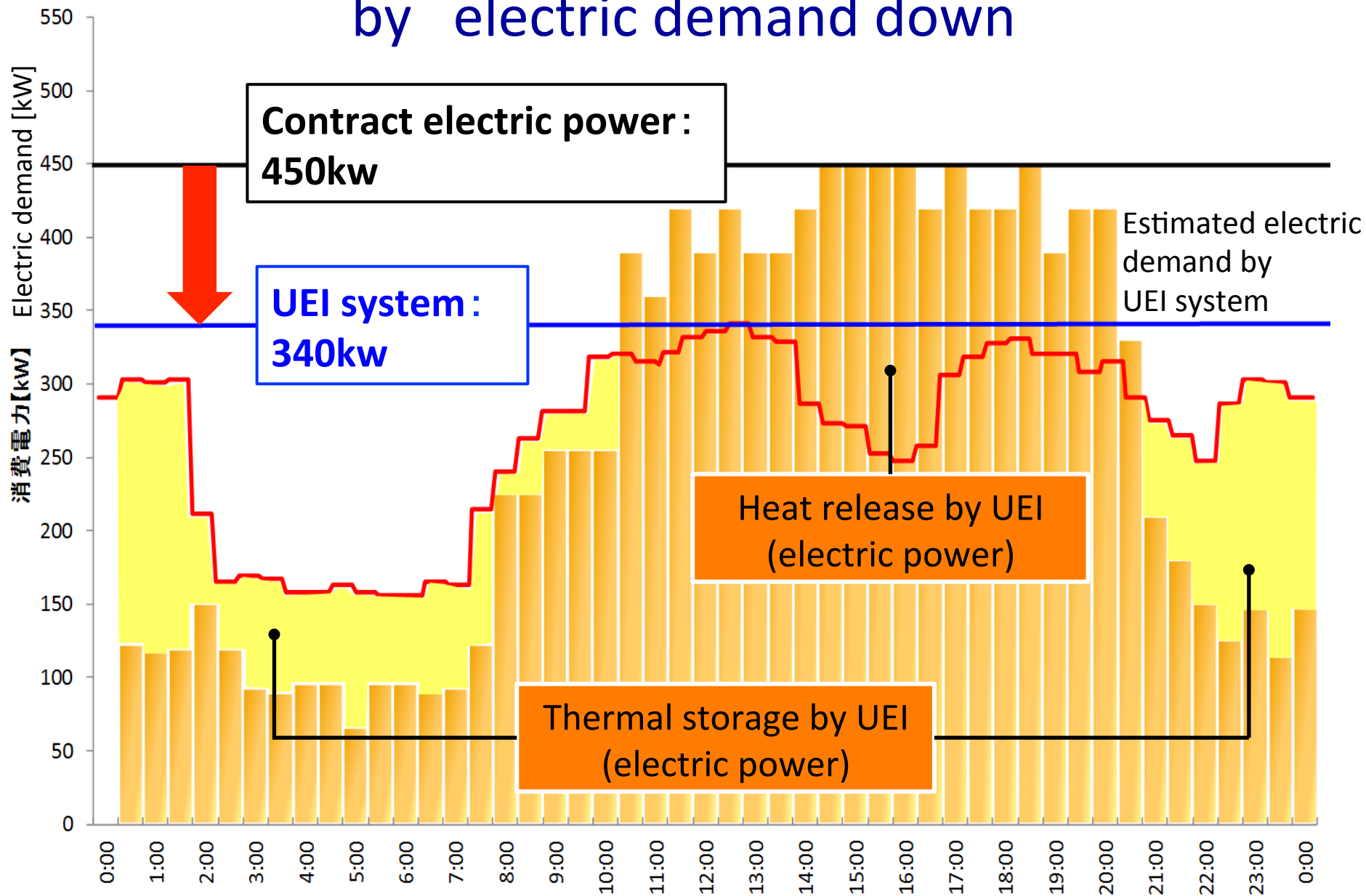


Coil in Thermal Storage Tank



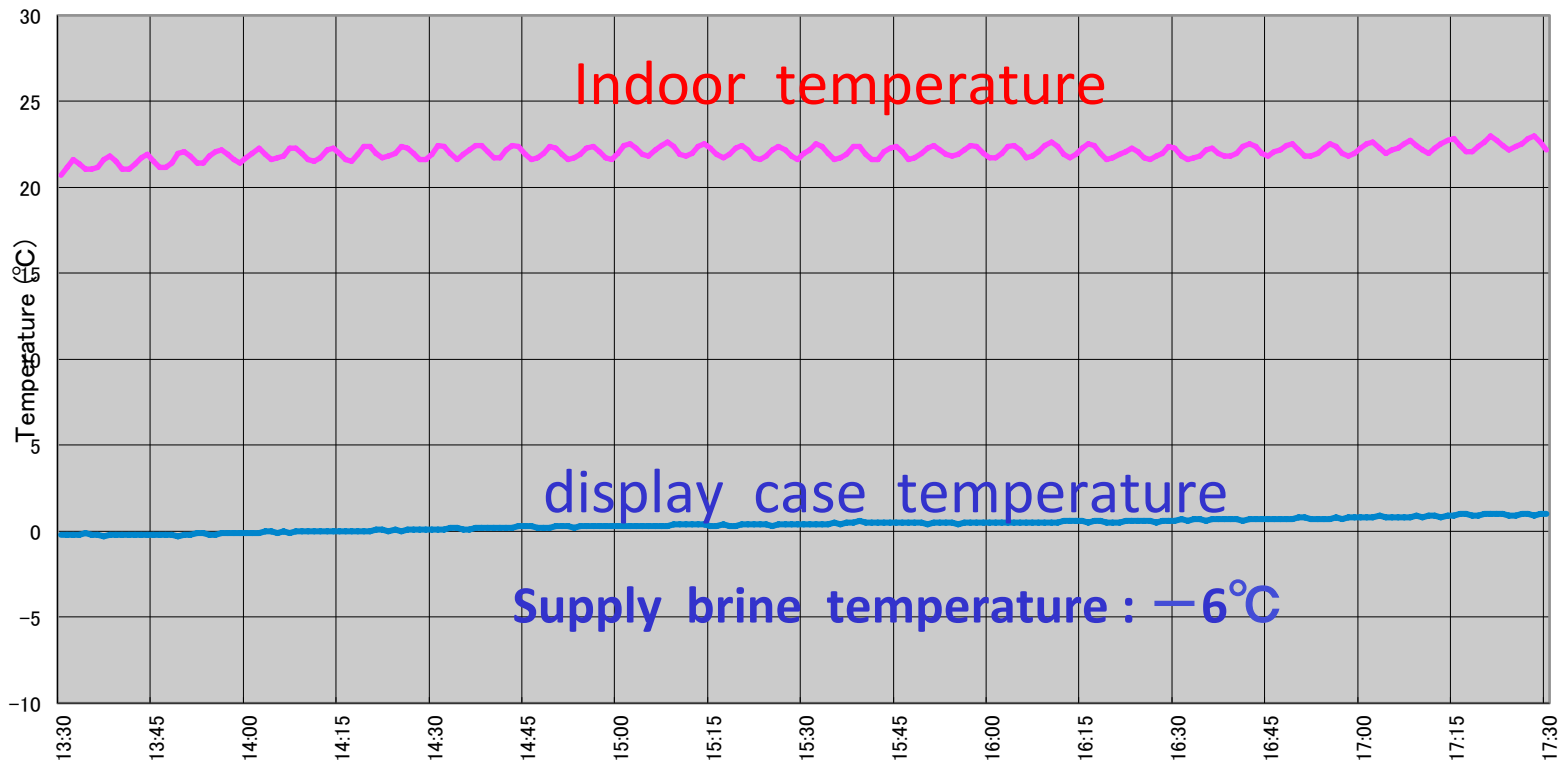
Brine Ice in Thermal Storage Tank

# Electric power cost $\approx$ $\blacktriangle$ 2.2M/y by electric demand down



# Brine-Systematized Display Cases for middle temperature (0°C)

Figure 1: Refrigeration temperature of brine-systematized display cases for mid. (0°C)

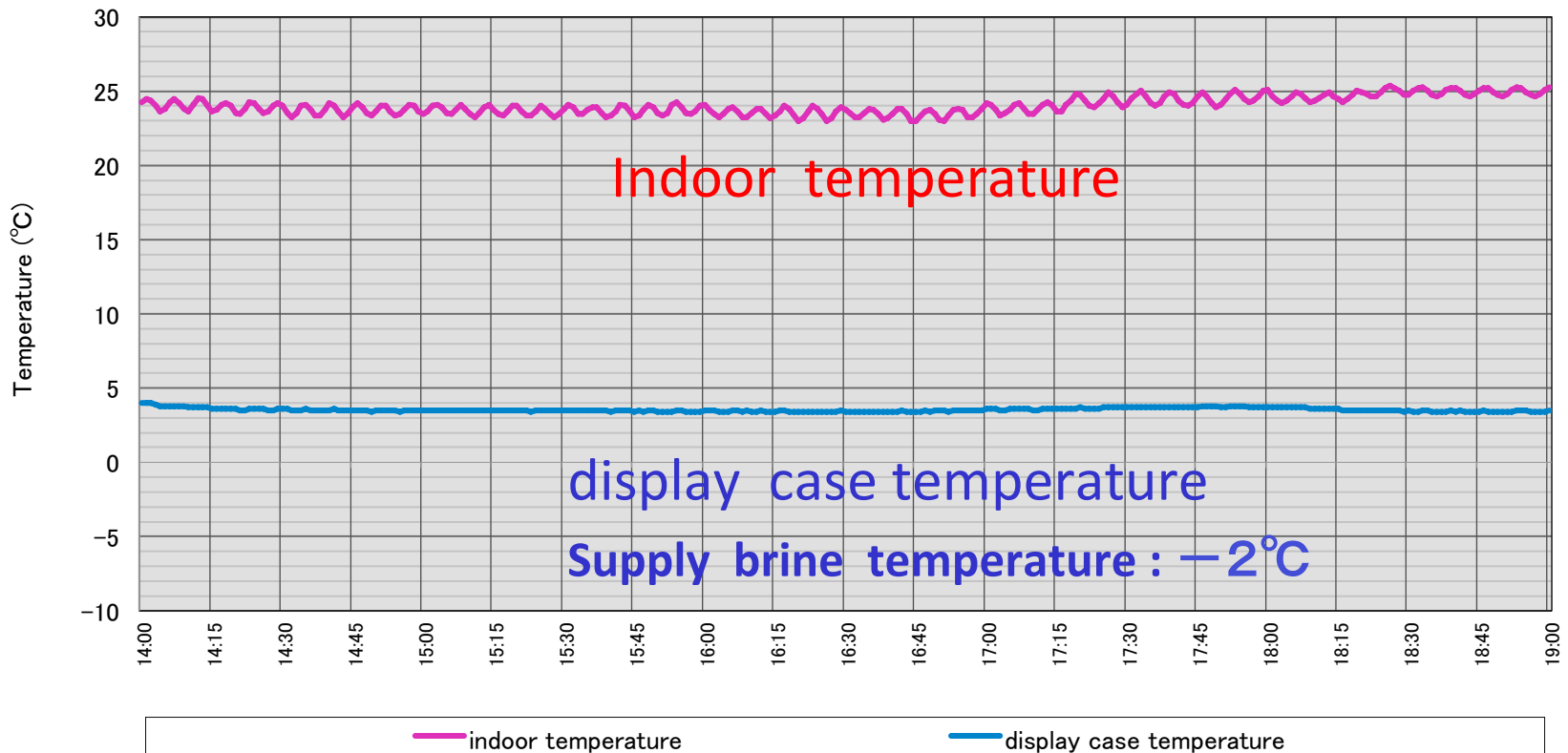


— indoor temperature

— display case temperature

# Brine-Systematized Display Cases for high temperature (5°C)

Figure 2: Refrigeration temperature of brine-systematized display cases for high- (5°C)





# Feature of F-Gas Free Ultra Eco-Ice System

- ① Energy saving :  $\Delta$  (20% +  $\alpha 1$ )
  - ② Electric demand down :  $\Delta$  (110kW -  $\alpha 2$ )
  - ③ Electric power cost down:  $\Delta$  (6.5M\\$/year +  $\alpha 3$ )
- actual figures (HFC-UEI vs HFC)

- Keep the quality of products
- Ensures high safety (no high pressure)  
and high reliability



**Thank you  
for your attention!**



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**ヤマト**