



Briefing on Sustainability

Daikin's Challenge to Achieving Carbon Neutrality

Daikin Industries, Ltd.
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Presenters

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Today's Briefing Agenda

Daikin's Challenge to Achieving Carbon Neutrality

I . Approach to Carbon Neutrality

II . Daikin's Rulemaking Initiative

I . Approach to Carbon Neutrality

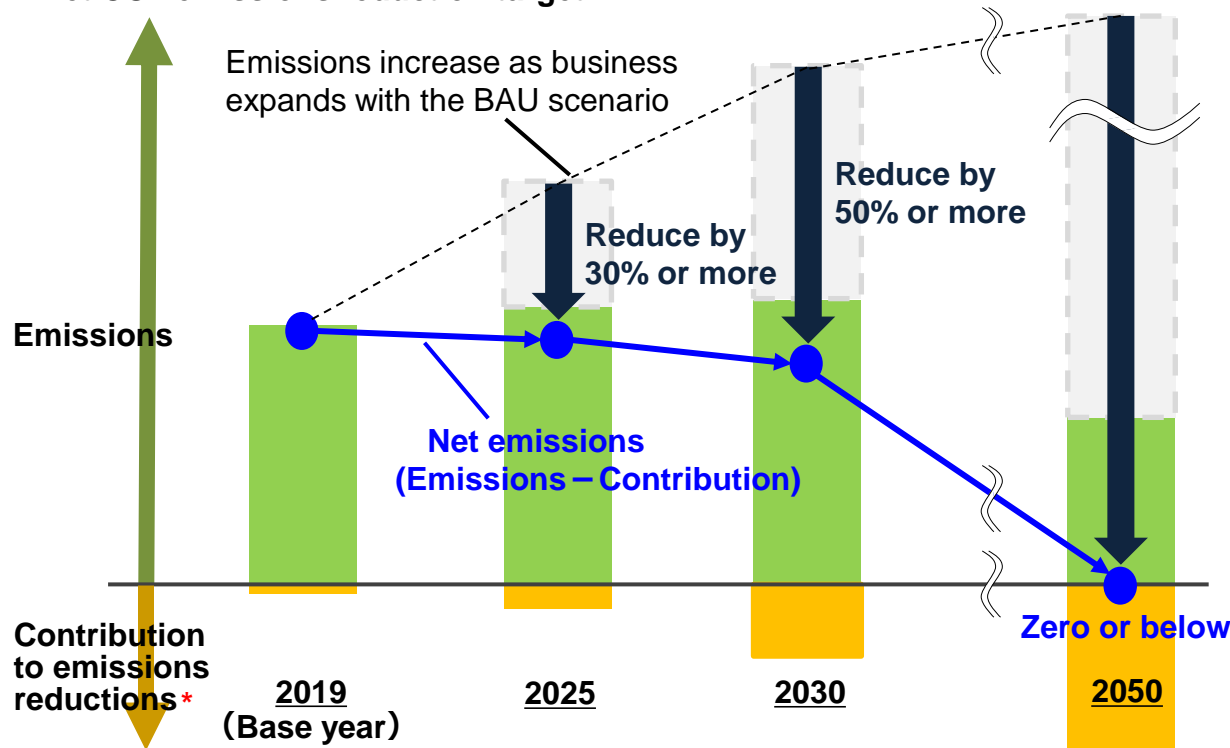


CO2 emissions reduction targets (A major Fusion 25 theme)

Clarify the short- to medium-term actions to reduce greenhouse gas emissions throughout the product lifecycle to achieve carbon neutrality for Daikin's Environmental Vision 2050.

- ✓ With the base year set at 2019, reduce net CO2 emissions* by **30% or more in 2025 and 50% or more in 2030**, compared with emissions without measures (business as usual (BAU))
*Net CO2 emissions = Emissions – Contribution to emissions reductions
- ✓ Fulfilling our social responsibility while leading the industry by expanding sales of heat pump space and water heaters and inverter units, proposing energy-saving solutions, and implementing other environmental initiatives

■ Net CO2 emissions reduction target



*Contribution to emissions reductions

Efforts to reduce CO2 emissions that contribute to society, including promotion of Daikin equipment with lower CO2 emissions (replacing other companies' equipment with higher CO2 emissions), energy creation, and forest conservation activities

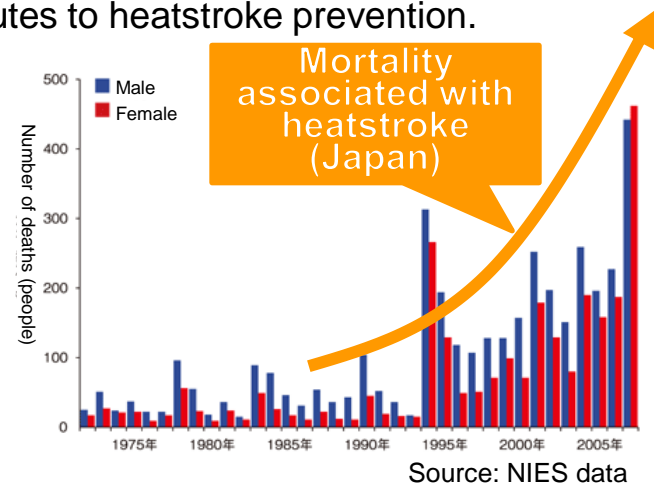
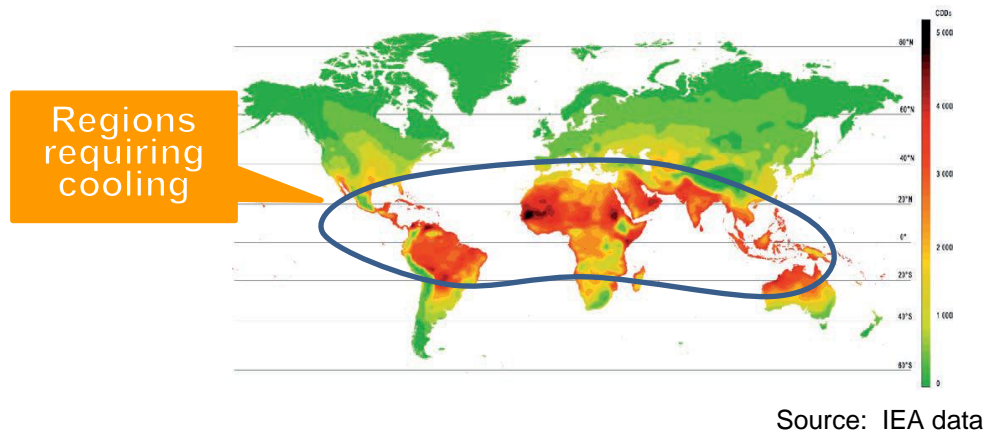
Air conditioning issues for carbon neutrality

Contribution of air conditioning to developing countries

- “Air conditioning was a most important invention for us (Singapore), perhaps one of the signal inventions of history.”
- “It changed the nature of civilization by making development possible in the tropics.” (Former Prime Minister of Singapore Lee Kuan Yew)



- ✓ Work requiring concentration and business activities are some of the tasks that are difficult to perform under conditions of high outdoor air temperature.
- ✓ The number of heatstroke patients increases every year, and heatstroke countermeasures are required for a large population of the world. Air conditioning contributes to heatstroke prevention.



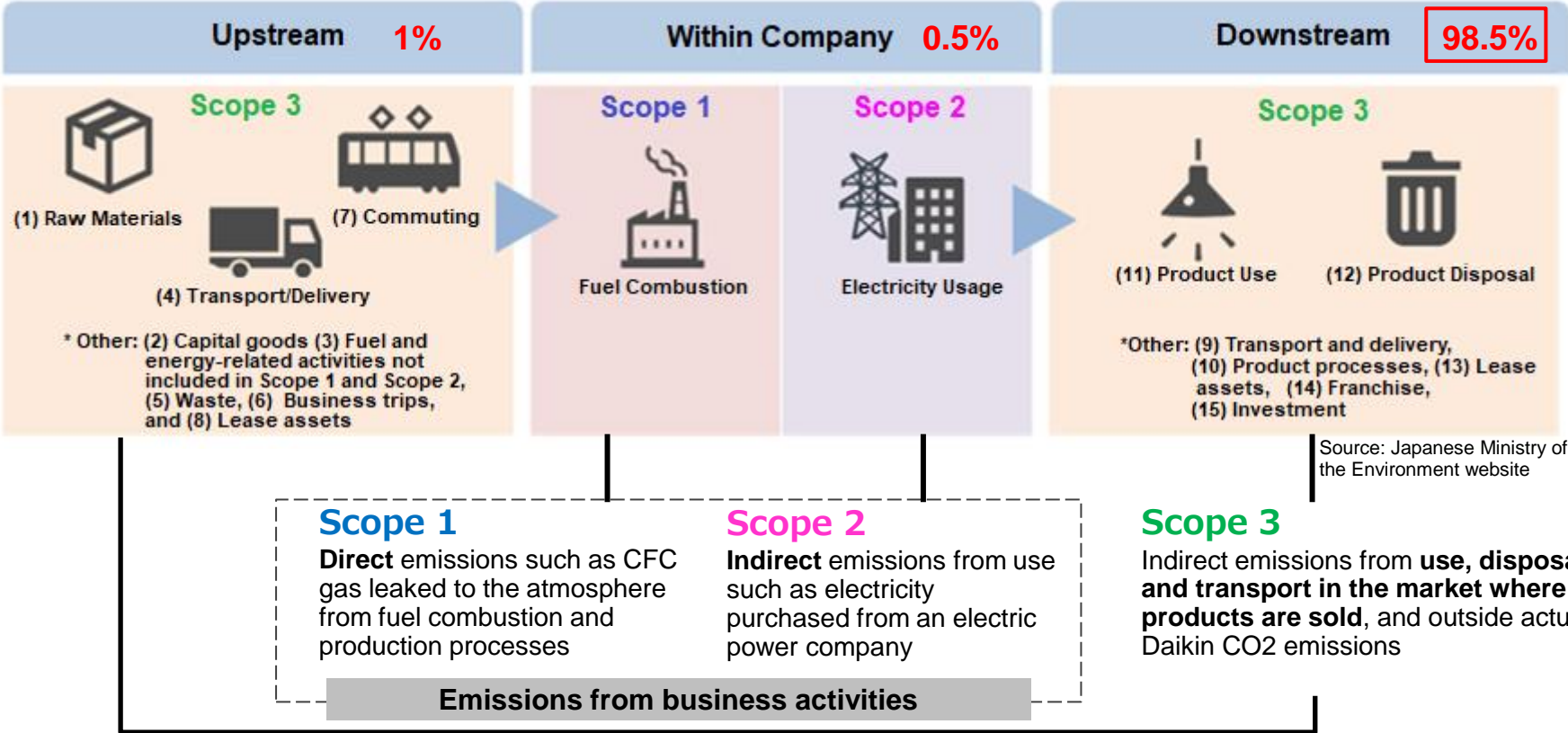
- ✓ Large economic losses caused by sleep disorders.

The number of air conditioning in stock will triple by 2050.

Current situation for CO2 emissions at Daikin

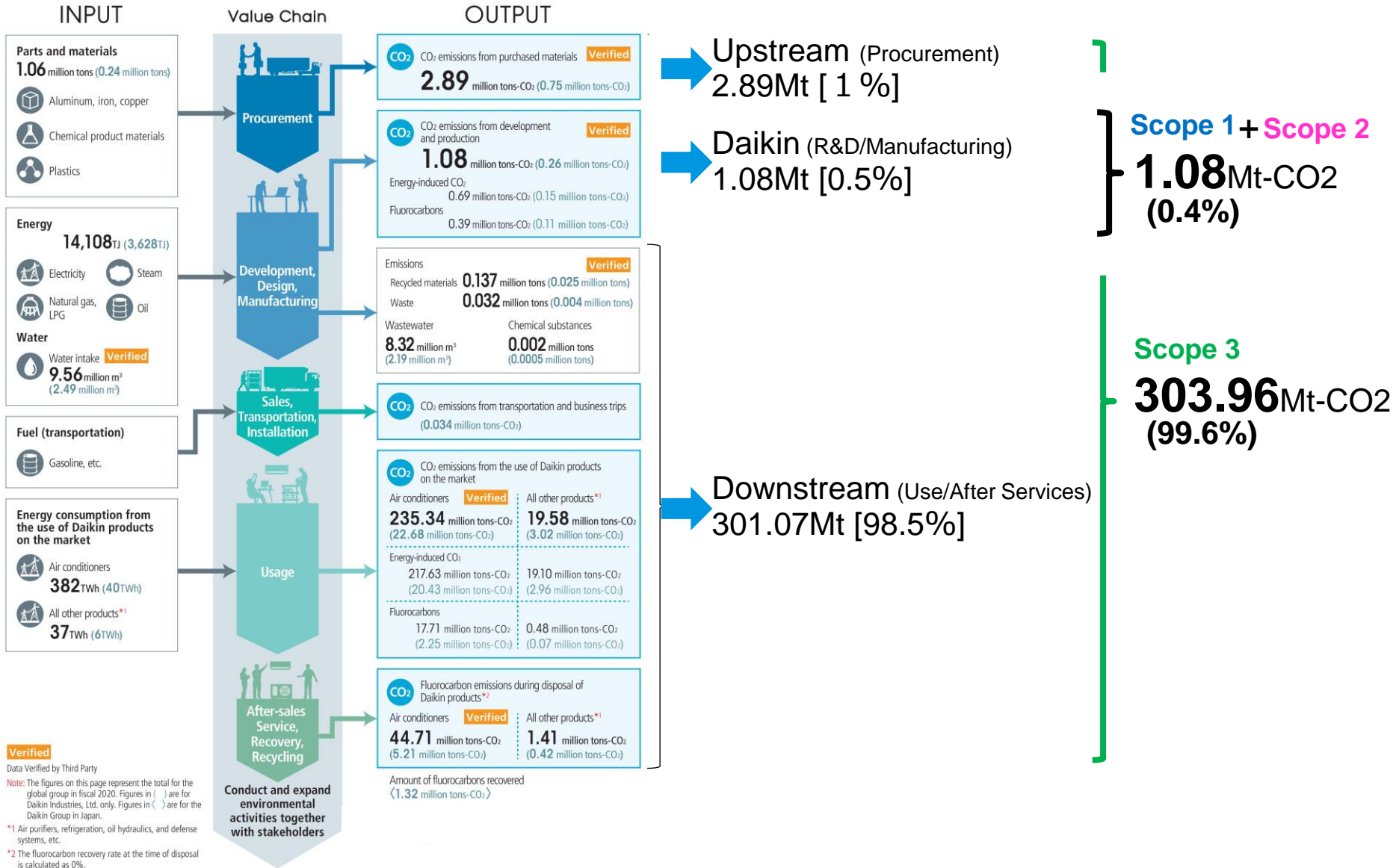
- ✓ Calculations are based on the international standard Greenhouse Gas (GHG) Protocol.
- ✓ **Targets are calculated and set for the entire lifecycle**, not just for the CO2 that is emitted by our business activities.

※ Total reduction targeting all CO2 source categories (Scope 1, 2, 3)



CO2 emissions result

<Lifecycle CO₂ Emissions (FY2020 Results)>

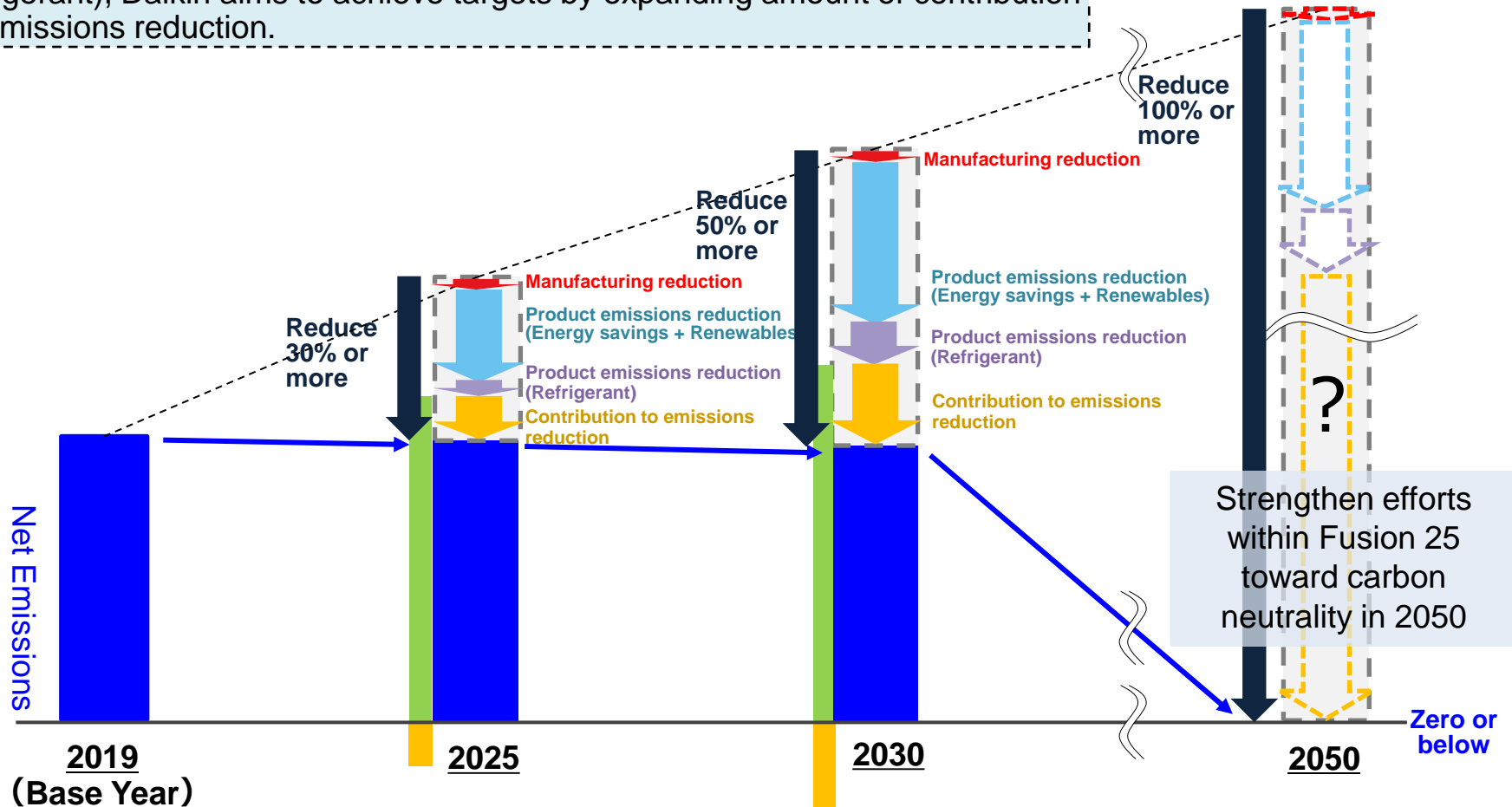


How to reduce net emissions

Emissions increase in outcome (BAU), but not in net emissions

Utilization of renewable energy and construction of energy-efficient buildings will advance in the future, and CO2 emissions from electricity usage are expected to decrease.

Together with measures from the aspect of products (energy savings, low GWP refrigerant), Daikin aims to achieve targets by expanding amount of contribution to emissions reduction.



Daikin's approach for contribution to emissions reduction

Amount of contribution that reduces the overall impact to society by extending beyond the value chain of the company and leads the market with development of products and services that mitigate the environmental impact (as assumed by third-party certification)

✓ **Promotion of Daikin equipment with lower CO2 emissions**

Without Daikin efforts, only the equipment with high emissions of other companies would be counted.

- Conversion of combustion heating to heat pump (trend in Europe in which the industry incorporates offsets)
- Conversion to inverter AC equipment (for areas with a low penetration rate)

✓ **Promotion of R32 AC equipment at other companies**

Some reductions of other companies using R32 are counted since its use has become more widespread by our providing free use of IP.

✓ **Promotion of refrigerant recovery**

For equipment disposal, calculation of emissions amount assumes that all refrigerant is released to the atmosphere and the amount collected by Daikin is the contribution amount.

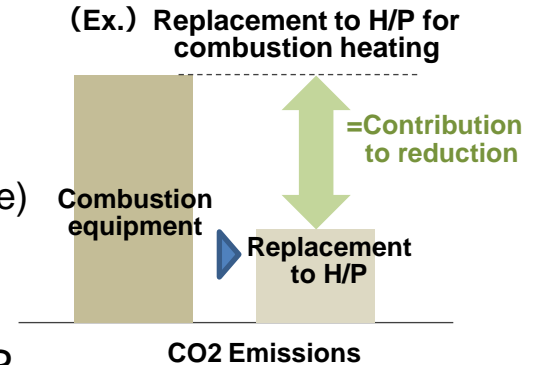
✓ **Initiatives for forest conservation activities**

Contributions to emissions reduction and CO2 absorption by forest conservation activities are counted.

✓ **Initiatives for new environment-related businesses**

Challenge new businesses such as energy creation (micro-hydroelectric power generation: DK-Power) and smart cities to increase the amount of contribution to emissions reduction.

✓ **Challenges for technology themes to recover, store, process, and use CO2**



Specific initiatives in Fusion 25

1) CO2 emissions reductions during manufacturing

Emissions reductions during development and production processes

- ✓ Initiatives to make factories carbon neutral
 - Measures are being implemented for a “Zero Emissions Factory” at the Sakai Plant.

2) Power consumption reductions during product use

Global acceleration of conversion to inverter units to lead other companies in energy savings

- ✓ Inverter ratio RA 75% in 2019 ➔ 98%+ in 2025
 - Inverter ratio for other devices improved 5-15% (*VRV is already 100%)
 - By product volume ratio for Goodman 10% in 2019 ➔ 30% in 2025
 - Inverter units are about 50% more energy efficient than non-inverter units.

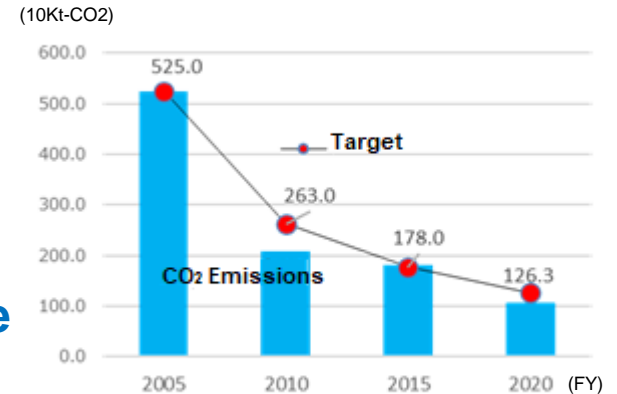
3) Expansion of the heat pump space and water heating business

130.6 billion yen in net sales for 2020 ⇒ 204 billion yen is targeted for 2023

Europe and North America are positioned as priority regions to accelerate conversion of combustion heaters to heat pump space and water heaters

- ✓ Europe: Aim to achieve No.1 share in major countries
 - Establishment of EMEA Development Center (Ghent) in 2023.
- ✓ North America: Accelerate sales of inverter heat pump unitary products (Sales expansion of strategic product FIT)

● CO2 emissions trends in development and production

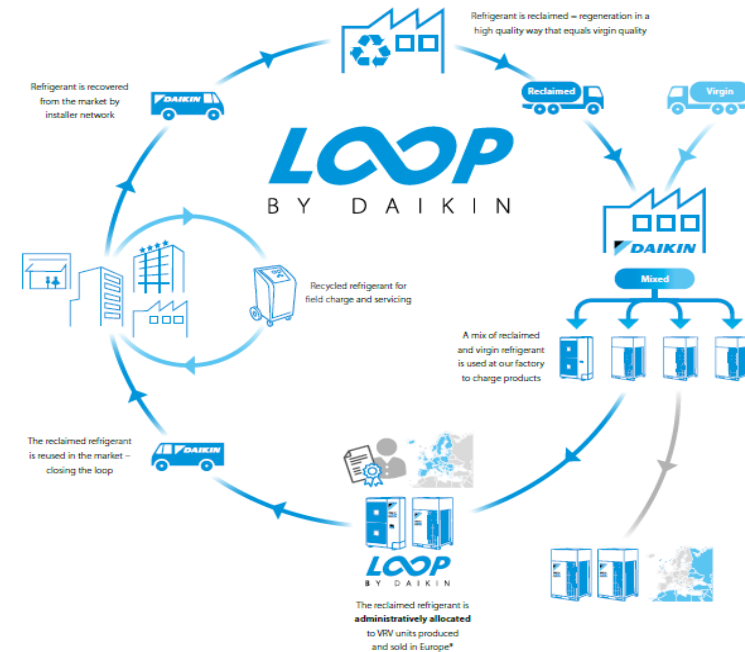


Specific initiatives in Fusion 25

4) Refrigerant initiatives to support the AC business

Advance various measures to lead an environmentally conscious society and industry

- ✓ Globally promote switching to R32.
R32 ratio in the global RA market: 83% in 2019 ➔ 95%+ in 2025
Currently R32 share already exceeds 50% globally, and promotion activities continue as a contribution to emissions reductions.
 - R32 promotion in North America where HFC regulations will be further tightened.
 - ✘ CA refrigerant regulations will require GWP of less than 750, and regulations for total HFC volume will start in the United States in 2022.
- ✓ Establish the refrigerant eco-cycle (Recovery, reclamation, destruction)
 - System creation centered on Japan, Europe, and the United States.
- ✓ Develop low GWP refrigerants
 - Refrigerant development for EV air conditioning
- ✓ Develop new systems and equipment using low GWP refrigerants



VRV L ∞ P utilizing reclaimed R410A in Europe

Specific initiatives in Fusion 25

Initiatives for the future (future contribution to emissions reductions)

5) Challenge to create new environment-related businesses

Challenge themes that can expect contribution to CO₂ emissions reductions

- ✓ Smart cities: Participate in projects in Asia, Europe, Japan, and other global regions
- ✓ Energy creation: Expand product lineup of micro-hydroelectric power generation

■ Smart city project in Singapore



■ Micro-hydroelectric power generation (DK-Power)



6) Technology development to realize a carbon neutral society

Research on leading-edge technologies on CO₂ decomposition, recovery, and reuse Specific measures to obtain those technologies

- ✓ Explore technology on ambient temperature separation, direct recovery, and reuse of CO₂ (collaborative innovation with Doshisha University)
- ✓ Establish a hypothesis for a net zero CO₂ emissions society (collaborative innovation with the University of Tokyo)



II . Daikin's Rulemaking Initiative



- 1. To be a sustainable company**
- 2. De jure and De facto**
 - Refrigerant conversion**

1. To be a sustainable company



- ① **Becoming a sustainable company**
- ② **Learning from the experience in Europe**
- ③ **Proactive rulemaking in China**

① Becoming a sustainable company



Becoming a sustainable company

Our Group Philosophy

“Be a Company that Leads in Applying Environmentally Friendly Practices”

Comprehensive rulemaking initiatives for a company
to expand the business while solving social issues

De-jure

De-facto

Toward Win-Win-Win for Market, Environment and Society

Elements for realizing comprehensive rulemaking for a company

① Important social issues (cause, rationale)

Climate change and global warming mitigation, a theme with a growing momentum towards a solution, is a social issue shared globally.

Condition

② Products and businesses with strength (contributions, achievements)

It is necessary to be able to establish a record in the market with strong development and sales capabilities. Areas that a company can drive the market is necessary.

Strength

③ Company's will and human resources (strategy, driving force)

The impact of the business and products on the environment is significant. Therefore, the will that “we are making the environmental contribution, we are doing the right thing,” is necessary in addition to technical capability and people who can play an active role in negotiations.

Intelligence

② Learning from the experience in Europe



- ✓ **Defensive rulemaking**
 - Refrigerants (F-gas regulation)
- ✓ **Offensive rulemaking**
 - Heat pumps (RES Directive)
 - Inverters (ErP Directive)

Defensive rulemaking – Refrigerants (F-gas regulation)

Advocacy activities to stop the HFC ban which was suddenly adopted by the European Parliament Committee on the Environment.

- In 2004, the EU Parliament began deliberating on F-gas regulation. In the first reading, it was decided not to impose any restrictions on the use of HFCs, regarding them as currently optimal F-gas.



- But in 2005, in second reading of the Committee on the Environment, **an amended regulation was suddenly submitted and approved to almost completely ban the use of HFCs starting from 2010.**



- If it passes the EU plenary session, the HFC ban will be enacted and the business of air conditioning manufacturers without alternative refrigerant technology will become unviable.

“If we don't stop it, our company cannot survive”

In cooperation with JBCE (Japanese Business Council in Europe), Daikin Europe's sales and manufacturing divisions repeatedly explained the role and importance of HFCs in air conditioners to EU lawmakers.



- In the EU plenary session of the second reading, **the HFC ban was voted down.**



Offensive rulemaking – Heat pumps (RES Directive)

Propose rulemaking to use heat pumps, defining energy obtained from air and water as renewable energy.

Europe's 20-20-20 Policy (2005)

20% in 2020 is difficult...
In 2005, the renewable energy ratio was only 8.5%

New renewable energy sources are needed

Daikin's Ideas

Proposal to define energy that can be extracted from air and water by heat pump technology used in air conditioners as a new renewable energy source.

By using heat pump technology, it is possible to obtain four times as much energy as electricity 1.

Offensive rulemaking – Heat pumps (RES Directive)

Realized win-win rulemaking by proposing new energy sources and technologies for the use.

○ Daikin's approach

Approached the EU Parliament and the EU Commission to revise the Directive on the promotion of the use of energy from renewable energy sources.

Challenges:

- Difficult for a company alone to approach
- Difficult to understand from technical theory alone
- Misunderstood as a company's pursuit of profit

Solutions:

- Take actions as an industry
- Expressing both policy and technology in simple expressions
- Support from academic societies, etc.

○ New RES Directive

Fuel Sector	Power Sector	Heating and Cooling Sector
Biofuel	8 types including wind, solar, hydro, geothermal, and bio-waste	Biomass heat, geothermal heat, solar, air heat and water heat

Newly added!

○ Win-win for Europe and Daikin

Europe

Achieved a renewable energy ratio of 20%



Daikin

Obtain incentive for heat pump space and water heater (Altherma)

Offensive rulemaking – Inverters (ErP Directive)

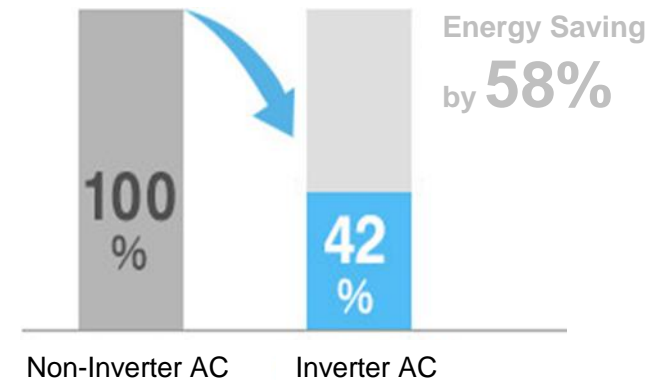
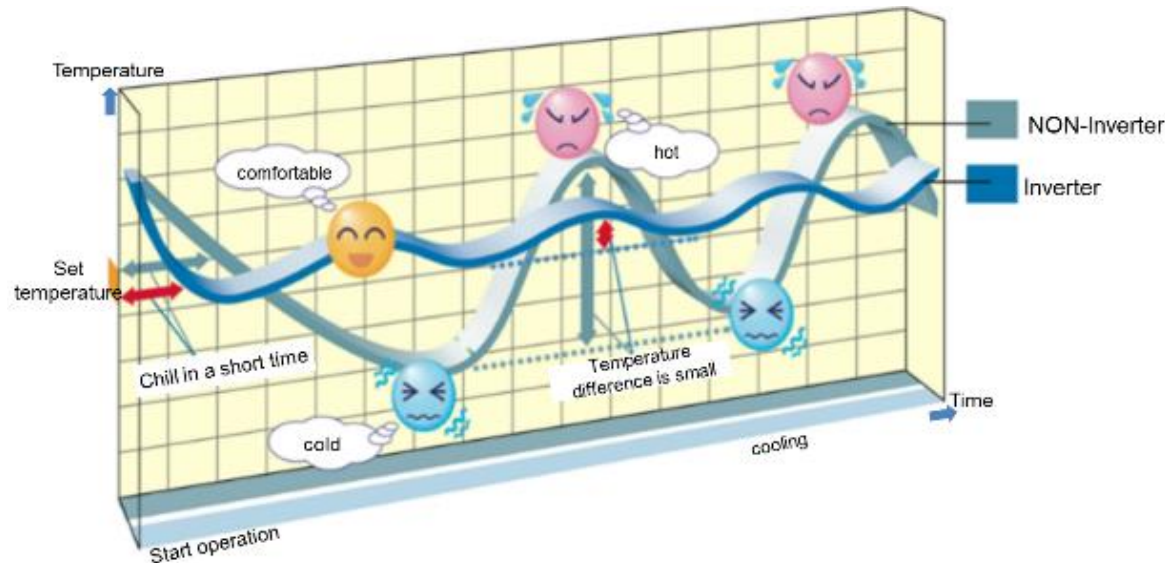
The inverter, which is one of Daikin's strengths, is a technology that controls voltage, current, and frequency to continuously control heating and cooling operations.

<Inverter>

Since the rotation speed of the compressor, the heart of the air conditioner, can be operated continuously, it is possible, for example, to operate at high power to cool the room quickly when it is hot, and then at low power to keep the room temperature cool, realizing efficient control with saved energy.

<Non inverter>

Since the compressor operation can only be simply turned on and off, the difference in room temperature becomes large. In addition, a lot of energy is required when the compressor is started, so the energy consumption is large.



Offensive rulemaking – Inverters (ErP Directive)

To create a market where inverter technology can spread

- **What is the ErP Directive?**

An EU directive that mandates environmentally friendly design (eco-design) for energy-using products.

- Air conditioners are also covered. Environmentally friendly design is required



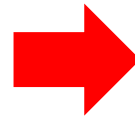
- **What is environmentally friendly design of air conditioners?**

- Adoption of inverter technology



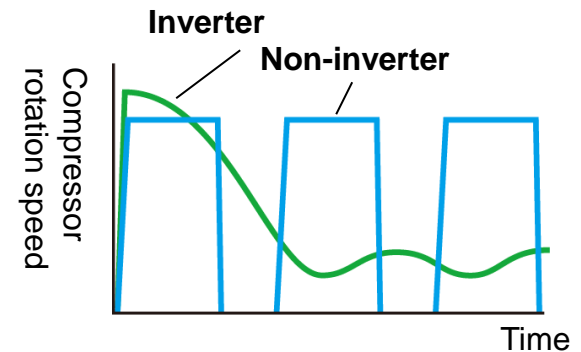
- **To instill the inverter technology**

- Changes in energy-efficiency performance evaluation standards
- From Coefficient of Performance (COP) to Annual Performance Factor (APF)

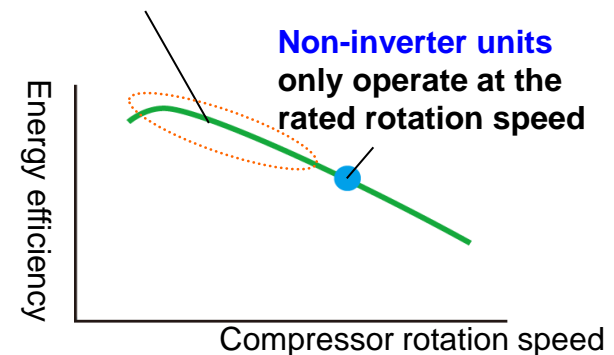


By being involved from the start of the technical committee and providing unbiased technical data, the foundation was created for our opinions to be accepted

From Coefficient of Performance (COP) to Annual Performance Factor (APF)



Inverter units operate at a low speed range with high efficiency at low loads



Non-inverter units only operate at the rated rotation speed

③ Offensive rulemaking in China



- ✓ **Energy policy change in China**
 - Energy efficiency labeling system
- ✓ **Alliance with Chinese company**
 - Open strategy

Policy change in China

Changes in China's Medium-Term Plan

- **The 10th Five-Year Plan (2001-2005)**

Development is the No.1 priority

⇒ **High economic growth orientation**

- **The 11th Five-Year Plan (2006-2010)**

Shifting the focus to building an economy and society capable of sustainable development

Developing a recycle-oriented economy and building a resource-saving and environmentally friendly society

⇒ **Full-scale expansion of measures against environmental issues**

- **The 12th Five-Year Plan (2011-2015)**

Promote structural reforms to create an economy and society capable of sustainable development

- Solving environmental problems that hinder sustainable development
- Solving environmental problems that damage the health of the public

⇒ **Further enhancement of environmental targets**

Two pillars of energy efficiency policy ("Management system" and "Incentive policy")

Management System:

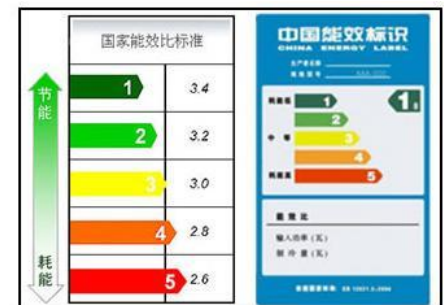
- Energy efficiency labeling system
- System to drive out high energy consumption product

Incentive Policies:

- Label certification system for energy efficient products
- Government purchasing system for energy efficient products
- Tax incentives for energy efficient products

The Chinese government has made a major shift to promote the environmental policy

■ Example of energy efficiency label for air conditioners



Turning the trend toward energy efficiency into a business opportunity

Policy

- Take advantage of energy efficiency regulations to disseminate and expand inverter products globally (80%: Non-inverter in China ('07))
- Realize global No.1 in air conditioning (Company-wide policy in 2008)

Opportunity to disseminate inverter technology which is Daikin's strength

Environmental contribution
Promote energy efficiency in the global air conditioning market

Business opportunity
Full-scale entry into a dissemination zone

Expanding inverter products to China, the world's largest air conditioning market

Initiatives of the technical support program

- Explaining the benefits of inverter technology to the National Development and Reform Commission through the Institute of Energy Research, Kyoto University, and Ritsumeikan University, and encouraging the spread of inverter products
- Approaching the World Business Council for the establishment of a subcommittee on inverter and heat pumps, and participating in it and subsequent international standardization support projects

Projects to Support International Standardization

Full cooperation to INOTEK project (Project related to international standardization of Annual Performance Factor of air conditioners subsidized by METI)

	FY2011	FY2012	FY2013
Project	Subsidy to promote Asian standard certification promotion project	Support and survey project on building infrastructure to promote energy efficiency	
	Performance evaluation project of RAC (Project to promote international standardization of Annual Performance Factor)	Support and survey project on international standardization of RAC and refrigeration	
Operator	IS-INOTEK (with JRAIA's full corporation)	<ul style="list-style-type: none"> • IS-INOTEK (with full cooperation from the Japan Refrigeration and Air Conditioning Industry Association (JRAIA)) • The Japan Electrical Manufacturer's Association (JEMA) 	
Overview of the Project	<ul style="list-style-type: none"> (1) Educational activities to promote understanding and dissemination of the new evaluation method of ISO Annual Performance Factor (APF) (2) Support for improving the certification capability of testing organizations in each country in accordance with the new ISO evaluation standards (3) Establishment of cooperative relationship with testing organizations in Asian countries by holding international workshops 	<ul style="list-style-type: none"> (1) Holding training workshops to support the introduction and incorporation of the new ISO Annual Performance Factor (APF) evaluation method into national standards in each country (2) Implementation of specific support to improve the capability of testing organizations in each country for the new ISO evaluation standards (testing procedures, efficiency calculation software) (3) Holding of international workshops to confirm the progress and the level of capability improvement 	
Manufacturers participated	Panasonic, Mitsubishi Electric, Sharp, Toshiba Career, Daikin		5 companies on the left + Hitachi Appliances
Budget of project (Million Yen)[AC]	20	77	76 (Budget)

[Result of activities]

- ✓ Countries are beginning to understand the effectiveness of the new international standards proposed by Japan and are positively considering their introduction.
- ✓ Through international workshops, energy efficiency policy organizations and standardization organizations have become more interested in evaluating the capabilities of their own test organizations, and have begun to actively participate in technical training sessions in Japan.
- ✓ Moreover, through this project, horizontal cooperation among related organizations in each country is progressing.

Purpose of the alliance with Gree

In February 2009, an alliance with Gree Electric Appliances was formed as a partner to expand business opportunities and jointly developed energy efficient inverter room air conditioners.

Purpose of the alliance between the two companies (Agreement)

- Air conditioners consume a large amount of energy, and it is the social responsibility of air conditioning manufacturers to reduce the environmental impact
- Against the backdrop of tightening energy efficiency regulations around the world, **the promotion of inverter products expands business opportunities for both companies**

Daikin's strengths



Supporting the No.1 market share of inverter products by

- Energy-saving technology
- High quality technology

February 18, 2009 in Zhuhai City
Announcement of partnership
signing ceremony held



Gree's strengths

Supporting the No.1 market share of non-inverter products by

- Low cost
- Mass production capacity



Promoting inverter air conditioners globally, including in China, to address environmental issues

“Decided to form an alliance to speed up the process.”

Advantages of the alliance and what we focused on

Provision of Daikin's core technology and inverter technology through jointly developed electrical components and compressors.

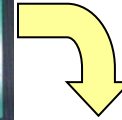
Example: Inverter ratio in the Chinese market

Before alliance: approx. 8% → After alliance (2018): approx. 76%
Further increase is expected



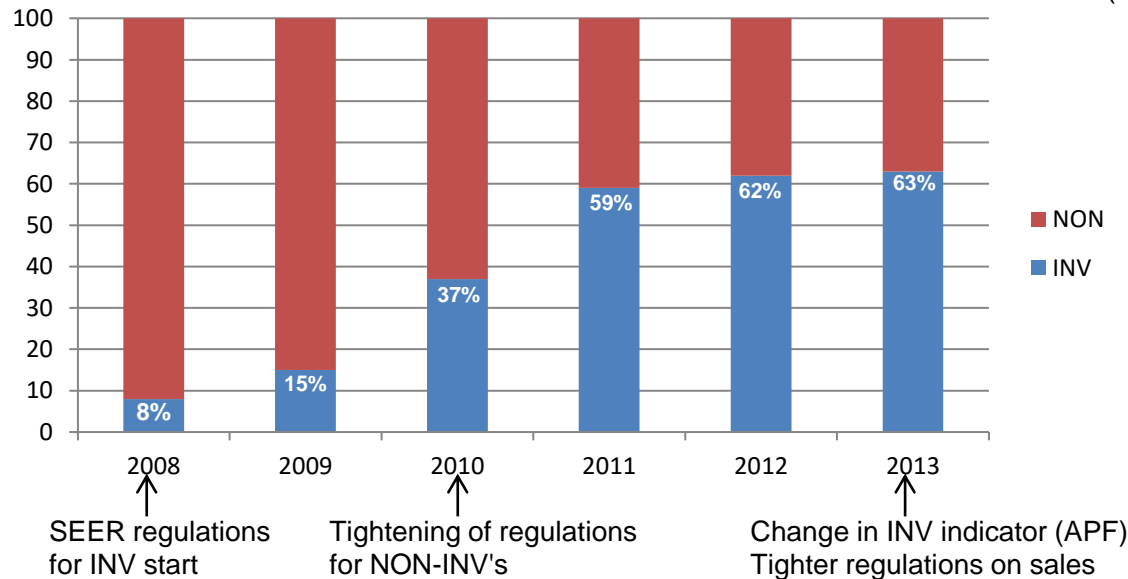
(inverter circuit)

(Control waveform according to the load)



(Compressor)

【Inverter Ratio of Room Air Conditioners in the Chinese Market】



"Inverter technology"
has become the global
standard technology for
energy efficiency!

Seeing changes in energy efficiency regulations around the world as a business opportunity, we consider further expansion of inverter air conditioners, which is one of our strengths

Initiatives to disseminate inverters in other countries

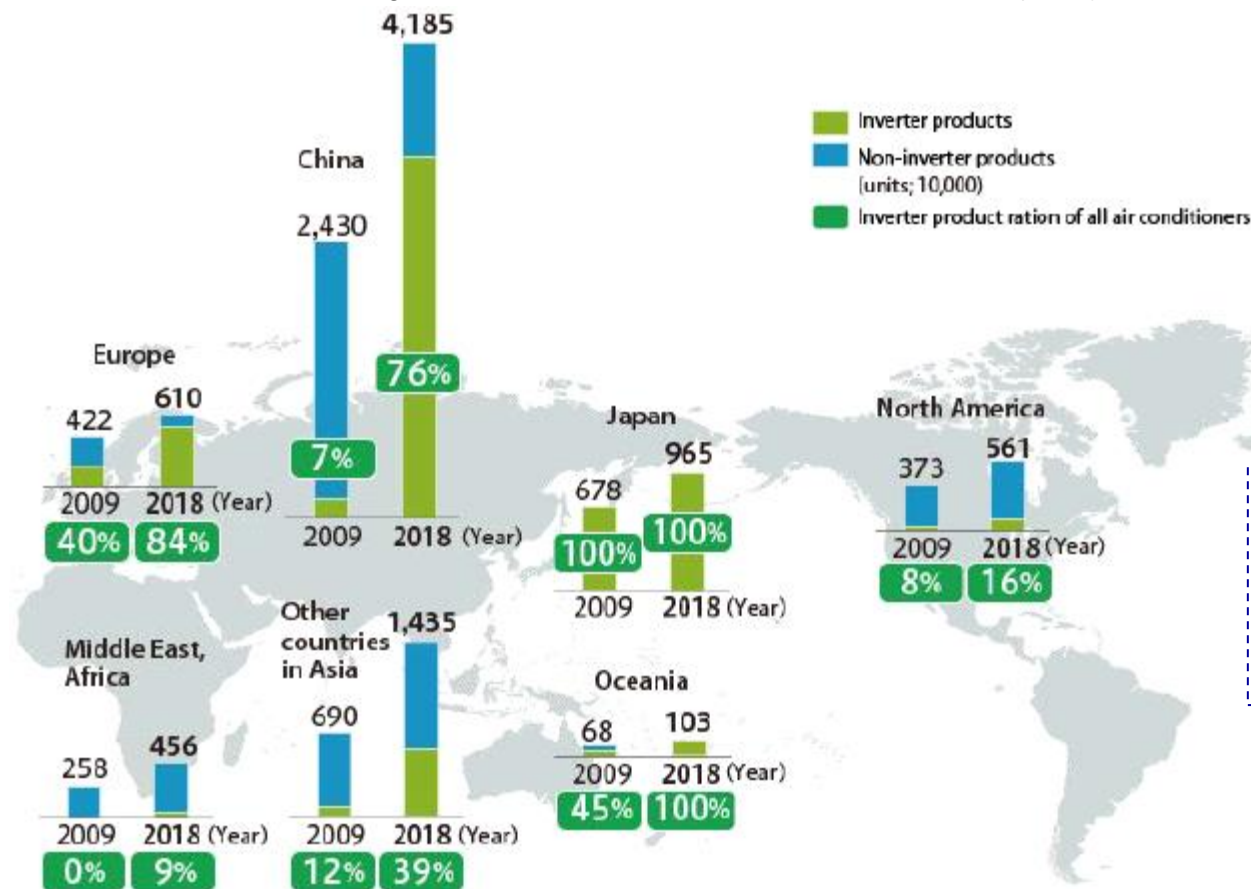
- In addition to China, we have been promoting inverters in India, Brazil, the Middle East, and ASEAN countries.
- Intergovernmental dialogue is also an important factor in these countries, so demonstration tests and seminars are conducted through research projects by Ministry of Economy, Trade and Industry and JICA projects. We provide information on inverter technology and support the revision of the labeling system.

(Specific actions be discussed later as supports to developing countries)

[Reference] Inverter products as percentage of all residential air conditioners worldwide

- The energy efficiency indicator has changed to annual performance factor (APF), and the trend is to eliminate non inverters due to stricter regulations.
- As indicators there are **SEER** (Seasonal Energy Efficiency Ratio, mainly in the US), **ErP** (Energy-related Products Directive, EU), **APF** (established in Japan) and others. APF has been adopted as an international standard (ISO16358) through the efforts by the Ministry of Economy, Trade and Industry. Support for its introduction to other countries is being promoted. Japanese technology is becoming the mainstream of the global market.

Inverter Products as Percentage of All Residential Air Conditioners Worldwide (2018)



Note: Residential air conditioners: Ductless air conditioners other than window and portable type products. Only in North America does the category include ducted air conditioners for residential use.

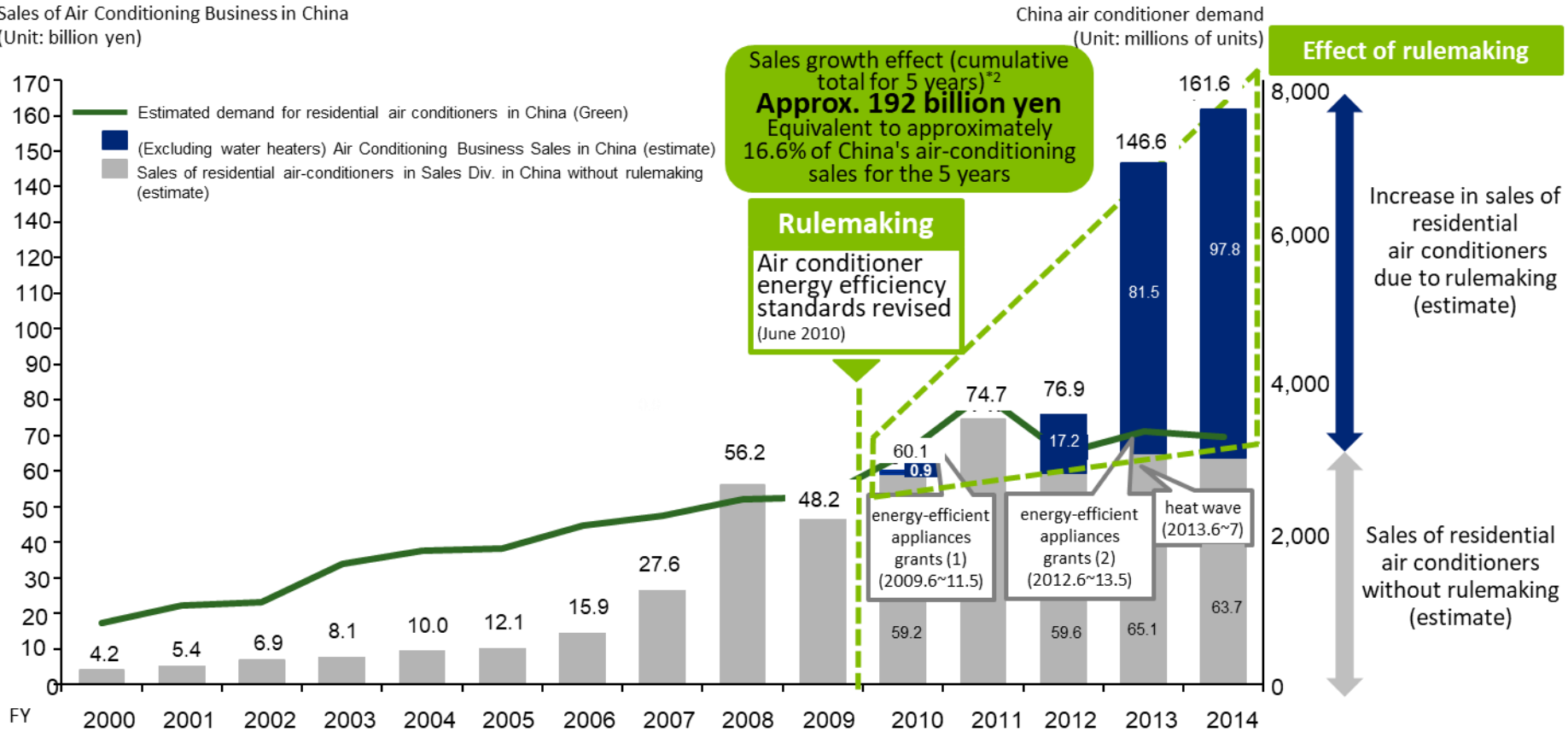
Source: Compiled by Daikin based on data from the Japan Refrigeration and Air Conditioning Industries Association.

[Reference] Business impact of rulemaking

Revision of air conditioner energy efficiency standards by Daikin in China

Daikin's Sales of Residential Air Conditioner Business in China*1

Sales of Air Conditioning Business in China
(Unit: billion yen)




*1 Based on interviews with Daikin, the effect of rulemaking on residential air conditioner sales is estimated using the sales ratio of commercial and residential air conditioners in the air conditioning business in China.

*2 Assuming that the effect of the rulemaking started to appear in June 2010, when the energy efficiency standard for non-inverter air conditioners was strengthened, the effect of the rulemaking for the five years from 2010 to 2014 is calculated. In addition, the effect of rulemaking from 2010 onwards was calculated based on the growth rate of the residential air conditioner market using the estimated demand for residential air conditioners in China. The difference from the actual result was calculated as the effect of rulemaking. (The actual result for 2011 was approximately 5.2 billion yen lower than the estimation calculated using the above growth rate due to the impact of subsidies. Therefore, it is not shown in the graph above, but is included in the results of the five-year effect calculation.)

Source: Deloitte Tohmtsu, based on Daikin HP and Japan Refrigeration and Air Conditioning Industry Association air conditioning business volume estimates

2. De jure and De facto – Refrigerant conversion



- ① **Social needs for global warming mitigation**
- ② **Approaches to international standards**
- ③ **Approaches to developing countries**

① Social needs for global warming mitigation

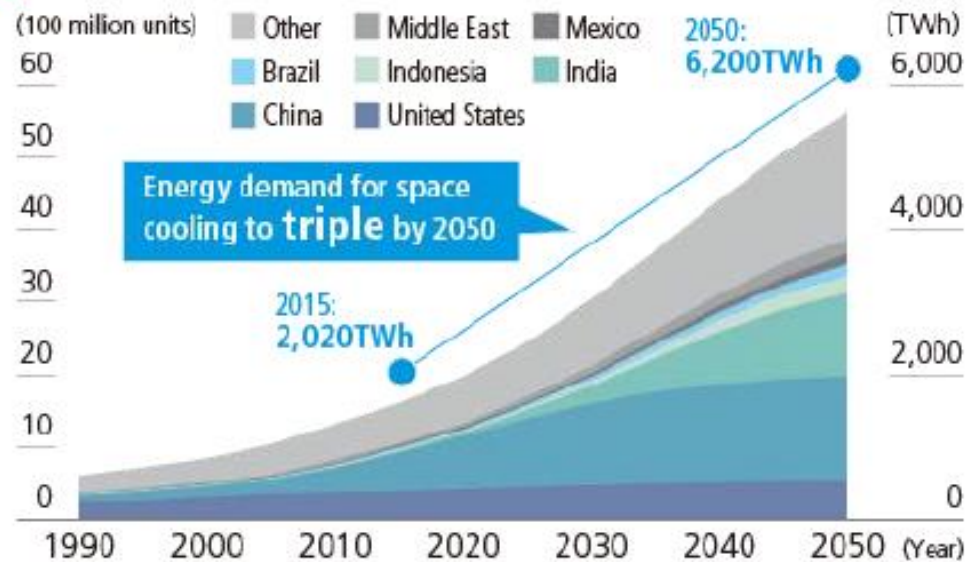


- ✓ **Current status of global warming and developments in the world**
- ✓ **Sooner the Better**

CO2 Emissions from air conditioners

With regard to climate change, it is assumed that the global temperature will rise due to the increase in greenhouse gas emissions. (WMO: World Meteorological Organization)
Challenges of air conditioners, one of the factors of the issue, needs to be addressed.

Worldwide Air Conditioner Stock (Number of Units) and Electricity Demand



Note: Graph figures compiled by Daikin based on IEA The Future of Cooling

Estimates are for air conditioning demand to rise rapidly and for energy demand for space cooling to triple by 2050.

Daikin is committed to reducing CO2 emissions from air conditioners

Paris Agreement and Montreal Protocol

		CFCs (ODS with significant greenhouse effect)	HCFCs (ODS with significant greenhouse effect)	HFCs (Non-ODS with significant greenhouse effect)
Montreal Protocol (Production and consumption control) entry regulation	Developed country	○ (phased out by 1996)	○ (phased out by 2020)	Kigali Amendment Agreement on HFC Phase Down
	Developing country	○ (phased out by 2010)	○ (phased out by 2030)	
Paris Agreement (Emission control) exit regulation	Developed country	-	-	○ (partially)
	Developing country	-	-	From now on

Originally, HFCs were covered by the Kyoto Protocol and not by the Montreal Protocol. However, in 2016, the Montreal Protocol, which has been successful in reducing CFCs and HCFCs, adopted “Kigali Amendment” which enable the Montreal Protocol to take the initiative to phase down HFC in GWP value. **HFCs are now regulated under both the Paris Agreement (exit regulation) and the Montreal Protocol (entry regulation).**

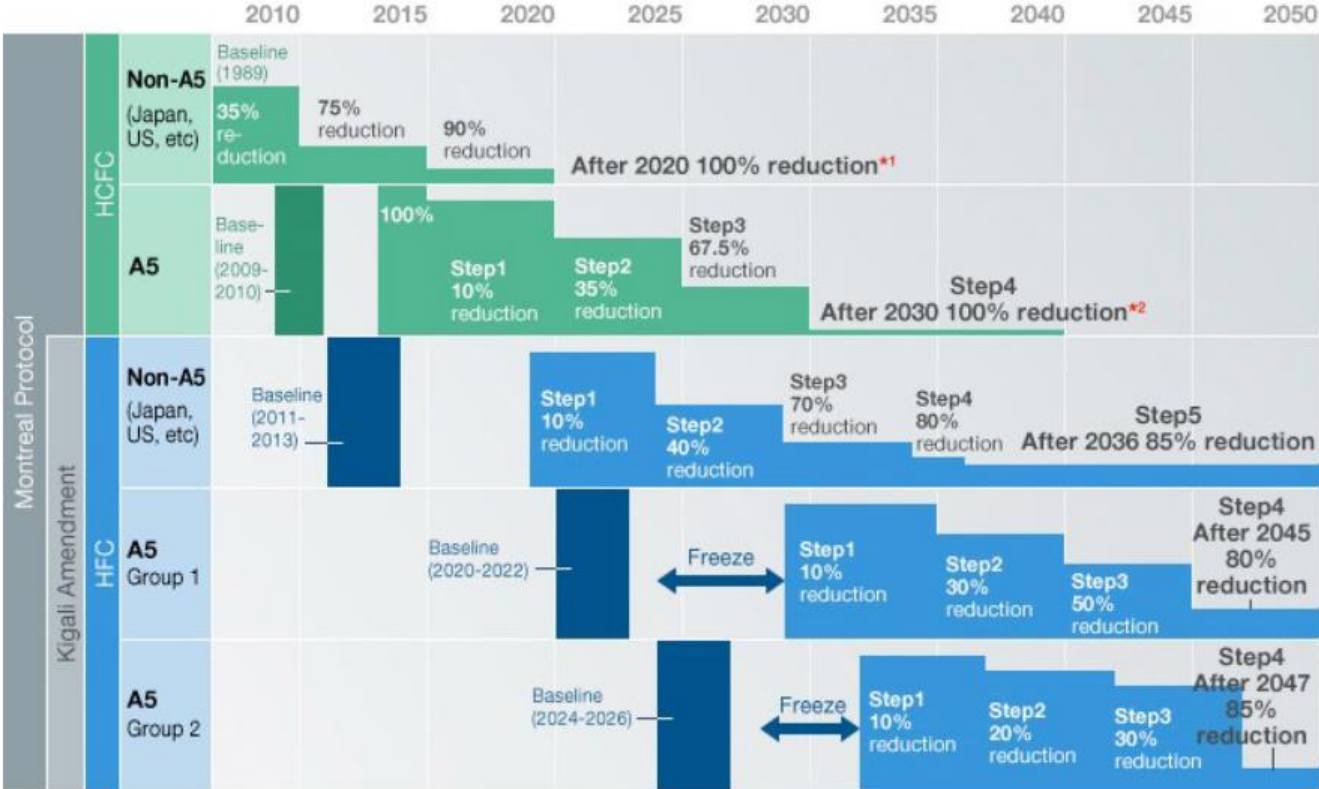
Montreal Protocol and Kigali Amendment

The Montreal Protocol

Adopted in 1987 and entered into force in 1989. Based on the Vienna Convention, it aims to identify substances that may deplete the ozone layer and to regulate the production, consumption, and trade of such substances. Specifically, it stipulates regulatory measures such as reduction schedules to curb emissions into the environment of CFCs and other substances that cause stratospheric ozone depletion.

The Kigali Amendment (2016)

The Montreal Protocol was revised in Kigali in 2016. HCFC alternatives (HFCs, etc.) will be required to phase down production and consumption in GWP, control trade, and report periodically on production and import/export volumes. By regulating HFCs, etc., which have a large impact on global warming, the Amendment aims to limit the rise in temperature by 0.5°C by 2100.

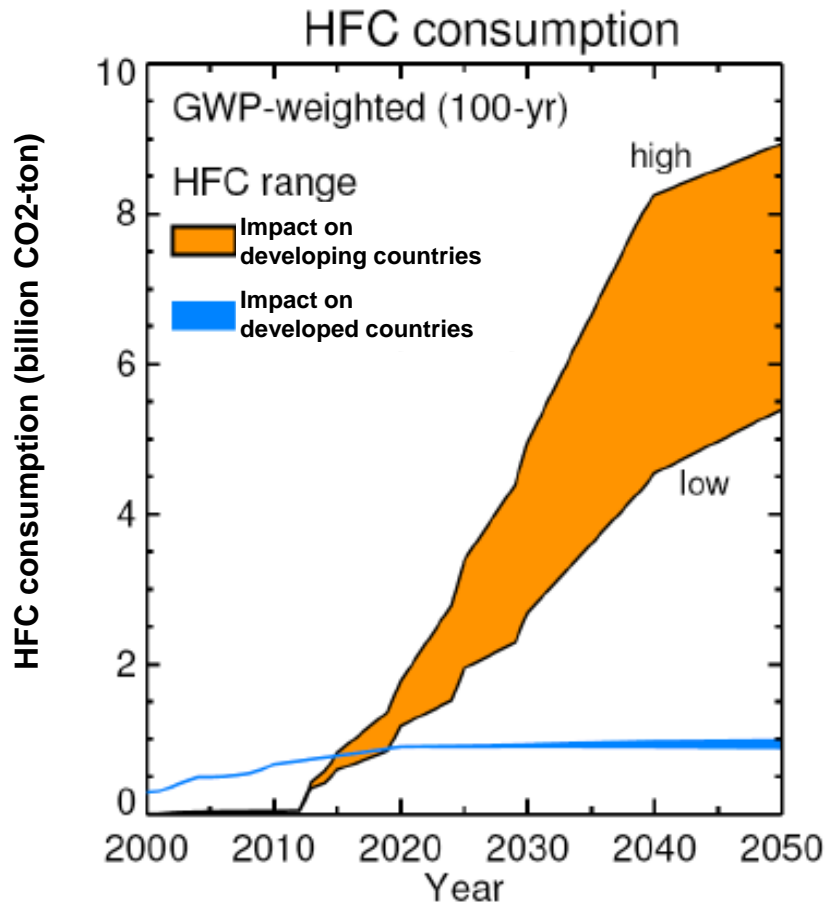


*1 During 2020-2030, allowance of 0.5% of HCFCs for servicing air conditioning or refrigeration equipment

*2 During 2030-2040, allowance of 2.5% average of HCFCs for servicing air conditioning or refrigeration equipment.

Factors to consider when selecting the optimal refrigerant

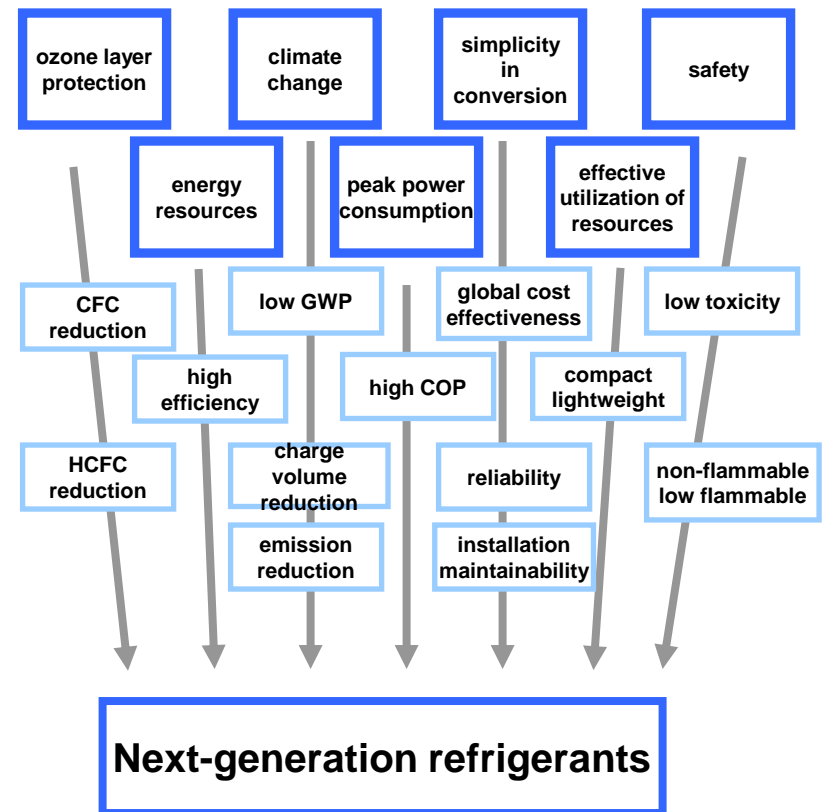
In emerging countries where HCFCs are phasing out and HFC consumption will increase significantly in the future, development and dissemination of lower GWP refrigerants are important.



Source: WMO (World Meteorological Organization) library, PNAS paper Velders et al 2009

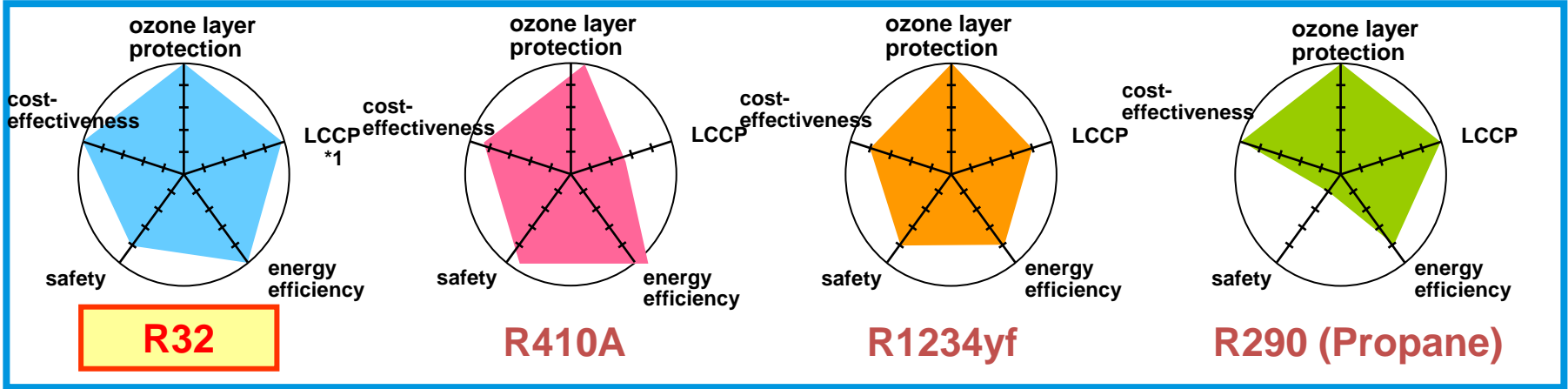
Evaluation factors required for refrigerant selection

◆ There are various evaluation factors necessary for the selection of a refrigerant. It is important to select it based on a comprehensive evaluation.

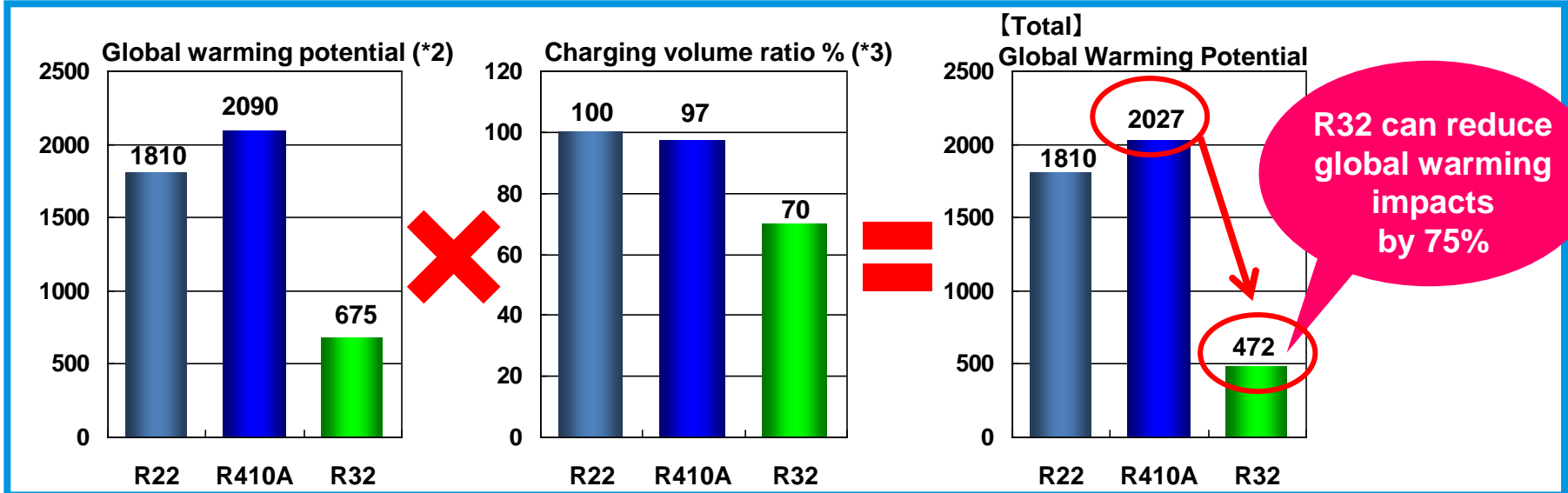


Sooner the Better – Daikin’s Policy

Sooner the Better -R32, the most balanced refrigerant available today



(*1) LCCP: (Life Cycle Climate Performance)



(*2) GWP values are based on the 4th IPCC AR (*3) Theoretical values assuming the same performance as R22 products

② Approaches to international standards



- ✓ **Why was it necessary?**
- ✓ **Daikin's challenge**
- ✓ **Daikin's actions**

Why was standardization necessary?

R32 that Daikin is promoting is **mildly flammable** but it has been proved there is no danger under the proper handling. **As of 1998**, then global standard & regulation only had “**flammable**” or “**non-flammable**” classification, therefore, the use of **mildly flammable refrigerant was unrealistic considering that the requirements were the same as hydrogen and propane.**

Growing call for avoiding high-GWP refrigerants to mitigate the global warming.

Social challenges

However, most of the low-GWP refrigerants are mildly flammable. They cannot be used.

Barriers in the real world

What kind of action is necessary to make them usable?

Looking for solutions

Recognition of mild flammability and dissemination of proper handling are necessary.

Aim for safe penetration through establishment of new category and requirements of proper handling in the international standard.

International standard as a tool

Daikin's challenge – Target

Previous category			New category (target)			
	A Low toxicity	B High toxicity		A	B	
Higher Flammability	3	3	➔	Higher Flammability	3	3
Flammable	2	2		Flammable	2	2
No Flame Propagation	1	1		Lower Flammability (Mild Flammability)	2L	2L
				No Flame Propagation	1	1

Establishing new category of 2L and requirements to respond to the mild flammability in ISO and IEC

Daikin's actions

Specific actions: (from 1997 - present)

- Successfully established new flammability category A2L in ASHRAE 34 (2010), the U.S. standard for refrigerant safety classification. A new class was also established in ISO 817 (2014), an international standard.
- Proper handling of A2L was established by revising ISO5149 (2014).
- IEC60335-2-40 (2013,2018), standards for safety of electricity, was revised for safe use of A2L in equipment.
- Analyzed behavior in refrigerant leakage and proposed a formula for calculating the allowable charging amount. Despite the opposition from U.S. manufacturers, working with European members, successfully revised standards for safe use of A2L refrigerants with calm and persistent discussions to suppress A2L opponents.



Daikin's contribution to the global conversion of the refrigerants was highly evaluated. An employee who led this initiative received the Industrial Standardization Award.

Received the award of Minister of Economy, Trade and Industry of Industrial Standardization Business Awards 2020

This award recognizes individuals and organizations that have made outstanding achievements in standardization activities, such as the development of international standards by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC), and the development of national standards (JIS).

The numbers of the recipients of 2020 awards are as follows.

Prime Minister's award: 1 person

Award of Minister of Economy, Trade and Industry: 22 people and 3 organizations

Director-General of the Industrial Technology and Environment

Bureau Award: 30 people and 2 organizations



A2L was newly established

	Low Toxicity	High Toxicity
Higher flammability	A3	B3
Flammable	A2	B2
Low (mild) Flammability	A2L	B2L
No flame propagation	A1	B1



ASHRAE 34 Safety Classification

ISO817 Safety Classification

ISO5149 Safe Installation

IEC60335-2-40 Safety of Equipment

National standards and regulations

Further revision is on going

③ Approaches to developing countries



- ✓ **Support for developing countries**
- ✓ **Patent release**
- ✓ **Worldwide dissemination at present**

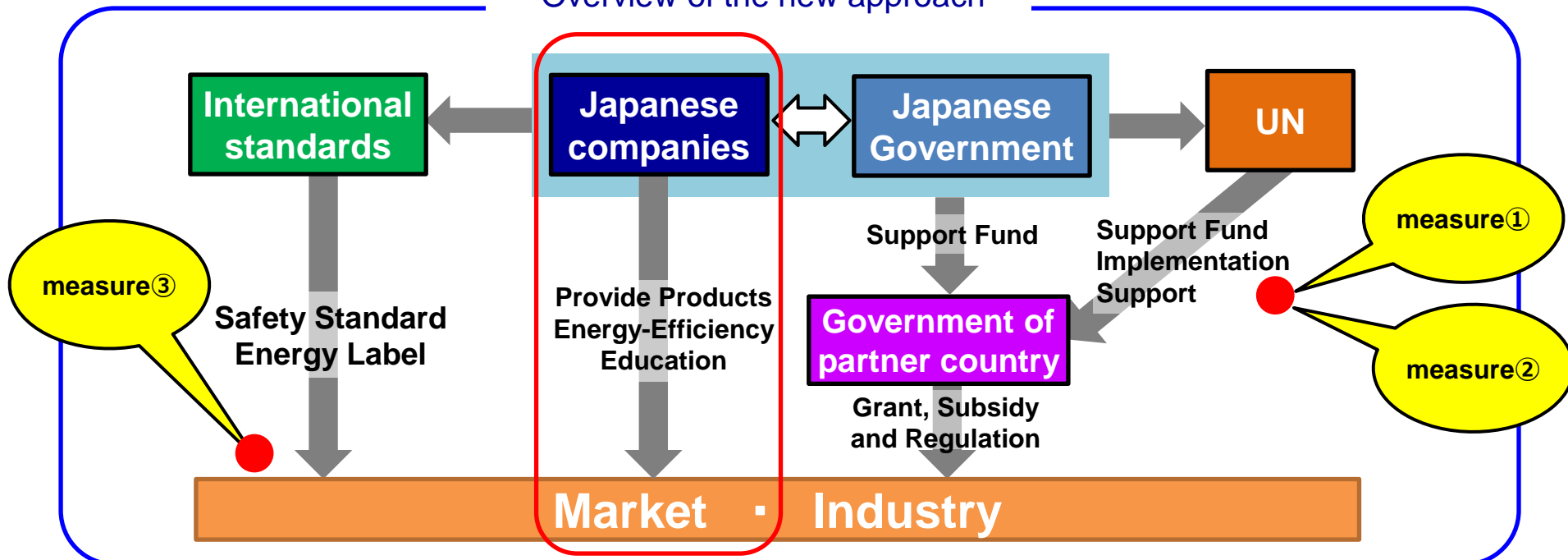
Approaches to developing countries

Involving the government of partner country, Japanese government, and international institutions

Three measures to work on both country and market

- ① **Policy proposal to country** ⇒ **Promote conversion to refrigerants with high environmental performance**
- ② **Technical support to local industry** ⇒ **Understanding of easiness of conversion**
- ③ **Establishment of standard for safety and performance** ⇒ **Safety improvement**

Overview of the new approach



Patent release – Toward the expansion of R32

Contribute to reducing the global warming impact of refrigerants by global promotion and expansion of R32, with Japan's environmental technologies at the core.

To disseminate environmental technology which uses R32 from Japan and to encourage the adoption of R32 globally, Daikin began offering 93 patents related to the manufacture and sales of air conditioners that use R32 free of charge. In 2019, we globally pledged to offer free access to patents which have been applied for since 2011.

- September 2011: offer free access to companies in emerging countries
 - To accelerate efforts to phase out ozone-depleting refrigerants
- September 2015: offer free access to companies in developed countries
 - To cope with global warming, developed countries also need to urgently convert to refrigerants with low global warming impacts
- July 2019: pledged to offer free access globally
 - offer free access to patents related to the manufacture and sales of air conditioners that use R32, which have been applied for since 2011.

Curbing global warming on a global scale

Various initiatives for dissemination

- **India**

- Demonstration tests, training, and policy proposals for the dissemination of R32 inverter air conditioners through METI projects
⇒ Contribution to the dissemination of R32. A labeling system that is advantageous to inverters has been established.

- **Saudi Arabia**

- Demonstration tests for the dissemination of R32 inverter air conditioners through METI projects
⇒ The understanding of R32 is spreading. A labeling system that is advantageous to inverters has been established.

- **Thailand**

- Support for R32 conversion through the Montreal Fund at the request of the Thai government
⇒ Contribution to the dissemination of R32.

- **Mexico/Brazil**

- Demonstration tests, training, and policy proposals for the dissemination of R32 inverter air conditioners through JICA projects
⇒ R32 is spreading. A labeling system that is advantageous to inverters has been established (Brazil).

In ASEAN, we are working with the Japan Refrigeration and Air Conditioning Industry Association (JRAIA) to promote energy efficiency performance evaluation standards.



R32 units is penetrated (RA)

- Daikin has sold approx. 33 million RA units in more than 100 countries & regions
- Global total approx. 160 million R32 RA units has been sold (estimation)
- Approx. 260 million tons of CO2 could be reduced by R32 conversion (estimation)

* In case of 1.3kg (including extra charging when installation) of refrigerant charge.

Refrigerant charge volume reduction and improvement of energy efficiency derived from R32 use are not considered.

Daikin's Sales by Countries





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