Ultra Eco-Ice System

- Innovative solution for Japanese supermarkets -

1. Problem and solution for most existing SM refrigeration facilities in Japan
2. The problem which the HFC system faces
3. Solution of HFC system;
   UEI system ver-2 for HT & MT display cases
4. Effect of UEI ver-2
5. Low-HFC & HFC-free for existing system
6. Innovation of CO2 system
7. Outdoor temperature around Tokyo
   - 7-1. The generation frequency of each outdoor temperature around Tokyo
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8. The result of UEI ver-3 actual proof research
   - 8-1. Ph diagram
   - 8-2. CO2 refrigerator

Presenter
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Managing Executive Officer, YAMATO,
P.E. Authorized by Japanese Gov.,
Member of ASHEAE, JSRAE, SHASE

YAMATO Co. Ltd.

① Established in 1945

② Capital is 5 billion yen

③ Main business:

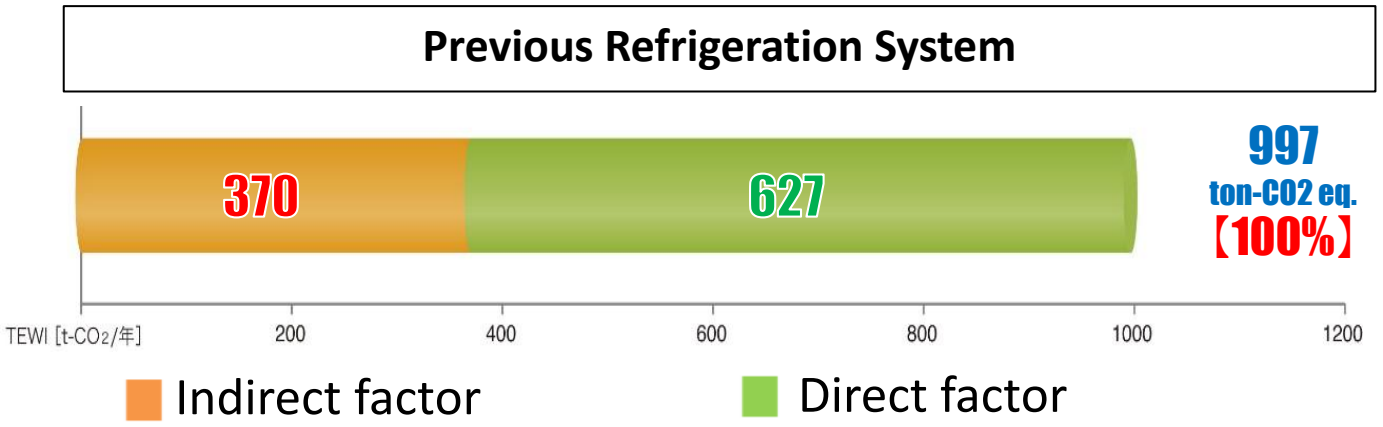
- design and installation for air-conditioning and refrigeration facilities
- Development and operation of thermal storage system

1. Problem and solution for most existing SM refrigeration facilities in Japan

- Current condition
  - ① Over 50% of the existing facilities apply HCFC refrigerant
  - ② New facilities apply HFC refrigerant
- What's the problem?
  - ① The HCFC production will be phase out in 2020 based on Montreal Protocol.
  - ② It proceed to convert into HFC with high global warming potential.

2. The problem of the HFC system

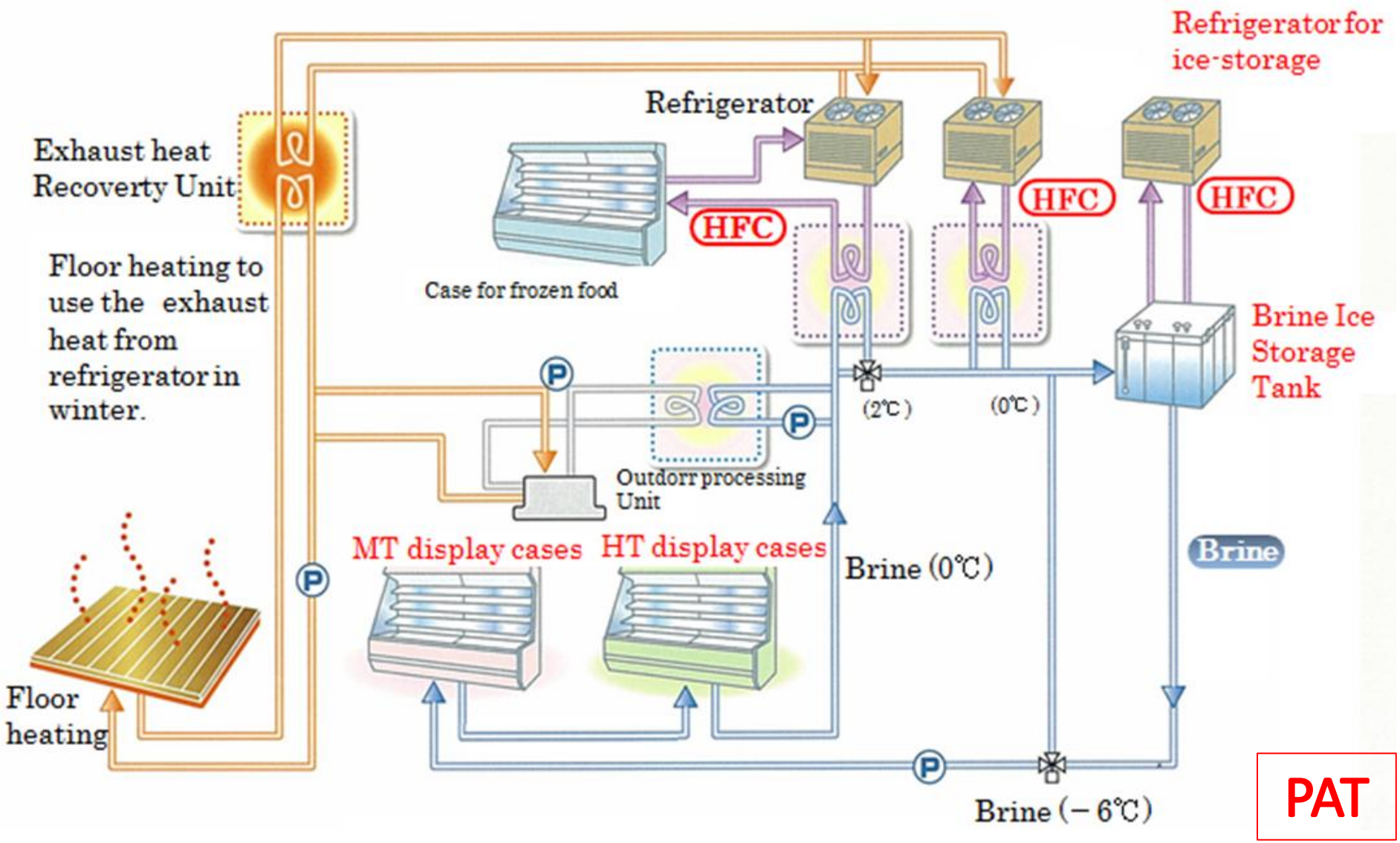
- Convert from existing HCFC system to HFC system ⇒ increase by 20 Mt/CO2eq in 2020.
- TEWI of HFC refrigeration system is over CO2 generation by electric demand considering the leak rate 16%.



TEWI (Total Equivalent Warming Impact)

3. Solution of HFC system;

UEI system ver-2 for HT & MT display cases



4. Effect of UEI ver-2

① TEWI: △ 51%

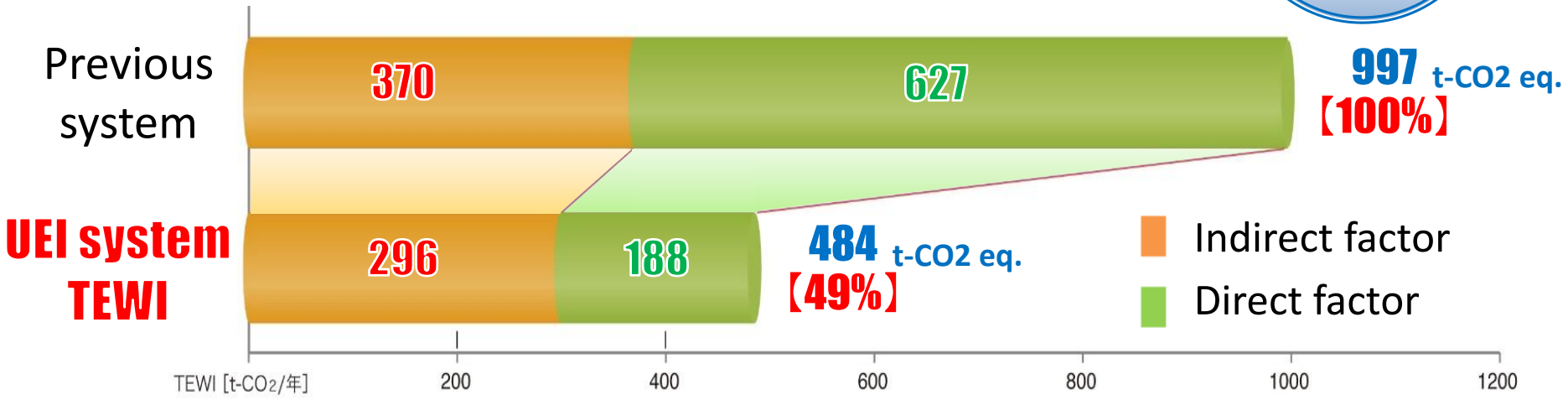
② Energy saving: △ 20%

③ Electric demand down: △ 110kW

④ Electric power cost down: △ 5M\

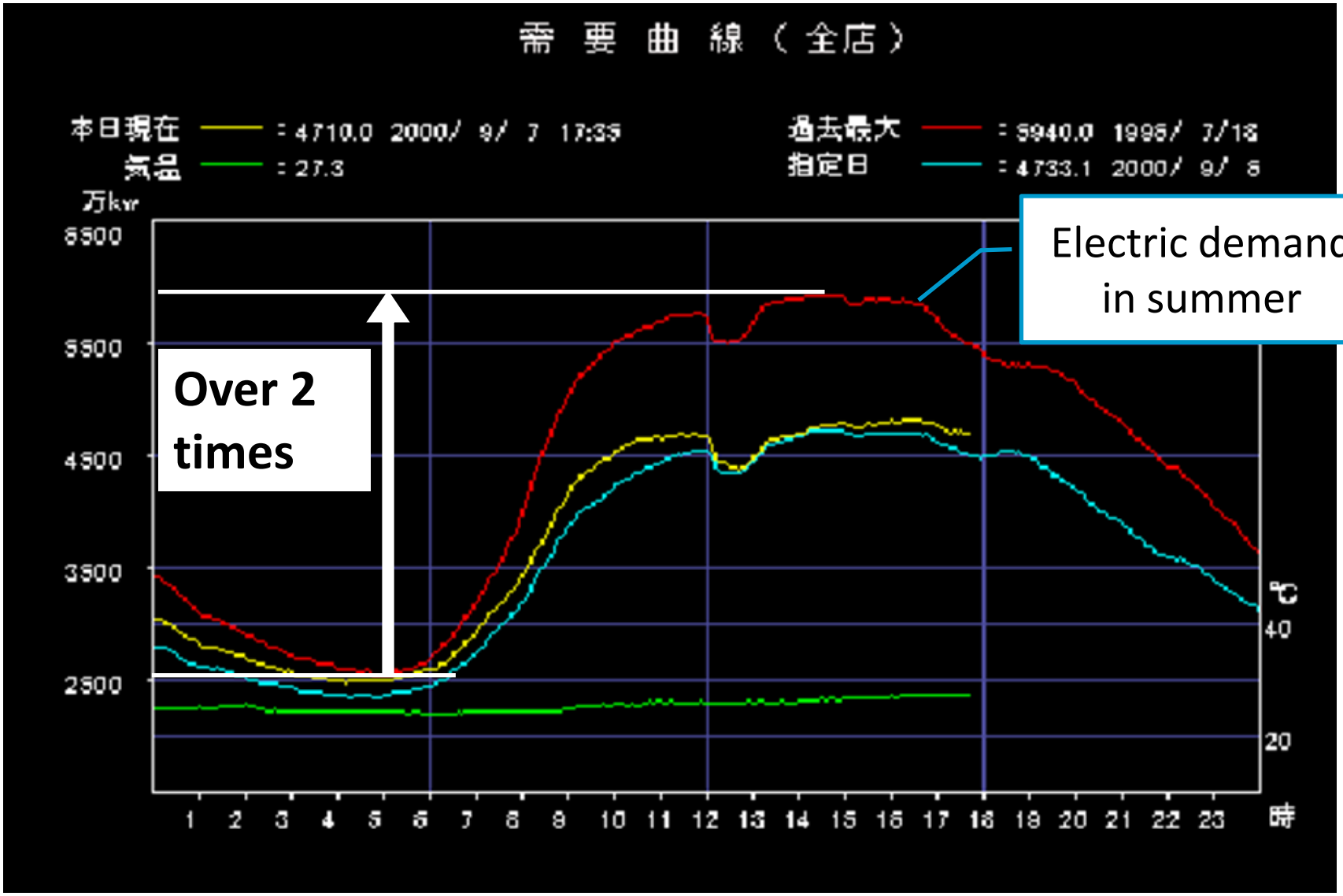
⑤ Keep the quality of products

TEWI 51% down



(Reference)

Electric demand curve



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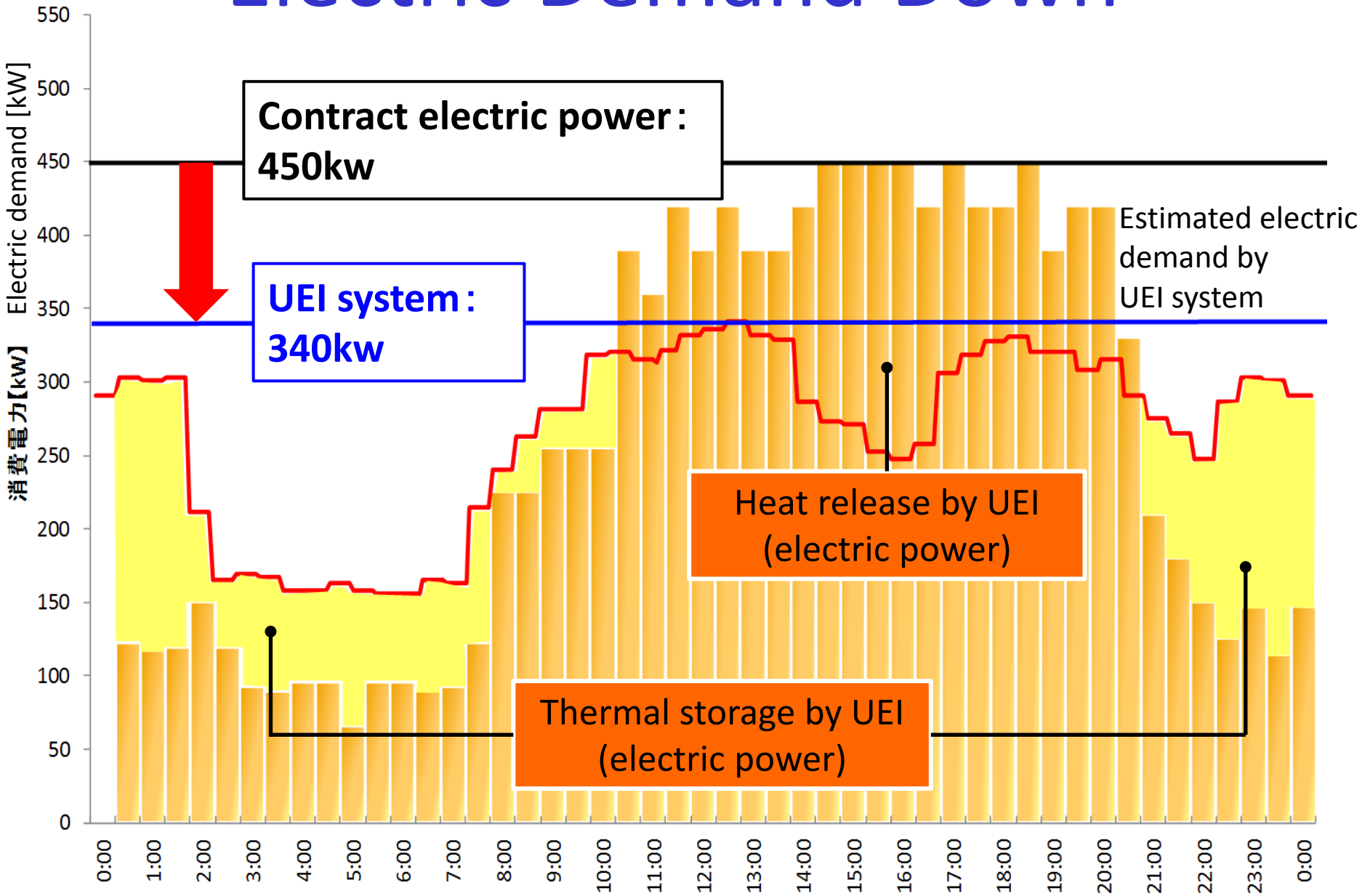
Electric Demand Down



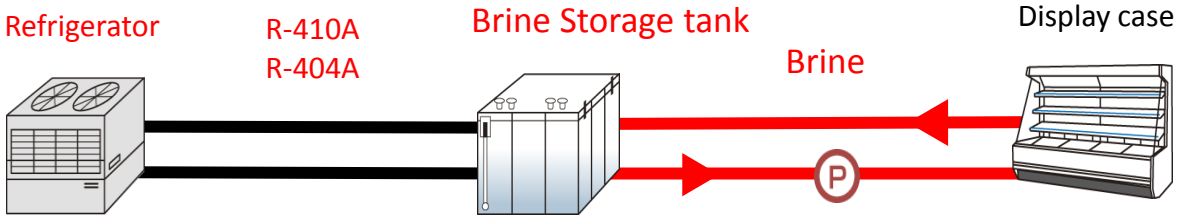
5. Low-HFC & HFC-free for existing system

Present approach : Replace R-22 for refrigerator to R-410A, R-404A

Ozone layer protection : ◎ Global warming prevention : ×

Our Proposal approach : STEP-1

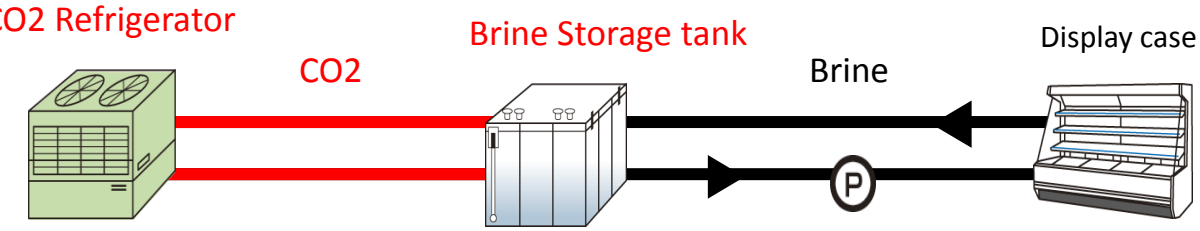
Low-HFC



Ozone layer protection : ◎ Global warming prevention : ○

Our Proposal approach : STEP-2

HFC-free



Ozone layer protection : ◎ Global warming prevention : ◎

6. Innovation of CO2 system

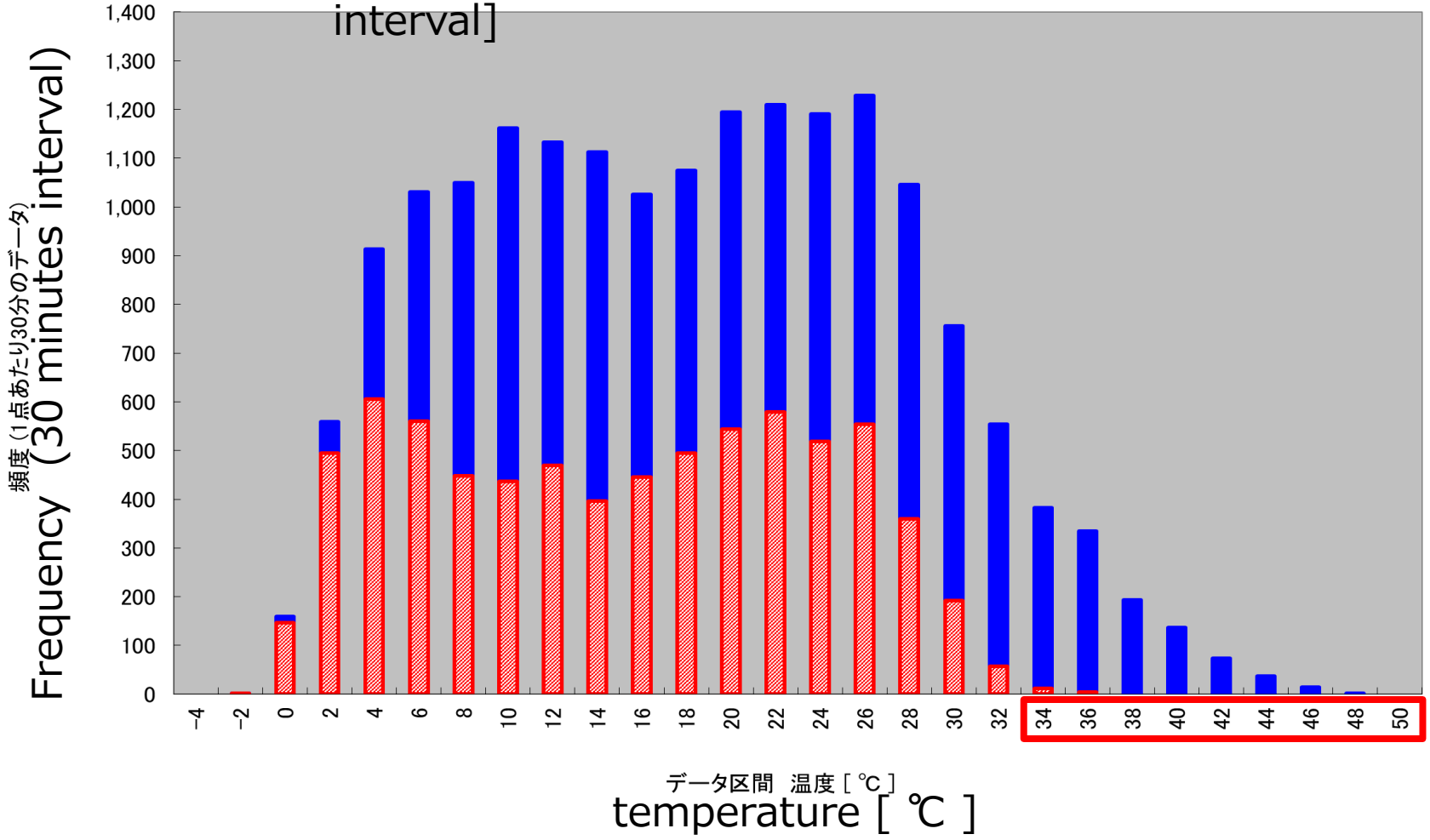
- Use the groundwater
  - Renewable energy
  - Government also recommend
- Effects
  - Subcritical operation: working pressure is medium pressure ≦ 6MPa
  - Improving COP: COP 3.05 (cooling brine)
    COP 2.60 (making brine ice)
    ※even in summer with high temp
  - Cost down the expensive installing cost of CO2 refrigerator
  - UEI ver-3 also performs same effect as UEI ver-2

7-1. The generation frequency of each outdoor temperature around Tokyo

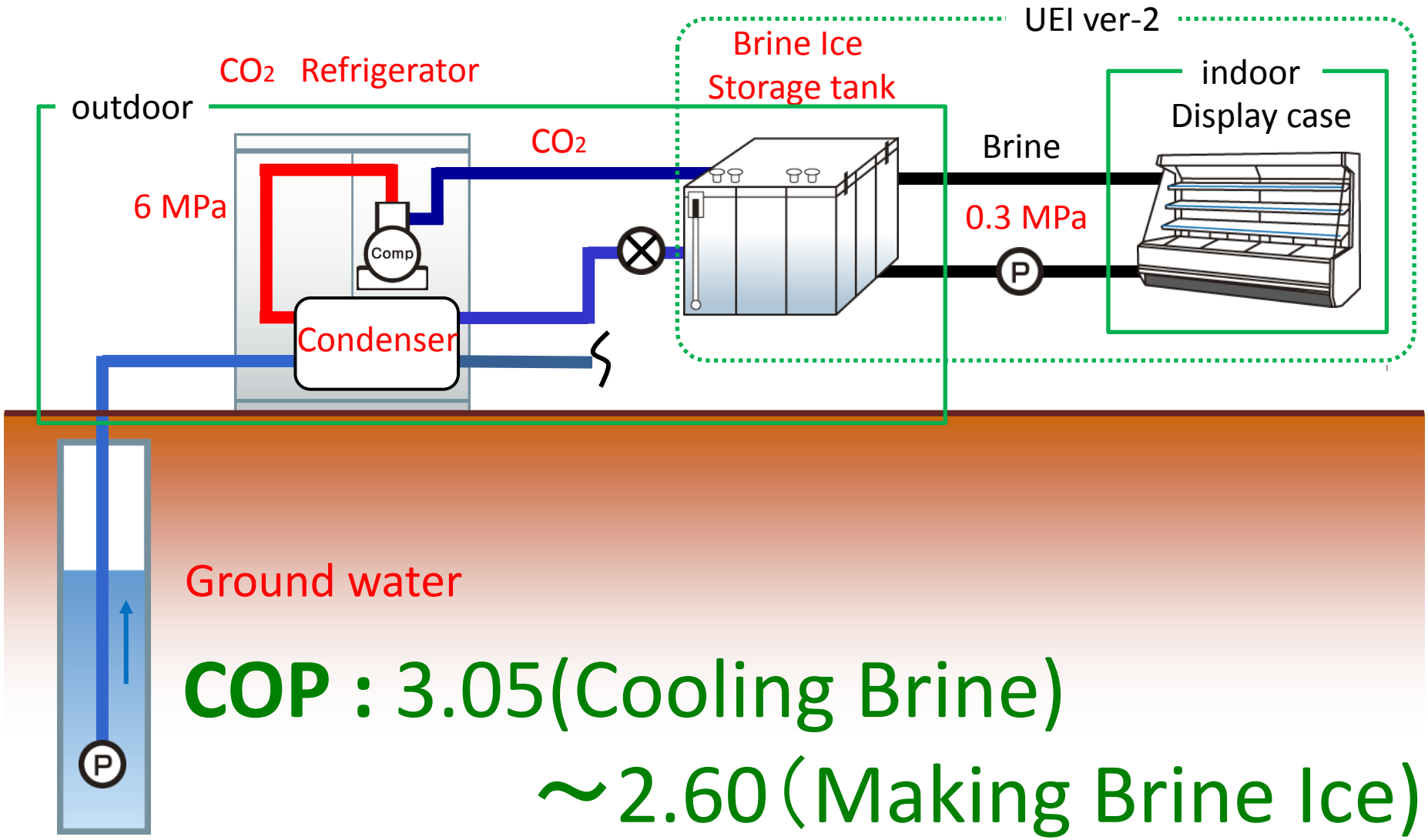
外気温度発生頻度　[30分間隔の計測]

外気温度データ計測

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



7-2. UEI ver-3 with CO2 refrigerator for application of groundwater

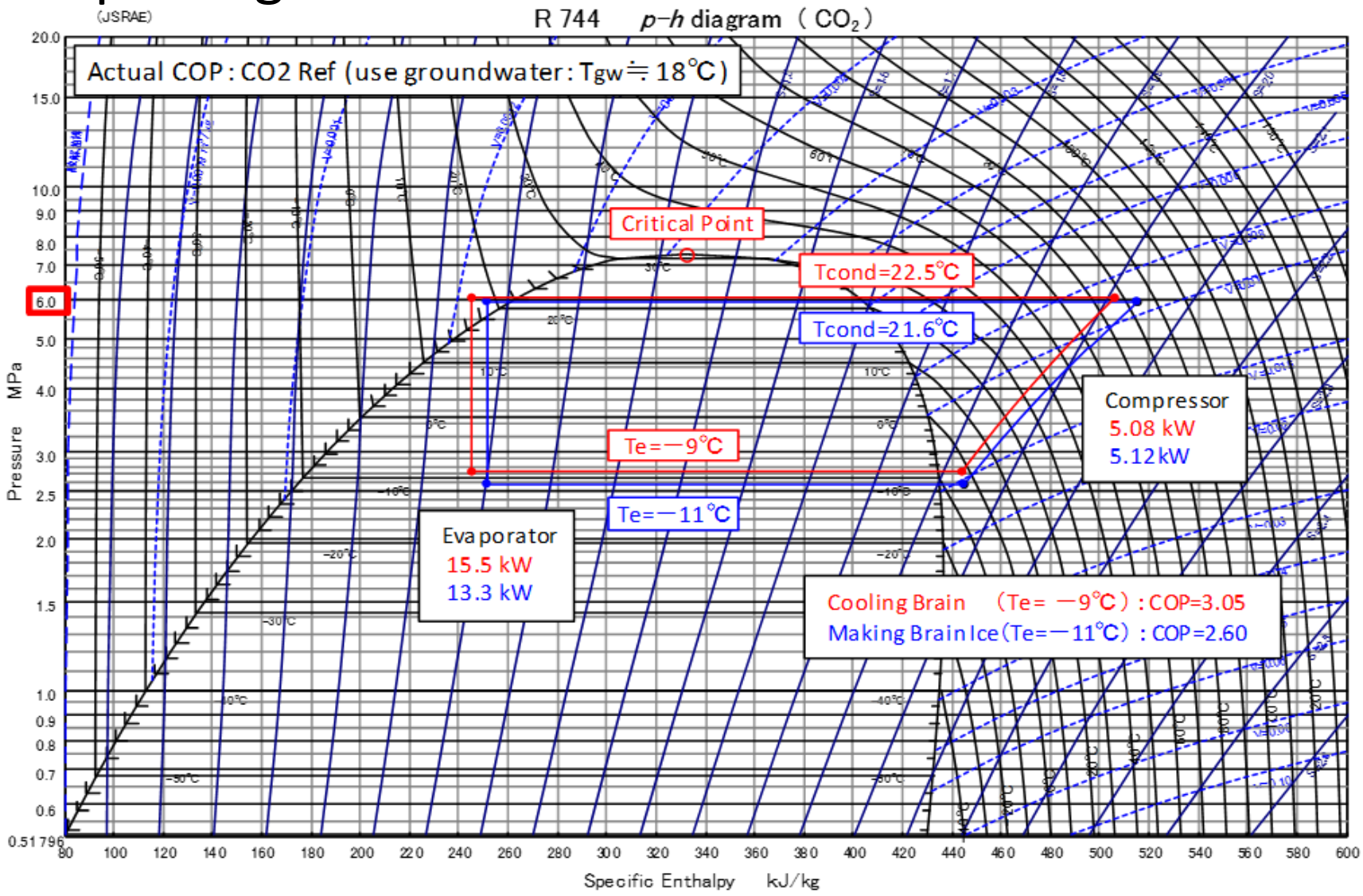


COP : 3.05(Cooling Brine)

～2.60（Making Brine Ice)

8. The result of actual proof research for UEI ver-3

8-1. ph diagram



8-2. CO_2 refrigerator

株式会社ヤマト

(Reference)

Electric power consumption in SM

electric power consumption and its distribution in common SM (2,800~3,000㎡)

Sales Floor Dimension:1,500㎡, Sale Time: 11 hours, Electric Defrost Type