

# Accelerating Efforts towards Carbon Neutrality 2050 in Japanese Industry

The Japan Refrigeration and Air Conditioning  
Industries Association

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# 1. Who is JRAIA?

## JRAIA (Japan Refrigeration and Air Conditioning Industries Association)

- **Established in Feb. 1949**
- Minato city, Tokyo (located in front of Tokyo Tower)
- Chairman: Yasumichi Tazunoki (from Mitsubishi Electric Co.)
- The number of the members: **168 companies** incl. associate members as of Apr. 2024
- **Business Fields:**
  - Air conditioning (residential, commercial, automotive)
  - Refrigeration (commercial, industrial, transport)
  - Ventilation
  - Heat pump system (HP water heaters)
  - Refrigerants
  - Parts
- **[www.jraia.or.jp/english](http://www.jraia.or.jp/english)**



## 2. Update on JRAIA's Key Activities

|                                 |   |
|---------------------------------|---|
| <b>Energy Efficiency</b>        | <ul style="list-style-type: none"> <li>• Active involvement in the technical group of ISO for next generation performance evaluation method</li> <li>• <b>Action for energy efficiency related regulations and standards in Japan, EU, etc.</b></li> </ul>  |
| <b>Refrigerants</b>             | <ul style="list-style-type: none"> <li>• Publish the guideline for the refrigerant leak detection monitoring for Japan market.</li> <li>• <b>Discussion for the next designated products of F-Gas Act in Japan</b></li> </ul>   |
| <b>Environment</b>              | <ul style="list-style-type: none"> <li>• Consideration of <b>LCCP (Life Cycle Climate Performance)</b></li> <li>• Action for environment related regulations especially in the EU; Ecodesign, F-Gas, PFAS, etc.</li> </ul>  |
| <b>International Activities</b> | <ul style="list-style-type: none"> <li>• ICARHMA meeting (<b>International</b> Council of Air Conditioning, Refrigeration, and Heating Manufacturers' Associations): Collaborate with 11 international industrial associations and contributed as advisory committee member for UNEP's RDL (Refrigerant Driving License)</li> <li>• Three Industry Association Meeting (<b>China-Korea-Japan</b>): Annual meeting to discuss common issues.</li> <li>• <b>ASEAN5 + J</b> Workshop: Exchange information on energy saving and refrigerant conversion including global environmental issues among industry associations of 5 ASEAN countries</li> <li>• Seasonal Energy Efficiency(<b>CSP</b>)Evaluation Method: Promotion in <b>ASEAN</b> countries</li> </ul> |

### 3. Industry's commitment to environmental issue

#### (i) Japan's HVAC&R market and refrigerant transition by product category

| Product Category              | No. of Units(k)<br>& Y/Y (%) | Refrigerants  |
|-------------------------------|------------------------------|---|
|                               | 2022FY                       |   |
| Residential A/Cs              | 9145.7 (98.4%)               | R32(almost 100%)  |
| Commercial A/Cs               | 823.2 (100.5%)               | R410A, R32(small size)  |
| Residential H/P water heaters | 704.4 (115.9%)               | CO <sub>2</sub> (almost 100%)   |
| Gas engine-driven A/Cs        | 26.9 ( 100.4%)               | R410A   |
| Water chilling units          | 12.7 (98.1%)                 | R32, R410A, R134A   |
| Air to air heat exchangers    | 139.5 (97.2%)                | NA  |
| Commercial ref. cabinets      | 248.4 (91.2%)                | R404A→R410A, CO <sub>2</sub> (separate type)<br>R290, R1234yf(self contained) |
| Condensing units              | 71.1 (89.0%)                 | R448A, R410A, CO <sub>2</sub>   |
| Refrigeration units           | 214.0 (106.6%)               | R22→R404A, R410A  |

# 3. Industry's commitment to environmental issue

## (ii) JRAIA's position on Carbon Neutrality

JRAIA will work towards the realization of CN2050 while considering S+3Es.

### ① HVAC&R industry's basic stance towards CN2050 :

- Aim to expand the use of heat pump technology and products that are also highly efficient from the perspective of utilizing renewable energy.
- Use the designated product system to reduce HFCs as much as possible and explore the possibility of safe use of lower GWP, e.g. "Green refrigerants" such as natural refrigerants and ultra low-GWP refrigerants.

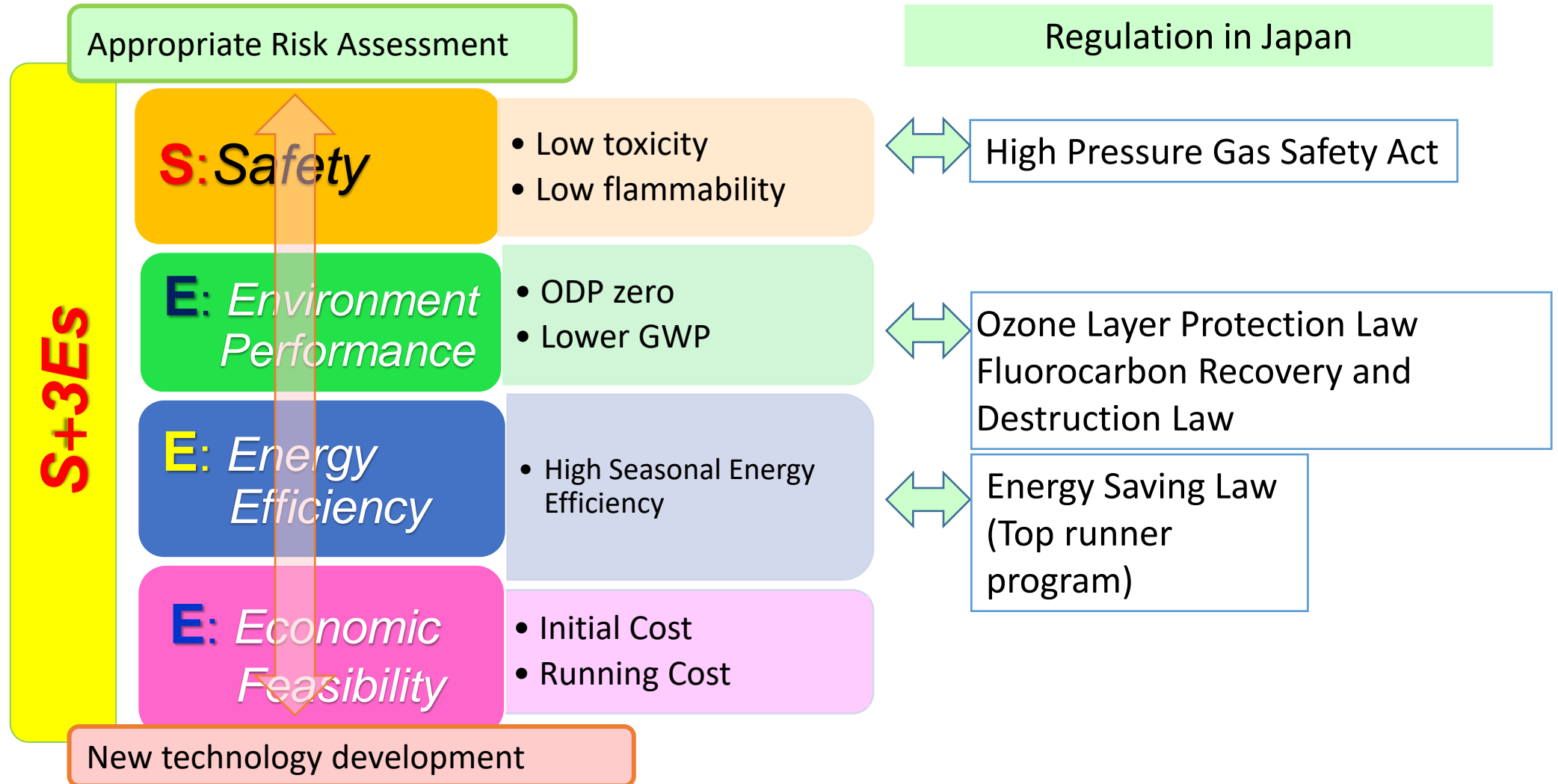
### ② Direction of response to CN2050 in HVAC&R sector: **Basic principle : S+3Es**

Balanced target setting and target-driven activities on Safety plus Environment performance, Energy efficiency and Economic feasibility are important.

- **Safety(S)** : Ensure safety together with users(consumers), installers and other relevant stakeholders
- **Environment performance(E)** : Convert to lower GWP refrigerants from an environmental point of view.
- **Energy efficiency(E)** : Improve the efficiency of equipment systems from the perspective of improving energy efficiency (directly linked to the reduction of CO<sub>2</sub> emissions).
- **Economic feasibility(E)** : A reasonable price (cost) that balances the above three items is essential to promote market diffusion.

# 3. Industry's commitment to environmental issue

## (iii) Important Issues to be considered in refrigerant conversion

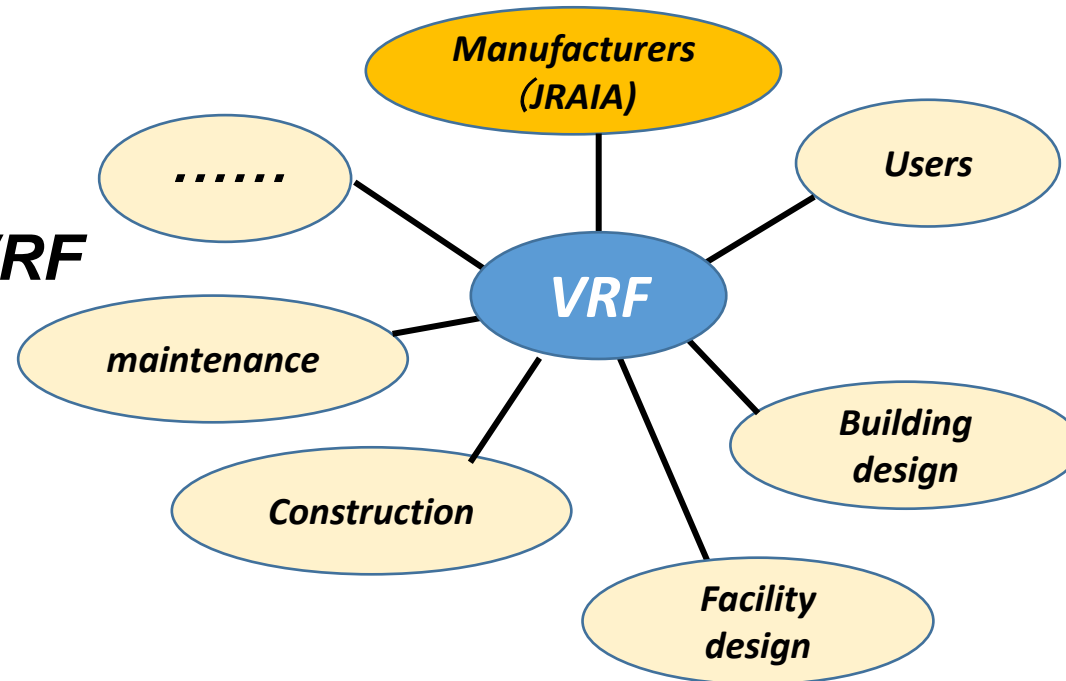


# 3. Industry's commitment to environmental issue

## (iv) VRF

Further consideration of **S+3Es** including risk assessment and discussion amongst all stakeholders is necessary for VRF

### Stakeholder



### Related regulations and standards :

1. High Pressure Gas Safety Act
2. Product Standards of JRAIA(JRA 4070)
3. Guideline of JRAIA( JRA GL16)

### Safety measures:

1. Regulation of refrigerant filling amount (upper limit)
  2. Installation of mechanical ventilation equipment
  3. Installation of shut-off device
- ※ ( 2 or 3 )+ Installation of detection and alarm device



# 3. Industry's commitment to environmental issue

## (iv) New Products-1

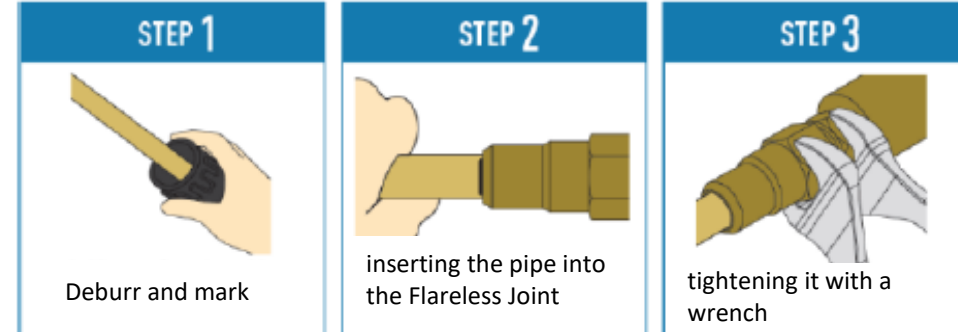
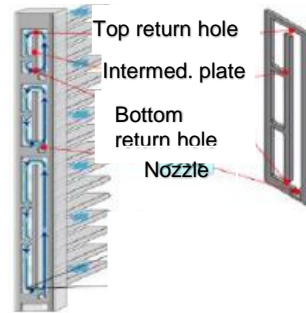
### Daikin: VRF 『VRV 7』series

(18.Jan.2024:Press release, Nov. 2024:Launch )

# VRV7



- 1) With the adoption of **R32**, the refrigerant **charge amount** has been reduced by **more than 10%** by updating the **microchannel heat exchanger** and reducing the diameter of the on-site refrigerant piping



- 2) Adopts "**Flareless Joint**" threaded joint as standard, which complies with ISO14903
- 3) Multi-refrigerant temperature control using a "**multi-refrigerant control unit**" that also functions **as a shut-off device**

# 3. Industry's commitment to environmental issue

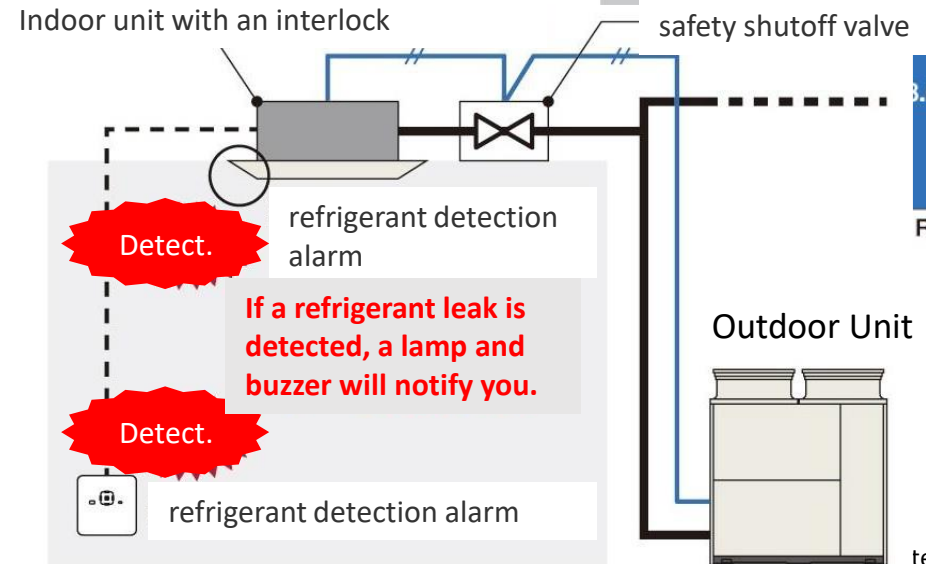
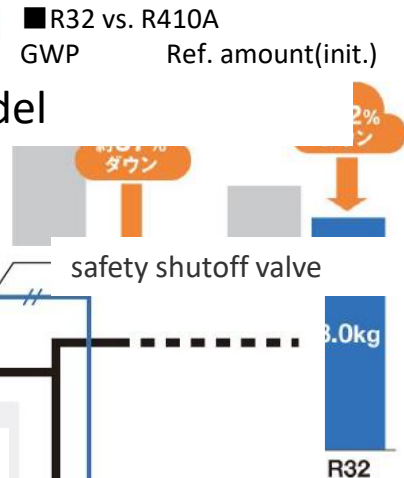
## (iv) New Products-2

### Johnson Controls Hitachi AC: VRF "Flex Multi" series (23.Jan.2024:Press release, Jun.2024:Launch)

1) Low GWP refrigerant **R32** adopted for VRF air conditioner

2) **Improved both AFP and COP** compared to our previous model

3) the indoor unit is equipped **with an interlock function.**



# 3. Industry's commitment to environmental issue

## (iv) New Products-3

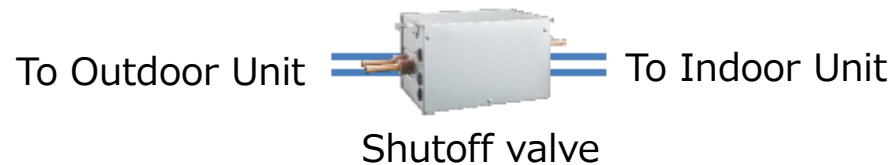
### Mitsubishi Electric: VRF "Grand Multi" series

(24. Jan. 2024: Press release, Sept. 2024: Launch)

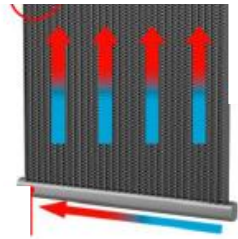
- 1) New type of heat exchanger "**Vertical Aluminum Flat Tube Heat Exchanger**" which has achieved the industry's highest class heat transfer performance



- 2) the industry's **highest class rating COP** of 4.55, which improves energy efficiency, and all models now use **R32**, achieving carbon neutrality.



- 3) a new structure that improves **work efficiency during installation and maintenance,**



# 3. Industry's commitment to environmental issue

## (v) LCCP (Life Cycle Climate Performance)

### JRAIA LCCP Evaluation WG

#### LCCP evaluation for residential use ACs using R22, R290, R410A, R32, R454C

- Evaluate the followings in addition to evaluation based on IEA Annex 54
  - ① System performance simulation with accurate test verification of refrigerants
  - ② Equipment operation time (calculated from IoT, big data, and outside air temperature)
  - ③ Amount of refrigerant leakage
- Evaluate electricity demand scenarios for each temperature regions in order to be utilized globally (Covering tropical / subtropical / moderate / cold region)
- Incorporate well-balanced consideration of S+3Es

### Action items

May 14<sup>th</sup> IEA Heat Pump Conference Paper Submission, Presentation

Aug ICR2023 International Conference (@Paris) Annex54 Workshop

**Nov Progress report at The International Symposium on New Refrigerants and Environmental Technology 2023@ Kobe, Japan**

# 4. Laws and regulations in Japan(HVAC sector)

## (i) Latest Japanese government's environmental policy

### ① Cabinet decision on the "Plan for Global Warming Countermeasures" (22<sup>nd</sup> Oct.2021)

|  | Fiscal year<br><b>2013</b> | Targets and estimates<br>in fiscal year<br><b>2030</b> | Reduction<br>Ratio | Conventional target<br>(Reduction Ratio) |
|--|----------------------------|--|--------------------|--|
| (Unit: Million t-CO <sub>2</sub> )                                       |                            |  |                    |  |
| Greenhouse gas<br>emissions and removals                                 | <b>14.08</b>               | <b>7.60</b>  | <b>▲46%</b>        | ▲26%                                     |
| Energy-related CO <sub>2</sub>   | <b>12.35</b>               | <b>6.77</b>  | ▲45%               | ▲25%                                     |
| Industry   | <b>4.63</b>                | <b>2.89</b>  | ▲38%               | ▲7%                                      |
| Commercial and others  | <b>2.38</b>                | <b>1.16</b>  | <b>▲51%</b>        | ▲40%                                     |
| Residential  | <b>2.08</b>                | <b>0.70</b>  | <b>▲66%</b>        | ▲39%                                     |
| Transport  | <b>2.24</b>                | <b>1.46</b>  | ▲35%               | ▲27%                                     |
| Energy conversion  | <b>1.06</b>                | <b>0.56</b>  | ▲47%               | ▲27%                                     |
| Non-energy-related CO <sub>2</sub> ( CH <sub>4</sub> , N <sub>2</sub> O) | <b>1.34</b>                | <b>1.15</b>  | ▲14%               | ▲8%                                      |
| Four gases incl. HFC etc.  | <b>0.39</b>                | <b>0.22</b>  | <b>▲44%</b>        | ▲25%                                     |
| Greenhouse gas removals  | -                          | ▲0.48  | -                  | -  |

## 4. Laws and regulations in Japan(HVAC sector)

### (i) Latest Japanese government's environmental policy

#### ② Cabinet decision on "the 6th Strategic Energy Plan"

(22<sup>nd</sup> Oct. 2021)

- The 10th anniversary of the Great East Japan Earthquake
- Confirmation of basic policy of **S + 3Es**  
(Safety, Energy Security, Economic Efficiency, Environment)
- **"2050 Carbon Neutrality"**
- Business / housing sector
  - Building Energy Conservation Law
  - Strengthen **"Top Runner Programs"**  
in building materials and equipment.

# 4. Laws and regulations in Japan(HVAC sector)

## (ii) Overview of Legislation in Japan

### Legislation on refrigerants

#### “Ozone Layer Protection Act” (revised in 2018)

- Regulation on production and consumption of CFC/HCFC/HFCs (abbr. OLP Act)
- National law to be ratified the Kigali agreement to the Montreal Protocol.

#### “Act on Rational Use and Proper Management of Fluorocarbons” (revised in 2021)

- Regulation on emission of CFC/HCFC/HFCs (abbr. Fgas Act) → **Sequential addition (22.3 Government Council; central air conditioner, GHP etc.)**
- Target GWP and year for each product group

#### “High Pressure Gas Safety Act” (revised in 2016)

- Regulation on safety of flammable (toxic) gas
- Method of safe use of products and refrigerants
- A2L refrigerants are included as “particular inert gas”

### Legislation on energy efficiency

#### “Global Warming Countermeasure Plan”

- Regulation on emission of energy origin CO2

#### “Act on the Rational Use of Energy(Saving Energy Act)” (revised every 3-5 yr)

- **Top Runner Program has been revised in 2022 (Target year for RAC (Wall-hung type) : 2027)**

## 4. Laws and regulations in Japan(HVAC sector)

### (iii) Japan's Energy Conservation Regulation: Top Runner Program

#### Review of Energy Efficiency Target Year for each product categories

Approved by METI's WG (Air Conditioner & Electric Water Heater Judgment Criteria WG, on 8 Feb 2023):

##### ➤ Residential-use Air Conditioners :

##### - Energy Efficiency Target Year

Wall-mounted type (single-split ACs): **2027**

other types (include multi-split ACs): **2029**

##### - Reviewed classification (including new class for equipment in cold regions )

##### ➤ Heat pump water heaters

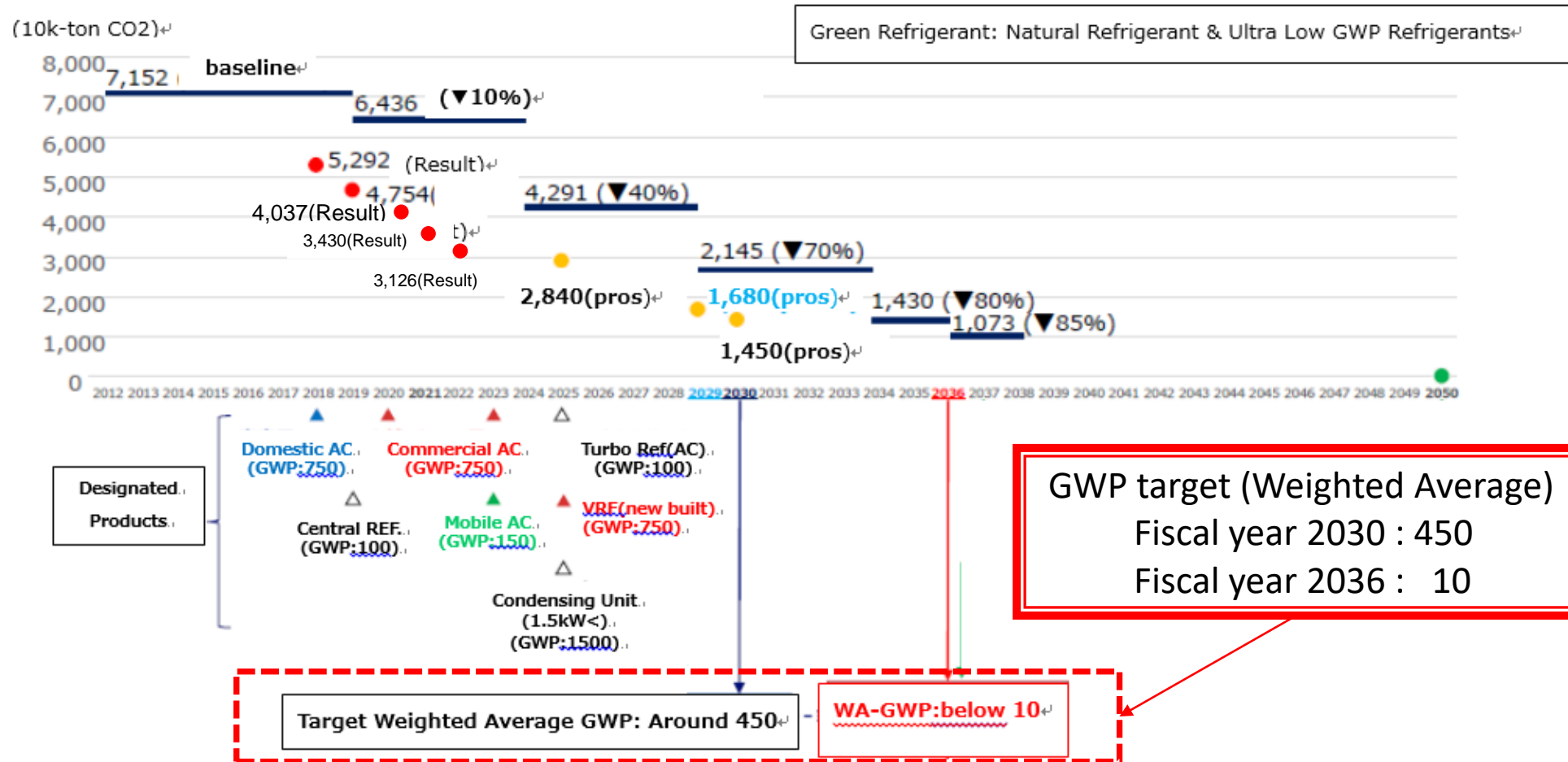
##### - Energy Efficiency Target Year : **2025**



# 4. Laws and regulations in Japan(HVAC sector)

## (iv) HFC reduction in Japan

### Implementation scenarios for green refrigerants and applicable equipment

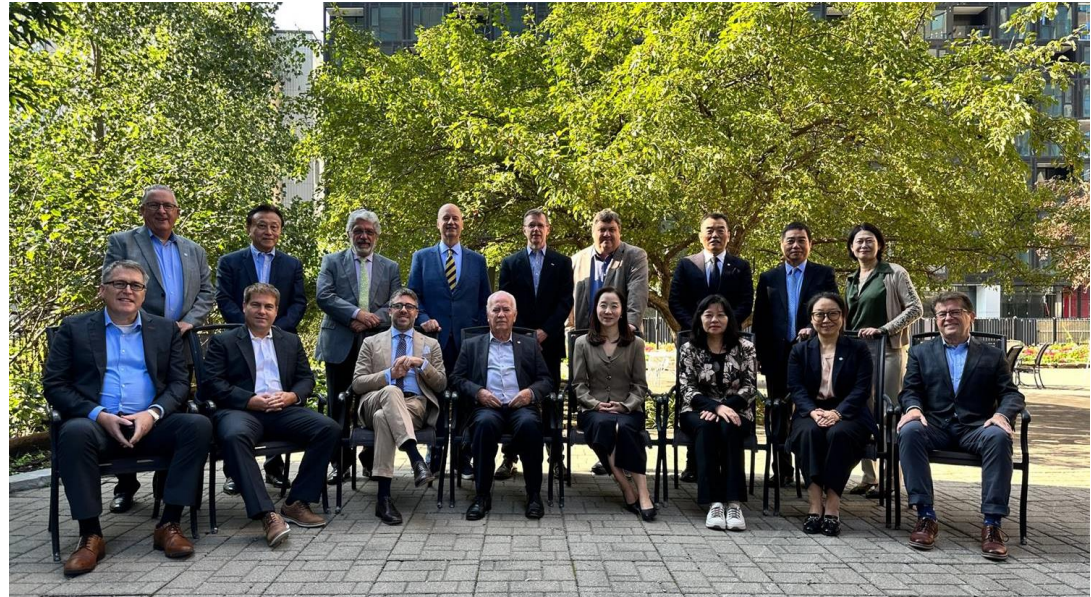


2024-3-22 by materials of Government of Japan Joint Council

# 5. International Activities

## 1) ICARHMA Meeting:

- Held once a year by each industry association (interim mtg is held during AHRI Show)
- Sept.22 Held in Montreal, Canada
- Participating organizations: AHRI (US), EPEE, Eurovent (EU), AREMA (Aust.), CRAA (China), KRAIA (Korea), HRAI (Canada), ABRAVA (Brazil), JRAIA
- Agenda: Sharing information about issues and responses faced by each region and organization.



# 5. International Activities

## 2) Southeast Asia :

### **ASEAN5+J workshop** (in Hanoi, Vietnam 26<sup>th</sup> Oct.2023)

- Participation in various industrial associations  
(Indonesia, Malaysia, Philippines, Thailand, Vietnam, Japan)
- Main subject: “ **Energy Efficiency, Safety, and Lower GWP Refrigerants** ”

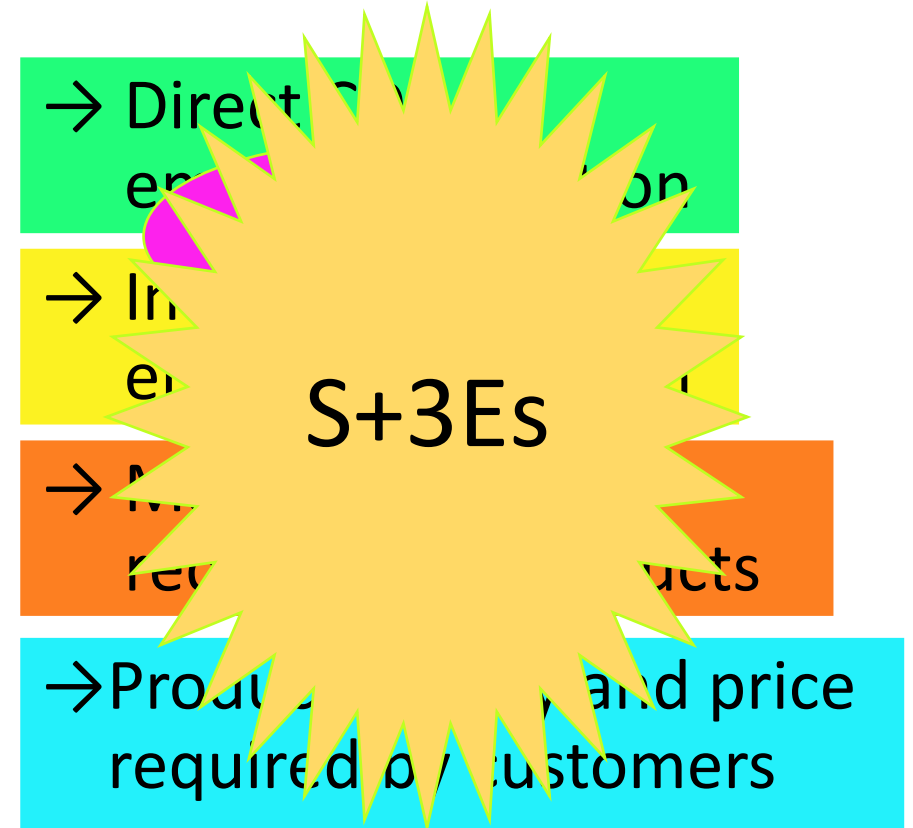


# Summary

## Direction to go: Actions towards carbon neutrality in 2050

Specific issues for this purpose:

- 1) **Refrigerant conversion**  
(“Green” refrigerants, Natural refrigerants)
- 2) Improving **energy efficiency**  
(MEPS, Top Runner)
- 3) **Ensuring safety**  
(manufacturing reliable products)
- 4) Expanding **market penetration**
- 5) **Unique technological capabilities**  
→ Demonstrate the strengths of Japanese manufacturers
- 6) Demonstration of **leadership and contribution** on the international stage  
→ Policy proposals, demonstration of technical capabilities, and support



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**Thank you for your attention**